Appendix 2

Natural History Features Inventory

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HAVE Plan for Rouge Park

Rouge Park

Introduction

This appendix reviews some of the information available about natural history features, natural processes that take place in the park, the park's current facilities and management actives.

In many cases the concepts that underlie natural features and their management are discussed as well. For example the Carolinian forest is a key feature of parts of the park, forest succession is a process that is taking place in the forest and forest block-size is an important concept recognizes that certain species need a minimum area of interior forest to survive and this concept drives some aspects of the park's forest restoration planning.

Time and budget did not allow for an exhaustive review of features and processes. Instead this appendix is intended as a start on which HAVE staff will continue to add information and details throughout the life of this plan. The information that the expanded appendix will contain can be used by Rouge Park HAVE staff and partners as a one-stop source of information about the Park's natural history.

This, appendix, along with Chapter 4: Features Analysis, can be the first step in developing accurate, effective Heritage Appreciation services, projects and products.

A Young Park Still Growing

At the time of writing, Rouge Parks is in acquisition phase. Since its creation in 1995, the park has grown significantly and may continue to grow as the park manager and Rouge Park Alliance members strive to meet the Park's mandate of protecting rivers, wetlands and lands from Lake Ontario to the Oak Ridges Moraine and to work toward the protection of more of the region's watersheds.

A Growing Core Area

The first lands to be acquired for the park were the valley and table lands of the lower Rouge between Lake Ontario and Steeles Avenue. Key studies of the geology, natural history, and cultural history of these lands had been commissioned in 1991 to support the development of the park. In 1994, the Rouge Park Management Plan was published to guide the development and management of the park.

Since then, additional lands along Little Rouge Creek and elsewhere have been added to the park by the Provincial and Federal Government. These additions have been supported by several management plans:

Satellite Properties

Recently, outlier properties, conservation lands that are located in the upper Rouge watershed, have been added to Rouge Park. A number of public use areas operated by municipalities or the Toronto and Region Conservation Authority are considered part of the Park. These include:

- Bruce's Mill Conservation Area
- Phyllis Rawlinson Park
- Milne Park
- Toogood Pond

More to Come?

Substantial amounts of public land lie east of the Park, in Durham Region. There may be opportunities for cooperation with the governments which own these lands to increase the benefits to Rouge Park of additional greenspace.

Other Important Sources of Information

There are several recent regional studies and plans that directly involve Rouge Park. These include:

- State of the Rouge Watershed Report
- Rouge River Fisheries Management Plan
- Rouge River Watershed Plan

These reports provide valuable information about watershed-level systems and trends that effect Rouge Park now and in the future. At the time of writing these three documents were in draft form. The information was made available to the authors of this HAVE plan with the understanding that details may change in the final approved reports.

Appendix Layout

The original studies on the lands between Lake Ontario and Steeles Avenue provide a tremendous amount of site-specific details—well beyond the level provided for lands added to the park at later dates. As well, the separate management plans for the various parts of the park do not always use the same terminology and approach. And as of yet there has not been an overall unified management plan for the entire park. This is understandable since the park is still growing and new areas are likely to be added.

This unevenness of information about the various portions of the park has required us to cover the park in the following sections:

- some big picture concepts
- key features, processes issues and ideas
- management issues

Figure A2.1 A generalized watershed system.

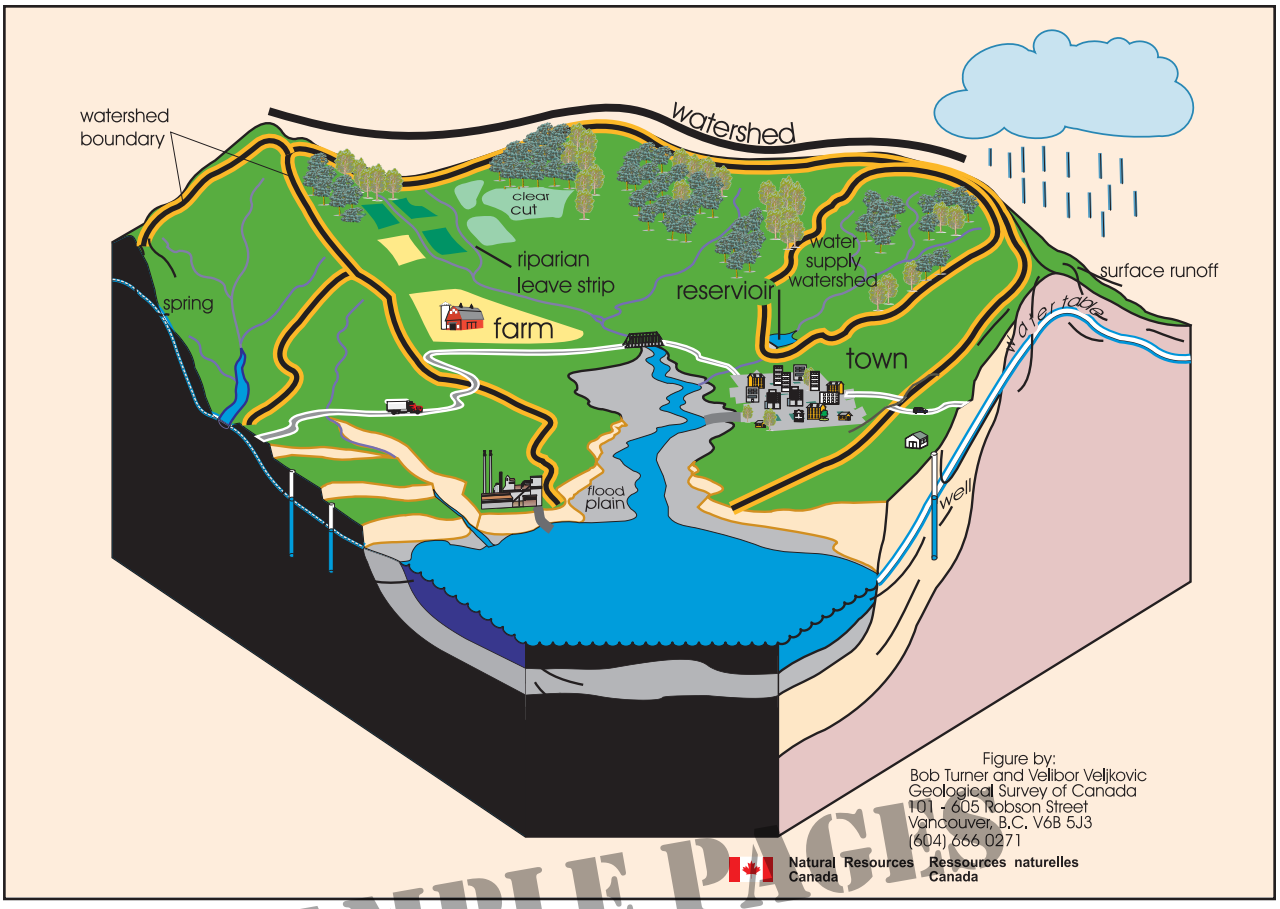
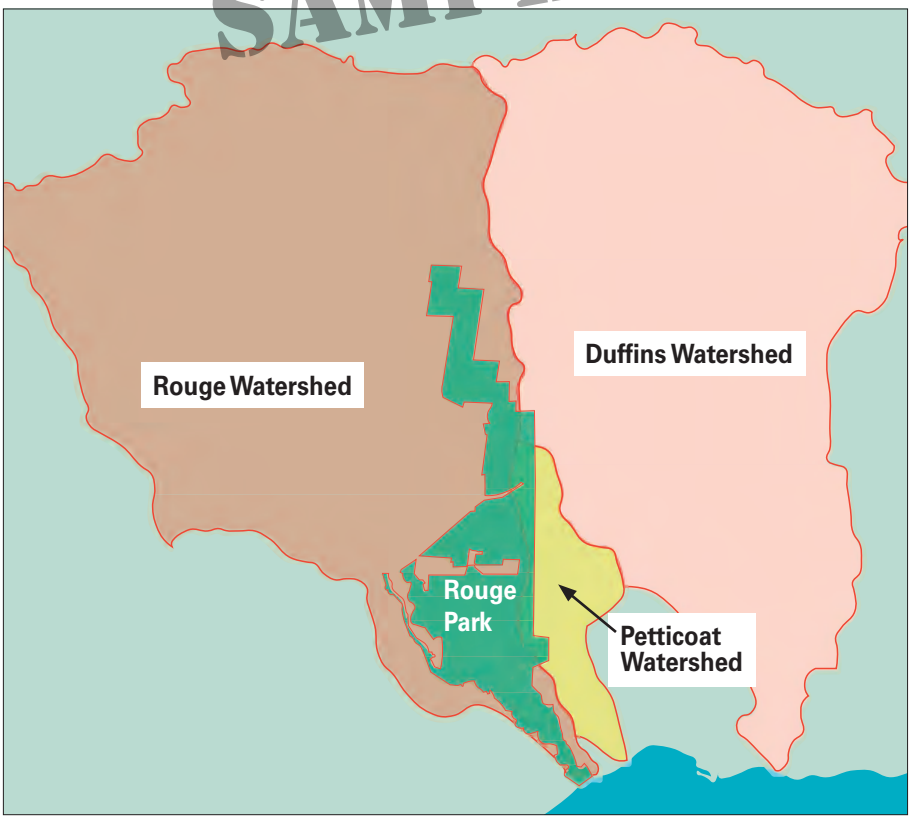


Figure A2.2 Rouge Park lies within three watersheds. However most of its lands lie in the Rouge River watershed.



The Big Picture Concepts

Watersheds

A Simple Watershed Model

For a simple model of a watershed, look at your roof. As it collects rain and snow, some moisture evaporates but most runs over the shingles, into the eaves troughs, and down the spout onto your yard. Unless you're troubled by leaks, your roof is a discrete water system or drainage basin where all the precipitation flows downward into ever-increasing tributaries to a final outflow site, your down spout.

A natural watershed is similar, but much more complex.

The Watershed Concept

Watersheds are nature's way of dividing up the landscape. Rain falls on the land, soaks into the soil or runs downhill. Surface water forms creeks, streams and rivers. Over time these watercourses dig channels and cut valleys that form natural drainage basins (see Figure A2.1).

A watershed is a drainage basin consisting of a valley, or interconnected system of valleys, that contain a single river system. Each watershed is separated from the one adjacent by a height of land or ridge. Some writers use the term watershed to describe this height of land. To avoid confusion, this document will use watershed only to refer to a river drainage basin.

Watershed Components

Watersheds have many living and non-living components, which co-exist and, in many ways, depend on one another. These components work together in complex ways.

Human Uses

In addition to the natural systems that provide free ecological services (e.g., store and purify water, maintain stream flow and recharge groundwater), watersheds also contain and sustain the forests, farms and fisheries from which humans draw their livelihoods. The actions of people who live within a watershed affect the health of the water that drains from it.

Because watersheds are, in effect, complete systems, land managers are using them as standard units for studying sustainable land use and resource management. By understanding the water cycle and the other components of a watershed, landowners and planners can minimize the impact of development.

Key Watershed Concepts

Watersheds Have Many Components

Watersheds have many living and non-living components which co-exist and, in many ways, depend on each other. These components work together in complex ways. A uniting factor for all of these functions and cycles is water. By understanding both the water cycle and the other components of a watershed, land owners and planners can minimize the impact of development.

Water Inputs are Finite

The water cycle, the natural circulation system of water on the earth, is central in all watershed systems. Water falls to the ground as rain, snow or hail, then runs downhill, either as surface runoff or groundwater, and eventually reaches the sea. Water in the ocean, and some water on its way to the sea evaporates and returns to the atmosphere and forms clouds. When clouds cool, it rains or snows, and the cycle begins again.

A watershed has a very simple water budget:

Input = Storage + Outflow

A sustainable watershed budget is simple also:

Water for Human Use = Input Needs of the Ecosystem

Sustainable development requires that use can never exceed the input rate minus the needs of the ecosystem—we should never use more water than what comes into a watershed as precipitation and we must share the resource with the plants and animals of the ecosystem that sustains the watershed.

Forests and Wetlands Maintain Watersheds

Forests are essential. They maintain both water quality and year-round water supply by preventing erosion, holding water for slow summer release and maintaining cool temperatures—Author Robert William Sandford, chair of the United Nations Water for Life partnership in Canada and the director of the University of Lethbridge's Western Watersheds Climate Research Collaborative, stated in an interview on CBC Radio in October 2007, that he and other experts believe that the most important product of forests is clean water—not wood and fibre.

Wetlands are critical water storage and purification sites. Whether they consist of large entities, such as major swamps, or tiny pockets of marsh, swamp and bog, wetlands are critical for maintaining water quality.

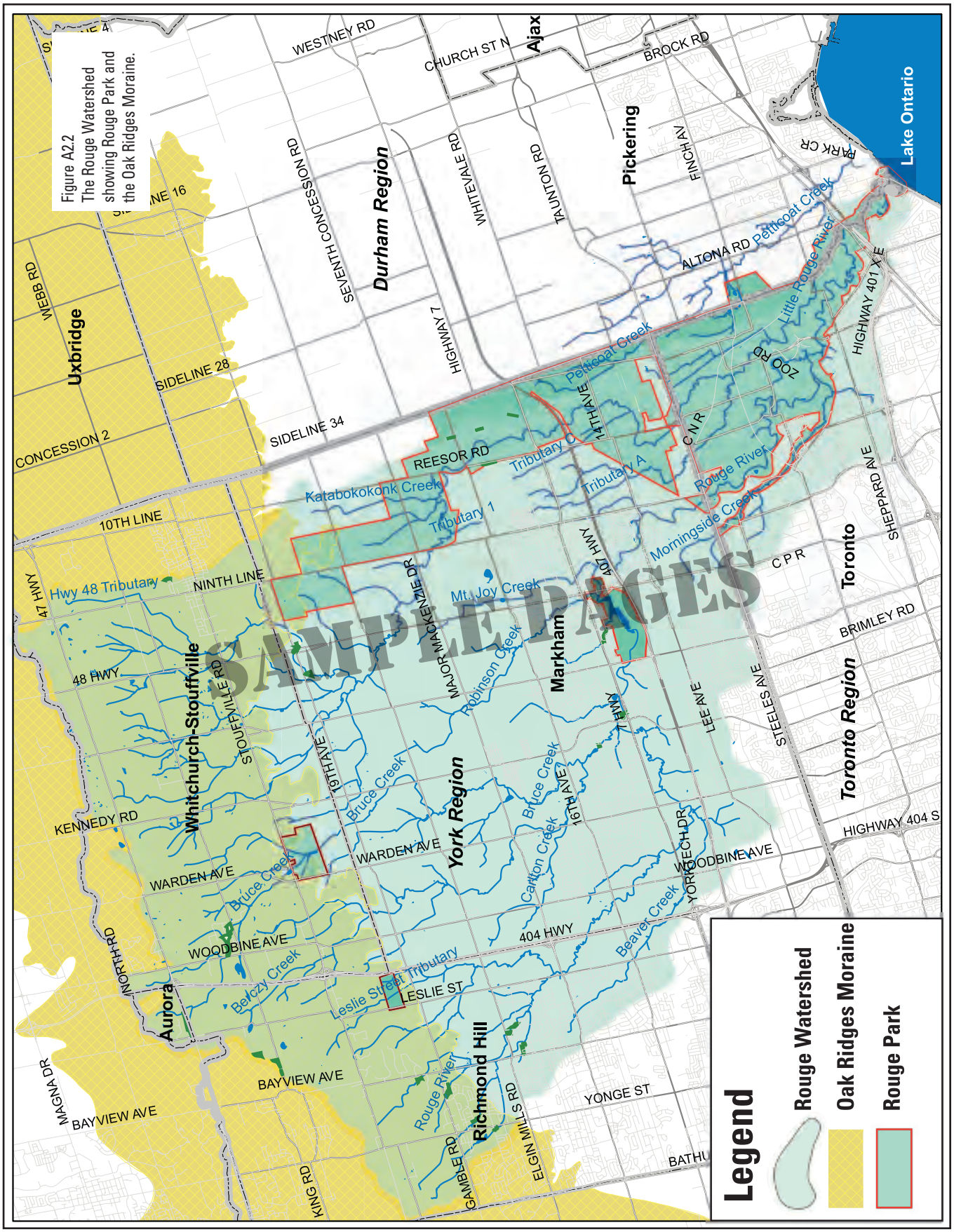


Figure A2.2
The Rouge Watershed showing Rouge Park and the Oak Ridges Moraine.

Water Flows Downhill
The importance of gravity cannot be overlooked. Any degradation of a watershed, be it destruction of part of a forest or wetland, the failure of a septic system, or the spilling or dumping of toxic waste, will have down slope effects on other parts of the watershed. Organic and chemical pollution are particularly dangerous to groundwater quality. The flow of groundwater through soil and rock can be very slow, taking hundreds of years to cycle through a watershed. A spill of toxic liquid today can contaminate our drinking water for decades.

Effects Can be Cumulative
A watershed consists of many parts working together to maintain a high quality renewable resource. The loss of one part of a watershed system through commercial, industrial or residential development can result in significant reduction in water quality or supply. Because watershed components are inter-related, the effects of development can't be considered solely on a property by property basis. The watershed as a whole, and the cumulative effects of development within it, must be the primary concern of any planning system.

The Rouge River Watershed

Rouge Park is almost entirely located within the Rouge River watershed. Currently only a small portion of the park extends into the Petticoat Creek and Duffins Creek Watersheds.

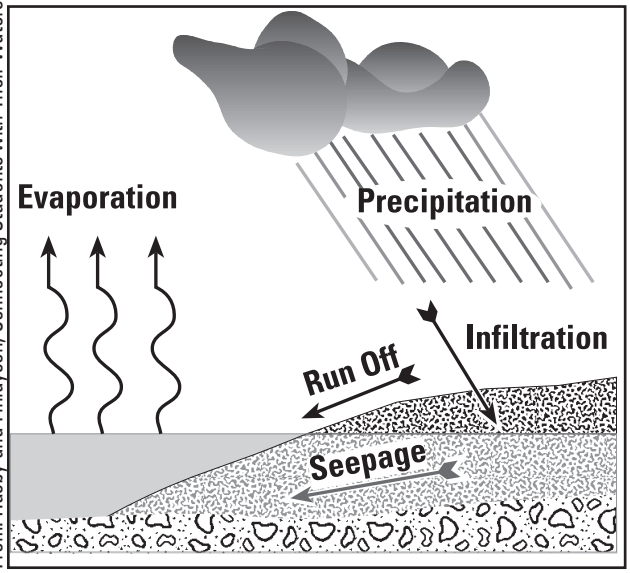
The Rouge River watershed is roughly 337 square km, located in the eastern end of Toronto and York Region and encompasses the growing town of Markham. The Towns of Richmond Hill, Whitchurch-Stouffville and the City of Pickering have lands that are included in or border directly with this watershed.

Rouge Watershed Issues

Key watershed-related issues are discussed in three documents that are nearing completion. These include:

- The State of the Rouge Watershed
- The Rouge Watershed Management Plan
- The Rouge Fisheries Management Plan

These documents will be likely be published soon after the completion of this plan. Much of the information covered here comes from drafts of these documents. Rouge Park HAVE staff should refer to these completed documents for further information about the watershed.



From: Husby and Finlayson, Connecting Students with Their Watersheds, 2001

The Water Budget of the Rouge System

The water budget is the pathways and storage of water in various parts of the ecosystem. Precipitation (rain or snow) may follow one of three pathways:

Infiltration:
Water can infiltrate into the ground and contribute to the recharge of groundwater aquifers. This water may emerge later as discharge into springs or streams.

Evaporation:
Water can be returned into the air as water vapor by evapotranspiration from plants or as evaporation from the ground, buildings, plants and other surfaces.

Runoff
The remainder runs over the ground as surface flow. In forested lands this flow is often detained or slowed by vegetation and/or the formation of temporary ponds or held for a time in permanent ponds and wetlands. In agricultural land, runoff can be delayed and retained in ponds and low ares.

In urban areas it usually rushed through storm drains and into the streams and rivers. However, in some cases the speed of runoff is slowed through the use of storm-water management pond systems.

Urbanization removes natural vegetation that would otherwise intercept, slow down and return water to the atmosphere. Grading in urban areas and farms eliminates natural depressions that capture and store surface water. Roads and buildings create impervious surfaces that prevent infiltration.

The increased surface runoff from urban areas results in a chain of effects in watercourses including higher peak flows and velocities, increased flood risks, stream bank erosion, degraded aquatic habitats, poor water quality and warmer water temperatures. Reductions in groundwater recharge limit the supply of water to aquifers and reduce the contributions of groundwater discharge to streams. (Draft *Rouge River Watershed Plan Report* of the Rouge Watershed Task Force. November 2, 2006)

Groundwater

Groundwater is water found underground in the spaces between soil particles and cracks in rocks located in the saturation zone or water table. This is the water that is available in wells, spring and seeps.

Groundwater is vital to the healthy functioning of a watershed because it provides a constant source of clean, cold water to lakes and streams. Researchers estimate that about 40- 60% of stream flow in the Rouge River and its tributaries comes from groundwater seeps and springs. Approximately 12,000 people in the Rouge River watershed rely on wells.

The Importance of the Oak Ridges Moraine

The highly permeable sands and gravels and hummocky topography associated with the Oak Ridges Moraine provide ideal conditions for groundwater recharge, about half of the annual precipitation that falls onto the moraine seeps into the groundwater system.

The Importance of the Lake Iroquois Deposits

The sand and gravel deposits associated with the Lake Iroquois shoreline are also important for recharge. However, the Iroquois shoreline is much less extensive in the Rouge River system than in neighbouring watersheds because the watershed is very narrow where it passes through the Lake Iroquois Shoreline (Draft Rouge River Watershed Plan Report of the Rouge Watershed Task Force. November 2, 2006). Also, extensive sand and gravel mining in the Rouge River watershed in the 1950s and 1960s has likely impaired the ability of surface water to infiltrate into the water table.

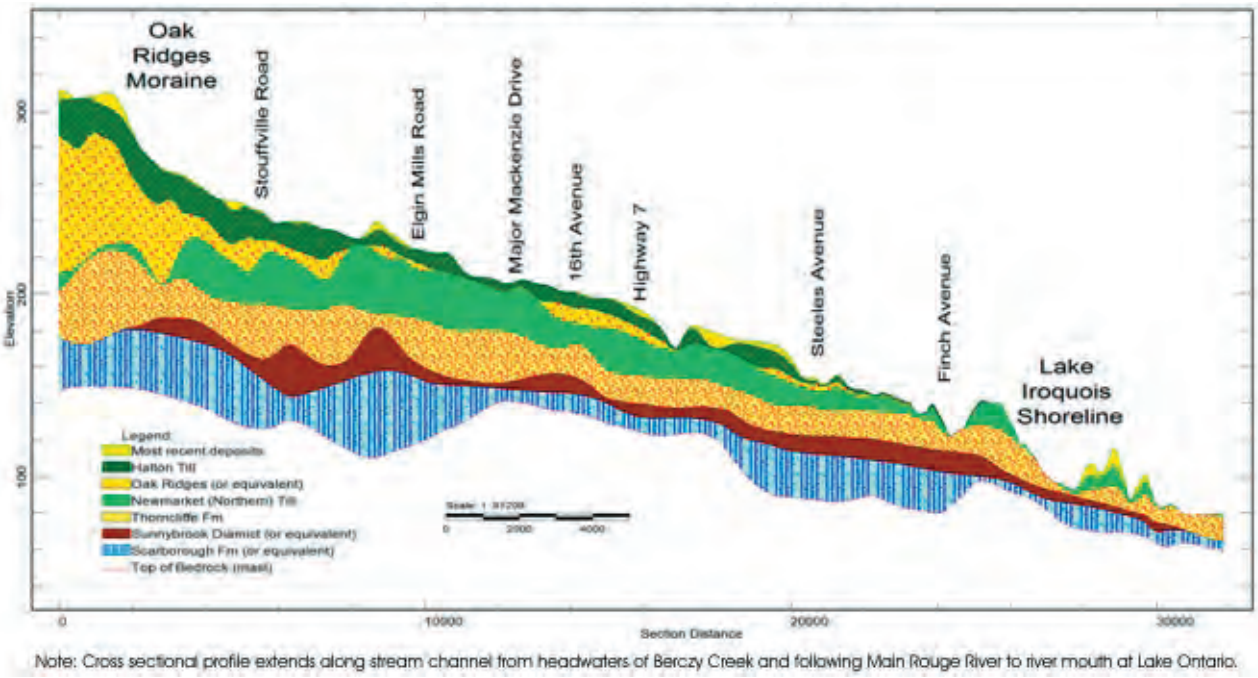


Figure A2.3 Geological cross-section of the major aquifers of the Rouge Watershed (from: Draft *Rouge River Watershed Plan Report* of the Rouge Watershed Task Force. November 2, 2006)

Note: Cross sectional profile extends along stream channel from headwaters of Berczy Creek and following Main Rouge River to river mouth at Lake Ontario.

Aquifers

There are four major aquifer systems in the Rouge River watershed:

- the Shallow System
- Oak Ridges Moraine Aquifer
- Middle Aquifer
- Lower Aquifer (see Figure A2.3).

Groundwater flow within the aquifers is predominantly south to southeast towards Lake Ontario. Note that the groundwater divide does not completely coincide with the surface watershed boundary. This is significant:

- to the north of the Rouge River watershed divide
  - recharge areas in the East Holland watershed supply groundwater to the Rouge River and its tributaries
- to the west of the Rouge River watershed
  - recharge areas in the East Humber watershed on the Oak Ridges Moraine supply groundwater to the Rouge River

Urbanization and Groundwater

Urbanization has the potential to affect groundwater recharge and discharge areas. In recharge areas, an increase in impervious surface reduces the amount of rainwater and snowmelt that infiltrates into the ground, lowering water tables.

Reductions in the water table will result in:

- reduced groundwater contributions to watercourses, thereby reducing flow (especially in summer when precipitation is less)
- increases in water temperature of streams (again in summer)
  - groundwater is significantly cooler than summer runoff

Individual tributaries of the Rouge River receive from 40-80% of their total dry weather flow from the Oak Ridges Moraine Aquifer, with the greatest amounts in:

- the northwest portion of the upper Rouge River
- Bruce Creek
- upper Little Rouge Creek

Note that some tributaries, notably upper Robinson, upper Morningside and upper Main Rouge, receive most of their groundwater inputs from local groundwater recharge sources, instead of the regional aquifers. This makes these streams very vulnerable to local urbanization—paving of lands adjacent to these watercourses will result in significant loss of groundwater and dramatic shifts in dry weather stream flow.

York-Durham Sewer System

Dewatering activities undertaken along 16th Avenue between Kennedy Road and Ninth Line as part of the construction of the York Durham Sewer System have reduced water levels in the Thorncliffe Till Aquifer (Middle Aquifer). Water table levels are predicted to return to normal within two years of completion of the dewatering cycle.

Historic State of the Rouge Watershed

The best detailed accounts about the original forest can be found in *Rouge, Duffins, Highland, Petticoat Conservation Report* edited by A.H. Richardson and A.S.L. Barnes (1956) and *Ecological Survey of the Rouge Valley* by S. Varga, J. Javlava and J.L. Riley (1991)

Forest Cover

People have lived in the Rouge, Petticoat and Duffins watersheds for thousands of years. In many cases the interaction of people with the forest has caused some small and some very large changes.

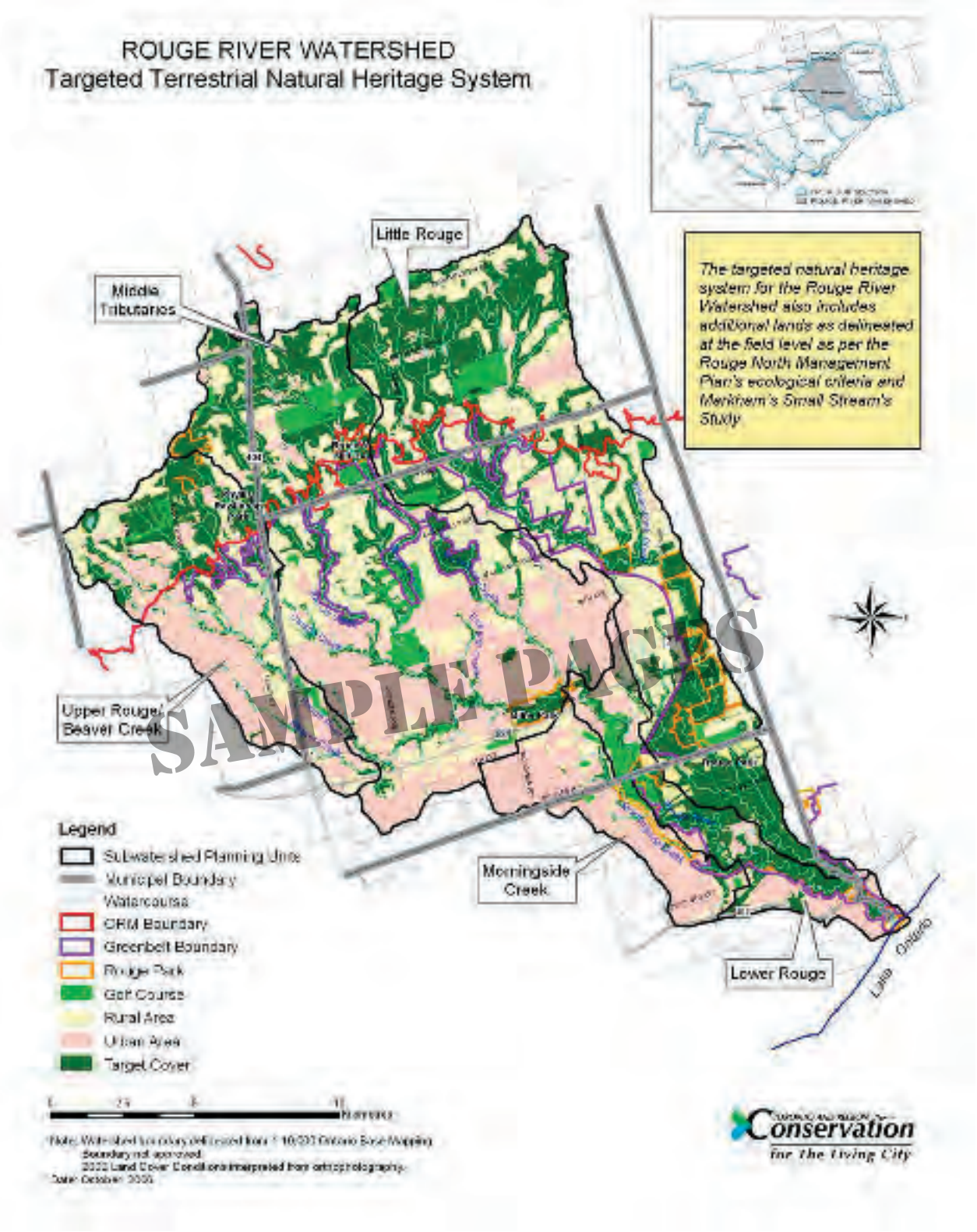
According to Richardson and Barnes 1956, good early descriptions of the forests of southern Ontario are rare. This is because early settlers looked at the forest as an obstacle to cultivation rather than a positive asset worthy of recording. The best accounts appear to be from the notes of land surveyors who recorded information about the forest cover along the lines that they surveyed. This would be similar to a transect inventory conducted by ecologists and foresters today.

Another interested party for early recording of forests were those people involved in high grading/harvesting of large white pine and oak for use of the British navy in the 1700s and 1800s.

From the surveyors records it appears that the entire watersheds of the Rouge River and Duffins and Petticoat Creeks were forested except for occasional open wetlands and small patches of windfall. The main forest was climax beech-maple with some elm and basswood. Oaks and white pine were common on sandy soils (probably in places like the old Lake Iroquois shore-line). However, the biggest pines were scattered throughout the hardwood forest in the better soils. There were forested wetlands (swamps) in parts of the valleys treed with ash cedar and tamarack. Like today, some north-facing valley slopes were dominated by hemlock.

Before European settlement, the Rouge River watershed was probably mostly covered by similar forest. However, for periods immediately before first contact and during the time of the early fur trade parts of the lower Rouge were cleared by First Nations farming communities. According to Varga, Jalava and Riley (1991), three Iroquoian villages supporting up to 1,500 people were located on the table lands between Rouge River and Little Rouge Creek south of where Steeles Ave now exists, between 1300 and 1400 CE. To support populations of this size, a fairly large amount of land must have been cleared. Probably as a result of the on-going competition and warfare between the First Nations of the region it

Figure A2.5 Proposed Natural Forest Cover (dark green) for the Rouge Watershed (from: Draft *Rouge River Watershed Plan Report* of the Rouge Watershed Task Force. November 2, 2006)



Plans to Deal with Increased Urbanization in the Rouge River Watershed

The current challenges to the health of the Rouge River watershed and the plan for dealing with them are contained in:

- **Rouge River Fisheries Management Plan**
- **Rouge Watershed Plan**

At the time of writing this plan, only drafts of these documents were available. HAVE staff should review the final documents and any subsequent reports for up-to-date information.

Original Conditions

The Rouge watershed has changed significantly since the 1700s, before land was cleared by European settlers for agriculture. Throughout the 19th and 20th century most of the forest cover was cleared for agriculture. More recently much of this farmland has been converted to urban landscapes of pavement and housing.

Major changes resulting from urbanization of the watershed include:

- increased surface runoff
- more water pollution
- greater annual flow volumes in rivers and streams
- increased erosion and sedimentation
- channel instability
- reduced groundwater discharge
- losses of cultural heritage and biodiversity

Rehabilitation of infrastructure and restoration of natural habitats to address these issues is underway, but is expensive and time consuming.

The pathway to a Healthier Watershed

Improvement of the ecological Integrity requires a comprehensive and inter-dependent set of strategies that will:

- protect and enhance habitat
- regenerate damaged systems
- build communities that are more sustainable

These strategies focus on three areas described below:

1) Expand and protect forest cover within the watershed

The TRCA has identified what they call an expanded targeted terrestrial natural heritage system that is designed to:

- expand and protect biodiversity and habitats
- maintain and restore water balance
- provide expanded opportunities for sustainable nature-based recreation
- improve quality of life
- be more able to respond to changes caused by urban growth and climate change.

This will be achieved by:

- protecting existing valued natural assets
- acquiring additional natural and agricultural lands
- regenerating degraded areas
- improving stewardship of public and private lands

Figure A2.5 shows the proposed expanded natural heritage system of the Rouge River watershed

2) Build Sustainable Communities

Sustainable communities aim to significantly decrease their environmental footprint (energy use, water use, waste production and impact on the environment). This involves new approaches to urban form, infrastructure, transportation and resource use and behaviours that will contribute to overall sustainable high quality of life.

Some of the key features of sustainable communities in the Rouge River watershed include:

- making built structures (roads, sidewalks, parking lots more porous in order to let precipitation soak into the soil thereby reducing immediate run-off into creeks and rivers and also increasing groundwater recharge.
- design to increase energy conservation, reduce vehicle use, support for local agricultural products and adaptive re-use of cultural heritage features

A significant proportion of sustainable community development depends on changes in behaviour but it also depends on new, innovative design of urban structures and new technology. Development should be designed to proceed at a pace that allows time to adopt, test and evaluate the effectiveness of new approaches, structures and technologies and to make adjustments.

3) Development of a Regional Green Space System

The Rouge Watershed has the basis for a significant, inter-connected regional green space system including Rouge Park and regional trails, conservation areas and major municipal parks. This system provides many free ecological services including support for high quality water (natural water purification, and storage), air

Table A2.1: Future Watershed Scenarios) from: Draft Rouge Watershed Plan (Nov. 2006)

Scenario	Description and Key Assumptions	Rationale	Predictions/Findings
1 Watershed conditions in 2002.	Conditions that existed in 2002.	Baseline for comparison.	• likely that the condition of the watersheds aquatic habitats in the past (pre-European) contact had significantly more groundwater flow and therefore had more extensive coldwater habitats • conversion of the watershed from forest to an agriculture dominated landscape in the 19th and 20th centuries shifted the hydrology to more of a surface flow based ecosystem - likely increased the proportion of the watershed that is dominated by warmwater habitats - has been a general trend towards the conversion of habitats to warmwater types - there are areas (especially headwaters) in the watershed that continue to support remnant populations of coldwater species such as brook trout - records show an increasingly warmwater/generalist, lacustrine-type fish community in the mid parts of the watershed
2 Official plan build-out	Current official plans is implemented. Assume: • current stormwater management practices • TRCA valley and stream corridor maintained • completion of Rouge Park restoration plans	Evaluate effect of implementing existing official plans.	• streams in the watershed are likely to have: - increased pavement and buildings will increase run-off an reduce groundwater supplies - increased surface runoff will enlarge stream channel cross-section, either through widening or deepening, or both - channel cross-sectional area in urbanized watersheds can be up to 6 times greater than that of rural streams - increased bank and/or bed erosion sending a larger sediment load to downstream areas - increase in water temperatures - probability that fish habitats and therefore communities through much of the watershed will shift to a warmer water community - fewer or no native coolwater specialists - fish species that rely on wetland and pool habitats are at greatest risk because erosive forces under this scenario will work to eliminate much of their habitat • Fisheries Management Zones 2 and 3 in the central parts of the watershed should continue to provide cool water habitat in their upper reaches
3 Official plan build-out and stormwater retrofit	Scenario 2 plus implementation of City of Toronto's: • 25 year Wet Weather Flow Management Master Plan • '905' municipalities' stormwater retrofit plans	Evaluate effect of stormwater retrofit on official plan implementation.	• simply utilizing current stormwater technologies in newly developed urban landscapes is assumed not to provide the level of hydrologic buffering or protection that will support a healthy aquatic ecosystem over the long term
4 Official plan build-out and enhanced natural cover	Scenario 2 plus implementation of: • TRCA Regional Terrestrial Natural Heritage Strategy • Markham Small Streams Study • Rouge Park ecological corridor and reforestation plans	Evaluate the effect of enhanced natural cover on official plan implementation.	• implementation of the target terrestrial habitat may maintain or improve baseline fish habitat and associated communities especially in FMZ 4 (Upper Little Rouge River) and stream headwaters in general - enhancement of coolwater habitat because of the significant amount of natural cover • habitats in the lower and mid reaches (FMZ 1, 10, 5 and lower portion of 2) remain about the same as existing conditions • habitats in FMZ 5 and 10 show continued lower quality aquatic habitat - the impacts of urban development upstream and nearby could overwhelm the small planting/naturalization area that was modeled in these zones
5 Official plan build-out, stormwater retrofit and enhanced natural cover	Scenarios 2, 3 and 4 combined.	Evaluate effect of stormwater retrofit and enhanced natural cover on official plan implementation.	

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Tallgrass Prairie

Historical and Current Range

Tallgrass prairie and related savanna communities are some of the most endangered ecosystems on the continent. Today, less than 1% of Canada's original tallgrass prairie remains. Ontario may have had more than a 1,000 square kilometers of tallgrass prairie and related communities; today, however, only a few scattered but important remnants remain (see Figure A2.6).

Prairie in Ontario is mostly a cultural phenomenon. For the past 5000 years, humans have been setting the prairie ablaze with a purpose.

First Nation peoples used fire to improve useful habitat:

- removal of old growth in the spring, resulted in fresh new grass
  - attracted more deer and other game to an area
  - probably improved conditions for some food plants e.g., Jerusalem artichoke
- removal of thorn thickets and deadfall made travel easier

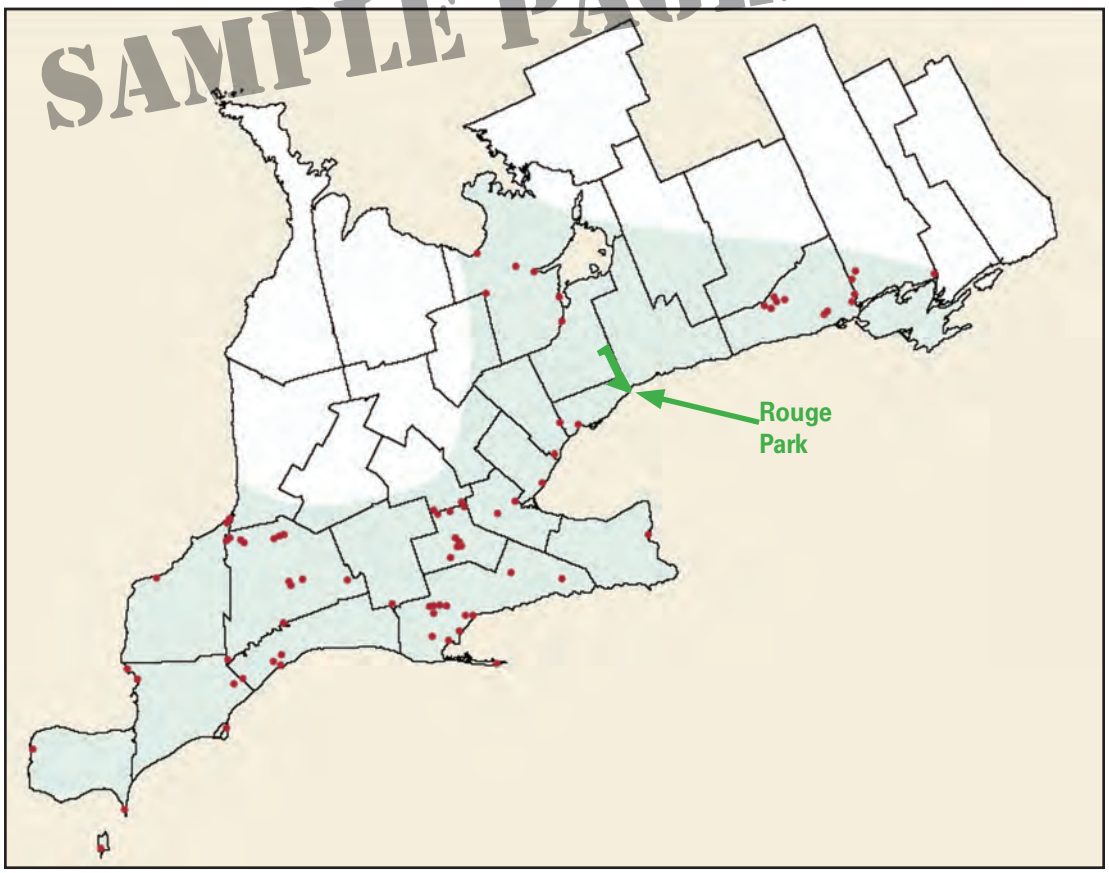


Figure A2.6 Distribution of tallgrass prairie in Southern Ontario. Historic distribution (light blue) and present distribution (red dots). Map from Delaney et al. (no date) *Planting the Seed: A Guide to Establishing Prairie and Meadow Communities in Southern Ontario*

Carolinian Forest as seen from Beare Hill © W. Husby

Forests

Past Forest Cover in Rouge Park

As stated earlier, historic accounts suggest that at the beginning of European Settlement in the late 1700s almost all of the watershed was clothed in forest.

Current Forest Cover in the Rouge Watershed

According to the Draft Rouge Watershed Plan (2006), natural cover including forest, wetland, meadow, beaches and bluffs—covers about 24% of the Rouge Watershed. This is a relatively high percentage compared to many watersheds in the Greater Toronto Area. However, it appears that only about 10% or less of the Rouge River watershed is forest (dark green land only) in Figure A2.4.

Terrestrial system

The *Draft Rouge River Watershed Plan Report* (2006) indicates that the watershed is located within four biogeographic regions:

- the Oak Ridges Moraine
- South Slope
- Peel Plain
- Iroquois Plain

Oak Ridges Moraine

There are three major forested areas associated with the watershed:

- the Jefferson Forest
- Bloomington Wetland
- the Little Rouge River headwaters

They feature some of the highest quality existing natural habitats in the Rouge Watershed, including:

- sandy meadows
- mature sugar maple forests
- small kettle wetlands
- ponds surrounded by coniferous swamp
- and dry coniferous plantations

The South Slope

This region has very little natural cover. It does contain some relatively high quality valley land in Rouge Park.

Other important natural areas located here include:

- the southern half of Jefferson Forest
- most of the Simeon Forest Complex
- Stouffville Marsh (provincially significant)
- Heise Hill Drumlin.

Sidebar: Quick Facts About the Carolinian Life Zone

- 25% of Canada's population on 0.25% of its area
- More endangered and rare species than any other life zone in Canada
- A great diversity of wildlife of all kinds, including many species not found elsewhere in Canada
- Less than 2% of the landscape is in public ownership
- 73% of the landscape is in highly productive agriculture.
- Forest cover has been reduced from 80% to 11.3%
- Forest interior has been reduced to just 2%
- Wetlands reduced from 28.3% to 5.1%

From: Carolinian Canada website: www.carolinian.org/WhoWeAre_Overview.htm

The Peel Plain

A key features in the Peel Plain include:

- Robinson Swamp (provincially significant wetland)
- Milne Pond (locally significant)
  - Milne Park also includes some hardwood forest and forested wetlands

The Iroquois Sand Plain

Rouge Park protects significant amounts of this region

- includes extensive areas of mature mixed and deciduous upland and lowland forests
- various types of wetland
- habitat that was probably once savannah and dry meadow

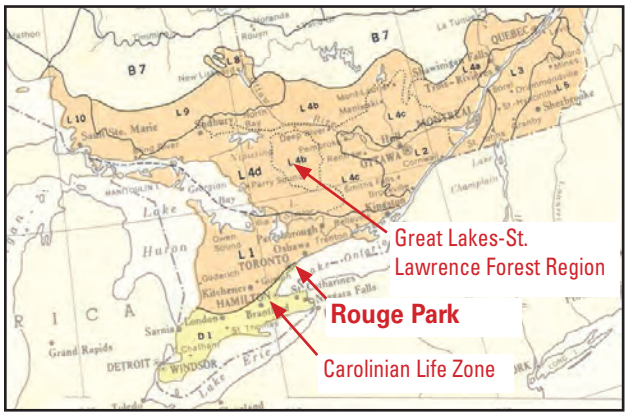
Forest Types

In southern Ontario, there are two main forest regions:

- the Great Lakes-St. Lawrence forest region
- the Eastern Deciduous forest region—also more well known as Carolinian Life Zone

Rouge Park is located on the North Eastern edge of Carolinian forest where it meets the southern edge of the Great Lakes-St. Lawrence forest. This edge is not marked by a distinct demarcation where one forest type ends and the other begins. Instead it is an area of blending of the two types of forest. A keen observer is likely to find species common in both types of forest and may also notice that the absence of some of the characteristic typical species that characterize each forest type—for example one is unlikely to find specimens of Pawpaw or Sassafras—common Carolinian forest trees—in Rouge Park.

The following is information about Carolinian Forest and Great Lakes-St. Lawrence Forest.



Carolinian Forest

The Carolinian Zone lies south of an imaginary line between Grand Bend on Lake Huron and Toronto on Lake Ontario. This region enjoys warmer year-round temperatures than any other part of Ontario. The accommodating climate supports ecosystems found nowhere else in Canada, along with levels of biological diversity unsurpassed elsewhere in the province and possibly the nation.

"Carolinian" is a Canadian name for the Canadian section of the Eastern Deciduous forest Region that is located mostly in the eastern USA. The name was coined by early botanists, who observed that hardwood forests in southwestern Ontario share many characteristics with forests as far south as the Carolinas. This type of forest occurs nowhere else in Canada.
This ecosystem contains the greatest number of plant and animal species of any Canadian ecosystem, but only exists in 1% of Canada's total land area.

A warm climate and rich soils have made the Carolinian zone attractive both for farming and for urban expansion. As a result, only three per cent of the original forest cover remains. Almost 90 per cent of the wetlands have been lost, and prairies are now among its most threatened ecosystems. The loss of habitat has had a major impact on flora and fauna—more than 40% of the national list of endangered and threatened species occur in the Carolinian zone—more than in any other Canadian life zone. There are many reasons for these high numbers —key among them are:

- habitat loss over 90 per cent of the original forests are gone
- fragmentation of remaining habitat
  - most of the remaining forests are too small and isolated to accommodate species such as Acadian Flycatchers, Hooded Warblers and others that depend on the specialized habitats found in large forests (see Sidebar: Small Forest—Big Trouble for Many Species)

Characteristic Trees

According to Carolinian Canada, forests in Ontario's Carolinian Zone are characterized by trees having a strong southern affinity, such as:

- tulip
- Kentucky coffee
- magnolia
- papaw
- sassafras
- cucumber
- black gum

The forest communities of this zone are dominated by broad leaved trees. The characteristic association, common in part to both the Great Lakes-St. Lawrence

Sidebar: What is Carolinian Forest?

Carolinian Forest is a fairly old term that was first defined in 1859 by an American botanist for a section of the hardwood forest that dominated eastern North America. Since then the term has been further refined and presently has been abandoned by everyone but Canadian researchers and naturalists in favour of the broader term Eastern Deciduous Forest.

Definitions of Carolinian Forest

- 1859, J.G. Cooper used the term Carolinian to describe a forest region running in a strip along the Atlantic coast from southern Long Island to Georgia.
- 1892, J.A. Allen used Carolinian for a faunal region stretching from the Carolinas to New Jersey and west to South Dakota and Oklahoma
- Allen and Cooper excluded southern Ontario from their Carolinian regions
- 1898 C.H. Merriam published *Life Zones and Crop Zones of the United States*
  - used isotherms as well as plant and animal ranges to define a Carolinian Area
    "Counting from the north - the Carolinian Area is that in which the sassafras, tulip tree, hackberry, sycamore, sweet gum, rose magnolia, redbud, persimmon, and short-leaf pine first make their appearance together with the opossum, gray fox, fox squirrel, cardinal, Carolina wren, tufted tit, gnatcatcher, summer tanager, and yellow-breasted chat. Chestnuts, hickory nuts, hazel-nuts, and walnuts grow wild in abundance."
  - Southern Ontario from the north end of Lake St. Clair to the west end of Lake Ontario was included in his Carolinian Area
- 1915, Canadian researchers Macoun and Malte used Carolinian to identify the vegetation in southern Ontario bounded by a line running approximately from the northern shore of Lake Ontario to Windsor
  - characterized the vegetation as including:
    - 6 species of Hickories
    - 10 species of Oaks
    - Black Walnut
    - Chestnut
    - Sycamore
  - less abundant and more locally distributed species included:
    - cucumber tree
    - tulip tree
    - flowering dogwood
    - papaw
    - american crab apple
    - red mulberry
    - sour gum
    - sassafras
  - herbaceous vegetation
    - very rich, at least a hundred species occurring nowhere else in Canada including:
    - may apple
    - wild lupine
    - tick trefoil
    - flowering spurge
    - swamp rose mallow
    - wild pansy
    - prickly pear
    - poke milkweed
    - wild potato vine
    - downy phlox
    - waterleaf
    - bee balm
    - foxglove
    - tall bellflower
    - great lobelia
    - ironweed
    - snakeroot
    - prairie dock
    - cup plant
    - tall coreopsis
    - indian plantain
    - golden seal
    - ginseng
  - many were at one time abundant but are now rare or extirpated
- 1938, Canadian, John Adams, mapped an "Interlacustrine or Carolinian Region"
  - northern limit along a line from Toronto to Sarnia
  - listed most of the same species as Macoun and Malte
- 1943 Dice defined the Carolinian Biotic Province
  - essentially followed that of Allen and Merriam
  - excluded most states west of the Mississippi
  - included Ontario below a line from Grand Bend to Toronto
- 1952–1954 J.H., Soper and W.S. Fox
  - Carolinian Zone formed a unit in eastern North America
    - northern limit in Canada—stretched south as far as Tennessee and the Carolinas
- Since the Fox and Soper the term Carolinian has received wide currency among Canadian Forest Ecologists

Other Classifications

Deciduous Forest Region

- defined by W. Halliday (1937) in 'Forest Classification for Canada'
  - low-lying portion of the Ontario peninsula, enclosed by lakes Ontario, Erie, and Huron.
  - associations predominantly composed of broad-leaved trees. - many at their northern limit
  - included a list similar to the above Carolinian Zone
  - indicate the species occur as scattered individuals or groups, either on specialized sites or within the characteristic associations
  - made up of widely distributed broad-leaved trees common in part to both the Great Lakes - St. Lawrence and the Deciduous Forest Regions

Forest patch along Morningside Creek © W. Husby

Urban Forests

"Although we know that urban forests act to reduce atmospheric contaminants, we do not yet know how to design those forests to maximize that function." (James R. Clark, Nelda P. Matheny, Genni Cross and Victoria Wake, *A Model of Urban Forest Sustainability,* ***Journal of Arboriculture 23(1): January 1997).***

There has been a lot of study of since Clark et al's quote (above). One recent study of note is *Oakville's Urban Forest: Our Solution to Pollution* ***available for download at: www.oakville.ca/Media_Files/forestry/UFORE.pdf. A PowerPoint presentation on the study is also available at: www.oakville.ca/Media_Files/forestry/UFOREPres25Oct06.pdf. This study is an ideal source of local information on the effects and values of urban forests that can be directly transferred to Rouge Park.***

Rouge Park as an Urban Forest

Rouge Park is located in Canada's largest urban zone, the Greater Toronto Area. The GTA is also one of the nation's fastest growing urban areas. The existing and planned forests of Rouge Park will be a major component of the urban forest of the GTA.

What is an Urban Forest?

Urban forests can be defined as:

The naturally occurring and planted trees in cities

A Sustainable urban forest is also:

A forest which is managed to provide the inhabitants with a continuing level of economic, social, environmental and ecological benefits today and into the future.

Urban Forest Facts:

- current thinking in urban forestry is that the ideal city forest cover should be between 30% and 40%
- urban areas in Canada have a maximum of 19% forest
  - the Greater Toronto Area (GTA) hits this average (19%) but one-third of this is located on the Oak Ridges Moraine
  - Markham only has 4% forest cover
- in most Canadian cities 90% of urban forest is on private land

Importance of the Urban Forest

While there are costs involved in planting, maintaining and removing trees in cities, in a sustainable urban forest the net benefits provided by these functions are greater than the costs associated with caring for the forest (James R. Clark, Nelda P. Matheny, Genni Cross and Victoria Wake, *A Model of Urban Forest Sustainability*, Journal of Arboriculture 23(1): January 1997).

Urban Forests Primarily Provide Services Rather Than Goods.

The most important outputs are services, such as:

- reducing environmental contamination, improving air quality
  - removing atmospheric gases
  - moderating storm water runoff
- improving water quality
- reducing energy consumption
- providing social and psychological well-being
- providing for wildlife habitat

These services, or benefits, are provided in two ways:

- direct
  - e.g., shading an individual home, buildings, streets and parks
  - e.g., raising the value of a residential property
- indirect
  - e.g., enhancing the well-being of community residents

Benefits of Urban Forests

Ecological Benefits

Sequestration of Carbon Dioxide

- an acre of forest absorbs about 2.5 tonnes of carbon each year
- the rate of carbon sequestering per year increases exponentially with the size of the tree
  - annual per tree gross sequestration of a small-stature tree is negligible compared to the contribution of a large-stature tree

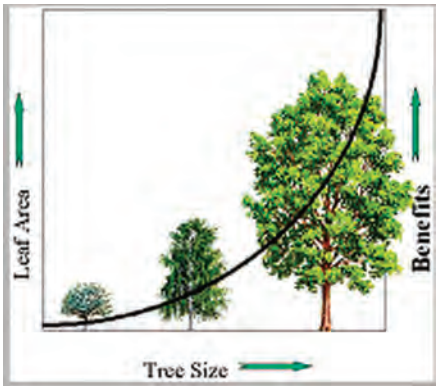


Illustration from: *Oakville's Urban Forest: Our Solution to Pollution* (2006)

  - you need about 500 full-sized trees to absorb the carbon dioxide produced by a typical car driven 20,000 km/year

Filtering of Dust

- a healthy tree can reduce air borne dust particles by as much as 7,000 particles per litre of air

Filtering of Microscopic Particulate Pollutants

- e.g., as sulphur dioxide (SO2) and nitrogen oxides (NOX)
  - have many well-documented health effects—chronic bronchitis, asthma, lung cancer and heart disease
- leaf surfaces directly absorb pollutants such as:
  - ozone
  - nitrogen oxides
  - particulate matter
  - sulfur oxides
- trees absorb these gaseous pollutants through the stomata in their leaves and break them down into less-harmful molecules during photosynthesis
- scattered individual trees can absorb pollution but urban forests provide the greatest impacts
  - the health cost of air pollution in Ontario is $1 billion a year

Cooler Air Temperatures

- forest canopy absorbs less heat than pavement
- evapotranspiration uses up heat energy

Oxygen Production

- a single mature tree produces the daily oxygen needs for 4 people

Reduce water pollution

- forest soils contain a complex matrix of bacteria, fungi and other microorganisms filtering out impurities
  - bio-filtration can dramatically reduce the sediment, pollutants and organic matter that reach streams and groundwater

Reduce Flooding

- tree leaves and branches catch rainfall during storms
  - water drips slowly from the tree, reducing the rate that storm water reaches the ground
  - decreases peak volumes of storm water that can overwhelm sewer systems
- trees divert captured rainwater from soil into the air
  - one large tree can lift up to 400 litres of water out of the ground and discharge it into the air in one day
- transpiration: water evaporates from leaf surfaces, going back into the atmosphere rather

Riparian Habitat

Riparian habitat is very important to wildlife, fish, and the maintenance of river and pond ecosystems. We recommend a more complete coverage of this section by Rouge Park HAVE staff.

This is habitat located on the banks of a river, stream, meadow, lake or other body of water. Riparian habitat usually forms a vegetated area along a stream or river. It can be narrow or wide depending on the physiography of the area. Generally this vegetation is denser and more productive that surrounding forest and fields because it is well supplied with water and nutrients.

Importance of Riparian Habitat

Riparian zones are another watershed component whose value is much larger than might be suggested by the small area they occupy in the Rouge Watershed. These zones are thin ribbons of dense vegetation adjacent to streams and the edges of wetlands, lakes and ponds. They provide a transition area between wet and dry habitats. Riparian zones include plants specialized for wet soils such as willows, as well as some wetland plants and some forest plants. Their key features are dense vegetation and high productivity. Riparian zones produce more vegetation and food than adjacent forests.

In floods, the density of plant life in riparian zones slows down water flow and the roots bind the soil of stream banks—a two-pronged approach to reducing stream bank erosion.

Riparian areas are vital for wildlife. Studies show that almost every species of animal found in forest habitat uses local riparian zones for either food, shelter or breeding.

Figure A2.11 Dense riparian vegetation along the banks of the lower Rouge River

© W. Husby

Most deer move to the cover of dense riparian forest for calving, and flocks of migrating song birds congregate in the same dense vegetation for cover and food. Almost all wildlife follow the riparian zones along streams as travel corridors to the various parts of their home range.

For fish, including Atlantic salmon and brook trout, riparian zones provide such essentials as:

- shade to keep water below lethal temperatures,
- food in the form of forest insects that fall from plants into streams,
- leaves and small twigs that provide food for aquatic insects, another major trout and salmon food
- branches and logs that fall into streams, slowing water flow and providing hiding places

Of all the components of a watershed, riparian zones are one of the most vulnerable to human activity. They are long, thin sections of forest which at times are not easy to distinguish visually from adjacent forest. Also, they occupy areas where people tend to build houses, roads and bridges. Disruption of small parts of a riparian zone may have widespread catastrophic effects. Erosion may cause silting of major salmon spawning areas downstream or an important wildlife corridor may be blocked, preventing deer from moving to their wintering quarters.

Importance of Riparian Habitat to the Rouge River System

Riparian, or stream-side, vegetation is essential to provide shade—thereby reducing water temperatures, to slow bank erosion, and to contribute nutrients to aquatic ecosystems.

Only 65% of stream length in the Rouge Watershed has riparian vegetation, with only 38% of this being more desirable woody vegetation.

© W. Husby

Figure A2.12
A riparian zone-free section of upper Morningside Creek .

Rivers

Three key sources of information about the Rouge River System are:

- **State of the Rouge Watershed Report**
- **Rouge River Fisheries Management Plan**
- **Rouge River Watershed Plan**

Rouge Park has many connections with the Rouge River system and connections with Petticoat Creek and Duffins Creek.

Rouge River and Little Rouge Creek are key components of Rouge Park. The streams in the park are influenced by the landscape inside the park and upstream in Markham and the other municipalities within the watershed. In order to interpret the in-stream features of the park, it is important to understand the physical and ecological features and processes that effect the entire waterway.

Physical Characteristics of Rivers

Key Concepts

Water Cycle

The water cycle refers to the pathways and storage of water in various parts of the ecosystem. Precipitation in the form of rain or snow may follow one of three pathways. It can infiltrate into the ground, contributing to the recharge of groundwater aquifers and may emerge later as discharge that contributes to springs or base flow in streams. It can be returned into the air as water vapor by evapotranspiration from the ground, buildings, plants and other surfaces. The remainder runs over the ground as surface runoff (stormwater) and finds its way into storm drains or watercourses.

Effects of Urbanization

Urbanization removes much of the natural vegetation that would otherwise intercept, slow down and return water to the atmosphere.

Grading eliminates natural depressions that capture and store surface water. Roads and buildings create impervious surfaces that prevent infiltration and increase surface runoff. Storm sewers collect urban runoff and convey it to nearby watercourses, by-passing the natural filtration processes that occur when water is allowed to infiltrate into the soil.

The increased surface runoff from urban areas results in a chain of effects in watercourses including higher peak flows and velocities, increased flood risks, stream

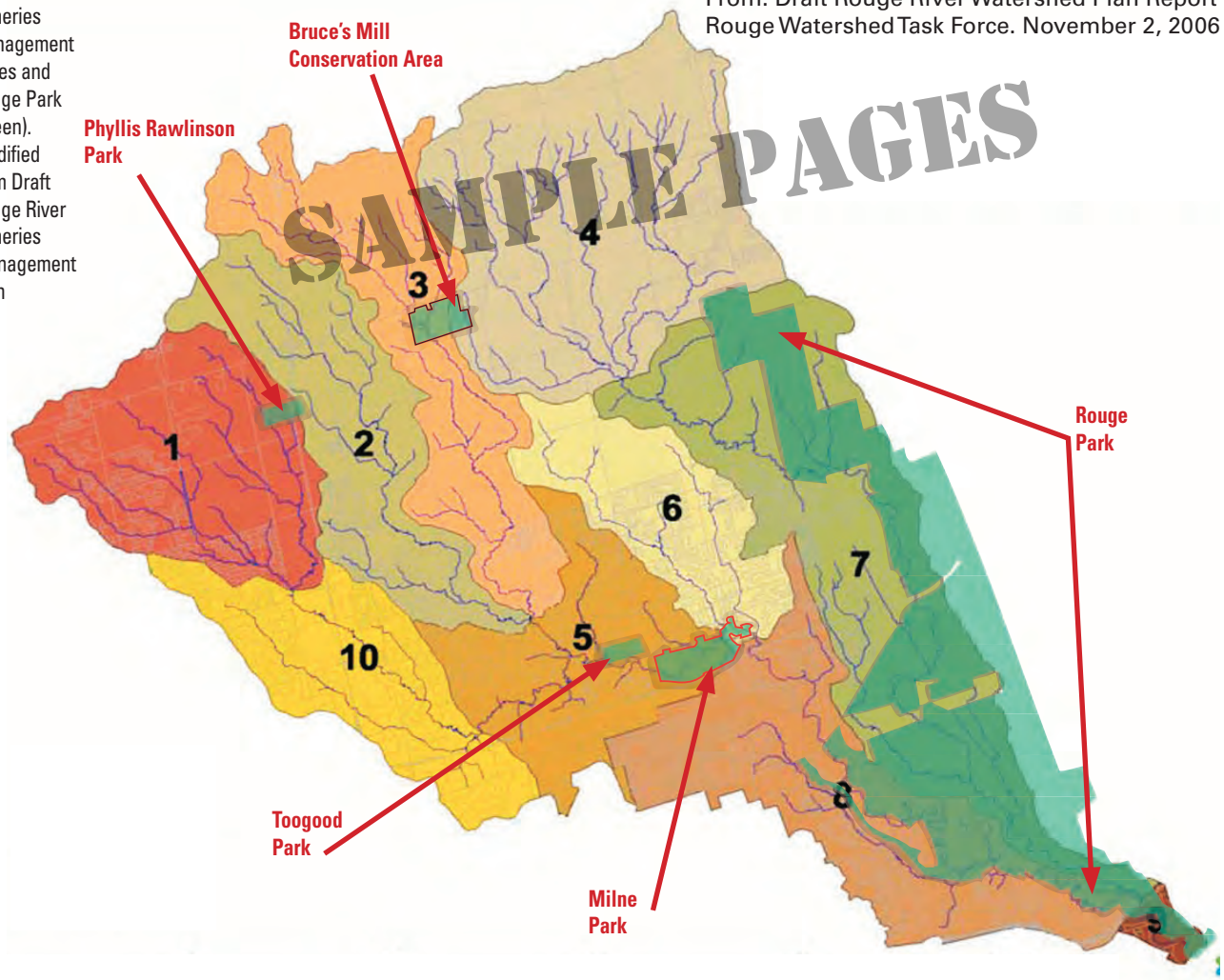
River Habitat Quality

The aquatic system in the Rouge river watershed is still relatively healthy in comparison with others in the GTA because it continues to support a high quality headwater system, diverse habitats and associated native species. According to 2003 surveys it supports at least 167 benthic invertebrates and 28 native fish species, including our target species, brook trout and redside dace (a Federal "species of special concern" and Provincial "threatened species"). However historic records dating back to 1946 indicate that a total of 47 native fish species were once found in the watershed. There are three broad categories of aquatic system in the Rouge Watershed:

1. A cold-water system in the headwaters.
2. A gradient of cool- to warm-water conditions in middle sections of the watershed.
3. A warm-water system in the Little Rouge and lower reaches of the Main Rouge.

From: Draft Rouge River Watershed Plan Report of the Rouge Watershed Task Force. November 2, 2006

Figure A2.14 Fisheries management zones and Rouge Park (green). Modified from Draft Rouge River Fisheries Management Plan



Fish

The Rouge River provides important habitat for the Lake Ontario fishery:

Warm-water Fish

- pike
- bass
- emerald shiners
- use Rouge Marsh (near the mouth of the Rouge) as spawning, feeding and nursery habitat
- migratory species such as suckers and carp swim up the Little Rouge as far as Elgin Mills Road to spawn

Cold Water Fish

- migratory salmonids use the river to spawn
  - rainbow trout in the spring
  - chinook salmon in the fall.
- re-establishment of a self-sustaining salmonid fishery in Lake Ontario will require continued stocking of lake trout and Atlantic salmon in rivers until a critical population threshold is established

There are many popular angling destinations in the Watershed including:

- the Rouge Marshes
- Toogood Pond
- Milne Reservoir
- Little Rouge Creek
- the main Rouge River

Non-native Game Fish

The non-native brown trout and rainbow trout fishery is dependent on stocking—not natural reproduction.

Contamination

There are consumption restrictions on:

Rouge Marsh

- smallmouth bass
- largemouth bass

Rouge River

- salmon and trout
  - elevated levels of PCBs, DDT and mercury.
    - probable source of these contaminants is Lake Ontario

Management of the Rouge River

Fisheries Management Zones

The Draft *Rouge Fisheries Management Plan* divides the Rouge River watershed has been divided into 9 fisheries management zones (Figure A2.8).

The watershed is divided into zones because individual streams and watercourses can be biologically and/or physically unique. They can also be uniquely influenced by various human induced factors.

Three of these zones (7,8 and 9) encompass the main parts of Rouge Park and outliers of the park are included in:

- Zone 1 (Phyllis Rawlinson Park)
- Zone 3 (Bruce's Mill)
- Zone 4 (Toogood Pond, Milne Park-in part)
- Zone 5 (Milne Park-in part)

The aim of the fisheries management plan is to deal with the current and future challenges to the Rouge River system, most specifically continued urbanization and climate change. Key approaches include forest and wetland habitat restoration, including the extensive forestry regeneration planned for Rouge Park, and creative sustainable design of future urban expansion projects which will minimize run-off and maximize soil permeability.

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May 2007

Figure A2.15
Rouge Marsh (red shaded area in the air photo right) the largest wetland in the watershed is located near the mouth of the Rouge River.

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August 2007

Wetlands in Rouge Park

Historic Wetlands

It is not clear how many wetlands, or the extent of wetlands originally existed in the Rouge Watershed before land clearing and draining took place in the 1800s. Early European settlers and their governments looked upon wetlands as they looked upon forests—as impediments to settlement and agriculture that should be eliminated as soon as possible. In fact in the 1800s malaria was present in Southern Ontario. This debilitating and often fatal disease is caused by a plasmodium microbe and vectored by mosquitoes of the genus *Anopholes* which breeds in temporary ponds that would have existed in the Rouge River watershed.

Currently there are only a few significant wetlands in Rouge Park and the entire Rouge Watershed.

Current Wetlands

Approximately 8% of the Rouge Park south of Steeles is wetland. Currently there is no wetland within the Little Rouge reek sub-watershed. However the park plans to include several seasonal wetlands in the restored forest scheduled for this area.

There are several important wetlands within lower Rouge Park. They are described below

Rouge Marsh

Key Features:

- is typical of the marshes that dotted the northern shoreline of Lake Ontario:
  - occupying a flooded lower valley ravine
  - behind a baymouth bar
- a 68-hectare wetland complex
- largest and most diverse coastal wetland in the GTA
- an area of exceptional biodiversity
- classified as Provincially Significant by the Ontario Ministry of Natural Resources
- nursery and breeding site for more than 27 species of fish
- home to Least Bittern, considered Provincially Vulnerable
- surrounded by residential, commercial and formerly industrial development

The Rouge lakefront marsh is a provincially significant and regionally rare wetland.

Composition of Rouge Marshes

Eagles and Beechey (1985) identified the following marsh/vegetation types

- open water 15%
- open water with floating and submergent aquatic vegetation 42%
- cattail marsh 36%
- grassy marsh 5%

The wetland merges into wooded bottomlands at the base of the valley slopes. These forests contain:

- willow
- cottonwood
- balsam poplar
- Manitoba maple
- dogwood
- ostrich fern
- black maple
- sycamore
- ash in some places

The deciduous ravine slopes lead to residential developments on the tablelands.

Past Water Levels

Cyclical Water Levels in Lake Ontario

Prior to the construction of the St. Lawrence Seaway, Lake Ontario water levels fluctuated both seasonally and over the longer term.

Seasonal Fluctuations

Water levels were typically highest in June, coincident with the spring runoff, and lowest in December. The average difference in water levels between these two months was about half a meter.

Long Term Fluctuations

The lake has also gone through longer term cycles which have lasted for years or even decades and are related to regional climate fluctuations. These periods of high and low cycles varied by up to 2.1 m over the last 100 years.

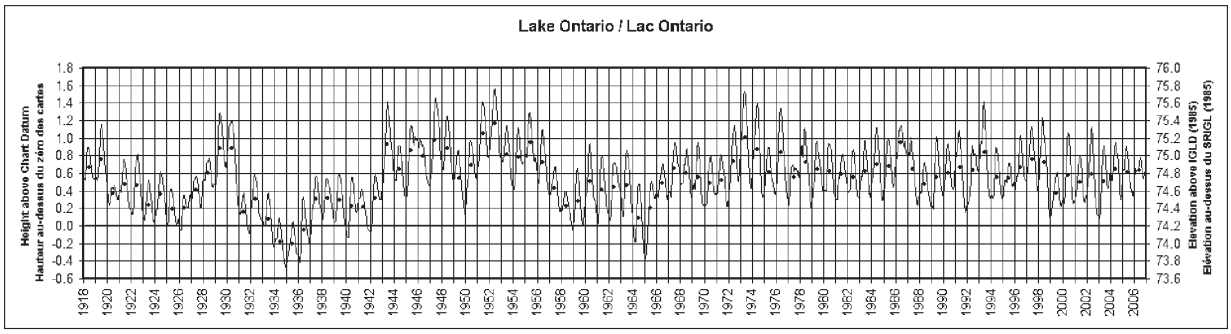
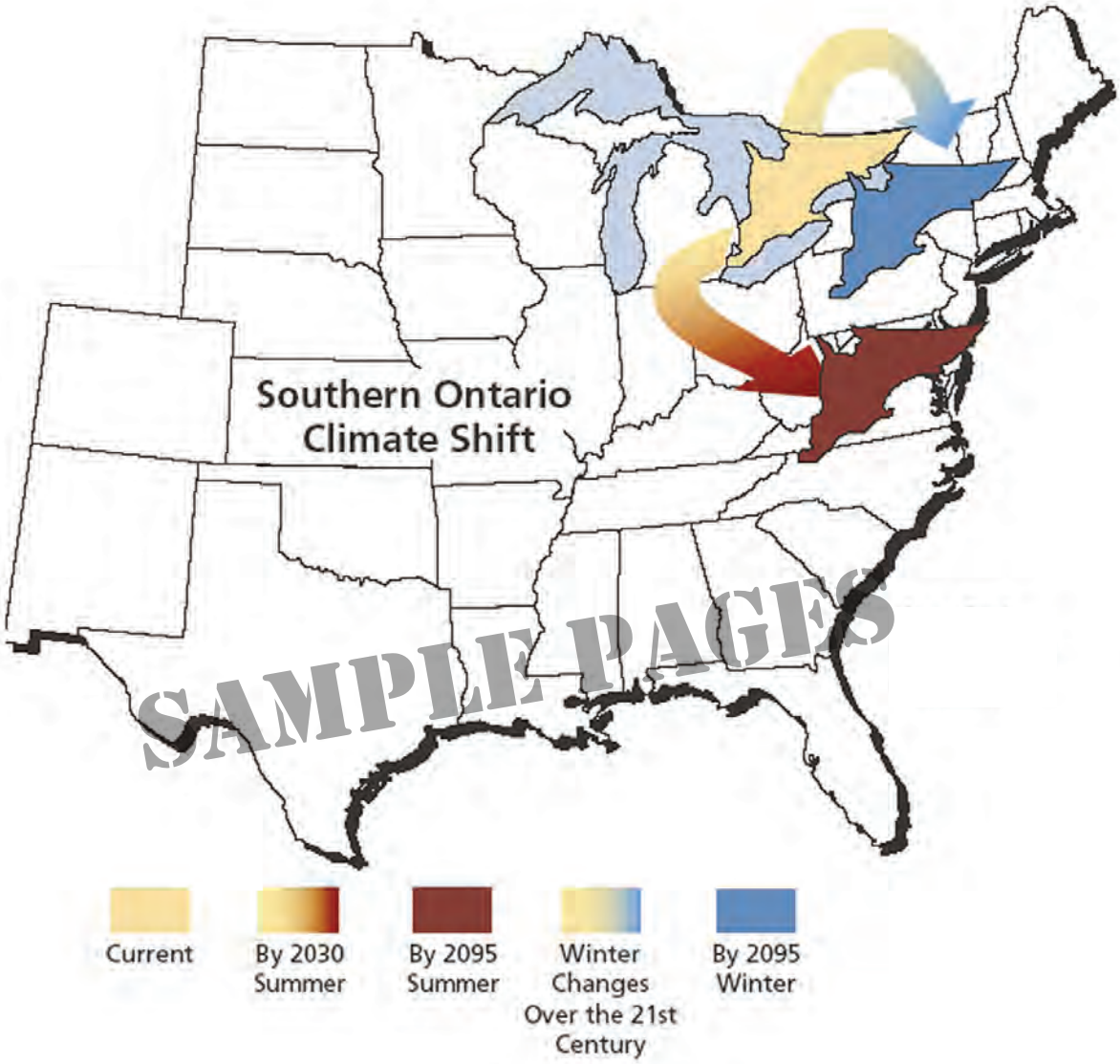


Figure A2.16 Fluctuations in Lake Ontario water levels (from Varga et. al, 1991).

Sidebar: Climate Change in Southern Ontario

The changes predicted for southern Ontario will dramatically affect how the climate feels. By the end of the century, an Ontario summer may resemble the hot and humid current-day summers of northern Virginia.

From: *Confronting Climate Change in the Great Lakes Region Impacts on Our Communities and Ecosystems* (2003). A Report of the Union of Concerned Scientists and The Ecological Society of America.



Sidebar: Small Forest—Big Trouble for Some Species

Edge Trouble

Small native species of birds, mammals and butterflies living in small woodlands are more vulnerable to an array of predators that thrive along forest edges, such as jays, crows, grackles, squirrels, raccoons, foxes, skunks and domestic cats. These predators are far more abundant in fragmented landscapes, with their higher proportion of edge habitat, than in forest-dominated landscapes. Fragmented habitat is dominated by fields, pastures, orchards and residential areas.

Large forests also reduce pressure on many bird species from Brown-headed Cowbirds. As "brood parasites," cowbirds do not build nests. They lay their eggs in the nests of other birds, which incubate the cowbird eggs and raise the cowbird hatchlings as their own. Baby cowbirds often push the eggs and young out of the host's nest. As a result, the host parents may raise few or none of their own young. Cowbirds who can be observed following cattle grazing on fields (hence the name cowbird) were originally an open grassland species that followed herds of buffalo and other large mammals, feeding on the insects disturbed by the moving herd.

This gypsy lifestyle made it impossible for cowbirds to build stationary nests and stay in one place to raise their young—brood parasitism arose as a solution to the need to have a stationary nest and to need to follow a moving food source. Today, Cowbirds flourish in fragmented landscapes, and target the nests of many species of songbirds, including endangered Acadian Flycatchers and Hooded Warblers.

The amount of edge habitat can be minimized by protecting large woodlands, increasing the size of individual forests through re-forestation projects, and avoiding further fragmentation of existing forests.

Benefits of Old-growth Forests

Older woodlands, which are disappearing rapidly in southern Ontario, have special ecological significance. They often support a greater mix of tree and plant species, and habitats at different stages of succession, than younger woodlands. They also offer the diversity of habitats required by a suite of area-sensitive forest birds (e.g., Acadian flycatcher) and mammals (e.g., flying squirrels).

Greater Park Ecosystem

The Greater Park Ecosystem is a concept developed by Parks Canada and used by other park systems in Canada and around the world.

This concept recognizes that ecosystem boundaries do not usually coincide with park boundaries and thus extend into surrounding areas. The area outside a park boundary containing part of the ecosystem is known as the greater park ecosystem.

Park managers realize that in order to avoid their parks becoming isolated islands of natural habitat, they must consider the greater park ecosystem and work with a multitude of stakeholders to maintain and enhance the natural connections between the park and the surrounding landscapes.

In order to conserve ecological integrity and further the principles of ecosystem management in protected areas, park managers need to be able to educate local communities on the importance of conserving not only the ecosystems within the park boundaries, but also those that are in adjacent lands including developed and developing areas.

Habitat Restoration Issues in Rouge Park

Habitat restoration is a key activity for Rouge Park. The restoration of forests and wetlands has also been identified as a key objective in the Official Plans of the municipalities on the Rouge Park Alliance. The federal government determined that for healthy, sustainable ecosystems at least 30% of a watershed should be forested and another 10% should be wetland (Environment Canada 2004).

From: *Little Rouge Corridor Management Plan (2006)*

Reforestation Issues

According to the Little Rouge Corridor Management Plan (2006), attempts to establish hardwood forests directly on abandoned agricultural lands has had mixed results. In some cases, fast-growing poplar plantations have been successful, as have some walnut plantations. In other cases the hardwoods are difficult to establish because:

- growth is slowed by competition from weeds and invasive species
- allopathic substances released by goldenrods kill or stung seedling growth
- the herbicide Atrazine remaining in agricultural soils kills seedlings
- herbivores such as white-tailed deer, rabbits and voles top or girdle seedlings and young trees

Note that the Little Rouge Corridor Management Plan includes detailed information on methods of restoration.

Reforestation and Climate Change

Some climate models predict conditions more conducive to Carolinian species since the Carolinian Zone may extend 200 km further north.

Potential Research Partner: Dr. Jay Malcolm, University of Toronto Faculty of Forestry

Types of Restoration

- Large Scale Reforestation (Pines and Spruces)
- Small Woodland Blocks
- Riparian Corridors and Wet Environments
- Hedgerow Restoration
- Grassland Restoration
- Meadow Habitats

See the Little Rouge Corridor Management Plan for details on each restoration approach.

Seed Sources

Successful reforestation planting requires good quality, healthy stock that is carefully selected to suit site conditions.

Sidebar: Social Marketing Opportunities For Sustainable Practices

Two recent studies provide valuable insights into the design and likely success of programs to encourage naturalization and lot level stormwater management by businesses and the public. They are the *Action Plan for Sustainable Practices in the GTA* – residential and businesses - by Freeman Associates and the *Canadian New Home Builder Customer Satisfaction Study* by J.D. Power and Associates. Key findings of these studies:

Residential

GTA homeowners' landscapes are viewed as an extension of their homes and themselves. A key barrier to adoption of sustainable practices for landscape design and maintenance is that homeowners have a deeply held landscape aesthetic (manicured, colourful, tidy, designed) that they do not associate with a "naturalized" landscape. However, when shown photographs of examples of naturalized landscapes and lot level stormwater infiltration methods, most people found them attractive and 84% were willing to consider changes to their home landscape. 46% of new home buyers would accept a low maintenance landscaping package requiring less water and fertilizer use if offered by the builder. Landscape professionals, nurseries, garden centres and large stores such as Home Depot and Canadian Tire are key trusted advisors for garden design and purchase of plants and products.

From: Draft Rouge River Watershed Plan Report of the Rouge Watershed Task Force. November 2, 2006

General Management Guidelines for Nature Reserve Zones:

- Maintain the highest level of protection for existing core natural areas. Management must support long-term ecosystem health.
- Management must recognize the significance of the Nature Reserve Zone within the context of restoration strategies. These areas act as the nuclei for ecological expansion into and re-establishment in surrounding lands.
- Conserve and manage existing cultural heritage features while ensuring protection of the surrounding natural environment.
- Public access will be restricted in Nature Reserve zones to:
  - provision of a route for the north-south trail only where needed to establish a road or creek crossing. In these instances access should be directed to areas of lesser ecological significance.
  - provision of routes for low-impact interpretive trails only to provide closer access to creek valley at non-sensitive locations, for viewing and fishing access points. The location, number and final routing of trails to be determined in the field, and in consideration of local site conditions, archaeological and ecological considerations.

From: *Little Rouge Corridor Management Plan*

Park Management

A key focus of Rouge Park is land management. The park has developed a set of land management zones described below.

Management Zones

Rouge Park is still in its growth phase. Recently—before the time of writing this HAVE Plan, substantial lands were added to the northern section of the park including the Bob Hunter Memorial Park . Discussions with the park manager indicate that further additions to the park are possible in the future. Corresponding to this several management plans have been developed. These include:

- Rouge Management Plan (1994)
- Rouge North Management Plan (2001)
- Little Rouge Corridor Management Plan (2006)
- Bob Hunter Environmental Area Master Plan (2006)
- Rouge Park East Management Plan (2008)

Each plan identifies specific areas zoned for particular management activities in the park lands that they cover. However, because each of these additions have specific issues, the classification of these zones varies between plans (see Table A2.1 below).

Table A2.1 Management Zones in Rouge Park

Management Zone	Rouge Management Plan (1994)		Rouge North Management Plan (2001)		Little Rouge Corridor Management Plan		Bob Hunter Environmental Area Master Plan	
	Described	Mapped	Described	Mapped	Described	Mapped	Described	Mapped
Nature Reserve	✔	✔	✔	✖	✔	✔	✖	✖
Natural Areas	✖	✖	✔	✖	✖	✖	✖	✖
Restoration Zone	✔	✔	✔	✖	✔*	✔*	★**	★**
Agricultural Heritage Reserve/ Type 1 Heritage Zone (LRC)	✔	✔	✔	✖	✔	✔	✖	✖
Access Zone	✔	✔	✖	✖	✖	✖	✖	✖
Special Management Zone/ Managed Areas	✔	✔	✔	✖	✔	✔	✖	✖
Heritage Zones								
Type 1	✖	✖	✖	✖	✔	✔	✖	✖
Type 2	✖	✖	✖	✖	✔	✔	✖	✖

* Includes: • Type 1 Restoration: Forest
• Type 2 Restoration: Grassland

** Although the term Restoration Zone is not used in the Bob Hunter Master Plan, the plan states that over 70% of the site will be restored to natural habitat

Nature Reserve

The following is a description of this zone from the Rouge North Management Plan (2001).

The primary purpose of the Nature Reserve Zone is to protect the core natural features of the Park. The zone is intended to provide protection for existing lands of natural significance and require protection that may include restrictive land use management including corridor and linkage functions.

Lands designated as 'Nature Reserve' are considered to be the most ecologically significant and sensitive lands within the park and merit the highest degree of protection to ensure that the ecological sustainability of the area is preserved and enhanced. Nature Reserves may also include areas, which due to their ecological context, possess the potential to enhance the breadth of function of ecologically significant areas. Uses within Nature Reserve areas are limited to low impact, permeable surface walking or hiking trails and viewing and interpretive areas, where environmental studies have demonstrated that these uses will not result in the degradation of the resources of the site.

Criteria for Designation

Areas afforded the Nature Reserve designation in the park include:

- environmentally significant and sensitive areas
- areas of natural or scientific interest
- locally significant areas and other woodlots that are greater than 1 ha. in size, which are within 100 m of a stream corridor
- wetlands, river and stream corridors
- areas of hydrogeological importance
- distinct landforms
- unique vegetation communities
- habitats for vulnerable, rare, threatened and endangered species and species of concern
- primary natural features identified within the existing background studies or through the course of defining Rouge Park in York Region through the planning process
- areas of critical importance to achieve terrestrial and aquatic habitat objectives,

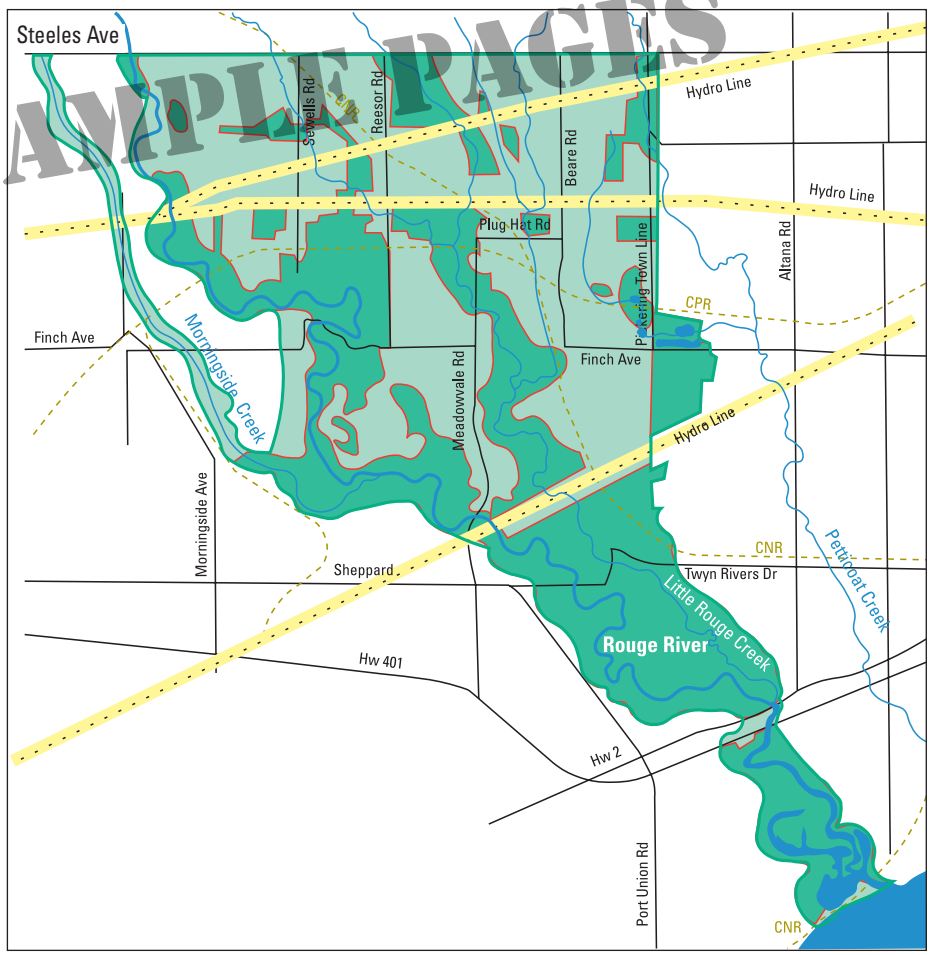


Figure A2.39 Nature Reserve lands (dark green) in Rouge Park, south of Steeles Avenue

Agricultural Heritage Reserve

The following is a description of this zone from the Rouge North Management Plan (2001).

Lands in Rouge Park south of Steeles and those contained in the Little Rouge Corridor Management Plan have been identified and mapped as Agricultural Heritage Reserve.

The Rouge Park Management Plan (1994) identifies this zone as areas which support, or are proposed to support, agricultural land uses within the park. Agricultural Heritage Reserves will be located only on tablelands, with the exception of built heritage resources exist, and on lands where no significant or sensitive natural or ecological resources, and limited potential to enhance the ecological integrity of Nature Reserves exists.

Criteria for Designation

- Existing rural agricultural lands that are of important cultural heritage value and which can contribute to the achievement of park objectives, or function as buffer lands adjacent to significant resources and corridors.

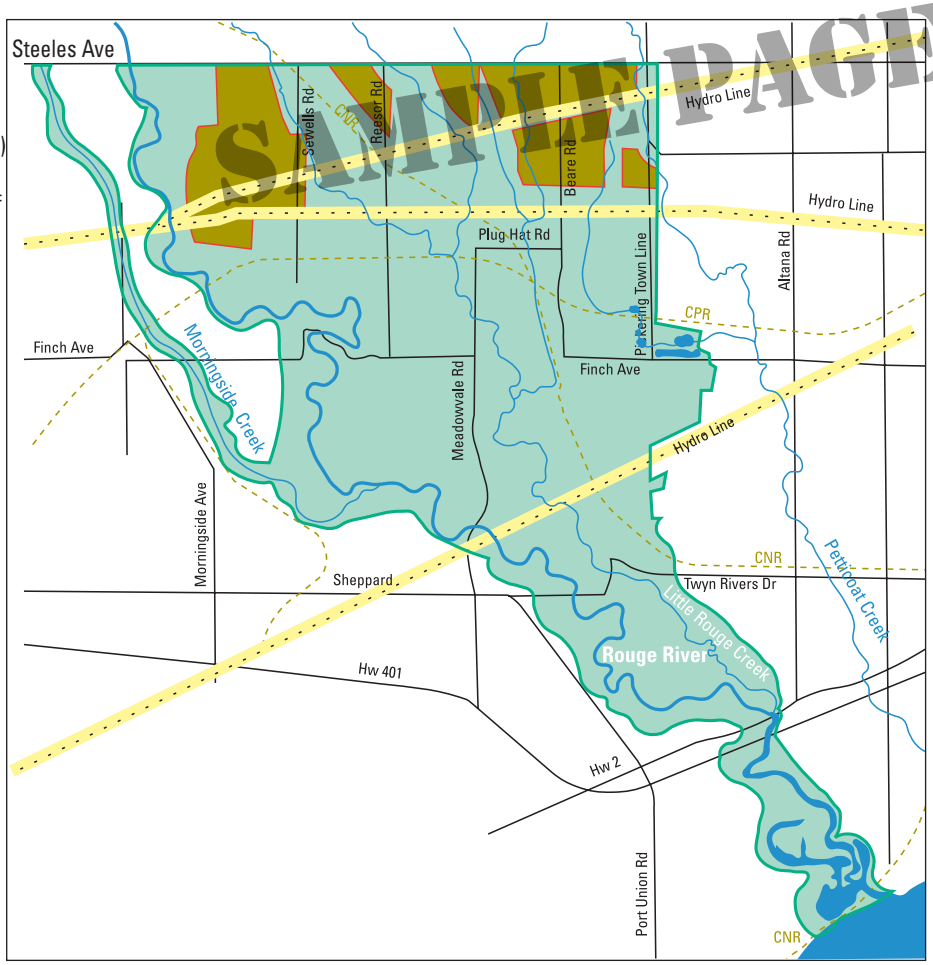


Figure A2.43 Agriculture Heritage Reserve lands (brown) in Rouge Park south of Steeles Avenue

Primary Objective

- To integrate agricultural heritage resources as cultural amenities, which simultaneously contribute to the achievement of ecological objectives within the northern parts of Rouge Park

Lands in Rouge Park South of Steeles Ave

The purpose of Agricultural Heritage Reserve (AHR) zones (approximately 10% of the park area between Lake Ontario and Steeles Avenue) is to maintain several significant agricultural areas for ongoing farming and to protect farm complexes which contain important cultural heritage values and contribute to the local rural identity.

elements within the Agricultural Reserve
- permit the establishment of a demonstration farm

Park Lands in the Little Rouge Corridor

These lands provide support for working ancestral farms in the Little Rouge Corridor including:

- former Wurtz-Pike farm
- Christian Reesor farm
- family cemeteries;
- Locust Hill Schoolhouse

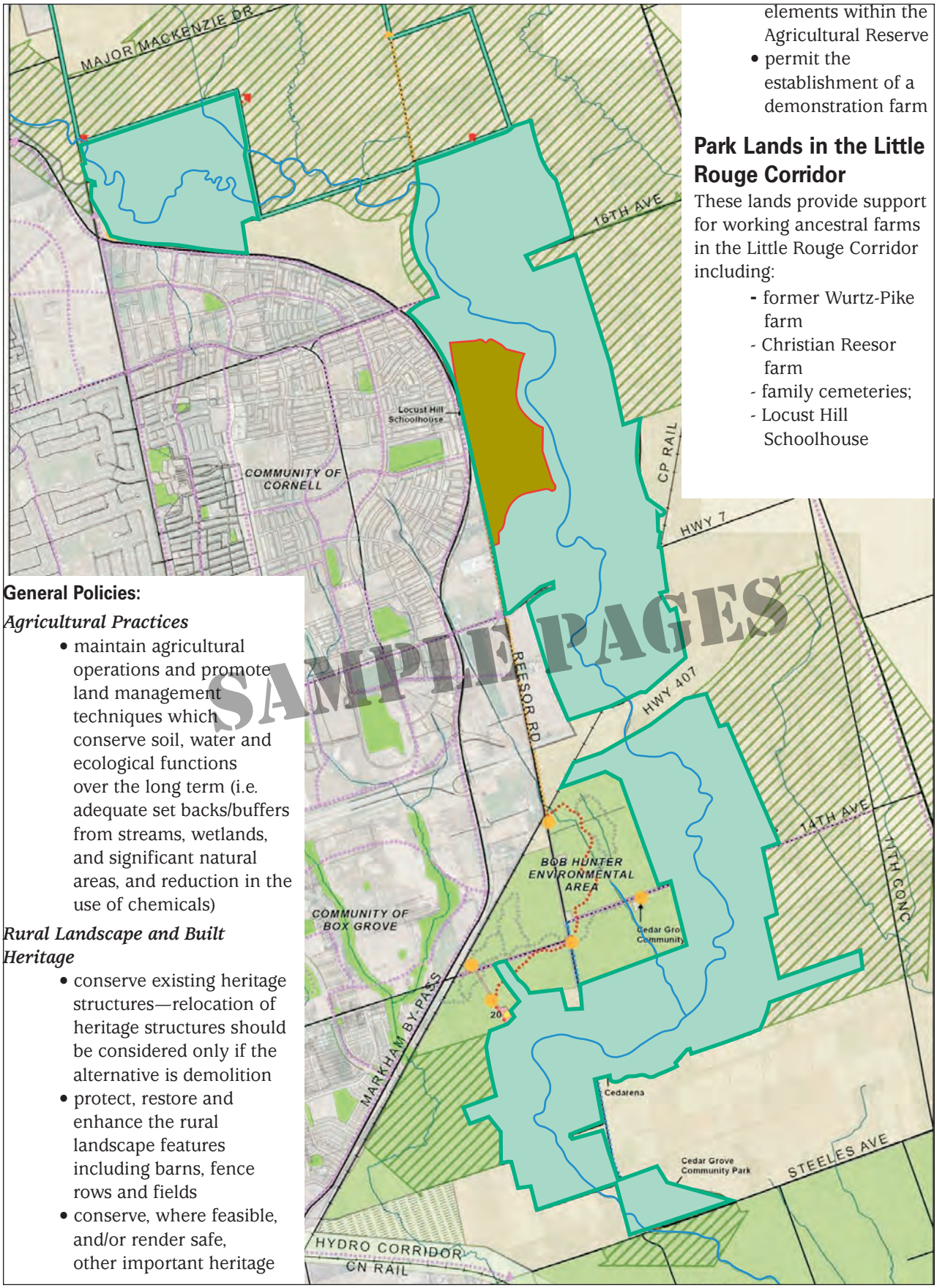


Figure A2.44 Agricultural Heritage Reserve lands (brown) in Rouge Park north of Steeles Avenue

General Policies:

Agricultural Practices

- maintain agricultural operations and promote land management techniques which conserve soil, water and ecological functions over the long term (i.e. adequate set backs/buffers from streams, wetlands, and significant natural areas, and reduction in the use of chemicals)

Rural Landscape and Built Heritage

- conserve existing heritage structures—relocation of heritage structures should be considered only if the alternative is demolition
- protect, restore and enhance the rural landscape features including barns, fence rows and fields
- conserve, where feasible, and/or render safe, other important heritage

Heritage Zones

Heritage Zones are identified only in the Little Rouge Corridor Management Plan (2006).

This zoning is meant to ensure the ongoing protection of built heritage areas and cultural heritage landscapes. Approximately 42.5 hectares of land enclosed in the Park north of Steeles Ave have been designated.

The Heritage Zone is made up of two types:

Agricultural Reserve

See Agricultural Heritage Reserve above.

Heritage Cultural Node

This zone protects the cultural heritage of small historical centres, and encourages compatible uses that support the local economy and recognize the historical significance of individual buildings and areas.

- encompasses the heritage hamlets of
  - Locust Hill
  - Cedar Grove

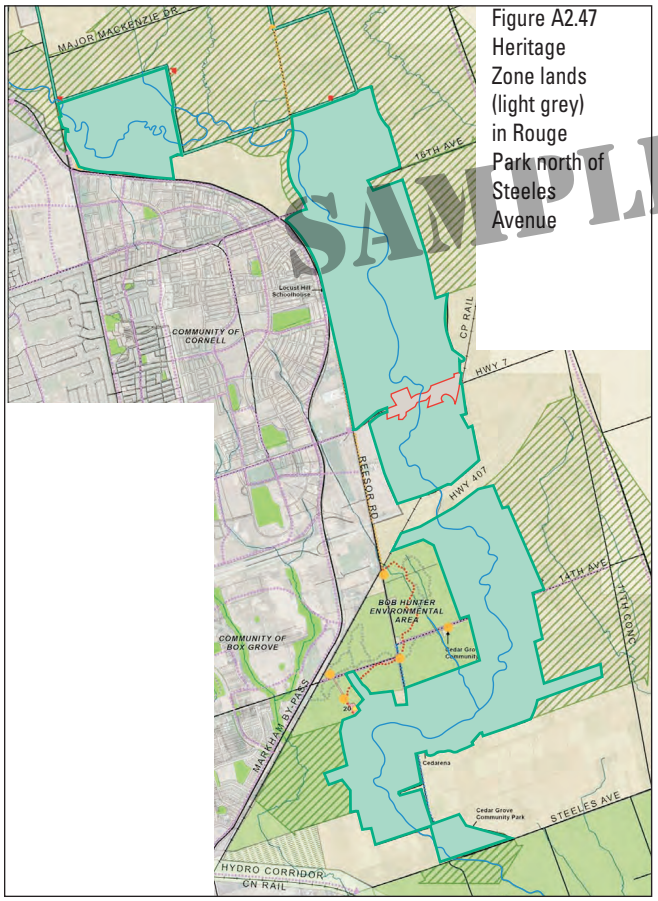


Figure A2.47 Heritage Zone lands (light grey) in Rouge Park north of Steeles Avenue

Sidebar: Management Guidelines

General Management Guidelines for the Heritage Agricultural Reserve:

- protect culturally significant features in association with ongoing ecosystem protection, through application of sound land management practices
- develop future lease terms to support long-term heritage conservation and agricultural uses. Use and management activities will remain consistent with local, regional and provincial efforts to support continual agricultural uses
- support the development of the north-south trail along Reesor Road (the western boundary of the Wurtz-Pike farm), to support public enjoyment of heritage zones and channel public uses in this area, supporting long-term heritage conservation and agricultural uses

General Management Guidelines for Heritage Cultural Nodes

- protect culturally significant features, including archaeological sites, in conjunction with natural heritage objectives
- protect designated cultural heritage sites through an ongoing commitment to conserve built heritage structures and landscape features, in keeping with their historical character
- develop future lease terms for heritage buildings to support long-term heritage conservation
- support Town of Markham in its investigation of the potential designation of Locust Hill and Cedar Grove as Heritage Conservation Districts
- consider adaptive re-uses for park purposes that respect the heritage structures (e.g. park warden office, archaeological field office, education/interpretation centre)
- provide for compatible commercial uses in heritage buildings (e.g. B&B, agri-tourism operations, furniture making, artisans).
- encourage public uses that support the overall intent of the cultural heritage node

From: *Little Rouge Corridor Management Plan* (2006)