Oakville Strategy for Biodiversity

August, 2018

OAKVILLE

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American Chestnut Recovery Pilot Project

In 2016, the town partnered with Conservation Halton to initiate a pilot project to bring back the American Chestnut, an endangered tree at risk due to Chestnut blight, a fungal disease. The fungus was introduced into North America in the early 1900s and killed 99% of the population within 30 years. In 2012, Oakville lost its last surviving naturally occurring specimen and in a 2014 update on naturally occurring American Chestnuts in the Golden Horseshoe, only 167 living trees were documented. The pilot project being undertaken will:

- Meet objectives in the provincial Species at Risk Recovery Strategy;
- Restore a locally extirpated endangered species to Oakville;
- Contribute to maintaining biodiversity in protected natural areas;
- Save locally adapted genetic material for use in future restoration projects; and
- Communicate to the public the steps taken to restore an endangered species.

By using seedlings from trees that have survived in the vicinity of Oakville, local genetics will be maintained. Vegetative cuttings are being propagated and grown in a greenhouse where the initial seedlings will be planted in Oakville in 2018.

ACKNOWLEDGEMENTS

The Oakville Strategy for Biodiversity (OSB) is the result of collaboration among the many stakeholders dedicated to the protection, enhancement and restoration of habitats that help to secure the long term future of Oakville's native plants and animals. In particular, we would like to thank the following participants:

Technical Team composed of:	Management Team composed of:
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Lura Consulting is acknowledged for organizing and reporting on the OSB stakeholder workshops.

To all the stakeholders who participated in workshops developing the OSB, your input is acknowledged as it has provided many useful ideas that helped shape the report, particularly the Management Opportunities and Recommended Next Steps.

This report was prepared by North-South Environmental Inc. (June 2018)
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Biodiversity is key to the maintenance of the world as we know it.

E.O. Wilson

Eastern Meadowlark and Bobolink Compensation at Old Landfill Site

During construction of the town's North Satellite Operations Depot, Bobolink (*Dolichonyx oryzivorus*) and Eastern Meadowlark (*Sturnella magna*), bird species which require open grassland or meadow habitats, were discovered on a portion of the site. Both of these species are designated as provincial Species at Risk (SAR) and are protected by the Endangered Species Act (ESA). The lands were confirmed to be suitable breeding habitat and therefore, under the Act, required a compensation plan to be developed. This involved replacing and improving upon the impacted habitat at an alternative location. The town worked with Conservation Halton and Halton Region to enhance approximately 24 hectares of the closed Fourth Line landfill site which included over-seeding with a native meadow grass mix, planting additional trees and shrubs on the periphery of the meadow, adjusting the mowing schedule outside of breeding bird windows, and a commitment to maintain the area as open meadow habitat. Although it was not directly observed, Eastern Milksnake (*Lampropeltis t. triangulum*) was identified as being possibly present. As an additional measure to provide habitat, snake cover and basking habitat was constructed to enhance the site quality to support this species.

1. INTRODUCING THE OAKVILLE STRATEGY FOR BIODIVERSITY (OSB)

The Oakville Strategy for Biodiversity (OSB) plays an important part in helping the town to achieve its Vision and in creating a livable town for both people and the many native species of plants and animals that inhabit it.

The OSB development was a collaborative effort that involved a broad range of staff from the Town of Oakville with input from Halton Region, Conservation Halton and community stakeholders dedicated to the protection, restoration and enhancement of habitats that help to secure the long term future of Oakville's native plants and animals.

Oakville Strategy for Biodiversity – The Framework

Council's Vision is to be "The Most Livable Town in Canada", with five areas of focus including ***Environmental Leadership***. Under the focus area of Environmental Leadership, a key action is to, "***develop (a) Biodiversity Strategy enabling integration of existing plans, policies and programs related to the natural heritage system, urban forests, parkland and open spaces and issues management***". The OSB fulfills this key priority and Figure 1 show how this is set out in the policy context.

The OSB is both informed by and will inform the update to the town's Official Plan, ***Livable Oakville***. The framework also sets the foundation for the work the Town and its partners will carry out through the implementation of the OSB, and provides a common platform from which to apply a "***biodiversity lens"*** for the town's work related to the natural environment, including updates to other master plans. Greater detail on the context of the OSB can be found in Section 2.

The Oakville Strategy for Biodiversity is framed as follows:

What we achieve…

Oakville values its diversity and richness in wildlife, vegetation and landscapes including water. The Town and its citizens work together to integrate our actions and the built environment to create and support an ecological network that is healthy, connected and well managed. This network is resilient and provides risk mitigation to the community and beyond.

What we do…

- Protect, restore and enhance habitats and species that support biodiversity throughout the Town;
- Celebrate biodiversity through education and stewardship; and
- Monitor biodiversity and use data to guide policies and programs.

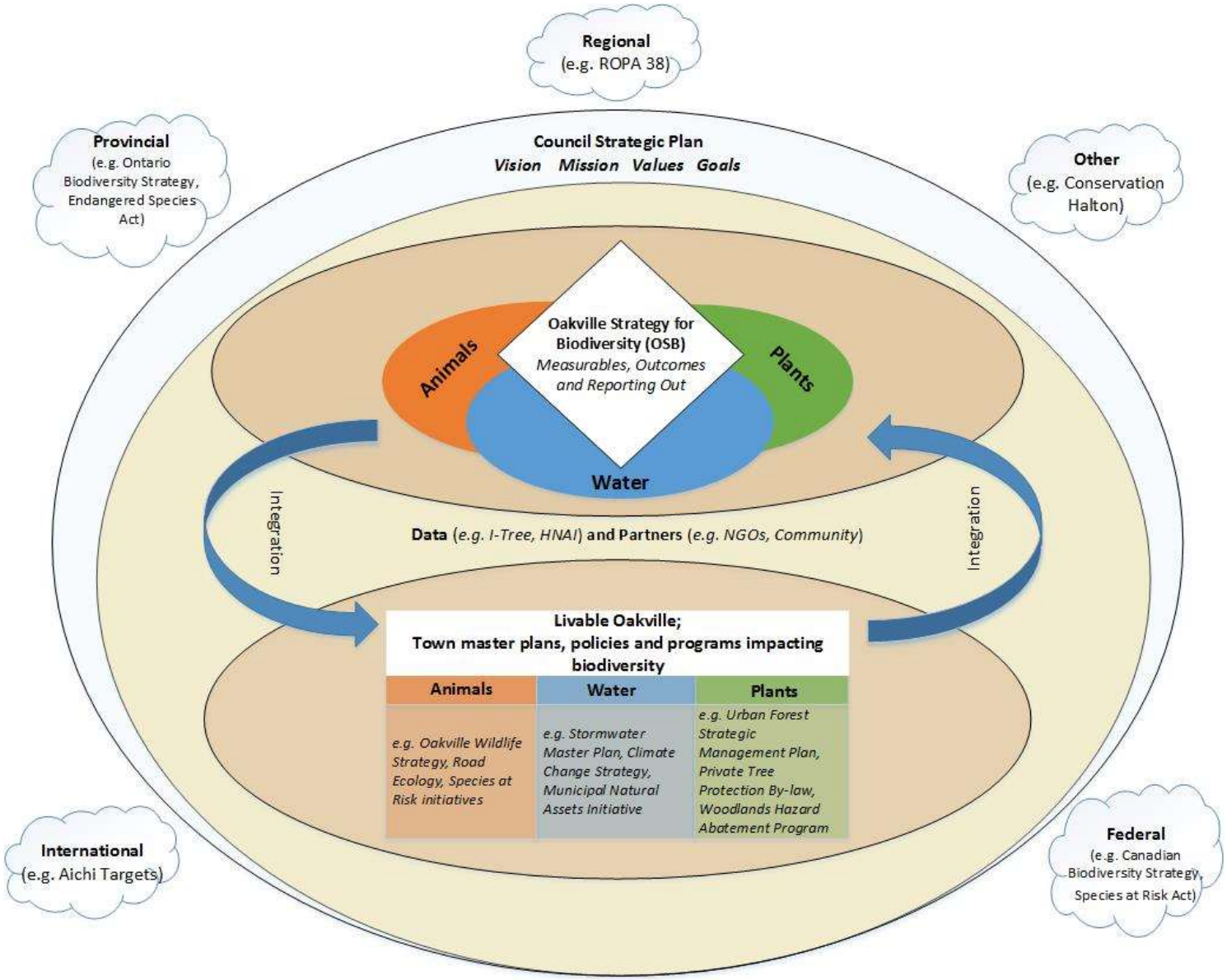


Figure 1: OSB Policy Framework

How we do it…

1. **Education**: Oakville supports the conservation and appreciation of biodiversity by cultivating knowledge and understanding about ecological processes, personal stewardship actions and Oakville's natural heritage.
2. **Creating resilience and mitigating risk**: Oakville engages in planning, protection, management and restoration that results in productive, diverse, healthy ecosystems with the capacity to recover from disturbance and adapt to change.
3. **Integration**: Oakville works with communities and businesses to build neighbourhoods that support local biodiversity conservation, healthy ecological processes and provide equitable access to nature.
4. **Collaboration**: Oakville works jointly and shares responsibility with individuals and groups to advance biodiversity and ecological resilience locally, regionally, provincially and globally.
5. **Biodiversity is inclusive**: It exists at both a macro and micro level throughout the town and everyone is encouraged to participate in its protection, restoration and enhancement. There are multiple ways to become involved and engaged.

The OSB integrates the management and protection of all potential terrestrial and aquatic habitats that support native species; from street trees to woodlands and water flowing through residential neighbourhoods into wetlands, creeks and rivers and takes the approach to *identify, protect, restore* and *enhance* biodiversity through the following actions:

- ***Identification of areas*** that have the potential to support biodiversity;
- ***Protection of habitats*** that support biodiversity;
- ***Restoration of habitats*** that have the potential to support biodiversity; and
- ***Enhancement of areas*** that can better support biodiversity.

Figure 2 describes the approach of the OSB.

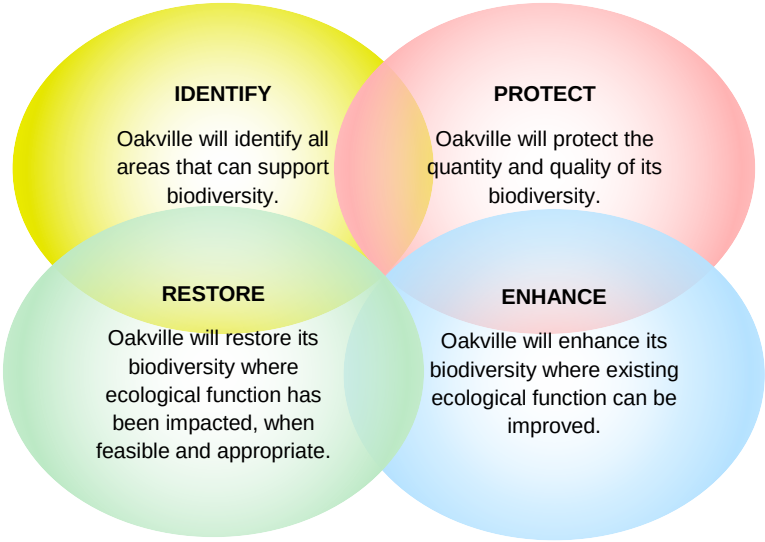


Figure 2: OSB approach to supporting biodiversity

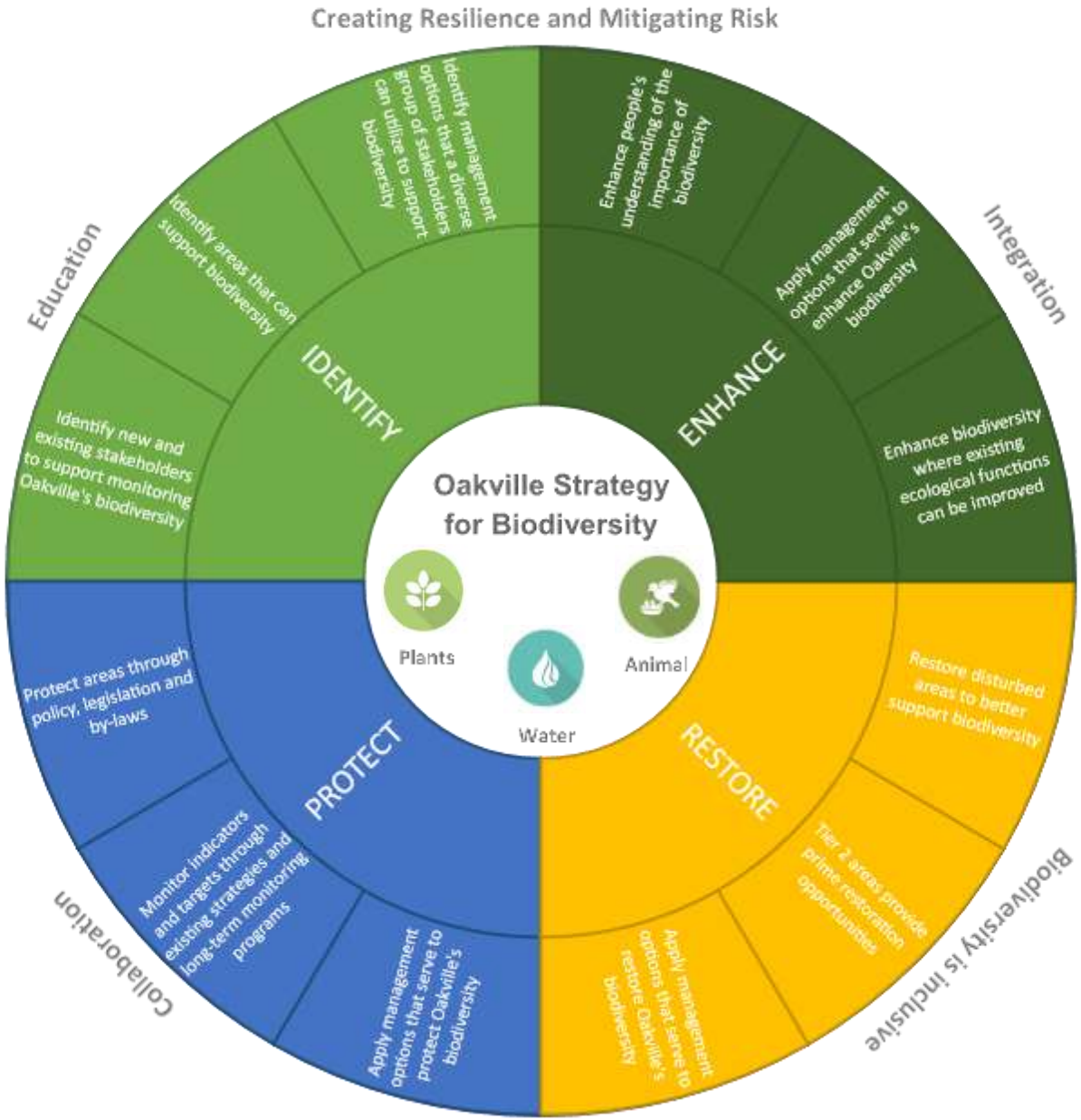


Figure 3: OSB Structure

HOW TO USE THE OSB

The OSB is intended to be used by the town and its stakeholders in working together to ***protect, restore and enhance*** Oakville's biodiversity. Key features of the strategy include:

Section 1. Why Biodiversity is Important to Everyone

- understanding how healthy habitats supporting biodiversity also provides a healthy environment for people; and
- recognizing there are threats to biodiversity and that we can take actions to mitigate these threats.

Section 2. Learning More about Oakville's Biodiversity

- background on some of the key features of Oakville's biodiversity;
- high level mapping based on ecological criteria shows areas supporting biodiversity on a scale from Tier 1 to 4 (see Appendix 2 for details on the mapping methodology and Appendix 3 for full page Tier 1 to 4 maps); and
- mapping shows areas supporting biodiversity are present everywhere in Oakville. This information is linked to Management Opportunity actions.

Section 3. How is Oakville's Biodiversity Protected?

- a review of the legislation, policies and programs that support biodiversity protection in Oakville; and
- a framework and policy approach for how Oakville will protect, restore and enhance its biodiversity.

Section 4. Management Opportunities

- 28 Management Opportunities that offer a range of actions to identify, protect, restore and enhance biodiversity throughout Oakville with multiple stakeholders;
- a figure linking Management Opportunities to the Tier 1 to 4 mapping;
- tables identifying specific areas and stakeholders for each Management Opportunity; and
- a detailed fact sheet for each Management Opportunity with "how to" assistance for implementation.

Section 5. Measuring Success Protecting Biodiversity

- an outline targets and indicators to help track the implementation and success of the OSB; and
- indicators are connected back to the *Ontario Biodiversity Strategy* and the *United Nations Aichi Targets*.

Section 6. Recommended Next Steps

- an implementation framework that builds on existing programs, policies and partnerships with next steps for action.

Oakville and Milton Humane Society and Town of Oakville – Roadkill app

Through a service contract, the Oakville and Milton Humane Society is responsible for removing dead animals from public roadways and public spaces. The vast majority of these animals are killed due to collisions with vehicles. A new application was developed through ArcGIS that allows OMHS officers to download the app through their smartphones to identify and geolocate any animals that are picked up. This information is then stored on a GIS database at the town where staff can use the information to determine where there may be areas of concern such as higher concentrations of vehicle strikes. This can assist in helping to guide where road ecology treatments such as signage or crossings may be appropriate. It also helps to identify whether any Species at Risk may be impacted, such as turtles. The program is simple and easy to use. The data can be used to improve both human and animal safety, better direct our resources to areas of high need, and help prevent impacts to local biodiversity.

2. PROTECTING OAKVILLE'S BIODIVERSITY – THE SUPPORTING POLICY CONTEXT AND FRAMEWORK

Successful protection of biodiversity is dependent upon the implementation of strategies, policies, laws and actions from local to global scales. This is due to the natural movement patterns and home ranges of different species and the need for collaboration among local, regional and global stakeholders who collectively contribute to successful biodiversity protection strategies.

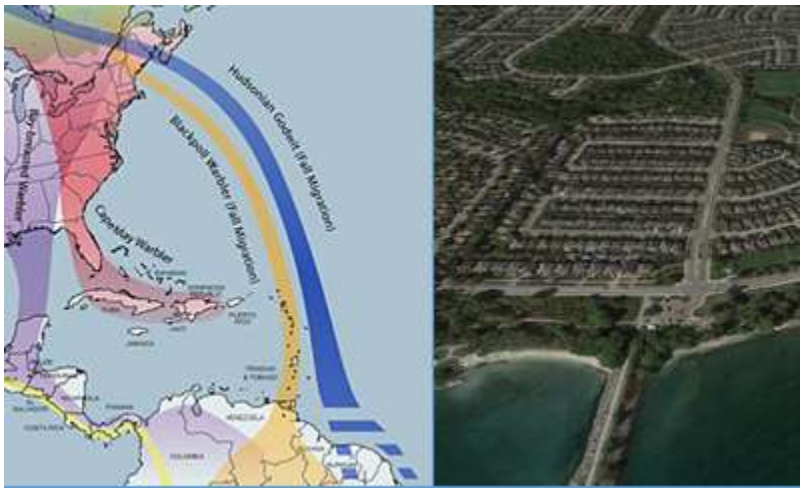


Figure 4: Global Songbird Migration Patterns & Local Shoreline Protection

At the local scale Oakville is identifying the needs and opportunities for habitat protection, enhancement and restoration through the OSB so that the necessary strategies, policies, laws and management opportunities can be taken by the Oakville community.

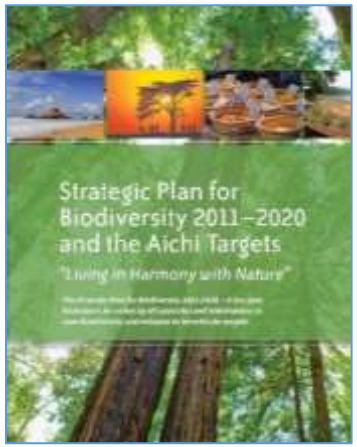
Plants and animals rely on healthy habitats that may be spread across hundreds or even thousands of kilometers. At a local scale, this means suitable habitat must be available within Oakville to support local, regional and global species. For example, migrating birds utilize areas of Oakville as ***summer breeding grounds***, but also travel over a wide range of other habitats along their migration routes and within their winter ranges. Oakville is one of many local stakeholders ensuring suitable habitat is available along the way.

THE GLOBAL FRAMEWORK

The Global Biodiversity Strategy developed by the International Union for Conservation of Nature (IUCN), United Nations Environment Programme (UNEP) and the World Resources Institute (WRI) lead to the creation of the ***UN Convention on Biological Diversity*** which Canada signed and ratified in 1992. The Convention has three main objectives:

- the conservation of biological diversity;
- the sustainable use of the components of biological diversity; and
- the fair and equitable sharing of the benefits arising out of the utilization of genetic resources.

In 2010 a revised ***Strategic Plan for Biodiversity*** was developed recognizing biological diversity underpins ecosystem functioning and the provision of ecosystem services essential for human well-being. Biodiversity supports food security, human health, the provision of clean air and water; it contributes to local livelihoods, and economic development, and is essential for the achievement of the Millennium Development Goals, including poverty reduction.



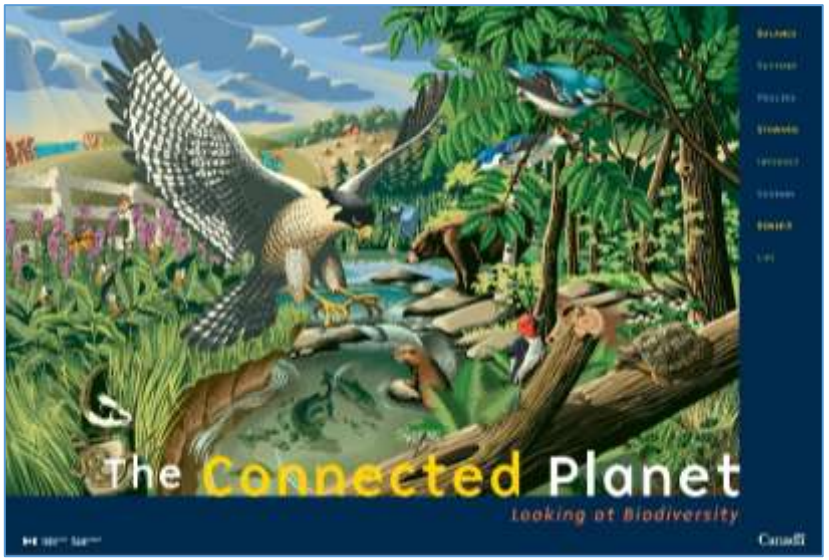
THE NATIONAL FRAMEWORK

The Canadian Biodiversity Strategy (1995) includes five goals

1. Conservation and Sustainable Use;
2. Ecological Management;
3. Education and Awareness;
4. Incentives and Legislation; and
5. International Cooperation.

The vision for the Canadian Biodiversity Strategy is:

> *A society that lives and develops as part of nature, values the diversity of life, takes no more than can be replenished and leaves to future generations a nurturing and dynamic world, rich in its biodiversity.*



THE PROVINCIAL FRAMEWORK

In Ontario, the Provincial Policy Statement (PPS) provides overall policy direction on matters of provincial interest related to land use and development. In 2014, the PPS introduced a change in policy direction with a greater emphasis on environmental sustainability and conservation. Part IV of the 2014 PPS includes reference to ensuring that resources are managed in a sustainable way to conserve biodiversity. Policies 1.1.1(h) and 1.1.4.1(h) both acknowledge that conservation of biodiversity is necessary to support healthy, liveable, safe and viable communities and rural areas.

The foundation for biodiversity is a healthy and connected natural heritage system and environment. The OSB incorporates the principles embedded in The Places to Grow Act (2005), the Greenbelt Act (2005), and the Growth Plan for the Greater Golden Horseshoe (2017) and that collectively emphasize policy direction that protects "what is valuable" – our water resource systems, and natural heritage systems. The role of resilient and biodiverse natural areas is recognized as playing a significant role in preparing the region for climate change, another key policy direction.

In 2011 the Ontario Government renewed the province's commitment to the Ontario Biodiversity Strategy (2005), highlighting four strategic directions:

- Engage People;
- Reduce Threats;
- Enhance Resilience; and
- Improve Knowledge.

Ontario's strategy states, "*Protecting the diversity of life on Earth – of which we humans are an integral part – requires broad societal consensus and participation. It is a challenge not for some of us, but for all of us.*"

The province has a number of other policies and legislation that support and direct biodiversity:

- The Endangered Species Act (2007) which identifies Species at Risk based on the best available scientific information; protect species that are at risk and their habitats, to promote the recovery of species that are at risk; and to promote stewardship activities to assist in the protection and recovery of species that are at risk;
- The Invasive Species Strategy (2012) and associated Invasive Species Act (2015) with the intent to prevent new invaders from arriving and surviving in the province, to slow or reverse the spread of existing invasive species and to reduce the harmful impacts of existing invasive species; and
- the Great Lakes Strategy (2012) and associated Great Lakes Protection Act (2015), the Endangered Species Act (2007) which sets out to protect and restore the ecological health of the Great Lakes-St. Lawrence River Basin and create opportunities for individuals and communities to become involved in the protection and restoration of the ecological health of the Great Lakes-St. Lawrence River Basin.

The OSB draws from and helps implement these through its policy framework and action plan.

THE LOCAL FRAMEWORK

Locally, the protection of biodiversity is aligned with these higher order policies and strategies, and is achieved through a wide variety of actions and partners in implementation. Following directly from Council's Strategic Plan (2015-2108), the Vision to be "the most Livable Town in Canada" includes a goal "to enhance our natural environment and to have programs and services that are environmentally sustainable". The development of a biodiversity strategy was identified in Council's plan as a key action to help implement this goal and create a cohesive approach. The Oakville Strategy for Biodiversity (OSB) is intended to provide a framework for coordinated and focused action to protect and restore the health of Oakville for future generations. The OSB development benefited from a strong foundation in existing global (United Nations Convention on Biological Diversity, 1992 and the Strategic Plan for Biodiversity 2011-2020 and the Aichi Biodiversity Targets), National (Canadian Biodiversity Strategy, 1995) and Provincial (Ontario's Biodiversity Strategy, 2011) plans and strategies as previously described.

Official Plans provide the means to directly implement provincial policy locally and an important foundation for biodiversity protection in Oakville are policies in ***Livable Oakville*** and mapping that identifies areas of environmental significance (Schedule B Natural Features and Hazard Lands). A Regional Natural Heritage System (RNHS) further identifies policies and mapping that outlines natural areas which support diversity and connectivity of natural features, creating a system which protects the long-term ecological function and biodiversity of natural features. The RNHS provides the starting basis for the OSB mapping as Tier 1 lands.

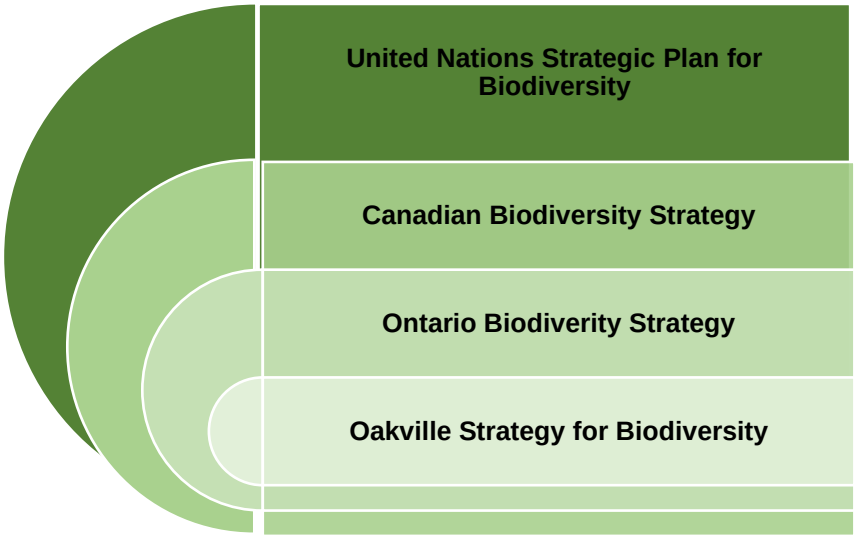


Figure 5: Hierarchy of Biodiversity Plans

Biodiversity is supported both directly and indirectly through a number of other plans and strategies. The Town and it's key partners – Halton Region, Conservation Halton, Credit Valley Conservation – as well as many community and business organizations and Environmental Non-Government Organizations (ENGOs) work collectively managing Oakville's lands through initiatives already underway that identify, protect, restore, enhance and contribute to better understanding Oakville's biodiversity and natural resources. Some examples are noted below and a more complete list of existing initiatives are described in Appendix 4:

- Halton Region Official Plan and RNHS
- Livable Oakville Official Plan
- North Oakville Urban Design and Open Space Guidelines
- North Oakville Secondary Plans (East and West)
- Environmental Sustainability Strategy (ESS)
- Oakville's Climate Change Strategy
- Growing Livability
- Urban Forest Strategic Management Plan
- A Healthy Green Space Strategy for Public Lands
- Oakville Wildlife Strategy
- Municipal Natural Assets Initiative
- North Oakville Creeks Subwatershed Study
- Oakville's Tree Protection Policy, Private Tree Protection By-law and Tree Protection During Construction Procedure
- Transportation Master Plan
- Active Transportation Master Plan
- Stormwater Master Plan
- Long Term Environmental Monitoring Program Reports
- Greenlands Securement Strategy

The ***Oakville Strategy for Biodiversity*** contributes to achieving ***Ontario's Biodiversity Strategy*** targets, and supports ***National*** and ***Global*** biodiversity targets, including:

- Increasing the number of Ontarians who understand biodiversity and its role in maintaining their health and well-being.
- Increasing the number of Ontarians who participate in biodiversity conservation activities.
- Ensuring all sectors implementing plans support the Ontario's Biodiversity Strategy by 2020.
- Integrating biodiversity values into all relevant policies and programs.
- Reducing greenhouse gas emissions by 6% below 1990 levels.
- Putting strategic plans in place to reduce the threats to biodiversity posed by invasive species.
- Reducing the release of pollutants harmful to biodiversity.
- Reducing Ontario's per-capita resource consumption and waste generation.
- Improving the status of species and ecosystems of conservation concern.
- Increasing the proportion of private lands in Ontario that are managed for biodiversity.
- Ensuring natural heritage system plans and biodiversity conservation strategies are developed and implemented at the municipal level.
- Establishing a long-term monitoring and reporting system for assessing the state of Ontario's biodiversity.
- By 2020, at least 17% of terrestrial and aquatic systems are conserved through well-connected networks of protected areas and other effective area-based conservation measures.
- By 2020, programs and policies are in place to maintain and enhance ecosystem services.

Ford Canada is a major employer located in Oakville that owns approximately 202 hectares of land around their assembly plant in the town's southeast corner. The property includes a large component of natural habitat that acts as a buffer around their assembly plant and onsite watercourses. In the mid 1990's Ford Canada had a report prepared by the Wildlife Habitat Council that identified opportunities on the site. An assessment of the important natural features was also conducted on the property that supported the site manufacturing expansion work during the same period (building, road, parking, and storm water systems).

Since this time, Ford has allowed additional significant areas of the property to naturalize, approximately 4 hectares on the southern end of the property and another 4 hectares on the northern end. Plantings around storm water facilities were selected to support native species. Similarly, when a new office was completed in 2002 native species were used for landscaping and a walking path was constructed for those on the site with nature in mind.

In 2018, a natural environment assessment was made of the southern portion of the site and storm water maintenance activities were conducted in a manner to protect wildlife and use native species for post-construction restoration. There are also plans to incorporate pollinator gardens in 2019.

These lands are held privately and serve as an important refuge area for local wildlife.

3. WHY BIODIVERSITY IS IMPORTANT TO EVERYONE

Oakville residents are fortunate to live in one of the most biodiverse areas in Ontario with over 900 different species of plants, 185 types of birds, 30 species of amphibians and reptiles, 29 mammals and 58 different kinds of fish. Some of these species live in trees and gardens around homes, others live in Oakville's protected natural areas and some species may be temporary residents that rely on natural habitats in Oakville to rest, forage and breed when migrating to and from winter home ranges (see text box). Environments that support high native species biodiversity generally have high ***ecological integrity***, these are areas with healthy soils, clean water, diverse native vegetation communities and high functioning ecosystem processes such as nutrient and water cycles that are resilient to negative impacts.

Canada Warbler

A small forest songbird that generally breeds in deciduous-coniferous or deciduous forests that have a dense, complex understory. Designated ***Threatened*** by the Committee for the Status of Endangered Wildlife in Canada (COSEWIC), threats include loss of breeding and nonbreeding habitat, forest harvesting, reduced availability of insect prey, and collisions with windows.

The IUCN, UNEP and the World Wildlife Fund (WWF) recognize the importance of biodiversity conservation to human survival (World Conservation Strategy 1980). Healthy natural environments support a wide range of ***ecosystem services*** that contribute to healthy human communities with clean air and water and opportunities to enjoy active lifestyles in contact with nature.

Figure 6. Metro Vancouver's Services and Solutions for a Liveable Region

Biodiversity and the ecosystem services provided by healthy natural environments are threatened globally. It is estimated there are approximately 8.7 million species on the planet and of these it has been predicted that 20 to 50 percent may become extinct by the end of the 21st century; this would be a loss of 1.74 to 4.35 million species. It is being called the sixth mass extinction and the window of opportunity to take effective action is very small (Ceballos *et al* 2017). The United Nations Convention on Biological Diversity has called on all local governments such as Oakville to conserve plants and animals and the habitats that support them (UN CBD).

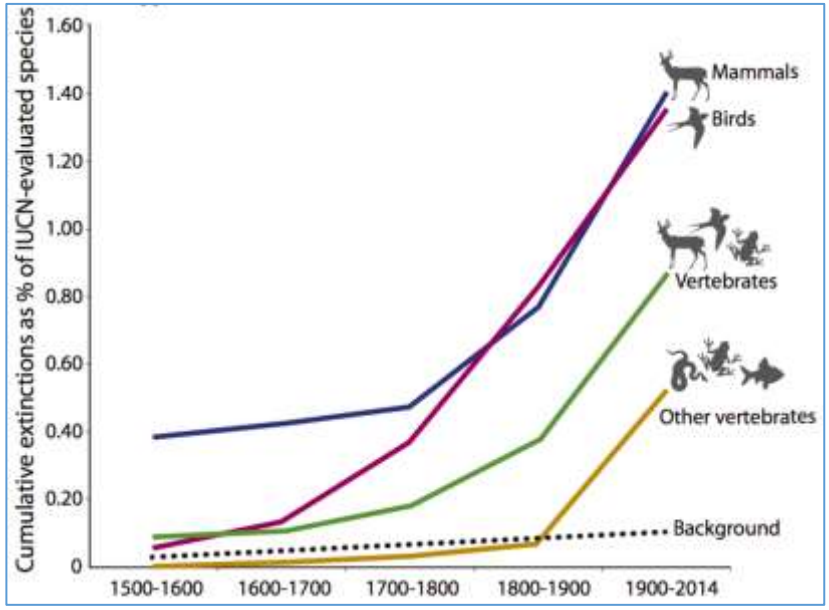


Figure 7: High conservative estimate of species extinctions

- ***invasive species*** that affect native species by taking over remaining natural areas or introduce new diseases;
- ***water pollution*** that make lakes and rivers uninhabitable for aquatic species;
- ***climate change*** that puts additional stress on native species as habitats respond to a changing climate and when more extreme climate events occur; and
- ***land-use changes*** can impact habitat areas if not managed properly.

Protecting and managing Oakville's natural areas is especially important to ensure high quality habitats continue to support all species of plants and animals, especially those that are already rare in Oakville, including:

- 56 Provincially Significant or Regionally Rare plant species;
- 33 Provincially Significant terrestrial fauna species;
- 10 Threatened terrestrial fauna species;
- 8 Special Concern terrestrial fauna species
- 3 Endangered terrestrial fauna species;
- 3 Threatened plant species; and
- 1 Endangered plant species.

Red necked grebe platforms

Supporting biodiversity doesn't need to be expensive or complex. Often, a willing host and an understanding of the species that inhabit the area are all it takes. Red necked grebes are migratory birds whose anatomy makes it difficult for them to walk on land. Because of this, they normally build their nests in open water, where they essentially float, tethered to subaquatic vegetation. Because of this precarious nesting situation, nests are often destroyed by wind or float away. At the Bronte Harbour Outer Marina, staff have supported and maintain floating tires that are anchored that the grebes now use as nesting platform. Many generations of grebes have been successfully raised at this location now, thanks to the efforts of staff at the Marina. This initiative supports both a somewhat uncommon bird to the Oakville area, but also provides birdwatchers a up close opportunity to view this interesting species and their offspring.

4. LEARNING MORE ABOUT OAKVILLE'S BIODIVERSITY

Oakville lies within southern Ontario's Carolinian Deciduous Forest Region, described as Ontario's most threatened ecological region due to the tremendous loss of natural habitat as a result of agriculture and urban development. No one could have predicted the tremendous explosion of urban development along the Lake Ontario shoreline. Historic aerial photos from 1954 and 2017 show just how dramatic the change is, with areas of natural habitat now restricted to about 18% of the Town of Oakville.

Figure 8: Urban development in the Town of Oakville in 2017 and 1954

Much of Oakville is on the Peel Plain characterized by clayey till soils deposited as glaciers which receded about 10,000 years ago. This till plain was incised by glacial meltwater channels flowing into glacial Lake Iroquois creating the valley systems of Fourteen Mile Creek, Bronte Creek, Sixteen Mile Creek, Morrison Creek and Joshua's Creek. As the glaciers receded, the volume of meltwater was reduced leaving the present day wide valley systems with wide floodplains and smaller creeks and rivers. The valley systems have experienced less development and now are home to some of Oakville`s most significant natural areas.

Figure 9: Healthy ecosystems of the 16 Mile Creek Valley

Figure 10: Urban development surrounding 16 Mile Creek

The most significant natural areas present in Oakville are described in studies on Environmentally Sensitive Areas (Halton Region 2005), Areas of Natural and Scientific Interest (OMNR 2003) and Halton Natural Areas Inventory (Conservation Halton 2006). These studies contain good information about the plants and animals present and they highlight the most important biodiversity areas in Oakville.

In Oakville natural areas and watercourses in the ravines of Bronte Creek, 14 Mile Creek, and 16 Mile Creek, as well as tableland woodlands in North Oakville and Iroquois Shoreline Woods are some of the most important and best quality natural habitats supporting native species biodiversity.

However all areas in Oakville can contribute to biodiversity, including individual trees and shrubs in residential areas and along roadways that can provide resting sites for migrating birds, butterfly gardens that support pollinators, and naturally vegetated swales and green roofs that help to improve the quality and quantity of rainfall entering streams and rivers.

IROQUOIS SHORELINE WOODS

Iroquois Shoreline Woods is a forested area containing a portion of the historic Glacial Lake Iroquois shoreline. Oak and maple woodland provide important habitat for significant species such as Eastern Milk Snake and Red-headed Woodpecker.

MAPPING BIODIVERSITY OPPORTUNITIES

Oakville's approach to biodiversity protection is inclusive - it varies from placing a nesting box under a bridge to restoring an ecosystem connection between a forest and a wetland. It can involve a wide range of landscapes in Oakville that can be found almost anywhere, from parking lots to treasured greenspaces.

To better understand how different areas in Oakville provide habitat that support plant and animal diversity, mapping has been created to broadly classify areas which support biodiversity. The approach of the mapping and the OSB is to look at what we have and to consider how we can maximize the habitats available and identify opportunities to support native biodiversity within the wide variety of places and spaces across the town.

To further understand the Tier 1 to 4 maps provided below, including how they are intended to work with the OSB here are a few things to keep in mind:

- the maps were developed using broad classifications based on the features of the land and their ability to support biodiversity (see Appendix 2 for mapping methodology);
- the maps do not infer any new land use designations, nor do they restrict current land use;
- the maps do not target any specific properties;
- the maps are intended to identify areas that may provide opportunities to protect, restore and enhance biodiversity through a wide variety of potential management opportunities; and
- the four tiers cover all the lands in Oakville, highlighting that biodiversity can be supported across land uses and types (Full page Tier 1 to 4 maps are provided in Appendix 3).

TIER 1 – NATURAL HERITAGE SYSTEM

The RNHS protects the most important natural areas supporting biodiversity such as native woodlands, wetlands, thickets and meadows. Species diversity in these complex ecosystems starts with healthy soils that support decomposing microorganisms, soil insects and small burrowing mammals such as moles and voles. Healthy soils support complex, multi-tiered plant systems, including low herbaceous plants, woody shrubs and taller shrubs, trees and vines. Multi-tiered plant systems provide a variety of places to live ("niche") and food sources resulting in a high diversity of insects, amphibians and reptiles, birds and small and large mammals.

Figure 11: Biodiversity Tier 1

TIER 2 – CONTRIBUTING AREAS

Outside the RNHS there are some areas with native woodlands, wetlands and cultural meadows that contribute to native biodiversity. While these areas may be smaller, they do provide supporting habitat and ecological connections or stepping stones for native species within the urban fabric. Some Tier 2 areas associated with Lake Ontario are important habitats that link terrestrial and aquatic environments. Tier 2 areas may also benefit from ecological restoration and the management of invasive species to enhance natural habitats supporting biodiversity within Oakville.

Figure 12: Biodiversity Tier 2

TIER 3 – SUPPORTING AREAS

Areas adjacent to the RNHS can provide an important supporting role for biodiversity when managed carefully. Tier 3 may include residential, commercial or industrial areas that are traditionally managed as lawns presenting the potential for tree planting and naturalization. They may also include drainage ditches and swales, where natural features can be enhanced to better support native biodiversity and improve storm water control and water quality. Lands which are active parks or cemeteries can provide important buffering to natural areas and may form important linkages between natural areas.

TIER 4 – ALL AREAS IN OAKVILLE

Perhaps surprisingly all areas in the Town of Oakville have the potential to support native biodiversity, particularly when they are managed to enhance habitat opportunities for native species. This can include the use of special engineering structures such as silva cells for planting trees in downtown areas, the creation of living green roofs and walls, the construction of special habitat features such as “bat condominiums”, or pollinator gardens. Providing good quality native habitats in all forms wherever possible will contribute to the overall health of Oakville’s native biodiversity.

Figure 13: Biodiversity Tier 3

Figure 14: Biodiversity Tier 4

Incorporating Habitat Enhancements into Town Projects

The Town of Oakville regularly undertakes projects to stabilize areas under threat of erosion and instability near creeks and waterways. To maximize the benefit in a project for Taplow Creek, enhancements to improve local biodiversity are being incorporated. These include the construction of pocket wetlands that will not only help divert water during high level periods, but will also provide improved habitat for fish, frogs, dragonflies and other species, increasing diversity within the adjacent significant woodland. Oakville Parks and Open Space will add native plants into the design to help improve forest cover and bat habitat will be provided with the installation of a bat box. The bat box will provide roosting habitat for bats, while restoration planting will provide habitat foraging, and over time, roosting areas for bats.

5. MANAGEMENT OPPORTUNITIES TO PROTECT, ENHANCE & RESTORE BIODIVERSITY

Within the Town of Oakville there are many opportunities to protect, enhance and restore habitats that support native plant and animal biodiversity. Currently there are many management activities being implemented by stakeholders, including the work of staff and departments at the Town of Oakville, Halton Region, and Conservation Halton. In addition, there are ENGOs, individual residents, and various institutions and private companies that are engaged in their own initiatives implementing activities aimed at protecting, enhancing and restoring Oakville's biodiversity.

In some cases, management is in response to ***issues that have a negative impact*** on Oakville's native habitats, issues such as non-native invasive plants or animals that overtake native habitats (e.g. European Buckthorn or Japanese Knotweed) or destroy native habitat (e.g. Emerald Ash Borer or Gypsy Moth) or more frequent extreme climate events such as windstorms and ice storms that impact Oakville's tree canopy. Some issues are human-related pressures, such as off-leash dogs and cats that frighten or kill birds and mammals, uncontrolled bike and foot paths in natural areas, and roads that pose a risk to wildlife.

In other cases management is in response to ***opportunities to enhance and restore*** the existing native habitats present in Oakville. Lawns can be converted to pollinator gardens with native plants, grassed swales can be enhanced with native wetland plants and shrubs, using special planting techniques trees can be grown in parking lots and sidewalks, and for the adventurous there are opportunities to establish green roofs and living walls.

PLANT SALVAGE

The Town of Oakville partners with others including Conservation Halton, Halton Region, Oakvillegreen and the Oakville Horticulture Society in ***plant salvages***. Development projects such as road widening or other urban development sometimes impact natural areas. Through advanced planning and partnerships, these areas are assessed and when possible arrangements are made to remove native species such as jack in the pulpit, Canadian anemone, trilliums, mayapple and many others prior to construction taking place.

These plants are then used either by the town or partner organizations for replanting and restoration projects in other areas of town. These species are not only native but are especially well adapted to the local environment. "Recycling" plants helps support local biodiversity.

On the following pages there are 28 OSB Management Opportunity Fact Sheets. Each fact sheet contains the following information:

Problem Identification
- describing the need for management

Management Options
- actions which may be taken by stakeholders

Stakeholder Involvement
- groups and individuals who may be involved

Potential Locations for Implementation
- areas best suited for management options

Measures of Success
- checking to see what works – "*adaptive management*"

Resources
- links to resources showing methods for action

Two key aspects of implementing the Fact Sheets is knowing ***where*** it is possible to take advantage of the opportunities and ***who*** are the people engaged in organizing and carrying out the activities. The most recognizable area where management opportunities exist is within the protected NHS. Within the NHS the Town of Oakville can partner with others such as Conservation Halton, ENGOs, and local residents to implement activities that protect, enhance and restore biodiversity. Outside the NHS there are also many opportunities to implement the OSB Management Opportunities described in the Fact Sheets. While it must be recognized these areas have existing uses and functions that must be respected, the Fact Sheets show creative ways of supporting habitats within an urban setting. The figure on the following page illustrates which of the OSB Management Opportunities are best suited to the Tier 1 to 4 areas.

To better understand the ***where*** and ***who*** associated with each OSB Management Opportunity two tables are also provided below.

The "***where"*** table identifies the following areas:
- Natural Heritage System (NHS)
- Parks and Open Space
- Transportation/ Utility Corridors
- Institutional/ Corporate Lands
- Commercial Lands
- Residential Lands

The "***who"*** table includes the following stakeholders:
- Town of Oakville
- Halton Region
- Conservation Halton
- Other Government
- Institutions/Businesses
- Community Groups/ENGOs

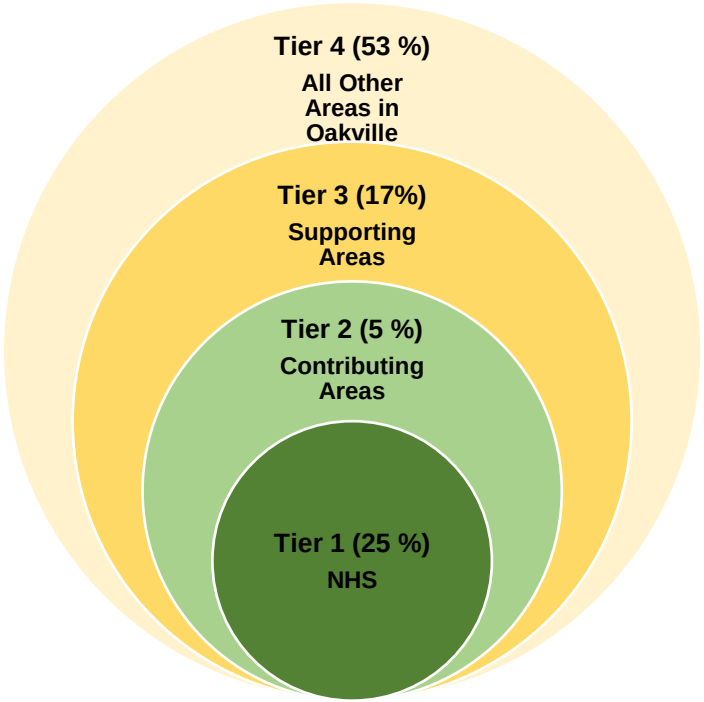


Figure 15: Management opportunities exist within all areas of Oakville (Total area of Oakville 13,948 hectares)

Tier 1

"Protection" Management Opportunities

- Controlling Dogs & Cats
- Controlled Light Pollution
- Controlling Pests & Disease
- Encroachment
- Invasive Species
- Keeping Toxins out of the Environment
- Managing Negative Impacts of Recreational Trail Users
- Public Education
- Working with Schools
- Climate Change

Tier 2

"Restoration" Management Opportunities

- Ecological Restoration
- Enhancing the Lake Ontario Shoreline
- Functional Ecological Linkage
- Invasive Species
- Meadow & Savanna Management
- Public Education
- Re-introducing Native Species to Restored Habitats
- Restoring Altered Watercourses
- Working with Horticulture Industry
- Working with Schools
- Climate Change

Tier 3

"Supporting" Management Opportunities

- Buidling Specialized Wildlife Structures
- Enhancing & Managing SWM Ponds
- Functional Ecological Linkage
- Invasive Species
- Pollinator Gardens
- Public Education
- Wildlife Friendly Gardening
- Working with the Horticulture Industry
- Working with Schools
- Climate Change

Tier 4

"Enhancement" Management Opportunities

- Building Specialized Wildlife Structures
- Controlling Dogs & Cats
- Controlling Light Pollution
- Creating an Urban Tree Canopy
- Creating Green Habitat in Challenging Environments
- Institutional/Corporate Open Space Management
- Keeping Toxins out of the Enviornment
- Low Impact Development (LID)
- Managing Negative Wildlife Encounters
- Pollinator Gardens
- Preventing Bird Strikes on Windows
- Public Education
- Reducing our Environmetnal Footprint
- Wildlife Friendly Gardening
- Working with Horticulture Industry
- Climate Change

Figure 16: Management opportunities and Biodiversity Tiers 1-4

TABLE 1. AREAS FOR IMPLEMENTATION OF MANAGEMENT OPPORTUNITIES (Prime locations highlighted in green)						
MANAGEMENT OPPORTUNITY FACT SHEETS	**NHS**	**Parks & Open Space**	**Transportation/ Utility Corridors**	**Institutional/ Corporate Lands**	**Commercial Lands**	**Residential Lands**
Addressing Climate Change	X	X	X	X	X	X
Building Specialized Wildlife Structures	X	X	X	X		
Controlling Dogs & Cats	X	X				
Controlling Light Pollution		X	X	X	X	X
Controlling Pests & Disease	X	X				
Creating an Urban Tree Canopy	X	X	X	X	X	X
Creating Green Habitat in Challenging Environments		X		X	X	X
Ecological Restoration	X	X				
Encroachment	X	X		X	X	X
Enhancing & Managing SWM Ponds	X	X				
Enhancing the Lake Ontario Shoreline	X	X		X		X
Functional Ecological Linkage	X	X	X			
Institutional/Corporate Open Space Management				X		
Invasive Species	X	X				
Keeping Toxins out of the Environment				X	X	X
Low Impact Development (LID)			X	X	X	X
Managing Negative Impacts of Recreation	X	X				
Managing Negative Wildlife Encounters				X	X	X
Meadow and Savanna Management	X	X	X			
Pollinator Gardens		X		X	X	X
Preventing Bird Strikes on Windows		X		X	X	X
Public Education				X		X
Reducing our Environmental Footprint			X	X	X	X
Re-introducing Native Species to Restored Habitats	X	X				
Restoring Altered Watercourses				X	X	X
Wildlife Friendly Gardening		X		X	X	X
Working with the Horticulture Industry		X		X	X	X
Working with Schools				X		X

TABLE 2. STAKEHOLDERS IN MANAGEMENT OPPORTUNITIES (Lead Stakeholder highlighted in green)						
MANAGEMENT OPPORTUNITY FACT SHEETS	Town of Oakville	Halton Region	Conservation Halton	Other Government	Institutions Business	Community Groups/ENGOs
Addressing Climate Change	X	X	X	X	X	X
Building Specialized Wildlife Structures	X	X	X			
Controlling Dogs & Cats	X					
Controlling Light Pollution	X	X			X	
Controlling Pests & Disease	X	X	X	X		
Creating an Urban Tree Canopy	X	X	X		X	X
Creating Green Habitat in Challenging Environments	X	X			X	
Ecological Restoration	X	X	X			X
Encroachment	X		X		X	X
Enhancing & Managing SWM Ponds	X		X			
Enhancing the Lake Ontario Shoreline	X		X		X	X
Functional Ecological Linkage	X	X	X			
Institutional/Corporate Open Space Management	X				X	
Invasive Species	X		X		X	X
Keeping Toxins out of the Environment	X	X		X	X	
Low Impact Development (LID)	X	X	X			
Managing Negative Impacts of Recreation	X		X			X
Managing Negative Wildlife Encounters	X		X		X	X
Meadow and Savanna Management	X		X		X	
Pollinator Gardens	X		X		X	X
Preventing Bird Strikes on Windows	X				X	
Public Education	X	X	X			X
Reducing our Environmental Footprint	X	X	X		X	X
Re-introducing Native Species to Restored Habitats	X		X			
Restoring Altered Watercourses	X		X		X	
Wildlife Friendly Gardening	X		X		X	X
Working with the Horticulture Industry	X	X	X	X		
Working with Schools	X	X	X	X		X

OSB MANAGEMENT OPPORTUNITY FACT SHEET – BUILDING AND INSTALLING SPECIALIZED HABITAT FEATURES

PROBLEM IDENTIFICATION

Urban landscapes can be challenging for wildlife when specialized habitat features are in limited supply. Building and installing specialized habitat features such as bat boxes, nest boxes, snake hibernacula and in stream aquatic habitat can help to re-create specialized habitats for wildlife and benefit biodiversity and wildlife populations.

Success of specialized habitat features depends largely on meeting required specifications desired by the target wildlife and installation into an appropriate location. Research and on site surveys are necessary to ensure that features are built and installed correctly.

Bat House

Public education is necessary to prevent vandalism of specialized habitat features and to encourage citizens to install specialized structures on their own property.

MANAGEMENT OPTIONS

ENHANCEMENT – Installing specialized habitat features can assist in re-creating some of the habitat lost by urbanization and benefit wildlife populations. However, exercise caution – before building on or installing habitat features, learn about the natural habitat that may be impacted.

- research appropriate specifications for specialized features and locations for installation
- develop a system for evaluating the needs and opportunities for specialized structures in an area
- develop a program for building and installing specialized structures that use the most recent scientific literature and site specifications
- develop a system for public education and/or signage to prevent vandalism of specialized habitat structures and to encourage private landowners to install features on their own properties

STAKEHOLDER INVOLVEMENT

- Municipal, Regional and Provincial Governments
- Conservation Authorities
- Land owners (Residential, Institutional, Commercial and Low-impact Industrial)
- ENGOs

- Communication facilities/organizations (e.g., Hydro One)
- Developers
- Schools/School Boards/Campuses

POTENTIAL LOCATIONS FOR IMPLEMENTATION

- Hydro corridor – perching poles
- School yards/Campuses
- Private land (caution for SAR)
- Public lands
- Next to Storm Water Management (SWM) ponds
- Linkages and watercourse corridors (e.g. North Oakville, snake hibernacula)
- New stream corridors
- Vernal pools in floodplain

MEASURES OF SUCCESS

- Develop a program to monitor specialized habitat features after a few years to confirm use by wildlife
- Increased number of property owners installing specialized wildlife structures on their land
- Increased understanding and appreciation for biodiversity
- Preventing vandalism to specialized wildlife structures
- Success of habitat use by target species (reporting centre – database)

RESOURCES

- *Ontario - Improving Fish Habitat*
- *Ontario Streams- Ontario's Stream Rehabilitation Manual*
- *Toronto Zoo - Bats: A Conservation Guide*
- *National Wildlife Federation - Build A Bat House*
- *Bat Conservation International - Installing Your Bat House*
- *BC Bats - Where to Install a Bat House*
- *Bird Studies Canada - Nest Boxes*
- *Cornell Lab of Ornithology - All About Birdhouses*
- *Canadian Wildlife Federation - Nest Boxes for Birds*
- *Toronto Zoo - Snake Hibernacula*
- *Long Point Land Trust - Building a Snake Hibernacula*
- *Canadian Herpetological Society - Education Products*

Photo credits: Town of Oakville – Bat House, Osprey Watch - Osprey Nesting Platform

Osprey Nesting Platform

OSB MANAGEMENT OPPORTUNITY FACT SHEET – ADDRESSING CLIMATE CHANGE IN OAKVILLE

PROBLEM IDENTIFICATION

Biodiversity and climate change are closely interconnected. While climate change seriously threatens Oakville's biodiversity, healthy habitats that support biodiversity improve Oakville's resilience and adaptability to a changing climate through the ecosystem services they provide. Consequently, conserving and sustainably managing biodiversity is an important part of addressing climate change.

Traffic in an Urban Area

There are many factors which contribute to climate change, some of the key drivers of climate change include transportation, home and workplace heating and cooling, industrial and agricultural energy use and emissions, and deforestation. Climate change is already occurring as seen in more frequent high heat days in summer and unusually warm days in winter or changes in precipitation patterns with summer drought or severe storms and flooding. A changing climate negatively impacts native plant and animal species and is associated with the loss of some native species and the introduction of new species and diseases that can impact native biodiversity.

It is important to understand the impacts of climate change on ourselves and on Oakville's biodiversity and to be aware of the opportunities to help reduce climate change and take early action to reduce the negative impacts of a changing climate.

MANAGEMENT OPTIONS

PREVENTION – prevent the loss of existing biodiversity by reducing greenhouse gas emissions, and energy consumption and proactively preventing negative impacts such as invasive species.

- Promote energy conservation, efficiency strategies, and sustainable energy supplies such as turning off home and office lighting to reduce electricity consumption and reduce the risk of bird collisions with buildings
- Support Net Zero Energy home developments that combines ultra-energy efficient designs with renewable energy strategies that together produce more energy than they consume over the course of a year
- Protect forests which are major stores of carbon and can help us limit atmospheric greenhouse gas concentrations
- Protect natural shoreline which can increase the city's resilience to rising lake levels associated with climate change
- Continue and enhance measures to effectively manage invasive species, pathogens and parasites (e.g. managing ticks and Lyme disease, etc.)

ENHANCEMENT – Changes to urban development and planning, as well as naturalization programs can serve to 'buffer' against the impacts of a changing climate.

- develop an information package on the environmental and financial benefits of naturalizing open spaces to support biodiversity and buffer impacts of climate change
- planting and restoration programs should consider the need to utilize a wider range of species adapted to a changing climate to increase ecosystem resilience (e.g. plants adapted to warmer temperatures and tolerant to extreme climate events)
- recognize the importance of maintaining ecological corridors to permit the movement/migration of species as climate changes
- increase pollinator and wildlife gardens to help mitigate changes caused by a mismatch in the timing of seasonal events (i.e. try to ensure flowers are available as food sources for insects which in turn feed other species such as birds and amphibians)
- place priority of efficient transportation of people and encourage growth along selected corridors that are well served by public transit

STAKEHOLDER INVOLVEMENT

- Municipal Government
- Schools and Institutions
- Residents
- ENGOs

Naturalized Shoreline in Oakville

POTENTIAL LOCATIONS FOR IMPLEMENTATION

- private lands
- municipal parks
- industrial/corporate offices and lands
- schools/campuses

MEASURES OF SUCCESS

- Plans for climate change mitigation are developed and implemented and contribute to Oakville's target to reduce greenhouse gas emissions by 2025
- Increased understanding of climate change and impacts to biodiversity by Oakville's residents
- Increased number of people choosing to take public transit
- Increased numbers of schools involved in learning about climate change impacts
- Increased numbers of more energy efficient builds and renewable energy strategies such as solar panels

RESOURCES

- *Federation of Canadian Municipalities – Municipalities for Climate Innovation Program*
- Ontario's Five Year Climate Change Action Plan 2016 - 2020
- Communicating Biodiversity and Climate Change – Ontario Biodiversity Council
- Climate Change and Biodiversity – Government of Ontario
- Net Zero Homes – Canadian Home Builders' Association

Photo credits: *Nayuki – Traffic jam; Jamie Hedworth - Oakville Pier Shoreline*

OSB MANAGEMENT OPPORTUNITY FACT SHEET – CONTROLLING DOGS AND CATS

PROBLEM IDENTIFICATION

Although cats and dogs make wonderful pets they can have negative impacts on wildlife if not controlled.

Outdoor cats are estimated to be responsible for killing 100 – 350 million birds each year in Canada. They also have an impact on native mammal, reptile and amphibian populations. Cats are instinctive predators so both house cats that are let outdoors and stray cats hunt wildlife, even if they are not hungry.

Dogs have also been known to kill a variety of wildlife including birds, mammals, reptiles and amphibians. Aside from simply killing animals, dogs (off-leash or stray) can harm wildlife in other ways such as causing disturbances by chasing or harassment. An additional problem is that when wildlife perceives a dog or cat as a threat, they may change their behaviour to avoid them. Consequently, this may result in reduced abundance and species richness of wildlife, even when dogs and cats are restrained on leads.

Cat predation on birds

This doesn't mean we have to prevent dog walkers from going on trails in natural areas, however use of ad-hoc trails by dog walkers has a greater impact than by other users.

MANAGEMENT OPTIONS

PREVENTION – Preventing direct mortality is the best way to reduce the impacts of dogs and cats on Oakville's biodiversity.

- use education and communication tools regarding the threats dogs and cats pose if not controlled
- enforce leash by-laws in natural areas of Oakville and designate off-leash dog parks to reduce direct mortality opportunities and other impacts of off-leash dogs
- obey existing Oakville by-laws that all domestic animals, including cats, must be leashed

CONTROL – Domestic pets should be on-leash in natural areas and stray cats and dogs should not be left on the street as they can have a negative impact on wildlife.

- develop a co-operative program with the Humane Society or other stakeholders to re-home stray cats and dogs
- encourage dog owners to walk their dogs on-leash along designated trail systems rather than using ad-hoc trails
- develop a system for detecting and closing ad-hoc trails

STAKEHOLDER INVOLVEMENT

- Municipal and Regional Governments
- Residents and Resident Groups
- Humane Society
- OSPCA
- Pet Stores
- Registered Breeders
- Doggy Daycares/Dog Walkers/Groomers
- Wildlife Rehabilitators
- ENGOs
- Conservation Authorities

POTENTIAL LOCATIONS FOR IMPLEMENTATION

- Signs at trailheads/parking lots

MEASURES OF SUCCESS

- Reduced mortality of birds and other wildlife due to unsupervised or off-leash cats and dogs
- Compliance with on-leash requirements in natural areas through increased awareness of biodiversity or the enforcement of by-laws
- Successful re-homing of stray cats and dogs
- System of identifying and closure of undesired ad-hoc trails to provide wildlife more space free from disturbance
- Number of areas protected and restored

RESOURCES

- *ABC Birds - Estimated Number of Birds Killed by Cats in Canada*
- *Sibley Guides- Causes of Bird Mortality*
- *Nature Canada - Cats and Birds*
- *Is Wildlife Going to the Dogs? Impacts of Feral and Free-roaming Dogs on Wildlife Populations*
- *Dogs Threaten Endangered Species Worldwide*
- *Is Wildlife Going to the Dogs?*
- *Effects of Dogs on Wildlife Communities*
- *Impacts of dogs on wildlife and water quality*
- *Oakville - Animal Bylaw*

Domestic dogs off leash disturb wildlife

Photo credits: Care2 - Outdoor Cat; Cuteness.com - Dog chasing bird

OSB MANAGEMENT OPPORTUNITY FACT SHEET – CONTROLLING LIGHT POLLUTION

PROBLEM IDENTIFICATION

Light pollution is the excessive or inappropriate use of artificial light. This includes unnecessary lighting or excessive groupings of light sources, which contribute to glare and urban sky glow.

Light pollution affects nocturnal wildlife (amphibians, owls, bats, etc.) and migratory birds. Birds that migrate at night use the light from the moon, stars and setting sun to navigate, however artificial lighting can interfere with their behaviour and draw them towards lit areas. These birds can become disoriented and collide with reflective surfaces or waste precious energy stores trying to get back on course. Beams of lights from festivals, stadiums, lighthouses and airports can 'trap' birds that become reluctant to fly back into the dark. Eventually these birds become exhausted and consequently may become more susceptible to predation.

Nocturnal species such as amphibians, small mammals, owls and bats can have their daily schedule disrupted by light pollution. In urban areas amphibian development and foraging time can be reduced as a result of artificial lighting.

Street lights affect plants and animals

Artificial light sources also interrupts natural cycles in plants, such as natural repair that occurs at night, or the timing of flowering and bud formation, and germination.

Light pollution can also have a negative effect on human health by disrupting our natural sleep patterns

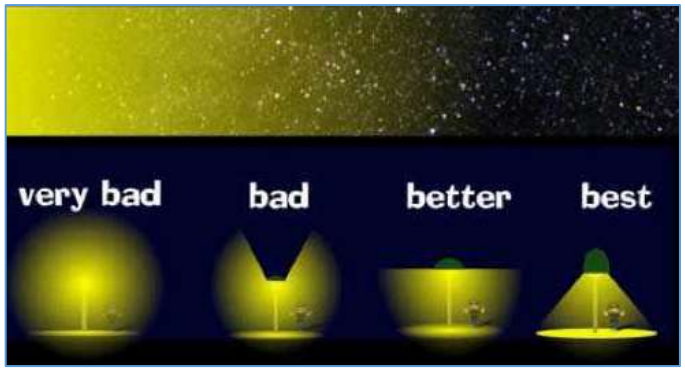
MANAGEMENT OPTIONS

PREVENTION **–** Preventing light pollution is the best way to reduce wildlife disruption, energy use, and improve both wildlife and human health.

- change building code to reflect designs that reduce light pollution (e.g. hoods on street lights or stadium lights)
- develop a public education program to encourage residential, industrial, commercial and institutional land owners to reduce light pollution of their properties
- encouraging the use of covered bulbs facing downward
- automatic systems to turn off lights such as motion sensors
- coloured lights (red, yellow and orange) that are less disruptive
- develop a program for identifying natural areas affected by light pollution and creating barriers (e.g. hedges, tree line, green wall, etc.) to reduce it
- utilize data on bird mortality to target areas for education
- develop a public education program to inform the public what to do if they find an injured bird

STAKEHOLDER INVOLVEMENT

- Municipal Government
- Residents and Resident Groups
- Industry, Corporations and Institutions
- Developers
- Conservation Authorities
- ENGOs
- Wildlife Rehabilitators
- FLAP Canada



Hoods on lights can reduce light pollution in the sky

POTENTIAL LOCATIONS FOR IMPLEMENTATION

- Roadways, trails and all urban lands adjacent to natural features and areas

MEASURES OF SUCCESS

- Increased awareness of the issues light pollution poses to wildlife
- Decreased light pollution in the town
- Reduction of bird strikes on reflective surfaces of buildings

RESOURCES

- *FLAP - Lights*
- *International Dark-Sky Awareness*
- *Dark-skies Awareness - Light Pollution*
- *Penny4NASA - Light Pollution and NASA*
- *Light Pollution Affects Amphibians in the Environment*
- *Effects of artificial night lighting on amphibians and reptiles in urban environments*
- *Oakville Municipal Lighting Strategy*

Photo credits: *deeproot*; *Penny4NASA; Toronto Star*

OSB MANAGEMENT OPPORTUNITY FACT SHEET – CONTROLLING PESTS AND DISEASE

PROBLEM IDENTIFICATION

Pests and disease (native or non-native) significantly reduce the survival of Oakville's native plants and animals. Pests and diseases may negatively impact native species in a variety of way, including – parasitizing, eating, smothering, allelopathy (chemical attack), competing for resources, disease vectors, etc.

The introduction of pests and disease into native habitats can occur in a number of ways – typically from soil, plant material or animals unintentionally carrying pathogens from place to place in cars, trucks, boats and planes and on people's feet.

Once new pests and diseases become established in native habitats, they can be extremely difficult or impossible to eradicate.

MANAGEMENT OPTIONS

PREVENTION - Prevent the introduction of pests and disease to Oakville's native habitats.

- use education and communication tools regarding the sources and risks of pest and disease introductions
- discourage the transportation of soils, wood and water from locations with pests and diseases into Oakville
- encourage the planting of native plants and reduce the planting of exotic species, which may include pest plants
- use research and knowledge to develop a program for monitoring and predicting outbreaks of pests and diseases
- continue Oakville's pest detection program

CONTROL – Where possible identify the areas where pests and diseases are impacting native habitats and prioritize control methods to eliminate pests and diseases.

- develop a catalogue of pests and diseases that put Oakville's native habitats at risk
- engage stakeholders in the identification of locations where these species impact native habitats
- continue Oakville's program to monitor and remove toxic plant species from areas that pose a threat to human or domestic animal health
- develop a system to dispose of plant material infected with pests or diseases or material of pest plants
- research and implement the most effective methods to control pests and diseases

Gypsy Moth and Egg Masses

STAKEHOLDER INVOLVEMENT

- Municipal, Regional, Provincial and Federal Governments
- Conservation Authorities
- ENGOs
- Residents and Resident Groups
- Commercial land owners, Industry and Institutions
- Horticulture/Landscape Industry
- Developers
- Construction Companies
- Ontario Invasive Plant Council (OIPC)

POTENTIAL LOCATIONS FOR IMPLEMENTATION

- Natural Features and Natural Areas
- Parks and Open Space
- Stormwater Management Ponds

MEASURES OF SUCCESS

- Reduction and management of existing pests and diseases
- Prevention of outbreaks of pests and disease
- Increased predictive ability of pest and disease outbreak through monitoring and research
- Early Detection and Rapid Response (EDRR) – reporting species occurrences with OIPC
- Increased awareness of residents and land owners

RESOURCES

- *Town of Oakville Trees and Woodlands Invasive Species Management*
- *Ontario - Dutch Elm Disease*
- *Agriculture Canada - Black Knot Fungus*

Photo Credits: Town of Oakville

Defoliation of Leaves by Cankerworm Insect Pest

OSB MANAGEMENT OPPORTUNITY FACT SHEET – CREATING AN URBAN TREE CANOPY

PROBLEM IDENTIFICATION

Urban landscapes with limited green space and many areas with impermeable surfaces and compacted soils provide challenges for growing trees. Further threats to an urban tree canopy include pests, disease, pollution and extreme temperature and moisture levels.

Maintaining a high tree canopy cover in urban landscapes provide numerous benefits to both maintain and enhance biodiversity and to create more liveable spaces for residents. An urban tree canopy is beneficial in reducing temperatures in summer months by providing shade. They are also a natural filter creating cleaner air and they help retain and recycle clean water. The urban tree canopy also creates environments that provide the shelter and food that support urban plant and animal populations.

MANAGEMENT OPTIONS

PREVENTION – Preventing further loss of existing trees is the best way to increase Oakville's canopy cover.

- educating the public about benefits of trees on their property in reducing energy costs and promoting biodiversity
- protecting street trees will allow canopy cover to increase
- protecting trees in natural areas, public parks and open space will continue to contribute to the urban canopy cover

ENHANCEMENT – Planting a diversity of native trees will increase Oakville's tree canopy and improve its resistance to pests and disease, and the resilience of the urban forest.

- providing education opportunities and incentives to landowners to naturalize their properties
- improving the growing condition of street trees will improve tree health and increase canopy cover
- using new designs for planting street trees that increase soil permeability and root growth for new construction or reconstruction of hardscape areas

CONTROL – Protecting existing trees from pests and disease are necessary to maintain the urban canopy

- continue to monitor for pests and diseases and implement forest management practices
- using a diversity of tree species for planting street trees will reduce their susceptibility to native and non-native pests and disease.

Tree planting and habitat enhancement

STAKEHOLDER INVOLVEMENT

- Municipal and Regional Governments
- Horticultural Industry
- Residents and Resident Groups
- Industrial and Commercial Landowners
- Institutions and Schools
- ENGOs
- Conservation Authorities
- Developers

POTENTIAL LOCATIONS FOR IMPLEMENTATION

- Residents
- Industrial/Commercial Lands
- Campuses/School yards

MEASURES OF SUCCESS

- Increased canopy cover
- Increased survival of tree plantings due to increased knowledge of proper planting and care
- Increased percentage of permeable surfaces
- Improved health and growth rate of street trees in hardscape areas where new designs (e.g., permeable surfaces, silva cells) are implemented
- Reduced tree mortality due to pests and disease, including invasive species

RESOURCES

- *Oakville - Urban Forest Strategic Management Plan*
- *North Oakville Urban Forest Strategic Management Plan*
- *City of Toronto - Toronto Street Trees*
- *Toronto- Green Street Technical Guide*

Natural area in Oakville at Lion's Valley Park

Photo credits: Town of Oakville

OSB MANAGEMENT OPPORTUNITY FACT SHEET – CREATING GREEN HABITAT IN CHALLENGING ENVIRONMENTS

PROBEM IDENTIFICATION

The Town of Oakville is a large urban community with many areas containing landscapes that are hard, non-permeable surfaces such as pavement, and concrete – sometimes referred to as “hardscapes”. Creating green habitat in these hard landscapes is challenging but not impossible. Hardscapes can offer limited space for root growth and may pose issues for drainage and design.

Street trees planted in sidewalks can frequently die off or become stunted due to lack of space for root growth and reduced water and nutrients in the soils. Sidewalk design can improve the health of street trees. Cobblestone allows for increased permeability but can be lifted up by the trees roots as it becomes larger. Continuous soil trenches between the road and the sidewalk can provide permeability and areas for root growth. Soil cell systems support the sidewalk or pavement without compacting the soil underneath, allowing for increased root growth and improving tree health.

Green wall in Europe

Rooftop gardens or green walls are examples of landscaping work in a hardscape environment that can serve to convert unused spaces into a garden that can function to produce edible foods, contain beautiful wildflowers that assist pollinator populations and/or be a relaxing place for people to visit.

Green habitats in hardscape environments also help to reduce water runoff issues, such as flooding and erosion, created by impermeable surfaces in urban landscapes. Green habitats provide shelter and food for wildlife and assist in enhancing linkages or corridors that support wildlife movements.

MANAGEMENT OPTIONS

CONTROL – Maintaining existing green habitat will benefit the town and its biodiversity.

- continue to maintain and protect municipally owned trees
- continue to utilize the tree-replacement formula of the Private Tree By-law and canopy cover targets for other permits
- develop an “adopt-a tree” program
- improve the growing conditions for street trees
- maintain existing public parks and open space as green habitats that can be used for recreation, will promote use by citizens, and can function as ecological linkages
- manage invasive species in existing green habitats and promote the planting of native species in gardens

ENHANCEMENT – Enhancing the town with green habitat will reduce the amount of water runoff, provide habitat for pollinators and other wildlife, and beautify the town.

- install pollinator gardens, food related plantings, community gardens and seed nurseries in urban areas
- use planning reviews and re-development as opportunities to increase tree canopy and create naturalized corridors
- install rooftop gardens and green walls into hardscapes
- use new designs for planting street trees that increase soil permeability and root growth that contributes to healthy trees
- use low impact development for a green streetscape
- use a diversity of tree species for planting street trees which will reduce their susceptibility to pests and disease
- develop a program to educate property owners, municipal staff and the public to promote biodiversity

STAKEHOLDER INVOLVEMENT

- • Municipal and Regional government
- • Industry and Business
- • Developers
- • ENGOs (e.g., Oakvillegreen)
- • Residents and community groups

POTENTIAL LOCATIONS FOR IMPLEMENTATION

- Downtown
- Residential areas

MEASURES OF SUCCESS

- Increased percentage of permeable surfaces.
- Increased greening of hardscape environment (planting gardens, LID, green roofs and walls, etc.)
- Increased education and awareness of property owners around how to improve and nurture biodiversity
- Connection between the OSB and the Convention on Biodiversity and Sustainable Development Goals
- Existing standards and designs are modified to integrate principles of biodiversity (e.g., multi-modal design criteria)
- Improved access to funding for green habitat projects.
- Improved water quality of stormwater management ponds
- Increased tree plantings and increased survival rate of plantings
- Number of greening projects per year
- Percentage of green roofs planted with native species

RESOURCES

- *City of Toronto - Toronto Street Trees*
- *Toronto- Green Street Technical Guide*
- *ASLA - Green Roofs and Walls*
- *About Green Walls*
- *About Green Roofs*
- *CH Landscaping and Tree Preservation Guidelines*
- *Halton Tree By-law*

Photo credits: Green Wall; Green Roof; DeepRoot - Silva Cells

Green roof on Chicago City Hall

OSB MANAGEMENT OPPORTUNITY FACT SHEET – ECOLOGICAL RESTORATION

PROBLEM IDENTIFICATION

Past land use practices have led to significant alteration of natural ecological features and functions that were once present in natural areas. In southern Ontario the majority of woodland and wetland areas have been removed and drainage functions altered to permit agricultural and urban land uses.

Ecological restoration has the capacity to restore natural habitats to support native plants and animals indigenous to Oakville. Areas altered by agricultural development may be replanted, and natural drainage patterns, including wetland habitats, can be restored. It is even possible to "daylight" streams that have been placed underground, and replace buildings and roads with native soils and vegetation, to initiate the restoration of natural habitats.

MANAGEMENT OPTIONS

ECOLOGICAL RESTORATION – There are many approaches to ecological restoration, the following framework provides a guide to restoring natural habitats and the native species they support.

- Step 1. Understand the native species and ecological conditions, particularly water and ecological processes such as fire or flooding, which were once present.
- Step 2: Develop Goals and Targets for site restoration
- Step 3: Develop an Implementation Plan outlining the work needed to restore conditions that will support native species
- Step 4: Identify Adaptive Management measures and Monitoring approaches that can be used to assess and refine the Implementation Plan in order to achieve the Goals and Targets for site restoration

STAKEHOLDER INVOLVEMENT

- Municipal and Regional Governments
- Conservation Authorities
- Residents and Resident Groups
- ENGOs
- Horticultural Industry
- Commercial and Industrial Landowners
- Institutions and Schools
- Developers

POTENTIAL LOCATIONS FOR IMPLEMENTATION

- Areas/sites that support rare ecological communities and/or species (e.g., ephemeral wetlands)
- North Oakville

White Oak Acorns

MEASURES OF SUCCESS

- Successful establishment of native vegetation
- Increased biodiversity in areas that have experienced ecological restoration
- Increased public awareness and participation in ecological restoration

RESOURCES

- *Conservation Halton - Ecological Restoration*
- *Society for Ecological Restoration Ontario*
- *Conservation Halton - Glenorchy Restoration*

Glenorchy Conservation Area, Oakville

Photo credits: Society for Ecological Restoration

OSB MANAGEMENT OPPORTUNITY FACT SHEET – ENCROACHMENT

PROBLEM IDENTIFICATION

Encroachments can damage the natural environment and cause irreparable damage to natural areas and sensitive ecosystems. Common types of encroachments include: composters, fences and sheds, lighting, playground equipment, dumping, irrigation systems, flower/vegetation gardens, and unauthorized mowing, cutting and pruning of wildflowers, trees and shrubs.

The impact of encroachment is the direct loss of natural habitat that may support native species of plants and animals. Horticultural plantings and the dumping of organic waste may lead to the introduction of non-native, invasive plants which may spread beyond the area of encroachment. If swimming pools are emptied into natural areas or toxic wastes are dumped, there will be negative impacts to the soil and water that support native species and healthy ecosystems.

MANAGEMENT OPTIONS

PREVENTION – Prevention is the best option to manage encroachment into Oakville's native habitats.

- education to landowners living adjacent to natural areas about the different kinds of encroachment and the negative impacts these may have on native plants and animals.
- update and modernize outreach materials and add to waste calendars or annual newsletters
- collaborate with landscaping businesses
- clear demarcation and signage along the boundary of natural areas to ensure clarity on what areas are protected for native plants and animals

CONTROL – Regular monitoring along the boundary of protected natural areas will identify areas where encroachment has occurred.

- develop a strategy that implements and maintains records of regular monitoring of natural area boundaries.
- enforce by-laws that prohibit encroachment into Oakville's natural and protected areas.
- enhance/support municipal staff involved in control/inspection and enforcing by-laws

Example of residential encroachment into a natural area

STAKEHOLDER INVOLVEMENT

- Municipal and Regional Governments
- ENGOs and Conservation Authorities
- Residential, Institutional, Commercial and Industrial Land Owners
- Gardening and Landscaping Companies

POTENTIAL LOCATIONS FOR IMPLEMENTATION

- Residential areas/developments adjacent to natural areas

MEASURES OF SUCCESS

- Workshop participants identify potential measures of success

RESOURCES

- *Oakvillegreen- Invasive species: Minimize your impact*
- *Oakville - Garbage and recycling*
- *Upper Thames River Conservation Authority - Living with natural areas: A guide for homeowners*
- *Halton Recycles - Yard Waste Composting*

OSB MANAGEMENT OPPORTUNITY FACT SHEET – STORMWATER MANAGEMENT

PROBLEM IDENTIFICATION

Opportunities exist to enhance and manage some of Oakville's existing infrastructure to promote biodiversity. Stormwater management ponds are manmade structures that a designed to control flooding and erosion and prevent pollution and sedimentation from entering natural watercourses. While not intended to provide habitat for wildlife, stormwater management ponds may inadvertently provide home for aquatic and terrestrial wildlife, especially when ponds are located adjacent to natural areas.

Stormwater management ponds are necessary to mitigate water runoff (from rain and snowmelt) in urban areas where pavement and buildings dramatically reduce the amount of water being stored. This has been known to have consequential effects on natural wetlands, and on the amount of water being absorbed into the ground, or transferred back to the atmosphere through evapotranspiration by plants. Stormwater management ponds are designed to temporarily hold excess runoff water, allowing for pollutants and sediments to be filtered, while slowly releasing the water back to natural waterways.

Stormwater management pond with little natural vegetation

Every 5-10 years the accumulated sediments must be removed from stormwater management ponds and hard infrastructure in place to control the pond's vital function must be maintained, posing challenges to fully naturalize this type of infrastructure. Nonetheless, enhancing natural vegetation around stormwater management ponds and adopting practices to mitigate impacts during maintenance activities is beneficial for wildlife habitat supporting biodiversity.

Stormwater management ponds also help to improve water quality for aquatic and terrestrial habitat within the receiving creek systems; however, reducing the amount of chemicals being used in Oakville that end up in water runoff in the first place (fertilizers, road salts etc.) is important to provide the best possible water quality in the natural environment.

MANAGEMENT OPTIONS

CONTROL – Regular maintenance of existing stormwater management ponds is necessary to sustain their functions of reducing flooding, erosion and the pollution and sedimentation of natural watercourses.

- Continue to maintain the function of the existing stormwater management ponds in a manner which can promote or provide less impact to natural vegetation and increase biodiversity
- educate the public about benefits of stormwater management ponds for water runoff and biodiversity
- research alternatives to salt use on roads

ENHANCEMENT – Enhancing the natural habitat around stormwater management ponds will improve its function as wildlife habitat.

- Continue to promote natural vegetation cover in a way that does not interfere with regular pond maintenance (e.g., no-touch area of the pond that will not be disturbed by regular maintenance)
- continue to look for opportunities to enhance the water quality treatment potential that ponds offer in order to increase biodiversity in the receiving creek system
- use education to reduce the amount of garbage and pollution entering stormwater management ponds
- where possible utilize low impact development or other means of providing a "treatment train approach" to stormwater to help reduce demand on stormwater ponds
- When retrofitting ponds, incorporate biodiversity areas to the extent possible

STAKEHOLDER INVOLVEMENT

- Municipal and Provincial government
- Industry & Business
- Residents

POTENTIAL LOCATIONS FOR IMPLEMENTATION

- Large stormwater management ponds and adjacent areas may provide opportunities for pollinator gardens/plantings
- Trails and stormwater management pond edges provide opportunities for enhancements
- Retrofit dry ponds to include wetlands

MEASURES OF SUCCESS

- Increased habitat.
- Reduced management requirements due to reduction in sediment influx.
- Higher biodiversity around stormwater management ponds.
- Reduction in invasive species populations around stormwater management ponds.
- Increased public knowledge and understanding of the importance and workings of stormwater management ponds.
- Water quality targets achieved in receiving aquatic systems.
- Number of new and/or innovative stormwater management approachs retrofitted or implemented in new developments.

RESOURCES

- *Oakville - Stormwater Management Ponds*
- *Ontario - Understanding Stormwater Management*
- *Ontario - Stormwater Management Planning and Design Manual*
- *Environmental Protection Agency - Stormwater Management Practices*

Naturalized stormwater management pond

Photo credits: The Nature of Cities

OSB MANAGEMENT OPPORTUNITY FACT SHEET – ENHANCING THE LAKE ONTARIO SHORELINE

PROBLEM IDENTIFICATION

Much of the Lake Ontario shoreline in Oakville is developed with natural vegetation removed, and shoreline hardening (concrete, stones) installed to control erosion. Opportunities do exist however, to enhance existing shorelines and adjacent areas to create a more natural environment.

Shoreline enhancement, where feasible can include converting engineered structures and armoured shorelines back to a more natural state and creating habitat features for aquatic species. Shoreline enhancement will have positive effect on wildlife by providing more natural waterfront habitats for plants, insects, birds and fish that utilize shoreline habitats.

Managing and preventing spread of invasive plant species along the shoreline is also an important consideration. This however must be done carefully. To avoid exposing soils and increasing erosion, bare soils must be naturalized quickly.

MANAGEMENT OPTIONS

PREVENTION – Prevention will assist in managing negative impacts of water runoff and erosion along Lake Ontario's shoreline and reduce the potential loss of vulnerable ecosystems and wildlife habitat due to flooding and erosion.

- maintain, where feasible the current natural areas along the Lake Ontario shoreline to prevent further loss of habitat
- ensure all waterfront developments are environmentally sound and conform to legislative requirements
- Consider outreach programs for educating and engaging the public in shoreline enhancement opportunities
- promote responsible recreation in shoreline areas and increase public education of the importance and benefits of shoreline naturalization
- educate land owners in the shoreline areas of the benefit to enhancing their properties

ENHANCEMENT – Enhancing the shoreline area will improve habitat for rare plants and various wildlife species, including migratory birds.

- develop a system for evaluating and prioritizing areas of shoreline for enhancement
- develop a program to restore natural terrestrial and aquatic shoreline habitats such as wetlands, floodplains and beaches that are adapted to potential flooding conditions
- develop a program for increasing canopy cover

Lake Ontario Shoreline beach in Oakville

- develop a program for improving habitat for migratory species including birds and insects
- develop a program to identify ways to link the shoreline to interior habitats through green corridors
- encourage donations of shoreline parcels for naturalization

CONTROL– Emergency planning for flooding and erosion will prevent damage to vulnerable ecosystems, rare plants and wildlife habitat.

- develop a system for invasive plant monitoring and removal
- create landscape design guidelines for shorelines

STAKEHOLDER INVOLVEMENT

- ENGOs and Non-Profit Organisations
- Municipal, Regional, Provincial, and Federal Governments:
- Special Interest Groups (e.g., Anglers, Boaters)
- Industry
- Institutions

POTENTIAL LOCATIONS FOR IMPLEMENTATION

- All shoreline areas

MEASURES OF SUCCESS

- Changes in species diversity and abundance
  - Higher species diversity and wildlife abundance
  - Reduction of invasive species
  - Fewer substitutions of non-native species
  - Increased number and diversity of native plant communities
  - Creel surveys (angler surveys)
- • Habitat improvements
  - More habitat creation
  - Reduced distance between natural spaces/ increased connectivity
  - More trails with adjacent naturalized areas.
  - Reduced loadings
  - Less chloride in water quality samples
  - Less damage in wetland communities
  - Successful naturalization of engineered erosion controls
  - Reduction in light and noise pollution along the shoreline
- • Change in attitudes towards conservation
  - Higher levels of participation in conservation (e.g., workshops, Conservation Halton Stewardship Program, etc.)
  - Promotion of cross-benefits of biodiversity
  - More shoreline property in public ownership
- • Watershed approach is implemented
- • Improved recreational opportunities
  - Increase in angling hours
  - Improved information availability of recreational opportunities (e.g., websites that prove accessible angling opportunities)

RESOURCES

- *Conservation Halton Lake Ontario Shoreline*
- *Lake Ontario Shoreline Stewardship Guide*
- *Watersheds Canada- Love Your Lake*

Photo credits: Town of Oakville

Stone piled along shoreline to prevent erosion presents an opportunity for naturalization

OSB MANAGEMENT OPPORTUNITY FACT SHEET – PROVIDING FUNCTIONAL ECOLOGICAL LINKAGE BETWEEN NATURAL HABITATS

PROBLEM IDENTIFICATION

The Town of Oakville is largely developed, however opportunities exist to enhance the ecological linkage between Oakville's remaining natural areas. Functional linkages will reduce the potential for negative wildlife interactions (e.g., road mortality) and improve their survival within urban natural areas.

Functional linkages promote biodiversity by allowing wildlife safe passage from one natural area to another, expanding their access to food, new territories, and ensuring genetic mixing of populations. Increasing connectivity can collectively increase smaller natural areas, capacity to support wildlife populations, and biodiversity.

Snapping turtle crossing a roadway

Shorelines and riparian areas following streams are natural ecological corridors that can become degraded with the effects of development, flooding, erosion and invasive species. Development can remove the natural features that support wildlife movement, including vegetation that provides shade required to maintain natural stream temperatures and nutrient inputs, and overhead cover that creates an effect of protection for species that are on the move.

Barriers such as roads lead to mortality as wildlife attempt to move across the landscape. Creating wildlife bridges over roads and ecopassages under roads can successfully maintain natural ecological connectivity and reduce the impacts of urban barriers.

MANAGEMENT OPTIONS

PREVENTION – Preventing further loss of existing natural areas and their linkages is necessary to promote functional linkages.

- develop a system for maintaining the function of the existing linkage by identifying where linkages exist and monitoring for any threats affecting their function
- educate the public about benefits of ecological linkages in order to encourage them to maintain or create natural habitats on their property. This will result in increased natural areas, canopy cover and the potential for ecological linkages within the city
- engaging the public in enhancement opportunities promotes community involvement and appreciation of biodiversity

ENHANCEMENT – Enhancing ecological linkage will improve its functions and support wildlife movement.

- increase canopy cover throughout Oakville to increase linkages for birds and other wildlife species

- develop a system to identify proposed linkage areas where efforts may be focused
- use opportunities in existing corridors, such as transmission lines to provide functional ecological linkages
- enhance shoreline and riparian ecosystems that will benefit both terrestrial and aquatic wildlife
- develop a program for identifying and prioritizing areas for installing wildlife tunnels and bridges

CONTROL– Managing the negative effects of development, erosion, flooding and invasive species.

- develop a system for evaluating riparian condition and implementing restoration where needed
- develop a system for monitoring and managing invasive species that threaten ecological linkages

STAKEHOLDER INVOLVEMENT

- Municipal, Regional and Provincial Governments
- Developers
- Land Owners (Residential, Commercial, Industrial, Institutional)
- ENGOs and Resident Groups

POTENTIAL LOCATIONS FOR IMPLEMENTATION

- Watercourse corridors
- Private and public lands
- Lakefront
- Provincial lands
- Road and natural corridor Anywhere intersections
- Everywhere adjacent to Natural Heritage Systems

MEASURES OF SUCCESS

- Higher biodiversity in connected ‘patches’
- Increased percentage of natural areas
- Reduced road mortality
- Successful establishment of native vegetation in linkage areas
- Increased awareness and understanding of biodiversity threats and needs by land owners with support for the towns efforts

RESOURCES

- *Linkages in the Landscape: The role of corridors and connectivity in wildlife conservation*
- *Biodiversity concepts and urban ecosystems*

Photo credits: Townvibe; Birdlife International

Wildlife bridges reduce negative effects of barriers such as roads

OSB MANAGEMENT OPPORTUNITY FACT SHEET – INSTITUTIONAL AND CORPORATE OPEN SPACE MANAGEMENT PROGRAM

PROBLEM IDENTIFICATION

Industrial and corporate open spaces represent a large portion of urban areas that may contain mowed lawn or unmanaged natural areas that provides opportunities for enhancement.

Planting native species in corporate and institutional open space can be simple, low maintenance and when done properly, can effectively create natural habitat with positive benefits for wildlife populations and biodiversity. Planting trees provides shade and reduces the energy use of buildings while also providing food and shelter for wildlife. Gardens with native wildflowers can support declining pollinator populations as well as provide habitat for other wildlife.

Co-operation between multiple organizations and the municipality will increase the effectiveness of education programs and incentives for native planting. Having institutions and corporations leading by example and converting their open space into naturalized areas will encourage citizens to convert their private lands as well.

Hardscape environment at Sheridan College, Oakville

Managing invasive species on institutional and corporate lands is also important to reduce their populations and spread. Institutions and corporations need to know the importance of managing invasive species and be provided information on how to recognize and manage the species that have become a threat in Oakville. A co-operative program to manage institutional and corporate lands will provide the institution/corporation with the support and knowledge they need, and can provide the city a necessary service and data on the spread of invasive species.

MANAGEMENT OPTIONS

PREVENTION - Prevent the loss of natural habitats on institutional and corporate lands.

- encourage institutions and corporations to maintain the natural land remaining on their properties

CONTROL - Identify the areas where non-native plants and animals are invading institutional or corporate lands and prioritize control methods to eliminate non-native species.

- develop a catalogue of non-native species that put Oakville's natural areas at risk and provide institutions and corporations the knowledge necessary for efficient monitoring and removal of these species
- develop a system for data exchange so that information on presence and successful removal methods for invasive species can be shared across organizations

ENHANCEMENT – Native planting can convert the large institutional and corporate open spaces in Oakville into natural habitats that promote linkage with natural areas.

- develop an information package on the environmental and financial benefits of naturalizing open spaces and how to do so. Highlight the 'stepping stone' opportunities that corporate and institutional spaces provide

- institutions and corporations have the opportunity to lead as an example for citizens and assist in encouraging others to create naturalized habitat on their properties
- encourage tree planting plans on institutional and corporate lands
- support stakeholder 'matchmaking' – connect property owners with subject experts and volunteers
- consider incentives (e.g., storm water tax) to 'engage' private sectors in naturalization project initiatives

STAKEHOLDER INVOLVEMENT

- Conservation Authorities
- Institutions and Campuses
- Municipal and Regional government
- Industry and Business
- Developers
- ENGOs (e.g., Oakvillegreen)
- Residents and community groups
- Horticultural/Landscape Companies
- Property management companies
- Condominium boards

POTENTIAL LOCATIONS FOR IMPLEMENTATION

- Corporate offices
- Campuses
- Residential and Commercial areas

MEASURES OF SUCCESS

- Increased percentage of permeable surfaces
- Increased greening (more naturalizations, pollinator gardens, low impact development, green roofs, etc.)
- Increased education and awareness of property owners
- Improved access to funding for biodiversity projects
- Increased number of tree plantings, survival of tree plantings and increase in overall canopy cover in industrial/ commercial areas
- Transition industrial registration and permitting to a regional model with industrial waste groups
- Reduction and control of invasive species on institutional and corporate lands

RESOURCES

- *CVC - Guide to Native Plant Nurseries and Seed Suppliers*
- *Canadian Wildlife Federation - Wildlife Friendly Gardening*
- *Nature Conservancy Canada- Native Gardening 101*
- *National Wildlife Federation - Garden for Wildlife*
- *Ontario - Pollinator Health*
- *Oakvillegreen*
- *Oakvillegreen - Supporting Pollinators in Oakville*

Photo credits: Inside Halton- Sheridan College; Land8 – Evergreen Brickworks

Evergreen Brickworks, Toronto, an example of naturalization within an institutional setting

OSB MANAGEMENT OPPORTUNITY FACT SHEET – NON-NATIVE AND INVASIVE SPECIES

PROBLEM IDENTIFICATION

Non-native and invasive plants and animals significantly reduce the survival of Oakville's native plants and animals. Non-native species have been either intentionally or accidentally introduced by humans or their activities. Invasive species are plants and animals that did not historically occur in an area, but when introduced to an area they develop abundant, widespread populations that negatively impact the environment. An important distinction between non-native and invasive species is that non-native species generally do not disrupt the natural functions and processes of our native ecosystems. Negative impacts of invasive species include ***competition for resources*** – for light, water, nutrients, food, etc. and ***direct attack on native species*** – by parasitizing, eating, smothering, allelopathy (chemical attack), etc.

European Buckthorn

The introduction of invasive plants and animals into native habitats can occur in a variety of ways – from seeds or cuttings of non-native plants growing in gardens, plants and animals unintentionally carried from place to place in cars, trucks, boats and planes, and exotic pets that escape from captivity.

Invasive plants and animals that become established in native habitats can be extremely difficult to eradicate.

MANAGEMENT OPTIONS

PREVENTION - Prevent the introduction of non-native plants and animals to Oakville's native habitats.

- use education and communication tools regarding the sources and risks of non-native species introductions
- restrict the use of non-native Invasive plants in horticulture
- regulate the transport and sale of non-native species

CONTROL - Identify the areas where non-native plants and animals are invading native habitats and prioritize control methods to eliminate non-native species.

- develop a catalogue of non-native species that put Oakville's native habitats at risk
- engage stakeholders in identifying the locations where non-native species invade native habitats
- research and implement the most effective methods to control non-native species

POTENTIAL LOCATIONS FOR IMPLEMENTATION

- Residential and Commercial areas
- Natural Areas including trails and parks

STAKEHOLDER INVOLVEMENT

- Municipal, Regional, Provincial and Federal Governments
- Conservation Authorities
- ENGOs (e.g., Oakvillegreen)
- Residents and resident groups
- Commercial land owners, Industry and Institutions
- Ontario Invasive Plant Council (OPIC)
- Horticultural companies
- Agricultural community

MEASURES OF SUCCESS

- Reduction and control of existing invasive species populations
- Prevention of outbreaks of new invasive species or new populations through development of programs for monitoring and rapid response
- Increased awareness of residents and landowners
- Increased knowledge of locations of invasive species through co-operation and data-sharing with other stakeholders
- Increased cooperation amongst stakeholders (Conservation Halton, Municipality, Region, ENGOs, Volunteer groups)

RESOURCES

- *Town of Oakville – Trees and Woodlands - Invasive Species*
- *Ontario- Invasive Species*
- *Invasive Species Awareness Program*
- *CFIA - Invasive Species*
- *CFIA - Plant Pests and Invasive Species*

Photo credits: Southeastern Wisconsin Invasive Species Consortium; Ecological Landscape Alliance

Community group using a weed wrench to remove European Buckthorn

OSB MANAGEMENT OPPORTUNITY FACT SHEET – KEEPING TOXINS OUT OF THE NATURAL ENVIRONMENT

PROBLEM IDENTIFICATION

Chemicals used in our homes, for lawn or garden care; chemical waste that has been improperly disposed of; and chemical spills from commercial or industrial activities can enter and contaminate our waterways and natural areas. Salt and other de-icing chemicals on roads can run-off into adjacent areas altering water quality in streams and lakes, and as a consequence, contaminate wildlife habitat and even our own supply for drinking water.

Chemicals have the ability to poison wildlife directly or through additive effects (bioaccumulation) in food chains as predators consume individuals contaminated with chemicals. Salt and de-icing chemicals can kill or harm wildlife and pets through ingestion. Impacts may result in mortality or poisoning, with symptoms such as dehydration, confusion and/or weakness.

Chemicals released in urban landscapes with non-permeable surfaces may send chemicals directly to aquatic systems or to stormwater management ponds. In stormwater ponds there is an opportunity to trap some toxins before they enter natural aquatic systems. The priority should always be to avoid the use of chemicals and prevent toxins from entering natural systems.

Chemical spill

MANAGEMENT OPTIONS

PREVENTION – Reducing chemical use and encouraging proper disposal is the best way to reduce chemical influx to natural areas

- develop a program for notifying the public about proper disposal of chemicals, batteries, etc. and encourage environmentally friendly alternatives to toxic herbicides and pesticides
- encourage naturalization and the reduction of manicured lawn areas to reduce the need for chemicals and fertilizers
- explore environmentally safe alternatives to commonly used salt and other de-icing chemicals

ENHANCEMENT – Enhancement of the stormwater system and adoptions of Low Impact Development (LID) techniques will improve filtration and reduce chemical influx into natural areas.

- continue to develop a system to identify opportunities for retrofitting LID and enhancing stormwater management ponds for better water quality
- consider developing a program for planting salt tolerant species in green strips along roadsides for improved salt filtration

CONTROL – Rapid response for chemical spills can dramatically reduce amounts released into the natural environment.

- develop a system for rapid response to chemical spills
- develop a system for monitoring water quality of natural water bodies and stormwater management ponds

STAKEHOLDER INVOLVEMENT

- Developers and builders
- Horticulture and landscaping industry
- Municipal, regional, provincial and federal government
- Landowners (residential, commercial, industrial and institutional)
- Agricultural community
- Various Industries (e.g., Oil and Gas, Industrial, Pharmaceutical, Cosmetic)

POTENTIAL LOCATIONS FOR IMPLEMENTATION

- Residential and Commercial areas
- Industrial areas
- Watercourses/water features
- Pipeline right-of-way's

MEASURES OF SUCCESS

- Improved water quality of natural water bodies (e.g., lower salt and chemical influx)
- Reduction in salt and de-icing chemical use on roads
- Increased greening of city streets with naturalized low impact development and salt tolerant filter strips along roadsides
- Increased public understanding and support for low impact development and stormwater management pond enhancement projects
- Increased awareness pf Best Management Practices (BMPs) leading to more naturalized areas on private and commercial lands, proper disposal of chemicals, decreased chemical use and increased use of environmentally friendly alternatives

RESOURCES

- *Ontario - Stormwater Management Planning and Design Manual*
- *CVC - LID Planning, Design and Construction*
- *CVC- Low Impact Development Stormwater Management Planning and Design*
- *City of Hamilton - Low Impact Development (LID) - Stormwater Management*
- *Halton Region - Spill Response Team*
- *New Hampshire Department of Environmental Services - Impacts of Road Salt*

Rock salt damages trees and plants

Photo credits: MSDS Online - Chemical Spill Response and Reporting; GreenIceMelting- Rock Salt Damages Trees and Plants

OSB MANAGEMENT OPPORTUNITY FACT SHEET – RETROFITTING LOW IMPACT DEVELOPMENT (LID) IN NEIGHBOURHOODS

PROBLEM IDENTIFICATION

The Town of Oakville is largely developed and includes many hard landscapes without impermeable surfaces that lead to large volumes of water runoff entering stormwater management systems. Low Impact Development (LID) includes design and construction of stormwater management systems that support traditional systems (such as stormwater management ponds and sewers) while increasing the infiltration of rainwater back into the groundwater, improving water quality entering watercourses, and reducing pressure on stormwater management systems by reducing overland flow volume.

LID includes green infrastructure such as infiltration basins, bioswales, green roofs, permeable pavements and sidewalks, engineered wetlands and rain gardens. The benefits of these include flood reduction, improved water quality, stormwater volume control, cost savings, beautifying the urban landscape, temperature mitigation, benefits to wildlife and biodiversity and climate change adaption. There are many opportunities to retrofit older neighbourhoods in Oakville with LID measures.

Rain garden to reduce stormwater flow

MANAGEMENT OPTIONS

ENHANCEMENT – Retrofitting LID in older neighbourhoods and incorporating LID into new residential areas will provide multiple benefits to Oakville's wildlife, stormwater management systems, and will help to beautify the urban landscape.

- Continue to identify opportunities for retrofitting LID in older neighbourhoods and incorporating LID into new builds such as green roofs, bioswales, permeable surfaces and rain gardens
- continue to highlight the use of LIDs and their benefits to the public

CONTROL – Once established LID should require little maintenance, however they should be monitored and managed until vegetation becomes well established.

- manage planted vegetation until it has become successfully established, including removal of non-native species from planted areas

STAKEHOLDER INVOLVEMENT

- Developers and builders
- Engineering consultants
- Landowners
- Municipal and provincial government and planning departments
- Federal government (LID outreach and education resources)
- Residents
- Commercial and industrial land owners

Low Impact Development creating green streets

POTENTIAL LOCATIONS FOR IMPLEMENTATION

- Old neighbourhoods
- New residential developments

MEASURES OF SUCCESS

- Improved water quality in natural watercourses (e.g. lower salt and chemical influx)
- Reduced maintenance requirements of stormwater management ponds
- Increased greening of city streets with naturalized low impact development
- Increased ecological connectivity through enhancing residential ecosystems
- Increased public understanding and support for low impact development projects
- Increased percentage of planting survival through the successful management of plantings
- Incentive programs (e.g., tax exemptions)
- Asset registries

RESOURCES

- *Ontario - Stormwater Management Planning and Design Manual*
- *CVC - LID Planning, Design and Construction*
- *CVC- Low Impact Development Stormwater Management Planning and Design*
- *City of Hamilton - Low Impact Development (LID) - Stormwater Management*

Photo credits: *On Street Rain Gardens;* Portland Green Street Program

OSB MANAGEMENT OPPORTUNITY FACT SHEET – MANAGING NEGATIVE IMPACTS OF RECREATIONAL USERS

PROBLEM IDENTIFICATION

Oakville's large urban population enjoys many recreation opportunities provided by the town's natural areas. This includes walking, running, bicycling, nature watching, picnicking, etc. Recreational use however, can result in negative impacts to natural areas through improper garbage disposal, noise and activity which may disturb wildlife, trampling of natural vegetation, the creation ad-hoc trails, off-trail bicycle riding, and the dispersal of invasive species into natural areas.

When recreation users stray off trails or create new ad-hoc trails, vegetation and soils are impacted. Compaction of soils reduces plants ability for root growth, nutrient uptake and water uptake. Soil compaction along with trampling of above ground vegetation has negative impact on the health and regeneration of native vegetation.

Trails without defined edges can lead to widening, ad-hoc trail creation and trampling of vegetation

Compacted soil has less capacity to absorb and hold water, resulting in increased amounts of stormwater runoff and reducing the ability of the natural area to contribute to the reduction of water pollution or flood conditions.

Increased foot traffic can increase the chance and spread of invasive species, displacing native species in natural areas. Increased food garbage, if not disposed of correctly, may attract predators such as raccoons and skunks, creating undesirable wildlife interactions.

MANAGEMENT OPTIONS

PREVENTION – Prevention is the best option to manage negative impacts of recreational impacts in native habitats.

- education of landowners living adjacent to natural areas about the different kinds of negative impacts and their effects on native plants and animals
- well maintained and well signed trails promote users to stay on the trail reducing trampling and soil compaction
- waste management systems should support the number of users and should not be accessible to wildlife
- Exclusion fencing to protect sensitive areas and features

CONTROL – Regular monitoring along the trails within natural areas will identify areas where negative impacts have occurred.

- develop a strategy that implements and maintains records of regular monitoring of trail edges for signs of trampling, compaction, ad-hoc trail development and invasive species occurrences
- develop a system of communication with volunteers in the community that can assist in identifying issues quickly to allow for a rapid response

- enforce fines for littering and developing ad-hoc in natural areas
- enforce leash laws on trails in natural areas and create designated off-leash areas
- Develop specific recreational user trails in less sensitive areas (e.g., bmx/mountain biking trails)
- Develop policies for recreational trail development (i.e., where/where not to allow certain types of recreational trail development)

STAKEHOLDER INVOLVEMENT

- Conservation Authorities
- ENGOs
- Ontario Invasive Plant Council
- Residents and community groups:
- Municipal, Regional and Provincial governments
- Schools
- Businesses

POTENTIAL LOCATIONS FOR IMPLEMENTATION

- Natural areas with recreational trail systems
- Off-leash areas
- Schools

MEASURES OF SUCCESS

- Reduction and eradication of invasive species
- Increase resilient habitats and native biodiversity
- Increased number of users but reduced needs for repair and management
- Improved natural trail standards to support biodiversity
- Reduced number of off-trail impacts
- Reduced waste in natural areas
- Increased number (km) trails rehabilitated or under treatment
- Use apps (e.g., Strava) to track use of ad-hoc trails

RESOURCES

- *USDA - Soil Quality, Urban Soil Compaction*
- *Effect of urban soil compaction on infiltration rate*
- *The nature of urban soils and their role in ecological restoration*
- *Soil compaction and growth of woody plants*
- *Soil structure and plant growth*

Photo credits: Town of Oakville

Trail with defined edges

OSB MANAGEMENT OPPORTUNITY FACT SHEET – MANAGING NEGATIVE WILDLIFE ENCOUNTERS

PROBLEM IDENTIFICATION

Many people may be familiar with negative wildlife encounters such as roadkill or wildlife getting into garbage. "Subsidized species" are species, such as racoons, skunks, and deer which have high population numbers due to humans providing reduced predation and greater access to food. Subsidized species can have a negative influence on natural areas through their higher numbers leading to increased predation of native wildlife or unnatural levels of browsing on plants. By refraining from feeding wildlife and restricting access to garbage and compost we can help control populations of subsidized predators.

Roads are unnatural barriers to wildlife and can lead to mortality of wildlife, reduced ecological connectivity, damage to vehicles or injury/loss of human life. In order to reduce these negative wildlife encounters we need to provide safe passage for wildlife across urban barriers. Wildlife bridges above roads and Eco passages underneath them can provide passage for wildlife if installed with fencing that directs wildlife to utilize them.

Wildlife eating garbage is unnatural and may result in habituated (accustomed) behaviours

MANAGEMENT OPTIONS

PREVENTION – Proper waste disposal that restricts access by wildlife is the best way to reduce negative interactions with humans and to reduce negative impacts from subsidized species.

- develop a program for notifying the public about proper disposal of garbage that restricts access by wildlife and ways to wildlife proof your house and household attractants
- develop an education program/ signage to educate the public about issues arising from feeding wildlife

ENHANCEMENT – Enhancing connectivity by providing and directing wildlife to safe passages across urban barriers can reduce road mortality of wildlife, property damage, and human injury/loss of life due to collisions with wildlife.

- use road mortality data to identify needs and opportunities for installing wildlife signs, crossings and Eco passages
- develop a program for installing signage, wildlife crossings and Eco passages in priority areas

CONTROL – A system to capture and release wildlife that pose frequent problems in urban areas can reduce negative encounters with wildlife.

- develop a co-operative system for the safe capture, removal and release of wildlife causing problems in urban areas
- develop a system for data sharing so that areas with frequent negative wildlife encounters can be identified

STAKEHOLDER INVOLVEMENT

- Municipal, regional and provincial governments
- Residents and resident groups
- ENGOs
- Wildlife rehabilitators
- Pest removal companies

POTENTIAL LOCATIONS FOR IMPLEMENTATION

- Residential and Commercial areas
- Roads
- Parks

MEASURES OF SUCCESS

- Increased connectivity of natural habitat leading to reduced road mortality of wildlife
- Reduced road collisions with wildlife causing property damage and human injury
- Wildlife use of passages and bridges can be measured with wildlife cameras
- Less complaints of pest species accessing garbage or entering houses

RESOURCES

- Town of Oakville - Wildlife Strategy
- Ontario - Preventing and managing conflicts with small animals
- Toronto Wildlife Centre- Conflicts with Wildlife
- Town of Oakville - Wildlife Proofing Your Property

Photo credits: *SOS Wildlife Control - Racoon; North-South Environmental*

Ecopassages create safe a passage for animals crossing under roads

OSB MANAGEMENT OPPORTUNITY FACT SHEET – IMPLEMENTING LONG-TERM GRASSLAND, MEADOW AND SAVANNA MANAGEMENT

PROBLEM IDENTIFICATION

Open habitats support a wide range of plants and animals that make an important contribution to the biodiversity of southern Ontario. However, as southern Ontario continues to be developed, large natural open habitat areas of grassland, prairie and savanna are increasingly becoming degraded or lost all together.

Protecting natural meadows, grasslands and savannas requires management through mowing or the use of prescribed burning. Regular disturbance maintains open habitats and creates the conditions which support unique wildlife populations. Burning and cutting can also assist in the removal of invasive non-native species. Open habitats require the implementation of management plans that consider target habitat, non-native species removal, and prescribed burning schedules (if applicable), when and how often to burn.

Meadow habitat in Oakville

Open habitats can also be enhanced by planting native species that may have been lost and restoring degraded habitats to support the diversity of wildlife species to the urban landscape.

MANAGEMENT OPTIONS

CONTROL – Maintaining existing grasslands, meadows and savanna habitat in Oakville will help preserve biodiversity.

- develop a system for surveying existing biodiversity in Oakville's savanna and meadow habitat in order to be able to evaluate the health of these ecosystems
- develop a system for managing savanna and meadow habitat in Oakville including the removal of non-native species and use of mowing and/or prescribed burning
- Adopt mowing regimes – include 'no mow areas' to the extent possible

ENHANCEMENT – Enhancing natural grasslands, meadow and savanna habitats through active management and restoration projects can increase biodiversity.

- Restore landscapes to pre-disturbed ecosystems that includes grasslands, meadows and savanna habitats
- natural habitats adapted to frequent disturbance require management to maintain optimal biodiversity
- develop and implement management plans to restore and enhance meadow and savannah habitats

- develop a program to restore degraded open habitats by planting native species

STAKEHOLDER INVOLVEMENT

- Municipal, Regional and Provincial Governments
- Fire Departments
- ENGOs
- Conservation Authorities
- Utility Companies
- Royal Botanical Gardens
- CN Rail

POTENTIAL LOCATIONS FOR IMPLEMENTATION

- Hydro/transmission corridors
- Boulevards
- Passive park systems

MEASURES OF SUCCESS

- Increased biodiversity of open habitats such as meadow and savanna
- Successful establishment of native plantings in restored or degraded areas

RESOURCES

- *Tallgrass Ontario - Tallgrass Prairie and Savanna Management in Ontario*
- *Tallgrass Ontario - Tallgrass Prairie and Savanna Prescribed Fire Decision Support System*
- *Complete Ecology Ltd - Meadow Management*
- *Prairie Nursery - Management of Prairie Meadows*
- *Savanna Burning for Faunal Diversity*
- *Evergreen - Natural Habitat Communities*
- *Carolinian Canada - The Truth About Tallgrass*
- *Oak Savannas*
- *Pinery Park - Oak Savanna*
- *Considerations for Prescribed Burning*

Photo credits: Town of Oakville; Province of Ontario

Wildlife of open habitats include Bobolink, one of Ontario's Species at Risk

OSB MANAGEMENT OPPORTUNITY FACT SHEET – CREATING AND MAINTAINING BUTTERFLY/POLLINATOR/INSECT GARDENS

PROBLEM IDENTIFICATION

Pollinators play an important role in natural ecosystems and are vital to producing many of Ontario's crops. Many plants require the assistance of pollinators to reproduce. Plants provide food and shelter for wildlife and the agricultural industry provides food and income for people.

Due to a combination of pesticide use and habitat loss, native pollinator populations are declining. Urban areas however provide many opportunities to create foraging habitat for pollinators that also assists in beatifying the urban landscape. Pollinator gardens (also called butterfly gardens or insect gardens) are comprised of native flowering plants and can be created in unused space on rooftops, lawns and balconies.

Hummingbird in Pollinator Garden

Reducing the amount of chemicals used will assist pollinator populations in remaining healthy. Maintaining large expanses of lawn or exotic gardens impact the environment in terms of chemical use, gas required to power machinery for maintenance, and contribute to noise pollution. Replacing portions of manicured lawns with pollinator gardens that are designed to be low maintenance can reduce costs and time associated with maintaining lawns/ exotic gardens and can benefit the environment and pollinators.

Pollinator gardens planted in clusters with a diversity of native wildflowers that bloom in various seasons are best for providing habitats for these special insects.

MANAGEMENT OPTIONS

PREVENTION – Preventing further loss of existing natural habitat is necessary to maintain pollinator/insect populations.

- natural areas provide homes for pollinators and preserving maintains healthy populations of pollinators
- educating the public about benefits of pollinator gardens encourages people to maintain or create natural habitats
- using education to reduce chemical use will prevent further loss of pollinator populations
- engaging the public in enhancement opportunities promotes community involvement and appreciation of biodiversity

ENHANCEMENT – Enhancing the town with pollinator gardens will reduce the amount of maintained lawns, beautify the city and positively contribute to pollinator populations.

- Offer workshops and identify areas in the city where space exists for creating pollinator gardens

- develop a partnership with multiple organizations to sell native seeds/plants and implement a planting plan for pollinator gardens in Oakville
- rooftop gardens can turn unused space into a beautiful natural garden that insects can forage in
- maintaining honey bee colonies within the urban area can be a pleasant and rewarding hobby. Education and encouraging the public to learn and engage in this hoppy can increase the number of pollinators in the city

STAKEHOLDER INVOLVEMENT

• Residents
• Municipal government
• Green Infrastructure Ontario
• Local ENGOs
• Industry and business:
• Funding providers

POTENTIAL LOCATIONS FOR IMPLEMENTATION

- Parks
- Corridors/roadsides
- Boulevards
- Rooftops
- Residential areas

MEASURES OF SUCCESS

- Greater awareness of biodiversity issues and a positive outlook on the towns efforts to improve biodiversity
- Greater diversity on private properties (can be measured by citizen science)
- Increased public health due to naturalization and greening of the urban landscape
- Increased biodiversity and population health of pollinators
- Increased ecological connectivity through enhancing residential ecosystems
- Development of demonstration gardens for public education
- Development of seed mix or native planting guidelines for planting in a variety of growing conditions based on species availability

RESOURCES

- *Ontario - Pollinator Health*
- *Oakvillegreen*
- *Oakvillegreen - Supporting Pollinators in Oakville*
- *Inside Halton- Oakville's First Pollinator Demonstration Garden*
- *Oakville Horticultural Society- A Garden For Life*
- *Backyard Beekeeping*

Photo credits: Town of Oakville; Country Living Magazine

Insect Garden

OSB MANAGEMENT OPPORTUNITY FACT SHEET – PREVENTING BIRD STRIKES ON WINDOWS

PROBLEM IDENTIFICATION

The growth of dense, urban areas along ancient, bird migration routes poses a significant and often fatal threat to migrating birds. Ornithologists now claim that bird collisions with human-built structures is a leading cause of bird death across North America.

Birds cannot see glass, what they see is a reflection of their habitat (trees, bushes, water, sky) in windows or in the mirrored exteriors on office towers and other structures. From a bird's perspective, glass is an invisible barrier to their habitat.

Deceived by the reflection, and unable to detect the presence of glass or mirrored exteriors as solid objects, birds often collide head-on with windows and glass buildings and die on impact, sustain serious injuries, or may be stunned falling to the ground and becoming vulnerable to predation.

Reflective surfaces look like continuous habitat

Many birds migrate at night and navigate using light from the moon and the stars, and from the setting sun to find their way. Brightly lit urban areas attract migrating birds pulling them off course. On foggy and rainy nights this effect can be exasperated, leading to catastrophic deaths through bird collisions with taller buildings.

Fortunately there are a number of ways to prevent the death of birds caused by windows and night lighting. Window treatments and appropriate landscaping help birds avoid windows and the use of appropriate urban lighting on buildings, roads and trails reduces impacts to migrating birds.

MANAGEMENT OPTIONS

PREVENTION **–** Preventing bird strikes is the best way to reduce mortality caused by reflective surfaces.

- Change building codes to reduce bird strikes
- Develop a public education program to encourage residential, industrial, commercial and institutional land owners to make their windows bird friendly and inform them how to make windows bird friendly
- Utilize data on bird strikes to target areas for education
- Develop a public education program to inform the public what to do if they find an injured bird

CONTROL **–** In order to determine successful reduction of bird strikes, data on mortality and injury should be collected.

- Develop a program to collect and share data on bird strikes through co-operation with other organizations and the public (e.g. FLAP, wildlife rehabilitators, MNRF, citizen science)

STAKEHOLDER INVOLVEMENT

- Municipal, Regional and Provincial Governments
- Residents and Resident Groups
- Industry, Corporations and Institutions
- Conservation Authorities
- ENGOs
- Wildlife Rehabilitators
- FLAP Canada

POTENTIAL LOCATIONS FOR IMPLEMENTATION

- Residential and Commercial areas
- Shoreline areas
- Developments near natural areas

MEASURES OF SUCCESS

- Reduction of bird strikes on reflective surfaces of buildings
- Increased awareness of the issues reflective surfaces pose to birds
- Increased number of landowners utilizing bird friendly windows
- Data available to pinpoint areas with high number of bird strikes

RESOURCES

- *Fatal Light Awareness Program - FLAP*
- *ABC Bird Friendly Building Design Guidelines*
- *LEED Credit 55: Bird Collision Deterrence*
- *City of Markham Bird Friendly Guidelines*

Treated glass visible to birds, transparent for humans

Photo credits: *Fatal Light Awareness Program - FLAP; Ornilux Bird Protect Glass*

Window film to prevent bird strikes

OSB MANAGEMENT OPPORTUNITY FACT SHEET – PUBLIC EDUCATION

PROBLEM IDENTIFICATION

The success of projects to protect or enhance biodiversity depends on the awareness, support and participation of Oakville's residents. The audience for public education programs are variable in age, background, interest and existing knowledge. With such a large and diverse audience the problem arises of how to convey information in a way that will maximize visibility and be positively received.

To increase effectiveness, a wide variety of media and events can be used to increase public awareness of issues and current projects. These may include websites, social media postings, newspapers, signs and pamphlets. Each method has a restricted number of users that will see the information. For example a sign in a natural area will only be seen by the users on the trail. Posting information on all relevant media maximizes visibility.

Oakvillegreen tree planting

Events such as tree planting, restoration projects, invasive plant pulls and natural gardening events put on by the municipality can be designed to target a variety of age groups to provide and increase public awareness. Other events such as festivals, fairs, "*bioblitzes*", etc. can also be explored.

MANAGEMENT OPTIONS

EDUCATION – Public education is necessary to create awareness, support and participation in biodiversity projects.

- develop online content that provides information on how to best manage private lands to assist with biodiversity Projects. Consider including notices, postings, and volunteer sign-up forms for events to gauge public interest. develop demonstration gardens in public spaces to encourage private landowners to naturalize their properties
- prioritize areas for public education based on proximity to natural areas, current impacts and population size, etc.
- develop a system for mailing information packages to priority areas
- develop signage for natural areas and naturalization projects to reduce users impacts to these areas
- develop handout materials such as pamphlets
- develop a co-operative system with like-minded groups for co-ordinating environmentally focused events or booths
- develop school naturalization programs that integrates important information into the curriculum and promotes awareness, involvement in the community, and biodiversity efforts
- partner with the horticulture industry to provide access to affordable stock of native plant species
- develop a recommended planting list for naturalization in various environmental conditions to provide the knowledge necessary for successful planting on private lands

STAKEHOLDER INVOLVEMENT

- Municipal Government
- Conservation Authorities
- Schools and Institutions
- ENGOs
- Horticultural Societies
- Horticulture Industry
- Residents and Resident Groups
- Businesses

POTENTIAL LOCATIONS FOR IMPLEMENTATION

- Residential/Community groups
- Horticultural workshops
- Social Media
- Natural areas for events/signage

MEASURES OF SUCCESS

- Successfully integrating naturalization and gardens into the school curriculum for biodiversity
- Increased understanding and appreciation of biodiversity by the public
- Increased naturalization and canopy cover on private property
- Reduced yard maintenance costs for those implementing naturalization projects
- Enrollment in ambassador programs
- Number of requests for tree/forest management plans

RESOURCES

- Calgary Zoo - Grounds for Change
- Seed Survivor - Schoolyard Naturalization
- Ontariogreen - School Programs
- Canadian Wildlife Federation - Wildlife Friendly Gardening
- Nature Conservancy Canada- Native Gardening 101
- National Wildlife Federation - Garden for Wildlife
- Oakvillegreen - Supporting Pollinators in Oakville
- Oakville Horticultural Society - A Garden for Life
- CVC - Selecting Native Plants

Photo credits: *Oakvillegreen - Tree Planting A Garden for Life*

Oakville Horticultural Societies' signage for A Garden for Life

OSB MANAGEMENT OPPORTUNITY FACT SHEET – REDUCING CAR-ORIENTATED TRAVEL

PROBLEM IDENTIFICATION

The Town of Oakville is largely built up. Widening streets to reduce congestion from increased traffic would be a challenging and expensive task. This may also require removing green strips currently existing between roads and sidewalks, which is reducing the green space/tree cover of the urban environment and therefore a negative for biodiversity. Travel by car is one of the leading causes of noise pollution in urban areas. In addition, automobiles generate emissions that reduce air quality, consequently impacting human health and the health of natural ecosystems.

In order to solve the issues of congestion and reduce amounts of noise pollution and emissions, the Town needs to reduce car-oriented travel and encourage alternatives.

Cycling to work reduces car-oriented impacts such as noise and air pollution

For the public to engage in using alternative methods of travel (biking, bus, walking) these activities must be safe, easy and enjoyable. The public must also be aware that paths for walking and cycling exist in order to use them.

As the town completes naturalization and greening projects, it also has the opportunity to create ecological linkages that may support wildlife and human travel (trails and cycling routes along these naturalized corridors).

MANAGEMENT OPTIONS

ENHANCEMENT – Developing a network of trails and cycling routes that provides safe, easy and enjoyable travel is necessary to reducing car-oriented travel.

- determine opportunities for installing bike lanes within the city and prioritize areas for retrofitting
- develop a system of trails and cycling routes that creates linkage between all areas of the city and adjacent cities via enjoyable and safe routes
- use naturalization and greening of the urban area to retrofit sidewalks and bike lanes to make them more enjoyable for travel

AWARENESS– In order to utilize alternative transportation forms, users must be aware of the bus routes and paths available.

- maintain and improve the public transit system to access growing areas within the town and continue to make information available to the public
- maintain and update trails and cycling path maps within the city. Make them accessible to different users (online and hard copy)
- develop information about trail etiquette for inclusion on maps and websites to reduce impacts of increased users

- use public education to encourage people to use alternative travel methods
- develop a program for cycling awareness so that cyclists can utilize roads and trails safely (e.g., share the road)

STAKEHOLDER INVOLVEMENT

- Municipal, Regional and Provincial Governments including planning departments
- Conservation Authorities
- ENGOs
- Residents and Resident Groups
- Oakville Cycling Club

POTENTIAL LOCATIONS FOR IMPLEMENTATION

- Signage along bike routes/trails
- Newly developed areas
- Bus stops/shelters
- Biking clubs

MEASURES OF SUCCESS

- Successful implementation of daylighting projects
- Reduction in flooding and erosion along watercourses that have experienced daylighting
- Improved water quality
- Successful establishment of native vegetation in-stream and riparian restoration
- Increased diversity of aquatic and terrestrial wildlife in restored areas

RESOURCES

- Town of Oakville - Transportation Overview Study
- Town of Oakville - Trails
- Town of Oakville - Trails and Cycleways
- Town of Oakville - Cycling Safety
- City of Toronto - A Road to Health
- City of Toronto - Trails

Photo credits: *Bicycle Commuters - The Star; Trail - Oakville Village*

Trail in Lions Valley Park, Oakville

OSB MANAGEMENT OPPORTUNITY FACT SHEET – RE-INTRODUCING NATIVE SPECIES TO RESTORED HABITATS

PROBLEM IDENTIFICATION

Restored habitats are areas where work is completed to actively assist in naturalizing the habitat. The goal of habitat restoration is to take a disturbed habitat and re-create natural conditions for flora and fauna. These disturbed habitats may exist in areas post-construction or after invasive species removal.

Habitat restoration can be challenging since disturbed habitats are often susceptible to rapid invasion by non-native plants and often times the plant species we hope to restore may not be the fast-growing, competitive, successional species needed to out-compete invasive plants. However, these successional species can still be a vital part of naturalizing and restoring disturbed habitats. Planting a high diversity of species suitable for the conditions in the area increases the chances of successful naturalization. Incorporating fast-growing successional species as well as long-term target species assists in re-creating the natural process of succession, while reducing opportunities for invasion by non-native plants.

Planting Native Species

Due to the risk of plant death and of invasive species establishment, all re-introductions should be monitored for several years after-planting to ensure successful establishment. Plantings may require supplemental watering or care, and in some cases replacement.

MANAGEMENT OPTIONS

PREVENTION - Prevent the loss of native local species.

- retain species to the greatest extent possible by implementing tree protection plans or by collecting native seed/ plants from the site before disturbance
- survey for species at risk before disturbance occurs so that these can be flagged and protected

ENHANCEMENT – Re-introducing native species into restored habitats is essential to naturalize disturbed areas.

- develop a system for prioritizing areas to restore
- develop a system for implementing restoration projects that incorporates both fast- growing successional species and long-term target species
- develop a process for determining appropriate native species and planting methods for restoration
- choosing a diversity of native plant species for restoration projects increases the chances of success
- cooperate with the horticulture industry to maintain a diverse supply of plants species which can increase the success of restoration
- encourage private land owners, institutions and corporations to restore disturbed lands on their properties by providing

education on the benefits to biodiversity and ways to naturalize disturbed habitats

- create a recommended species list for a variety of habitat conditions for private land-owners to reference when restoring their lands

CONTROL – Maintain plantings until they become established and identify the areas where non-native plants and animals are invading restored lands. Always prioritize control and management methods to eliminate non-native species.

- develop a system for monitoring restored lands
- develop a system for managing new plantings (watering, etc.) until they become established
- create a system to evaluate success of restoration projects
- develop a system to monitor progress and succession of restored areas

STAKEHOLDER INVOLVEMENT

- Municipal and Regional Governments
- Conservation Authorities
- Developers
- ENGOs
- Residents and Resident Groups
- Horticulture Industry

POTENTIAL LOCATIONS FOR IMPLEMENTATION

- Industrial lands
- Closed landfills
- Parks
- Utility Corridors

MEASURES OF SUCCESS

- Successful establishment and survival of native plantings
- Increased biodiversity in restored areas
- Prevention of invasion by non-native species to restored habitats
- Reduction of invasive species populations

RESOURCES

- *Society for Ecological Restoration - Native Plant Resource Guide*
- *Credit Valley Conservation - Native Plant List for Breeding Birds*
- *TRCA - Seed Mix Guidelines*
- *City of Toronto - Construction Specification for Direct Seeding*
- *Credit Valley Conservation - Guide to Native Plant Nurseries and Seed Suppliers*
- *Canadian Wildlife Federation - Wildlife Friendly Gardening*
- *Nature Conservancy Canada- Native Gardening 101*
- *National Wildlife Federation - Garden for Wildlife*

Photo credit: Town of Oakville

Native Trilliums – Ontario's Flower

OSB MANAGEMENT OPPORTUNITY FACT SHEET –RESTORING ALTERED WATERCOURSES

PROBLEM IDENTIFICATION

The Town of Oakville is largely developed, which has resulted in altering natural watercourses through re-directing, burying, and channelization. This has resulted in vegetation removal, water retention and filtration reductions, and increased downstream flooding and erosion impacts.

Restoring a watercourse may involve removing obstructions and naturalizing the channel and riparian areas, or may involve creating a new or realigned channel, using natural channel design principles suitable for the volume of water conveyed. Buried watercourses may be "day-lighted", returning them to their natural open condition. Restoration can increase the storage capacity of a watercourse, thus reducing the risk of flooding and erosion. Restoring watercourses creates attractive areas for passive recreation enjoyment. Natural streams are more effective at filtering pollution and nutrients and allow for habitat enhancement with natural vegetation. Stream and riparian enhancement increases opportunities for biodiversity and improves water quality. Restoring watercourses also contributes to creating ecological linkages supporting wildlife movements within urban environments.

Buried watercourse in Oakville

MANAGEMENT OPTIONS

ENHANCEMENT – Watercourse restoration has social, economic and environmental benefits.

- continue to identify restoration needs and opportunities within the urban area
- continue to notify the public about watercourse restoration projects and their benefits
- continue to enhance in-stream and riparian habitat, including information of habitat features (for example bat boxes, wetland pockets, raptor poles, etc.)

CONTROL – Maintain existing open watercourses and prevent watercourse channelization, piping or burial.

- continue to monitor stability and establishment of watercourse restoration projects
- manage planted vegetation until it has become successfully established, including removal of non-native species from planted areas
- ensure channel maintenance practices are such that created habitat features are undisturbed

STAKEHOLDER INVOLVEMENT

- Municipal, Regional and Provincial Governments
- Horticulture Industry
- Conservation Authorities
- ENGOs
- Residents and Resident Groups
- businesses

POTENTIAL LOCATIONS FOR IMPLEMENTATION

- Private lands
- Historic neighbourhoods/areas

MEASURES OF SUCCESS

- Successful implementation of projects that restore natural watercourses
- Improved water quality
- Successful establishment of native vegetation from in stream and riparian restoration
- Increased diversity of aquatic and terrestrial wildlife in restored areas
- Increased length of day lit watercourses
- Reduced turbidity

RESOURCES

- *Evaluating Creek Daylighting as a means of Urban Conservation*
- *Land 8 - 10 Reasons Why Cities Should Daylight Rivers*
- *NRC - Daylighting Rivers and Streams*
- *Ontario's Stream Rehabilitation Manual*

Photo credits: Town of Oakville

Watercourse restoration

OSB MANAGEMENT OPPORTUNITY FACTSHEET – WILDLIFE FRIENDLY GARDENING: CREATING RESIDENTIAL ECOSYSTEMS

PROBLEM IDENTIFICATION

In urban landscapes how people maintain their privately owned land can have both positive and negative effects on wildlife.

Maintaining large expanses of lawn, planting non-native and/or invasive species, and using pesticides or herbicides will have negative impacts on biodiversity. Environmental impacts include chemical applications (pesticides), gas requirements to power machinery for maintenance, noise pollution and reduced natural forage and habitats that support biodiversity.

Wildlife friendly gardening can be simple, low maintenance and effective in residential areas by creating natural habitats with positive effects on native wildlife populations and biodiversity. Planting native trees in residential yards not only provides shade and this can reduce the energy use of homes while also providing food and shelter for wildlife. Pollinator gardens with native wildflowers can assist in supporting declining pollinator populations as well as provide habitat for other wildlife.

Pollinator garden with a diversity of flowers

MANAGEMENT OPTIONS

PREVENTION – Preventing further loss of existing natural habitat is an important way to preserve Oakville's biodiversity.

- educating the public about benefits of wildlife friendly gardens in order to encourage them to maintain or create natural habitats on their property will increase natural areas and support biodiversity within Oakville
- using education to reduce chemical use will prevent further loss of pollinator populations and improve water quality for all wildlife
- develop a program educating landowners along watercourses and wetlands to leave these habitats undisturbed and providing ways to incorporate these natural features into backyard landscapes while reducing impacts
- protecting trees within the city will allow canopy cover to increase
- develop a citizen science program to monitor biodiversity in the town

ENHANCEMENT – Wildlife friendly gardening can convert a larger part of residential areas in Oakville into natural habitats that provide stepping stones and linkage among natural areas.

- develop a system providing education opportunities and incentives to landowners to naturalize their properties
- educate landowners about opportunities for creating wildlife habitat such as bird boxes, bat boxes and snake hibernacula including where and how to create
- develop a system for public education promoting native plant species and wildlife friendly gardening that targets residential areas closest to natural areas and linkages

- provide examples of wildlife friendly gardening in municipal parks as an example and inspiration to private landowners

STAKEHOLDER INVOLVEMENT

- • Residents
- • Municipal government
- • Green Infrastructure Ontario
- • Local ENGOs
- • Industry and business:
- • Funding providers

POTENTIAL LOCATIONS FOR IMPLEMENTATION

- Municipal and regional offices
- School yards/campuses
- Community parks
- Boulevards
- Industrial/corporate offices/lands
- Private lands

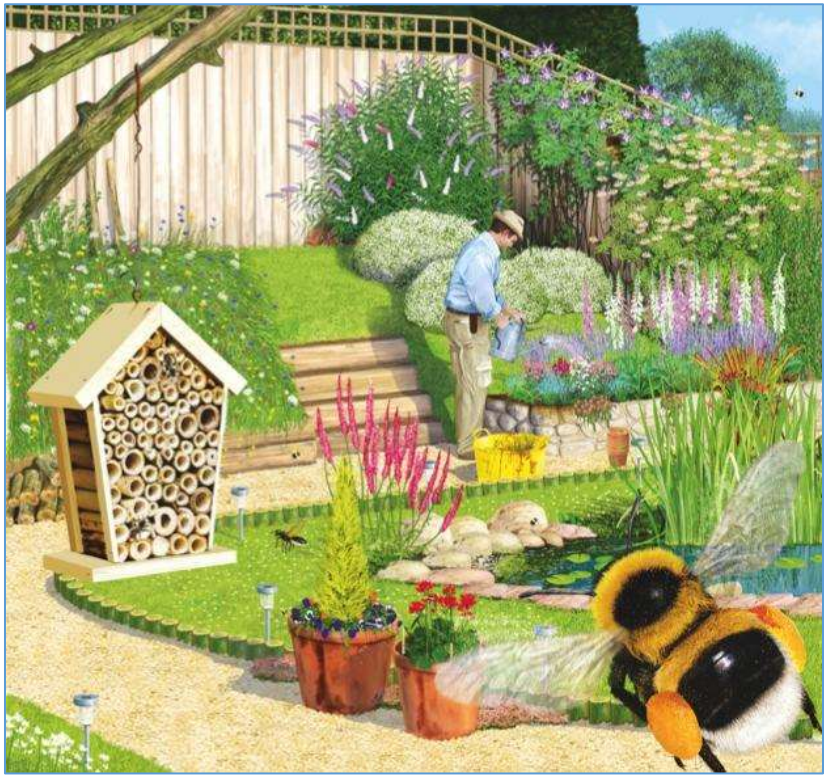
MEASURES OF SUCCESS

- Greater awareness of biodiversity issues and a positive outlook on the towns efforts to improve biodiversity
- Greater diversity on private properties (can be measured by citizen science)
- Regular monitoring and data collection
- Increased participation in biodiversity related events and citizen science
- Increased ecological connectivity through enhancing residential ecosystems
- Increased access to funding and knowledge for biodiversity related projects
- Development of seed mix and native planting guidelines for a variety of growing conditions based on species availability
- Development of demonstration gardens for public education

RESOURCES

- *Canadian Wildlife Federation - Wildlife Friendly Gardening*
- *Nature Conservancy Canada- Native Gardening 101*
- *National Wildlife Federation - Garden for Wildlife*
- *Ontario - Pollinator Health*
- *Oakvillegreen*
- *Oakvillegreen - Supporting Pollinators in Oakville*

Photo credit: *Xerces Society for Invertebrate Conservation; Discover Wildlife*



Bee friendly gardening

OSB MANAGEMENT OPPORTUNITY FACT SHEET – WORKING WITH THE HORTICULTURE INDUSTRY TO ENCOURAGE NATIVE SPECIES PLANTING

PROBLEM IDENTIFICATION

In urban landscapes historically there has been a trend to use exotic species of plants, shrubs and trees brought to Canada from all corners of the world. This tradition can have a serious impact on native wildlife populations due to the fact that exotic plants may not provide suitable food sources or habitat for native wildlife. Exotic plants also often end up growing in natural areas where they may outcompete and displace native plants and their associated habitats.

Encouraging the planting of native species is important for increasing the biodiversity of Oakville, however these public education programs require time and effort. Co-operation between multiple organizations and the municipality will increase the effectiveness of education programs and incentives for native planting. However, without an easily accessible, affordable source of native plants from local garden shops, programs will not be effective at encouraging citizens to plant native species. Working with the horticulture industry will assist in providing citizens with knowledge on where to buy native plants, thereby creating an accessible supply which is vital to the success of the program.

Native species ready to be planted in Oakville

MANAGEMENT OPTIONS

ENHANCEMENT – Native planting can convert more residential areas in Oakville into habitats that support native species.

- develop a system of education programs, events and/or demonstration gardens to engage the public and encourage native planting on private lands
- develop a partnership with local nurseries able to supply affordable native plants to citizens so that the horticulture industry benefits from increased business and publicity and programs can provide knowledge about locally sourced, easily accessible, affordable local plants for purchase
- involve horticulture industry in education programs, events and/or demonstration gardens for mutual benefit (publicity for nurseries and access to native plants for citizens)
- develop a system of pilot projects for educational display within the town
- provide incentives to landowners to naturalize their properties (plant giveaways, etc.)
- develop local seed mixes that can be provided to local residents

STAKEHOLDER INVOLVEMENT

- • Residents
- • Community Groups
- • Municipal and Regional governments
- • Green Infrastructure Ontario

- • Local ENGOs
- • Industry and business:
- • Funding providers

POTENTIAL LOCATIONS FOR IMPLEMENTATION

- private lands
- municipal parks
- industrial/corporate offices and lands
- schools/campuses

MEASURES OF SUCCESS

- Greater awareness of biodiversity issues and a positive outlook on the towns efforts to improve biodiversity
- Greater biodiversity on private properties
- Reduction of invasive species on private properties
- Reduction in the percentage of manicured lawns and the noise/ pollution that corresponds to maintenance activities
- Increased demand for native species for planting
- Increased accessibility of native seed sources
- Increased participation in biodiversity related events and citizen science
- Increased ecological connectivity through residential ecosystems
- Development of seed mix or native planting guidelines for planting in a variety of growing conditions based on species availability
- Development of demonstration gardens for public education

RESOURCES

- *Credit Valley Conservation - Guide to Native Plant Nurseries and Seed Suppliers*
- *Canadian Wildlife Federation - Wildlife Friendly Gardening*
- *Nature Conservancy Canada- Native Gardening 101*
- *National Wildlife Federation - Garden for Wildlife*
- *Ontario - Pollinator Health*
- *Oakvillegreen*
- *Oakvillegreen - Supporting Pollinators in Oakville*

Photo credit: Town of Oakville; Native Plant Nurseries

Turtlehead (*Chelone glabra*)

OSB MANAGEMENT OPPORTUNITY FACT SHEET – WORKING WITH SCHOOLS TO IMPLEMENT NATURALIZATION PROGRAMS

PROBLEM IDENTIFICATION

Schools represent an opportunity for education about the importance of biodiversity and the enhancement of school properties to support native biodiversity. Naturalization programs on school properties have the opportunity to actively engage children in the establishment of habitat supporting biodiversity in Oakville. This can have spin off benefits as parents see the benefits of naturalizing and it inspires younger generations to adopt new approaches to how they will manage their future properties.

Schools generally maintain open manicured lawns that requires maintenance with negative impacts on the environment through use of gas mowers and noise pollution. Reducing the amount of mowed lawn on school properties will help reduce maintenance costs and benefit the environment.

Lakeview Park, Oakville

Naturalization programs on school properties have the opportunity to create woodlands and gardens that provide both educational and recreational opportunities. Trees provide shade and play structures can be created within the woodland area for young children to enjoy without the risk of sunburn. Native woodlands benefits wildlife by providing food and shelter and bring children closer to nature.

Creating pollinator gardens with native wildflowers is an easy activity that students can get involved with to increase their appreciation and knowledge of biodiversity. Pollinator gardens assist in supporting declining pollinator populations as well as provide habitat for other wildlife.

MANAGEMENT OPTIONS

PREVENTION - Prevent the loss of natural habitats on school lands

- encourage schools to maintain the natural land remaining on their properties

ENHANCEMENT – Naturalization programs can provide an educational opportunity for students that increases their knowledge and appreciation for biodiversity and well as beautifies and reduces maintenance costs of the schoolyard.

- develop an information package on the environmental and financial benefits of naturalizing open spaces
- develop a program that assists schools in creating and implementing planting plans based on age groups and available space
- forge a partnership between schools and organizations that can provide a supply of native seeds
- encouraging tree planting plans on school lands
- encouraging and supporting the use of “outdoor classrooms”

STAKEHOLDER INVOLVEMENT

- Municipal Government
- Schools and Institutions
- ENGOs
- Horticulture Industry
- Funders

POTENTIAL LOCATIONS FOR IMPLEMENTATION

- School yards/campuses
- daycares

MEASURES OF SUCCESS

- Successfully integrating naturalization and gardens into the school curriculum for biodiversity
- Increased understanding and appreciation of biodiversity
- Increased naturalization of school property
- Increased canopy cover on school property
- Reduced yard maintenance costs for the schools implementing naturalization projects
- Increased service requests
- Increased numbers of schools involved

RESOURCES

- *Calgary Zoo - Grounds for Change*
- *Seed Survivor - Schoolyard Naturalization*
- *Ontariogreen - School Programs*
- *Canadian Wildlife Federation - Wildlife Friendly Gardening*
- *Nature Conservancy Canada- Native Gardening 101*
- *National Wildlife Federation - Garden for Wildlife*
- *Ontario - Pollinator Health*
- *Oakvillegreen - Supporting Pollinators in Oakville*

Photo credits: *Southeast Oakville Real Estate- Lakeview Park; Alternatives Journal - Natural Playground*

Natural Playground

Bronte Bluffs Bioswale

As part of a Province of Ontario Great Lakes Guardian Community Fund award, the town undertook a restoration project at the Bronte Bluffs that featured the installation of a bioswale, a type of “green infrastructure”. Green infrastructure broadly refers to the use of natural materials and features that harness the power of nature to perform the function of “traditional” infrastructure. This multi-year project brought together a diverse set of partners that included the Bronte Business Improvement Area; the Bronte Historical Society; local guiding, scout and girl guide groups; local high schools; residents; multiple town departments; Oakvillegreen; AMEC Foster Wheeler; and Conservation Halton. The work is part of an ongoing initiative to help restore this area critical to migratory birds and insects as they arrive from long journeys from across Lake Ontario and beyond. The project included removal of invasive species; replanting with native plants and shrubs; removal of a direct outfall pipe into the lake and replacing it with a bioswale to absorb and filter runoff; and the installation of educational signage.

The project not only provided numerous direct biodiversity benefits but also served to bring together the community to support our local environment. It also provided an opportunity for the Bronte Historical Society to develop a retrospective display on the history of the bluffs, culminating in the current restoration project.

6. MEASURING SUCCESS PROTECTING BIODIVERSITY

Monitoring provides a measure of success protecting Oakville's biodiversity. ***Targets and Indicators*** provide a framework to measure and report on success towards achieving the goals established for the OSB:

1. Protect, restore and enhance habitats and species where appropriate;
2. Support biodiversity throughout the town;
3. Incorporate the protection, restoration and enhancement of biodiversity as part of development processes;
4. Celebrate biodiversity through education and stewardship; and
5. Monitor biodiversity and use data to guide policies and programs.

In addition, the measures of success can be aligned with other program targets to consider how the success of the OSB contributes to an understanding of biodiversity protection at provincial, national and global scales (see Appendix 5 Comparison of Aichi Biodiversity Goals and Targets with National and Provincial Targets and OSB Targets and Indicators) .

The OSB targets include:

- ***Direct measures of biodiversity protection*** that assess:
  - important species groups such as Species at Risk (SAR) or Invasive Species; and
  - habitats supporting biodiversity, such as % tree canopy cover, diversity of plant communities, # of pollinator gardens, and the quality of aquatic habitats, etc.
- ***Indirect Measures of biodiversity protection*** that assess:
  - the success of programs and policies that identify, protect, enhance, and restore biodiversity;
  - continuing to meet the standards of the Forest Stewardship Council certification; and
  - development and implementation of a communication strategy for biodiversity protection.

The data gathered on indicators and targets also forms part of an ***adaptive management cycle*** that reviews and refines the actions outlined in the OSB. Through monitoring the most successful management actions can be scaled up to increase their impact on the protection of biodiversity and less successful actions can be reviewed and refined to improve biodiversity protection.

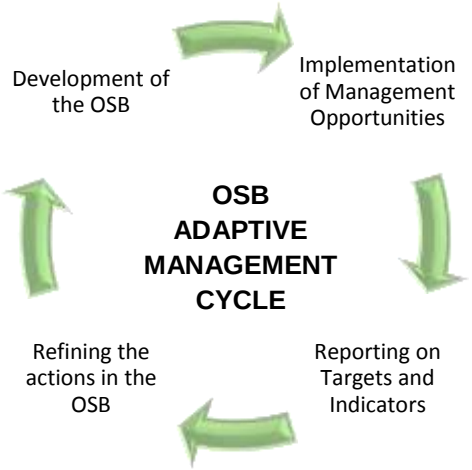


Figure 17: OSB Adaptive Management Cycle

Preparing a ***Report Card on Targets and Indicators*** provides feedback to all stakeholders, acknowledging the progress made and provides encouragement to continue working to attain future targets.

The table below identifies eighteen (18) targets for the OSB and indicators which can be measured to report on the success of achieving targets.

TABLE 3. OSB GOALS, TARGETS AND INDICATORS	
GOAL 1 Protect, restore and enhance habitats and species where appropriate	
Targets	**Indicators**
1. By 2018 Oakville has adopted the Oakville Strategy for Biodiversity (OSB)	• Council Approval of OSB
2. Oakville continues to lead by example through its policies and programs in supporting the sustainable use of resources	• Use of certified sustainably produced paper products in all Town facilities; • Annual Town facility energy management objectives met; • Implementation of policies and programs to reduce plastic use; and • Reduction in the use of water for town operations outlined in the town's 2018 Water Efficiency and Conservation Strategy.
3. Programs and policies are supported that improve the health of Oakville creeks and the Lake Ontario waterfront	• Region of Halton Health Department water quality monitoring of beaches - # of beaches open/closed due to water quality; • Conservation Halton Watershed Report Card data – improvements supporting increased health; • Stormwater management monitoring data – improvements supporting increased health; • Sustainable fishing and clean water communication materials prepared and disseminated; and • Sustainable fishing and clean water communication signage installed.
4. Progress is being made to reduce the threat of invasive species	• Invasive Species Management Plan developed and implemented; • Invasive species education materials prepared and disseminated; • Resources assigned for invasive species management; • Total area surveyed for invasive species yearly; • Hectares of invasive species removed; • Success of native species established; and • Early Detection & Distribution Mapping System (EDDMapS) data for invasive species being used by town and promoted to community.
5. Oakville's Species at Risk (SAR) populations remain secure or show signs of recovery	• Natural area monitoring data on the status of SAR.
6. Progress is made towards increasing Oakville's tree canopy coverage, consistent with the targets set out in Oakville's Urban Forest Strategic Management Plan (UFSMP)	• Tree canopy %.
7. Progress is made towards increasing and/or improving natural wetland and beach habitats along the Lake Ontario shoreline	• Percent or meters of Lake Ontario shoreline supporting natural wetland and beach habitats; and • # of aquatic habitat enhancement projects.

TABLE 3. OSB GOALS, TARGETS AND INDICATORS	
GOAL 2 Support biodiversity within the identified Ecological Network (private and public)	
Targets	**Indicators**
8. The town has engaged the private sector in the development and implementation of the OSB	• # private agencies that have developed programs that address protection of biodiversity; • # of sponsored incentive programs working with the private sector; and • # of projects being adopted/implemented as a part of development application condition of approval.
9. Oakville's forests are managed sustainably to meet Forest Stewardship Council (FSC) certification standards	• FSC certification maintained (audits passed).
10. Oakville protects at least 17% of terrestrial and inland water areas in a natural state supporting biodiversity	• Policies in place to support the protection of 17% of terrestrial and inland water areas in a natural state supporting biodiversity; and • Percent protected natural areas in Oakville.
GOAL 3 Protect, restore and enhance biodiversity during development (tree by-law, NHS policies, stewardship)	
Targets	**Indicators**
11. Biodiversity protection, restoration and enhancement initiatives are integrated into Town policies, procedures and programs	• % increase of Oakville procedures and programs that address protection of biodiversity; • Budget allocated for Oakville procedures and programs that address protection of biodiversity; and • # of hectares protected, restored and enhanced as a result of initiatives integrated into Town policies, procedures and programs.
12. Stormwater management meets or exceeds guidelines that support healthy aquatic ecosystems	• Stormwater management monitoring data; • Conservation Halton Watershed Report Card data; • Region of Halton Health Department water quality monitoring of beaches; and • # of communication events addressing nutrient runoff and toxins and # of public attending.
13. The size and diversity of natural habitats in Oakville are sustained or increased	• Percent natural areas present; • Hectares of representative natural habitats present; and • Hectares of interior forest present.

TABLE 3. OSB GOALS, TARGETS AND INDICATORS	
GOAL 4 Celebrate biodiversity through education and stewardship	
Targets	**Indicators**
14. Community and staff have an increased awareness of the importance of biodiversity and are provided with guidance on how they can participate in implementing the OSB	• Communication Strategy completed in 2019; • # of biodiversity communication events organized and # of public attending; • Biodiversity communication materials prepared and disseminated; and • Biodiversity communication signage installed.
15. Oakville is engaged with Indigenous peoples in decision making and implementation of the OSB	• # of mechanisms in place for acquiring Aboriginal Traditional Knowledge (ATK) to inform decision- making; and • # of initiatives/projects which consider ATK.
16. Resilience of Oakville's biodiversity to climate change is increased through mitigation and adaption measures and the town meets its GHG reductions as set out in the Partners for Climate Protection (PCP)	• New policies included in OP or other relevant masterplans that support biodiversity; • # of electric car charging sites; • # of electric cars/trucks/buses operated by Town of Oakville; • Percent tree canopy coverage sequestering carbon; • Annual targets met for town's facilities energy reductions; • Uptake of alternative transportation methods such as bicycle use and car share programs; • Restoration plans include consideration of climate change in the selection of appropriate methods and species; • Tree planting programs consider climate change in the selection of appropriate species; and • Stormwater management programs consider the impacts of climate change on new and existing infrastructure.
17. Incentive programs supporting biodiversity protection and enhancement activities are in place	• # of persons or agencies utilizing incentive programs; • Annual budget provided for incentive programs; • # trees planted through incentive programs; and • # bat boxes, pollinator gardens, etc. installed through incentive programs.
GOAL 5 Monitor biodiversity	
Targets	**Indicators**
18. OSB monitoring and reporting developed and implemented	• OSB Annual Report Card.

Glenorchy – Prairie Restoration and Prescribed Burns

Glenorchy Conservation Area, a 401 hectare (990 acres) property in Oakville, was established in 2008 to protect lands notable for the Sixteen Mile Creek gorge, forested slopes, headwater creeks, wetlands and shale bluffs. The Province of Ontario owns the land and has an agreement with Conservation Halton to manage it. A newly created 50 hectare (123 acre) tallgrass prairie ecosystem forms an important part of this property and part of the North Oakville Natural Heritage System.

As only 2 to 3 per cent of Ontario's native prairie remain, this restoration project helps to reintroduce and manage a rare ecosystem into the landscape, while supporting a high diversity of native plants, birds, mammals and insects, including a number of rare and endangered species.

www.conservationhalton.ca/glenorchy-prescribed-burn

7. RECOMMENDED NEXT STEPS TO SUPPORT OAKVILLE'S BIODIVERSITY

The OSB has identified a number of existing programs, policies, standards and actions that are being implemented in Oakville to ***identify, protect, restore and enhance*** biodiversity. It has also identified a wide array of stakeholders who are or can be engaged in biodiversity protection. The OSB Management Opportunity Fact Sheets present a wide variety of possible biodiversity protection actions, which may be implemented across Oakville through the engagement and collaboration of multiple stakeholders.

The following figure illustrates how stakeholders are currently implementing many of the Management Opportunities through their existing programs that ***identify***, ***protect***, **restore** and ***enhance*** biodiversity in the Town of Oakville.

The final table in the report provides detailed information that highlights existing programs, standards, policies, and bylaws that can be enhanced through recommended next steps to build on the implementation of all Management Opportunities identified in the OSB.

Together the Town of Oakville, Halton Region, Conservation Halton, ENGOs and other Community Groups and other community partners can make an important contribution to the long term sustainability of native biodiversity in Oakville.

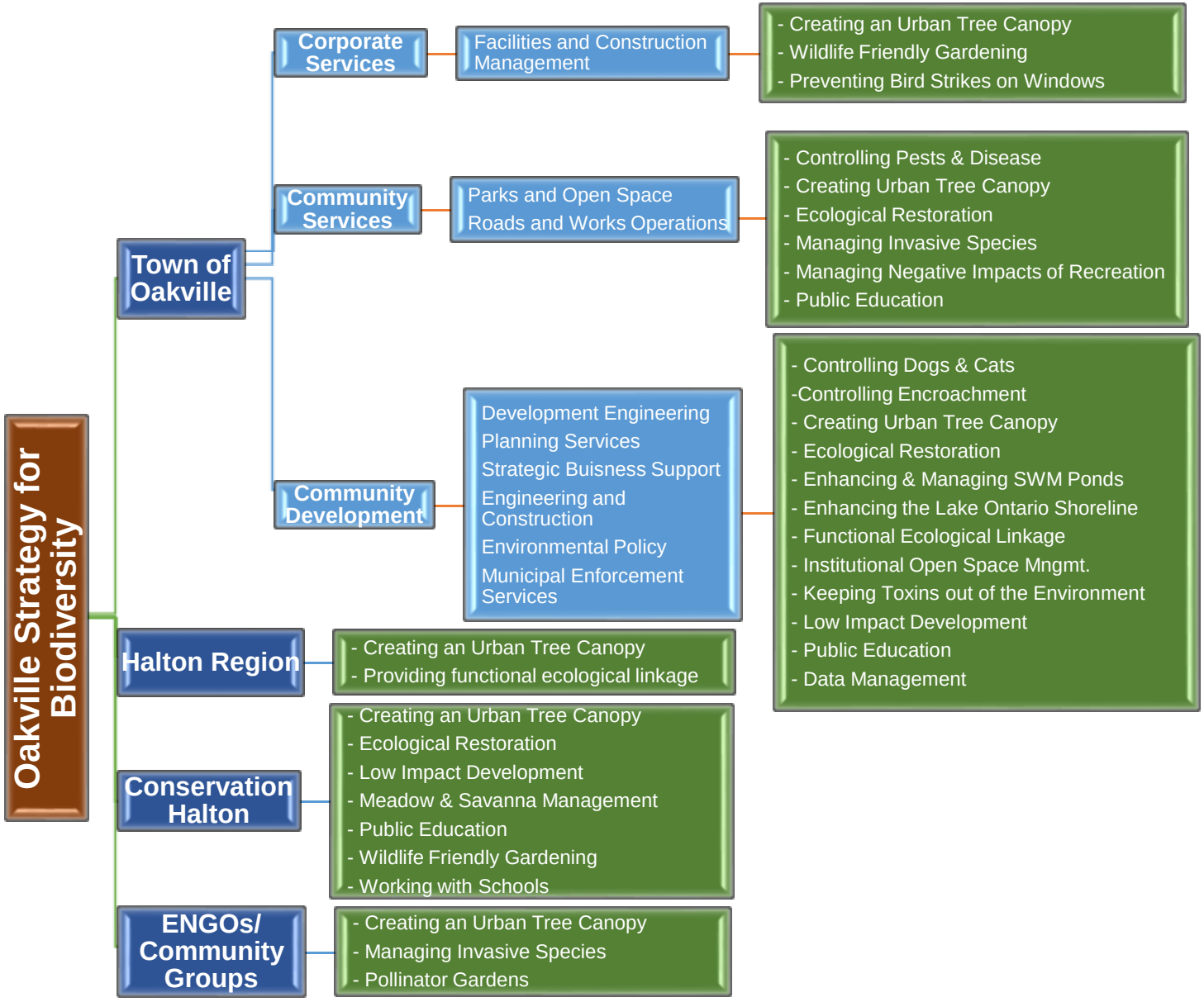


Figure 18: OSB Stakeholders and Potential Management Opportunities

Table 4. Recommended Next Steps for Oakville Strategy for Biodiversity			
Existing Programs, Standards, Policy, Bylaws	**Recommended Next Steps Biodiversity Integration Opportunities**	**Management Opportunities Supported**	**Stakeholders**
POLICIES			
❖ **Official Plan policies protecting species and areas supporting biodiversity**	1. Incorporate findings of the OSB into the Sustainability Discussion Paper as a component of the town's ongoing Official Plan Review. Specifically: ○ Use the OSB as the basis for determining what aspects of *biodiversity* are currently supported in the town's Official Plan in terms of identifying, protecting, enhancing and restoring biodiversity. ○ Review provincial and regional policies to identify additional opportunities/requirements for providing policy support for biodiversity. ○ Provide policy directions for updating the town's Official Plan, as appropriate. 2. This discussion paper would be linked to the Natural Area & Open Space Discussion Paper also part of the town's Official Plan Review.	All Management Opportunities	• Planning • Development Engineering • Environmental Policy • Parks and Open Space Planning

Table 4. Recommended Next Steps for Oakville Strategy for Biodiversity			
Existing Programs, Standards, Policy, Bylaws	**Recommended Next Steps Biodiversity Integration Opportunities**	**Management Opportunities Supported**	**Stakeholders**
❖ **Town Master Plans and Operations, such as:** ○ **Environmental Sustainability Strategy** ○ **Transportation Master Plan** ○ **Active Transportation Master Plan** ○ **Urban Forest Strategic Management Plan** ○ **Stormwater Master Plan** ○ **Sustainable Building Design Procedure and Standards**	3. Integrate the OSB Vision, Guiding Principles and Goals into all applicable master planning initiatives, policies and operational programs.	All Management Opportunities	• Corporate wide
OUTREACH AND EDUCATION			
❖ **Numerous environmental outreach and education programs** ❖ **Living with wildlife program** ❖ **Halton Children's Water Festival** ❖ **Conservation Halton Education Workshops** ○ **Healthy *Neighboursheds*** ○ **Designing Your Native Landscape and** ○ **Pollinator Gardens** ❖ **School and community outreach and education programs (Oakvillegreen)** ❖ **Collaborative outreach programs with Conservation Halton and Oakvillegreen**	4. Develop a cohesive outreach and education plan that applies a biodiversity lens to existing programs and supports staff and public initiatives.	Public Education Working with the Horticulture Industry Working with Schools	• Environmental Policy • Conservation Halton • Halton Region • Oakvillegreen

Table 4. Recommended Next Steps for Oakville Strategy for Biodiversity			
Existing Programs, Standards, Policy, Bylaws	**Recommended Next Steps Biodiversity Integration Opportunities**	**Management Opportunities Supported**	**Stakeholders**
❖ **Lunch/Break and learn programs**	5. Develop a staff and stakeholder education program for both technical and general biodiversity topics.	Public Education	• Environmental Policy
MAPPING AND RESTORATION			
❖ **Pollinator gardens established through partnerships with local NGO's, Parks and Open Space and Environmental Policy** ❖ **Review of by-laws and zoning regarding beekeeping** ❖ **Website in progress on pollinators** ❖ **Collaborative outreach programs with Conservation Halton and Oakvillegreen**	6. Collate existing programs and information to develop Pollinator Guidelines to support biodiversity and native species.	Enhancing the Lake Ontario Shoreline Functional Ecological Linkage Meadow and Savanna Management Pollinator Gardens Re-introducing Native Species to Restored Habitats Wildlife Friendly Gardening Working with the Horticulture Industry	• Clerks (Municipal Enforcement) • Environmental Policy • Facilities and Construction Management • Parks and Open Space • Conservation Halton • Oakvillegreen

Table 4. Recommended Next Steps for Oakville Strategy for Biodiversity			
Existing Programs, Standards, Policy, Bylaws	**Recommended Next Steps Biodiversity Integration Opportunities**	**Management Opportunities Supported**	**Stakeholders**
❖ **Conservation Halton Programs** ○ **Natural Areas Inventory (NAI) database** ○ **stewardship database** ○ **restoration opportunities database** ❖ **Forest Management Plan** ❖ **Woodlands Conservation Strategy** ❖ **North Oakville Creeks Subwatershed Study** ❖ **OSB Tier 1-4 mapping**	7. Collate and build on existing work, such as Forestry's inventory and operational monitoring programs, to monitor species and identify priority restoration areas.	Controlling Pests & Disease Creating an Urban Tree Canopy Ecological Restoration Functional Ecological Linkage Invasive Species Working with the Horticulture Industry	• Parks and Open Space • Development Engineering • Conservation Halton • Halton Region
IMPLEMENTATION SUPPORTS			
❖ **Biodiversity Technical Team assembled to provide input on the development of the OSB**	8. Review composition of team to add departments as needed and continue with the Technical Team to support implementation of the OSB.	Working with the Horticulture Industry Working with Schools Institutional/Corporate Open Space Management	• Development Engineering • Engineering & Construction • Environmental Policy • Parks and Open Space • Planning • Roads and Works • Conservation Halton • Halton Region

Table 4. Recommended Next Steps for Oakville Strategy for Biodiversity			
Existing Programs, Standards, Policy, Bylaws	**Recommended Next Steps Biodiversity Integration Opportunities**	**Management Opportunities Supported**	**Stakeholders**
❖ **Environmental Sustainability Policy**	9. Develop checklist as integration tool to support application of a biodiversity lens to project and policy work.	All Management Opportunities	• Development Engineering • Engineering and Construction • Environmental Policy • Facilities and Construction Management • Planning • Roads and Works • Strategy, Policy and Communications
❖ **Road Ecology draft report prepared** ❖ **Wildlife Crossings / Ecopassages already being considered / incorporated into road projects** ❖ **Conservation Halton Road Ecology Technical Guide**	10. Finalize Oakville's draft road ecology work and revise framework to produce a technical guide for Oakville.	Functional Ecological Linkage Public Outreach	• Planning • Development Engineering • Engineering & Construction • Environmental Policy • Conservation Halton • Halton Region

Table 4. Recommended Next Steps for Oakville Strategy for Biodiversity			
Existing Programs, Standards, Policy, Bylaws	**Recommended Next Steps Biodiversity Integration Opportunities**	**Management Opportunities Supported**	**Stakeholders**
❖ **Forest Health Monitoring** ❖ **Forest Insect Monitoring** ❖ **EAB management plan/program** ❖ **Gypsy Moth and Asian Long-horn Beetle management** ❖ **Hogweed management program** ❖ **Woodlands Conservation Strategy** ❖ **Invasive species removal activities by:** ○ **ENGO's** ○ **community groups** ❖ **Conservation Halton programs, such as:** ○ **prescribed burns** ○ **buckthorn removal** ○ ***Phragmites* control**	11. Build on existing programs to develop a comprehensive invasive species management strategy.	Controlling Pests & Disease Invasive Species Public Education Working with Schools	• Development Engineering • Environmental Policy • Parks and Open Space • Conservation Halton • Halton Region
REPORTING			
❖ **Oakville State of the Environment Report (SOER)** ❖ **Oakville Forest Health Report** ❖ **World Council on City Data** ❖ **Conservation Halton Watershed Report Cards** ❖ **Halton Region State of the Natural Heritage System reporting**	12. Build on existing environmental reporting systems to develop a biodiversity reporting program that incorporates the targets set out in the OSB.	Public Education	• Development Engineering • Parks and Open Space • Planning • Conservation Halton • Halton Region

Supporting Pollinators

Pollinators such as bees, butterflies and many insects provide a great service through their ability to transfer pollen between plants. The town and its partners support these amazing animals in many ways:

- Our Parks Department leaves Milkweed, a favourite plant of monarch butterflies, in informal shrub beds and mow around them in natural areas.
- In 2016 a pollinator themed garden was installed at Shell Park and included a Bee condo and informational signage by the plants to assist with public education. The garden was awarded second place in the All America Selection (AAS) landscape design contest.
- Potting demonstrations are hosted at the annual Oakville Children's festival where participants can take home a pollinator plant such as Echinacea, Rudbeckia or Milkweed.
- A staff workshop was held to educate on the importance of native bees and teach participants how to construct native bee boxes.

Oakvillegreen, a local environmental organization, has also been active in introducing pollinator gardens in collaboration with the town and other community partners, such as the local school boards where they have been involved in the planning, planting and maintenance of over 10 school and community pollinator gardens. Pollinator gardens at schools offer the added benefit of providing a great place for hands-on learning.

APPENDIX 1 OAKVILLE STRATEGY FOR BIODIVERSITY STAKEHOLDER LIST

Bronte BIA	Halton District School Board	Oakvillegreen
Bronte Creek Provincial Park	Halton Environmental Network	Ontario Biodiversity Council
Bronte Horticultural Society	Halton Healthcare (Carillion)	Ontario Federation of Anglers and Hunters
Bronte Marina	Hydro One	Ontario Nature
Carolinian Canada	ICLEI Local Governments for Sustainability	POWER Halton/VectorIAS
City of Burlington	Jennifer Lawrence and Associates Inc.	Sheridan College
City of Mississauga	Kerr BIA	Siemens Canada
CN Rail	Lake Ontario Atlantic Salmon Restoration Program	Six Nations of the Grand River
CP Rail	Ministry Municipal Affairs	South Peel Naturalist Club
Credit River Valley Conservation	Ministry of Natural Resources and Forestry	St Volodymyr Ukrainian Cemetery
Enbridge Gas	Ministry of Transportation	Suez Water and Process Technologies
Faith and the Common Good	Mississaugas of the New Credit First Nations	Suncor
Ford Canada	Oakille BIA	Town of Oakville
Friends of Bronte Creek	Oakville and Milton Humane Society	Tree Canada
Friends of the Greenbelt	Oakville Horticultural Society	Trout Unlimited
Halton Catholic District School Board	Oakville Hydro	Union Gas

APPENDIX 2 OAKVILLE STRATEGY FOR BIODIVERSITY DIGITAL DATABASE

Digital Data Algorithm Used to Create NHS Map

- Land Information Ontario (LIO) digital data of Provincial Greenbelt NHS
- Livable Oakville digital data of Natural Areas
- Halton Region NHS within Parkway Belt areas

Digital Data Algorithm Used to Create Tier 1, 2, 3 and 4 Maps

Tier 1

- all areas within Halton Regional Natural Heritage System (RNHS)

Tier 2

- all Ecological Land Classification (ELC) codes for native vegetation communities, except ELC vegetation type Cultural Meadow (CUM), located outside the RNHS
- all woodlands mapped by the Town of Oakville located outside the RNHS
- Conservation Halton's mapping of the 100 Year Lake Ontario Shoreline Flood zone
- all areas within the Parkway Belt that are not Tier 1
- Conservation Halton's mapping of Lake Ontario Shoreline Hazard areas

Tier 3

- areas within 30 metres of the Town of Oakville NHS, Greenbelt NHS and Parkway Belt land use designations
- parks, open space and cemeteries land use designation
- areas mapped as Stormwater Management ponds
- Conservation Halton's mapping of Flood Plains
- Conservation Halton's mapping of Meander Belt Hazard zone
- all areas within a 7.5 m of informal, unregulated drainage swales located outside Tiers 1 and 2

Tier 4

- all other areas within the Town of Oakville municipal boundary

Other Digital Data Supporting Monitoring and Analysis of Biodiversity

Conservation Halton

- benthic records
- fisheries occurrence
- species occurrence records (Terrestrial)

Town of Oakville

- i-Tree data available for individual trees
- woodland regeneration mapping
- High Conservation Value woodlands mapping
- parcel fabric mapping

Halton Region

- Natural Heritage System Key Features mapping

APPENDIX 3 OAKVILLE STRATEGY FOR BIODIVERSITY TIER 1 TO 4 MAPPING


Areas Supporting Biodiversity in Oakville
Legend
Tier 1
Tier 2
Municipal Boundary
Highway 407
Dundas Street West
Dundas Street East
Upper Middle Road West
Upper Middle Road East
Bronte Road
Trafalgar Road
Queen Elizabeth Way
Lakeshore Road
Lake Ontario
August 2, 2018
0 500 1,000 2,000 3,000
Meters


Areas Supporting Biodiversity in Oakville
Legend
Tier 1
Tier 2
Tier 3
Municipal Boundary
Highway 407
Dundas Street West
Dundas Street East
Upper Middle Road West
Upper Middle Road East
Bronte Road
Dorval Drive
Trafalgar Road
Queen Elizabeth Way
Lakeshore Road
Lake Ontario
August 2, 2018
0 500 1,000 2,000 3,000
Meters


Areas Supporting Biodiversity in Oakville
Legend
Tier 1
Tier 2
Tier 3
Tier 4
Municipal Boundary
Highway 407
Dundas Street West
Dundas Street East
Upper Middle Road West
Upper Middle Road East
Bronte Road
Dorval Drive
Trafalgar Road
Queen Elizabeth Way
Lakeshore Road
Lake Ontario
August 2, 2018
Meters

APPENDIX 4 REVIEW OF POLICIES, PLANS AND LEGISLATION RELATED TO THE OSB

FEDERAL

- Canadian Biodiversity Strategy. In 1992, following the United Nations Convention on Biological Diversity, Canada became the first industrialized country to ratify the Biodiversity Convention. The Biodiversity Convention recognizes three key objectives:
    - The conservation of biodiversity;
    - The sustainable use of biological resources; and
    - The fair and equitable sharing of benefits resulting from the use of genetic resources.

  The Canadian Biodiversity Strategy provides '*a framework for action at all levels that will enhance our ability to ensure the productivity, diversity and integrity of our natural systems, and as a result, our ability as a nation to development sustainability."*

PROVINCIAL

- Ontario's Biodiversity Strategy. A guiding framework to coordinate the conservation of Ontario's diversity of living organisms and ecosystems. The updated 2011 Strategy builds on the 2005 Strategy with the addition of new and updated directions that be adopted over the next decade. It supports both the *Canadian Biodiversity Strategy* and the *Convention on Biological Diversity's (CBD's) Global Strategic Plan for Biodiversity 2011 – 2020* as well as the *Aichi Biodiversity Targets.* The 2011 Strategy provides four strategic directions related to outreach, stewardship, threat reduction and resilience, being:
    - Improve Knowledge;
    - Engage People;
    - Reduce Threats;
    - Enhance Resilience;

  The overarching recommendation of *Ontario`s Biodiversity Strategy,* 2011 advices that the protection and sustainable use of biodiversity is a shared responsibility of Ontarians, not just government, which calls into action various stakeholders including municipalities to develop implementation plans and specific actions to help achieve the visions and goals provided in the Strategy.

- Provincial Policy Statement. Most of the protection of Natural Heritage in Ontario is driven by the *Planning Act*'s Provincial Policy Statement 2014 (PPS). The PPS provides policy direction related to land use planning and development by setting the policy foundation for regulating the development and use of land in the Town of Town. Through the PPS, Municipalities must ensure that its resources are managed in a sustainable way to conserve biodiversity, minimize environmental and social impacts, and meet its long-term needs.

MUNICIPAL

- Livable Oakville Official Plan. The Livable Oakville Plan (2009 Town of Oakville Official Plan) with amendments to the text and schedules that were approved up to, and including April 2, 2017, was developed to conform to the Province of Ontario`s *Growth Plan for the Greater Golden Horseshoe, 2006, as* required by the Places to Grow Act, 2005. It applies to all lands within the town of Oakville, except the North Oakville East and West Secondary Plan areas. The Plan is a comprehensive and integrated policy framework for setting priorities and making decisions including natural heritage features. Specifically, *Natural Areas* are designated in the Plan to support diversity and

connectivity of natural features in creating a system, and the long-term ecological function and biodiversity of natural features. The Plan supports maintaining, restoring, and where possible, improving links and corridors between and among natural heritage features and areas in support of biodiversity values. The Plan outlines general Permitted Uses (Section 16.1.1) which may threat biodiversity values and ecosystem functions such as recreational amenities (e.g., paths, trails, walkways, bike paths). Lands designated as Natural Areas may contain one or more of the following features with required buffers: (a) significant habitat of endangered and threatened species; b) wetlands; c) woodlands; d) valleylands; e) significant wildlife habitat; f) environmentally sensitive areas; g) areas of natural and scientific interest; g) fish habitat: or h) natural corridors. With regards to biodiversity, lands designated as Natural Areas are provided protection from development. Where planning applications are not subject to the *Environmental Assessment Act*, an environmental impact statement (EIS) is required, to the satisfaction of Oakville, to establish that the use will not negatively impact the natural features or ecological functions contained within the Natural Area designation.

- North Oakville Urban Design and Open Space Guidelines. The North Oakville Urban Design and Open Space Guidelines was created to establish physical design concepts that will lead to the development of a high quality, **sustainable** and integrated community. The vision and guiding design principals for North Oakville is noted to be significantly influenced by natural heritage and open space systems which have been designed to protect the natural environment, to provide balance between active and passive recreation needs, and to contribute to the quality of life for Town residents. This is reflected in the following Urban Design Principles for which:
    - Natural Heritage and Open Space Systems provide a primary framework for community development;
    - Public safety, views and accessibility to the Natural Heritage component, will be important considerations in community design;
    - Opportunity exist to develop high density buildings adjacent to the Natural Heritage system to capitalize on exceptional views and connections to recreational trail systems.

- North Oakville Secondary Plans (East and West). Land located north of Dundas Street and south of the 407 fall under the North Oakville Secondary Plan (NOSP) that has established a Natural Heritage System (NHS) of 900 ha for the area. This NHS includes linkages with open space and wildlife corridors. Conservation Halton believes the North Oakville area provides an important greenspace for Halton's expanding communities which serves to maintain and enhance critical natural habitat for protecting and maintaining biodiversity in the watershed.

- Environmental Sustainability Plan. The Environmental Sustainability Plan (ESP) for the Town of Oakville was first approved in 2005 and with the most recent update in 2018. As the Town's environmental master plan, the ESP contains a vision, guiding principles and goals with action plans and implementation processes. The ESP further supports the conservation of biodiversity through a number of its goals:
    - To sustain and enhance our natural environment;
    - To reduce our resource consumption and waste production
    - To establish an environmentally friendly transportation network
    - To create and support a healthy, resilient community
    - To foster environmental stewardship through education

- To lead in applying innovative best environmental management practices

and through its specific direction to develop and implement a biodiversity strategy.

- Growing Livability. Oakville conducted an urban forest canopy assessment to map land over across the Town of Oakville south of Dundas Street, to quantify the distribution of existing and potential urban forest canopy, and to track canopy cover since 2005. The results of the assessment formed the basis of recommendations to decision makers in urban forestry and urban planning in the Town of Oakville, to seek and enhance the growth potential and health of Oakvilles urban forest and attain a goal of 40% urban forest canopy cover. With respect to biodiversity, the report acknowledges that urban forests with high species diversity is better equipped to absorb the effects of species-specific disease or pest outbreaks than an urban forest with lower species diversity. It does not acknowledge however that other ecosystem types (e.g., wetlands, meadows, etc.) are largely beneficial to biodiversity, and that implications may exist for conserving and sustainably meeting biodiversity targets for one ecosystem type over others.

- Town of Oakville Urban Structure Review. The urban structure review focuses on the town's urban structure – including natural heritage and open space, as well as residential, commercial, employment and mixed-use areas – to see if changes are necessary to accommodate trending urban growth. The proposed amendments (Sept 26, 2017) although awaiting approval from the Halton Region, provide a framework for how the town will accommodate required growth to 2041, while protecting natural heritage, open space and cultural heritage features.

- Urban Forest Strategic Management Plan. This document is a strategic management plan for Oakville's urban forest south of Dundas St. It's presented as a more effective approach to the management and stewardship of Oakville's 'green infrastructure' and provides direction for the use of native species [stock] in both intensively and extensively managed areas for the preservation and enhancement of local natural biodiversity. The objectives of the Forest Strategic Management Plan will be met by:
  - Helping partners identify a range of species, seed sources and stock types required for priority site restoration.
  - Coordinating stock demand and appropriate supply for planting
  - Promoting the ecological value of native species and seed source identification (e.g. certification).
  - Identifying superior seed sources (forests) and working with owners to help ensure a long-term supply of seed for Oakville.
  - Forecasting, collecting, documenting and tracking the use of high quality seed.
  - Establishing a long-term program that will address seed source management, seed crop forecasting, collection and banking and seedling production in support of the Oakville Restoration Strategies.

- Parks, Recreation and Library Facilities Master Plan. This plan is meant to ensure the wellbeing of Oakville residents through the cohesive development of communities through parks, recreation and library facilities and amenities. One of the recommended strategies (No. 52) in support of biodiversity is to:

  Improve awareness and understanding about the natural heritage system within the community, the features and areas it contains, and how to maintain and enhance its resources through various initiatives

and programs (e.g., Environmental Strategic Plan, Adopt-a-Park, urban forestry, etc.). In consultation with residents, continue to identify and pursue opportunities within existing and future parks for naturalization/ restoration initiatives.

- A Healthy Green Space Strategy for Public Lands. This strategy was developed cooperatively from the town working with other levels of governments, community organizations, businesses and individual residents to better conserve, connect and restore the green spaces that are considered "vital features" of Oakville's landscape. This Strategy outlines the many initiatives the Town currently has underway to promote, maintain and enhance the long-term ecological health of Oakville's parks and open spaces with the ultimate goal of cleaner air, cleaner sources of water, more wildlife habitat, better soil conservation, new recreational opportunities, and a better connection to nature, which ultimately, in principal, support biodiversity and natural values.

- Oakville Harbours Master Plan. To ensure that Oakville Harbour and Bronte Harbour continue to thrive, the town developed a Harbours Master Plan with an explicit key direction to *'Protect Natural Features'.* The master plan covers a significant waterfront area and makes specific recommendations for Shipyard Park, Tannery Park, Walker Street Promenade and Waterworks Park.

- Oakville Wildlife Strategy. The Oakville Wildlife Strategy (OWLS or the "Strategy") was developed as part of the implementation associated with the Town of Oakville's 2005 Environmental Strategic Plan (ESP). Action 1.1.3 of the ESP states, "to develop a Wildlife Management Plan in order to maintain biodiversity recommended for implementation in the short term (1 to 2 year timeframe)". The Town of Oakville currently recognizes a number of challenges associated with wildlife, largely as a result of urbanization. This strategy was developed to identify and collate information and procedures for dealing with wildlife in Oakville through the identification of challenges and opportunities. Two fo the six outlines objective of OWLS related to this initiative is to:
  - Conserve biodiversity;
  - Education staff and the public on wildlife, including legislation and regulatory requirements.

  These objectives were developed through consultation with staff, partner agencies and other stakeholders. In developing and implementing policies and procedures that deal with wildlife in the town of Oakville, the following four relevant guiding principle will be applied:
  - All species have an intrinsic value within their ecosystems and to the people of Oakville;
  - An adaptive management approach will be applied to ensure that policies and procedures are continually evaluated and improved based on new information;
  - The Oakville Wildlife Strategy will be considered for review periodically to ensure the documents remain current and meaningful;
  - Policies and procedures will be supported by the best available scientific information and community knowledge;
  - A landscape and ecologically-based approach is central to conserving biodiversity and using natural resources in a sustainable manner;
  - Policy and procedure approaches will be developed in collaboration with interested public, staff and stakeholders.

- FSC Principles and Criteria. The Forest Stewardship Council (FSC) Principles and Criteria describe the essential elements or rules of environmentally appropriate, socially beneficial and economically viable forest management. There are ten

principles setting out this vision; each of which is supported by several criteria that provide a way of judging whether the principle has been met in practice. The FSC Principles that relate to biodiversity require the forest owner or manager to do the following:

- **Principle 6: Environmental Values and Impacts** - maintain, conserve and/or restore ecosystem services* and environmental values* of the Management Unit*, and shall avoid, repair or mitigate negative environmental impacts;
- **Principle 7: Management Planning** - have a management plan* consistent with its policies and objectives* and proportionate to scale, intensity and risks* of its management activities. The management plan shall be implemented and kept up to date based on monitoring information in order to promote adaptive management*. The associated planning and procedural documentation shall be sufficient to guide staff, inform affected stakeholders* and interested stakeholders* and to justify management decisions.
- **Principle 8: Monitoring and Assessment** - demonstrate that, progress towards achieving the management objectives*, the impacts of management activities and the condition of the Management Unit*, are monitored and evaluated proportionate to the scale, intensity and risk* of management activities, in order to implement adaptive management*
- **Principle 9: High Conservation Values** - maintain and/or enhance the High Conservation Values* in the Management Unit* through applying the precautionary approach*.

- North Oakville Creeks and Subwatershed Study. The management strategy outlined in Section 6.0 of the North Oakville Creeks Subwatershed Study (Subwatershed Study) provides a recommended approach for the management of the Natural Heritage System and guidance for future land use changes in accordance with the North East Oakville Secondary Plan. The management strategy identified the potential to create a Natural Heritage System. It also specified the land use requirements (i.e., constraint lands), together with associated management requirements, for the lands associated with the Natural Heritage System.

  Specifically, the management strategy recommended, in support of biodiversity, that the Natural Heritage System be comprised of the following areas:

  - Core Areas;
  - Linkages; and
  - High and Medium Constraint Stream Corridors.

  Biodiversity monitoring was recommended for fish communities on Fourteen Mile, East Morrison and Joshua's Creeks and for invertebrate communities in the other watercourses. Both species richness (number of species) and evenness (distribution of individuals across species) is provided as a recommended measurement of biodiversity using common indices such as those developed by Shannon and Weaver, and Simpson both of which are scientifically defendable.

- Stormwater Master Plan. For fifty years, the Town of Oakville has had a stormwater system in place. To build on this progress and to ensure long-term maintenance for stormwater management, Oakville has developed a Stormwater Master Plan called 'Be rain ready'. The plan is considered essential due to increases in extreme rain events being experienced in Southwestern Ontario. To protect residents from flooding while also preserving the natural environment, the Strategy has been built upon the vision "to build the town's resiliency to the impacts of a changing

climate", and has been structured around three (3) objectives as follows:

- Objective 1: to increase the town's capacity to protect against and respond to projected climate changes;
- Objective 2: to educate staff and residents through effective and efficient means of communication;
- Objective 3: to monitor the implementation of adaptation action and goals in order to make continuous operational improvements.

- Town of Oakville Municipal Natural Assets Pilot. Intensification of land use in Oakville, primarily in the form of larger homes than traditional norms, has been recognized as putting increased pressure on the existing storm water system. As new, larger homes are built, there may be a corresponding and tangible loss of storm water service to the municipality through reductions in permeable surface to absorb and manage the water. For this reason, the Town of Oakville is leading a pilot project to better understand the Town's Municipal Natural Assets. The pilot area is fully urbanized, and so the natural assets that form the basis of the pilot include: publicly-owned ditches, green spaces, tree canopy and the remnants of once-intact streams; and, privately held natural assets such as streams and ditches on the property of individual landowners. Management questions that Town of Oakville is exploring through the Municipal Natural Assets (MNA) initiative include:
  - What is the value to the Town of the loss of municipal services created by the conversion of existing natural assets, and is there any corresponding financial risk and/or liability to Oakville?
  - What can be learned from the remnant stream in the pilot area that would help Oakville better prioritize and manage other streams in the community?
  - Can the monetization of municipal services create a basis for new municipal strategies to manage natural assets?

- Glenorchy Master Plan. The Glenorchy Conservation Area Master Plan consists of development and restoration plans, resource and park management plans, as well as preliminary assessments of capital and operating costs. The vision of the master plan is to protect and enhance the significant natural features and ecological functions of the conservation area while providing opportunities for the public to gain an appreciation for this significant area and allow for limited recreational opportunities. This master plan serves as the principal guiding document for the future planning, design, development and resource management of the conservation area in accordance with all relevant acts and regulations and with the terms and conditions of the property management agreement that Conservation Halton entered into with the Ontario Realty Corporation. The 401 hectares of the property are to be protected and enhanced to achieve sustainability of a range of vegetation communities that have been recognized as providing habitats for a broad diversity of species. Restoration projects have been prioritized based on the degree of ecological function the project is likely to restore or improve. A large tract of native grassland will be established in the centre of the conservation area. Treed swamp, riparian and other wetlands will be enhanced, restored or created as a result of the Plan.

All of the key actions outlined in the implementation of this plan support biodiversity principles:

- Close and restore existing unauthorized roads and trails;
- Secure the property from unauthorized and/or illegal uses such as hunting, dumping, motorized vehicles;
- Prepare a detailed restoration plan for forest, wetland/riparian and grassland/prairie habitats;

- Establish the proposed trail system and associated amenities such as interpretive signage, lookouts and webcams;
- Develop a Visitor Impact Management program;
- Monitor and protect species at risk;
- Manage for invasive species;
- Encourage and seek partnerships that support cost sharing and sponsorships.

- Long Term Environmental Monitoring Program Reports. In 2005, Conservation Halton implemented the Long Term Environmental Monitoring Program (LEMP for short). This program ensures that monitoring is completed in a consistent manner over an extended period of time. It also provides a comprehensive understanding of the structure and function of local ecosystems, which has been deemed necessary for assessing the long-term health of the watershed. Designed to monitor species, ecosystems, and changes in the watershed over time, the Long Term Environmental Monitoring Program helps ensure that Conservation Halton's mission of "protecting and enhancing the natural environment, from lake to escarpment, for the benefit and enjoyment of present and future generations" is being fulfilled.

- Halton Natural Areas Inventory. The Halton Natural Areas Inventory is a project that provides important information on the biodiversity of Halton's natural areas. Conservation Halton's watershed has many natural areas that support a rich diversity of natural features, including rare plants and animals, significant habitats and geological formations, and important wildlife corridors. There had been a number of efforts to achieve a better understanding of the flora and fauna in this area, but there had never been a comprehensive biological inventory of these areas. In 2003 and 2004, three local Naturalists clubs—Hamilton Naturalists' Club, South Peel Field Naturalists' Club, and Halton North Peel Naturalist Club—along with municipal partners and other stakeholders joined forces to conduct plant and animal surveys throughout many of the natural areas in Halton Region. In order to conduct the inventory, many landowners granted access onto their properties to the group. Copies of the Inventory are available for purchase through Conservation Halton.

- Greenlands Securement Strategy. In 2005, Regional Council adopted the Regional Official Plan Amendment (ROPA) # 25, which included new Greenlands System protection policies and a corresponding land securement strategy as a long-range planning objective. Regional Council also authorized the Halton Green Fund to assist in funding land securement. After developing this program in consultation with various stakeholders and potential partners, the Halton Greenlands Securement Program (GSP) was endorsed by Regional Council for implementation in 2009. The GSP was originally designed to educate conservation-minded landowners about the variety of long-term conservation options available to them. It also focused on bringing together land securement partners, funding partners and other available resources within the Region. The goal of the GSP is to work cooperatively with partners to permanently secure conservation lands in the Greenlands System by keeping this land in public ownership. The Greenlands Securement Strategy discusses options for protecting valuable green space in Halton for current and future generations and complements existing programs by conservation authorities and other agencies involved in land securement for permanent natural heritage protection.

  The main goal of the GSP is to achieve the minimum recommended target of 12% of the region being under long-term protection – doubling the 6.3% of already publicly protected lands.

- Halton Region Official Plan. The Regional Official Plan (ROP) is Halton's guiding document for land use planning. It contains the goals, objectives, and policies that manage growth and direct physical change and its effects the social, economic and natural environment of the Region. The ROP is reviewed periodically to ensure that it remains responsive to Halton's needs and the vision of Regional Council. The last review – called Sustainable Halton – was undertaken to update the Halton Region Official Plan (2006). It culminated on December 16, 2009 with Regional Council unanimously adopting Regional Official Plan Amendment No. 38 (ROPA 38). Certain policies of the Regional Official Plan are now approved and in force as of the date set out in the OMB Order, subject to site specific or area specific matters. The new September 28, 2015 Interim Office Consolidation has been prepared to show those policies that are approved and in force as well as those policies that remain under appeal.

  Greenlands Securement Strategy. The Regional Municipality of Halton ("*Region*") covers over 93,887 hectares of land and is home to 439,256 residents (2006 Census). In addition to the prominent Niagara Escarpment and Lake Ontario shoreline, the Region is characterized by 18,500 ha of forests, wetlands, river and stream corridors and other natural features designated as the Regional Greenlands System ("Greenlands System") within its Official Plan, which may be termed Natural Heritage System (NHS). There are currently 5,494 ha or approximately 30% of the Greenlands System secured in public ownership by the Region's partners. However, on a total land mass basis only 6.3% of the Region has achieved environmental long-term protection. The Greenlands Securement Strategy ("Strategy") is intended to bring to the table land securement partners ("Halton Partners"), funding partners and other available resources within the Region to work cooperatively towards complimentary goals of securing further greenlands. In order to meet a minimum recommended target of 12% of protected areas over the entire Region, this strategy sets an achievable goal of the addition of 5,355 ha over the next 15 years. This equates to the permanent securement of 357 ha per year based on the assumption that properties in the Region have an average parcel size of 14 ha. The securement or acquisition of greenlands will be achieved through fee simple donations first (full value or split-receipt), followed by conservation agreements and purchase last.

  Switching Gears Transportation Master Plan. Oakville's Switching Gears: Transportation Master Plan (TMP) considers all modes of transportation including public transit, walking, cycling and ride-sharing along with strategic roadway improvements to ensure safe, convenient and efficient transportation for people and goods. It is the town's guiding document for the development of practical, sustainable, long-term plans to guide the town's transportation system that serves to meet the needs of anticipated growth in the Town. Environmental Sustainability is key consideration in the MTP through the promotion of alterative travel modes to increase sustainability and reduce impacts to air quality, both of which support biodiversity values and functions.

- Active Transportation Master Plan. The Active Transportation Master Plan (ATMP) recommends an extensive network of facilities composed of on-road and off-road paths designed to meet the needs of a range of active (non-vehicle) transportation users. The plan focuses on expanding the network, and promote cycling and walking in Oakville. The town of Oakville recognizes that transportation is a major contributor of Ontario's Green House Gases (GHGs). Cycling and walking emit no GHGs which supports biodiversity and ecosystem services.

APPENDIX 5 COMPARISON OF AICHI BIODIVERSITY GOALS AND TARGETS WITH NATIONAL AND PROVINCIAL TARGETS AND OSB TARGETS AND INDICATORS

Aichi Targets	Canada's Draft National Targets	Ontario's Provincial Targets	OSB Targets	OSB Indicators
Aichi Goal A. Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society				
1. By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.	18. By 2020, biodiversity is integrated into the elementary and secondary school curricula. 19. By 2020, more Canadians get out into nature and participate in biodiversity conservation activities.	1. By 2015, biodiversity is integrated into the elementary, secondary and postsecondary school curricula, including schools of business. 2. By 2015, 50 per cent of Ontarians understand biodiversity and its role in maintaining their health and well-being. 3. By 2015, the number of Ontarians who participate in biodiversity conservation activities is increased by 25 per cent.	1. By 2018 Oakville has adopted the OSB 2. By 2019 an OSB Communication Strategy is increasing people's awareness of the values of biodiversity and providing guidance in how they can help protect biodiversity 3. By 2020 Oakville produces an Annual Biodiversity Report Card	• Council Approval of OSB • Communication Strategy completed • # of biodiversity communication events organized and # of public attending • biodiversity communication materials prepared and disseminated • biodiversity communication signage installed • publication of Annual Biodiversity Report Card
2. By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.	4. By 2020, biodiversity considerations are integrated into municipal planning and activities of major municipalities across Canada. 17. By 2020, measures of natural capital related to biodiversity and ecosystem services are developed on a national scale, and progress is made in integrating them into Canada's national statistical system.	5. By 2020, all relevant policies and programs integrate biodiversity values.	4. Biodiversity strategies integrated into Town policies, procedures and programs 5. Work with the private sector to encourage development and implementation of biodiversity strategies	• % of Oakville procedures and programs that address protection of biodiversity • # private agencies that have developed programs that address protection of biodiversity

Aichi Targets	Canada's Draft National Targets	Ontario's Provincial Targets	OSB Targets	OSB Indicators
3. By 2020, at the latest, incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio-economic conditions	13. By 2020, innovative mechanisms for fostering the conservation and sustainable use of biodiversity are developed and applied.	14. By 2020, programs and policies are in place to maintain and enhance ecosystem services.	6. Expand incentive programs supporting biodiversity protection and enhancement activities	• # of persons or agencies utilizing incentive programs • annual budget provided for incentive programs
4. By 2020, at the latest, Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits.	3. By 2020, Canada's wetlands are conserved or enhanced to sustain their ecosystem services through retention, restoration and management activities. 6. By 2020, continued progress is made on the sustainable management of Canada's forests 7. By 2020, agricultural working landscapes provide a stable or improved level of biodiversity and habitat capacity. 8. By 2020, all aquaculture in Canada is managed under a science-based regime that promotes the sustainable use of aquatic resources (including marine, freshwater and land based) in ways that conserve biodiversity 9. By 2020, all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem-based approaches.	4. By 2015, all sectors have initiated the development of implementation plans in support of Ontario's Biodiversity Strategy, and by 2020, those plans are implemented. 9. By 2020, the growth of Ontario's per-capita resource consumption and waste generation is halted and reversed.	7. Oakville should continue to lead by example through continuing and expanding its policies and program related to the sustainable use of resources 8. Manage all forest areas sustainably to meet FSC certification standards	• use of certified sustainably produced paper products in all Town facilities • Annual Town facility energy management objective met • FSC certification maintained (audits passed)

Aichi Targets	Canada's Draft National Targets	Ontario's Provincial Targets	OSB Targets	OSB Indicators
Aichi Goal B. Reduce the direct pressures on biodiversity and promote sustainable use				
5. By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.	3. By 2020, Canada's wetlands are conserved or enhanced to sustain their ecosystem services through retention, restoration and management activities. 6. By 2020, continued progress is made on the sustainable management of Canada's forests. 7. By 2020, agricultural working landscapes provide a stable or improved level of biodiversity and habitat capacity.	12. By 2015, natural heritage-systems plans and biodiversity-conservation strategies are developed and implemented at the municipal and landscape levels. 14. By 2020, programs and policies are in place to maintain and enhance ecosystem services.	9. Oakville has no net loss of natural habitats 10. Tree canopy coverage consistent with UFSMP 11. Work towards increasing and/or improving natural wetland and beach habitats along the Lake Ontario shoreline	• percent natural areas in Oakville • tree canopy % • percent of Lake Ontario shoreline supporting natural wetland and beach habitats
6. By 2020 all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.	9. By 2020, all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem-based approaches.		12. Develop OSB communication strategy promoting sustainable fishing practices in Oakville 13. Support programs and policies that reduce contamination of Oakville creeks and the Lake Ontario waterfront	• # of communication events organized and # of public attending • sustainable fishing and clean water communication materials prepared and disseminated • sustainable fishing and clean water communication signage installed
7. By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.	6. By 2020, continued progress is made on the sustainable management of Canada's forests 7. By 2020, agricultural working landscapes provide a stable or improved level of biodiversity and habitat capacity. 8. By 2020, all aquaculture in Canada is managed under a science-based regime that promotes the sustainable use of aquatic resources (including marine, freshwater and land based) in ways that conserve biodiversity.	11. By 2015, the proportion of private lands in Ontario that are managed for biodiversity is increased.	8. Manage all forest areas sustainably to meet FSC certification standards	• FSC certification maintained (audits passed)

Aichi Targets	Canada's Draft National Targets	Ontario's Provincial Targets	OSB Targets	OSB Indicators
8. By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.	10. By 2020, pollution levels in Canadian waters, including pollution from excess nutrients, are reduced or maintained at levels that support healthy aquatic ecosystems.	8. By 2015, the release of pollutants harmful to biodiversity is reduced.	14. Ensure stormwater management meets or exceeds guidelines that support healthy aquatic ecosystems	• nutrient and toxin monitoring of Oakville's aquatic systems • # of communication events addressing nutrient runoff and toxins and # of public attending • reducing fertilizer use and controlling toxins communication materials prepared and disseminated • percentage of days that Lake Ontario beaches meet bacterial standards considered safe for swimming
9. By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.	11. By 2020, pathways of invasive alien species introductions are identified, and risk-based intervention or management plans are in place for priority pathways and species.	7. By 2015, strategic plans are in place to reduce the threats posed to biodiversity by invasive species.	15. Develop and implement a comprehensive Invasive Species Management Plan for Oakville	• Invasive Species Management Plan developed and being implemented • resources allotted for invasive species management • hectares invasive species removed
10. By 2015, the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning.	3. By 2020, Canada's wetlands are conserved or enhanced to sustain their ecosystem services through retention, restoration and management activities.		16. Oakville has a Climate Change strategy that includes plans to mitigate GHG emissions	• # of electric car charging sites • # of electric cars/trucks/buses operated by Town of Oakville • percent tree canopy coverage sequestering carbon • Annual targets met for town's facilities energy reductions
Aichi Goal C. To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity				
11. By 2020, at least 17% of terrestrial and inland water, and 10 % of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscape and seascapes.	1. By 2020, at least 17 % of terrestrial areas and inland water, and 10 % of coastal and marine areas, are conserved through networks of protected areas and other effective area- based conservation measures. 16. By 2020, Canada has a comprehensive inventory of protected spaces that includes private conservation areas.	13. By 2020, at least 17 per cent of terrestrial and aquatic systems are conserved through well-connected networks of protected areas and other effective area-based conservation measures.	17. Oakville protects at least 17% of terrestrial and inland water areas in a natural state supporting biodiversity 11. Work towards increasing and/or improving natural wetland and beach habitats along the Lake Ontario shoreline	• percent natural areas in Oakville • percent of Lake Ontario shoreline in natural wetland and beach habitats

Aichi Targets	Canada's Draft National Targets	Ontario's Provincial Targets	OSB Targets	OSB Indicators
12. By 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.	2. By 2020, species that are secure remain secure, and populations of species at risk listed under federal law exhibit trends that are consistent with recovery strategies and management plans.	10. By 2015, the status of species and ecosystems of conservation concern in Ontario is improved.	12. Oakville's SAR populations remain secure or show signs of recovery	• natural area monitoring data on the status of SAR
13. By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio- economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.			n/a	
Aichi Goal D. Enhance the benefits to all from biodiversity and ecosystem services				
14. By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.	3. By 2020, Canada's wetlands are conserved or enhanced to sustain their ecosystem services through retention, restoration and management activities.	14. By 2020, programs and policies are in place to maintain and enhance ecosystem services.	17. Oakville protects at least 17% of terrestrial and inland water areas in a natural state supporting biodiversity 11. Work towards increasing and/or improving natural wetland and beach habitats along the Lake Ontario shoreline	• percent natural areas in Oakville • percent of Lake Ontario shoreline in natural wetland and beach habitats
15. By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15% of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.	3. By 2020, Canada's wetlands are conserved or enhanced to sustain their ecosystem services through retention, restoration and management activities.	6. By 2015, plans for climate-change mitigation are developed and implemented and contribute to Ontario's target to reduce greenhouse-gas emissions by 6 per cent below 1990 levels.	16. Oakville has a Climate Change strategy that includes plans to mitigate GHG emissions	• # of electric car charging sites • # of electric cars/trucks/buses operated by Town of Oakville • percent tree canopy coverage sequestering carbon • Annual targets met for town's facilities energy reductions

Aichi Targets	Canada's Draft National Targets	Ontario's Provincial Targets	OSB Targets	OSB Indicators
16. By 2015, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation.		n/a	n/a	
Aichi Goal E. Enhance implementation through participatory planning, knowledge management and capacity building				
17. By 2015 each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan.		n/a	n/a	
18. By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels	12. By 2020, customary use by Aboriginal peoples of biological resources is maintained, compatible with their conservation and sustainable use. 15. By 2020, Aboriginal traditional knowledge is respected, promoted and, where made available by Aboriginal peoples, regularly, meaningfully and effectively informing biodiversity conservation and management decision-making		18 Oakville has engaged Aboriginal peoples in the development and implementation of OSB	• Number of mechanisms in place for Aboriginal traditional knowledge (ATK) to inform decision- making

Aichi Targets	Canada's Draft National Targets	Ontario's Provincial Targets	OSB Targets	OSB Indicators
19. By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.	5. By 2020, the ability of Canadian ecological systems to adapt to climate change is better understood, and priority adaptation measures are underway. 14. By 2020, the science base for biodiversity is enhanced and knowledge of biodiversity is better integrated and more accessible. 16. By 2020, Canada has a comprehensive inventory of protected spaces that includes private conservation areas.	15. By 2015, a long-term monitoring and reporting system for assessing the state of Ontario's biodiversity is established and operating.	19 OSB monitoring and reporting implemented 2 By 2019 OSB Communication Strategy is increasing people's awareness of the values of biodiversity and providing guidance in how they can help protect biodiversity.	• OSB Annual Report Card • # of biodiversity communication events organized and # of public attending • biodiversity communication materials prepared and disseminated • biodiversity communication signage installed
20. By 2020, at the latest, the mobilization of financial resources for effectively implementing the Strategic Plan 2011- 2020 from all sources and in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization should increase substantially from the current levels. This target will be subject to changes contingent to resources needs assessments to be developed and reported by Parties.	In 2012, Canada submitted its baseline assessment of Canadian resources mobilized in support of biodiversity.	n/a	n/a	

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