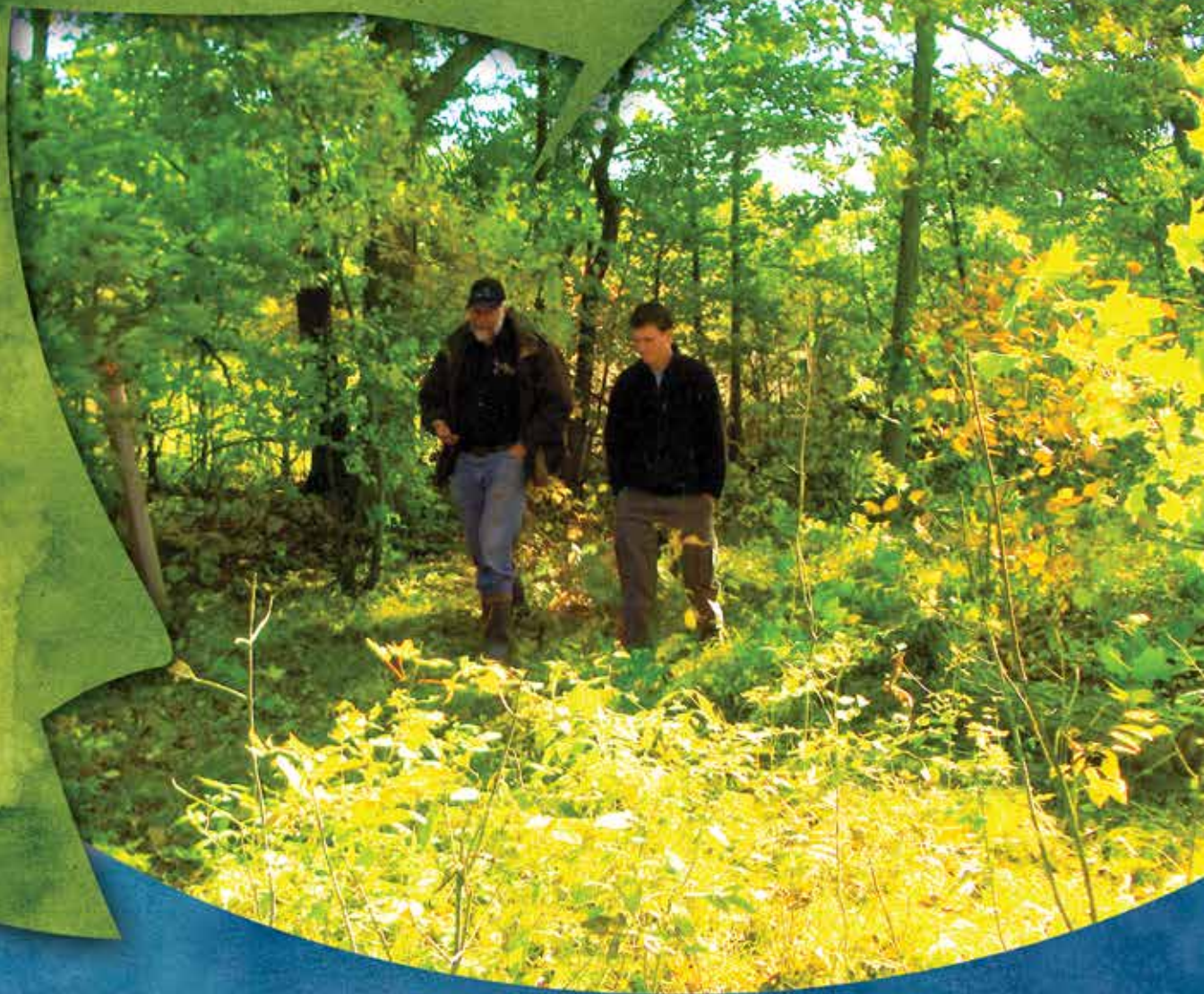


WALKER'S CREEK



LANDOWNER STEWARDSHIP GUIDE



NIAGARA PENINSULA
CONSERVATION
AUTHORITY

TABLE OF CONTENTS

Introduction 4

The Walker’s Creek Watershed 6

How to Improve Water Quality 12

Water Supply 13

Wastewater 17

Runoff & Flooding 23

Water Course Alteration 30

Erosion 34

How to Improve Habitat Quality 39

Biodiversity 40

Invasive Species 46

Species at Risk 52

Landscapes at Risk 56

Aquatic Habitat – fisheries 67

Conclusion - Get Involved! 70



250 Thorold Road West,
3rd Floor Welland, ON L3C 3W2
Phone: 905.788.3135 Fax: 905.788.1121
www.npca.ca

**WALKER’S CREEK
NEIGHBOURHOOD ASSOCIATION**

P.O. Box 20234
St. Catharines, ON L2M 7W7
Phone: 905-688-5601 ext. 1912
www.walkerscreek.ca



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INTRODUCTION

Living near natural areas is something that many people desire. It can be very satisfying to hear water trickle through a creek, watch wildlife in your backyard or have a natural feature add aesthetic value to your property. Anyone who has ever lived next to water knows, that along with the joys, come challenges. During storm events, water can overflow onto your property causing damage. Landowners are often not fully aware of how their actions may be impacting the environment around them, particularly in and around water. Seemingly simple things such as cutting grass to the edge of a creek can impact the land and may result in flooding and erosion.

This Landowner Stewardship Guide was developed for residents living in the Walker’s Creek watershed to provide information about the watershed, and provide you with options for better environmental decision making. How activities on your property are managed play a role in determining local water and habitat quality. Although no one person can solve all the issues within Walker’s Creek, as a community we can make a big impact.

- This Guide is divided into three sections:**
- 1. Walker’s Creek Watershed – an Overview
 - 2. How to Improve Water Quality in Walker’s Creek
 - 3. How to Improve Habitat Quality in Walker’s Creek

Each section outlines specific actions to help improve the overall quality of Walker’s Creek watershed. Some actions can be undertaken individually, while others may require the help of professionals. This guide will provide relevant information about why it is important to take action and what the benefits will be for you and your community. We have done our best to provide as much information as possible. Please remember that each property is unique and may require an individual assessment. We strongly recommend that before undertaking any construction activity in or near a natural heritage feature (woodlot, wetland, valley, or watercourse), you contact the Niagara Peninsula Conservation Authority (NPCA). Any work related to erosion control, bank stability, in-stream habitat, tree removal, etc., may require permits and permissions from the NPCA, and/or other agencies.

NIAGARA PENINSULA CONSERVATION AUTHORITY

Established in 1959, the Niagara Peninsula Conservation Authority (NPCA) serves approximately 500,000 people and covers an area of 2,424 km² . It encompasses the entire Niagara Region, 21% of the City of Hamilton, and 25% of Haldimand County. There is a varied range of land use within the NPCA watershed. Rural areas, including agriculture, account for 70% of our jurisdiction, with 24% of our area in natural cover and the remaining 11% consisting of urban development.

With its unique resources, the Niagara Peninsula is one of the most complex watersheds in the province. It includes lands drained by the Niagara River, Twenty Mile Creek, the Welland River and the Welland Canal. Nestled between Lake Erie and Lake Ontario and traversed by the Niagara Escarpment, the Niagara Peninsula has truly unique climatic and biotic zones that are unlike anywhere else in North America.

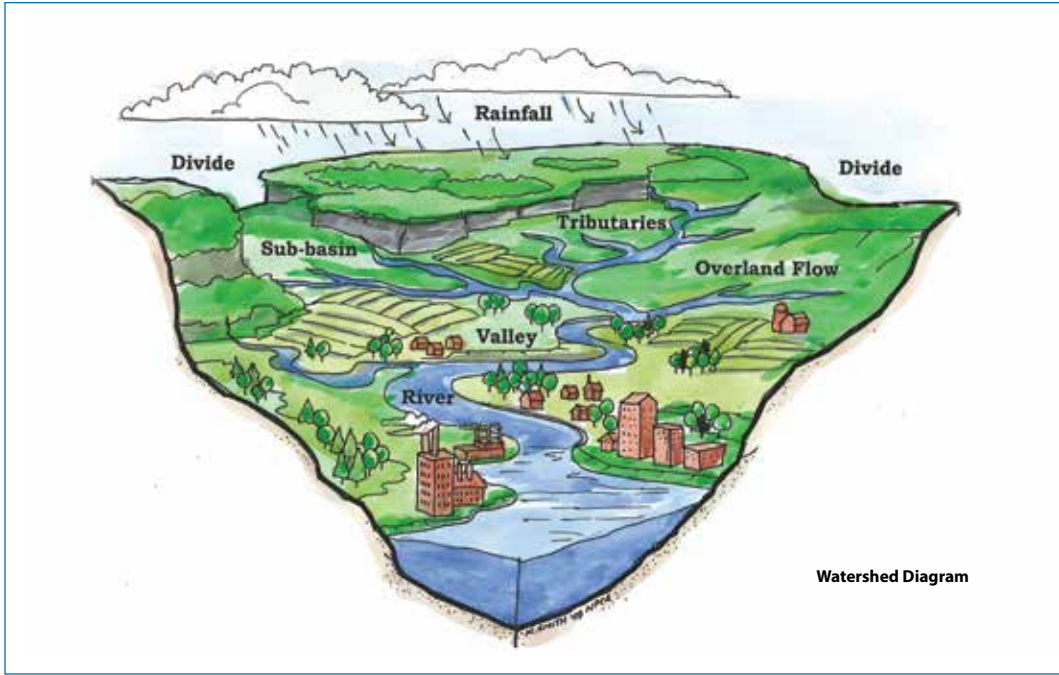
As a leading watershed management agency, the NPCA's focus is on balancing environmental protection and enhancement with human needs. Programs include; planning, regulations, water quality, stewardship, restoration, community outreach and conservation through land acquisition, and public ownership.



Niagara Peninsula Watershed Map

What is a Watershed?

No matter where you live, you live in a watershed. A watershed is an area of land over which precipitation (i.e. rain and snow) drains, defined by topography (high and low areas) and eventually forming some type of watercourse, such as a creek. As water trickles over the surface of the land, moving from high areas to low areas, it combines to form swales, creeks, streams, rivers and eventually outlets into a lake or ocean. Water always flows from high to low areas, from upstream to downstream. A watercourse is recharged or “refilled” by precipitation. The way that plants and vegetation breathe (evapotranspiration) and the permeability (ability of water to seep through spaces) of soil and bedrock, all contribute to the formation of a watershed and the water cycle.



The Walker's Creek Watershed

Walker's Creek Neighbourhood Association

The Walker's Creek watershed drains through central St. Catharines, flowing north from the QEW between Grantham Ave. and Vine St., and outlets to Lake Ontario at Cherie Park. The watershed is small and highly urbanized, with a population of 17,000 people with a drainage area of approximately 6.4 km². The area drained by Walker's Creek has a rich cultural history. Early Native Americans used the area, particularly near the entrance to Lake Ontario, as a meeting ground, where spawning fish were plentiful. As settlers arrived, many whom were United Empire Loyalists, the land was transformed from Carolinian Forest into viable farmland and homesteads. Orchards and farms became residential neighbourhoods, schools were built to accommodate the growing population, and Grantham Township amalgamated with St. Catharines.

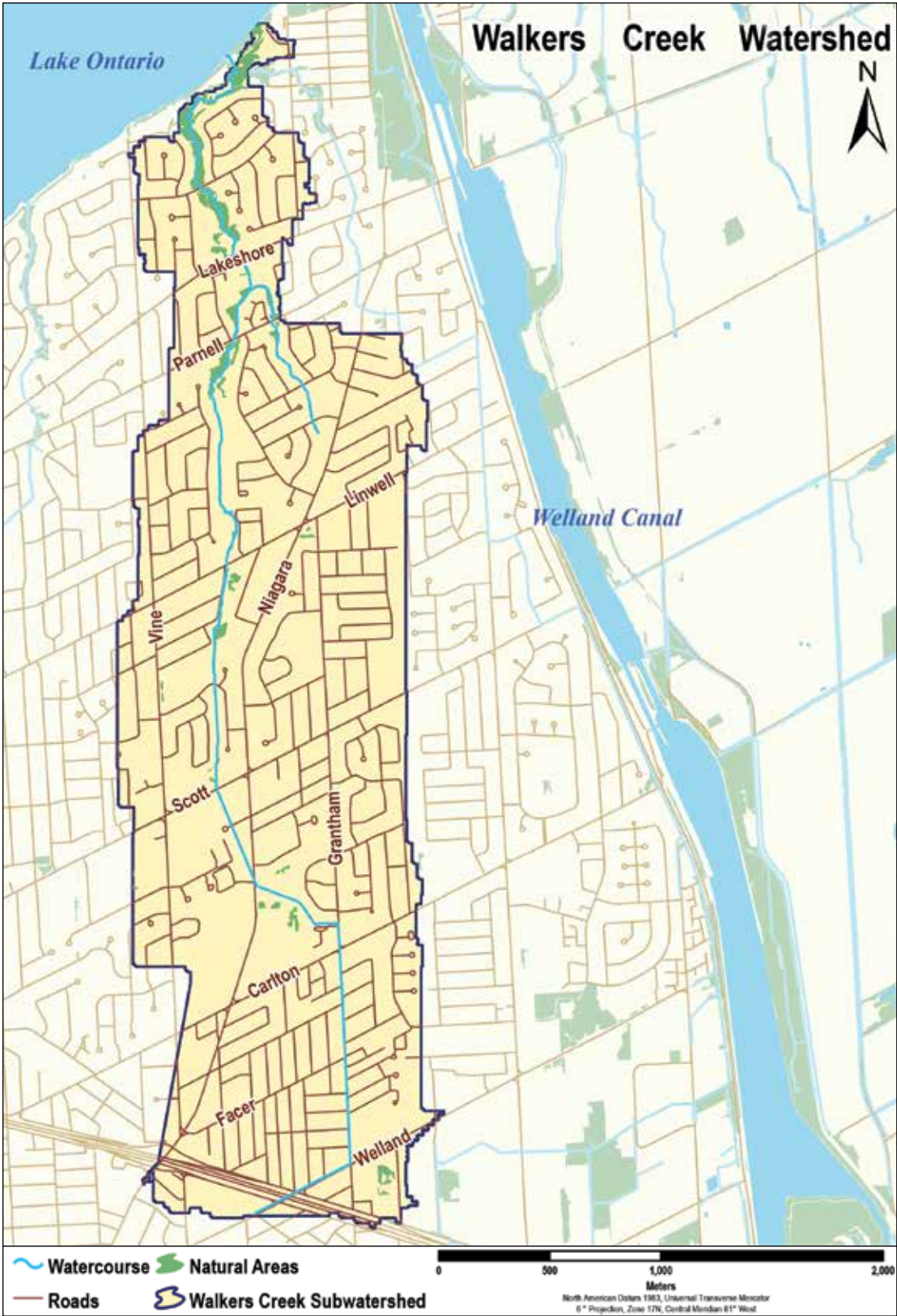


Over time, the creek transformed from a natural drainage system, to a wastewater system. It became a means to move wastewater from developing areas to the lake. Parts of the upper creek were buried beneath streets in large pipes. The “City Fathers” had the foresight to keep portions of the creek free of development and secure them in their then semi-natural state. Today, many portions of the creek remain open and visible, containing a comprehensive system of trails, parks, and natural areas. Some notable species found within the watershed include Butternut, Cherry Birch, Cucumber Tree, Flowering Dogwood, White Wood Aster, and Yellow-breasted Chat. All of these species are classified as Endangered according to Ontario Species at Risk legislation.



Stormwater System Outlet to Creek

In the upper headwater areas, the creek runs underground, as part of the stormwater system, draining east from the QEW at Welland Avenue and flowing north along Grantham Avenue. The creek channel is exposed for the first time as it flows north past Carlton St., travelling several hundred metres before returning underground to the stormwater system. The creek surfaces again north of Scott St., where it remains open until it outlets at Lake Ontario.



The mid-section of the creek, below Scott St., has been straightened and channelized, with some natural stream-side vegetation present. The creek still functions as an open stormwater system in this area. North of Linwell Road, the creek opens up to resemble a natural system, meandering through residential areas with adjacent park features.



Mid-section of Walker's Creek

Cherie Park is located in the lower section of Walker's Creek and encompasses the mouth of the creek at Lake Ontario. The park is 29 hectares and contains passive and play areas, including playground equipment. The mouth of Walker's Creek has been identified by the Ontario Ministry of Natural Resources (OMNR) as suitable for Walleye spawning. The main branch, north of Scott St. and the eastern branch of Walker's Creek has also been identified as important fish habitat.



Walker's Creek at Lake Ontario



Drainage Outfall



The physical characteristics of Walker's Creek have been significantly influenced by human urbanization activity. The entire watershed is serviced municipally for sewer and drinking water. There are no combined sewer overflow systems and 80 stormwater outfalls and 12 ditch/drainage outfalls (culverts at the end of a ditch connected directly to the watercourse). Drinking water is supplied from the DeCew Falls Water Treatment Plant in St. Catharines.

The stream bed of Walker's Creek is predominately owned by the municipality of St. Catharines. Although Walker's Creek runs adjacent to many private properties, it is important to remember that no one person owns the creek. Locally, the Niagara Peninsula Conservation Authority (NPCA) is responsible for regulating activities in Walker's Creek. Any proposed floodplain changes or in-stream work or construction should be consulted in advance by the NPCA.



Bank Erosion

What are the issues?

Residents of the Walker's Creek watershed raised concerns regarding the condition of the creek and adjacent lands. In response, the Walker's Creek Neighbourhood Association was formed in 2002. The goal of the association is to improve the water quality and natural areas of Walker's Creek.

The following issues were identified by the Niagara Peninsula Conservation Authority and the Walker's Creek community:

- Odour and poor water quality from stormwater and ditch outfalls
- High flows and pollutants from urban stormwater systems
- Erosion and creek siltation
- Health concerns (including West Nile Virus)
- Stream alterations
- Debris
- Loss of natural stream functions
- Lack of riparian vegetation
- Wildlife impacts
- Agency/landowner responsibilities (who does what?)
- Flooding
- Impacts on Lake Ontario (beaches)



The Walker's Creek Neighbourhood Association advocated the need for a landowner stewardship guide to help landowners address the variety of environmental issues and develop strategies to deal with concerns. The intent of this guide is to help foster a cooperative approach between community partners and private landowners to achieve ecological sustainability.



How to Improve Water Quality

Protecting and improving water quality is important not only for humans, but for all life. All life on Earth depends on water for the simple reason that it provides our most basic need, from the smallest organisms to the largest. The human body is comprised of approximately 60% water and therefore, the water around us will in turn impact our lives, whether we see the connection or not. For this reason, it is essential for us to remember that water is a resource that we all share.

It is also important to keep in mind that the amount of water on Earth is finite and limited. The water that is in your bath tub and in the oceans is the same water that was on Earth when it was formed. The water cycle may move water from one state to another (liquid to gas through evaporation) or from one location to another, but all of the water on Earth is connected, whether it is a small creek, the Pacific Ocean or an iceberg in Alaska. We must be good stewards of this precious resource!

Humans value clean, abundant and healthy sources of water. Identifying areas of pollution inputs is critical to the long-term health of Niagara's human and non-human residents. What we do to the land is reflected in the quality of our water. If we are cutting down trees, filling in wetlands, paving over natural areas, not maintaining septic systems, pouring chemicals down drains, overusing fertilizers and pesticides, etc., poor water quality will result. Problems such as turbidity, low dissolved oxygen, and high levels of bacteria, phosphorus and other nutrients in our local water sources indicate that Niagara residents are not being good stewards of the land.

When water falls on the surface of the Earth it has to go somewhere. When it reaches the ground, it immediately starts to move, either into the soil or over it. Water always moves from a higher to a lower area. Eventually those droplets of water will combine to form or join a small swale, creek, etc., eventually making its way to a river, lake, and then ocean. This water will run over our lawns, driveways, and streets. This can have a serious impact on the quality of the local water that we use everyday.

For this reason, every landowner should consider what role their actions have on local water quality. If we can identify sources of pollution on our own property, then we can take steps to correct or reduce them. This section of the guide will help you to identify areas where changes can be made to help improve local water quality.



WATER SUPPLY

What is the problem?

Water supply is the process or activity by which water is provided for some use, such as domestic, industrial, or business. The term implies drinking water, but it is not always the case. For the purpose of this guide, when we refer to water supply we are referring to our drinking water supply only.

The demand for fresh, clean water is steadily increasing, because there are more people and practices that require it. Increasing water pollution, declining water tables, and prolonged drought conditions (climate change) are shrinking our supply of useable water. In Niagara, it may seem like we have an endless supply of freshwater, but we don't.

Only 7% of the available water on the planet is freshwater and of that, only 1% is available for drinking. North American residents use more water than anyone else in the world. The average Canadian uses 350 L of water in a single day (that's the same as filling an average bath tub almost 3 times). Of those 350 L, only 5% (17.5L) is used for drinking and cooking. The majority of the remaining water is used in the bathroom.

From an environmental standpoint, high consumption places stress on rivers, lakes and groundwater aquifers. Many rivers are dammed to hold back water, causing flooding and other serious ecological impacts. As well, the discharge of used water or treatment water can damage aquatic ecosystems.



From an economic standpoint, high water consumption requires ever-increasing and expensive investments in water system infrastructure needed to gather, deliver and dispose of water (dams, reservoirs, water treatment facilities, distribution networks, and sewage treatment). This in turn increases our energy consumption and magnifies our ecological problems.

Consuming energy causes a wide range of health and environmental impacts, from the habitat loss associated with exploration for fossil fuels and the construction of hydroelectric facilities, to the pollution resulting from the burning of fossil fuels. Fossil fuel combustion is the main source of three major air pollution problems: climate change, acid precipitation, and urban smog. According to Environment Canada, energy use produces 90% of Canada's carbon dioxide emissions, 55% of sulphur dioxide emissions, 90% of nitrogen oxide emissions, and 55% of volatile organic compound emissions.

Why should I care?

Collectively, all of our actions are having an impact on the quantity of available freshwater. You have the ability to reduce and conserve water, which in turn will improve the environment.

The benefits of conserving water include:

- Reduced stress on water and wastewater treatment plants
- Reduced infrastructure maintenance costs
- Less environmental impact

What can I do?

Learn where your drinking water comes from. The following map illustrates the seven municipal Water Treatment Plants (WTP's) located within the NPCA's watershed. These seven treatment plants supply all of the municipal water for Niagara's residents, as well as for those who order water for their personal cisterns. The seven WTP's are located in Welland, Thorold / St. Catharines, Port Colborne, Niagara Falls, Fort Erie, Grimsby, and Hamilton. All water sources are from the Great Lakes, including the Welland Canal and DeCew Falls (Lake Erie water). The DeCew Falls Water Treatment Plant in St. Catharines is the largest water treatment plant in the Niagara Region and can supply 227.3 million litres of water per day.



If you live outside of these depicted areas, you are most likely receiving drinking water from a well, cistern, or bottled water supply. If your drinking water is obtained from another source (pond, direct lake / river intake), please take care to have your water properly tested by a professional to ensure it is safe to consume.



Lawn Sprinkler

Conserve Water

Water conservation is the conscious act of using less water around our homes and in our everyday lives. Limiting water use can help prevent untreated water from entering natural watercourses and reduce stress on our freshwater resources. The following water conservation tips will help reduce the stress on both the water treatment plants that supply our drinking water and on the wastewater plants that treat our water after we use it.

Lawn

- Avoid watering your lawn in the spring. Grass will develop a deeper root system, allowing it to tap into the water table, encouraging drought tolerance.
- Listen to the weather report and water accordingly.
- Water in early morning (this reduces the chance of fungal disease).
- Lawns do not require more than 2–3cm (1 inch) of water per week.
- A low sprinkler that lays water down in a flat pattern is much better than an oscillating sprinkler, which can lose as much as 50% of what they disperse through evaporation.
- Make sure your sprinkler is aimed properly and is not leaking.
- Use a garden hose nozzle that shuts off when it is not being used.
- Avoid cutting your grass too short. Leaving it longer (between 5 and 8cm) allows the blades to provide shade for the roots, requiring less watering.

The summer is the biggest yearly peak period for water use. Half to three-quarters of all municipally treated water (drinking water) is sprayed onto lawns.

Garden

- Use a rain barrel to collect water for plants.
- Apply water directly to the base of plants, to lessen water loss through evaporation.
- Mulching around plants helps to retain moisture in the soil and protect the roots from drying out on hot summer days.
- Rethink your yard. Evaluate the areas on your property that you are currently mowing and consider retiring or naturalizing areas that you are not actively using.

Home & Business

- Low-flow showers, low-flush toilets, and composting use less energy and water.
- Dual flush toilets (two buttons or handles to flush different levels of water) use up to 67% less water than conventional toilets.



Retired Lawn Cutting Area

- Grey water from laundry and dishwaters can be recycled for flushing toilets.
- Faucet aerators break water flow into fine droplets to maintain “wetting effectiveness”, while using less water. An additional benefit is that they reduce splashing while washing hands and dishes.
- Use high-efficiency clothes washers, dishwashers, and other appliances.
- Use a broom to sweep your driveway/ walkway, as opposed to hosing it off. You can save 200 litres of water each time, plus, you can sneak in a little exercise.
- Wash your car at a public car wash. They are equipped to deal with the wastewater. If you must wash your car at home, use a bucket and rag instead of leaving the

hose running. Once the car is clean, use the hose to quickly rinse it off. This can save about 300 litres of water each time.

- Water can also be conserved by landscaping with native plants and by changing behavior, such as shortening showers and not running the faucet while brushing teeth.

Agriculture

- Keep clean water clean through rain harvesting and recycling. Capture roof water from barns and divert to cisterns, storage tanks or through a tile, away from livestock and traffic areas. Use grey water for washing farm equipment, etc.
- Choose crops that are locally appropriate and that don't require large amounts of water through irrigation. Use local climate and soil data to assist in irrigation decisions.
- For crop irrigation, optimal water efficiency means minimizing losses due to evaporation, runoff or subsurface drainage while maximizing production. Drip or trickle irrigation is one of the most efficient forms of irrigation. It saves a significant amount of water when compared to traditional irrigation systems.



WASTEWATER

What is the problem?

Wastewater is any water that has been adversely affected in quality by human influence. It is comprised of liquid waste discharged by domestic residences, commercial properties, industry, and agriculture. Sewage is wastewater that contains human waste (feces/urine), but is often used interchangeably with the term wastewater. The physical infrastructure, including pipes, pumps, screens, channels, etc., used to convey sewage from its origin to the point of eventual treatment or disposal, is termed sewerage or sewer system.

Wastewater can contain a wide range of potential contaminants in varying concentrations, including human waste, household chemicals, pharmaceuticals, nutrients, etc. A sewer system that is not properly working or maintained can leak untreated contaminants into the environment.



Wastewater and Runoff

If you live in an urban area you have likely encountered all, or a combination of the systems described below.

Stormwater System

A stormwater system collects rainwater through catch basins, usually located on the sides of roads. These catch basins are designed to capture runoff from roads, driveways, lawns, and roofs, and redirect it through a network of underground tunnels. This untreated water is discharged directly into the natural environment.

A downspout is a downward leading pipe that carries rainwater away from a roof and foundation of a building. Downspouts are often connected to or discharge towards the stormwater system or the sanitary sewer system. These connections contribute more water to the sewer systems and can cause stress on the system during rain/storm events. These stresses can cause basement or other flooding.

Municipal Sanitary Sewer System

A sanitary sewer system is used to transport wastewater from toilets, showers, sinks, etc. in our homes, businesses, and industries to a Wastewater Treatment Plant (WWTP). A WWTP cleans and filters the wastewater and then releases it back to the environment (via the nearest creek, lake or river system).

Some sanitary sewer systems still have illegal connections (i.e. sump pumps) and are subject to extraneous flows. These additional water inputs cause extra water to be diverted to the Wastewater Treatment Plant, which can cause overloading during rain/storm events.

Combined Sewer Overflow System

A Combined Sewer Overflow (CSO) system is one that consists of two partially separated pipes for stormwater and sewage. During dry periods, the wastewater goes to the WWTP, gets treated and is discharged back into the environment. When it rains, the stormwater is collected in the



Sanitary Sewer Overflow

same pipe and is also sent to the WWTP. This increases the volume of water that needs to be treated and also increases the cost to the taxpayer. During large rain events, the CSO does not have the capacity to treat and hold all of the excess water. The result is the discharge of wastewater (both sewage and stormwater) to the nearest outflow pipe. The CSO system is designed to protect against the back up of water and sewage into basements and prevent overloading of pumping and treatment facilities. Because the domestic waste is released untreated

into local water supplies, CSO's often trigger increased bacteria levels and associated problems, such as unsafe swimming conditions in lakes.

Sanitary Sewer Overflow (SSO) or Emergency Outflows are often located at various points along sewer systems. Unlike the "planned" combined sewer overflows, an SSO is a spill of raw sewage and untreated sanitary wastewater into the natural environment that occurs as a result of an accident, equipment malfunction or flooding from an extreme weather event.

If you live in a rural area, you likely have an on-site wastewater treatment system.

The following are the most common types found in the Niagara Peninsula:

Septic System

A conventional septic system is an on-site wastewater treatment system that is made of two parts, a septic tank and a leaching bed, both of which are buried in the ground. Household waste enters the septic tank and solids are allowed to settle to the bottom. Natural bacteria found within the septic tank will partially break down these solids over time, allowing for their release into the leaching bed. Grease, fat and soap will float at the top of the tank forming what is called the scum layer. Found between the solids and scum layer is the liquid waste layer.



This liquid waste layer flows out of the septic tank and into a leaching bed, where it is slowly released through different pipes into gravel layers and soil. The gravel and soil are able to naturally filter the liquid waste before it leaves the leaching bed into the natural environment. A septic system that is not properly maintained is bound to malfunction.

Therefore, be mindful of what you are putting down the drain, avoid trees or activities near the leaching bed that may damage it, and have your system serviced on a regular basis.

Biofiltration System

Biofiltration is a pollution control technique using living material to capture and treat pollutants. A biofiltration system is an advanced, on-site wastewater treatment system for residential households, cottages, small commercial, and light industrial properties, such as golf courses, wineries and restaurants. Biofiltration is a less commonly used way of treating wastewater, but is gaining popularity for its economical and environmental benefits.

Conventional septic systems discharge raw sewage directly into the landscape and rely on the soil (tile bed) to both treat and dispose of wastewater. Biofilters treat sewage before it is disposed into the landscape/natural environment. Some examples of these systems include wetlands, treatment ponds, and filter boxes/strips. Different biofilters can be used to deal with different types of waste, from runoff to sewage. Not all biofilters are able to handle the remediation of human waste.

Generally, all biofilters operate on the same principal. They create an ideal environment for beneficial bacteria to colonize on filter medium surfaces, such as wood chips or other organic materials. These microbes break down pollutants, such as coliform bacteria, ammonium, and phosphorous. Air circulates throughout the filter medium providing an aerobic treatment environment. Treated effluent is dispersed back into the soil through disposal beds or trenches and can be reused on-site for such things as irrigation or toilet flushing.

Why should I care?

Your daily actions have an impact on the quality and quantity of water entering wastewater systems and the associated costs of operating and maintaining these systems. The Environmental Protection Act and (Ontario) Building Code Act specifically require that any sewage system or any part thereof, shall not emit, discharge or deposit sewage or effluent onto the surface of the ground. Untreated contaminants can make their way into groundwater, water wells, water bodies and eventually our drinking water supply. You are required by law to properly maintain your sewer system and report any problems that may

occur. All new and replacement on-site wastewater treatment systems require a building permit and must be approved and inspected by the local enforcement agency, to ensure that it meets the requirements of the Building Code Act.

What can I do?

Know where your wastewater goes when you empty your sink or flush your toilet. If your home is in an urban area, the wastewater likely goes into a municipal sanitary sewer system, then to a wastewater treatment plant. If your home is located in a rural area or a small community, you are likely one of the 25 per cent of Canadians whose wastewater is treated by a septic system (also referred to as an on-site wastewater treatment system).

Urban Wastewater

Municipalities across the Niagara Peninsula are dedicated to reducing and eliminating CSO's and SSO's. This is an expensive and time consuming task. Currently, there are several hundred combined sewer overflows remaining. Many municipalities have installed underground storage tanks, which can hold a significant volume of stormwater, to help alleviate stress on the system during high flow events.



Downspout Connected to Storm System

One disconnected downspout can redirect thousands of litres of stormwater every year. Each city and municipality has its own bylaws for whether or not it is legal to have your downspout connected to the stormwater system. Since a downspout connected to the stormwater system can increase nuisance flooding, it is best to contact your municipality to determine the regulations in your area. The benefits of disconnecting will depend on the specific situation and whether you were originally connected to the sanitary or stormwater.

To reduce stress on the system you can disconnect your downspout, sump pump or weeping tiles from the storm and sanitary sewer systems. Roof flows and runoff can be redirected over your lawn or garden, allowing water to infiltrate into the ground. This infiltration will help to reduce the risk of flooding and also recharge the local groundwater supply. If possible, the redirection should be towards natural areas to allow a greater volume of water to be absorbed. Downspouts and eavestroughs should be cleaned regularly. In order to avoid basement flooding, downspout spillways should be extended to at least 1.8 metres (6 feet) away from your basement walls. This will avoid adding extra flow to the house drains (weepers).

Disconnection from the sanitary sewer system will result in:

- reduced overflows of the sanitary sewers
- reduced basement flooding
- reduced treatment costs at the wastewater treatment plant
- reduced energy consumption and greenhouse gases

Disconnection from the stormwater system will result in:

- reduced nuisance flooding that can cause erosion and property damage
- reduced chance of flooding caused by sewer back up
- improved groundwater recharge
- reduced pollution (i.e. sediment, nutrients, oil, grease, bacteria)
- improved aesthetics
- improved water quality for aquatic organisms



Disconnected Downspout

Rural Wastewater

The following are some things you can do to responsibly operate and maintain your on-site sewage system:

- Know the location of your tank and bed. Have the tank contents pumped out when necessary (generally every 3 - 5 years).
- Protect your sewage system – avoid driving over it and do not construct anything on or near the tank or bed. (e.g. pools, driveways, trees)
- Avoid putting food, compost or grease down the drain. Limit use of antibacterial soaps, bleaches, and harsh cleaning products.
- Conserve water. Too much wastewater will lessen the systems effectiveness. Spread water use over the course of the week.
- Keep plumbing in good repair. Leaky faucets can add an extra 1 - 5 liters of unnecessary water to your septic tank each day.

Regular inspections are important for the proper maintenance of your sewage system and can identify on-going or potential problems. Inspections can help to ensure a long, useful lifespan for your sewage system.



Yellow Fish Road™ Program

The Yellow Fish Road™ program is a hands-on environmental project intended to encourage youth to help decrease water pollution in their communities. As storm drains connect directly to local water bodies, anything entering a storm drain will end up untreated in a creek, stream, or lake. These wastes can negatively impact the aquatic ecosystem, causing harm to fish and wildlife.

Yellow Fish Road™ volunteers paint “yellow fish” symbols next to storm drains and distribute fish-shaped brochures to nearby households, reminding people that anything that enters the storm drain system can end up in their local water body.

The program is implemented nationally by Trout Unlimited Canada. To date, over 220 communities across Canada have approved and implemented this educational initiative. The NPCA is the regional coordinator for Yellow Fish Road™ in Niagara.



RUNOFF & FLOODING

What is the problem?

Runoff - Urban

Runoff is the water from rain, snow or hail that moves over the land, instead of soaking into the ground. It is easiest to see runoff on hard surfaces, such as driveways, roads, and parking lots. These are known as impervious surfaces, meaning the water is not able to soak in. In urban areas, the number of impervious surfaces is very high. Runoff is often dealt with by directing rainwater into storm drains or catchment basins.



Typical Storm Drain

soaps, fertilizers, pesticides, bacteria, and nutrients can be found in runoff. All of these things can have a negative impact on the environment. They will harm fish and wildlife and degrade surface water quality and drinking water quality for humans.

A storm drain is a grate that is found on the street by a curb or in a parking lot. Storm drains collect runoff, such as rainwater, and redirect it through a network of underground tunnels (stormwater system), discharging to the natural environment.

Runoff that is collected by storm drains may contain pollutants, including nutrients, chemicals, and bacteria. Anything that runs off lawns, driveways, sidewalks, and roads can end up in a storm drain. In urban areas, litter, salt,

In urban areas, runoff is transported (via stormwater systems) directly to the closest watercourse at a much faster rate than it would in a naturalized environment. This rapid increase in water causes inconsistent (flashy) flows and nuisance flooding. During storm events, extra caution should be exercised around urban watercourses. Children in particular should stay away from these areas.

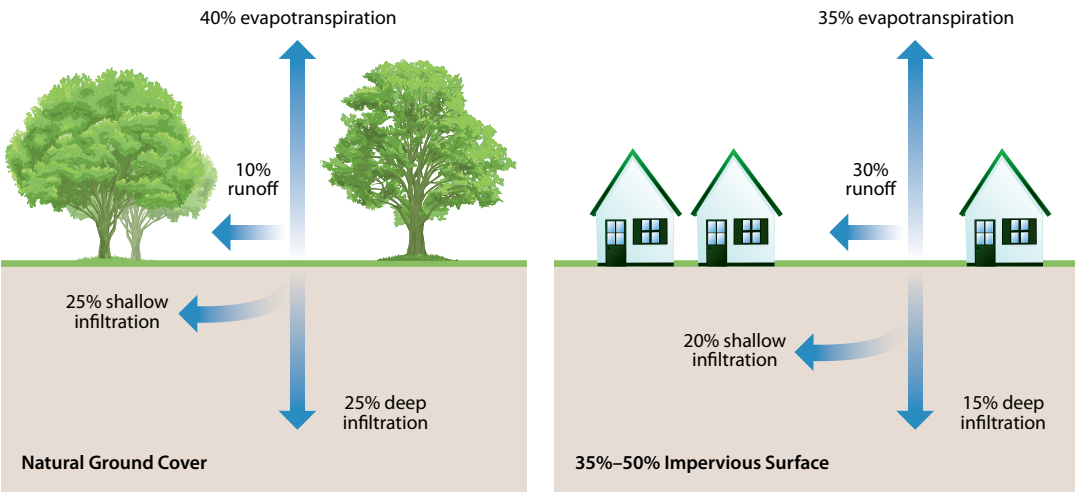
Runoff – Natural environment

In natural environments, there is less surface runoff. There are fewer hard surfaces; therefore most excess water can be absorbed into the ground. It goes through an underground network of soil, rocks, and plant roots, which eliminates many of the pollutants. During rain events, natural areas such as wetlands, act like large sponges, absorbing high volumes of water. When water is allowed to sit in a low spot, like a wetland, it will slowly seep into the ground, recharging groundwater. This water will eventually make its way back into the creek, at a very slow rate.



Typical Storm Flooding

When comparing urban runoff to that in a more natural environment, we often use the brick/sponge scenario for contrast. The urban environment is like a brick; if you pour a glass of water on a brick, it quickly runs off. The natural environment is more like a sponge; if you pour a glass of water on a sponge, it is absorbed and then slowly released.



Runoff. Hard versus a Natural Surface

When runoff occurs in a natural area, it is usually because the ground is saturated and is not able to absorb any more water. Runoff in an agricultural setting can cause problems for the farmer/producer and the environment. Surface runoff can cause a significant amount of soil loss, due to erosion and ineffective results from fertilizer, herbicides, and pesticides, all of which can be transported to the nearest watercourse, causing sedimentation and degraded water quality.

Why should I care?

There never seems to be “the perfect amount of water” in our watercourses. We often have too much or too little. The lack of natural areas and the increasing number of hard surfaces in the watershed are the main causes for this.

Having an appropriate amount of water is an important factor in determining the fate of aquatic organisms, including fish and their food sources. Many creatures rely on a sustainable flow of water in order to survive. Without the flow of water, fish are unable to move up or downstream effectively and may become “trapped” in small pools of water. Having a sustainable flow of water is aesthetically pleasing for residents living adjacent to watercourses. In addition, it can



control nuisance insects and prevents odour issues. Slowing down the rate in which water travels over the landscape improves water quality, water quantity and helps to control/lessen flooding. Water can be slowed down by capturing and controlling it.

The three main reasons for capturing and controlling rainwater/runoff are:

- improved water quality
- improved water quantity, maintaining baseflow during drier periods
- improved drainage and storage, which can prevent excessive flooding during storm events

Some benefits resulting from the capture and control of rainwater/runoff include:

- reduced surface runoff during storm events
- less pollutants entering watercourses (i.e. pesticides, oil, fertilizers)
- reduced nuisance flooding
- reduced erosion/sedimentation
- groundwater recharge
- aesthetic value
- water conservation
- reduced pressure on wastewater treatment plant
- reduced emergency sewer overflow events
- provides habitat for wildlife, such as birds, fish, pollinators, and other beneficial insects



Excellent Riparian Habitat

What can I do?

There are many ways to lessen the frequency and effects of flooding. Leaving natural areas and watercourses alone is the easiest way. Reducing/eliminating hard surfaces may be more difficult, but it can be done. For example, gravel driveways are better than asphalt. Stone paths are better than concrete. Naturalized lawns are better than manicured ones.

The following are some steps that can be taken to reduce the risk of flooding:

- Avoid building in the floodplain, or other regulated areas.
- Avoid straightening, altering or hardening a natural watercourse, even a small or intermittent one.
- Maintain a buffer area around watercourses to slow runoff and increase infiltration.
- Increase the number of recharge areas on your property.

The following four techniques are effective solutions for capturing and controlling rainwater/ runoff and can be useful in both urban and rural settings.

Riparian Buffers

A **riparian buffer** is a strip of land along the edge of a watercourse that is left in a natural state. Riparian areas are often cleared of vegetation and maintained in turf grass or utilized for agricultural purposes. Turf grass offers limited protection against runoff or erosion. Inadequate riparian buffers allow increased volumes of water to enter the creek during storm events and causes water to move quickly through the system, increasing flooding. Farming practices within the riparian zone can cause a significant amount of erosion and ineffective results from fertilizer, herbicides, and pesticides. Establishing or maintaining a healthy riparian buffer will reduce surface runoff, encourage infiltration, prevent erosion, filter pollutants, and provide shade, which will lessen water loss through evaporation.



Healthy Riparian Buffer

Rain barrels

Using a rain barrel is one of the simplest ways to capture and control rainwater. Collecting rainwater from a rooftop via eavestroughs and downspouts is a great way of reducing runoff and saving money. Rainwater is healthier for plants than municipally treated water because many plants are sensitive to chlorine and other additives. The best part is that it is free.

Reported precipitation accumulation after a normal rainfall event doesn’t usually sound like much, maybe a few centimetres. However, the amount of rain that falls onto an average size roof during a rain event quickly adds up.

How much water comes off my roof?

Average roof size:	112m ²
Average rainfall event:	2cm
Volume of water:	112m ² x 0.02m (2cm) = 2.24m ³ or 2240 L



Rain Barrel

The average person’s roof has the ability to intercept over 2000L of water per rain event. The average bathtub holds approximately 150L of water. Capturing 2000L of roof water is the equivalent of filling your bathtub up 13 times. As you can see, a significant amount of water can be diverted, controlled or captured from roof tops in rain events. The average rain barrel holds between 180L and 300L of water. There may be more water coming off your roof in a single rain event than a rain barrel can handle, therefore; many people choose to have a rain barrel at each downspout. Some rain barrels come with an overflow system that will help direct the water away from your home, should it start to overflow.

You can purchase rain barrels at most local hardware stores and many municipalities now offer subsidies. Rain barrels generally cost between \$80– \$150, depending on the size and model.

Once you obtain a rain barrel, the next step is to redirect your downspout into the barrel, use the water for your garden and save money on your next water bill. Your plants will thank you and so will your downstream neighbours.



Rain Garden

Rain Gardens

A rain garden is a simple and cost-effective way of reducing the amount of water that rushes off your property during storm events. This low maintenance garden can be easily created by redirecting the rainwater from your rooftop, via eavestroughs and downspouts.

Rain gardens are designed to collect the few centimetres of water during a rain event and allow that water to slowly seep back into the ground. Your rain garden will rarely need to be watered, because most of the water it needs will come during regular rain events. A rain garden can be planted with any type of vegetation to help facilitate absorption and transpiration. Native wildflowers, grasses, and shrubs are recommended because they are adapted to local climate and environmental conditions. They respond well with very little maintenance and are resistant to most diseases and insects which occur in Niagara. They are also the plants that local wildlife, such as birds and butterflies prefer. Finally, there is a large diversity of native plants to choose from in Niagara, which can add colour and aesthetic value to your property.

Rain gardens are capable of capturing 30% more rainwater than regular turf grass. The plants intercept rainwater, allowing it to slowly seep into the ground. In addition, this process of water filtration improves baseflow and groundwater recharge.

Will my rain garden become a breeding ground for mosquitoes?

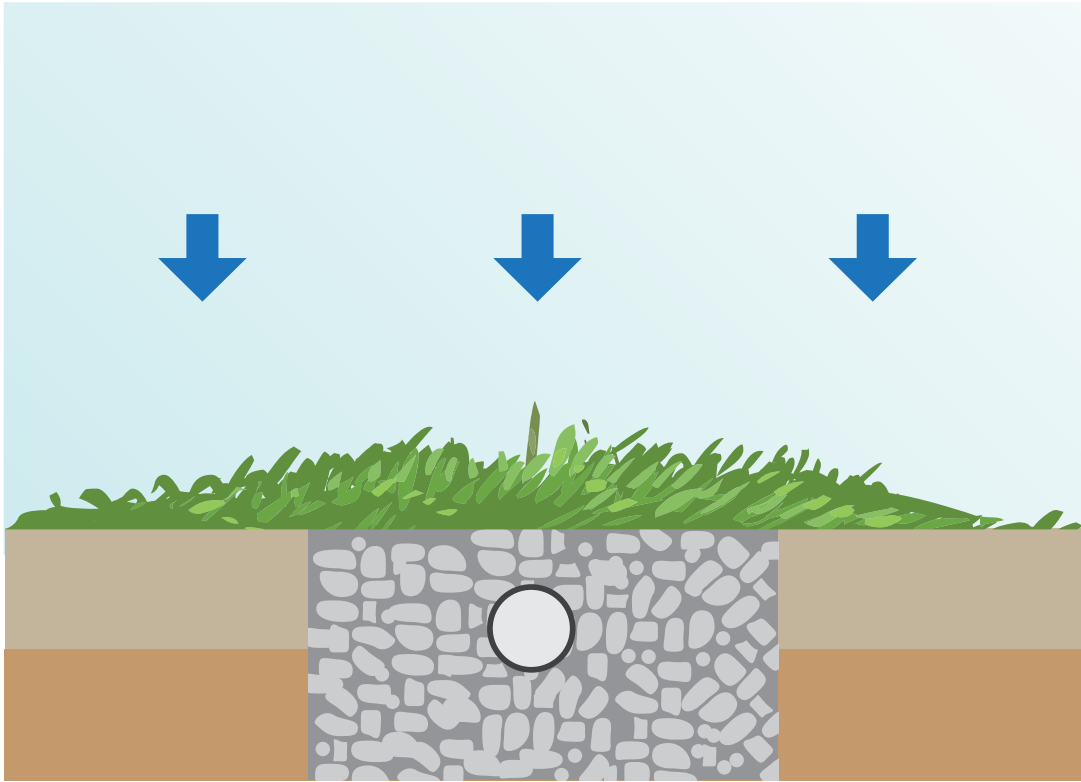
A rain garden is designed to allow rainwater to seep into the ground after a rainfall and therefore should not pond. Without prolonged ponding, the rain garden is unlikely to provide a breeding area for mosquitoes. The water will dry up before the eggs can hatch. Keep in mind that different soil types will allow the water to seep in at different rates.

Soakaway pits

Soakaway pits function similar to rain gardens by controlling and capturing rainwater/runoff by diverting water away from storm drains and watercourses. Soakaway pits are different from rain gardens, as they do not have an aesthetically pleasing above ground “living” component — they are underground. They are ideal for landowners who do not have the space to devote to a rain garden. The deep underground pit is lined with gravel, sand and other coarse materials. The gravel and sand help filter the water as it moves through the pit spaces. During this filtration process, groundwater is recharged and baseflow improves.

Unlike rain barrels and rain gardens, soakaway pits typically require professional design and installation. If you would like more information about soakaway pits contact the NPCA.

You have the ability to minimize or eliminate the pollutants running off your property. According to Environment Canada, as much as 50% of the chemicals applied to lawns and gardens, to ward off insects or to increase plant growth, end up in ground and surface water. Reducing chemical use around homes can improve local water quality and create a safer environment for children, pets, and ourselves. In addition, costs of treating drinking water can be reduced.



Soakaway Pit



WATERCOURSE ALTERATION

What is the problem?

Generally, watercourse alterations can be characterized by the addition or removal of something from a creek, stream or river. It is a common belief that by removing a fallen branch / tree from a creek or stream, you are doing something good for the environment. However, this activity can be harmful. You may be removing the homes of fish and other aquatic life and dislodging built up sediment downstream. Alternatively, the addition of objects, such as bridges, retaining walls or other hard structures can contribute to erosion, flooding, water quality impairment, and the destruction of aquatic habitat. Essentially, both activities can disrupt the natural balance of our ecosystems.

Alterations to the stream bed and bank can cause serious complications.

Some common alterations include:

- Hardening with retaining walls, riprap, armor stone, rubble, etc.
- Dredging of the stream bed
- Removing woody debris and in-stream vegetation
- Removal of existing vegetation on the creek edge (riparian area)



Hardened Creek Bank

Flooding is a natural function of any watercourse and is to be expected by anyone who lives near water. There are certain times of the year, usually in the early spring and early fall, when there is much more water on our landscape. This is typically when we experience normal flooding events. In the spring, flooding is often due to melting snow. When snow melts slowly, the water seeps into the ground, causing the soil to become saturated. Eventually the soil can't hold anymore water and it runs into nearby streams and creeks. People often dislike having excess water on their properties and want to get the water off as quickly as possible. This often leads to watercourse alterations. The work may be well intended, but frequently leads to greater complications on your own property and your downstream neighbours.

Urban Areas

In urban areas, concerns associated with flooding, water ponding, stagnation, erosion, and lack of flow are usually the results of human alterations to the watercourse. These alterations typically include channel straightening, removal of riparian vegetation, placement of rubble (bricks/concrete), armor stone, culverts, etc. These actions unfortunately do not solve the problem.



Flooding Upstream of Undersized Culvert

Straightening and cleaning out the stream bed causes water at the upper reaches of the system to travel more quickly. This may solve flooding problems initially, however, getting rid of water quicker will only cause problems to your downstream neighbours, who will now be faced with twice the amount of water in half the amount of time. This excess water will eventually back up onto your own property in greater volumes.

Water travels from high to low areas and will eventually outlet to a larger waterbody, such as a river, lake or ocean. Under high flow conditions, water will back up from the outlet (i.e. river mouth), as flooding happens from downstream to upstream. To illustrate this point, consider a highway tunnel that can accommodate two lanes of traffic in both directions. Increasing the number of lanes of traffic leading up to the tunnel, but not through the tunnel, will create a 'bottle neck' and cause traffic to build up behind the tunnel. This will eventually create a traffic jam, or "nuisance flooding", if we compare this situation to watercourse alterations, such as undersized culverts, straightening, widening, and/or deepening.

Rural Areas

In rural areas, concerns associated with the flooding, conveyance, debris jams, erosion, and lack of flow often result in alterations to watercourses. These alterations typically include “cleaning out” portions of a watercourse, as it is believed this will reduce flooding of land adjacent to the main channel. The term “clean out” as it relates to a watercourse generally involves excavating, typically with a backhoe, a section of the watercourse channel. This includes removing all plant growth, reshaping the channel bottom and banks and depositing the sediment and debris removed, adjacent to the channel. Simply “cleaning out” sections of a watercourse on a reactive basis, merely transfers water from one property to another and can result in other damage (i.e. increase in channel erosion, bank failure, slumping, and destruction of habitat). This approach treats a watercourse as a drainage ditch and ignores ecological impacts, as well as potential flooding impacts on downstream landowners.

This is a traditional approach that is not well suited for larger watercourses. The “clean out” approach can be suited for small intermittent agricultural drainage or road ditches where fewer ecological features (i.e. amphibians, fish) are present. In most natural watercourse systems, sediment deposits will establish and over time be gradually carried away as the watercourse reacts to varying flow conditions. In the Niagara Peninsula Watershed, flooding of low lying areas and roadside ditches adjacent to creek channels can be expected in both the spring and fall.

Why should I care?

By forcing water to leave your property quickly, it decreases the natural ability of the system to filter out pollutants and increases the erosive power of the water. The faster water flows, the more sediments and pollutants it picks up and carries downstream, which leads to flooding, erosion, and water quality problems.

Watercourse alterations disrupt the stream bed and will affect the aquatic organisms that live there. Healthy populations of aquatic organisms are an important part of a watercourse and help control nuisance insect populations, such a black flies and mosquitoes, among other things.



Ecologically Sustainable Creek Work

What can I do?

In order to ensure that watercourses stay healthy, we need to be mindful that they provide homes for other creatures. When possible, we should leave them alone. If intervention is required, it needs to be done in a sustainable and ecologically responsible way.



Fallen Tree in Creek

Human caused barriers or channel obstructions can cause upstream ponding of water (during low and/or high flow conditions). Preventing and eliminating these obstructions enables flows to ‘work’, with respect to moving sediment and maintaining natural channel features, such as riffles and pools. Human imposed obstructions are different than natural barriers. Natural barriers might include branches, rocks or fallen trees and provide important habitat sources for aquatic organisms, which in turn provide food sources for fish and larger organisms. In most situations, flow will redirect itself around natural features and they should not be removed. If redirected flow is causing erosion and could adversely affect a structure such as a house, then the removal can be justified. A permit may be required and we recommend you contact the NPCA for advice in this regard.

Whose tree is it anyway?

If a tree falls in a watercourse and nobody sees it, does it make a noise? You bet it does and anyone who lives near it is likely to hear about it. If you own a tree, meaning you own the land in which the majority of the root wad is housed, then the tree is your responsibility. If the tree falls into a watercourse and is not causing an erosion problem, then it can likely remain in place. If the tree falls into a watercourse and is causing erosion on your property or someone else’s, it is the responsibility of the owner of the tree, including partial or full removal. The NPCA should be consulted to provide technical advice on how to best approach removal.

EROSION

What is the problem?

Erosion is the gradual wearing away of land surface materials, including rocks, sediments, and soils, by water, wind or glaciers. Although it is a natural process, humans have accelerated erosion in many situations.

Watercourses are dynamic systems; they are constantly moving and changing. Think of a downhill skier. They move side to side in "s" shaped patterns in order to slow and control their movements. Watercourses behave in a similar way. They meander back and forth in an effort to slow and control the energy of moving water.



Healthy Stream Meander



Straightened Watercourse

In an effort to move water off our properties as quickly as possible, watercourses are often deepened and straightened. This is actually counterproductive. Flooding occurs from downstream to upstream; speeding up water will actually make flooding worse.

In addition, it increases the erosive force of the creek. To add to the problem, the increasing amount of hard or impervious surfaces in the watershed causes rainwater to run off very quickly into the creek. This excess volume of water also increases the erosive force of the water. This is very different from a natural landscape, where much of the rainwater would slowly seep into the soil. There are a number of factors that can contribute to the erosion potential of your property. The following are some of these factors.



Sandy Soil

Soil type

Different soil types have different erosion rates. Generally, soils that have greater infiltration capabilities (larger spaces to allow water to easily seep in, such as sand and loam textured soils) are less likely to erode. Soils that do not allow as much infiltration, such as clay and silt, are more likely to erode.

Other factors that contribute to soil erosion rates include the amount of organic matter in the soil and compaction. Increased levels of organic matter usually result in

better infiltration and less erosion. In contrast, heavily compacted soils do not allow much infiltration and are much more susceptible to erosion.

Slope

In general, the steeper the slope, the more likely it is to erode, as water will be moving more quickly over it. In addition, the longer the slope is, the more susceptible it will be to soil erosion, as the erosive forces will have a longer time to act on the soils.

Vegetation

If natural vegetation has been removed from the bank of a watercourse, the soil will be more likely to erode. The roots of mature trees, shrubs, and grasses help to stabilize the slope and prevent erosion. Trees that create dense shade, including Norway Maple and Manitoba Maple, can sometimes prevent the growth of understory vegetation. This results in a lack of root structure to hold the soil in place. Generally, it is best to have a mixture of wildflowers, grasses, shrubs, and trees, with some open canopy.

Hardened creek edges

Hardened creek edges, such as retaining walls, concrete, gabion baskets, rip rap, armor stone, etc., will likely cause increased erosion downstream. Hard surfaces will speed up the rate at which water moves through the channel, therefore increasing its erosive force.





Runoff Carrying Sediment

the results will runoff into the nearest creek or storm drain. As the water rushes over the landscape, it will pick up soil (and other) particles and carry them to the watercourse.

Why should I care?

Erosion problems are common for people living near water. As mentioned, some erosion is naturally occurring. Most erosion problems are caused by well intentioned landowners who are trying to solve a perceived problem. Even small creeks can become very powerful after a heavy rain. Erosion of the creek bank can cause the loss of land over time, decreasing property values and land productivity. The most susceptible part of the creek is where the water meets the land (riparian zone). This is the area that causes most concern for landowners and is the area most often changed by the landowner.

Erosion compromises water quality because it causes sedimentation. When sediment enters a watercourse it can cause a number of problems, including clogging of fish gills, suffocation



Bank Erosion

Rainfall and runoff

Runoff is the water from precipitation that moves over the land, instead of soaking into the ground. During a rain storm, the intensity of the rain drops hitting the ground can cause soil erosion. Rain tends to move lighter soil types, such as very fine sand, silt, clay and organic matter. Generally, a short, high intensity storm will cause the most severe erosion. If the rain is falling quicker than it is being absorbed,

of fish eggs, and destruction of the habitat of bottom dwelling organisms, such as crayfish and insects. The silt and sediment that enters a watercourse can increase the cost of water treatment, decrease the aesthetic quality, cause unpleasant odours, and change the structure of the creek bed (can fill it in and make the creek shallower).

The main benefits of controlling erosion include:

- Improved habitat
- Improved water quality
- Reduced silt/sediment
- Increased floodplain capacity
- Reduced threats to aquatic life

What can I do?

Prevention of erosion causing problems is the first step. The easiest and simplest way to prevent erosion is to maintain a riparian buffer of natural vegetation, such as trees, shrubs, wildflowers, and grasses. The plants that naturally grow along the bank of watercourses are vital to the stability of the bank and the health of the watercourse. Turf grass (lawn) is not naturally occurring and offers very little erosion protection.

If you took all the creeks, streams, and rivers in the NPCA watershed and lined them up end to end, their length would stretch from Niagara to Florida and back. Only 30% of this distance is adequately 'buffered' with vegetation. This means that 70% of our watercourses are extremely vulnerable to pollution. It is therefore not surprising that 70% of the NPCA's water quality monitoring stations have a rating of impaired water quality. If every person living along a watercourse in the NPCA's watershed maintained a riparian buffer, this would go a long way to improving the water quality of the creek.

Property owners have the right to protect their land from erosion. In many cases, landowners magnify their erosion problems by undertaking activities that are not properly understood or designed. Avoid building or adding weight close to the edge of a watercourse, the extra weight can cause the bank to slump and erode quickly. This includes heavy machinery or any type of large equipment (lawn mowers for example).

Ask for help. The Conservation Authority has programs to assist landowners with erosion concerns.

Any proposed floodplain or in-stream work or construction should be approved in advance by the NPCA, the municipality and possible additional agencies. We recommend you consult the NPCA anytime you are planning to work in or around a watercourse.

If your erosion problems are mild and you have a gentle slope leading to the creek, it may be adequate to plant some fast-growing trees and shrubs along the edge to establish a riparian buffer to prevent further erosion.

The following tips can assist in preventing and controlling erosion along a watercourse:

Stop mowing

Leaving an area along the edge of a watercourse to grow naturally is probably the easiest way to slow/prevent erosion. In time, trees, shrubs, wildflowers, and grasses will establish and create a buffer.

Choose native plants

Always try to use plants that are native to the Niagara Peninsula. Native plants are the species that have evolved through thousands of years of changing geological and ecological conditions. More specifically, native plants are those that were growing naturally in the area before humans introduced plants from distant places.

Plant/maintain a riparian buffer

As mentioned earlier, planting along the edge of a watercourse is a simple and cost-effective way of preventing and correcting erosion problems. Plant material can range from seeds to potted stock.



Before Riparian Buffer Project



After Riparian Buffer Project

Seed your slope

Seeding is an appropriate technique to use if you have mild erosion problems. Seeding is useful for stabilizing a slope until shrubs or trees can establish. Choose species of grasses and wildflowers that are suitable for the site conditions (light and moisture). Fast growing species are recommended. Straw mulch or biodegradable coconut (coir) fabrics may be put on top of seeded soil to hold seeds in place until they become established and prevent bird predation. It may be necessary to water the seeds for the first several months until the plants become self-sufficient.



Bank Bioengineering

Bioengineering

Bioengineering is the technique of using live plant materials in the place of hard engineering structures, to control erosion problems and unstable slopes. Bioengineering not only stabilizes slopes and reduces erosion; it also creates a riparian buffer at the same time. One of the basic tools of bioengineering is the live stake. A live stake is a pointed cutting from a living native tree or shrub (willows, poplars and dogwoods are common donors of live stakes).

The stakes are inserted into the ground, with the cut side down. With sufficient water, it will start to root and grow. The roots will form a network that holds soil in place.

Crib walls, fascines, and brush mattresses are other bioengineering techniques that can be utilized for stabilizing slopes. They can be complicated and often require civil engineering support. If you have erosion that requires complex solutions, NPCA staff may be able to provide you with technical advice.

How to Improve Habitat Quality

Creating wildlife habitat is a great thing to do, especially where there are few natural habitat areas left. As natural areas disappear, it becomes increasingly necessary to look at our own landscapes for opportunities. Native organisms, including plants, mammals, reptiles, birds,



Swamp Milkweed

amphibians, and insects create an intricate web of life. This is a wonderful natural orchestration, with each species' life cycle highly dependent on the others. For example, spring wildflowers are pollinated by and provide nectar to tiny flies. These flies become food for early spring birds. The timing is orchestrated perfectly. It is not a coincidence that local native plants have seeds and berries ready just when the birds need them. Bird droppings are also the best way for plants to get their seed dispersed.

Plants and animals that have evolved together depend upon each other for survival. In the Niagara Peninsula, pollinators such as flies, bees, wasps, and butterflies are vital to food production, supporting the world famous Niagara tender fruit and wine industry.

Unfortunately, natural areas are being lost at an alarming rate. When natural areas disappear, native vegetation disappears as well. The insects and other organisms that rely on those plants are displaced, which in turn may eradicate or displace the wildlife which depends on them. The loss of a species can quickly escalate to affect an entire ecosystem, including human health and well being.



Great Horned Owl

There are practical and economical pay-offs to encouraging a biologically diverse landscape. Healthy, balanced ecosystems clean the air we breathe and the water we drink. They also provide the food and other resources that we depend on to survive.

The next section of the guide will help you to identify areas where changes can be made to help improve local habitat quality.

BIODIVERSITY

What is the problem?

Biodiversity is the variety of all living things; the different plants, animals, and micro organisms, the genetic information they contain, and the ecosystems they form. Biodiversity includes genetic diversity, species diversity, and ecosystem diversity. These three levels work together to create the complexity of life on Earth.



Common Garter Snake

Genetic diversity is the variety of genes within a species. Each species is made up of individuals that have their own particular genetic composition. This means a species may have different populations, each having different genetic compositions. Genes are the basic units of all life on Earth. They are responsible for both the similarities and the differences between organisms. Genetic diversity serves as a way for populations to adapt to changing environmental conditions. With more variation within a species, some individuals will be better suited for the environmental stresses they are faced with. Those individuals are more likely to survive and reproduce. The population will continue for more generations because of the success of these individuals.

Genetic diversity

Genetic diversity is the variety of genes within a species. Each species is made up of individuals that have their own particular genetic composition. This means a species may have different populations, each having different genetic compositions. Genes are the basic units of all life on Earth. They are responsible for both the similarities and the differences between organisms. Genetic diversity serves as a



Blue Spotted Salamander | Rob Tervo, Photographer

Species diversity

Species diversity is the variety of species within a habitat or a region. Some habitats, such as rainforests and coral reefs, have many species. Others, such as salt flats or arctic regions have fewer. Species are grouped together into families according to shared characteristics.

Invertebrates - animals without backbones - make up about 99% of all animal species, and most of these are insects. Invertebrates include crabs, snails, and worms, as well as insects such as beetles and flies. Insects fill many vital roles in ecosystems as pollinators, recyclers of nutrients, scavengers, and food for others. While we may mostly notice mammals, they actually make up less than 1% of all animal species.



Painted Turtle

Ecosystem diversity

Ecosystem diversity is the variety of ecosystems in a given place. An ecosystem is a community of organisms and their physical environment interacting together. An ecosystem can cover a large area, such as a whole forest, or a small area, such as a pond.

The Niagara Peninsula falls within the Carolinian Vegetation Zone of Canada, which encompasses most of Southern Ontario. The line delineating the Carolinian Vegetation Zone from the Great Lakes – St. Lawrence Vegetation Zone in Ontario, starts at York County, runs west across the north shore of Lake Ontario to Cambridge and then crosses west to Grand Bend. This area is unique because of the climate, soils, and vegetation found here. The Carolinian Vegetation Zone in Canada contains over 30% of Canada's rare, threatened, and endangered species and over 60% of Ontario's rare species. This small region accounts for approximately 1% of Canada's land area, but is home to 25% of the Canadian human population.

Why should I care?

Biodiversity has an intrinsic value, but also performs a number of ecological services for humankind that have economic, aesthetic, or recreational value. Biodiversity provides us with many benefits. Some of these benefits come in the form of goods that can be directly valued, because they provide something that can be extracted and sold. These goods



Beneficial Insect

include everything from the domesticated agricultural crops that form the basis of the world's food supply, to medicines that protect and cure us, and the fibres that make up the clothes we wear. Biodiversity also provides critical indirect benefits to humans that are difficult to quantify. These benefits encompass ecosystem services, such as air and water purification, climate regulation, and water retention.

One third of all our food—fruits and vegetables—would not exist without pollinators visiting flowers. But honeybees, the primary species that fertilizes food-producing plants, have suffered dramatic population declines in recent years. This is mostly due to environmental stresses, such as pesticide application on crops and climate change.

A group of scientists that recently attempted to quantify the price of replacing these ecosystem services, calculated that they would cost over \$3 trillion. That's greater than the entire global Gross National Product! In other words, the world cannot afford to replace these services, therefore we must work to protect our ecosystems.

What can I do about it?

Species diversity is key in Niagara, where well over 2,200 species of plants and animals live. Unfortunately, nearly 10% of these species are considered to be rare or at risk due to habitat loss, urban sprawl, invasive species competition, pollution, and climate change. Every year, over 150 species of plants and animals become globally extinct.



Pawpaw Tree | Robert Ritchie, Photographer

Over 93% of the land in Niagara is privately owned. Protecting and preserving wildlife and their habitats is everyone's responsibility. By incorporating natural areas on your property, you can protect and increase biodiversity. In addition, natural areas help filter pollutants, reduce erosion, slow flooding, and keep water flowing in our creeks and streams throughout the year. Your efforts to improve and protect local water quality will help protect wildlife populations and species diversity for future generations.

Creating wildlife habitat on your property can be as simple as not mowing portions of your lawn, installing a bird box, or planting trees. It's all up to you! Here are a few simple tips for enhancing or creating wildlife habitat on your property.



Small Naturalized Garden

If you build it, they will come.
As a landowner, you can create space for wildlife by setting aside a piece of your property that you wish to contribute towards wildlife habitat. This can include birds, insects, reptiles, amphibians, or mammals. This will help to improve the natural spaces in Niagara and provide refuge for wildlife.

Although you may not think that a little garden can make a difference, it's important to know that ecosystems come in many different sizes. Even a small garden, if filled with appropriate species, can be a great contribution to local wildlife.

Build a home for wildlife
You do not have to naturalize large portions of your property to provide shelter for wildlife. Many Niagara species, including birds, small mammals,



Bluebird Nesting Box

and reptiles would use a simple brush pile for shelter and cover from predators, and breeding. Instead of burning or putting branches out to be collected, consider piling them up in one area of your yard. You can also include logs and rocks in your pile to diversify the habitat. Clay pots turned on their side provide shelter for toads, so consider placing some of them in the middle of your pile. Rocks also provide excellent basking spots for amphibians and reptiles.

Bird, bat, and butterfly houses are another great way of providing shelter. Birdhouses or nesting boxes can be customized to attract specific bird species. Bat houses will attract bats to your property, which can help control your mosquito population. Bats are nocturnal (come out at night), so you normally won't see them during the day. They eat between 500 and 1,000 mosquitoes each, in a single hour! Many species of birds, including swallows, also consume a significant number of mosquitoes.

Variety
The secret to attracting diverse wildlife is creating a variety of habitat features. A variety of species type, age, and size will provide a wider range of opportunities and fulfil more life cycle needs. Coniferous trees provide winter shelter for many bird species, while deciduous trees provide shade and habitat during the summer months. Even dead or fallen trees are important habitat for wildlife. If you are concerned that a dead or diseased tree on your property might be a safety hazard, consult a professional arborist for advice.

Connect the dots
Many of the natural areas in Niagara are fragmented (disconnected), as a result of urbanization and land clearing for agriculture. In the NPCA watershed, there are numerous homes, manicured lawns, roads, and parking lots. The natural areas that do exist are often not connected together. If the entire length of a water system was vegetated with an appropriate buffer, not only would it provide excellent filtering for water quality, it would



Connective Corridor Before



Connective Corridor a Year Later

also provide a connected habitat corridor for wildlife movement. Keeping waterbodies well vegetated ensures that there is good cover for wildlife travelling along the edge of the watercourse. Planting between natural areas to connect the dots is a great way of providing safe travel corridors for wildlife.



Butterfly Garden

species spend the winter months either as larvae, eggs, pupae, or adults. Over-wintering butterflies will require shelter from the cold. This usually consists of wood piles or tree cavities. Many garden centres carry plants that are supposed to attract butterflies. While these may attract some species, using plants that are native to Niagara will be best for attracting our native butterflies.

Choose Native Plants

When incorporating plants into your landscape, use plants that are native to the Niagara Peninsula. Native plants are the species that have evolved through thousands of years of



Butterfly Milkweed

changing geological and ecological conditions. More specifically, native plants are those that were growing naturally in the area before humans introduced plants from distant places. The natural evolution of native plants makes them ideal for use in local climate and environmental conditions. Adapted to deal with local insects and diseases, they get all the nutrients they need from the soil. They can be easily incorporated into your landscaping to reduce mowing and improve water quality. They also provide food and breeding areas for many species, including birds, butterflies, and desirable insects. Native plants normally do not require extra watering and thrive without the application of pesticides and fertilizers.

Create a butterfly garden

Butterfly gardens are becoming increasingly popular. Many people want to attract these beautiful and graceful creatures to their garden, so they can enjoy watching them float around from flower to flower.

If you want to attract butterflies to your yard, you should include both host plants for the caterpillars and nectar plants for the adult butterflies. Also, some butterfly

Where to Get Native Plants

Plant material that is native to your geographic region is the best to use. In general, the more closely you match the environmental conditions of the source of your plant material to that of the planting site, the better it will grow. Plants should be bought from reputable nurseries. A list of nurseries carrying native plants can be obtained from the NPCA.

General Considerations

- Order plants by scientific name to ensure native species.
- Ask the nursery about the source of their plant material.
- Ask for seedling stock, not clonal stock, cultivars, or horticulturally enhanced plants. Clonal stock, cultivars, and horticulturally enhanced varieties lack genetic variation. They are usually selected for bigger, showier flowers or more sturdy stems and this goal of aesthetic uniformity is at the expense of genetic diversity.
- Beware of plant material dug from the wild or plants which are “nursery grown” in pots after being dug from the wild. Plants should instead be “nursery propagated” from seed or cuttings.
- Ensure plants are not on the Species at Risk list for Ontario or subject to a Provincial Recovery Strategy.
- Advance ordering will ensure the appropriate stock and volumes you require.
- Always try to use plants native to the Niagara Peninsula or native to where they are to be planted. Seed zones for trees have been developed. When planting in Niagara, ask for seeds from EcoDistrict 37 (7E-3 and 7E5). Shrubs, herbaceous, and aquatic plants should be sourced (seeds should have been collected) within 100 km of where it will be planted.

Seed collection



Seed Collection

When collecting seeds, collect from many individual plants from within the same ecotype of each species (rather than taking seeds only from the biggest plant, for example) and do not take all the seeds from any one plant. This will help preserve and increase the genetic variation of the population. Also, be sure to get permission from the landowner before collecting seed.

Seed zones — What are they?

Planting the right tree seed in the right seed zone is critical to tree growth and survival. The appropriate seed varies from area to area and is dependent on many things, such as geographic location, soil conditions, and temperature. Seed zones were developed to ensure that the variation of growing season length within each zone corresponds with the variation of commercial tree species in the province. For example, the growing season in northern Ontario will be considerably less than in southern Ontario. A White pine tree purchased in the north will have adapted to these conditions and will not thrive in the south.

INVASIVE SPECIES

What is the problem?

Invasive species (exotic or alien) are species that are not native to an area, but have been introduced, either intentionally or accidentally. This introduction is most often caused by human activities such as landscaping, shipping, trade, and commerce. There are approximately 500 non-native invasive plants in Canada, over 440 of these plants are found in Southern Ontario. If conditions are favourable, introduced species can grow out of control, as they rarely have natural predators. Native species have to compete with invading species for food and habitat, which will often displace native populations of trees, plants, fish, and other wildlife, with disastrous consequences.

Norway wher and Periwinkle are examples of common evasive species occurring in Niagara. Both species were introduced from Europe. Norway Maple is a popular boulevard tree used in landscaping. It develops leaves in the spring a few weeks earlier than most native Niagara trees, providing early foliage, which is very desirable (for people). Periwinkle provides a quick and easily established groundcover, used as borders in gardens. Both Norway Maple and Periwinkle can now be found in our natural environments. Norway Maple develops leaves



Periwinkle Invading Creek Bottom

sooner than other native Niagara trees and shrubs. This provides early shade, limiting sunlight for emerging understory woodland plants. This lack of sunlight at critical growth stages can kill desirable native woodland species, such as Trilliums and Jack-in-the-pulpit. Periwinkle in natural environments can create dense monocultures and can dominate entire areas, killing many of the native plants that would have once grown there.

When diverse plant communities are replaced by single species, significant losses of habitat for local wildlife will occur. Many types of insects and birds rely on a variety of plants to help fulfil their life cycles. When certain species start to disappear due to competition from invasive species, many associated types of plants and animals will disappear as well. We are all connected!

Why should I care?

Invasive species are a threat to all living things on Earth. In Canada, the occurrences of invasive species introductions are increasing because of global trade and travel. One of the main consequences of invasive species is that they reduce biodiversity. Biodiversity, or the variety of living things, is important because each species performs a function that contributes to the overall health of the ecosystem, which does not preclude humans. A biologically diverse environment will be resilient to disturbances, such as climate change.

The benefits of controlling invasive species include:

- Protecting biodiversity
- Increased resilience to disturbances
- Reduced competition for native species
- Increased shelter and food options available for local, native wildlife
- Improved aesthetic and habitat value for your property and region
- Reduced human and nuisance species interactions

Understanding the enemy

A weed is not necessarily an invasive plant species. Weeds are simply plants that are unwanted in their current location. The term 'weed' is subjective, as it does not refer to any specific plant and does not indicate whether a plant actually belongs where it is growing. It is all in the eye of the beholder! This is why it is encouraged to refer to plants as either native or non-native, instead of simply just weeds.



Giant Hogweed

Noxious weeds on the other hand, are designated and controlled under the Ontario Weed Control Act, administered by the Ontario Ministry of Agriculture and Rural Affairs (OMAFRA). Noxious weeds are generally those which cause problems for the agricultural community and are mostly poisonous to livestock. The Weed Control Act of Ontario does not distinguish between native and non-native species.

What can I do?

The first step to controlling and preventing the spread of invasive species is to learn to recognize and identify them. Disturbance is something that often leads to the invasion of non- native species. These species are just waiting for an open patch of soil to invade and take over. Native groundcovers should be planted quickly after construction or any other disturbance of the soil, to ensure that no invasive species move in first. Keeping an eye out for new sprouts of invasive species is an effective method of control, because you can pull them before they become established.

Before you buy plants from a nursery, ask whether it can become invasive and where it is native to. Never buy varieties of invasive species. Some of the most common invaders in Niagara are available for purchase at your local garden centre. A few examples of these are Periwinkle or Vinca, English Ivy, and Norway Maple varieties (e.g. Crimson King). If the plant is identified as providing fast spreading groundcover, it is likely highly competitive and



possibly invasive.

Although the NPCA encourages the use of native plants, please note that not all non-native plants are invasive. For example, annual bedding plants like pansies and petunias are generally not a problem. Non-native perennials to avoid are those with aggressive reproductive qualities, such as rapid growth, abundant seed production, widespread seed dispersal, and vigorous vegetation spreading, such as purple loosestrife.

Be cautious when trying to control invasive species as well, it is easy to do more harm than good. By controlling one species, you may inadvertently be making the area susceptible to the invasion of many more. It is advised that you research the best control method for the specific species you are trying to eradicate from your property, as each species and situation is different. You may also require the help of a professional.

The following techniques are some of the most commonly used for controlling and eradicating invasive plant species:

Chemical Removal

On Earth Day 2009, Ontario's Cosmetic Pesticides Ban came into effect, enforced by the Ontario Ministry of the Environment (MOE). The ban was passed to set out clear guidelines for communities across the province, so that unnecessary exposure to toxic chemicals would be eliminated and public health would be further protected.



Chemical Spraying Along One Mile Creek

There are exemptions to the ban, including public health or safety reasons, such as controlling West Nile Virus, poisonous plants, and stinging insects. Agriculture, forestry, and some conservation projects are also excluded from the ban.

There are no exemptions for pesticide use on lawns, gardens, patios, driveways, cemeteries, parks, and school yards. If landowners require pest control, bio-pesticides or lower risk pesticides can be used and are widely available at most local garden centres.

Mechanical Removal

Pulling – Some species can be controlled by simply pulling them out of the ground. It is best to pull plants in early spring before they get too big and before they have a chance to produce seeds. Never compost invasives. Carefully place all plant parts in a large garbage bag and put them out on your regular garbage day.

Tilling – This method is only effective on annual and non-root generated plants. Plants such as bindweed and garlic mustard grow from small pieces of root, so tilling them will spread their growth even farther.

Mowing – Similar to tilling, the unwanted vegetation is not able to produce seed. If the vegetation is annual, this will eventually exhaust the seed bank, however this is less effective for perennials.

Boiling water – Cut off the plant above the ground and pour the boiling water at ground level to kill the roots. This process may have to be repeated if the plant grows back, but again, be patient. You are gradually weakening the plant.

Solarization /Smothering – Placing black plastic over the desired area in the hottest part of summer heats the soil and burns the plants and their roots. The perimeter of the solarizing plastic should be firmly secured, so that the heat is trapped inside, allowing the plants to “bake”.

Corn-Gluten Meal – Corn gluten meal is a safe, organic product that kills germinating weeds and adds nitrogen to soil. It works by preventing sprouting seeds from developing normal roots. This does not directly kill the seedlings, but makes them susceptible to dehydration if the soil gets dry.



Pesticide Free Lawn

Vinegar – Vinegar kills the vegetation above ground and therefore, cuts off the plants production of energy. Regular kitchen vinegar is 5% acetic acid and is strong enough to remove vegetation from sidewalks and driveways. Vinegar can be purchased at higher concentrations (up to 20%) to deal with stubborn invasive species.

Soap and water solutions – Soap and water has the same effect as vinegar in that it kills the above ground parts of the plant depriving it of energy. To make your own herbicidal soap, use a concentration of ½ cup of liquid dishwashing soap in 7½ litres of water. This should cover an area up to 100m2.

Fire – Fire can be an effective method to removing unwanted vegetation. On a small scale, torches can be used to burn vegetation off of driveways and between patio bricks. Like vinegar and herbicidal soap, fire kills the above ground portion of the plant and deprives it of energy. Caution should always be used when working with fire.

Salt and plastic over stump – This method is to be used on woody vegetation (trees and shrubs). Cut the trunk low to the ground, while still leaving enough stump to fit plastic over



Beneficial Insect

top. Pour table salt immediately onto the cut and then secure a plastic bag on top to keep the salt in place. For best results use this method in the fall, when the tree/shrub will be sending all of its fluids down to the roots.

Girdling – Girdling is a process of removing a strip of bark from around a tree or shrub. Girdling works by destroying the tree’s fluid exchange capacity. The bark contains layers that conduct water, minerals, and food between the roots and the rest of the tree.

Beer or brewers yeast in a dish – Bury a small container in the ground, at ground level and fill it with a bit of beer. Slugs are attracted to the fermented yeast smell and will slide right in and drown.

Beneficial Insects – Beneficial insects are natural enemies to many pests. Beneficial insects, such as butterflies, bees, and other insect predators are in the environment around us. All you need to do is plant some native flowers to provide them with some food and shelter. Native plants are best for attracting beneficial insects, as they have evolved with the insects in the Niagara Peninsula. Also, native flowers are less likely to be invasive, which is preferable if the planting is near agricultural lands. Planting native wildflowers also adds to local biodiversity, providing flowers throughout the season to sustain beneficial insects, as opposed to monocultures which only flower at one time during the year.

Conservation Landscaping – Although you can no longer use pesticides to keep your lawn and garden weed and pest free, there are many ways to accomplish this without pesticides. A healthy, lush, and weed free lawn can be maintained by developing a good root structure. Water less often (1-2 times/week) to a depth of 3 cm to train the roots to go deep for moisture, allowing the grass to thrive during hot, dry spells. Fertilize or leave light grass clippings to naturally release nitrogen back into the ground to aid in the development of the lawn. Over seeding and mowing your lawn higher (7–10 cm) will also promote thicker grass with deeper roots, which will help discourage weeds from growing and pests from invading.

SPECIES AT RISK

What is the problem?

A "Species at Risk" is a species that is at risk of disappearing or becoming extinct in the near future. Species may include plants, animals, and other kinds of organisms. Although extinctions are a normal part of life and evolution, the current rate of extinction is thought to be 1,000 times higher than the rates only a few hundred years ago. Once these species disappear, they are gone forever!

It is difficult to accurately predict the consequences of a species' extinction. A species may play a vital role in maintaining the integrity of its ecosystem and its elimination may severely affect other species. Because the roles of each species are not entirely understood by humans, it is wise to be cautious and conserve all species. A species that is in trouble may be naturally rare or it may have been common in the past and suffered recent declines. Many of these species provide an indication that something has gone wrong in a particular habitat and act much like the canary in the coal mines, alerting people to dangerous conditions. The solution to protecting a species most often involves habitat conservation, so this early warning serves not only to protect the species in question, but also the whole array of species that are dependent on that species and habitat.



Monarch Caterpillar on Butterfly Milkweed

As a result of our increasing demands on the natural environment, humans are responsible for almost all modern extinctions. As humans are the driving force behind putting many of these species in peril, it is only reasonable that we should be the ones that are responsible for aiding in their protection and recovery, once their plight has been recognized.

There are four main ways that wildlife species are put in jeopardy:

Loss of Habitat

Habitat loss and degradation occur throughout Canada due to urban sprawl, transportation networks, forestry, mining, and agriculture. All species have specific food and habitat needs. The more specific these needs and localized the habitat, the greater the vulnerability of species to loss of habitat. The Bald Eagle nearly disappeared from the lower Great Lakes region in the first part of the 20th century, largely due to loss of nesting habitat. Nesting Bald Eagles require mature forests near coastal marshes or open water away from roads and settlements. The Bald Eagle is an important indicator species. They are long-lived, top predators of the aquatic ecosystem food chain and will have the greatest exposure to toxins, such as DDT and PCBs, it is a species that is sensitive to human activities. Healthy Bald Eagle populations signal healthy ecosystems. Today, these large predatory birds are making an impressive comeback in their traditional nesting areas in the Great Lakes Region, except for the Lake Ontario basin. The Bald Eagle is listed provincially as special concern.



Southern Ontario Eagle Family | Christine White – Photographer | www.sandpiperstudio-photographybychristine.com

Pollution

Toxic chemicals in the environment can harm a species, by killing it outright, by reducing its ability to reproduce, and degrading its required habitat. The Peregrine Falcon is currently a threatened species in Ontario, due to the affects of the pesticide DDT, which was introduced to the market in the 1940's. The pesticide accumulated in the bodies of large raptors, such as the falcon, affecting their ability to produce strong egg shells. These weak shells were prone to breaking under the weight of the bird and few eggs survived, resulting in a population crash.

Canada banned the use of DDT in 1985 and the falcon's populations have begun to recover with the help of breeding and release programs. Even though restrictions on the use of DDT in North America have been critical to the success of the Peregrine Falcon's recovery, DDT and other dangerous chemicals still persist in our landscapes.



Common Reed

and rivers. Threats to the recovery of this species include habitat alteration, fragmentation, pollution, poaching, and invasive species competition.

Non-native Invasive Species

Non-native invasive species compete for the same resources as native species. Invasive species can be very aggressive and take over large areas where natives once existed. Phragmites australis or Common Reed, is currently taking over wetlands, roadside ditches, municipal drains, and agricultural fields throughout the Niagara Peninsula. Phragmites out-competes native vegetation, reduces biodiversity, changes water levels and nutrient cycling, increases fire hazards, and is eliminating essential wetland and shoreline habitat for numerous wildlife species.

Why should I care?

All people have a shared obligation to ensure healthy functioning ecosystems for future generations. Governments alone cannot adequately protect Species at Risk.

Canadian Legislation

The Species at Risk Act (SARA) is a piece of federal legislation, which was passed on December 12, 2002. The SARA designates the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), an independent group of wildlife experts and scientists, to identify Species at Risk and assess their conservation status.

Species at Risk are listed in one of the the following categories:

- Extinct:** A wildlife species that no longer exists.
- Extirpated:** No longer existing in the wild in Ontario, but still exists elsewhere.
- Endangered:** Facing extinction or extirpation.
- Threatened:** At risk of becoming endangered.
- Special Concern:** Sensitive to human activities.

The SARA sets out a framework for governments, organizations, and individuals to work together in order to protect existing ecosystems, as well as recover threatened or endangered species and their habitats.



Endangered Spotted Turtle | Katherine Yagi, Photographer

What can I do about it?

An ounce of prevention is worth a pound of cure.

In the Niagara Peninsula, there are well over 2,200 species of plants and animals. Unfortunately, nearly 10% of these species are considered to be rare.

Lessen your impact to habitat loss. Do not build or encroach into an environmentally sensitive area. Natural spaces are decreasing in Niagara, leaving fewer spaces for wildlife to live, eat, drink, and travel without human interaction.



Environmental Encroachment

Ontario Legislation

The Ontario Endangered Species Act (ESA) is provincial legislation that was passed in 2007 and is administered by the Ontario Ministry of Natural Resources (OMNR). The goal of the Act is to locally protect and restore native species, in order to prevent them from becoming at risk. The ESA compliments the federal SARA by protecting species and by prohibiting damage or destruction of their associated habitat.

You can play a role in helping to protect, improve or create habitat for Species at Risk. Creating wildlife habitat on your property can be as simple as not mowing parts of your lawn, installing a bird box, or planting trees. Creating or enhancing habitat for a specific Species at Risk may take a little more effort. Recovery teams for certain species are in place and recovery strategies have been completed for several Species at Risk. Each species will have different threats, issues, and habitat requirements, so these recovery teams and documents should be looked upon for guidance. Getting involved with an existing Species at Risk program, such as the Butternut Recovery Program, is a great way to do your part.

Stewardship programs are available through many organizations in Niagara, including the NPCA, and are a wonderful way for you to become connected with you community. It is advisable to seek input from the NPCA or local OMNR office when dealing with Species at Risk.



LANDSCAPES AT RISK

WOODLANDS

What is the problem?

A forest is an area with a high density of trees. A typical forest is composed of a canopy (upper tree layer) and an understory. The understory generally contains smaller trees, a shrub layer, and herbaceous layer (plants without woody stems, such as grasses). Forests are characterized by having a largely closed canopy, which provide extensive and nearly continuous shade. A woodland is an area with a lower density of trees than a forest. Woodlands may support an understory of shrubs and herbaceous plants. They typically form open habitats with plenty of sunlight and limited shade.



In Niagara, many of our forested areas have been cleared for residential, industrial, and agricultural purposes. Our remaining forested areas have been fragmented due to activities, such as transportation networks. Our present day forests in Niagara are characterized as woodlands, which account for less than 18% of our current land use. The most common forest community in Niagara is a Red Maple Forest.

Canadians cut down and process 5 million trees every year for our domestic paper needs. Each Canadian uses about 750 pounds of paper every year, the equivalent of a 40 metre tall tree, every year for our paper and wood product needs.

Why should I care?

Trees are central to all human life because they provide a diverse range of resources; they store carbon, release oxygen, aid in regulating our climate, purify water, and mitigate natural hazards such as floods. Studies have shown that trees can reduce asthma rates related to poor air quality, contribute to increased physical activity, mood improvement, and promote psychological well being.



Trees Provide Psychological Benefits

Trees are one of the Earth's greatest natural resources. The leaves of a mature tree filter an average of 3,000 liters of rainfall a year. A typical tree produces about 118 kilograms of oxygen each year, enough to sustain one human for 6 months. The average tree cleans 150 kilograms of carbon dioxide

from the atmosphere, through direct absorption into the trees wood (carbon sequestration); about the same amount of carbon a car produces annually.

Trees are valuable and necessary to our very existence. Without trees, humans would not survive!

What can I do?

We rely on healthy trees every day. It is in our best interest to appreciate, respect, and preserve them. We need to make sure that we are harvesting them sustainably so that they will be around for future generations of humans and wildlife to enjoy and use.



Backyard Naturalization

Fortunately, there are things that every one of us can do. Planting trees is an easy way to start restoring nature. Many beautiful varieties of native trees are available. They can be easily incorporated into your landscape to improve water quality and provide food and shelter for many



Kids Connecting with Nature Through Tree Planting

Modifying your lifestyle to reduce waste can help prevent deforestation and other environmental problems. Many products contain excessive packaging. You can make a difference by reducing the amount of packaged products that you buy. Less packaging equals more trees. Recycling paper products (after they can no longer be reused) will prevent new trees from being cut down. Recycling and buying products containing recycled material can protect woodlands and forests.



Habitat Loss

species of birds, mammals, fish, and plant life, making them the most diverse ecosystems in Ontario. In Ontario, 72% of original (pre-settlement) wetlands have been lost. The decline of wetlands has been most drastic in Southern Ontario, where the loss is greater than 90%.

Why should I care?

Wetlands are a vital part of Ontario's environmental and economic sustainability. They provide many benefits, such as enhancing water quality, groundwater recharge, drought prevention, and mitigating the impacts of natural hazards, such as flooding and climate

species, including humans. Nut trees will provide a great source of food for many types of wildlife. Evergreen trees provide excellent year-round shelter. Deciduous trees provide a good source of organic matter when the leaves drop and decay in the fall. When grouped together, trees create larger natural areas that fulfil a bigger environmental role. Linking natural areas through tree planting creates corridors to connect fragmented habitats. This will help provide safe travel routes for wildlife and provide additional shelter and food sources.

WETLANDS

What is the problem?

A wetland is an area of land where the soil is saturated with water, either permanently or seasonally. Wetlands are categorized by their vegetation and unique soil conditions. Wetlands include swamps, marshes, fens, and bogs. Wetlands are communities of plants and animals that depend on the presence of water and wet soil to survive. They are home to over 600



Wetlands - We All Have a Role to Play

change. Wetlands are important habitats for species at risk, offer ecotourism opportunities, and provide important social and cultural benefits. Despite these values, wetland loss continues at an alarming rate.

Wetlands help reduce flooding by acting like giant sponges to absorb excess water. They slow surface runoff and allow the slow release of water into watercourses, to keep them flowing year round. When we cut trees down, fill in wetlands, and pave over natural areas, we lose these natural sponges. As a result, water moves through watercourses faster, causing increased flooding in the spring and dried out areas in the summer.

Mosquitoes carrying West Nile Virus are typically not wetland species, but rather live in urban areas. Wetlands actually help to control mosquito populations, not increase them!

Over 93% of the land base in the Niagara Peninsula is privately owned. You can help protect water quality for future generations by preserving or restoring wetland habitat on your property.



Livestock Restriction

This is the same water that eventually becomes our drinking water.

What can I do?

The best natural safeguard for water quality is a wetland. Wetlands act as nature's water filtration and purification system, capable of filtering pollutants before they enter our watercourses.

To protect wetlands on your property you can:

- Limit agricultural activities around wetlands, such as livestock access.
- Create buffer areas of shrubs and trees between wetlands and other land use.
- Restrict vehicle access, such as tractors, ATV's, and snowmobiles.

If you do not have wetland areas on your property, you can create them. Creating a wetland pond is an easy way to start restoring nature. Growing a beautiful garden of native wetland plants will help replace some of the important natural wetland functions that may have been lost through development.

RIPARIAN AREAS

What is the problem?

The word riparian comes from the Latin word “ripa”, which means bank. The riparian area is the area of land adjacent to a waterway, including streams, creeks, rivers, and lakes. A



Healthy Riparian Habitat

riparian buffer is a strip of land along the edge of a watercourse that is left in a natural state. Too often riparian areas are cleared of vegetation and maintained as turf grass. Turf grass provides no habitat value, does little to protect against erosion, and delivers chemicals and sediment directly to the water by acting as “green concrete”. Healthy riparian buffers include a mixture of native trees, shrubs, grasses, and wildflowers.

If you took all the watercourses in the Niagara Peninsula and lined them up end to end, the distance would be equivalent of driving to Florida and back. Less than 30% of this stream length is protected

with adequate riparian buffers. This leaves a significant area of unprotected watercourses in Niagara vulnerable to pollution and impairment.

Why should I care?

Buffers are complex ecosystems that improve water quality and provide habitat. Buffers can help control flooding, prevent erosion, improve water clarity, and provide shade and cooler water temperatures for fish and other creatures, such as turtles and frogs.

“Riparian buffers are the single most cost- effective protection for our water resources”

Buffers provide habitat for native wildlife

There are numerous plant and animal species that rely on the unique habitat features of the riparian area. If connected, riparian areas can provide travel corridors for wildlife as well.



Buffer Providing Travel Corridors Between Properties

Buffers act as natural filters

A healthy riparian buffer of trees, grasses, shrubs, and wildflowers will remove sediment and pollution before they reach a watercourse. A good buffer can improve water quality by over 30%. They can help transform phosphorus and nitrogen from fertilizers and animal waste into less harmful forms, reducing algae blooms and odour problems. Forested or treed buffers help improve water quality by providing shade. Shade keeps water cooler and improves dissolved oxygen levels. This is important for fish and other aquatic organisms.

In addition, the leaves and woody debris

that fall into a watercourse help to provide food and shelter for many aquatic creatures that sustain the food web.

Buffers prevent erosion

The roots of turf grass are only a few centimetres deep and provide limited soil protection. Buffers help prevent erosion because the deep root systems of the vegetation help to hold soil in place. In addition, riparian vegetation, such as trees and shrubs, can help protect the bank of the stream from the force of falling rain, sleet, and hail. Riparian areas also slow the velocity of water running into and through the creek during a storm event by adding roughness or friction; this will reduce the erosive force of the creek in its banks.



Enjoy a Low Maintenance Yard

Buffers can reduce the amount of mosquitoes and Canada Geese

Buffers help reduce the number of mosquitoes you notice because they create a habitat for mosquito predators, such as bats and dragonflies. Buffers can also prevent Canada Geese from accessing your property, as they do not like to walk through tall vegetation.

Naturalizing can save you time and money

A buffer does not require mowing and generally requires little to no maintenance. Natural areas require no watering or chemicals to keep them healthy and free of pests. The native flora of Niagara is well adapted to our local climate, soils, pests, and diseases.



Niagara Parkway Mow Free Zone

can be easily created. Once you create a natural buffer, you will be amazed at the increase in wildlife using your property.

Stop mowing

A simple way to ease into creating your buffer is to avoid maintaining a turf grass lawn next to the creeks edge. Stop mowing and let the grass grow. In the first season, the unmown area may look a little “messy”. Over the next several seasons you will begin to see different species of wildflowers, grasses, shrubs, and trees sprouting up. Be aware of what species are native to the area and which ones are potentially invasive and should be removed.

Prune trees and shrubs to open views instead of cutting them down

Many people cut down trees and shrubs to open their view to a watercourse. Proper pruning or “windowing” may provide a good view without compromising the water quality or the stability of the bank from tree removal. Creating “windows” to the creek can be as simple as



Buffer Diversity

What can I do?

A significant portion of riparian buffer habitat has been eliminated through urbanization and agriculture. Creating a buffer can be as simple as retiring an area of your property adjacent to water that you would normally maintain. Manicured lawns and gardens provide few water quality and habitat improvement opportunities.

If you have an existing riparian buffer, you should enhance and protect it. If you don't have one, it

removing specific branches that obstruct your most desired viewing locations.

Plant it up!

Planting a variety of native trees, shrubs, wildflowers, and grasses is the best way to increase the buffering capacity of your riparian area. Remember to always try to use plants that are native to the Niagara Peninsula.

Protect young trees and shrubs

Whether your young trees and shrubs are newly planted or naturally sprouting, deer, rodents, and rabbits can be a challenge. Young trees and shrubs should be protected for at least three years after planting. Trees and shrubs can be protected with a wrap around tree guard, wire mesh, or plastic tree shelter.

How wide does my buffer have to be?

When it comes to buffers, there is no right answer to this question, as it is site and circumstance specific. Generally, the wider the buffer is, the better the buffering ability will be. A minimum width of 5 metres is generally suggested, however, any width of buffer is better than no buffer at all.

GRASSLANDS

What is the problem?

Grasslands can be defined as grass-dominated areas where few or no trees grow and include prairies and savannahs. They are climax communities, meaning the development of vegetation in an area over time, has reached a steady state. This equilibrium occurs because the vegetation is composed of species best adapted to average conditions in that area. Grassland vegetation remains dominant in a particular area, usually due to grazing or natural/manmade fires, all discouraging colonization of tree and shrub seedlings. Some of the world's largest expanses of grassland are found in the African savannah, maintained by wild, grass eating animals (herbivores), such as antelope and zebras. In addition, many types of grasslands are maintained by nomad tribes (pastoralists) who roam extensively with their grazing livestock, such as cattle and sheep.

Grasslands are one of the most endangered ecosystems in the world, even more so than tropical rainforests. Less than 3% of the original tall grass prairie in Ontario remains today.



Bobolink

There are two major threats to grasslands - conversion to agriculture/ urban areas and global warming. Many grasslands are flat, nutrient rich areas, which are easily converted to agriculture. From a climatic perspective, grasslands occupy a very small niche. Even slight changes in global weather patterns can have devastating effects on grasslands, either creating situations that are too wet or too dry to maintain the required vegetation.



Tall Grass Prairie Demonstration Site - E.C Brown Conservation Area

In southern Ontario, two main types of true grasslands exist: tall grass prairie and savannah.

Tall Grass Prairie

Just as the name implies, this prairie is characterized by the tall grass. Some species, such as Big Bluestem, can reach over 2 metres in height. The tall grass is a result of more rainfall; short grass prairies tend to be drier.

Savannah

Savannahs are also tall grasslands, but feature scattered trees. The trees tend to be few and are far enough apart to allow adequate light penetration to allow grass species to dominate. In the case of Oak Savannahs, the main tree species is commonly White Oak.

Others types of grasslands found in Ontario include naturalized areas, such as meadows, old fields, and agricultural areas. These areas are not considered true grasslands because they



Successional Meadow

are often not grass dominated and are often transitional (successional) in nature, although they do provide important habitat opportunities. Where true prairies are lacking, songbirds such as Bobolinks and Eastern meadowlarks rely on these areas for breeding. They build their nests on the ground, raise young, and forage exclusively within hayfields, meadows, and pastures during the summer.

Why should I care?

For many people, the word “grasslands” creates an image of seemingly endless grassy landscapes, such as the prairies of Canada and the savannahs of Kenya. Unfortunately, many of the world’s original grasslands have been completely transformed—converted to farmland or urban areas. Urban sprawl, road networks, and agricultural practices interrupt grasslands, breaking large tracts into fragmented pieces, forever changing grassland composition and extent. These human influences jeopardize the many goods and services grasslands provide, including their ability to supply food for livestock, maintain biodiversity, and provide areas for recreational use and wildlife viewing. Many of the plants and animals associated with grasslands are at risk of becoming threatened, rare, or extinct.



Prairie Restoration Workshop

What can I do?

Think beyond trees. When landowners express an interest in naturalizing, they tend to think of only tree planting. Creating grasslands is a low cost naturalization alternative to tree planting, with high yielding biodiversity gains. Creating grasslands can be as simple as retiring a portion of your property that you currently maintain in turf grass. You may simply let it go wild, or strategically plant native grasses and wildflowers.

Grasslands can include retired areas, such as old fields, pasture land, hayfields, or transitional areas between active farmland, woodlots, or homesteads. A few simple management practices can go a long way in enhancing these existing areas to provide habitat for declining grassland-dependent bird species and other important grassland wildlife. It is important to find a balance of land use practices that are complimentary to your stewardship goals. Even active land uses, such as haying, grazing, and crop farming can be coordinated with grassland stewardship in mind.



The following are some simple management practices that can be incorporated to enhance and protect existing grasslands.

- Avoid disturbing grasslands during nesting season - early May to late July.
- Mow grasslands every 2-3 years in late summer to keep out trees and shrubs.
- Use native grass seed to maintain a diversity of grass heights and densities.

- Monitor and remove invasive grassland species, such as Canada thistle (*Cirsium arvense*).
- Keep grassland areas free of pesticides, herbicides, and fertilizers.
- To enhance bird habitat, install nest boxes or perching posts.
- Rotate grazing areas to leave refuges for breeding birds.
- Protect grasslands from hunting and other recreational uses, such as ATV's.

Grasslands, once established, must be managed to prevent it from succeeding into a forest over time. Depending on the type and the use of your grassland, there are 3 practices to keep grasslands habitats healthy and productive:

- mowing/haying
- burning
- grazing

If you would like to use burning as a method of management, it is highly recommended that you hire a Fire Professional to complete a prescribed burn on your behalf. Also remember to contact your local fire department to discuss your strategy beforehand, as permits and permissions may be required.



Robert Laliberte, Photographer



AQUATIC HABITAT

What is the problem?

The NPCA watershed is home to numerous aquatic species, including fish species and benthic macro invertebrates (bottom dwelling insects, such as dragonfly nymphs). Fish and other aquatic life need healthy places to live, feed and reproduce. The places that provide food and shelter for fish during all their different life stages are called fish habitat. Habitat and food requirements can change as a fish progresses through its life cycle, from egg to adult. If there is a threat to just one aspect of its life stage requirements, populations could suffer.

Stream alterations, such as hardened banks and dredging, are common occurrences in the NPCA watershed. When alterations like dredging occur, it is disruptive to the animals that live there and also their habitat (homes). For example, dragonflies have several life cycle stages



Young-of-the-Year Musky

(similar to butterflies). The first stage is aquatic, the second phase is terrestrial (land). Dragonflies live as juveniles in the wetted banks of creeks and streams. If bank alterations occur, dragonfly populations will decline. Dragonflies, like many aquatic macro invertebrates, are a very desirable species, as they are stunning to look at and eat large quantities of mosquitoes. Along with damselflies, caddisflies, mayflies, and stoneflies, dragonflies are a popular food choice for many fish and bird species, making aquatic macro invertebrates a key component of a healthy aquatic and terrestrial ecosystem.

Why should I care?

Without fish habitat there will be no fish! Fish are important to the ecosystem. They contribute to biodiversity, are an important part of the food web, and are highly valued by humans for both cultural and recreational reasons.

Fish and fish habitat are federally protected by the Department of Fisheries and Oceans Canada (DFO), under the Fisheries Act. Under this Act, work that may result in the Harmful Alteration, Disruption or Destruction (HADD) of fish habitat, needs to be authorized by the Minister of Fisheries and Oceans Canada. The NPCA acts as an agent at the local level on behalf of DFO and can be contacted for additional information.



Storm Flooding



Buffer to Reduce Flooding

What can I do?

We all play a role in improving fish habitat. Planting native aquatic vegetation in and along watercourses provides habitat for aquatic life. This vegetation will also slow down runoff and reduce erosion. It provides filtration, and removal of harmful pollutants, while shading water to reduce water temperatures. These efforts will help to reduce stagnant conditions, and improve oxygen levels. When a watercourse is healthy, so are the things that live in and around it.

The following are some recommended guidelines that can help improve fish habitat:

Let the water flow

Do not attempt to slow the flow of water by damming a watercourse. Obstructions can hinder fish passage and migration.

Leave natural vegetation alone

A riparian buffer is one of the easiest and most beneficial ways to improve local water quality. In addition, vegetation provides shade, which keeps the water cool during hot summer days. Riparian vegetation can also help to reduce erosion and thus cause less sediment runoff.

Be careful when working near water

Operating small or heavy equipment near the edge of the creek can cause damage to the bank, as well as to fish habitat.



Tire Ruts and Bank Erosion

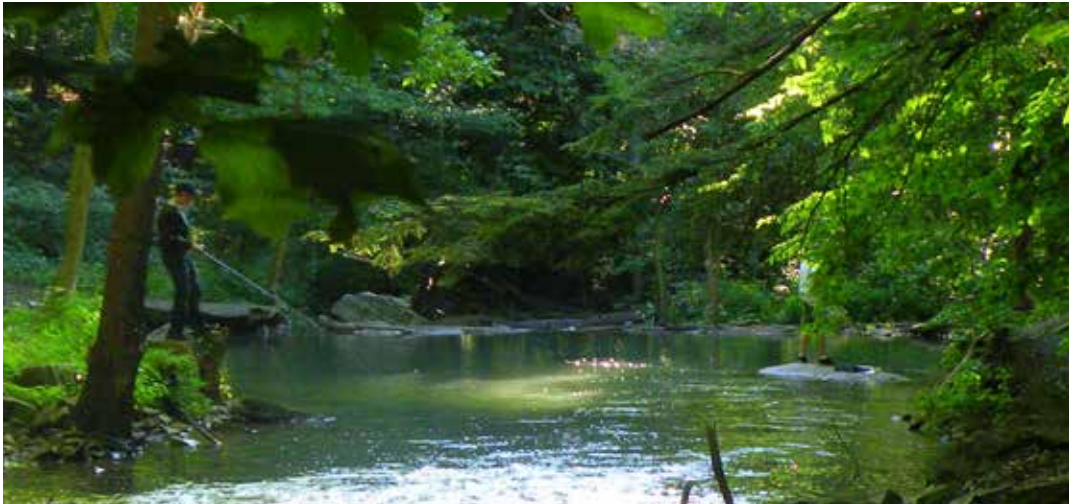


Keep All-Terrain-Vehicles (ATV's) out of the creek
Do not cross the creek with ATV's or other motorized vehicles, this can cause serious damage to the stream bed and to fish habitat. Tire ruts can cause erosion problems and blockages to fish migration.

Do not allow chemicals, garbage, and other pollutants to enter the creek.
Household chemicals, including herbicides, fertilizers, detergents, oil, and gasoline are extremely harmful to fish and other aquatic life. Litter can also be detrimental to water quality and fish habitat. Remove any garbage or litter in and around the creek. Also make sure to secure recycling and garbage receptacles on collection day, so the materials to not inadvertently make their way into nearby watercourses.

Habitat restoration projects

Habitat creation or enhancement projects can involve the creation of riffles, pools, and other in-stream habitat features, including bioengineering. Consultation with a professional is recommended for this type of work. Call the NPCA for assistance in determining what type of projects might be beneficial.



Robert Laliberte, Photographer

Get Involved!

Living near water can be a very rewarding experience, but it also carries with it a great deal of responsibility. With 85% of the land in Walker's Creek watershed privately owned, landowner participation is vital to help protect and preserve water and habitat quality. We have done our best to provide you with as much information as possible in this guide; however each property is unique and will require an individualized approach.

Keep in mind that everyone living in Walker's Creek watershed can play a part, no matter how small, in helping to build and maintain a sustainable environmental legacy within the Walker's Creek watershed.



Celebrating community involvement since 2001, the Walker's Creek Neighbourhood Association has proven to be a significant advocate for the protection and improvement of Walker's Creek.

Your own property is where caring for the environment can start. You can make a difference in protecting Walker's Creek and we would like to help you.

For more information on how to get started please contact:



250 Thorold Road West, 3rd Floor Welland, ON L3C 3W2
Phone: 905.788.3135 | Fax: 905.788.1121 | www.npca.ca

WALKER'S CREEK NEIGHBOURHOOD ASSOCIATION

P.O. Box 20234 St. Catharines ON L2M 7W7
Phone: 905-688-5601 ext. 1912 | www.walkerscreek.ca





NIAGARA PENINSULA
CONSERVATION
AUTHORITY

250 Thorold Road West, 3rd Floor Welland, ON L3C 3W2
Phone: **905.788.3135** | Fax: **905.788.1121** | **www.npca.ca**