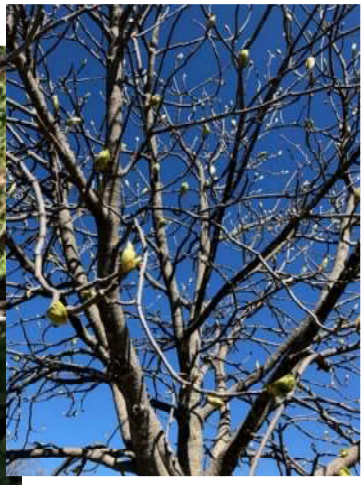
MORRISON HERSHFIELD

FINAL REPORT

Ecological Asset Review

First Unitarian Church



Presented to:

The Planning Committee

First Unitarian Church
30 Cleary Ave, Ottawa, ON K2A 4A1

Report No. 1 2100557.ON January 8, 2021

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1. INTRODUCTION

The First Unitarian Church commissioned Morrison Hershfield (MH) to complete a review of the existing ecological assets on their 7-acre parcel on Cleary Avenue near Richmond Road owned by the First Unitarian Congregation of Ottawa, City of Ottawa, ON (the property, refer to **Figure 2**).

This review describes the ecological assets that currently exist within the property, their condition, and their qualitative value. Ecosystems provide resources which include social, economic, and natural resources, not only for humans, but for other species. This study will focus on the ecological assets that are primarily biological, but will also include a review of how those biological features interact with the geology, water, and air[1]. It includes a review of drawbacks that are impacting the assets, such as invasive species and the increasing of runoff due to surface hardening and vegetation removal. It also provides guidance on correcting or minimizing their effect on the natural features. Recommendations are provided on how the use and value of those ecological assets may also be tied to the congregation's social objectives, as well as how the assets may be enhanced and methods to achieve enhancements. Finally, as stewards of the property, the congregation wishes to avoid impacts during site development, by retaining and sustaining ecological assets, and would like to determine mitigation strategies where impacts to the natural environment are unavoidable.

This review is being completed as a preliminary due-diligence measure, to inform the congregation about the current state of all ecological assets. This will allow them to plan the future use of the property in accordance with retaining and enhancing those features, and mitigating any potential damages, both in accordance with applicable Laws, regulations, by-laws, guidelines, or orders rendered by any governmental authority, but also in accordance with the principles of good stewardship.

This property offers a beautiful combination of architectural interest, adjacent water, and views of low mountains. It gives the opportunity to stop or pause for relaxation and rejuvenation. The courtyard with its shade trees provides an area for events, ceremonies, and gatherings. Green space is also a haven from the stress, noise, and activity of modern life. They are places of inspiration away from the rush of daily lives, and they provide a connection to the rest of creation.

The Unitarian Universalist congregations affirm and promote seven Principles. The impetus for this study is based on the seventh principle: "*Respect for the interdependent web of all existence of which we are a part*".

Figure 1: Church building; image from Google Earth, 2020.

[1] While carbon storage is also an important ecological asset, it is not discussed in this report as it is outside of the expertise of the author.

2. EXISTING ECOLOGICAL ASSETS

2.1 Site Overview

The property is unique in that it is located in an urban/natural interface. It is located beside the Ottawa River, a major river in eastern Ontario which was designated as a Canadian Heritage River in 2016 in recognition of its historical and cultural value. It contains a mix of treed areas, naturalized areas, manicured landscapes, buildings, and hard landscaping/parking areas.

The property is situated on traditional, unsurrendered and unceded Algonquin Anishinabeg Territory; the land was never empty and has a long history which included humans with rich cultures and of course many other species. Since European settlement, the area has slowly been altered, and in the last century has become part of the urban area. Very recently, a major public transportation hub, i.e. the Light Rail Transit (LRT) phase 2 station, is going to be located in Byron Linear Park between Sherbourne and Cleary Avenue, approximately 100 m from the property. As the area around and within this property develop to increase density as is suitable for an area near a major transit station, maintaining an oasis with natural features will be even more important. The addition of this soon-to-be built major transit hub allows for ease of access from people all over the City, thus opportunities for social engagement and use of the assets within this property are higher than in areas that are not as well-connected.

Retaining and enhancing ecological assets is more than simply an idealist effort to protect nature; it also protects and enhances social cohesion and equality (Jennings & Bakole, 2019; Cole *et al*, 1999). The First Unitarian Church's goal to understand what ecological assets exist on and connected to this property, and how they can be protected and enhanced, opens up opportunities to encourage social cohesion and equality, and create a better understanding of the interplay and connection between nature and humanity.

Figure 2: First Unitarian Church Property and nearby Cleary LRT Station; image from GeoOttawa, 2020.

2.2 Methodology

In order to determine the ecological features for this assessment, background information from a variety of sources were reviewed and a site visit was carried out.

2.2.1 Summary of Background Information

Background information for ecological features for the property was obtained from the City of Ottawa, the National Capital Commission and numerous background sources, both governmental and non-governmental. These studies and sources of information included the following:

- GeoOttawa, historical aerial images from 1958 to 2017
- Google Maps/Google Earth Pro satellite images from 2018
- Well Record Reports, Ministry of Environment and Energy, Ontario, 2020
- Bradley, D. J. (2013). Southern Ontario Vascular Plant Species List (3rd ed.). Peterborough, ON: Southern Science & Information Section, Ontario Ministry of Natural Resources.
- City of Ottawa. (2019, June 15). Species at Risk in Ottawa.
- Natural Heritage Information Centre (NHIC).
- Ministry of Natural Resources and Forestry (MNRF), Kemptville District Office.
- Cumberland Transitway/Blackburn Hamlet Bypass Extension Environmental Assessment Proposal, Declan, 1996.
- Cumberland Transitway/Blackburn Hamlet Bypass Existing Conditions Report, Declan, 1999.
- Urban Natural Areas (UNA) Report (Brunton, D.F., 2005).
- City of Ottawa - Species at Risk in Ottawa as of November 2, 2017

- City of Ottawa Official Plan Schedule K: Natural Heritage System (City of Ottawa, 2009).
- City of Ottawa Official Plan Annex 14: Environmental Constraints and Schedule L1: Natural Heritage System (East) (City of Ottawa, 2003)
- City of Ottawa Official Plan Greenspace Master Plan, Map 1
- National Capital Commission Greenbelt Master Plan, (NCC, 2013)
- Land Information Ontario (LIO).

2.2.2 Site visit

A screening level site visit was carried out on November 12, 2020, with the following members of the church:

- Terry Kimmel, Chair of Campus Planning Committee (CPC)
- Susan Tanner, Member of the CPC
- MaryAn O'Hagan, Congregant and resident of Unitarian House
- Lavonne Carter, Member of CPC representing River Parkway Childcare Centre

A short follow-up visit was carried out on December 8, 2020 from the publicly accessible parking lot. As well, a Planning Committee meeting was held on December 9, 2020, where further background knowledge, suggestions and ideas were solicited from those in attendance.

2.3 Site Geology

The bedrock here is Ordovician limestone laid down in quiet shallow seas 400 million years ago. The bedrock geology is comprised of limestone, dolostone, shale, arkose, sandstone (Ontario Geological Survey, 2018). The surficial geology is described as till, or more specifically, "Stone-poor, sandy silt to silty sand-textured till on Paleozoic terrain" (Ontario Geological Survey, 2018).

There are two (2) well records from the property (well tag A089793 and an unnumbered well). The unnumbered well to the north was drilled in 1952 and completed at 12.2 m deep (40'). Water was found at 12.2 m depth and the materials that were drilled through are simply described as 'limestone'. The second well, which is located further south, was drilled in 2011 for water supply and completed at a depth of 115.8 m (380'). The materials it was drilled through are described as packed till to 2.4 m (8'), black shale from 2.4 to 19.8 m (8' to 65'), grey limestone from 19.8 to 31.7 m (65' to 104'), and black shale from 31.7 to 115.8 m (104' to 380'). The surface layer of soil is not described.

The geology of the site influences the topography, soil development, soil moisture, vegetation and wildlife, as well as the effect of climate on the site. For example, this property's lower water table ensures that wetland species are confined to areas with constant surface water inputs, as opposed to forming due to a high water table.

2.4 Recent Historical Influences

Although the history of this property dates back to ancient times, a review of more recent site history was carried out to determine what activities occurred that created the current

conditions on the property. This review assists in understanding where and how proposed enhancement actions are most effective.

The aerial image taken in 1958 (refer to **Figure 3** below) shows the site was treed, and the neighboring areas contained low-rise buildings, cottages, houses, an old streetcar line and a CPR spur. The areas immediately adjacent to the river were already annexed in 1950 for the future Parkway Project. The adjacent neighborhoods were fairly new, and tree cover on residential properties was limited. The property contained a few buildings (possibly cottages), and a linear ditch to direct water through the property and towards the river is visible in the image.

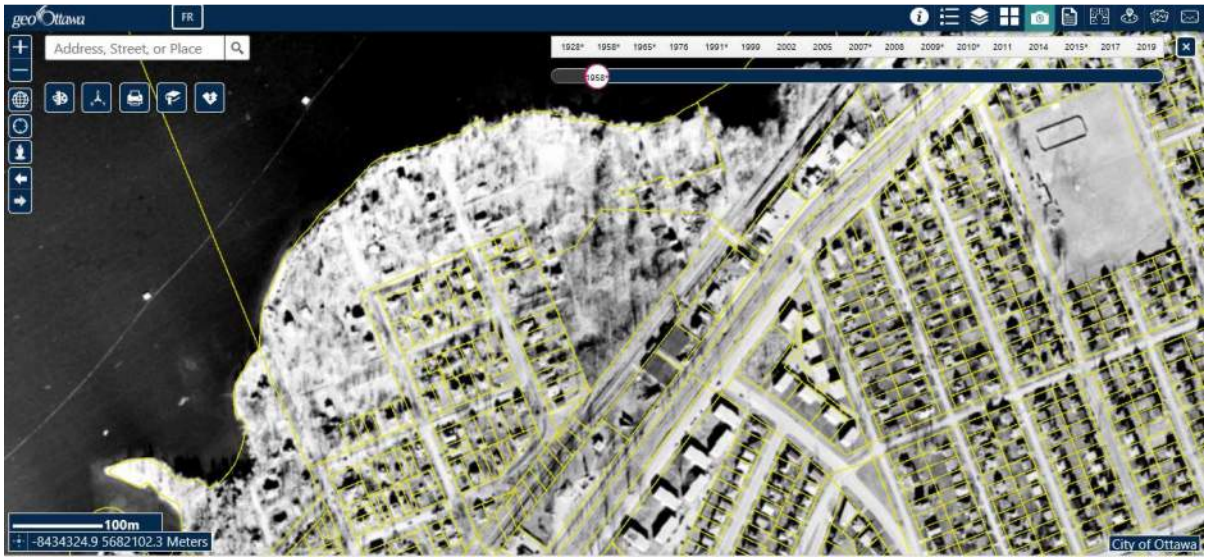

Figure 3: First Unitarian Church Property Aerial Image from 1958; image from GeoOttawa, 2020*.*

After 1958, the NCC's Sir John A. McDonald Parkway was built, taking 12 years in total, with the portion extending west to Woodroffe being completed in 1964, as seen in **Figure 4** below. Much of the river's shoreline was cleared and converted to lawn with trees, and it appears that some of the Ottawa River was filled in to expand the shoreline to the northeast of the property. Tree cover in adjacent neighborhoods remained limited. Little had changed in the property since 1958, and the tracks of the former railway are still visible in the south of the property in 1964.

Figure 4: First Unitarian Church Property Aerial Image from 1965; image and property boundaries from GeoOttawa, 2020*.*

The First Unitarian Church moved to this site from Elgin street in 1967. Interestingly, the church campus was built in 1966 in this location to take advantage of the automobile age, and now will gain the benefit of Ottawa's largest public transportation project to date. At the time, the property was built on what was considered the outskirts of Ottawa, and the entrance was selected on the basis of elms and willows bordering a natural pathway. Based on information from a committee member, from 1966 to 1982, the entrance to the property was along Algonquin Avenue, within the residential area west of the property.

The neighboring residential areas were already well established, and it appears that tree cover in adjacent neighborhoods was maturing and became more prevalent (refer to **Figure 5**). However, the stately elms that bordered the entrance mostly died during the Dutch Elm Disease outbreak in the 1970's and have since been replaced with a variety of deciduous and a few coniferous trees. As well, during development, many trees were removed to make way for buildings, parking lots, and lanes. However, the trees adjacent to the former railway are maturing, and the tracks were no longer present and were replaced with lawn and bare soil.

Figure 5: First Unitarian Church Property Aerial Image from 1976; image and property boundaries are from GeoOttawa, 2020.

Following the 1970's, the present-day parking lots were mostly in place, as well as the two gardens, the Unitarian House, and the River Parkway Childcare Centre.

It must be noted that as of 1976, the parcel shape and ownership was not as is depicted in **Figure 2** and figures in this section of the report. A triangle of land on the east side belonged to the NCC, and the woodlot on the Ottawa River side of the property still belonged to the Unitarian Church. Also at this time, the NCC still owned the former CPR railway strip.

When Unitarian House was built in about 1982, the main entrance to the campus was changed to Cleary Avenue, and, through a land exchange of land, a block of NCC land east of the campus was added to the campus while the woodlot on the Ottawa River side was transferred to the NCC. At that time too, various roadways and parking areas were paved. Some years later, the Congregation acquired the former CPR railway strip of land from the NCC, and parts of that land were turned into parking lots, some paved and some gravel surfaced.

The tree cover that existed in the 1970's was slowly replaced, particularly in central parts of the property, with younger trees. Between 2005 and 2007, an addition parking lot was established in what was formerly an old rail bed and the River Parkway Childcare Centre was under development (refer to **Figure 6**). Within the two garden areas and the courtyard, trees and other vegetation were maturing.

In 2007, the River Parkway Children's Centre was built, partly on the CPR strip of land. An area north of that building was paved for vehicle access and for parking. These changes are shown, in part, on **Figure 7**, as of 2007 and fully built out on **Figure 9**, as of 2019.

Figure 6: First Unitarian Church Property Aerial Image from 2007; image from GeoOttawa, 2020.

Since 2007, the City of Ottawa changed much of the zoning in the immediate area to allow for taller buildings, in anticipation of the future LRT and the desire for intensification near the proposed future station. Recently, demolition related to the LRT has resulted in the removal of the strip mall at the nearby 747 Richmond Road, the removal of vegetation in Byron Linear Park (not yet initiated in 2019, when the image in **Figure 7** was taken) and in the relocation of underground Bell and Rogers duct banks and structures along Richmond Road from Cleary to Woodroffe Avenue. The prep work for a new 11-storey building has begun at 851 Richmond Road. Kristy's Restaurant at 809 Richmond Rd. is proposing to replace the building with a multi-storey tower with mixed-use development. All this adjacent development is changing drainage patterns, increasing shade, and resulting in less vegetation and more hardened surfaces.

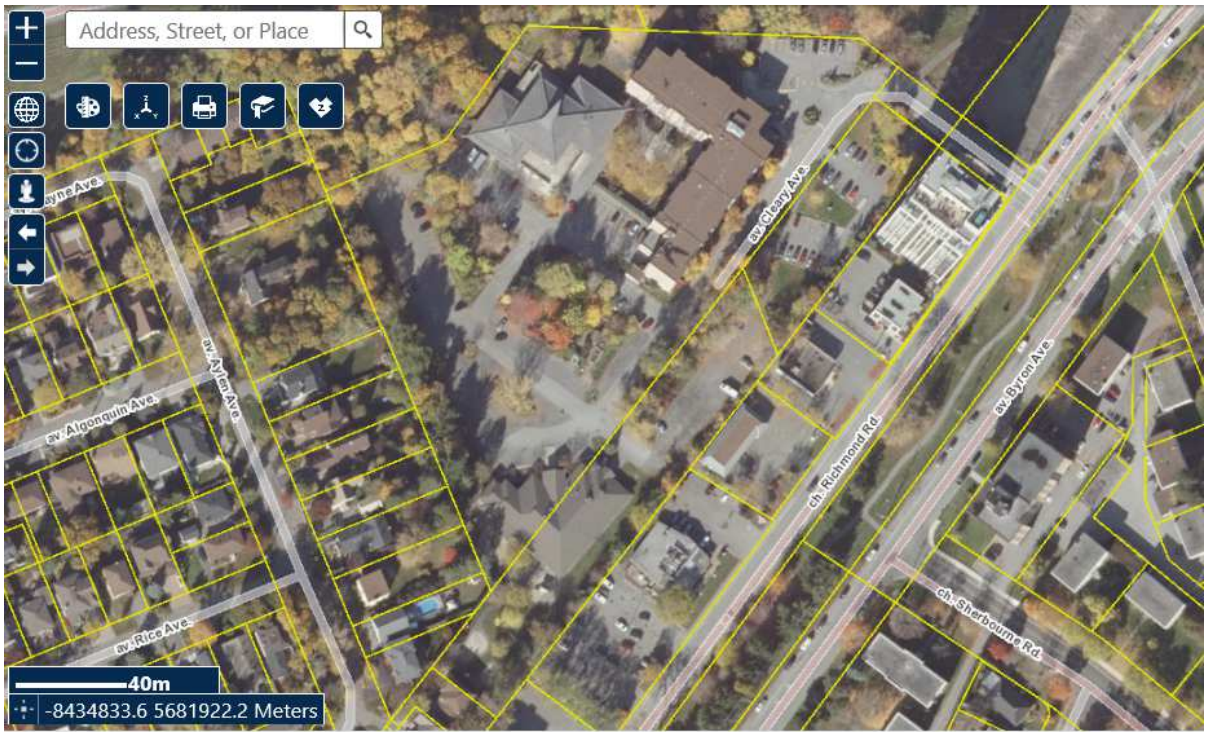

Figure 7: First Unitarian Church Property Aerial Image from 2019; image from GeoOttawa, 2020.

Based on this review, the area containing the old rail line ballast (refer to **Figure 8** below), currently used as a parking lot, is likely underlain with gravel and may contain contaminated soils from chemicals used to treat railroad ties such as creosote; spilled or leaked liquids such as oil, gasoline, cleaning solvents; herbicides; and fossil fuel combustion products (PAHs). An Environmental Site Assessment is recommended in order to determine the actual presence of contamination. Restoration in the former rail line area will impose challenges due to the ballast materials and due to possible soil pollutants. The proposed use for the development of high-rise buildings is appropriate given the challenges with restoring natural habitat in this area. As well, parking could be retained in underground or above-ground parking levels within the buildings.

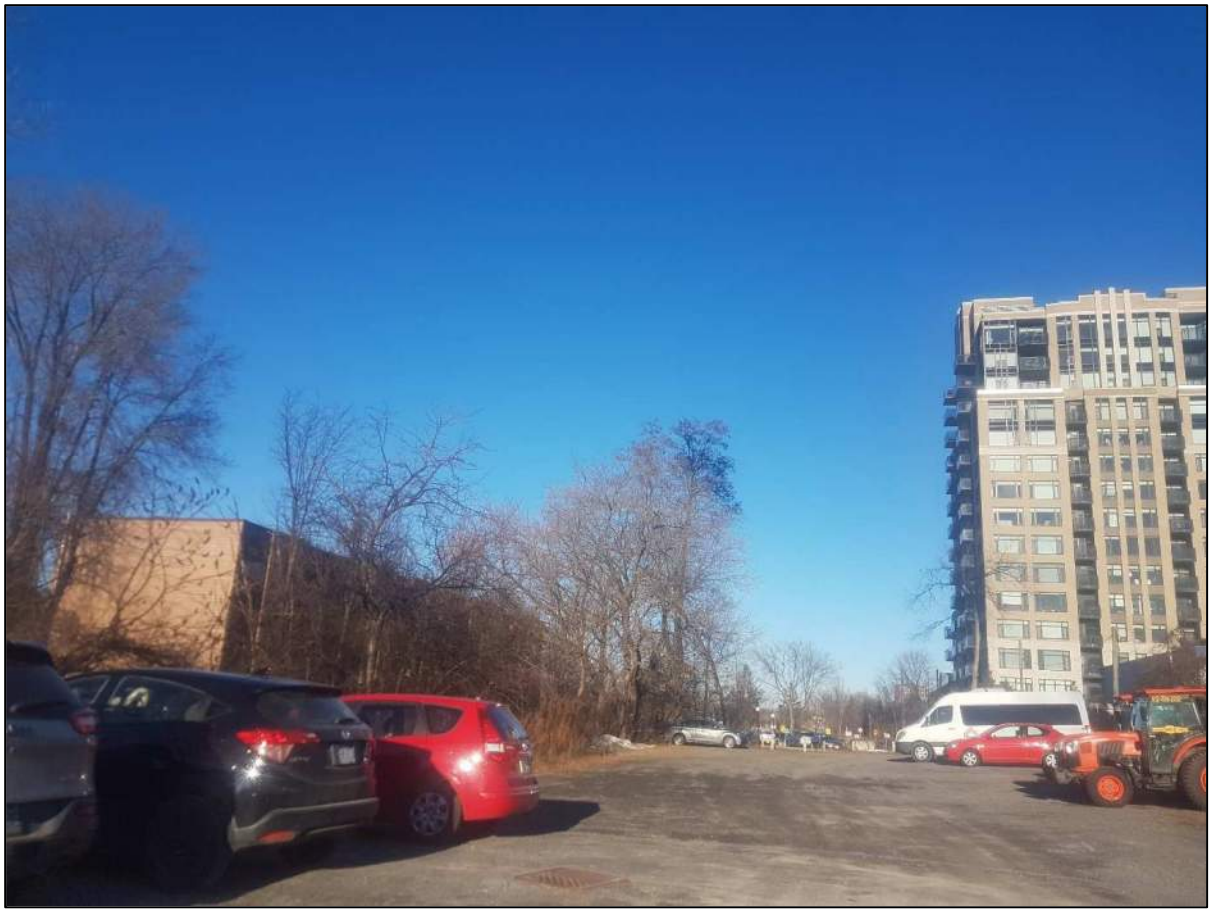

Figure 8: Old Rail Line area, photo taken November 12, 2020.

The sloped area between the old rail line and the Cleary Avenue entrance lane has generally stayed vegetated and would likely contain original native soils near or at the surface, as would the two (2) garden areas and areas near the northern fenceline that borders the NCC property.

As well, the southern boundary of the property will likely be subject to a varying amount of shade from proposed and existing high-rises on the adjacent properties (851 Richmond Road, 801 Richmond Road, 809 Richmond Road, 75 Cleary Avenue). The amount of shade will depend on the height of the buildings, and the sun's angle.

The effects of the historical influences on the opportunities for asset restoration and augmentation will be discussed further in **Section 4**.

2.5 Surface Water

Storm water drainage on the property is in part through natural watercourses and in part through storm sewers connected the City's system. This report does not try to describe the below-ground storm water drainage system on the property, which drains much of the surface water from parking lots and other hardened and landscaped surfaces. Instead, it

highlights surface watercourses in several locations that play significant roles in the ecology of the site.

At some point before 1958, part of the onsite drainage was channelized into a linear ditch to direct water through the property and towards the river, as noted above in Section 2.4, and as seen in **Figure 4**. Over time, the surface water drainage has been altered and is now comprised of several ephemeral and one more permanent watercourse, none of which are displayed on the City of Ottawa's online GeoOttawa but are illustrated below in **Figure 9**, and discussed below.

The first surface drainage feature (Drainage #1 in **Figure 9**) enters the property from a culvert on the south side of the property (refer to photo in **Figure 10**), located between the two upper parking lots. A committee member confirmed that the flow in the culvert originates from the parking lots on properties facing Richmond Road. The upstream part of this surface drainage feature used to be treed, but was recently cleared.

A more semi-permanent stream (Watercourse in **Figure 9**) starts from within the property from a culvert located on the treed slope along the north side of the old rail line (refer to photo in **Figure 13**). This then flows under the driveway, through the southern Memorial Garden (refer to photos in **Figure 14**, **Figure 15**, and **Figure 16**), under another lane, into the northern triangular Meditation Garden (refer to photo in **Figure 17**), and finally exits into the drainage feature on the adjacent NCC property (refer to photo **Figure 18**), that flows into the Ottawa River to the north.

A second drainage feature (Drainage #2 in **Figure 9**) conveys surface water from south west of the property (refer to photo in **Figure 19**), south of the River Parkway Childcare Centre (refer to photo in **Figure 20**). A committee member confirmed that the flow in the culvert originates from the from the parking lot of the Lord Richmond apartments, 851 Richmond Road. They also confirmed that this drainage flows through a below-ground culvert which exits at the surface on the treed slope discussed above (refer to photo in **Figure 13**), continuing into the semi-permanent watercourse that runs through the gardens.

A third surface drainage (Drainage #3 in **Figure 9**) appears to convey stormwater runoff from adjacent areas through swale that runs from south to north along the west side of the property through a semi-natural area (refer to photos in **Figure 21** and **Figure 22**, **Figure 24** and **Figure 25**). It also exits into the drainage feature on the adjacent NCC property (refer to photo **Figure 23** and **Figure 30**).

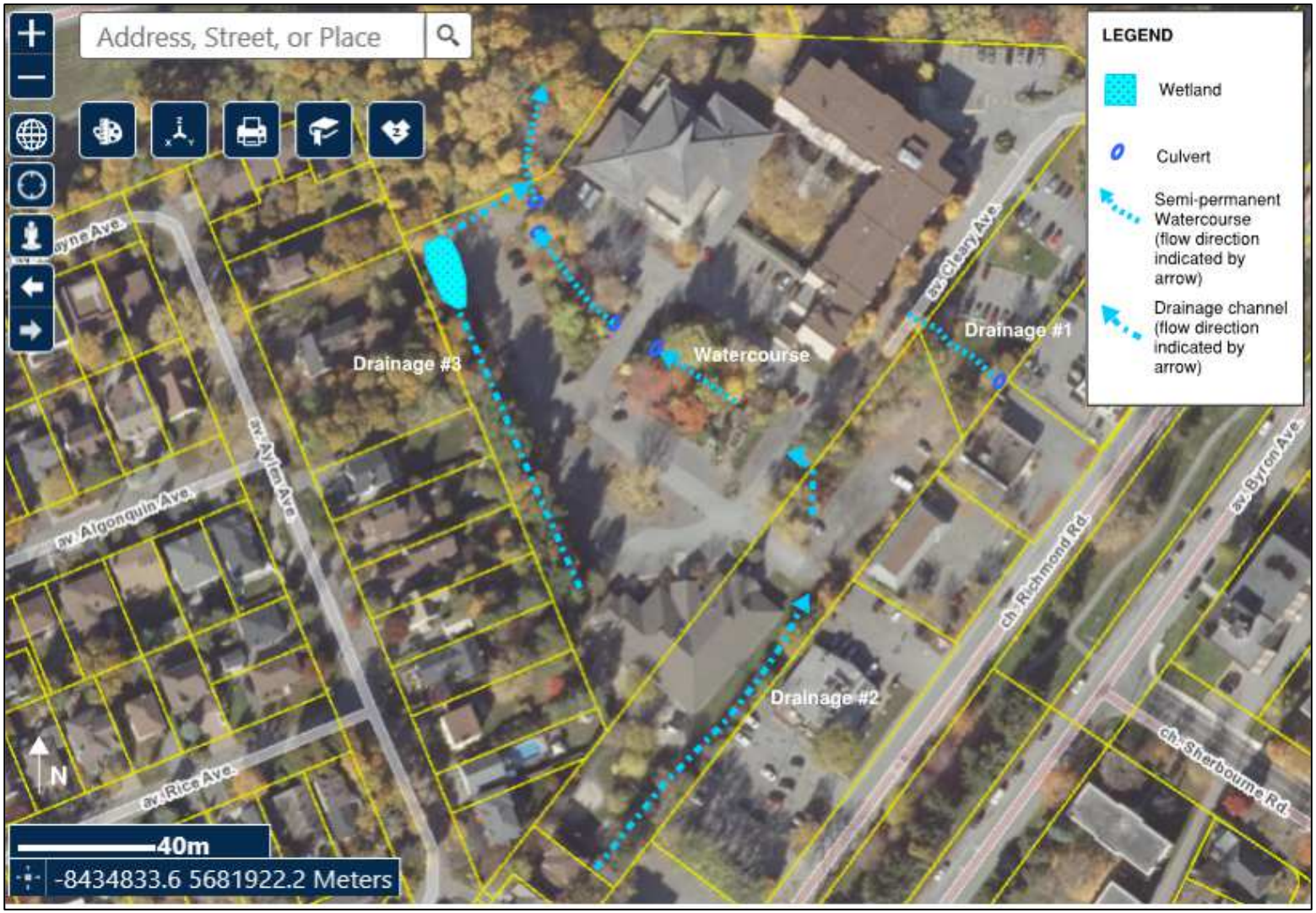

Figure 9: Illustration of several key surface watercourses and drainage features on the property, drawn on GeoOttawa Image, 2020.

Figure 10: Upstream portion of the first surface drainage feature, at south central part of the property, coming from between the parking lots on the Old Rail Line area; photo taken November 12, 2020.

Figure 11: Downstream portion of the first surface drainage feature, south of the Unitarian House, facing north; photo taken November 12, 2020.

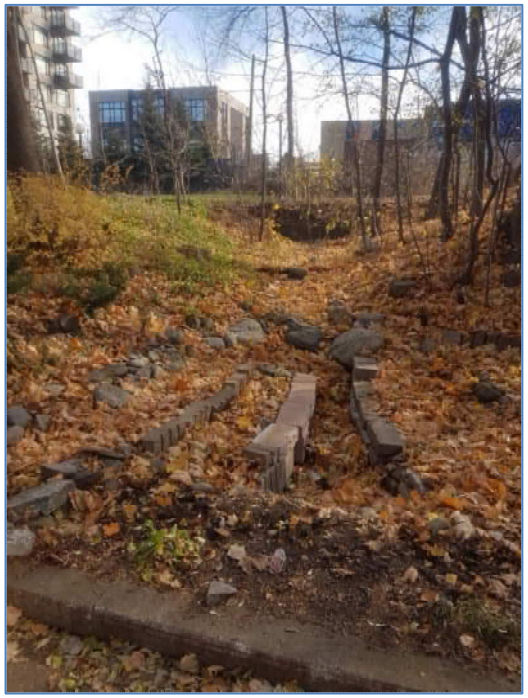

Figure 12: Downstream portion of the first surface drainage feature, south of the Unitarian House, facing south; photo taken November 12, 2020.

Figure 13: Upstream portion of the watercourse, located below the parking lots on the Old Rail Line area; photo taken November 12, 2020.

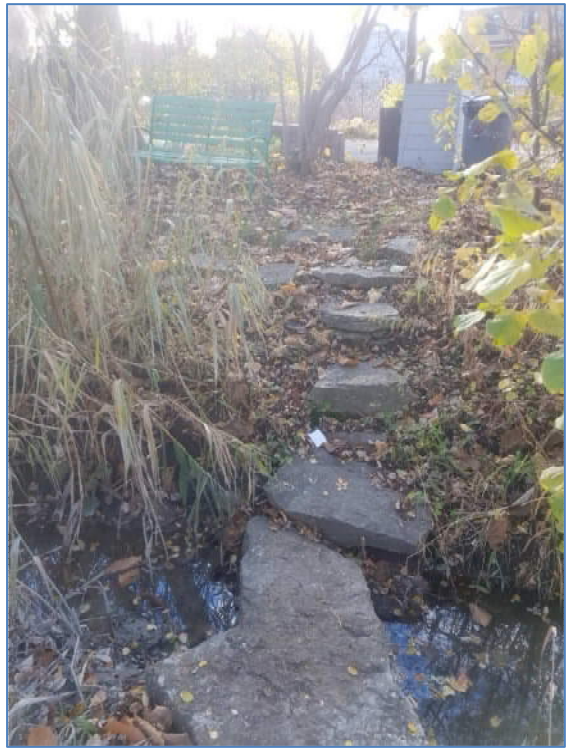

Figure 14: Path crossing the watercourse, within the Memorial Garden; photo taken November 12, 2020.

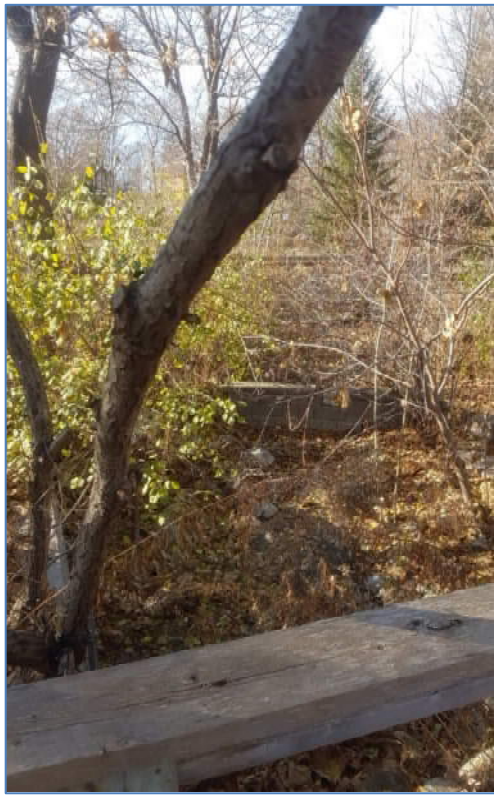

Figure 15: View of semi-permanent watercourse and weir from within the Memorial Garden; photo taken November 12, 2020.

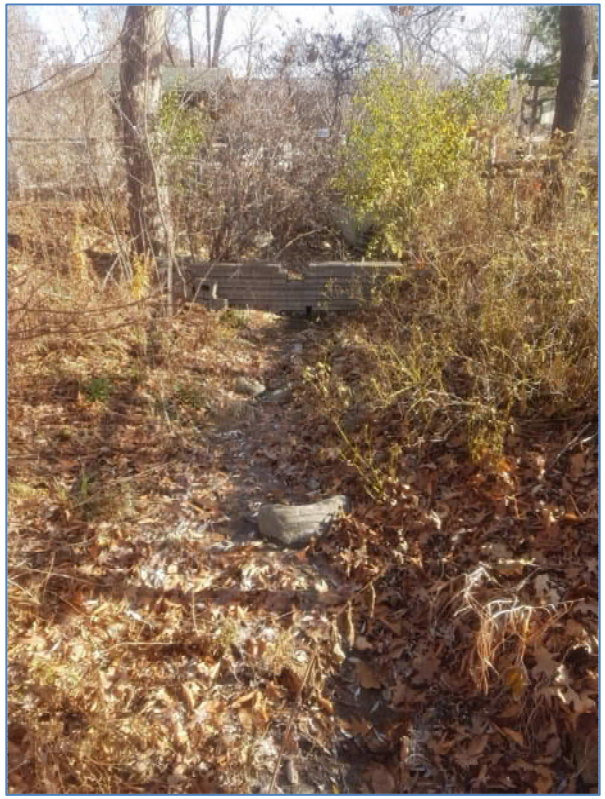

Figure 16: View of semi-permanent watercourse and another downstream weir from within the Memorial Garden; photo taken November 12, 2020.

Figure 17: View of semi-permanent watercourse from within the Meditation Garden, where watercourse enters culvert under lane; photo taken November 12, 2020.

Figure 18: Downstream end of watercourse, where it connects to the watercourse within the NCC property; photo taken November 12, 2020.

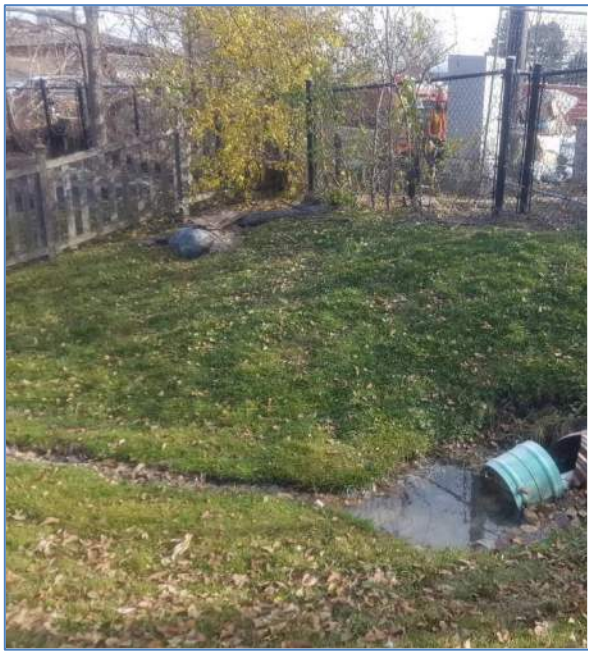

Figure 19: Downstream end of culvert and source of the second surface drainage feature, at southwest corner of the River Parkway Childcare Centre's playground; photo taken November 12, 2020.

Figure 20: The second surface drainage feature downstream of the end of the culverts, south of the River Parkway Childcare Centre's playground; photo taken November 12, 2020.

Figure 21: Upstream portion of third surface drainage feature on the west side of the property, from near the River Parkway Childcare Centre; photo taken November 12, 2020.

Figure 22: Downstream portion of the third surface drainage feature, facing north; photo taken November 12, 2020.

Figure 23: Watercourse on the NCC property north of the property, within a woodlot, facing north; photo taken November 12, 2020.

Figure 24: Origin of third drainage feature on the west side of the property, originating from near the River Parkway Childcare Centre; springtime photo supplied by Maryan O'Hagan.

Figure 25: Downstream portion of the third drainage feature, facing north; springtime photo supplied by Maryan O'Hagan.

Figure 26: Watercourse on the NCC property north of the property, within a woodlot, facing north; springtime photo supplied by Maryan O'Hagan.

The topography of the northern part of the property is lightly sloping with a more prominent ridge running generally east to west immediately south of the driveway. The surface water generally flows from the south to the north.

These surface water features are a considerable asset for many reasons:

- They provide opportunities for biodiversity because they create areas with higher moisture and humidity levels which in turn support species that would not be found in drier areas.
- They are important to wildlife for breeding areas (e.g. amphibians and many insects require water for their larval stages), feeding (e.g. all wildlife requires water to exist), bathing (e.g. birds bathe in water to maintain their plumage), and migration (microbes, periphyton, hydrophytes, phytoplankton, zooplankton, insects and fish).
- Small streams such as the ones in the property tend to be shaded by an interlocking, overhead tree canopy. This results in cooler water which hold higher levels of oxygen, which is vital for many aquatic organisms, including fish in the downstream Ottawa River.
- The vegetation and soil in the stream purifies the water by removing sediments and other invisible pollutants.
- They are extremely important in nutrient cycling, as nutrients that that are carried from oceans, lakes and rivers are deposited on land by wind, precipitation, humans and wildlife are slowly cycled through the landscape.
- Fine particles of organic matter are released as the leaves are broken down by biological communities in the streams.
- They recharge rivers, groundwater, and wetlands and provide flood control.
- They are aesthetically pleasing.

The proximity to the Ottawa River also provides significant benefits including the moderation of temperature and incredible views of open water. It attracts people who seek a pleasant view, relaxation, and recreational activities, such as cycling, walking, fishing, photography, skating, swimming, boating, and paddle boarding, to name a few. The presence of NCC lands along the river offers some protection to the preservation of the treed woodlot adjacent to the property and the semi-natural park areas between the river and the property.

The Ottawa River is the route for the seasonal migration journey of birds, bats, butterflies and even some dragonflies each spring and fall. Further details on wildlife are found in **Section 2.8** below.

2.6 Wetlands

A small area of cattail and Common Reed marsh wetland is located on the northwest side of the property (refer to **Figure 27**), surrounding the third drainage feature that runs from south to north along the treed and vegetated west side of the property (refer to **Figure 9**). While it is small (only approximately 50 m^2 [540 sqft] and not displayed on the City of Ottawa's online GeoOttawa), similar to the assets described above for surface water, wetlands play a

crucial role for the following:

- it provides an open sunlit area where plant and wildlife species that are not found in drier areas may flourish
- wildlife habitat, i.e. foraging, overwintering, aestivation[2], nesting, breeding, cover, humidity and moisture, and migration stopover
- the vegetation shades the water and adds nutrients
- the vegetation purifies the water by removing sediments and other invisible pollutants.
- the microorganisms decompose organic materials that allow nutrients to be cycled back into the ecosystem
- recharge watercourses downstream, recharge groundwater and provide flood control
- aesthetic interest

Figure 27: Watercourse on the NCC property north of the property, within a woodlot, facing north; photo taken November 12, 2020.

2.7 Vegetation Communities & Plants

In Ontario, the Ministry of Natural Resources (MNR) defines ecological units on the basis of bedrock, climate (temperature, precipitation), physiography (soils, slope, aspect) and corresponding vegetation, creating an Ecological Land Classification (ELC) system. This classification of the landscape enables planners and ecologists to organize ecological information into logical integrated units to enable landscape planning and monitoring. Using the ELC system, the property would be classified as predominately Constructed Lands, due to the use for the church facility, the daycare, and the senior's residence. As well, the ELC system requires that vegetation communities a minimum of 0.5 ha in size are to be mapped as a community, and as the largest somewhat heterogenous community on the property is 0.1 ha, the ELC system it not appropriate for use in defining these vegetation communities. As this method of classification is not suited to this assessment, the categories that are used in the ELC system are referred to where appropriate, but the vegetation communities are also referred by their purpose or how they are locally known (refer to **Figure 28**).

It should be noted that although they are a vital and essential part of the ecosystem, Protists, Fungi, Archaebacteria, Eubacteria are not included in this study simply because not enough is known about their potential presence and life-cycles.

[2] prolonged torpor (a state of physical or mental inactivity; lethargy) or dormancy of an animal during a hot or dry period.

Figure 28: Vegetation Communities on GeoOttawa Image, 2020.

2.7.1 Adjacent Deciduous Woodlot

The property is located adjacent to NCC lands, where a small remnant woodlot is situated. This woodlot appears in older aerial images, and is estimated to be older than 60 years, likely 80+ years old, based on the size of the tree crowns in the aerial image from GeoOttawa from 1958 (refer to **Figure 3**). The woodlot is dominated by mature maple (*Acer* sp.) trees and contains little understory (refer to **Figure 29** and **Figure 30**). One mature Northern Catalpa tree *(Catalpa speciosa*) is located along the property boundary, and was likely planted, as this North American species is not naturally occurring in the Ottawa area and very seldom self-seeds. The groundcover appears to be dominated by a thick layer of decaying fallen leaves (which are providing a natural mulch), invasive species (such as Garlic Mustard; see **Section 3.1** for more details), and some areas of bare earth. The

woodlot is approximately 0.7 ha in size and contains no core habitat[3]. Despite this, it is one of very few pockets of wooded areas along the Ottawa River between Mud Lake (1.4 km to the west) and a woodlot near Island Park Drive (2.3 km to the east) and is likely important for birds and insects requiring rest, food, shade, and protection from aerial predators as they migrate or move from site to site.

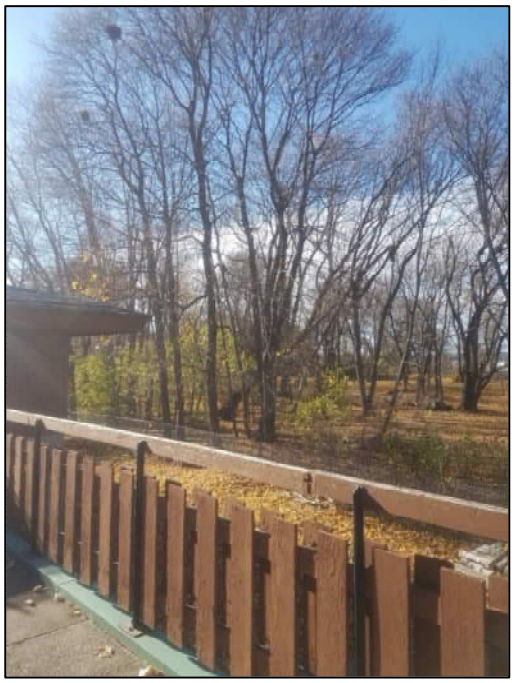

Figure 29: View of woodlot within NCC property from the upper deck; photo taken November 12, 2020.

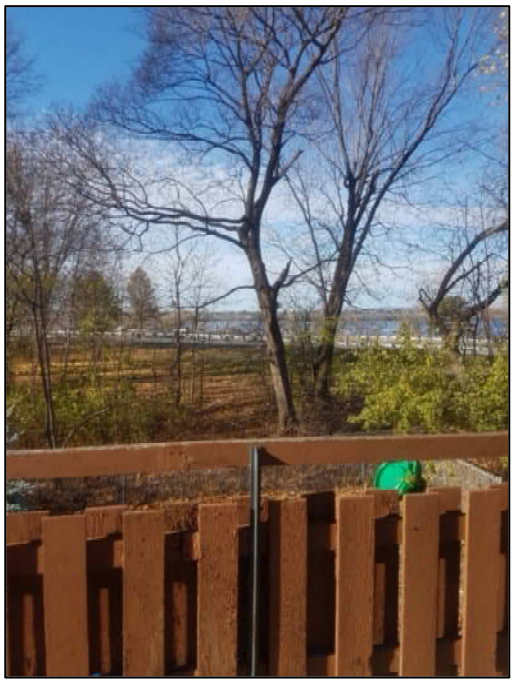

Figure 30: View of woodlot within NCC property and Ottawa River from the upper deck; photo taken November 12, 2020.

2.7.2 Meditation and Memorial Gardens

The vegetation communities on the property included two (2) diverse gardens – the Meditation Garden to the north, which is approximately 700 m^2, and the Memorial Garden to the south, which is approximately 1,100 m^2 (refer to **Figure 31** through **Figure 40**). Both contain a high proportion of native and uncommon species, for example the Tulip Tree (*Liriodendron tulipifera*), a beautiful and unusual tree originating from the southern parts of Ontario. A likely hybrid Butternut (*Juglans* × *bixbyi*, the progeny of a native Butternut [*Juglans cinerea*] and a non-native Japanese Walnut [*Juglans ailantifolia*]) is located near the Tulip Tree in the Memorial Garden (refer to **Figure 41**) and will provide copious nuts rich in oil and nutrients for the wildlife and humans who wish to partake. The gardens offer visitors shady beautiful paths under the tree canopy, and along the watercourse, with several seating areas and interesting sculptures. There is a diversity of canopy levels, with

[3] Forest interior that is more than 30 m (100 feet) from any edge; is ecologically important for many bird species

an overstory (i.e. supercanopy) of older mature trees, a subcanopy of shorter mature trees, an understory of shrubs and small trees, and a variety of groundcovers, ranging from a few centimeters to a few meters in height. There is also a diversity of species, which creates a robust and resilient vegetation community. For example, if an invasive pest or disease that targets Tulip Trees is introduced and decimates the existing Tulip Tree, the gardens contain many other tree species that will persist and provide canopy cover and habitat.

Figure 31: Map of the Gardens from posterboard; photo taken November 12, 2020.

Figure 32: Garden path and small pergola over seating area; photo taken November 12, 2020.

Figure 33: Wooden bridge over semi-permanent watercourse; photo taken November 12, 2020.

Figure 34: Entrance to Memorial Garden where posterboard is located; photo taken November 12, 2020.

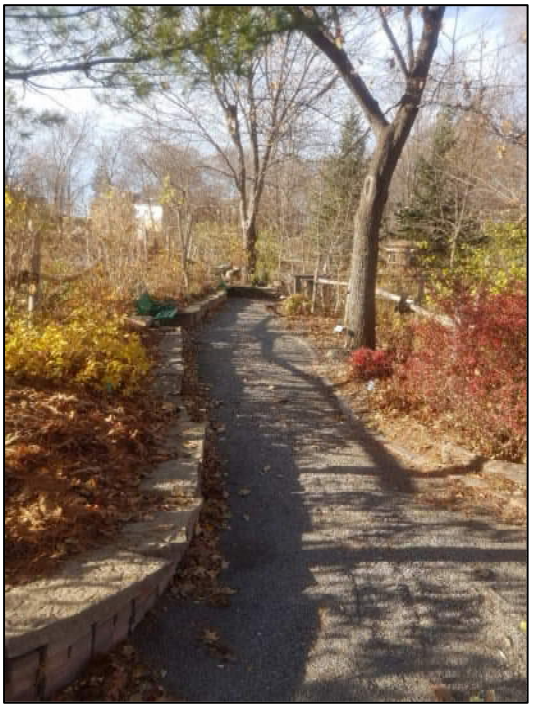

Figure 35: Path within Memorial Garden; photo taken November 12, 2020.

Figure 36: Garden shed and seating area within Memorial Gardens; photo taken November 12, 2020.

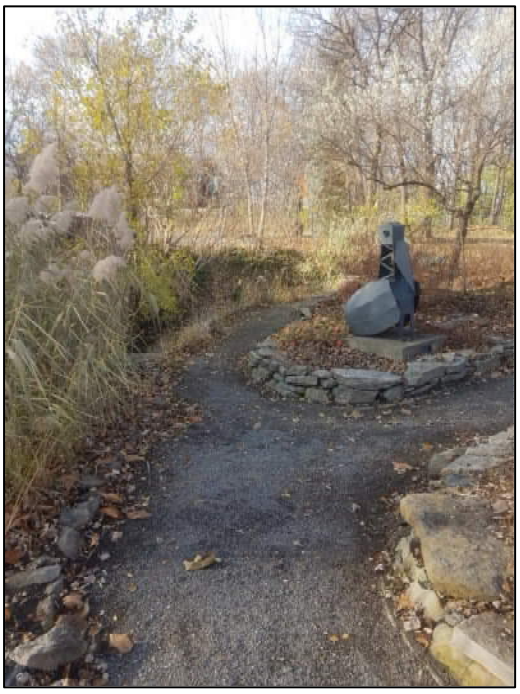

Figure 37: Meditation Garden art beside watercourse; photo taken November 12, 2020.

Figure 38: Walled edge of Meditation Garden; photo taken November 12, 2020.

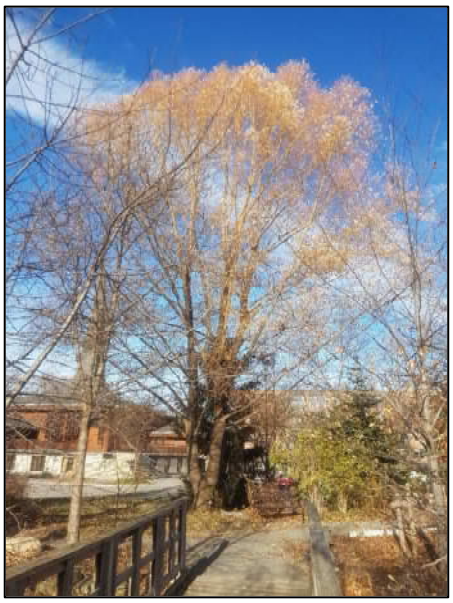

Figure 39: Large willow within Meditation Garden; photo taken November 12, 2020.

Figure 40: Meditation Garden loop; photo taken November 12, 2020.

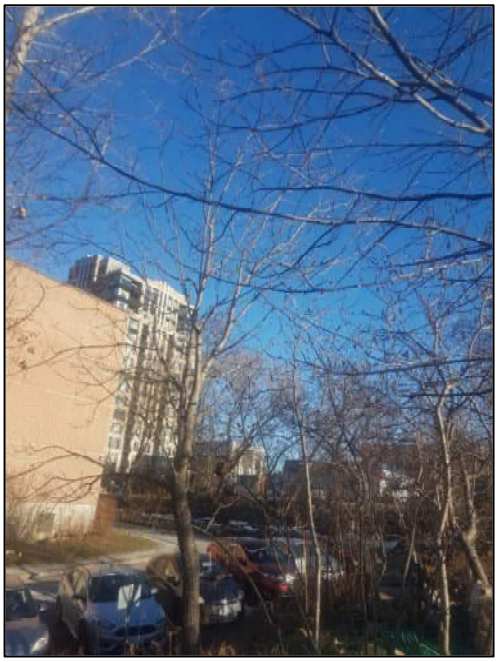

Figure 41: Likely Hybrid Butternut planted in Memorial Gardens; photo taken November 12, 2020.

2.7.3 Semi-Naturalized Linear Western Boundary

Along the western edge of the property, the vegetation community contains a mix of planted Red Pine (*Pinus resinosa*), self-seeded Manitoba Maples (*Acer negundo*), and a few Wild Grape (*Vitus riparia*) and European Black Alder (*Alnus glutinosa*). It contains a shrub layer of self-seeded Common Buckthorn (*Rhamnus cathartica*) and shrub honeysuckles (comprised of a mix of non-native *Lonicera sp*., including *L. japonica, L. maackii, L. morrowi, L. tatarica, and L. xylosteum*) (refer to **Figure 42** and **Figure 43**). The groundcover under the trees is predominately composed of non-native species such as Garlic Mustard (*Alliaria petiolata*), Common Motherwort (*Leonurus cardiaca*), and Creeping Bellflower (*Campanula rapunculoides*). Between the trees and the parking lot, taller herbaceuous vegetation is well-established, and is composed of a mix of mostly native and a moderately high level of non-native species. The native species include New England Aster (*Symphyotrichum novae-angliae*), Canada Goldenrod (*Solidago canadensis*), and Jerusalem Artichoke (*Helianthus tuberosus*), which, despite its name, is a species of sunflower native to central North America with an edible tuberous root. It also contains a swale that was partly filled with water at the time of the site visit. The swale is bordered by the small wetland area (discussed in **Section 2.6**), which contains a mix of Cattails (*Typha* sp.), European Common Reed (*Phragmites australis ssp. australis*), and Reed Canary Grass (*Phalaris arundinacea*).

The community is about 1,300 m2 in size, and averages approximately 12 m in width, and is 100 m long. It has historically been heavily disturbed, contains what appears to be a mix of broken concrete fill in the location where a former access lane came through from Aylen Avenue, and does not contain any trees that existed prior to 1958 based on the aerial imagery on GeoOttawa. Despite the lack of native plants within the treed portion, it provides ecological value by simply providing cover, protection, and foraging opportunities for wildlife, including insects. The presence of the wetland and water is of importance to many species (discussed in **Section 2.6**). It also creates a contiguous canopy of trees with the adjacent Deciduous Woodlot (discussed above in **Section 2.7.1**), providing a movement corridor for birds that prefer to stay under cover as they move through the landscape.

Figure 42: View of treed boundary from near the River Parkway Childcare Centre; photo taken November 12, 2020.

Figure 43: Treed boundary near the old lane from Aylen Avenue; photo taken November 12, 2020.

Figure 44: View of herbaceous plant cover in summer along treed boundary; photo provided by Maryan O'Hagan.

Figure 45: Native flowering plants along treed boundary during summer; photo provided by Maryan O'Hagan.

2.7.4 Semi-Naturalized Linear Treed Slope

Running generally east to west and immediately north of the old rail line, a treed slope follows the entrance lane that exists at the end of Cleary Avenue (refer to **Figure 46** and **Figure 47**). Two (2) drainage features flow down this slope (discussed in **Section 2.5**). It also contains a rock garden which is maintained by residents. It is approximately 12 m wide, 90 m long, and is 1,100 m^2 in size. It appears to contain some trees which may have been present since 1958, however has had some history of disturbance due to clearing for parking lots on the upper part of the slope, i.e. on the old rail line.

The tree species on the slope are a mix of native Eastern White Pine (*Pinus strobus*), small spruce (*Picea* sp.), Manitoba Maple, Crabapple (Malus sp.), and other deciduous species. It contains a moderately dense understory of and regenerating trees (comprised of the same species at the overstory) and shrubs. The shrub species are comprised of the same species that can be found on the semi-naturalized linear western boundary area (discussed above in **Section 2.7.3),** as well as Staghorn Sumac (*Rhus typhina*). The groundcovers are also similar to those found under the trees in the western boundary area. Similar to the western boundary area, the understory and groundcover are a testament to the legacy of disturbance.

This area is ecologically isolated from other treed areas, but nevertheless, the vegetation plays an important role in stabilizing the soil on the slope and purifying the water that runs over the slope. Trees create a large canopy that disperses the force of rain, and captures precipitation, allowing it to trickle slowly off the leaves and branches so it does not wash out soil and vegetation downstream. The shade and beauty provided by these trees is also undoubtably invaluable to the residents of the Unitarian House and the congregants of the First Unitarian Church.

Figure 46: View of treed slope; photo taken November 12, 2020.

Figure 47: Rock Garden within the treed slope; photo taken November 12, 2020.

2.7.5 Parking Lot Islands

There are several small islands of vegetation interspersed within the parking lot areas (refer to example in **Figure 48**). Most contain one (1) to a few trees, lawn, and some have shrubs as an understory to the trees. A few small islands in front of the Unitarian House contain landscape plants and shrubs (refer to **Figure 49**). One of the islands which is located between the two (2) paved parking lots on the old rail line area (at 25 Cleary Avenue) used to be treed in 2005, but the trees were removed in 2011 and a remaining tree in 2014. Due to their small size, they play a very minor role in their ecological importance for wildlife, but do provide a surface that allows precipitation to infiltrate into the soil, trees to cool the air and soil, and visual interest. As well, the graveled parking lots allow water to infiltrate into the soil, and do not exacerbate stormwater runoff to the same extent that harder surfaces such as roofs, asphalt, and concrete do.

Figure 48: Island near entrance with trees, shrubs, and lawn; photo taken November 12, 2020.

Figure 49: Small landscaped garden within parking island containing a mix of non-native and native herbaceous plant species; photo taken November 12, 2020.

2.7.6 Central Courtyard

The courtyard is shaded by a number of large Honey Locust trees (*Gleditsia triacanthos*), contains several raised garden boxes, a small 250 m^2 lawn, and is surrounded by flower beds containing shrubs such as the native Serviceberries (*Amelanchier sp*.). It offers an inviting and lightly shaded location for gatherings and events (refer to **Figure 50** and **Figure 51**).

Figure 50: View of courtyard from the parking lot; photo taken November 12, 2020.

Figure 51: Courtyard planter boxes and mature trees; photo taken November 12, 2020.

2.7.7 Children's Playgrounds

There are two (2) playground areas, one on the west of the River Parkway Childcare Centre which is approximately 1,400 m^2 in size (refer to **Figure 52** and **Figure 53**), and the other on the north side of the church facing the Ottawa River which is approximately 400 m^2 in size (refer to **Figure 54** and **Figure 55**). Both contain trees, lawn, and mulch or other surface treatments that are suitable for children. The trees provide vital shade, but also a connection with nature and a potential for adventure for the children who attend these childcare centres. As noted by one of the Planning Team members (Lavonne Carter) "*the natural playground provides our children a special direct relation with nature; a relationship that is necessary for becoming stewards of this earth….open space for running and playing games*".

Figure 52: Children's playground at River Parkway Childcare Centre; photo taken November 12, 2020.

Figure 53: Children's playground at River Parkway Childcare Centre; photo taken November 12, 2020.

Figure 54: Children's playground at north of the church; photo taken November 12, 2020.

Figure 55: Graceful and venerable old Eastern White Cedar in the children's playground provides opportunities for climbing and interesting textures; photo taken November 12, 2020.

2.8 Wildlife Habitat

2.8.1 Insects

This site provides a large variety of trees and other plants species, which in turn, can support a sizable variety of insects throughout their life stages. Many insect species require water for their juvenile stages, and the existing small ponded areas and watercourses will host a variety of these species. Not all are the much-denigrated and bothersome mosquito; benthic invertebrates (which refers to organisms that live on the bottom of a water body or in the sediment and have no backbone) also include midges, mayflies, true bugs (from the order Hemiptera), and damselflies. The watercourses and drainages may also support aquatic worms, aquatic caterpillars (they have gills), aquatic sowbugs, and aquatic snails. Due to the lack of flow and runoff from parking lots and adjacent urban areas, the onsite watercourses likely do not contain insect larva that are intolerant of pollutants.

In terrestrial areas, many insects will deposit their eggs on the surfaces and internally on leaves and trees. After they hatch, the leaves provide a food source and refuge for insects species such as aphids, caterpillars, beetles, and grasshoppers, while other species such as beetles, bees, wasps, moths, and butterflies will feed on pollen and nectar from the variety of plants that bloom throughout the season. As an apex predator in the insect world, dragonflies will feed on the other insects that live in the area.

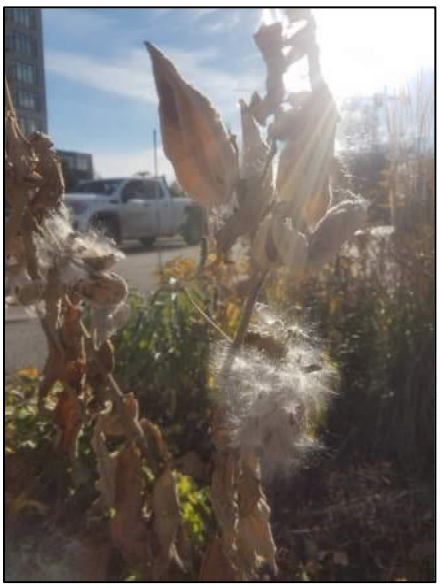

Figure 56: Seed pod from Common Milkweed, the Monarch's larval food; photo taken November 12, 2020.

Visitors and residents to the property may also notice an enormous number of midges and mayflies during the spring. This burst of life occurs every year, and is an incredibly important part of how nutrients from the Ottawa River, in the form of protein-rich insects, travel back to then enrich the land as they pass through a variety of amphibians, mammals, other insects, and birds. This spectacular natural phenomenon that plays a key role in regional food webs as well as nutrient redistribution. It is also an ecological indicator, and as there are reports of serious insect declines, the reduction in abundance of these insects signal a deterioration in water quality and an overall reduction in the health of the ecosystem. While humans still have a limited understanding of the critical links within ecosystems, these flows are increasingly disrupted by anthropogenically-caused environmental change with dynamic cascading effects on ecology and biogeochemistry. This is a global issue, but can be influenced at a local level, through the reduction and elimination of the use of products that will make their way into our watercourses. These include a variety of fossil fuels, plastics, and harmful fluids and chemicals, such as road salts, cleaning products, hair dyes and detergents.

2.8.2 Birds

An abundance of bird activity is expected in this property due to its proximity to the Ottawa River, the nearby woodlot and open grassy areas, and the treed areas within the property. Bird species[4] include many that are permanent (year-round) residents, such as Downy Woodpecker, Wild Turkey (refer to **Figure 60**), White breasted Nuthatch, Common Raven, Pileated Woodpecker, American Crow, Mourning Doves, Northern Cardinals, and Blue jays, and flocking birds such as Black-capped Chickadee, European Starling, House Sparrow[5], House Finch, American Goldfinch[6], and Cedar Waxwing. There is also a high likelihood of birds of prey, such as the Eastern Screech Owl, Cooper's Hawk, and Peregrine Falcons, all of which have been reported in the area by expert and enthusiast birders on Ebird.org.

Millions of birds travel along and live on the Ottawa River every year. Migrants and river specialists that can be seen passing over or within the property include Black-backed gulls, Ring-billed gulls, Mallard (refer to **Figure 57**, **Figure 58** and **Figure 59**), Great Blue Heron, Black-Crowned Night Heron, Canada Goose, Killdeer, Red-winged Blackbird, and Bald Eagle. With up to 70 percent of all North American waterfowl breeding in Canada, the conservation of shorelines and wetlands is crucial for these species, ensuring that these seasonal migrants and resident species have a place to come year after year.

Portions of the nearby Ottawa River are within Lac Deschênes-Ottawa River Important Bird Area (IBA), site ON112. The IBA includes a core area of approximately 45 kilometres of the Ottawa River from the Chaudière dam in the east to the Sault-des-Chats Dam near Fitzroy Harbour to the west which covers several key areas where waterbirds congregate. Brant have been recorded migrating through the region in spring and fall. Additionally, Canada Goose can occur in large numbers during spring migration. Other numbers of waterfowl can be very high, especially in the late fall, up to 20,000 individuals (Nature Canada, 2014).

Some smaller migrants that are more likely to remain in treed areas as they move through include Golden-crowned Kinglet, Ruby-crowned Kinglet, Hermit Thrush, American Pipit, Common Redpoll, and Pine Warbler.

Some birds will be seen in warmer parts of the year after overwintering in areas further south. These include Song Sparrow, White-throated Sparrow, Red-eyed Vireo, Eastern Kingbird, American Robin, Chipping Sparrow, American Tree Sparrow, Field Sparrow, Gray Catbird, American Yellow Warbler, Baltimore Oriole, Barn Swallow, Tree swallow, Grackle, and Phoebe. Then there are others that consider Ottawa to be going south for the winter; these include Dark-eyed Junco, Snow Buntings, Bohemian Waxwing, and Evening Grosbeak.

Birds perform vital roles in our ecosystems such as distributing seeds, eating insects, and in some cases pollinating plants. They help to maintain the ecological health of our landscapes, and provide us with valuable pest control services. Birds also keep us in touch

[4] Scientific names are not provided as, unlike with plants, bird's common names have been standardized

[5] It is hard to believe that the House Sparrow was a desert dweller of the American South West until a handful of birds were released in New York City in 1939. Since then it has become one of the most common songbirds of the North East.

[6] A flock of Goldfinches is called a charm

with nature, and add to our quality of life. A landscape without birdsong and activity would be very bleak.

The ecological asset of the property in relation to birds is its proximity to the Ottawa River, and the nearby woodlot and open grassy areas that attract species ashore. It is also benefitted by the treed areas within the property that provide a respite for migrating species and those who follow the shoreline to move between areas with more suitable habitat in search of mates, shelter, and food.

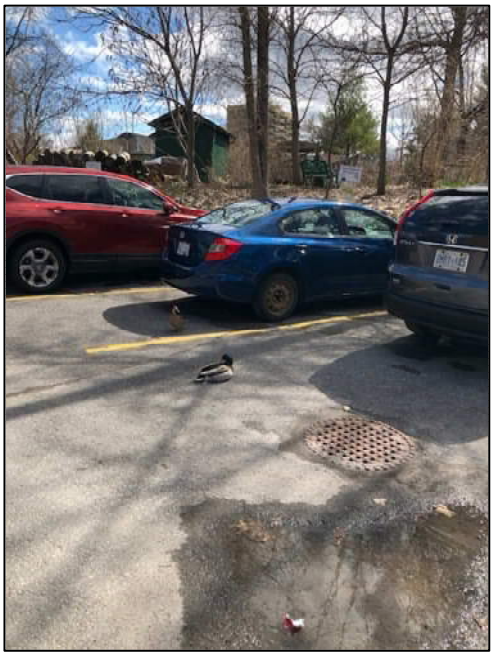

Figure 57: Male Mallard looking at his transportation options; photo provided by Maryan O'Hagan.

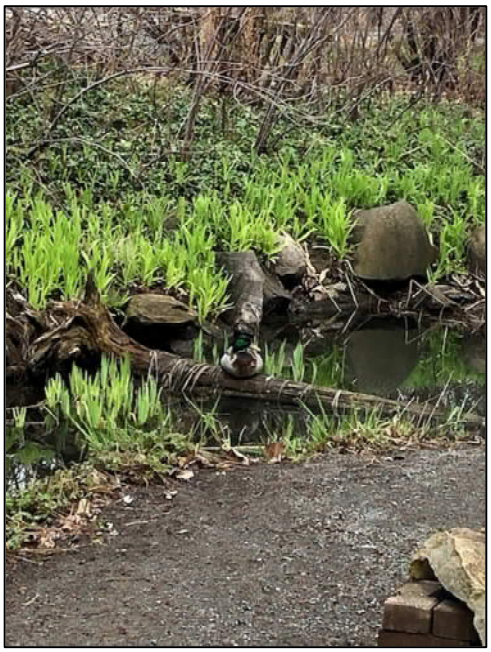

Figure 58: A male Mallard, practicing the easy pose in the Meditation Garden; photo provided by Maryan O'Hagan.

Figure 59: Pair of Mallards making the most of the property; photo provided by Maryan O'Hagan.

Figure 60: Wild Turkey on a stroll; photo provided by Maryan O'Hagan.

2.8.3 Reptiles and Amphibians

Because the Sir John A. McDonald Parkway presents a near-impenetrable barrier to the grounded reptiles and amphibians, and the property contains very little habitat that could support them, the property is likely only host to American Toad, and occasional amphibian species such as Green Frog and Northern Leopard Frog. Reptiles that may infrequently make it to the property despite the numerous roads and urban predators such as cats includes Eastern Garter Snake, Midland Painted Turtle, and Snapping Turtle. As with birds, the ecological asset of the property is its proximity to the Ottawa River, and the nearby woodlot and open grassy areas that attract species ashore.

2.8.4 Mammals

Urban tolerant species such as Raccoon, Coyote, Red Fox, Eastern Cottontail, Eastern Chipmunk, Black Squirrel, Red Squirrel, and Striped Skunks are likely to visit the property periodically or commonly. Several bat species are also present during the warmer parts of the year, including Big Brown Bat, Silver-haired Bat, Eastern Red Bat, and Hoary Bat. While an introduced fungus that causes White Nose Syndrome is decimating the populations of several other bat species, these four (4) species are less susceptible to the deadly effects of this fungus. As with the two previous groups of species, the property's proximity to the Ottawa River, the nearby woodlot, and open grassy areas ensure that it is also visited by species that are less common in highly urban areas.

2.8.5 Species at Risk

Numerous Species at Risk (SAR) have been confirmed to be present in nearby areas. A summary of all potential and confirmed SAR, and their legal statuses are provided in **Table 1** below. The legal statutes referred to below include two (2) federal laws and two (2) provincial laws. The *Species at Risk Act* (SARA) is a federal law that applies on federal lands such as the NCC lands to the north and protects SAR and their habitat. The *Migratory Bird Convention Act, 1994* (MBCA) is another federal law that protects many bird species from harm or harassment, and also protects their eggs and nests. The *Endangered Species Act, 2007* (ESA) is a provincial law that applies on all provincial lands including the property, and protects SAR and their habitat from harm or harassment. The Ontario *Fish and Wildlife Conservation Act* (FWCA) protects many wildlife species from harm or harassment that are not protected under the other laws, including species that are not at risk, such as Eastern Swallowtail, Eastern Milksnake, Coyote, Raccoon, Red Squirrel, Striped Skunks, Black Squirrels, all Ottawa bat species, Snapping Turtle, Blue Jays, Common Ravens, and many species of raptors[7]. It should be noted that the species that are protected under SARA and the ESA are constantly under review, and will change over time.

The property provides limited habitat for occasional use by SAR, however the property can and does provide a necessary buffer between urban areas and the habitats nearer the Ottawa River for many of the mobile species (i.e. not Butternut).

Table 1: Potential SAR that may frequent the Property

Species		Designations		Protection*	
Common Name	**Scientific Name**	**Federal (SARA)**	**Provincial (ESA)**	**Federal Legislation**	**Provincial Legislation**
Bald Eagle	*Haliaeetus leucocephalus*	NAR	SC		FWCA
Bank Swallow	*Riparia riparia*	THR	THR	SARA, MBCA	ESA
Barn Swallow	*Hirundo rustica*	THR	THR	SARA, MBCA	ESA
Blanding's Turtle	*Emydoidea blandingii*	THR	THR	SARA	FWCA, ESA
Chimney Swift	*Chaetura pelagica*	THR	THR	SARA, MBCA	ESA
Common Nighthawk	*Chordeiles minor*	THR	SC	SARA, MBCA	-
Eastern Small-footed Myotis	*Myotis leibii*	END	END	SARA	FWCA, ESA
Eastern Wood-pewee	*Contopus virens*	SC	SC	MBCA	-

[7] Includes owls, hawks, falcons, osprey, vultures, and eagles.

Species		Designations		Protection*	
Common Name	**Scientific Name**	**Federal (SARA)**	**Provincial (ESA)**	**Federal Legislation**	**Provincial Legislation**
Little Brown Myotis	*Myotis lucifugus*	END	END	SARA	FWCA, ESA
Monarch Butterfly	*Danaus plexippus*	SC	SC	-	FWCA
Northern Myotis	*Myotis septentrionalis*	END	END	SARA	FWCA, ESA
Olive-sided Flycatcher	*Contopus cooperi*	THR	SC	SARA, MBCA	
Peregrine Falcon	*Falco peregrinus anatum/tundrius*	SC	SC	MBCA	FWCA
Snapping Turtle	*Chelydra serpentina*	SC	SC	-	FWCA
Tri-colored Bat	*Perimyotis subflavus*	END	END	SARA	FWCA, ESA
Wood Thrush	*Hylocichla mustelina*	THR	SC	SARA, MBCA	-

*Status as of December 2020

3. EXISTING DRAWBACKS & MITIGATIONS

A few features exist that are harmful to the ecological potential of the property and can be improved with management and planning, as well as commitment and effort. These are invasive plant species, hard surfaces, and vegetation (especially tree) loss. By removing the drawbacks, the property stewards create an opportunity for restoration, which is discussed in **Section 4**.

3.1 Invasive Species

Due to the legacy of soils disturbance, introduction of plants, and proximity to urban areas that have brought harmful species into the area, the site has a very high proportion of introduced and invasive species, including many herbaceous plants such as Creeping Bellflower (refer to **Figure 61** and **Figure 62**), Garlic Mustard (refer to **Figure 63** and **Figure 64**), Black dog-strangling vine (aka Black Swallow-wort, *Cynanchum louiseae*), Dog-strangling vine (aka, Pale Swallow-wort, *Vincetoxicum rossicum* aka *Cynanchum rossicum*) (refer to **Figure 65**), Japanese Knotweed (*Reynoutria japonica*) (refer to **Figure 66** and **Figure 67**), European Common Reed (**Figure 68**), Periwinkle (*Vinca minor*), Ground-Ivy (*Glechoma hederacea*), Canada Thistle (*Cirsium arvense*), Crown Vetch (*Coronilla varia*), Goutweed (aka Ground Elder, *Aegopodium podagraria*), White sweet clover (*Melilotus alba*), Yellow sweet-clover (*Melilotus officinalis*), , Bird-foot trefoil (*Lotus corniculatus*), Dame's Rocket (*Hesperis matronalis*) (refer to **Figure 69**), Smooth Brome (*Bromus inermis*), and Himalayan Balsam (*Impatiens glandulifera*) (refer to **Figure 70**) – note that this is not a comprehensive list. The property also has several woody invasive species within or adjacent including Common Buckthorn (refer to **Figure 71**), Black Alder (refer to **Figure 72**), shrub honeysuckles (refer to **Figure 73**), Scots Pine (*Pinus sylvestris*), Norway Maple (*Acer platanoides*), and Japanese Barberry (*Berberis thunbergia*) (refer to **Figure 74**). Manitoba Maple (refer to **Figure 75**), while native to North America, is also considered an invasive species by many Conservation Authorities and some municipalities owing to its ability to dominate a landscape at the expense of a diverse tree canopy, and because of the increase in erosion during rain and flooding events under Manitoba Maples when compared to other native species.

Some of these species are more damaging to ecosystems than others. For example, Ground Ivy, Creeping Bellflower, and Smooth Brome are "*Exotic species that do not pose a serious threat to natural areas unless they are competing directly with more desirable vegetation. These can often be tolerated in restoration projects if they are already present. They may eventually be replaced through natural succession or management. Control where necessary and limit their spread to other areas*" (from the Ontario Invasive Plant Council's "A Landowner's Guide to Managing and Controlling Invasive Plants in Ontario", listed in **Appendix A**).

However, others are a more serious threat to natural areas. These include: Goutweed, Dog-strangling Vine, Garlic Mustard, Black Alder, Dame's Rocket, Himalayan Balsam, Canada Thistle, shrub honeysuckles, European Common Reed, Common Buckthorn, and Manitoba Maple, all of which are noted as Category 1 invasive species and are "*Aggressive invasive exotic species that can dominate a site to exclude all other species and remain dominant on the site indefinitely. These are a threat to natural areas wherever they occur because they can reproduce by means that allow them to move long distances. Many of these are*

displaced by birds, wind, water, or vegetative reproduction. These are top priority for control, but control may be difficult. Eradication may be the only option for long-term success." (ibid)

Some species fall somewhere between a serious threat and a moderate threat to the ecosystem. These include Japanese Knotweed, Norway Maple, Scots Pine, Moneywort (aka Creeping Jenny, *Lysimachia nummularia*), Black locust (*Robinia pseudoacacia*), White sweet clover, Yellow sweet-clover, Siberian Elm (*Ulmus pumila*), Cow Vetch (*Vicia cracca*), Lilac (*Syringa vulgaris*), Periwinkle, Japanese Barberry, and others. These are noted as "*Exotic species that are highly (or moderately) invasive but tend to only dominate certain niches or do not spread rapidly from major concentrations (or tend to dominate when the proper conditions exist). Many of these spread vegetatively or by seeds that drop close to the parent plant. They may have been deliberately planted and persist in dense populations for long periods. Control where necessary and limit their spread to other areas*." (ibid)

What may be surprising to some is that Kentucky bluegrass (*Poa pratensis*), the much-esteemed component of most lawns, is also an invasive plant. It is important to limit its spread to areas where a low and traffic-tolerant groundcover is required, but is replaced with other more ecologically beneficial and diverse plant species in areas where it is simply being used to create a flat green area. Replacing it with low-growing native or non-invasive species such as Yarrow (*Achillea millefolium*), Creeping Thyme (*Thymus serpyllum*), White Clover (*Trifolium repens*), Horizontal Juniper (*Juniperus horizontalis* and related species), Chamomile (*Anthemis nobilis,* not reliably a perennial and may need frequent re-seededing), Rock cress (*Arabis* and *Aubrieta spp*), Creeping phlox (*Phlox subulata*), Pussytoes (*Antennaria dioica*), Dwarf veronica (*Veronica alpina*, but caution is needed with its more aggressively-spreading relative - Prostrate Speedwell *V. rupestris*). In shady areas, species such as Sweet woodruff (*Galium odoratum*, which also tolerates sun), Barren Strawberry (*Waldestenia fragaroides*, also tolerates sun), Bunchberry (*Cornus canadensis*), Wild Ginger (*Asarum canadense*), Big-root Geranium (*Geranium macrorrhizum*), sedges (*Carex* sp. preferably native species), Foamflower (*Tiarella cordifolia*), and Lungwort (*Pulmonaria officinalis*). It can be difficult to modify cultural expectations and aesthetics for an even and featureless green lawn, but there is much to be gained from replacing lawns with low-growing alternatives, including a decrease in the use of human power and other energy sources (electricity and fuel, plus the materials that go into the equipment) in maintenance.

There is a recently enacted law that pertains to invasive species in Ontario - the *Invasive Species Act*. It currently is applicable to a small number of especially deleterious species that are listed as **restricted species**, including Black Dog-strangling vine, Dog-strangling vine, Japanese Knotweed, and European Common Reed. The *Invasive Species Act* prohibits any activity that is likely to increase the threat of the invasive species to the natural environment in Ontario and specifies circumstances in which an activity or act prohibited by the order or under this Act may be carried out. Further, no person shall bring a member of a restricted or prohibited invasive species into Ontario or cause it to be brought into Ontario; or deposit or release a member of a restricted or prohibited invasive species or cause it to be deposited or released; or shall possess a member of a **restricted** or prohibited invasive species in any part of Ontario other than in a prescribed area except under the Authority of the government. This act also refers to regulations, which may designate an area of Ontario as an invasive species control area with respect to a significant threat invasive species. In these areas, regulations may specify measures to control the spread of the invasive species. What this means is that any proposed work on the site should address the management and control of these species, and it is in the bests interests of the property that these species are eradicated where they are present. As it appears that one (1) of the two

(2) Japanese Knotweed colonies is growing within the property line, it will require coordination with the NCC to remove it and control any regrowth, as well as to carefully dispose of any plant material, as it can regenerate from a tiny fragments of rhizome[8].

For control of the numerous species noted below, please refer to guidance from the Invasive Plant Council of Ontario, who provides publications with clear and effective control methods that suit a variety of conditions and the landowner's access to resources. These are referred to in **Appendix A**. The control of these species can be undertaken when carrying out the recommendations for Asset Restoration and Augmentation, discussed in **Section 4** below. In general, controlling these species, particularly those that will be pulled out, will cause soil disturbance, and must be followed up with restoration and planting with desirable species. Bare and disturbed soil will ultimately recreate the conditions that favoured the invasive species and will quickly recolonize from the seed-bank or from nearby sources of seed or rhizomes.

3.1.1 Sheet Mulching

In many cases, such as the conversion of lawn or areas with dense colonies of invasive plants to other vegetation and desirable groundcovers, the simplest and most effective method is called "Sheet Mulching" and is carried out as follows:

- Remove surface growth, preferably at the height of the growing season (early to late summer) but before additional seeds set
- Rake the area relatively smooth if the surface is highly uneven
- Apply a single or double layer of thick plain undyed corrugated carboard without holes (such as from fridge packaging), overlapping edges where more than one piece is needed, and cutting or placing around trees and other features that are to be retained; wet it down (additional non-dyed newspaper may also be applied on top of the cardboard but is generally not as effective on its own as it breaks down too rapidly)
- Cover the cardboard with a layer of clean, weed seed and pollutant-free soil, approximately 4 to 30 cm thick (depending on desired topography), then a layer of undyed shredded bark, wood chips (free from seeds), straw, or compost mulch a minimum of 10 cm thick, and a maximum of 15 cm
- Wet it down thoroughly to settle the materials, and leave in place until the next year's spring or fall, then replant the area by cutting through the cardboard where new plants are to be planted
- Monitor for any regrowth of invasive species and remove as they appear, as they can be incredibly durable (which makes them successful as invasive species)

[8] a continuously growing horizontal underground stem that puts out lateral shoots and adventitious roots at intervals

This method can be applied on a large or small scale. Besides being relatively easy and inexpensive, this method has several benefits. These include: (a) no requirement for special tools, (b) the soils structure is left in place and not disturbed, (c) the sheet mulching traps moisture allowing for better plant establishment, and (d) over time the materials decompose and add to the soil nutrients and organic matter (important for retaining nutrients and moisture).

Figure 61: Flowers of Creeping Bellflower; photo taken from Google.

Figure 62: Creeping Bellflower plants without flowering stems growing in the semi-naturalized linear western boundary and by adjacent deciduous woodlot ; photo taken November 12, 2020.

Figure 63: Flowers of Garlic Mustard; photo taken from Google.

Figure 64: Garlic Mustard plants without flowering stems growing in the semi-naturalized linear western boundary and by adjacent deciduous woodlot; photo taken November 12, 2020.

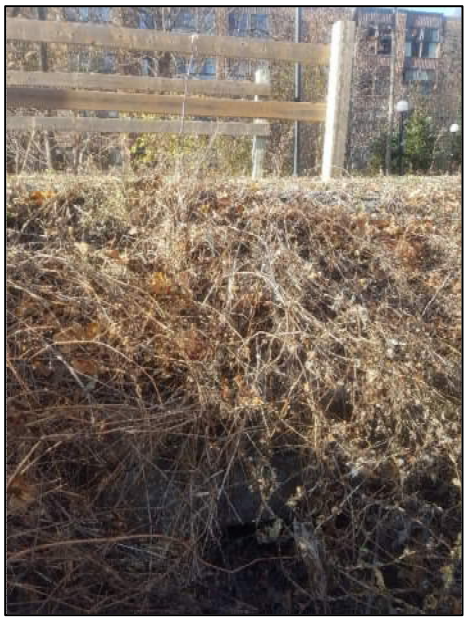

Figure 65: Dog Strangling Vine growing in the upper section of Drainage #1; photo taken November 12, 2020.

Figure 66: Japanese Knotweed growing in fenceline between the north side of the church and the NCC property; photo taken November 12, 2020.

Figure 67: Japanese Knotweed growing in the semi-naturalized linear western boundary and by adjacent deciduous woodlot; photo provided by Maryan O'Hagan.

Figure 68: European Common Reed growing by adjacent deciduous woodlot on the NCC lands; photo taken November 12, 2020.

Figure 69: Dame's Rocket growing in the semi-naturalized linear western boundary in concrete rubble fill area; photo taken November 12, 2020.

Figure 70: Himalayan Balsam flowering stems growing in the semi-naturalized linear western boundary and by adjacent deciduous woodlot; photo provided by Maryan O'Hagan.

Figure 71: Common Buckthorn growing in the semi-naturalized linear western boundary (and found throughout the property); photo taken November 12, 2020.

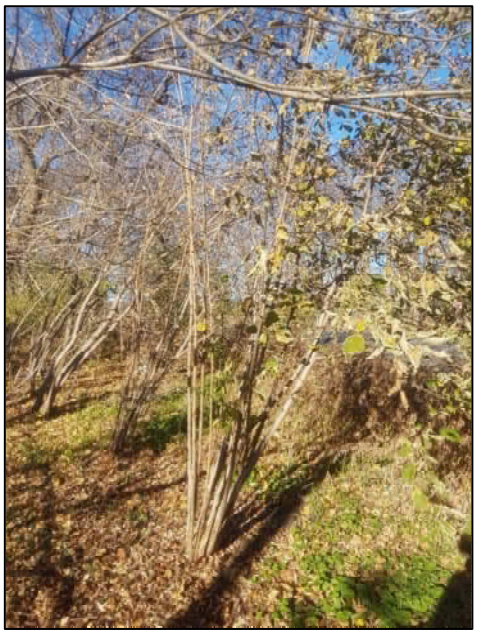

Figure 72: Black Alder plants without flowering stems growing in the semi-naturalized linear western boundary and by adjacent deciduous woodlot; photo taken November 12, 2020.

Figure 73: Shrub Honeysuckle growing in semi-naturalized linear western boundary; photo taken November 12, 2020.

Figure 74: Japanese Barberry growing in fenceline between the north side of the church and the NCC property; photo taken November 12, 2020.

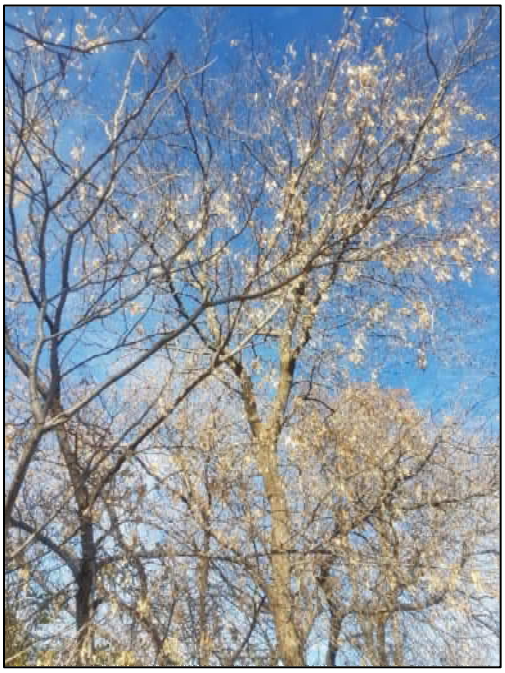

Figure 75: Manitoba Maple growing in the small wetland (also found along the watercourse in the Meditation Garden); photo taken November 12, 2020.

Figure 76: Creeping Charlie without flowering stems growing in parking lot areas along the upstream area of drainage #1; photo taken November 12, 2020.

3.2 Hard Surfaces and Loss of Vegetation and Vegetation Diversity

The impacts of a lack of vegetation are compounded when those areas are covered with a hard surface. Based on the review of historical influences (discussed in **Section 2.4**), the property has slowly (and at times rapidly) lost vegetation during the construction of buildings, access roads, parking lots, and associated infrastructure. Over time, soil is covered with gravel or pavement that may not serve a purpose (refer to **Figure 77**, **Figure 78**, and **Figure 79**), trees have been removed (refer to **Figure 80**) and not replaced or are replaced with lawn, and buildings are constructed without the possibility of a green roof.

Soils and vegetation fulfil a range of vital functions, from providing the basis for our food production, to filtering water, reducing the frequency and risk of flooding and drought, supporting biodiversity, and helping to regulate the local and global climate.

A lack of vegetation also refers to a loss of vertical vegetation where it has been replaced with gravel parking lots or lawns, or where the groundcovers lack diversity and are limited to one or a few species. While there appears to be a trend in farming, which also appears in landscape plans, to grow plants of the same species in orderly rows, natural areas tend to lack this orderly structure. However, due to our continuing disconnection with natural areas, we are now recognizing[9] that this connection is not only vital for the functions stated above, but for improved human cognition and energy, reduced stress, better attention and concentration, increased problem solving and creative abilities, and sensory awareness and adaptiveness. We tend to feel more grateful when we are in natural areas. As people are active adapters to their environment, they reshape their social identities and affiliations according to the physical space they live in. Thus, creating a more natural environment can have far-reaching impacts, particularly as the intent is to draw more of the community to the property.

[9] Not for the first time in human history has this been recognized, as Cyrus the Great, who 2,500 years ago was building gardens for relaxation from the busy Persian capital. Also, Marco Polo's diary from 1272 remarked on this phenomenon.

Figure 77: Pavement near NCC lands; photo taken November 12, 2020.

Figure 78: Pavement near NCC property; photo taken November 12, 2020.

Figure 79: Paved drainage feature, for conveying stormwater from parking lot; photo taken November 12, 2020.

Figure 80: Recently removed trees along Drainage #1; photo taken November 12, 2020.

4. OPPORTUNITIES FOR ASSET RESTORATION AND AUGMENTATION

The property offers many opportunities for enhancement and restoration. The following habitat restoration and augmentation principles are provided as well as specific recommendations where habitat appears to be limiting the ecological potential of the property.

4.1 Water Quality & Quantity Management

- Eliminate/mitigate erosion to ditches and watercourses by dispersing the force of run-off from parking lots, roofs, and roads (for an example of an area that is subject to erosion due to a downspout, refer to **Figure 81**). This can be achieved through establishing a rain garden at the base of downspouts, and by adding a catchment by digging a hole approximately 0.5 x 0.5 m x 0.5 m and filling it with crushed gravel or rocks approximately 3 to 5 cm in diameter. Some suggested species that are readily available and aesthetically pleasing are listed in **Appendix B**.

Figure 81: Erosion in garden in front of the River Parkway Childcare Centre from downspout; photo taken November 12, 2020.

- Return watercourses and drainage to a more natural configuration with sinuosity and pools, and by restoring natural cover (refer to **Figure 80** for an example of area requiring more natural configuration and vegetation, and to **Figure 101**, #1 for other areas where this is proposed). The work that was completed on the watercourse running through the Memorial and Meditation garden is an example of a more natural configuration, and the same principles can be applied to the drainages within the property. For example, the lawn around Drainage #2 can be replaced with a diversity of plants suited to the fluctuating soil moisture conditions.

- Minimize nutrient and chemical inputs within 8 m (25 feet) of all ditches and watercourses.

- Eliminate potential chemical runoff and drift near ditches and watercourses by designating “no spray” zones, using spot treatments, increasing thresholds for pest problems, using coverings or hoods over spray nozzles if applying by spray, and taking the weather into account prior to application.

- Raise mowing heights to slow and filter runoff, to improve the health of existing lawns, and reduce the incursion of undesirable species and the grasses' dependence on supplemental water and nutrients. (Research has shown that, on a slight slope, an 8 m (25 feet) buffer of 8 cm (3 inch) lawn provides filtering benefits.)

- Reduce the potential for nutrient loading to water bodies by using slow-release fertilizers, spoon feeding, and filtering drainage through vegetative or mechanical filters prior to entering drainages.

- Install a permeable surface for your parking lot and outdoor walkways. This is a lot of space that may not see much use, so it is a good candidate for surfaces that limit the amount of water being sent to storm sewers and ditches.

- Where possible eliminate paved surfaces—on walkways use gravel or wood chips (refer to **Figure 82** for examples of surface treatments, from most to least permeable).

- Keep any paved areas as short and narrow as possible.

- Avoid running any sprinklers at peak evapotranspiration times and spot water where possible.

- Maintain soils and vegetation to maximize water absorption and reduce runoff and evaporation, including: maintain soil cover, improve soil structure, add or maintain natural organic matter in the soil, and improve drainage).

- Use vegetation that is appropriate for the local climate and growing conditions and does not require supplemental water or fertilizer.

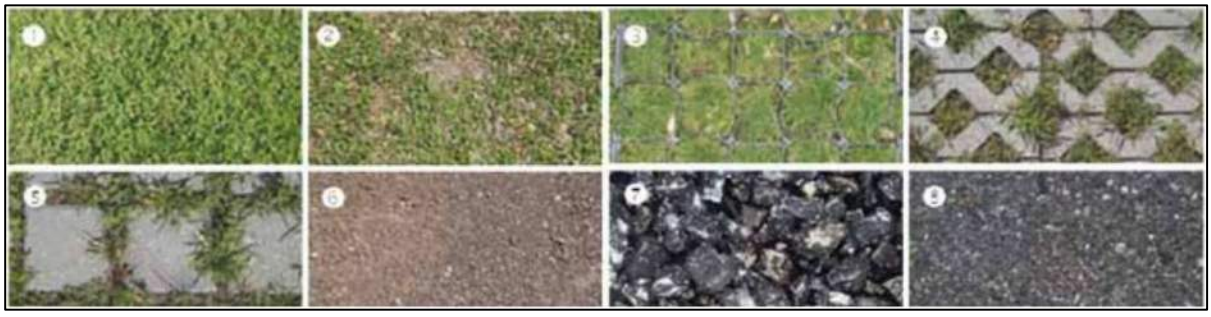

Figure 82: Overview of most common ground surfaces, from most to least permeable (European Union, 2013)

4.2 Soils, Vegetation & Landscape

As the property is located beside a mature woodlot along a major migration route and is used by a variety of wildlife, there are opportunities to increase and enhance the existing and adjacent ecological assets. One of the most obvious and with the greatest impact is to

“unseal” the soils from asphalt and gravel and replant with native species, and restore any unnecessary lawn areas to a greater diversity and ecological health.

One ecological principle is that natural areas are more capable of providing habitat when they are larger and less fragmented. Smaller wooded areas have a greater proportion of edge to interior, and the edge interface has significant adverse effects on the interior. For example, when forest birds nest near the edge, they suffer from increased nest predation and parasitism, and are less successful at reproducing and maintaining populations. Decomposition and denitrification[10] are two critical functions involved in forest nutrient cycling that are often compromised in smaller, degraded woodlots.

There is an opportunity to achieve multiple and compounding ecological improvements ?by carrying out one major effort - increasing the size of the woodlot on the adjacent NCC property by removing parking area and restoring it to woodland (refer to **Figure 98**, **Figure 99**, **Figure 100**, and to **Figure 101**, #2 for other areas where this is proposed). In the case of woodlands, bigger is better. Although this would be a long-term effort, as woodlots mature slowly, it would be an incredible legacy for future generations and a learning opportunity for residents, children who attend the care centres, congregants, and guests.

Prior to carrying this out, it would be prudent to confirm the remaining parking is sufficient, or to determine methods that could reduce the number of necessary parking spaces, such as by implementing care-share programs (with easier post-COVID implementation), increasing bicycle storage, potentially providing a changing/showering rooms for those who can and will bike or use more physical transportation methods, analyzing and confirming use of public transportation, and possibly offering a shuttle/pickup service to communities or groups of people who are not as well-connected through other means.

As well as providing an exponential increase ecological benefits, the restored woodland area could be used to demonstrate plants that are used for healing and food based in local Algonquin Anishinabeg Traditional Ecological Knowledge. To this regard, requesting the advice and participation of the local Algonquin Anishinabeg in planning, selecting, possibly germinating, planting, tending, and eventually harvesting the restored area could provide them with an area that is theirs to use, and allows for a forging connections to the greater community.

If the NCC woodlot comes under the management of the First Unitarian Church, it would be recommended to install signage to explain the ecological importance of the area, guidelines for respecting and protecting it and its inhabitants, and to indicate any special features for a self-guided educational journey. As the understory is currently becoming invaded by invasive shrubs and herbaceuous plants (including Garlic Mustard, Common Buckthorn and shrub honeysuckle), efforts will need to be made to remove and replace these with shade-tolerant saplings/seedlings. While some prefer an open understory for aesthetics (it offers a view through the trunks, and a mature woodland ‘look’ is appealing to many), keeping the understory open is not suitable for this urban woodlot, as it has stressors that would not be found in a larger mature forest. These include altered vegetation structure, increased

[10] Is the anaerobic process by which nitrate is converted by soil microbes to nitrogen gases, mainly N2O and N2, returning mineral N to the atmosphere through transformation into its gaseous form

sunlight availability, greater fluctuations in humidity, greater soil compactness, and more exposure to pollution (Wallace et al., 2018).

By underplanting the edges and sparsely underplating the interior with native species and removing the invasive herbaceuous and shrubby species, it will create many positive benefits, including:

- Maintenance of higher humidity levels, which allows for healthier plants due to improved soil moisture.
- Reduction in nutrient pollution loads, which are common in urban forests, and favour the growth of invasive plants.
- Increasing soil moisture which in turn increases denitrification, in order to favour native species over invasive species (which are facilitated by excess nitrogen).
- Reduce the invasive herbaceuous and shrubby species, thereby reducing the decomposition of leaf litter, that in turn temporarily increases the natural mulch while the understory matures by decelerating decomposition; the natural mulch will reduce the germination of invasive species and keep the soil less prone to moisture fluctuations.
- This underplanting is essential in providing the basis for natural regeneration as the canopy ages and dies

Ongoing invasive species management can be in part achieved by restricting pedestrian traffic through the area to pathways, to the extent possible, to reduce impacts to the trees roots, reduce soil compaction, and reduce the accidental introduction of non-beneficial and invasive species. However, it must be acknowledged that the presence of human activity in a small woodlot, or through naïve human interest and disturbance of nests during breeding bird periods may have a negative impact by unintentionally causing nest abandonment. As well, the presence of something unusual or noteworthy, such as an Eastern Screech Owl, may achieve ‘celebrity’ status and inadvertently interest too many spectators, who then may trample and crowd the woodlot in their excitement. It is recommended that a plan be put in place to educate visitors and possibly exclude certain types of activities during sensitive times of the year, on an as needed basis.

In addition to increasing the size of the woodlot by removing parking area, additional woodland buffer can be instated along the northern side of the church (refer to **Figure 83** to **Figure 87**, and to **Figure 101**, #2 for other areas where this is proposed), where lawn currently exists. While access to these areas could and should be maintained by either creating a path or leaving a groundcover that is resilient to traffic, these areas appear to be maintained as relatively large lawn areas with no purpose other than to cover ground. If they are underused and lawn in these areas is not strictly necessary, but the congregation wishes to maintain views towards the river, it is recommended that a lower mixed-height canopy of trees is established (by selecting trees with a lower mature height, such as Blue Beech, *Carpinus carolina*; refer to **Appendix A** for sources for additional species) to maintain some open view from the church windows while still providing a buffer for and expanding the woodland.

Along the west side of the property and on the slope south of the Cleary Avenue entrance lane, the treed areas have developed a moderate to heavy understory of invasive trees, shrubs and other plants. These can be removed and replaced with a mix of native and non-invasive plants trees, shrubs and other plants (refer to **Figure 94** to **Figure 97**, and to **Figure 101**, #3 for other areas where this is proposed). By removing these invasive species, it will reduce the source of seeds and propagules[11] that may infiltrate other areas, while improving food sources for visiting wildlife. The invasive Common Buckthorn and others like shrub honeysuckles produce a berry that is eaten by birds, but provide a lower nutritional value than the fruit from native species that are displaced. Birds must then spend more time and energy searching for non-native berries to fuel themselves and their young. As well, Common Buckthorn in particular is known for producing a secondary metabolite called emodin that produced deformation and mortality on early developing larvae (i.e. tadpoles and efts[12]) of some amphibian species (Sacerdote-Velat, 2014; Lincoln Park Zoo, 2013). These exudates can travel in water to the river, harming wildlife offsite. As an example of preferred species, the native Serviceberry shrubs that are planted near the Unitarian House entrance and around the Courtyard undoubtedly used by local birds and wildlife.

Along the northwest side of the property, an area of lawn with a pathway can be converted to an additional “Healing Garden” (also under the direction of the Algonquin Anishinabeg) or combined with a Food Garden (which is in itself healing and medicinal), potentially including plants that are considered medicinal in ‘western’ culture (although a lot of these plants will be non-native, not all are invasive). Pollinator plants would also do well in this area, mixed in for colour and interest (refer to **Figure 88** to **Figure 90**, and to **Figure 101**, #4 for other areas where this is proposed).

Towards the south end of the property, areas of lawn surrounding the parking lots have been either slowly overtaken by invasive shrubs or have lost tree cover over time. As well, there is an excess of lawns along the south end of the Unitarian House and around the River Parkway Childcare Centre. These areas would provide more beauty, wind protection, shade, and ecological benefits if planted with native trees, shrubs, grasses and herbaceous plants, including pollinator and wildlife ‘friendly’ species (refer to **Figure 92** and **Figure 93**, and to **Figure 101**, #5 for other areas where this is proposed). In areas where snow storage must be maintained during the winter, lower-growing plants can replace the lawn. While these plants establish themselves, undyed shredded bark or other organic mulch should be applied, and reapplied as necessary to maintain a 5 to 8 cm depth of mulch.

This could be achieved slowly, over time and as resources are available. It would not have to be created all at once. It is also important to note that although invasive species will remain present on the nearby properties in in unmanaged natural areas, the removal of invasive species from this property will create local improvements as well as can provide educational opportunities that have farther-reaching effects.

To select appropriate species, the Plant Database, developed and maintained by Watersheds.ca, provides an excellent resource with photos, as well as a filtering tool to allow for the selection of plants based on the type of plant, the light conditions, the soils

[11] a vegetative structure that can become detached from a plant and give rise to a new plant, e.g. a bud, sucker, or spore.
[12] Juvenile newt or salamander

type, and the soil moisture conditions. This website can be found at https://naturaledge.watersheds.ca/plant-database/.

Figure 83: Lawn area north of the church adjacent to the NCC lands; photo taken November 12, 2020.

Figure 84: Pavement and lawn north of the church near NCC property; photo taken November 12, 2020.

Figure 85: Lawn area north of the church; photo taken November 12, 2020.

Figure 86: View of lawn area from lower church level; photo taken November 12, 2020.

Figure 87: Pavement and lawn north of the church near NCC lands; photo taken November 12, 2020.

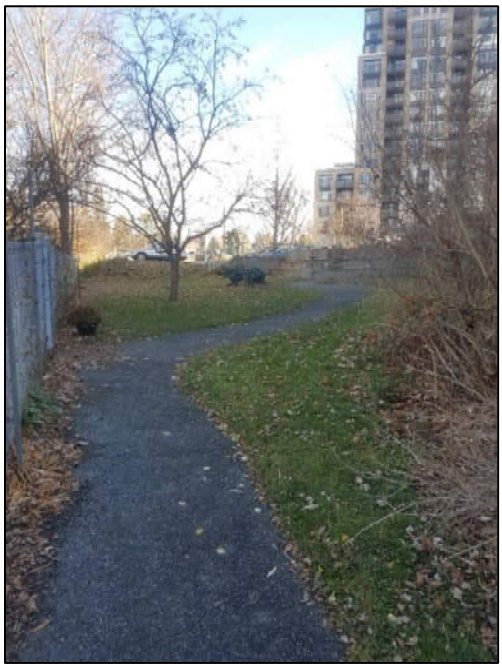

Figure 88: Lawn area beside Unitarian House that can be converted to Food and Healing gardens; photo taken November 12, 2020.

Figure 89: Lawn area beside Unitarian House that can be converted to Food and Healing gardens; photo taken November 12, 2020.

Figure 90: Lawn area beside Unitarian House that can be converted to Food and Healing gardens; photo taken November 12, 2020.

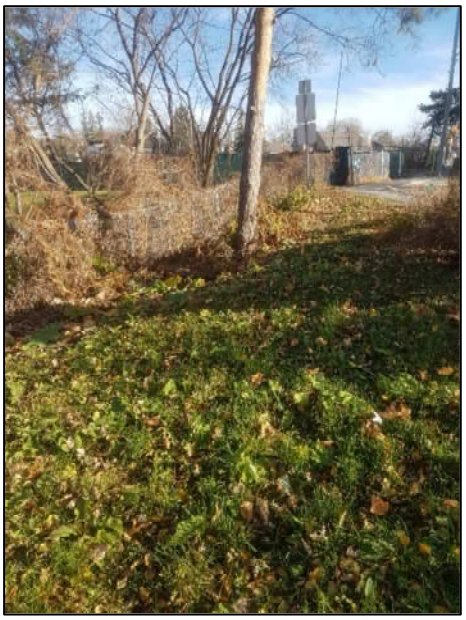

Figure 91: Lawn area beside Unitarian House that can be converted to Food and Healing gardens; photo taken November 12, 2020.

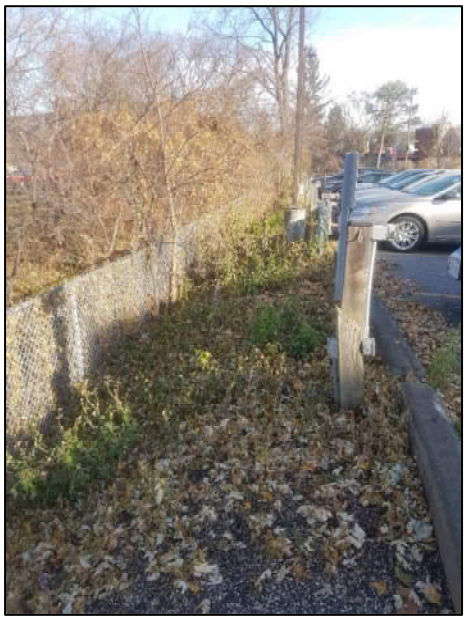

Figure 92: Neglected area near Unitarian House parking lot that can be reforested; photo taken November 12, 2020.

Figure 93: Lawn area near Unitarian House parking lot that can be reforested; photo taken November 12, 2020.

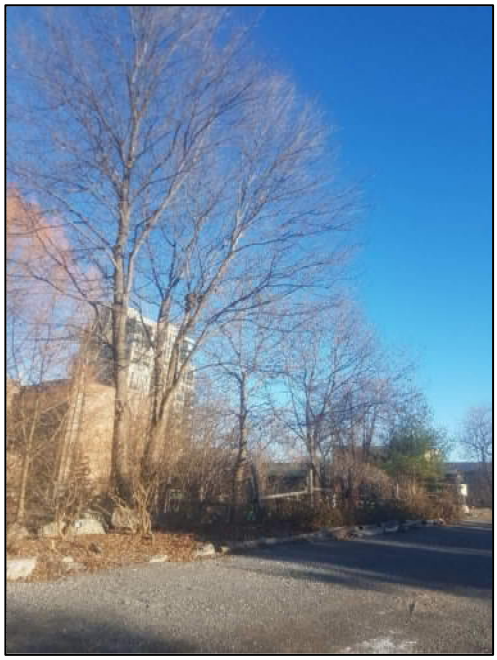

Figure 94: Treed slope north of Cleary Avenue Lane that can be reforested; photo taken November 12, 2020.

Figure 95: Treed slope north of Cleary Avenue Lane where invasive species can be replaced; photo taken November 12, 2020.

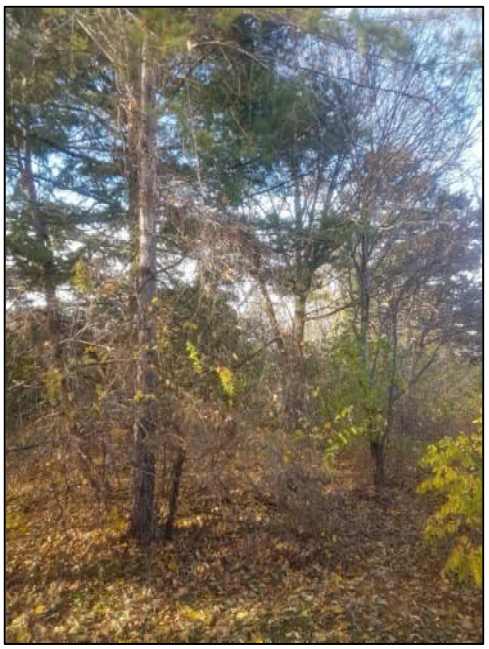

Figure 96: Treed western boundary where invasive species can be replaced; photo taken November 12, 2020.

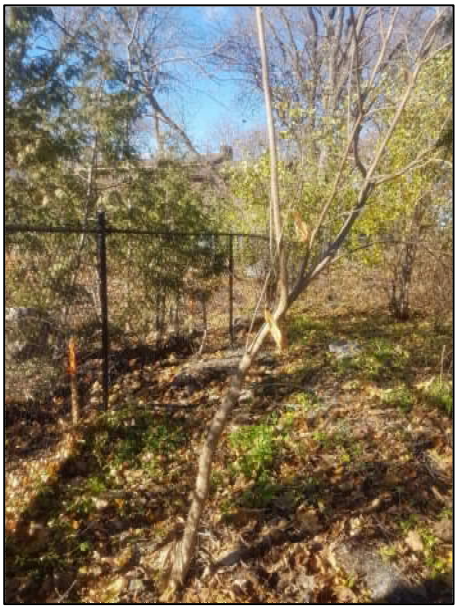

Figure 97: Treed western boundary where invasive species can be replaced and concrete rubble can be removed; photo taken November 12, 2020.

Figure 98: Pavement and lawn near NCC property that can be taken up and reforested; photo taken November 12, 2020.

Figure 99: Pavement and lawn near NCC property that can be taken up and reforested; photo taken November 12, 2020.

Figure 100: Pavement near NCC property that can be taken up and reforested; photo taken November 12, 2020.

Figure 101: Overall Ecological Restoration and Augmentation Recommendations; aerial image from GeoOttawa.

4.2.1 General Principles for Ecological Enhancement

The following guidelines are adapted from the Audubon Cooperative Sanctuary Program, and can be applied as the recommendations in this plan are adapted to meet the overall goals of the property stewards:

- Maintain natural wildlife habitat in at least 50% of all minimally used portions of the property.
- Connect small and large natural areas as much as possible to improve wildlife movement throughout the area to neighboring natural areas. For instance, connect woods, meadows, stream corridors, and ponds with corridors of natural vegetation.
- Maintain or plant varying heights and types of plants, from ground cover to shrub and tree layers in habitat areas (e.g., leave understory in woodlands; maintain grasses and herbaceous plants in tall grass areas).
- Leave dead trees standing when they do not pose a safety hazard to leave habitat for local wildlife.
- Maintain a water source for wildlife with aquatic plants and shrubbery or native landscaping along the shoreline (i.e., not turfgrass). This could be a pond, stream, wetland, or river corridor. On smaller properties, this may also include a birdbath or created “backyard” pool.
- Naturalize at least 50% of drainage features and watercourses with emergent aquatic and wetland plants. Give special attention to shallow water areas (<2ft. deep) since wildlife is most abundant when shallow water includes emergent aquatic vegetation.
- Where lawns are kept, maintain mowing heights at levels that can be reasonably maintained on a day-to-day basis without continually stressing turf or maximizing chemical inputs; this height is generally no lower than 7 cm (3 inches).
- Regularly work to improve soil health. This may include amending organic content, aerating, and improving water infiltration to cultivate a diverse, living biotic soil community.
- Base fertilizer applications upon soil test information.
- Maximize vegetation health and minimize resource inputs by improving vegetation conditions.
- Plant pest-resistant or stress-tolerant cultivars in lawns, gardens and in naturalized aeras landscaping. Select plant species/cultivars best suited for climate, soils, and growing conditions.
- Designate and train key people to monitor plant health and pest populations as part of the IPM program.

- Identify and record “hot spots” where invasive species, disease or insect outbreaks first occur. Identify other areas where poor growing conditions and disturbance often lead to problems.

- Use scouting forms to record the type, severity, location, and treatment of pest problems.

- Establish aesthetic and functional thresholds for insects, fungal diseases, and invasive species for all areas.

- Evaluate potential control measures, including alterations in cultural management, biological, physical, and mechanical controls, and chemical methods.

- Consider the environmental impact of pest control measures, e.g., leaching and runoff potential, toxicity to non-target organisms, soil absorption capacity, pesticide persistence, water solubility, effects on soil microorganisms.

- Actively work to reduce vegetation stresses and change cultural practices or other conditions to prevent or discourage recurrence of problems.

- Maintain records of treatments employed and their effectiveness and use them to guide future pest control decisions.

- Avoid areas of bare soil. Dirt not covered by plants or grass can more easily flow into streams, leading to soil erosion and water pollution.

- Landscape to encourage water to run into the ground rather than onto neighboring sidewalks, driveways, and streets. (A below-ground cistern can be installed from which rainwater can be pumped to water the lawn.)

- Mulch all planted areas—bases of trees and shrubs, gardens, flower beds, etc.—in order to allow for better water absorption, lower evaporation, and to help prevent erosion from runoff. You can use grass clippings, leaves or any other vegetative material, and this will have the added benefit of being self-composting, eventually turning into an organic fertilizer for the plants.

- Use a mulching lawnmower and leave lawn clippings on the grass. The organic material in the clippings will provide nutrients for the lawn, reduce the chance for soil loss, and decrease the volume of lawn waste in the landfill.

- If you have a roof without a gutter, plant grass or spread mulch or gravel under the drip line to increase the capacity of the ground to absorb water and prevent soil erosion.

- Avoid pesticides and herbicides on lawn because these chemicals can seep into the groundwater system or run off into streams and rivers during heavy rains.

- Install a container garden on deck areas (note: review the Bird Safe Guidelines in **Section 4.3.3**, prior to carrying this out as it may serve as an

attractant for birds). Putting plants on the roof reduces the amount of water runoff. A rooftop garden will also reduce your cooling energy bills since the sunlight that hits the roof, instead of being transferred into the building, will be used by the plants to fuel their growth. Before installing a garden on an existing roof, be sure that it can support the weight of the soil and plants as well as any water the containers may retain—this can be a lot of weight in one area. Low weight soil may be considered, such as one used for rooftop gardens that contains a high proportion of perlite, Haydite or Basalite aggregate. For example, Lightweight-Horticultural perlite and peat moss, fully watered, weigh only 40 lbs. per cubic foot. Plants that mature at less than 5' high are less likely to tip out of the shallow planters; if taller plants are used, install guy-wires or brace them with wood. Design for this possibility with any new structures.

4.2.2 Pest and Disease Awareness

At this time, no provincial legislation governs forest pests and pathogens as all invertebrates regulated under the Invasive Species Act are aquatic, however the Ontario Invading Species Awareness Program (OISAP) tracks a number of forest pests and pathogens. Common pests and diseases that may be found within the property and the potentially affected tree species are listed in **Table 2**, along with the regulatory acts or authorities that track each one. Note that Asian Longhorn Beetle and Oak Wilt are currently uncommon but are a serious concern and are to be reported immediately to the CFIA if observed.

The *Plant Protection Act* prohibits the import, movement, or growth of pests, things infested with pests, or biological obstacles to pest control that are injurious to plants. Its focuses are the agricultural and forestry sectors. While the property is primarily zoned for residential and institutional uses, these species may eventually spread from the property into agricultural and forestry land use areas. As land stewards, it is suitable to control and limit the spread of invasive species and pests found within the property. The *Plant Protection Act* also regulates a number of forest pests that are relevant to the health of some of the trees within the property.

Table 2: Common Pests and Diseases

Common Name	Scientific Name	Affected Species	Plant Protection Act	Ontario Invading Species Awareness Program
Emerald Ash Borer	*Anoplophora glabripennis*	Native Ash (Native *Fraxinus*)	✓	✓
Asian Longhorn Beetle	*Argrilus planipennis*	Native Maples (Native *Acer*) and other hardwood trees	✓	✓
Gypsy Moth	*Lymantria dispar*	Several deciduous species; prefer Oak (*Quercus*)	✓	✓
Hemlock Wooly Adelgid	*Adelges tsugae*	Native Hemlock (Native *Tsuga*)	✓	

Common Name	Scientific Name	Affected Species	Plant Protection Act	Ontario Invading Species Awareness Program
Oak Wilt	*Ceratocystis fagacearum*	Oaks (*Quercus*)	✓	
Beech Bark Disease	*Nectina coccinea var. faginata*	Native Beech (*Fagus*)		✓
Butternut Canker	*Ophiognomia clavigignenti-juglandacearum*	Butternut (*Juglans cinerea*)		✓
Dutch Elm Disease	*Ophiostoma ulmi, O. novo-ulmi*	Native Elms (Native *Ulmus*)	✓	✓

4.3 Wildlife

The following guidelines are adapted from the Audubon Cooperative Sanctuary Program and can be applied as the recommendations in this plan are adapted to meet the overall goals of the property stewards. Recommendations that are specific to a group of wildlife are provided in the following sections below.

- Identify core habitats, such as mature woodlands, wetlands, or stream corridors, and special habitat concerns, such as endangered or threatened species, on the property.
- Train staff to understand that management practices may positively enhance or adversely impact wildlife species and habitats on the property.
- Maintain an on-going written inventory of at least bird and mammal species to document and track wildlife use of the property.
- Choose flowers for gardens or container plants that will provide nectar for hummingbirds or butterflies.
- Maintain nesting boxes or other structures, when appropriate, to enhance nesting sites for birds or bats.
- Protect wildlife habitats, and any endangered or threatened wildlife or plant species, from disturbance by residents, visitors and maintenance activities. Use buffers, mounted signs, fencing, or designated “environmentally-sensitive zones” as needed.
- Establish and maintain at least 80% of the landscaped trees, shrubs, and flowers, excluding turfgrass, with plants that are indigenous to the native plant community of the ecological region of the property.

- Purchase landscape plants from locally-grown sources, whenever possible, to support the genetic integrity of local native plant communities.

- Avoid disturbing known bird nests or den sites until after young have dispersed. Stake or flag such areas when needed (e.g., rope killdeer nests; avoid removing or pruning shrubs or trees during bird nesting season if nests are present; do not mow natural areas until after bird nesting season).

- Restore degraded habitats, such as eroded slopes, compacted soils, polluted water sources, or areas overrun with invasive exotic species.

- Clean up trash from habitat areas when necessary.

- Confine roads, paths, trails, and necessary vegetation removal to the edges of existing habitats to minimize habitat disturbance and fragmentation.

4.3.1 Monarch and Other Insects

To create additional habitat for Monarch, Common Milkweed (refer to **Figure 102**), Swamp Milkweed, and Butterfly Milkweed should all be seeded or planted in the property. Seeds should be locally sourced where possible, to ensure genetic suitability to the site conditions. These will support larval stages of Monarch. Adults can be supported by the seeding of nectar bearing species such as those noted in **Appendix B** (refer to **Figure 103)**. By enhancing insect populations, they in turn pollinate and enhance plant diversity and reproduction and become a food source for birds and other wildlife.

Figure 102: Common Milkweed plant in existing pollinator garden adjacent to the Unitarian House parking lot; photo taken November 12, 2020.

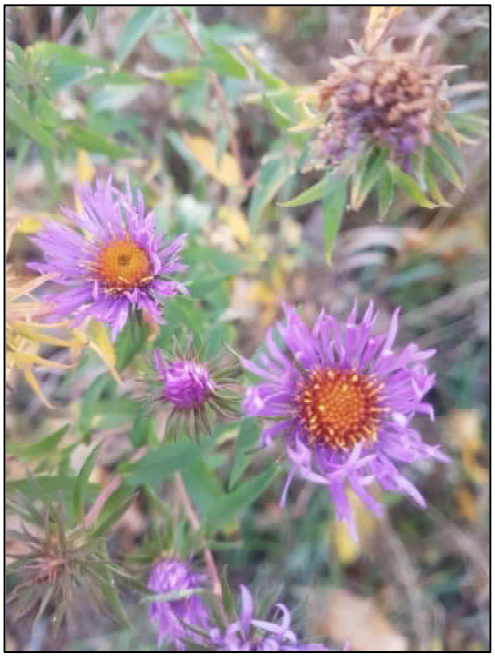

Figure 103: New England Aster growing within the naturalized border along the western boundary of the property; photo taken November 12, 2020.

4.3.2 Reptiles and Amphibians

As noted in **Section 2.8.3**, there is currently limited habitat within the property for amphibians, however, American Toads are likely present, and Leopard frogs may occasionally be encountered. It is also possible, although unlikely, for one of the turtle species that inhabits the Ottawa River to make its way past the Sir John A. Macdonald Parkway.

All frogs require relatively pollutant-free water to survive, and road salt (both NaCl and $MgCl_2$) is a major pollutant that can severely affect the embryonic survival and development of most amphibians. Chloride is a permanent pollutant. There is no way to remove it from water without expensive treatment. Thus, one of the most impactful measures to improve conditions that support amphibians is to eliminate the use of road salt where possible. While there are no ecologically friendlier products available at this time for de-icing, traction can be increased through the use of sand and grit, and ice buildup can be reduced by more regular and complete snow removal, thus requiring less de-icer to melt it.

Due to potential safety issues with ponds (due to the presence of child care facilities), and the historic lack of any naturally occurring ponds (probably due to site topography and soils being unsuitable for the development of ponded areas), no ponds are recommended for inside the property.

If a turtle or Common Garter Snakes (aka Eastern Garter Snake) makes its way into the property, efforts should be made to return it safely to the Ottawa River. They are unlikely to survive a second attempt at crossing the Sir John A. Macdonald Parkway, and there are no suitable turtle habitats further inland, and snake habitat is also very limited. If the turtle is injured, it is recommended to carry out the following (taken from Ontarioturtle.ca):

- Carefully place the injured animal in a well-ventilated plastic container with a secure lid (turtles can climb!), and no water.
    - Note: Most turtles can be picked up carefully with two hands. When handling snapping turtles keep a safe distance from their head as they will snap at you if they feel threatened. You may want to use a shovel or board to lift the turtle. Watch our video clip for more tips for handling turtles.
- Note the location (road, major intersections, and mileage) where the turtle was found to ensure it can be released according to provincial regulations.
- Call the Ontario Turtle Conservation Centre at 705-741-5000 (for turtles only) or the Rideau valley Wildlife Sanctuary at 613-258-9480
    - Note: DO NOT EMAIL with information about an injured turtle or snake. An injured animal needs medical attention as soon as possible.
- Do not offer the turtle or snake water or food, and do not try to treat the turtle/snake in any way.
- Wash your hands after handling the animal.

- If you have to keep a turtle/snake overnight, keep it in the well-ventilated container and place it in a cool, dark place, away from pets. Leave us a message and the Ontario Turtle Conservation Centre (for turtles only) or the Rideau valley Wildlife Sanctuary will get back to you when they open.

If turtle eggs are found, or a nesting turtle is seen, do not disturb the nest or nesting turtle. Not only is this not legal, but it can often lead to death of the eggs/hatchlings. Refer to the instructions at https://ontarioturtle.ca/ourmission/drop-off/ for further details.

4.3.3 Birds

Due to the proximity of the Ottawa River and a major migration route, it is recommended that protection measures for birds are carried out. Although more birds collide with houses, proportionately, large buildings (low, mid or high-rise) tend to have higher per-structure kill rates than houses due to their greater mass and their more extensive use of glass and lighting (City of Ottawa, 2020). The following guidelines are adapted from the City of Ottawa Bird-Safe Design Guidelines, and refer to further details on guidelines found at https://documents.ottawa.ca/sites/documents/files/birdsafe_designguidelines_en.pdf :

- Treat glass to make it more visible as a barrier to birds (see Guideline 2 at the link above for more details).

- As the Courtyard area can fatally entrap birds, especially because it contains trees and plants surrounded by windows or other glazed surfaces, treat glass surfaces within the courtyard to make it more visible to birds.

- As most migratory songbirds migrate at night, design and manage exterior lighting to minimize impacts on night migrating or nocturnal birds, as artificial lights can disorient them, causing them to collide with buildings or to become exhausted. Specific measures for exterior lighting include:

    - Avoid up-lighting

    - Use full cutoff exterior fixtures

    - Ensure that all exterior light fixtures are properly selected, mounted and aimed to prevent unintended light trespass

    - Use motion detectors and other automatic lighting controls to reduce or extinguish non-essential lighting between 11 pm and 6 am.

    - Use minimum wattage fixtures to achieve appropriate lighting levels (minimum levels are established by the Ontario Building Code)

    - Minimize amount and visual impact of perimeter lighting

    - Avoid use of floodlighting

- Turn off or minimize interior lighting during spring and fall migration periods. Specific measures for interior lighting include:

- Use window shades or blinds to prevent light escape between sunset and sunrise
- Use motion detectors and/or other automatic lighting controls to turn off lights from non-residential buildings after business hours
- Create smaller zones in lighting layouts to discourage wholesale area illumination
- Incorporate and encourage the use of localized task lighting
- Install light dimmers in lobbies, atria and perimeter corridors for nighttime use

If the following efforts are made to attract birds to the property, these attractants should not be used without first considering bird-safe design:

- Landscaping with native plant species that supply food and/or shelter to birds.
- Water features that provide clean water for birds to drink and bathe in.
- Birdhouses or nest platforms.

For any existing glazing with glass surfaces that are greater than 5 cm in any direction, such as the example in **Figure 104**, visual markers should be applied to the **exterior** surface (treatments applied to the interior surfaces will not address reflectivity issues). Specifications for effective visual markers are:

Figure 104: Large windows require bird protection measures; photo taken November 12, 2020.

- High colour contrast to the glass surface.
- Any pattern of visual marker is acceptable (i.e. lines, dots, etc.) as long as a maximum spacing of 50 mm by 50 mm is used (refer to **Figure 105** below).
- Individual marker elements should be a minimum of 4 mm diameter, or 2 mm wide by 8 mm long for linear elements.

For many marker options, both for commercial and for smaller applications, refer to https://safewings.ca/strategies/homes/. If someone would prefer to create their own pattern for bird protection, they can draw or stencil an opaque design (stripes, dots or anything else) on the outside of the window using a bold-tip oil-based paint marker (e.g. Sharpie Oil-Based Paint Markers). As long as the pattern elements are no more than 5 cm apart, and a high contrast colour such as white is selected, it will be visible under a wide range of light conditions. Oil-based paints will last a very long time, but can be scraped off if necessary.

For temporary measures that can be applied only during migration periods, and for ideas for new construction, refer to the City of Ottawa Bird-Safe Design Guidelines.

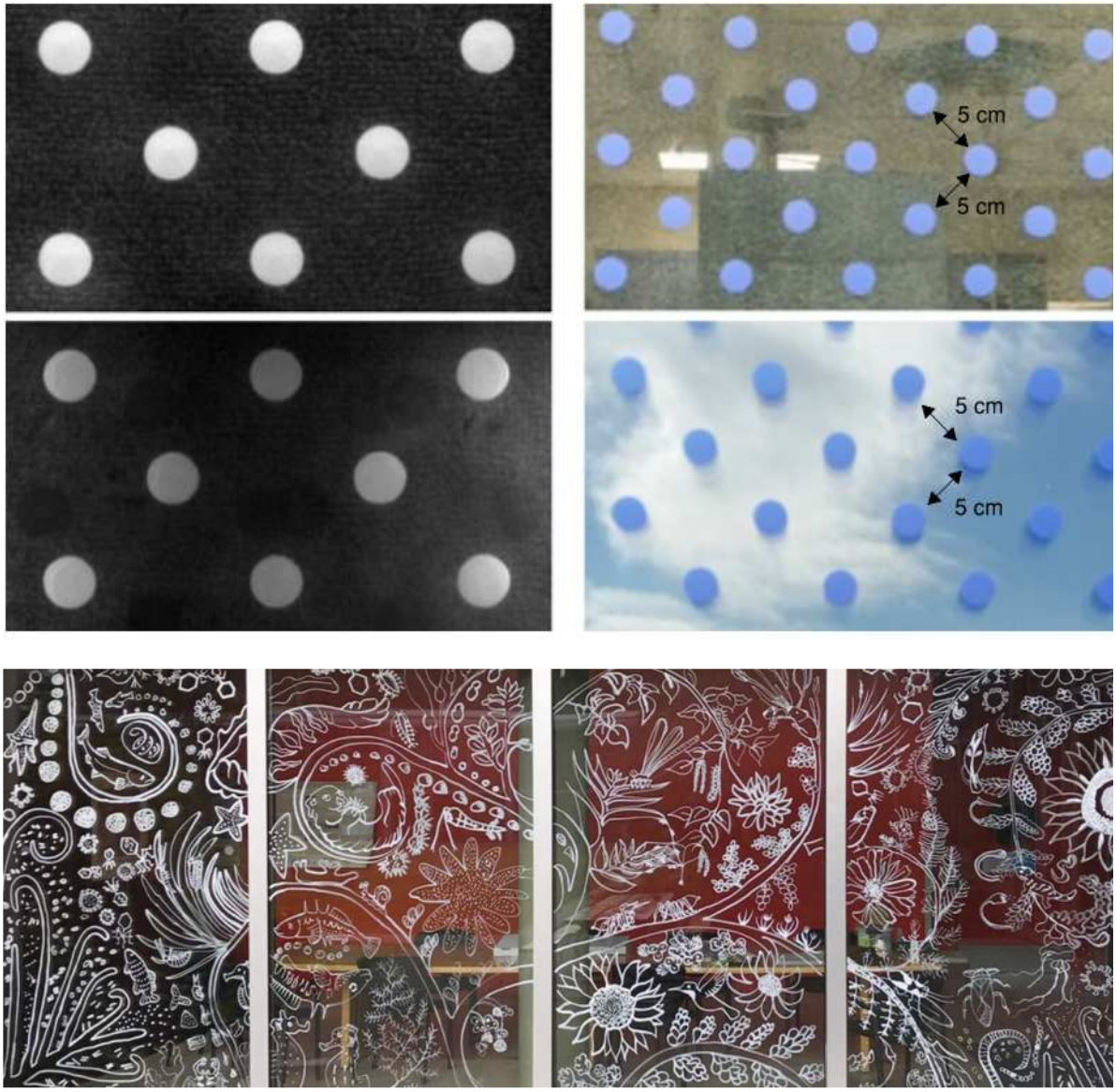

Figure 105: Glass coatings for the protection of bird collisions (taken from glassonweb.com and American Bird Conservancy at ABCbirds.org).

Nesting boxes

There appeared to be few large trees with cavities within and adjacent to the property. In order to provide nesting habitat for cavity-nesting species, it is recommended that a variety of nesting boxes are installed around the property. The following text provides descriptions of the types of nesting habitat for cavity-nesting species being recommended.

Single-compartment nest boxes are the easiest to build and the most frequently used by birds (Minister of the Environment, 1991). The boxes should be built to allow for annual

cleaning and occasional observations (ibid). Annual maintenance in fall is recommended to clean the box and discard used nesting material after the birds have left to eliminate parasites (ibid). Nest materials do not need to be put into the box in the spring as most birds prefer a clean empty box (ibid). For birds of the woodpecker, owl, chickadee, and duck families, a layer of wood chips or shavings (not sawdust) about 2.5 cm deep may be placed in the bottom of the box (ibid). The boxes should be dry. To assist in keeping it dry, drainage and ventilation are important features. Both can be provided by drilling a few small holes just below the roof overhang and in the floor of the box near the walls (ibid).

Boxes should be protected from predators (Minister of the Environment, 1991). Do not install a platform or perch at the entrance, as this provides a support to animals raiding the nest, and may tempt young birds to venture out of the box before they can fly (ibid). Nest boxes should be placed on poles well away from trees and shrubs to stop squirrels from jumping to the roof of the box (ibid). To prevent raccoons from raiding duck boxes, make the entrance hole oval in shape and erect the pole in water near the shore (ibid). Boxes that are placed on poles can be protected with a predator guard, such as a large inverted cone or a 60-cm strip of metal wrapped around the pole (ibid). A large clean plastic bottle (e.g., a bleach container) with the bottom cut out and nailed to the pole at the neck may also work (ibid).

Providing a second box approximately 6 m away from another box can help reduce chick death from parasites for birds that create a second brood (Minister of the Environment, 1991). Monitoring is recommended, as the second box should remain closed until about nine (9) days after the first eggs have hatched, when the adult is ready to re-nest (ibid). Diatomaceous earth sprinkled in the nest box may also assist in controlling parasites, and is harmless to other life-forms (ibid).

Although the basic design for nest boxes is standard, the size and location of the box will vary depending on the species of birds (Minister of the Environment, 1991). **The following link** gives the dimensions of nest boxes for some common species. It is important to make the entrance hole the correct size for the desired species - http://publications.gc.ca/collections/collection_2018/eccc/CW69-4-89-1991-eng.pdf. The box may be suspended from a tree or mounted on a pole (ibid). The location should be protected from the sun for part of the day, and the entrance should be turned away from the prevailing direction of wind and rain (ibid). The interior of the box should have rough sides, and the wood should be rot resistant (ibid).

Any wood debris should be kept on-site as it will provide nesting, foraging, perching, and shelter habitat for some bird and other wildlife species (such as snakes). Brush piles should also be created to provide shelter for birds and other wildlife. They should be 3 m high or more, and a minimum of 3m in diameter. They can be located near the edges of treed areas or drainages. The brush pile should have a base, preferably of logs that are 15 to 20 cm in diameter and 2 to 3 meters long. Place four to ten poles on the ground parallel to each other, 20 to 30 cm apart. Place more poles of the same size perpendicularly across the top of the first set of poles. Other materials can be used for the base such as large rocks or stumps or combinations of each. The large materials will serve to keep tunnels open under the pile after the brush is stacked on top. Stack brush over the base, preferably sourced from natural events such as windstorms.

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4.3.4 Bats

Due to the lack of large-diameter tall cavity trees within and adjacent to the property, artificial roosts could be installed. These may be composed of a mixture of artificial bark for day roosting and potentially maternity roosting, and bat condos for maternity roosts. Brandenbark™ is recommended for artificial day roosting sites, and bat condos can be purchased from Canadian Bat Houses (www.canadianbathouses.com), who offers several products. The Nursery Model is a two-chamber design that can accommodate up to 300 bats. BCI studies have shown that occupancy rates for multi-chamber nursery models that are at least 7.6 m (25") tall have an occupancy rate of 80%. Taking this into account, at an 80% occupancy rate, a single roosting structure will provide alternative roosting area for up to 240 bats, four (4) will provide roosting for 960 bats, and six (6) will provide roosting for 1440 bats. Providing more than one bat house allows the bats to switch roosts, which is typically carried out by both non-breeding and breeding bats (EC, 2015).

The artificial roosting structures should be installed in clusters of two (2) per pole, with one facing north and one facing south. Clustering the structures will allow for a range of microclimate variability in the roosting opportunities at the cluster sites (Olsen & Barclay, 2013). Having multiple roosting opportunities at one location will also accommodate multiple roosting groups or larger roosting group sizes. This will allow for adjustments in group size as a response to changing conditions and physiological requirements (Olsen & Barclay, 2013).

The sites selected for structure placement should be surrounded by a variety of vegetative communities in order to provide heterogeneous foraging habitat in the vicinity. It is also recommended that the artificial structures are installed by April 1st, well prior to the bat active period (April 15th).

The structures should be mounted on poles, as bats are able to find houses located on poles in half the time as those mounted on trees (BCI, 2017). Roosts on poles also had higher occupancy rates and were used more frequently than those placed on trees in compared studies (Mering & Chambers, 2014). The structures should be mounted 3.5 to 6.0 m above ground and located 6.0 to 9.0 m from any tree branches or other obstacles that could interfere with flight or make roosting bats more vulnerable to predation (BCI, 2017; Toronto Zoo, 2017). The poles should have metal 'predatory guards' (1 m long metal sheets) wrapped around and attached tightly (with no protruding nail heads) to the support post below the bat box (Government of Alberta, 2010).

The structures should be placed above the highest surrounding vegetation in order to receive 6 to 8 hours of sunlight, and should be placed facing south to receive maximum available sunlight (BCI, 2017; Toronto Zoo, 2017). White-nose syndrome affected bats were much more likely to use heated bat houses and modelling predicted energy-savings of ~80% (Wilcox and Willis, 2016), indicating that roost temperature is critical for best solar heating, and overall improves success for White-nose syndrome affected bats rearing young. Warm roost microclimates could also enhance recovery from White-nose syndrome (Wilcox and Willis, 2016).

It should be noted that if the roost is occupied by many bats, a large amount of nitrogen-rich guano will be created. If desired, a pan or tarp can then be placed under the roost to capture the guano for use on food gardens.

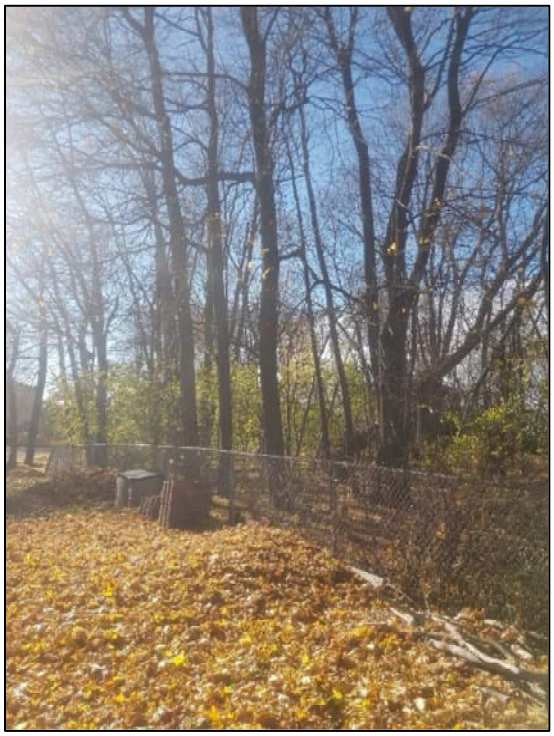

Figure 106: One of the potential general locations for Bat house installation, north of the church near the NCC woodlot; photo taken November 12, 2020.

Figure 107: Another potential general location for a Bat house installation, north of the church near the NCC woodlot; photo taken November 12, 2020.

4.3.1 Other Mammals

Observations of mammals in urban area are a typically a delightful experience (unless it is a skunk that is about to spray). As the property is likely already visited by an abundance of wildlife, the main measure that is recommended is to ensure that wildlife does not become attracted to or trapped in any waste containers. It appeared that there were no exposed garbage areas where this might occur. However, this measure may need to be considered when there are events taking place, that plans are in place to remove waste from exterior areas to spaces that wildlife cannot get into.

4.4 Protection Measures during Construction

As the First Unitarian Church plans to embark on further construction, a series of mitigation measures for the preservation and avoidance of harm to trees, vegetation, and wildlife during construction has been assembled and is provided in **Appendix C**.

4.5 Potential Partners for Success

Ecological enhancement opportunities can be more completely carried out with the guidance, enthusiasm, and support of others. This is a challenging endeavor, and the advice that “it takes a village” can be applied. As such, a list of potential partners is listed below, and their specialty areas for collaboration. It should be noted that none of these partners have been contacted to determine their availability and interest.

Nature Canada - is one of the oldest national nature conservation charities in Canada. They have previously organized an event called the Migration Parade that may be of interest as an educational and outreach activity - https://naturecanada.ca/news/blog/2016_migration_parade/. They also have a program called NatureHood that connects people of all ages to nearby nature and offers parents and families resources tailored to helping you and your children enjoy, discover and connect with nature in your own backyard - https://naturecanada.ca/enjoy-nature/your-naturehood/naturehood-blog/

Ottawa Riverkeeper – a grassroots charity that brings together volunteers, communities, businesses, and all levels of government to find solutions to the problems that threaten the health of the Ottawa River. They conduct a Watershed Health Assessment and Monitoring project, that seeks to understand and evaluate the health of the Ottawa River watershed. They are partnering with Indigenous communities to co-design projects, working with communities throughout the watershed to understand local issues, and engaging citizen scientists to participate in community-based monitoring projects. They also provide a Youth Water Leaders Program for youth aged 17 – 25. https://www.ottawariverkeeper.ca/ -

The Ottawa Field Naturalists - is the oldest natural history club in Canada. Members can provide advice and inspiration for native plant gardening, and organic and low energy garden maintenance techniques. They have many expert birders, carry out birding events, and could offer advice on bird nesting box construction and installation, as well as bird safety measures. Their website contains various educational material, and they offer many children and youth activities. https://ofnc.ca/

For a more comprehensive list, please refer to https://greenottawa.ca/directory/.

As well, the City of Ottawa offers a website that lists services and programs they provide. http://www.ottawa.ca/city_services/environment/index_en.shtml

Programs

- Natural Areas Protection and Enhancement
- Water Protection Programs
- Climate Change/Energy Efficiency/Air Quality Management
- Waste Management

Environmental Funding Programs

- Community Environmental Grants Program
- Community Partnership Tree Planting Projects
- Green Acres - Ottawa's Rural Reforestation Program (although for rural, they may offer advice for urban areas)

4.6 Opportunities for Social Outreach and Education

The ecological endeavors deserve to be recognized, appreciated, and be celebrated and enjoyed by many, and one way to do that is through outreach and education. This property is a gift and will hopefully be able to continue to keep giving. Engaging others in the process also ensures that the ownership of the endeavors is carried by many. Some principles to follow to this regard include the following:

- Communicate environmental goals, objectives, and projects to patrons, staff, and organization decision makers.
- Provide regular updates about progress and accomplishments. Activities may include: one-on-one communication, presentations to the boards and committees, environmental display board, newsletter articles, special brochures, signage, posters, rental information, property tours, and workshops.
- Invite employees, patrons, and community members to help with stewardship projects, as appropriate. For instance, monitoring nest boxes, inventorying wildlife species, hosting workshops or tours. As well, wildlife observations can be documented on iNaturalist.org (a citizen science atlas for all natural species) and eBird.org (a citizen science atlas specifically for birds)
- Communicate with neighboring property owners, homeowners' associations, and community groups to inform them of the church's involvement in the various environmental stewardship projects (e.g., letters to neighbors; press releases; presentations at workshops, seminars, committee meetings).

Some specific events where outreach and education can take place are at the annual Fall Fair. As well, when the property is used for ceremonies, events (e.g. Child Haven Fiesta, Young String Performers' Foundation, Arts Night, A Midsummer Ritual) and rentals for office space and for courses (such as the Mindfulness), the visitors can be provided with a brochure that explains the principles of the property and provides some insight into the goals.

Image from Google Streetview, 2019

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APPENDIX A: Additional Resources

Environmental Guide for Congregations, Their Buildings, and Grounds. Authored by D. Glover and D Rhoads and Published by Web of Creation in 2006.
https://www.webofcreation.org/Environmental%20Guide.pdf

Enjoying the Birds of the Ottawa Valley - Birds Around the Home
https://www.johnsankey.ca/enjoy2.html

Urban Forestry, FORESTRY FACTS - Controlling Invasive Plants -
http://treetesting.com/Controlling_Invasive_Plants.pdf

A Landowner's Guide to Managing and Controlling Invasive Plants in Ontario. Appendix 1: Invasive Species Lists and Fact Sheets https://www.ontarioinvasiveplants.ca/wp-content/uploads/2016/07/35266_LandOwnersGuide_Appendix_Jul262013_D4_WEB-5.pdf

APPENDIX B: Recommended Plants

Suggested Native Plants for Rain Gardens

Shrubs and Perennials for part or full sun

- Common buttonbush *Cephalanthus occidentalis 5' (tall) x 5' (spacing width)*
- Common winterberry *Ilex verticillata 4-7' x 5'*
- Rosy meadowsweet *Spiraea tomentosa 3' x 3'*
- Pussy willow *Salix discolor 10' x 5'*
- Smooth arrowwood *Viburnum dentatum 7' x 5'*
- Swamp milkweed *Asclepias incarnata 3' x 2'*
- Asters *Symphotrichum novae-angliae, S. novi belgii 3' x 2'*
- Marsh-marigold *Caltha palustris 18" x 16"*
- Joe-Pye weed *Eutrochium maculatum 5'-7' x 3'*
- Boneset *Eupatorium perfoliatum 3' x 2'*
- Meadow bottle gentian *Gentiana clausa 1' x 16"*
- Blue iris *Iris versicolor 2' x 18"*
- Cardinal-flower *Lobelia cardinalis 3' x 18"*
- Golden grounsel *Packera aurea 1' x 1'*
- Three-lobed coneflower *Rudbeckia triloba 4' x 2'*
- Blue vervain *Verbena hastata 5' x 2'*
- Hayscented fern *Dennstaedtia punctiloba*

Shrubs and Perennials for shade

- Witch-hazel *Hamamelis virginiana 8' x 3'*
- Northern spicebush *Lindera benzoin 10' x 3'*
- Highbush blueberry *Vaccinium corymbosum 5' x 3'*
- Cinnamon fern *Osmundastrum cinnamomeum 3' x 2'*
- Royal fern *Osmunda regalis 3' x 2'*
- Maidenhair fern *Adiantum pedatum 3' x 2'*
- Lady fern *Athryium felix-femina 3' x 2'*
- Cardinal flower *Lobelia cardinalis 3' x 18"*
- Blue lobelia *Lobelia siphilitica 18" x 18"*
- Golden groundsel *Packera aurea 1' x 1'*

- Northern Oak Fern *Gymnocarpium Dryopteris*
- Marginal wood fern *Dryopteris marginalis*
- Sensitive fern *Onoclea sensibilis*
- New York Fern *Parathelypteris noveboracensis*
- Christmas Fern *Polystichum acrostichoides*
- Rock polypody *Polypodium virginianum (for rock ledges beside water)*

Suggested Plants for Pollinator and Healing Gardens

Seed Source Companies:

- https://www.ernstseed.com/
- https://www.oscseeds.com/
    - Little Bluestem, Schizachyrium scoparium
    - Virginia Wildrye, Elymus virginicus
    - Purple Coneflower, Echinacea purpurea
    - Bachelor's Button/Cornflower, Centaurea cyanus
    - Lanceleaf Coreopsis, Coreopsis lanceolata
    - Rocket Larkspur, Delphinium ajacis
    - Blackeyed Susan, Rudbeckia hirta
    - Sweetwilliam, Dianthus barbatus
    - Bigleaf Lupine, Lupinus polyphyllus
    - Shasta Daisy, Chrysanthemum maximum
    - Marsh Blazing Star, Liatris spicata
    - Swamp Milkweed, Asclepias incarnata
    - Plains Coreopsis, Coreopsis tinctoria
    - Rattlesnake Master, Eryngium yuccifolium
    - California Orange Poppy, Eschscholzia californica
    - Oxeye Sunflower, Heliopsis helianthoides
    - Red Corn Poppy, Papaver rhoeas (non-native but non-invasive)
    - Narrowleaf Mountainmint, Pycnanthemum tenuifolium
    - Grey Headed Coneflower, Ratibida pinnata
    - Ohio Spiderwort, Tradescantia ohiensis
    - Zigzag Aster, Aster prenanthoides

- White Wild Indigo, Baptisia alba
- Blue False Indigo, Baptisia australis
- Wild Bergamot, Monarda fistulosa
- Golden Alexanders, Zizia aurea
- Gray Goldenrod, Solidago nemoralis
- New England Aster, Symphyotrichum novae-angliae
- Smooth Blue Aster, Symphyotrichum laevis
- Licorice Scented Goldenrod, Solidago odora

APPENDIX C: Construction Precautions and Mitigations

Precautions within the Tree Protection Zone

Roots of trees not slated for removal may be damaged during construction from soil grading, compaction, and disturbance (e.g. during excavation), in a large part caused by heavy equipment operation and materials storage within the Tree Protection Zone (TPZ). The TPZ can be estimated as a radius around the trees that equals the diameter at breast height in centimeters multiplied by 12, which is then the radius in meters around a tree where protection measures are to be carried out.

The following list provides the effective methods to be applied within the Tree Protection Zone (TPZ) of trees that are to be retained during construction:

1. No materials or equipment shall be stored or operated within the TPZ of the tree.

2. Do not attach any signs, notices, or posters to trees.

3. Do not raise or lower the existing grade within the TPZ of a tree to be retained by more than 5 centimeters without approval from the Contract Administrator.

4. Should work be required within the TPZ of a tree to be maintained, such as roots requiring pruning for construction, or grade raising or lowering greater than 5 cm, or the operation of equipment, the individual tree should be assessed by an arborist to provide detailed mitigations based on the tree species, size, condition, and the site conditions such as wind and potential targets; in general, no more than 30% of the overall root system should be removed or damaged, and no major structural roots (those greater than 5 cm diameter) should be removed or damaged. All equipment operation over the root system should be avoided or only conducted if protection is placed over the TPZ to distribute the equipment weight and reduce compaction (such as plywood of an appropriate thickness depending on the weight of the equipment). All excavation within this area should be performed by hand or with an air-spade.

5. Do not attach any fencing, signs, notices, or posters to any tree.

6. All exposed roots of trees to be retained should be covered in a minimum of 5 cm of firm soil within 24 hours of exposure.

7. During excavation, equipment must be maintained within the confines of the work area, so as not to disrupt any soil or tree roots unnecessarily, and the storage of equipment and vehicles around trees within the TPZ is prohibited.

8. For any trees that have had work done within the TPZ, it is recommended that follow-up care is provided. Adequate soil moisture, nutrition, and aeration should be maintained in the following year; monitoring of the trees should be carried out on a yearly basis during an appropriate time of year for 2 years following work within the TPZ to determine if further follow-up action is required.

9. No fuel is to be stored within the TPZ of any tree.

10. Do not raise or lower the existing grade within the TPZ of a tree.

11. Tunnel or bore a minimum of 0.5 m below ground surface within the TPZ of a tree, where the tree is to be retained. Note that within the City of Mississauga, the minimum depth is 1.2 m and only upon request with justification and approval of the City of Mississauga.

12. Do not damage the root system, trunk or branches of any tree; if any roots are encountered during excavation while working outside the TPZ, they should be cut off cleanly under the direction of a qualified tree professional who should be on-site to perform or supervise this work.

13. All exposed roots of trees to be retained should be covered in a minimum of 5 cm of firm soil within 12 hours of exposure.

14. Any work carried out within the TPZ must be performed under the supervision and guidance of a qualified tree professional.

15. Undertaking the tree cutting work must only be carried out under the supervision of an arborist.

16. The Contractor shall take all reasonable caution to protect all trees not designated for removal.

17. Do not place any material or equipment within the TPZ of the tree.

18. All excavated material, including imported material, must be removed immediately and not placed near trees, in order to prevent root damage, accidental hitting of adjacent trees, and root damage outside of the work area.

19. Disturbed soil is to be reinstated to its original state immediately upon completion of work.

20. Ensure that exhaust fumes from all equipment are not directed towards any tree's canopy.

21. Equipment working around the tree canopy (i.e. excavator or feller buncher) must be utilized in such a way as to prevent damage to tree branches and avoid them.

22. It is important to note that some trees may be suitable for retention based on their location and condition, but complete avoidance of impacts due to construction may not be achievable. In those cases, a qualified tree professional should be consulted to review the potential for retaining trees that are deemed to be worthwhile.

23. Clearing of vegetation beside drainages and watercourses should be kept to a minimum: use existing trails or roads wherever possible to avoid disturbance to the vegetation and prevent soil compaction. When practicable, prune the vegetation instead of grubbing/uprooting.

24. Minimize the removal of natural woody debris, rocks, sand or other materials from the banks, the shoreline or the bed of the waterbody below the ordinary high-water

mark. If material is removed from the waterbody, set it aside and return it to the original location once construction activities are completed.

Tree Protection Fencing

To protect trees on adjacent properties during removals, the existing fencing, which is in much of the project area, will provide the demarcation of the TPZ and protection for trees that are on adjacent properties.

The Tree Protection Zone (TPZ) is to be protected using Tree protection fencing where the TPZ overlaps with any construction, grading, or material storage by 30% or more. In these circumstances (more than 30% overlap), fencing is recommended for all trees except for those that are dead. The fencing is to be installed as follows:

1. A fence is to be erected at the TPZ of trees to be retained that overlap the construction limits or the dripline (edge of crown), or the edge of construction, whichever is furthest from the tree, where possible.

2. Tree protection measures will be installed prior to commencing construction and will be monitored on a regular basis by a certified arborist. A written report from the arborist for this monitoring will be submitted documenting the condition and any breaches of the tree protection measures.

3. The Contractor is responsible for the maintenance of 'Tree Protection Fencing' at all times during construction. Maintenance includes repairing damaged fence sections and reinstatement of 'Tree Protection Fencing' as required.

4. Ensure that site clearing is only carried out in areas specifically required, and that the marking of areas to be cleared is carefully and clearly delineated.

5. Snow fencing or hoarding should be installed at the limit of the vegetation removals zone to provide tree protection fencing prior to the initiation of tree removals; if existing fences are present and are standing in good repair at a height that is visible to all equipment operators, they may be left in place and act as tree protection fencing.

6. In the event that tree protection fencing cannot be installed, other effective methods to delineate the TPZ may be used under written approval of the Contract Administrator.

Tree and Root Pruning

1. All pruning work must be performed under the supervision and guidance of a qualified tree professional in accordance with the latest ANSI A300 Pruning Standards and best management practices identified by the International Society of Arboriculture.

2. Do not damage the root system, trunk or branches of any tree; if any roots are encountered during excavation, they shall be cut off cleanly under the direction of a certified arborist or forester who shall be on-site to perform or supervise this work.

3. If root pruning is done, the crown of the tree should be reduced to reduce wind sail. Pruning should be kept to thinning cuts (no major limb removal), and crowns should be further maintained at two years prior to root pruning to remove any die-back.

4. Undertaking the tree cutting work must only be carried out under the supervision of an arborist.

5. If root pruning is implemented, the crown of the tree should also be reduced proportionately, in order to decrease wind sail and balance the crown. Pruning should be kept to thinning and small reduction cuts (no removal of limbs with a higher than 1:2 size ratio with the main stem, targeting limbs of the smallest diameter that achieve the intended goal for clearing within the vegetation clearing zone), and crowns should be further maintained at two (2) years prior to root pruning to remove any die-back, and to correct structural issues created by pruning.

Environmental Spills

1. Any environmental spills (biological, chemical or petroleum based) must be reported to the MOE 24 Hour Emergency Communication Service at 1 (800) 268-6060 (or (416) 325-3000).

2. Any release of potential contaminants, such as fuel, chemicals, or other hazardous materials, must be reported to Metrolinx immediately.

3. A spill report form will be completed and sent to Metrolinx Environmental Services within 24 hours of the spill. The Spill Report, Response and Review Log will be submitted to the Metrolinx Contract Manager and will include details on the spill.

4. All spills must also be reported to the appropriate provincial authority where a spill: discharges to air, land or water, is in excess of normal usage, has escaped its means of containment, or has been combined with other products affecting its chemical stability that could cause an adverse effect (i.e. negative impact on health, environment or property).

5. Spill response materials should be available wherever hazardous materials are used or stored. These spill response materials should be suitable in type and quantity to the type and quantity of hazardous materials being used at that location.

6. All Contractors and their staff must be trained on how to use the spill material and equipment.

7. All used absorbent material must be disposed of in accordance with applicable regulatory requirements.

8. Spills must be contained and cleaned up in accordance with all federal, provincial, and local regulatory requirements.

Noise

The following provides general guidance on methods to reduce noise.

1. Avoid excess and unnecessary noise.

2. Equipment and machinery will be maintained in good working condition to keep noise levels as low as possible.

3. Speed limits shall be respected and the speed of vehicles on the work site shall be limited.

4. Motorized equipment and other noisy equipment will be equipped with mufflers, acoustic enclosures, or other noise-control devices.

5. Any powered equipment will be shut off when not in use.

6. Advise nearby residents of construction schedules, specifically for work that generates specific nuisances.

7. If necessary, provide suitable personal hearing protectors as well as proper instruction to construction workers so that exposed workers can perform their work in a manner that is safe and without risks to their health and safety.

Precautions Around Natural Areas

1. Machinery will be clean and free of fluid leaks, invasive species, and noxious weeds on arrival at the construction site and will be maintained in this condition through regular inspections.

2. Refueling, maintenance and necessary repairs will be carried out on a site designated for this purpose located at least 60 m away from any waterbody, up to the annual high-water mark. A tarp will be placed under the machinery during refueling. Machinery will not be washed at the site.

3. Litter or debris must never be swept or pushed into a waterbody or watercourse. The Contractor will ensure that all debris and solid waste left on site, as well as temporary fencing and signs are removed after completion of the works.

4. Wash, refuel and service machinery and store fuel and other materials for the machinery in such a way as to prevent any deleterious substances from entering the water.

5. Do not apply fertilizers or other products containing phosphorus or nitrogen within 15 m of a waterbody or watercourse.

6. Creating holes and ruts that restrict surface water runoff and soil infiltration will be avoided by using vehicles adapted to the soil's bearing capacity and taking care not to operate vehicles on wet soil (and particularly during spring thaw or winter thaws when surface soil and moisture is trapped over an impermeable frozen layer) or perform maneuvers requiring tight turns (especially at higher speeds).

7. Weight bearing materials (e.g. spreading mulch, wood fibre blankets, geotextile membranes, and granular material) may be added to the existing ground surface in order to support machinery weight and to avoid creating holes and ruts to the soil

surface. Weight bearing materials should be promptly removed once the project has been completed.

8. If soil or groundwater contamination is present, testing prior to off-site disposal may be required.

9. No soils from a contaminated site will be reused elsewhere.

10. Management and disposal of contaminated soils will follow all applicable regulations and guidelines.

11. If soils must be stored overnight, they should be covered with a tarp.

Reinstatement Following Removals

12. A planting plan for all disturbed areas is recommended.

13. The Contractor will be held responsible for the appropriate reestablishment of groundcover vegetation for the period of one year and for trees, for a period of two years.

14. The Contractor will ensure that all debris and solid waste left on site, as well as temporary fencing and signs are removed after completion of the works.

15. All vegetation or tree debris that may fall or enter any waterbodies must be removed immediately with as little disturbance as possible.

16. When removing invasive plant species, ensure that plant material is appropriately disposed of to minimize spread.

17. Clean sludge, dirt, and plant material from equipment and tools before leaving a site infested with invasive species. High pressure air hoses, mobile cleaning stations that retain water runoff, and brushes or brooms are acceptable cleaning methods.

18. Vegetate any disturbed areas by planting and seeding shrubs or grasses and cover such areas with mulch to prevent erosion and help seeds germinate. If there is insufficient time remaining in the growing season, the site should be stabilized (e.g. cover exposed areas with erosion control blankets to keep the soil in place and prevent erosion) and vegetated the following spring.

19. All activities that take place on the property must be in full compliance with all federal pesticides legislation and regulations as well as be in full compliance with the requirements under the *Ontario Pesticide Act*, as applicable.

20. Only products registered by Agriculture and Agri-Food Canada under the Pest Control Products Act may be used.

21. Immediately stabilize banks of drainages and watercourses disturbed by any activity associated with the project to prevent erosion and/or sedimentation, preferably through re-vegetation with native species suitable for the site.

22. Disturbed surfaces will be rehabilitated at the end of the work native seed mixture suitable for the property and clean topsoil.

23. Restore bed and banks of any drainages or watercourses to their original contour and gradient; if the original gradient cannot be restored due to instability, a stable gradient that does not obstruct fish passage should be restored.

24. If replacement rock reinforcement/armouring is required to stabilize eroding or exposed areas, then ensure that appropriately sized, clean rock is used; and that rock is installed at a similar slope to maintain a uniform bank/shoreline and natural stream alignment.

25. All materials should be removed at the completion of works. Disturbed areas should be reinstated to original conditions, or better, including the restoration of both topsoil and native vegetation.

26. Revegetation must be done as soon as possible within the growing season. If unfeasible, the Contractor must stabilize disturbed areas with erosion control blankets to keep the soil in place and prevent erosion in waterbodies. Blankets must be removed only at the end of the revegetation work.

27. Use non-invasive plant species and preferably native species for ornamental purposes. Consult invasive species lists before the introduction of a new ornamental species.

Compensation for Accidental Damages to Trees

28. In the event of injury to any tree not designated for removal or pruning, the Contractor should be required to reimburse the property managers for the cost of treatment for the tree or cause the tree to be repaired by a qualified tree professional and bear the cost of repairs and labour. Injury includes the failure to protect a tree in accordance with the protection measures stated above.

29. In the event that the tree is irreparably injured (considered major damage) as determined by the qualified tree professional, the Contractor should be required to reimburse the property managers for the cost of removal and replacement of the tree.

30. Generally, major damage to a tree shall mean any one of:

    a. A wound greater than the square of the DBH of the tree (for example, a wound with an area of 100 square centimeters is major damage to a tree with a DBH of 10 cm);

    b. Any wound greater than 1000 square centimeters;

    c. If the wound in paragraph a or b contacts the ground then the wound shall be considered major damage if it is 60% of the size specified in paragraph i or ii respectively;

    d. Broken branches destroying more than 33% of the Crown;

e. The exposure, severing or compaction of more than 25% of the root area;

f. The breaking off of any tree;

g. The noticeable tipping of any tree.

Bird Protection during Construction or Maintenance

The Migratory Birds Convention Act requires that migratory birds listed under Schedule I, their eggs, and active nests, be afforded protection from harassment, harm, disturbance, death. Environment Canada provides Best Management Practices to assist proponents in reducing potential for incidental take of migratory birds. To reduce the possibility of contravention of the MBCA, vegetation removal should be scheduled to occur outside of the overall bird nesting season of April 1 to August 31. Some birds may nest before and after this peak bird nesting season due to annual seasonal fluctuations. If a nest of a migratory bird is found within the construction area outside of this nesting period it still receives protection.

If vegetation must be removed during the overall bird nesting season, nest and nesting activity searches will be conducted in areas defined as simple habitat[13] by a qualified Biologist, generally no more than 48 hours prior to vegetation removal. The timing must be determined by qualified Biologist to ensure compliance with MBCA and ECCC guidelines. The qualified Biologist shall make the determination of timing based on a number of variables that could include available habitat, species noted in the area, time of year, environmental conditions, and other applicable factors.

Nesting activity will be documented when it consists of confirmed breeding evidence, as defined by OBBA criteria (OBBA, 2001).

- If an active nest or confirmed nesting activity of a migratory bird is observed in simple habitat, regardless of the timing window recommended, a species-specific buffer area following ECCC guidelines will be applied to the nest or confirmed nesting activity wherein no vegetation removal will be permitted until the nest is no longer active. The radius of the buffer will depend on species, level of disturbance and landscape context (ECCC, 2014), which will be confirmed by a qualified Biologist, but will protect a minimum of 10 m around the nest or nesting activity.

[13] Simple habitats refer to habitats that contain few nesting spots or few species of migratory birds, where identification of active nests or confirmed nesting activity can be completed with confidence. According to ECCC (2014), examples of simple habitat include the following:

- Urban parks consisting mostly of lawn with a few isolated trees;
- Vacant lot with few possible nest sites;
- Previously cleared area where there is a lag between clearing and construction activities (and where ground nesters may have been attracted to nest in cleared areas or in stockpiles of soil); or
- Structure such as a bridge, beacon, tower or building (often chosen as a nesting spot by robins, swallows, phoebes, nighthawks, gulls and others).

- The results of all nest searches will be documented at the end of each survey day in a Technical Memorandum, including information on the searcher, date, time conducted, weather conditions, habitat type, vegetation community type, observations of breeding activity, observations of confirmed nests including co-ordinates, and, if required, the buffer applied to identified breeding/nesting sites.

- If vegetation removal must occur in complex habitats within the above-listed timing windows and absolutely cannot be avoided, the same best management practices such as nest and nesting activity searches described above will be undertaken in a manner that does not contravene the MBCA.

The Contractor shall provide all reports, permits, and correspondence related to the *Migratory Birds Act* to the property manager for review prior to commencing any clearing operations.

Ministerial Orders for Ash Trees

All vegetation to be removed must be done in a manner in compliant with the Ministerial Order which has been issued by the Federal Government restricting the movement of wood out of the regulated area due to Emerald Ash Borer (EAB). Due to Emerald Ash borer invasion, it is recommended that the owners have them removed by a reputable Contractor. The Contractor must dispose of all wood at registered Waste Facility.

For properties where the emerald ash borer has been confirmed, a prohibition of movement will be issued. A prohibition of movement prohibits the movement of regulated materials from that specific property. This measure is taken to prevent movement of potentially infested materials off the property.

The Ministerial Order states that Regulated articles include the following:

- Ash nursery stock;

- Ash trees;

- Ash logs;

- Ash wood;

- Rough lumber (including pallets and other wood packaging materials containing ash, wood, bark, wood chips or bark chips from ash trees); and

- Firewood of all tree species.

The ministerial order extends to vehicles that were used to carry any of these items.

Moving these materials from regulated areas is permitted only if the following conditions are met:

- The materials have been treated to kill or remove all life stages of the emerald ash borer; and

- Written permission has been obtained from a Canadian Food Inspection Agency (CFIA) inspector.

The Contractor shall ensure that all infested trees are removed from the property in a manner that will prevent the emergence and spread of EAB from the infested tree material and such that no trees or wood chips shall be moved outside of the EAB quarantine zone as defined by the Canadian Food Inspection Agency, except in strict compliance with CFIA regulations.

For more details, refer to the latest information provided by the CFIA.

Species at Risk

SAR and their habitat are expected to be impacted as a result of tree removals, including a number of protected threatened (THR) and endangered (END) species. In some cases, avoidance and mitigation may be proposed that may negate the requirement for ESA permits, but will require consultation with MECP, and documentation within an Information Gathering Form and an Avoidance Alternatives Form for submission to the MECP. Refer to Appendix L for the Information Gathering Form and Alternative Avoidance Forms, which have been submitted to MECP for their review. It provides a full account of the proposed avoidance measures that must be adhered to, pending MECP approval. Should further alternatives avoidance methods or commitments be required by MECP, these will be provided to the Contractor. Finally, if concerns remain for the potential for contraventions of the ESA, a permit application or registration under the ESA or its regulations may be required by the MECP.

For impacts to SAR on federal lands on Lakeshore East Corridor, avoidance of impacts is critical. Although ECCC may also authorize projects without ministerial approval under the SARA where avoidance and mitigations to minor impacts are proposed, the ECCC SARA Permit review is currently underway. Should further alternatives avoidance methods or commitments be required by ECCC or Parks Canada, these will be provided to the Contractor.

The removals contractor shall contact the local MECP and ECCC if any SAR is encountered at any time during the Project.

The removals contractor shall not conduct any site clearing or tree/vegetation removal without written confirmation from the Consultant indicating that clearance from all regulatory authorities for SAR has been received. The following guidance is specific to the SAR that are expected to be of concern during tree removals.

Butternuts

One (1) potential Butternut was found on site. It may be assessed when it has leaves to determine whether it is a hybrid or pure Butternut, and is thus a Species at Risk. If it is a pure Butternut, Butternut habitat is presumed to be any areas within 25 m of a Butternut that contain soil and suitable growing conditions (full sun), as well as an additional 25 m seed zone. If it is a pure Butternut, a Butternut Health Assessment should be carried out prior to any construction within 25 m. This assessment will determine if any permit authorization may be required, or if the O. Reg 242/08 self-registration process should be followed. To

protect the 25 m tree protection zone, all equipment operation over the root system should be avoided or only conducted if protection is placed over the TPZ to distribute the equipment weight and reduce compaction (such as plywood of an appropriate thickness depending on the weight of the equipment). To ensure compliance with applicable laws and regulations, the MECP should be contacted for steps to avoid a contravention of the ESA and to determine if avoidance of impacts through protection measures within 25 m tree protection zone are adequate.

SAR Bats

SAR day roosting bat habitat should be assumed to be present within all areas with mature trees. Maternity roosting habitat, a key habitat that is critical to the recovery of SAR Bats and is limited in availability, may be within the woodland habitat. In accordance with the ESA and SARA, any tree/vegetation removals should be scheduled to occur outside of April 1 and September 30 of any calendar year, with a strict no tree/vegetation removal from June 1 to July 31 within areas with potential maternity roosting habitat in order to avoid the SAR bat breeding season. The removals contractor must acknowledge that in accordance with the ESA and SARA, they are to remove all vegetation outside of the bat active season (April 30 to September 30) unless all precautions above are carried out.

General Wildlife Protection Mitigations during Construction

The following are recommended methods for avoiding harm to wildlife during construction, and in order to be in compliance with laws protecting wildlife:

- Tree and vegetation clearing must be carried out in a manner that is not in contravention of the Migratory Birds Convention Act (1994) or does not impact nesting turtles (primarily in May 1st through July 30th).

- Any soil excavation or filling or construction must be done in a manner so as not to harm wildlife protected under the *Fish and Wildlife Act (1997)*; this includes many snakes and turtles, bullfrogs, some invertebrates, and many other birds and mammals.

- Prior to removing trees in winter, spring and early summer, inspect the trees for wildlife, as they may contain overwintering species in the trees, or wildlife bearing young, or wildlife seeking shelter. Refer to the City of Ottawa's Protocol for Wildlife Protection during Construction for other recommendations and mitigations (http://documents.ottawa.ca/sites/documents.ottawa.ca/files/documents/construction_en.pdf).