

Regional Municipality of York

Appendix 3C-1a

Terrestrial & Aquatic Ecology

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1. Methodology

A considerable amount of natural heritage information has been collected by Toronto and Region Conservation Authority (TRCA) and the Ontario Ministry of Natural Resources (OMNR) in the City of Vaughan. Many of the records date back more than fifty years and provide historical context to present conditions within the City. Data provided by these agencies and other secondary source information was compiled and analysed for this report.

This discussion is based on a review of existing documentation and interviews with agency staff, residents and naturalists. The aim was to locate and examine existing information on the environmental functions or features of the Study Area, species of concern, existing mapping and other available data. The background review included correspondence with appropriate agencies and stakeholders including the TRCA and the OMNR.

1.1 Available Secondary Source Information Collection and Review

Numerous reports and databases were acquired and compiled for the City of Vaughan. Spatial data was mapped to provide an understanding of species distribution, hydrogeology, vegetation communities, habitat fragmentation and sensitive areas.

- **Ontario Ministry of Natural Resources (OMNR)**
 - MNR Natural Heritage Information Centre (NHIC) Species at Risk
 - MNR NHIC Natural Areas Records
 - MNR NHIC Life Science Areas of Natural and Scientific Interest (ANSI)
 - Natural Resource Values Information Centre (NRVIS)
- **Toronto and Region Conservation Authority (TRCA)**
 - Environmentally Significant Areas Study (1982)
 - Terrestrial Natural Heritage System Strategy
 - Humber River Watershed Plan
 - Humber River Fisheries Management Plan
 - City of Vaughan Sub-watershed Plan
 - A Time for Bold Steps: Don Watershed Report
 - 40 Steps to a New Don
 - Surface Water Quality Conditions of Streams in the Toronto Area
 - Don Report card 2003
 - Summary of Water Quality Data in the Toronto Region 1996-2002
 - Report Card on the Health of the Humber Watershed
 - Fisheries Datasets
 - Ecological Land Classification Data
 - Wildlife Observations Dataset
- **Ontario Breeding Bird Atlas (Second Edition) 2008**
- **Nature Conservancy Canada Conservation Blueprint for the Great Lakes Region**

- **Consultant Reports**
 - Gartner Lee Limited Internal Reports
 - City of Vaughan Focus Rural Area Woodland Ecosystem Assessment – AMEC
 - Highway 427 Environmental Assessment Report – AMEC
 - Pine Valley Environmental Assessment – Gartner Lee Limited
 - Bathurst Environmental Assessment – Gartner Lee Limited

- **York Region**
 - York Region Significant Woodlands Study

- **City of Vaughan**
 - City of Vaughan Sub-watershed Study
 - OPA 160 Official Plan Review AMEC
 - OPA 600 – Gartner Lee Limited

- **Ontario Ministry of the Environment**
 - Waterwell Records

2. Existing Natural Environment Conditions

2.1 Fisheries and Aquatic Environment

Typically natural heritage systems focus on the terrestrial portion of the landscape. However, as a system, the connections among terrestrial features (wetlands, woodlots and meadows), aquatic features (watercourses, ponds) and groundwater are important to recognize in order to identify appropriate land use policies.

The objective of this section is to generally characterise the aquatic environment within the Study Area as well as identify unique characteristics that may provide significant support to distinguish among alternative methods for the purpose of the environmental assessment (see **Figure 1**).

There are two main watersheds in the Western Vaughan Study Area (total area 11,956 ha), the Humber River (11,392 ha in Study Area) and the Don River (564 ha in Study Area). These watersheds are further divided into sub-watersheds, each with a unique characterization of surficial geology and discharge systems, and fish, plant and insect communities. Each watershed and subwatershed is described below, providing a general discussion of the water quality, common fish species, Species at Risk and presence of non-native species. Aquatic species respond to changes in habitat and their physical environment, so the presence or absence of a species may indicate changes in the aquatic environment. This can include changes in land use, nutrient inputs, water chemistry, riparian cover, and levels of contaminants. Using this information, stressors to the aquatic environment and sensitive areas can be identified. Areas that provide habitat for Species at Risk require special attention. The Redside Dace (*Clinostomus elongates*) and the Northern Brook Lamprey (*Ichthyomyzon fossor*) are both classified as Species at Risk, where the Redside Dace is listed as endangered nationally and provincially and the Northern Brook Lamprey is classified as a species of special concern, both nationally and provincially.

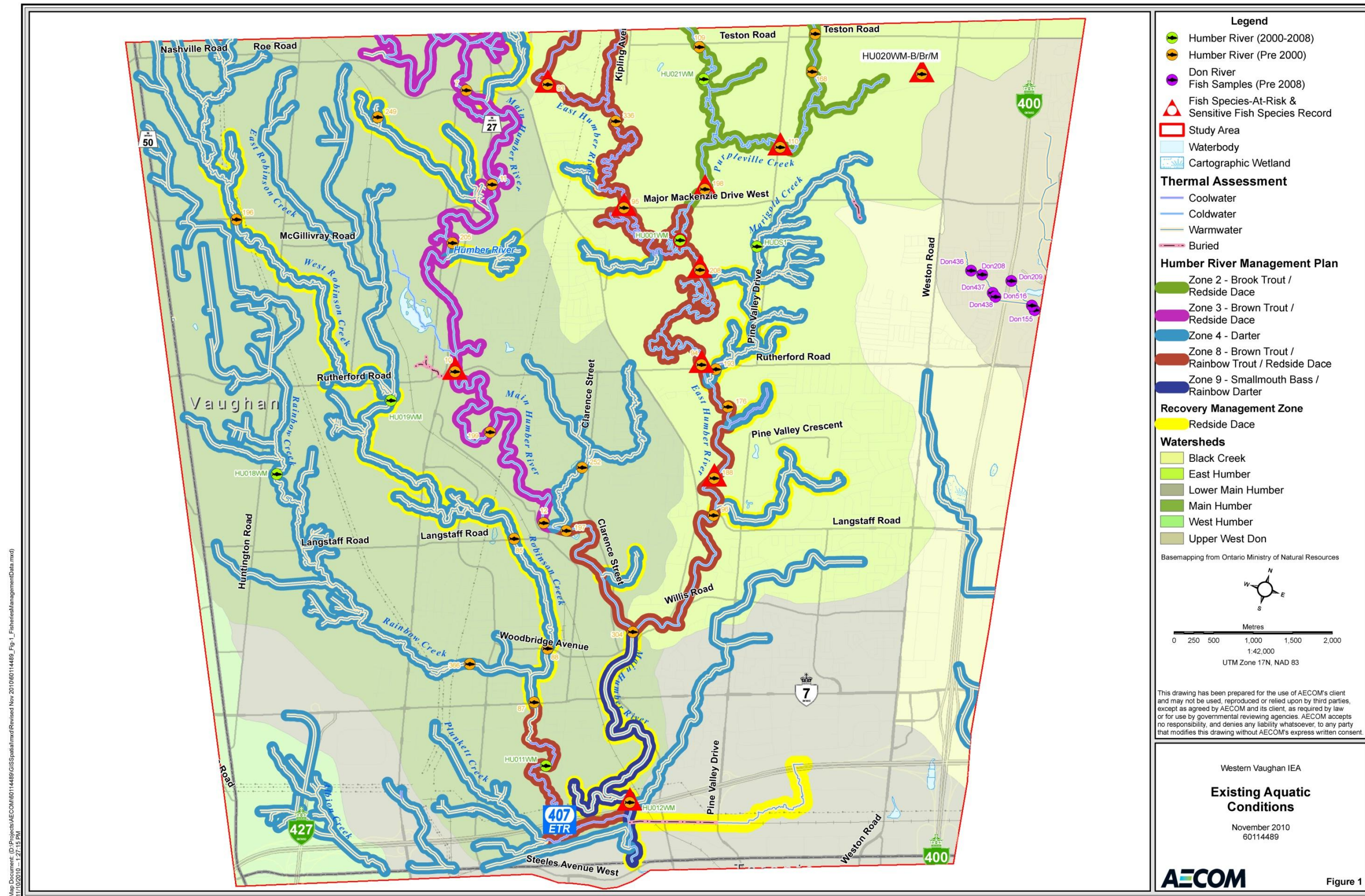


Figure 1. Existing Aquatic Conditions

2.1.1 Humber Watershed

The land use within the Humber River watershed has been classified as 26.2% urban, 40.2% rural and 32.2% natural. The total drainage of the Humber River watershed is 908 km² and supports a population of 600,000 people (OMNR and TRCA 2005).

The major physiographic regions in the Humber watershed are the Niagara Escarpment (limestone bedrock ridge), Oak Ridges Moraine (sand and gravel ridge), south slope (area of sloping glacial till plain), Peel plain (flat, silty clay, former lakebed) and the Iroquois Sand Plain (sand, silt and clay deposits from former Lake Iroquois) (TRCA 2007).

Only a portion of the Humber River watershed is within the Western Vaughan Study Area. The Humber River watershed can be divided into five sub-watersheds: Main Humber, East Humber, West Humber, Black Creek and Lower Humber (TRCA 2007).

A total of 47 fish species have been found within the Humber watershed from 1946-2004. Four are non-native species including: Brown Trout (*Salmo trutta*), Common Carp (*Cyprinus carpio*), Goldfish (*Carassius auratus*) and Rainbow Trout (*Oncorhynchus mykiss*). Within the Western Vaughan Study Area 42 fish species were found, and two of them are non-native.

Data sources for the Humber River watershed include the Humber River Fisheries Management Plan (2005), Humber River Watershed Plan: Draft (2007), Humber River Watershed Report Card (2000), OMNR records, TRCA records, and numerous consultant reports from properties in the area. The Humber River Fisheries Management Plan (HRFMP) divides the watershed into management zones based on the thermal regime (cold water, cool water and warm water), channel characteristics such as stream order and channel slope, as well as the target fish species for management (OMNR and TRCA 2005, Table 39-43). Each management zone was divided into numerous categories (e.g., riparian zone, wetland creation and rehabilitation, habitat rehabilitation, water quality) and evaluated as having high, medium or low priority for management. The management zones within the Humber River Fisheries Management Plan are currently being reworked, to reflect zone management instead of the current reach management. Fish presence/absence data for the Humber River watershed within the Study Area are presented in **Table 1** (below), and distinguish whether a species was found before or after 1988. Species found within the last twenty years are more likely to reflect recent conditions in the watershed.

Table 1. Fish Species Found in the Western Vaughan Study Area – Humber River Watershed

Common Name	Scientific Name	Thermal Regime	OMNR Status	COSEWIC Status	S Rank	1946-1987	1988-2006
American Brook Lamprey	<i>Lampetra appendix</i>	Cold	NAR	NAR	S3	X	X
Banded Killifish	<i>Fundulus diaphanus</i>	Cool	NAR	NAR	S5	X	
Blackchin Shiner	<i>Notropis heterodon</i>	Cool	NAR	NAR	S4	X	
Blacknose Dace	<i>Rhinichthys obtusus</i>	Cool	NAR	NAR	S5	X	X
Blacknose Shiner	<i>Notropis heterolepis</i>	Cool	NAR	NAR	S5	X	
Blackside Darter	<i>Percina maculata</i>	Cool	NAR	NAR	S4		X
Bluegill	<i>Lepomis macrochirus</i>	Warm	NAR	NAR	S5		X
Bluntnose Minnow	<i>Pimephales notatus</i>	Warm	NAR	NAR	S5	X	X
Brassy Minnow	<i>Hybognathus hankinsoni</i>	Cool	NAR	NAR	S5	X	X
Brook Stickleback	<i>Culaea inconstans</i>	Cool	NAR	NAR	S5	X	X
Brook Trout	<i>Salvelinus fontinalis</i>	Cold	NAR	NAR	S5	X	X
Brown Bullhead	<i>Ameiurus nebulosus</i>	Warm	NAR	NAR	S5	X	X
Brown Trout	<i>Salmo trutta</i>	Cold	NAR	NAR	SNA		X

Table 1. Fish Species Found in the Western Vaughan Study Area – Humber River Watershed

Common Name	Scientific Name	Thermal Regime	OMNR Status	COSEWIC Status	S Rank	1946-1987	1988-2006
Central Stoneroller	<i>Campostoma anomalum</i>	Cool	NAR	NAR	S4		X
Common Carp	<i>Cyprinus carpio</i>	Warm	NAR	NAR	SNA		X
Common Shiner	<i>Luxilus cornutus</i>	Cool	NAR	NAR	S5	X	X
Creek Chub	<i>Semotilus atromaculatus</i>	Cool	NAR	NAR	S5	X	X
Emerald Shiner	<i>Notropis atherinoides</i>	Cool	NAR	NAR	S5	X	X
Fantail Darter	<i>Etheostoma flabellare</i>	Cool	NAR	NAR	S4	X	X
Fathead Minnow	<i>Pimephales promelas</i>	Warm	NAR	NAR	S5	X	X
Golden Shiner	<i>Notemigonus crysoleucas</i>	Cool	NAR	NAR	S5		X
Goldfish	<i>Carassius auratus</i>	Warm	NAR	NAR	SNA		X
Green Sunfish	<i>Lepomis cyanellus</i>	Warm	NAR	NAR	S4		X
Hornyhead Chub	<i>Nocomis biguttatus</i>	Cool	NAR	NAR	S4	X	
Iowa Darter	<i>Etheostoma exile</i>	Cool	NAR	NAR	S5	X	X
Johnny Darter	<i>Etheostoma nigrum</i>	Cool	NAR	NAR	S5	X	X
Largemouth Bass	<i>Micropterus salmoides</i>	Warm	NAR	NAR	S5	X	X
Longnose Dace	<i>Rhinichthys cataractae</i>	Cool	NAR	NAR	S5	X	X
Mimic Shiner	<i>Notropis volucellus</i>	Warm	NAR	NAR	S5		X
Mottled Sculpin	<i>Cottus bairdii</i>	Cool	NAR	NAR	S5	X	X
Northern Brook Lamprey	<i>Ichthyomyzon fossor</i>	Cool	SC	SC	S3		X
Northern Hog Sucker	<i>Hypentelium nigricans</i>	Warm	NAR	NAR	S4	X	X
Northern Redbelly Dace	<i>Phoxinus eos</i>	Cool	NAR	NAR	S5		X
Pumpkinseed	<i>Lepomis gibbosus</i>	Warm	NAR	NAR	S5	X	X
Rainbow Darter	<i>Etheostoma caeruleum</i>	Cool	NAR	NAR	S4	X	X
Rainbow Trout	<i>Oncorhynchus mykiss</i>	Cool	NAR	NAR	SNA		X
Redside Dace	<i>Clinostomus elongatus</i>	Cool	END	END	S3	X	X
River Chub	<i>Nocomis micropogon</i>	Cool	NAR	NAR	S4	X	X
Rock Bass	<i>Ambloplites rupestris</i>	Cool	NAR	NAR	S5	X	X
Rosyface Shiner	<i>Notropis rubellus</i>	Warm	NAR	NAR	S4	X	X
Sand Shiner	<i>Notropis stramineus</i>	Warm	NAR	NAR	S4	X	
Smallmouth Bass	<i>Micropterus dolomieu</i>	Warm	NAR	NAR	S5	X	X
Spottail Shiner	<i>Notropis hudsonius</i>	Cool	NAR	NAR	S5		X
Stonecat	<i>Noturus flavus</i>	Warm	NAR	NAR	S4		X
White Sucker	<i>Catostomus commersonii</i>	Cool	NAR	NAR	S5	X	X
Yellow Bullhead	<i>Ameiurus natalis</i>	Warm	NAR	NAR	S4	X	
Yellow Perch	<i>Perca flavescens</i>	Cool	NAR	NAR	S5	X	X

S-rank: The Natural Heritage provincial ranking system (provincial S-rank) is used by the MNR Natural Heritage Information Centre (NHIC) to set protection priorities for rare species and natural communities.

Definitions are as follows:

- S1** Critically Imperilled; extremely rare in Ontario with 5 or fewer occurrences in the province. These species are especially vulnerable to extirpation.
- S2** Imperilled; very rare in Ontario due to restricted range, 20 or fewer populations or steep declines. These species are vulnerable to extirpation.
- S3** Vulnerable; rare to uncommon in Ontario due to restricted range, fewer than 80 populations or recent and widespread declines.
- S4** Apparently Secure; uncommon but not rare. Usually greater than 100 occurrences in the province.
- S5** Secure; common, widespread and abundant in the province.

MNR Status: Based on consultation with COSSARO (Committee on the Status of Species at Risk in Ontario), which evaluates the conservation status of species occurring in Ontario.

Definitions are as follows:

- EXT** Extinct; a species that no longer exists anywhere.
- EXP** Extirpated; a species that no longer exists in the wild in Ontario, but occurring elsewhere.
- END** Endangered; a species facing imminent extinction or extirpation in Ontario.
- THR** Threatened; a species that is at risk of becoming endangered in Ontario if limiting factors are not reversed.
- SC** Special Concern; a species with characteristics that make it sensitive to human activities or natural events.

COSEWIC rankings: The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assigns a federal status ranking to all assessed species.

Definitions are as follows:

- EXT** Extinct; a species that no longer exists anywhere.
- EXP** Extirpated; a species that no longer exists in the wild in Canada, but occurring elsewhere.
- END** Endangered; a species facing imminent extinction or extirpation in Canada.
- THR** Threatened; a wildlife species likely to become endangered if limiting factors are not reversed.
- SC** Special Concern; a species that may become a threatened or endangered species because of a combination of biological characteristics and identified threats.

Water quality within the Humber River watershed varies considerably, with the highest quality water associated with the headwater, and poorer water quality associated with the lower reaches of the river (TRCA 2007). Water quality data was collected by TRCA in 2006 and 2007 (18 monthly samples) at two stations within the Western Vaughan Study Area. Both stations showed elevated levels of total phosphorus and ammonia above the Provincial Water Quality Objectives (PWQO) (30 and 20 µg/L respectively) in more than 50% of the monthly samples. More than 50% of the monthly samples exceeded the PWQO guidelines for *E. coli* (100 colonies/100 mL). Turbidity and total suspended solid values were also relatively high. Chloride levels were consistently below PWQO value of 200 mg/L, but stations further south in the watershed consistently exceeded the PWQO levels. A report card on the health of the Humber watershed was published in 2000, and gave the watershed a D grade for pollutants such as nutrients, turbidity and chloride (TRCA 2000). The watershed was given a grade of E for bacterial levels. Another issue is the presence of heavy metals and organic contaminants in the watershed. The presence of lawn care and agricultural pesticides such as Atrazine, Diazinon, MECOPROP and Metolachlor are also an issue because of their persistence in the environment (Struger and Fletcher 2007). The watershed was given a C grade for Heavy metals and organic contaminants in the watershed (TRCA 2000). Although nutrient suspended solid and *E. coli* levels are high, they are not unexpected in this urbanized environment. Water quality conditions further downstream within the City of Toronto are more degraded than within the City of Vaughan (TRCA 2005).

2.1.1.1 Main Humber River Sub-Watershed

The headwaters of the Main Humber River sub-watershed rises in the Oak Ridges Moraine, continue through the south Slope and onto the Peel Plain. The characteristic permeable soils of the Oak Ridges Moraine permit relatively large recharge rates and contribute to relatively high base flows in creeks during dry weather. In the lower reaches of the sub-watershed less permeable soils with lower recharge rates allow for more surface runoff. The land use within the main Humber is mostly agricultural, with a relatively high amount of natural area. The upper Main Humber River sub-watershed has an area of 357 km² and is the largest of Humber's sub-watersheds and contains 597 km of stream (OMNR and TRCA 2005).

The Humber River Fisheries Management Plan has divided the sub-watershed into seven management zones based on habitat categories, channel characteristics such as stream order and channel slope, as well as the target fish species for management (OMNR and TRCA 2005, Table 39). Five of those zones occur within the Western Vaughan Study Area. The target species for management include: Darter species, Brown Trout, Redside Dace, Smallmouth Bass (*Micropterus dolomieu*), and Rainbow Trout.

In the Western Vaughan Study Area, three main watercourses are present within the sub-watershed and include Rainbow Creek (East), Robinson Creek, the Main Humber River, and their tributaries. A brief description of each watercourse (i.e. surrounding land uses) is provided for each as it relates to water quality, fish and fish habitat.

Robinson Creek

In the northern portion of the Study Area Robinson Creek is in two branches, the East Robinson Creek and West Robinson Creek. Both originate in agricultural fields and have little to no riparian vegetation. The lack of riparian vegetation can result in reduced water quality (e.g. nutrients) from agricultural runoff. They continue to meander through agricultural fields until they join just downstream of Rutherford Road. As Robinson Creek flows downstream from Rutherford Road it continues to pass through agricultural fields until it crosses Highway 27 just north of Langstaff Road where it then enters a residential area. Some riparian vegetation is present along the creek as it meanders through the residential area. The creek then merges with Rainbow Creek just south of Woodbridge Avenue, north of Highway 7. South of Highway 7 the creek

flows through the Vaughn Grove Sports Park, where is highly vegetated. As the Creek passes major roads and enters into residential areas, spray and surface water runoff will reduce water quality (e.g. metals, oil and grease, sediment and salts); however, the moderate downstream buffer will help to reduce the exposure.

Robinson Creek can be classified as a ephemeral (upper reaches) to permanent (lower reaches), warmwater system that is of low to moderate sensitivity. Indirect (headwaters) to direct (lower reaches) fish habitat is present and has a warmwater community comprised of species including Pumpkinseed, Largemouth Bass, Yellow Perch, Shiner sp., Dace sp., Darter sp., Sucker sp., Minnow sp.. Robinson Creek and its tributaries are all managed for darter species under the HRFMP (MNR & TRCA, 2004), and is also managed Redside Dace recovery habitat under the Redside Dace Recovery Strategy (MNR, 2010).

Rainbow Creek is located west of Robinson Creek. In the northern portion of the Study Area, the Creek flows through agricultural fields and has minimal to no riparian vegetation. Downstream of Major Mackenzie Drive the creek flows adjacent to the CN rail yard. Drainage from the rail yard may discharge into the Creek and reduce water quality. Continuing downstream, the creek flows through agricultural fields with minimal riparian vegetation. As the creek approaches Highway 27, just north of Highway 7, it flows adjacent to a commercial/industrial area. Riparian vegetation is better developed in this area; however, the creek becomes sparsely vegetated downstream of Highway 27 before it merges with Robinson Creek. Due to the minimal riparian buffer, the Creek is more susceptible to spray and surface water runoff from roads.

The northern portion of Rainbow Creek can be classified as an ephemeral, warmwater system that has low sensitivity and indirect fish habitat. Continuing downstream (approaching Rutherford Road) the creek can be classified as a permanent, warmwater system that is of low sensitivity. Direct fish habitat is present and has a community comprised of Chub sp., Sucker sp., Stickleback sp.. Rainbow Creek and its tributaries are all managed for Darter species under the HRFMP (MNR & TRCA, 2004).

Main Humber River

In the northern portion of the Study Area, the Main Humber River flows through a sparsely populated residential area where it has moderate riparian vegetation. The river flows past the Kleinburg sewage treatment plant, approximately 1 kilometre north of Major Mackenzie Drive. Downstream water quality has shown increased concentrations of un-ionized ammonia and lower levels of dissolved oxygen compared to those measured upstream (TRCA, Humber River watershed report, 2008). Downstream of Major Mackenzie Drive the river continues to meander and the residential areas become more densely populated, with moderate riparian vegetation. Approximately 2 km south of Rutherford Road the river flows through a golf course, where there is potential for reduced water quality due to surface runoff of nutrients. The river continues to flow through residential areas, with moderate riparian buffers, into a green space area south of Highway 7.

The northern portion of the Main Humber River, south to approximately Langstaff Road, is considered a permanent, coldwater system that has a rare sensitivity rating due to the presence of rare species (Redside Dace). Direct fish habitat is present and has a community comprised of Sucker sp., Minnow sp., Chub sp., Shiner sp., Dace sp., Darter sp., Rock Bass, Stonecat, Largemouth Bass, Yellow Bullhead, Stickleback sp., Brown Trout, and American Brook Lamprey. It is managed for Brown Trout and Redside Dace under the HRFMP (MNR & TRCA, 2004). Continuing downstream the Main Humber River, between Langstaff Road and Woodbridge Avenue, is also classified as a permanent, coldwater system and is managed for Rainbow Trout in addition to Brown Trout, and Redside Dace under the HRFMP (MNR & TRCA, 2004). As the Main Humber River joins the East Humber it becomes a warmwater system and has a fish community consisting of Sucker sp., Chub sp., Shiner sp., Minnow sp., Dace sp., Rock Bass, Pumpkinseed, Largemouth Bass,

American Brook Lamprey, and Rainbow trout. It is managed for Smallmouth Bass and Rainbow Darter under the HRFMP (MNR & TRCA, 2004), as well as the Redside Dace recovery habitat under the Redside Dace Recovery Strategy (MNR, 2010).

2.1.1.2 East Humber River Sub-watershed

The headwaters of the East Humber River sub-watershed lie within the Oak Ridges Moraine. Soils in this sub-watershed are characterized by clay loam, with pockets of sandy loam, loam and silt (TRCA 2007). The soil characteristics permit little infiltration resulting in moderate to high runoff potential. The land use within the watershed is largely agricultural, but with a significant portion of urban development in the southern section. The East Humber watershed drains an area of approximately 200 km² and contains approximately 257 km of watercourses (OMNR and TRCA 2005).

The Humber River Fisheries Management Plan has divided the sub-watershed into four management zones based on habitat categories, channel characteristics such as stream order and channel slope, as well as the target fish species for management (OMNR and TRCA 2005, Table 40). The target species for management include: Brown Trout, Brook Trout, Redside Dace, Rainbow Trout and Darter species.

In the Western Vaughan Study Area, three main watercourses are present within the East Humber River sub-watershed and include the East Humber River, Purpleville Creek, Marigold Creek and their associated tributaries. A brief description of the watercourses (e.g. surrounding land uses) are provided for each as it relates to water quality, fish and fish habitat.

East Humber River

In the northern portion of the Study Area, the East Humber River flows through agricultural fields and has a fairly dense riparian buffer. Downstream of Major Mackenzie Drive, the river flows through The Kortright Centre for Conservation and Boyd Conservation Area. In both conservation areas the river has well developed riparian vegetation. South of Langstaff Road the East Humber River flows adjacent to residential areas and maintains a fairly dense riparian buffer. Approximately 1 km north of Highway 7, the East Humber River joins the Main Humber River, just north of the Islington Avenue and Woodbridge intersection.

The northern section of the East Humber River is classified as a permanent, coolwater system that is of rare sensitivity due to the presence of rare species (Northern Brook Lamprey). It is direct fish habitat and has a fish community comprised of American Brook Lamprey, Rainbow Trout, Northern Brook Lamprey, Sucker sp., Dace sp., Rock Bass, Chub sp., Darter sp., Minnow sp., and Brown Bullhead. As the East Humber River flows south past Major Mackenzie Drive it becomes a permanent, coldwater system that is of rare sensitivity. It is direct fish habitat with a fish community comprising of American Brook Lamprey, Brown Trout, Rainbow Trout, Sucker sp., Minnow sp., Chub sp., Shiner sp., Dace sp., Rock Bass, Darter sp. The entire length of the East Humber River contained within the Study Area is managed for Brown Trout, Rainbow Trout, and Redside Dace under the HRFMP (MNR & TRCA, 2004) and is also managed Redside Dace recovery habitat under the Redside Dace Recovery Strategy (MNR, 2010).

Purpleville Creek

In the northern portion of the Study Area, Purpleville Creek flows through agricultural fields with moderate riparian vegetation. It joins the East Humber River just south of Major Mackenzie Drive. It is classified as a permanent, coldwater system that is of rare sensitivity due to the presence of rare species (Redside Dace). It is direct fish habitat and has a community comprised of American Brook Lamprey, Brown Trout, Rainbow Trout,

Brook Trout, Stoneroller, Largemouth Bass, Sucker sp., Chub sp., Shiner sp., Minnow sp., Dace sp., Shiner sp., Darter sp., Sculpin sp., Sunfish sp.. It is, in large part, managed for Brook Trout and Redside Dace under the HRFMP (MNR & TRCA, 2004) and is also managed Redside Dace recovery habitat under the Redside Dace Recovery Strategy (MNR, 2010) and has had specific restoration projects as part of this strategy.

Marigold Creek

Marigold Creek is contained entirely within the Study Area. The headwaters originate in a low density residential area north of Major Mackenzie Drive and contain sparse riparian vegetation. Downstream of Major Mackenzie Drive it flows through the Kortright Centre, adjacent to Pine Valley Drive, and discharges into the East Humber River at Rutherford Road.

The Marigold Creek headwaters are classified as an intermittent, warmwater system and of low sensitivity. It is considered direct fish habitat and has a recorded fish community comprised of Minnow sp. and Sunfish sp.. Continuing downstream the creek becomes a permanent, warmwater system that is of rare sensitivity due to the presence of rare species (Redside Dace). It is direct fish habitat with a fish community comprising of Redside Dace, Dace sp., Sunfish sp., Darter sp., Chub sp., and Minnow sp., The presence of Redside Dace within the lower reaches are expected to be a function of its proximity to the East Humber River. The entire creek is managed for Darters under the HRFMP (MNR & TRCA, 2004), however the downstream portion (near East Humber River confluence) is also managed as Redside Dace recovery habitat under the Redside Dace Recovery Strategy (MNR, 2010).

2.1.1.3 West Humber River Sub-watershed

The headwaters of the West Humber River sub-watershed originate on the South Slope, but the majority of the watershed lies within the Peel Plain. Clay till soils predominate in the sub-watershed, resulting in low recharge rates, and low base flows. The northern portion of the watershed is largely agricultural land use, whereas the southern portion of the watershed is dominated by urban residential development associated with the City of Toronto and the City of Brampton. The West Humber River sub-watershed is roughly the same size as the East Humber River sub-watershed (200 km²), and contains 311 km of watercourses. The watercourses within this watershed are particularly sensitive to storm events, resulting in rapidly fluctuating water levels. This sub-watershed has a relatively low amount of woody riparian vegetation.

A total of 40 species have historically been found within the sub-watershed including: Blackchin Shiner (*Notropis heterodon*), Brassy Minnow (*Hybognathus hankinsoni*), Brook Trout, Central Stoneroller (*Camptostoma anomalum*), Iowa Darter (*Etheostoma exile*), Redside Dace, Mottled Sculpin, River Chub (*Nocomis micropogon*), Northern Redbelly Dace (*Phoxinus eos*) and Smallmouth Bass. Only the southwest corner of the Western Vaughan Study Area is within the West Humber sub-watershed and no fisheries data have been collected in this area.

The Humber River Fisheries Management Plan has divided the sub-watershed into five management zones based on habitat categories, channel characteristics such as stream order and channel slope, as well as the target fish species for management (OMNR and TRCA 2005, Table 41). One of those zones exists within the Western Vaughan Study Area (Humber Fish Management Zone 7). This zone is managed for Darter species.

2.1.1.4 Black Creek

Close to 70% of the Black Creek sub-watershed is urbanized (OMNR and TRCA 2005). Historically large sections of Black Creek were transformed into concrete channel to direct flow quickly downstream and

alleviate the risk of flooding. The risk of flooding is greater in highly developed areas due to impervious surfaces limiting infiltration and causing high amounts of runoff and high peak flows during storm events. Much of the area was developed before stormwater quality and quantity control measures became commonplace. The Black Creek sub-watershed is the smallest sub-watershed within the Humber River watershed system with a total area of 68 km² and 46 km of watercourses. A total of 18 species were historically found in the Black Creek sub-watershed. The historical presence of the Redside Dace and Rainbow Darter (*Etheostoma caeruleum*) and Fantail Darter (*Etheostoma flabellare*) indicate that the water quality and habitat within the creek were once of better quality than today.

Only a small portion of the eastern side of the Western Vaughan Study Area is within the Black Creek sub-watershed, but no sites were sampled for fish community within this area. Common species found within the lower reaches of Black Creek include; White Sucker, Fathead Minnow (*Pimephales promelas*), Creek Chub (*Semotilus atromaculatus*), and Brook Stickleback (*Culaea inconstans*).

The Humber River Fisheries Management Plan has divided the sub-watershed into two management zones based habitat categories, channel characteristics such as stream order and channel slope, as well as the target fish species for management (OMNR and TRCA 2005, Table 42). One of those zones exists within the Western Vaughan Study Area (Humber River Fisheries Management Zone 11). This zone is managed for Darter species.

2.1.1.5 Lower Humber River Sub-watershed

The Lower Main Humber originates in the Peel Plain and flows across the Iroquois Sand Plain south of Vaughan to Lake Ontario. This sub-watershed is similar to Black Creek watershed in that the area is largely developed (78%) (OMNR and TRCA 2005). Few modern stormwater management facilities are in place in the Lower Humber watershed. Many of the tributaries have been piped and/or channelized.

This sub-watershed is only 80 km and has a total of 62 km of watercourses. The Lower Main Humber River arises south of Langstaff Rd. west of Highway 400 in the City of Vaughan.

Only a small section of the Lower Main Humber watershed is in the Western Vaughan Study Area, and fisheries sampling was conducted at one location (data collected in 2001 and 2004). There were a total of 14 species found at this location, including many cool and cold water species such as: American Brook Lamprey, Fantail Darter, Rainbow Darter and Rainbow Trout.

The Humber River Fisheries Management Plan has divided the sub-watershed into five management zones based on habitat categories, channel characteristics such as stream order and channel slope, as well as the target fish species for management (OMNR and TRCA 2005, Table 43). Two of those zones occur within the Western Vaughan Study Area (Humber River Fisheries Management Zones 5 and 6). The target species for management within these zones include Darter species and Smallmouth Bass.

2.1.2 Don River Watershed

The Don River watershed is 360 km² and is divided into several sub-watersheds, but only the Upper West Don sub-watershed is in the Western Vaughan Study Area. The watershed is highly urbanized (roughly 78%) and has a population of 800,000. The Don River watershed is the most heavily urbanized within the City of Toronto, and areas of new development such as Vaughan and Markham are also contributing to urbanization.

Water discharges from the Oak Ridges Moraine in the north, flowing over the till plain and various glacial lacustrine features, to Lake Ontario in the south (Don Watershed Council 1997). A total of 35 species have been identified within the Don River watershed from 1949 to 2005. Four non-native species were found within the Don watershed including: brown trout, common carp, goldfish and rainbow trout. Only a portion of the Don watershed is in the Western Vaughan Study Area, and there were a total of seven sites sampled. A total of six species were recorded in the Study Area, two of which are non-native. The most common species were white sucker and fathead minnow. There were no coldwater fish species found within the sub-watershed in either the more recent surveys, or in the historic records. This is to be expected based on the predominance of surface inputs and little influence from groundwater in this portion of the sub-watershed.

Data sources for the Don River watershed include the Don River State of the Watershed report (MTRCA 1992), Don Watershed Report Card (Don Watershed Council 2000) and The City of Vaughan Sub-watershed study (Gartner Lee Limited 1993) as well as numerous consultant reports. A new Fisheries Management Plan is currently being produced by TRCA. Although the management plan has yet to be completed, ongoing discussions with staff at TRCA have generated important information related to the Don River for this report.

Surface water quality varies considerably throughout the Don River watershed with the highest quality water associated with groundwater inputs from the Oak Ridges Moraine, and the more degraded water quality associated with the developed southern portion of the watershed.

A report card on the health of the Don watershed was published in 2000 (Don Watershed Regeneration Council 2000). The watershed was rated on a number of variables as either improving, worsening or no change. Bacterial levels have been increasing due to inputs from combined sewer overflows. Another concern is the decrease in water quality monitoring due to cut back by the Ontario Ministry of the Environment. Monitoring of suspended solids and nutrients in the water indicates that there has been little change, and definitely no improvement. Another issue is the presence of heavy metals and organic contaminants in the watershed. The presence of lawn care and agricultural pesticides such as Atrazine, Diazinon, MECOPROP and Metolachlor are also an issue because of their persistence in the environment (Struger and Fletcher 2007). The watershed was given a C grade for heavy metals and organic contaminants in the watershed (TRCA 2000). Although nutrient, suspended solid and *E. coli* levels are high, they are not unexpected in this urbanized environment. Water quality conditions further downstream within the City of Toronto are more degraded than within the City of Vaughan (TRCA 2005).

2.1.3 Significance and Sensitivity

The thermal regime and the hydrology of a watershed have a profound influence on the associated fisheries and fish habitat of a particular watercourse. Areas of high recharge (identified in the Hydrogeology section) contribute cold clean groundwater to downstream portions of the watershed. The degree of groundwater discharge, amount of riparian cover and stream morphology will influence the thermal regime, and the fish species occurring within a watercourse or portion of a sub-watershed.

Sensitivity of fish habitat was determined following the Ministry of Transportation Environmental Guide for Fish and Fish Habitat: Analysis of Fish and Fish Habitat Sensitivity (MTO/DFO/OMNR, 2009) and communication with the Department of Fisheries and Oceans (DFO).

In determining Sensitivity of fish habitat the following four primary attributes were considered:

- a) Fish species sensitivity;
- b) Species dependence on habitat;
- c) Rarity; and
- d) Habitat Resiliency

The analysis defines fish habitat within five categories: rare sensitivity (presence of rare species- listed SAR), highly sensitive (i.e. trout habitat), moderately sensitive (i.e. sport fish habitat –bass), low sensitivity (i.e. baitfish habitat) and no sensitivity (not fish habitat)

Construction within rare and highly sensitive reaches should follow the precautionary principle, and more detailed studies of the area may be required during the detailed design phase. Innovative mitigation strategies, rigid sediment and erosion control measures and appropriate construction timing will benefit the aquatic ecosystem and limit impacts to species. Two fish Species at Risk occur in the Don River and Humber River watersheds within the Western Vaughan Study Area, the Redside Dace and the Northern Brook Lamprey. The distribution of Redside Dace (*Clinostomus elongates*) in Canada is limited to southern Ontario and primarily within western Lake Ontario tributaries. Biological characteristics, habitat specificity and range limitations are three contributing factors that are theorised to affect the survivorship of this species in southern Ontario. The Redside Dace is a visual feeder and an insectivore; it relies on habitat attributes such as overhanging riparian vegetation as a source of food and shelter as well as relatively clear water conditions for observing prey. Suspended insects within the overhanging vegetation are the primary food source and this species is capable of breaching the surface of the water in order to capture food. For these reasons, the habitat requirements of the species are very specific and are likely factors in limiting their distribution in Canada. Further to this, the southern Lake Ontario populations represent the northernmost extent of the species range suggesting that climate likely contributes to the species distribution. Despite being a globally secure species, the Redside Dace is listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as Endangered (COSEWIC 2007) and is defined by COSSARO as also Endangered within the Province of Ontario (MNR 2006). In 2009 the Ministry of Natural Resources published the Redside Dace Recovery Strategy (MNR, 2009). The long-term goal of this recovery strategy is to restore viable populations of Redside Dace in a significant portion of their historic range in Ontario by:

- protecting existing healthy, self-sustaining populations and their habitats;
- restoring degraded populations and habitats;
- re-establish Redside Dace to sites of former distribution where feasible.

The short-term recovery objectives to be addressed over the next 5 years are to:

- Determine distribution and abundance of extant populations.
- Maintain the current geographical distribution and abundance of Redside Dace through habitat protection and other measures.
- Establish a long-term monitoring program to assess the status of Redside Dace and its habitats.
- Generate awareness regarding the significance of Redside Dace and protection and stewardship of its habitats.
- Rehabilitate degraded Redside Dace habitats and identify candidate areas for re-introductions.

The recovery strategy identifies approaches that will protect existing populations, rehabilitate degraded habitats, collect information on the status of Redside Dace and its habitats, and increase awareness regarding the significance of Redside Dace.

The Northern Brook Lamprey (*Ichthyomyzon fossor*) is classified as a species of special concern by both COSEWIC (COSEWIC 2007) and COSSARO (OMNR 2006). Their range includes the Mississippi and Great Lakes basins. It is found in clear streams, and spawning occurs in fast flowing areas with coarse gravel or rocky substrates. It is a non-parasitic filter feeder, and it feeds on organic detritus, algae and protozoans. The Northern Brook Lamprey is under threat from lampricide used to control the Exotic Sea Lamprey, as well as changes in temperature and pollution. It is important to note that sampling has not occurred in all streams within the Don or Humber watersheds. For this reason there are potentially other areas of high quality fish habitat that have not been identified.

There are several areas within the Humber River watershed that have been identified as having high quality fish habitat, or have uncommon fish species or Species at Risk. The headwaters of the East Humber and Purpleville Creek have high groundwater discharge and provide habitat for coldwater species such as the Brook Trout, Mottled Sculpin, Rainbow Trout and Brown Trout, as well as the Redside Dace. This area (north of Major McKenzie between Jane Street and Kipling Avenue) is largely undeveloped. This area with relatively high amounts of groundwater recharge is also important for maintaining flow to downstream sections during drier periods. Several watercourses such as Robinson Creek, Main Humber, East Humber, Purpleville Creek and lower reaches of Marigold Creek are also managed as Redside Dace Recovery Habitat under the Redside Dace Recovery Strategy (MNR, 2009).

2.2 Terrestrial Ecology

2.2.1 Vegetation

Existing Natural Cover in the subject lands comprises approximately 2618 ha, or 22% of the total Study Area (TRCA 2004). This is above the average of 17% natural cover in the TRCA jurisdiction. Two watersheds, Don River and Humber River, are encompassed by the subject lands. The Humber River Watershed accounts for approximately 95% of the land base, with the remaining 5% governed by the Don River. Natural cover is higher in the Humber River portion of the city at 23%, whereas cover in the Don River is only 5% (**Table 2**). This pattern is consistent throughout the whole extent of the two watersheds; the Don River is more heavily urbanized with less remaining natural cover than the Humber River Watershed.

TRCA has grouped natural vegetation communities into four broad habitat types that include forest, wetland, native meadow and successional habitats.

Table 2. Natural Cover in the City of Vaughan by Watershed According to TRCA Terrestrial Natural Heritage System Information

Cover Type	Humber River Watershed Within the Study Area	Don River Watershed Within the Study Area	Study Area
Watershed Composition (%)	95	5	100
Natural Cover (%)	23	5	22
Forest Cover (%)	13	3	13
Wetland Cover (%)	0.4	0.4	0.4
Meadow Cover (%)	8	1	8
Successional Cover (%)	1	0.04	1

2.2.1.1 Forest Cover

Approximately 13% forest cover remains in the subject lands, which accounts for most (57%) of the existing natural vegetation communities in the area (**Table 3**). From a watershed perspective, remaining forest cover

is higher in the Humber River portion of the city at 13%, versus 3% cover in the Don River Watershed (Table 2). Forest cover in the Study Area is much lower than the York Region average of 22.5% cover (North-South Environmental Inc. 2005).

Table 3. Description of Forest Communities According to TRCA ELC Information

Forest Cover Type	Number Forest Community Types	% of Total Forest Cover
All Forests	57	13
Deciduous Forests (FOD)	29	46
Coniferous Forests (FOC)	5	8
Mixed Deciduous Forests (FOM)	11	27
Cultural Plantation (CUP)	12	19

The TRCA has described approximately 56% of the vegetation communities within the Study Area according to the standardized method of Ecological Land Classification (ELC; Lee *et al.* 1998). This system is a structured approach that incorporates both biological features such as dominant plant species composition, and physical characteristics such as soil type, within a hierarchical framework. The detailed ELC information provided by TRCA for a portion of Vaughan is used here to describe overall patterns of natural cover for the whole Study Area. A total of 57 forest community types were identified in the surveyed portions of the City of Vaughan: 29 deciduous, five coniferous, 11 mixed deciduous communities and 12 cultural plantations. Deciduous forest communities are the dominant forest type at 46% cover, followed by mixed deciduous forests at 27%, cultural plantations at 19% and the remaining 8% in coniferous forest cover. The 10 Sugar Maple-Black Maple Deciduous Forest communities identified in the city are considered to be regionally rare by the Natural Heritage Information Centre (NHIC).

Most of the forest cover is found west of Pine Valley Drive in designated ESAs, in areas where the water table is relatively high and in association with river valley features. In fact, 73% of the forested communities are below top of bank, in valleyland systems (TRCA TNHS). Natural areas occurring in topographical depressions and containing running or standing water are classified as Valleylands. In southern Ontario, valleylands are often the only remaining natural areas within a region, thereby enhancing their importance as storm water storage systems, nutrient transport systems, wildlife habitat and habitat connectors. A large proportion of the remaining forest cover in Vaughan is in valleyland systems, confirming the importance of these features in a highly urbanized landscape. Upland forests in the southern portion of the city are small and uncommon due to agricultural and urban pressures. The average forest patch size in Vaughan is 6 ha, versus a mean size of 10 ha in York Region (North-South Environmental Inc. 2005). Upland forests are larger and more abundant north of Teston Road and on the Oak Ridges Moraine, where agriculture and development pressures are not as extreme.

Two studies have been conducted in portions of Vaughan, in which individual woodlot quality and importance were evaluated based on criteria such as overall attributes, functions and linkages. Attributes included features such as the presence of ESAs, wetlands, ANSIs, rare species and unique vegetation communities. Both hydrological and forest habitat functions were considered. Hydrological functions include erosion control, groundwater discharge, groundwater recharge and water quality improvement. Forest habitat functions include patch size, maturity and structural diversity. Woodlots linked to other natural cover were also considered to be of higher value than isolated patches. The *Sub-watershed Study* (1993) evaluated 56 forest patches in three regions south of Teston Road. Seventy-five percent of the high and moderately ranked woodlots were associated with tributaries in valleyland systems. The *Focus Rural Area Woodland Ecosystem Assessment* (2002) evaluated woodlands primarily north of Teston Road, with a supplementary

region in the south. Forty-three of the high and moderately ranked woodlots were in valleylands or had wetland communities within their boundaries. The remaining highly ranked upland forests were large, diverse, mature communities with unique features, or woodlots associated with ESAs.

Forest cover in the Study Area is below the minimum 30% cover recommended by Environment Canada (2004) to achieve and maintain healthy forest ecosystems and watersheds. The proposed percent cover targets are supported by current scientific understanding of landscape level ecosystem functions (Andren 1994, Fahrig 2002, Villard *et al.* 1999). Forests provide a number of ecosystem functions including the provisioning of habitat for migratory birds and other wildlife species, improvement of air and water quality, reduction of stormwater runoff and soil erosion.

2.2.1.2 Wetland Communities

Approximately 0.4% wetland cover remains in the Study Area, which accounts for only 2.0% of the existing natural vegetation communities in the area. Remaining wetland cover is the same in both watersheds encompassed by the Study Area (Table 2, Table 4). The few remnant wetland communities are all associated with Don and Humber River tributaries.

Table 4. Description of Wetland Communities According to TRCA ELC Information

Wetland Type	Number of Wetland Community Types	% of Total Wetland Cover
All Wetlands	35	0.4
Marsh (MAS/MAM)	14	51
Treed Swamp (SWD/SWC/SWM)	17	45
Thicket Swamp (SWT)	2	2
Shallow Water (SAF/SAM/SAS)	5	2

According to TRCA ELC information, a total of 35 wetland community types were identified: 14 marsh communities, 17 treed swamps, two swamp thickets and five shallow water communities. Marsh communities are the dominant wetland type at 51% cover, followed by treed swamps at 45%, swamp thickets at 2% and the remaining 2% in shallow water communities. A total of eight community types, representing 23% of wetland area identified by TRCA, have organic soils. Organic soils indicate the presence of ground water seepage. These community types include four treed swamps and four marsh community types. and one swamp thicket community type. One Bur Oak Deciduous Swamp community identified in the city is considered to be regionally rare by the NHIC.

The ecological services performed and economic benefits associated with wetland communities are well documented. Ecological services and benefits include provisioning of habitat for a diversity of wildlife species including amphibians and birds, nutrient retention, water filtration, flood control, groundwater recharge and micro-climate stabilization. In addition, wetlands are used both recreationally (i.e., boating, birding, fishing) and for personal harvesting of nuts, berries, fish and lumber. The function and quality of the few remaining fragmented wetlands within Vaughan have the potential to be severely compromised by intense urbanization and agriculture. Wetlands are sensitive to increases in nutrient loads, suspended solids, and organic contaminants from run off as well as from changes in hydrology (Mitch and Gosselink 2000).

Although the evaluated wetlands within the Study Area are protected under the PPS, the remaining unevaluated wetlands are still vulnerable to loss and further reductions in overall quality.

2.2.1.3 Meadow

Approximately 8% meadow cover exists in the City of Vaughan, which accounts for approximately 36% of the existing natural vegetation communities in the area. From a watershed perspective, meadow cover is higher in the Humber River portion of the city at 8%, versus 1% cover in the Don River Watershed (**Table 2**).

Meadows are early successional, open vegetation communities that are dominated by wildflowers and grasses. These communities are created by natural or anthropogenic disturbance, and if deep fresh soils exist and adequate precipitation occurs, will succeed to communities with a woody component. Meadow communities in the subject lands are primarily associated with tributaries and found in riparian areas, both within and along the periphery of forest communities. There are a number of meadow communities with straight edges that are likely abandoned agricultural fields reverting to natural cover. Meadow functions are generally undervalued, however, these communities provide important buffering services to the forest and aquatic communities they surround. Meadows provide habitat for a diversity of plant and animal species, especially communities that are greater than 10 ha in size. As natural cover, they can also function as connectors between forest and wetland communities.

2.2.1.4 Successional Habitats

Approximately 1% successional cover exists in the City of Vaughan, which accounts for approximately 5% of the existing natural vegetation communities in the area. From a watershed perspective, successional cover is much higher in the Humber River portion of the city at 1%, versus 0.04% cover in the Don River Watershed (**Table 2**). Successional habitats are in a transitional phase and are classified as cultural woodlands and/or thickets. From a wildlife perspective, cultural thicket patches can support a diverse composition of breeding and over-wintering bird species. The thickets provide berries and insects for birds to forage on, and nesting substrates for species such as Northern Cardinal (*Cardinalis cardinalis*) and Gray Catbird (*Dumetella carolinensis*). Larger thickets will also support area sensitive species such as Brown Thrasher (*Toxostoma rufum*), Yellow-billed Cuckoo (*Coccyzus americanus*) and provincially threatened Golden-winged Warbler (*Vermivora chrysoptera*).

In the Study Area successional communities are found along forest boundaries and function as edge habitats. Successional habitats can be restored to natural cover actively and contribute to vegetation cover, provide a buffering service or connectivity between patches.

2.2.1.5 Flora

A list of rare and uncommon plant species has been compiled by referring to Gartner Lee Limited internal reports, TRCA's *Environmentally Significant Areas Study* (1982) and NHIC (**Table 5**). Rarity was evaluated according Varga *et al.* (2000). Twenty-three rare plant species have been observed, 14 of which have been reported by Gartner Lee Limited in the last seven years. Apart from Bee-balm (*Monarda didyma*), which was reported in 1948, the remaining species were observed after 1982. Most detections are in ESAs, although intensive sampling by GLL of the Pine Valley Drive-Pine Valley Crescent area have contributed to many records in these areas. One Nationally and Provincially ranked species, the endangered Butternut (*Juglans cinerea*) tree has been reported in the southern part of the city. The population declines of the Butternut tree is attributed to infection by the lethal butternut canker, not habitat loss.

Table 5. Provincially, Regionally and Locally Rare/Uncommon Plant Species

Common Name	Scientific Name	Status ¹	Data Source
Canada Waterleaf	<i>Hydrophyllum canadense</i>	Locally Rare (York), Regionally Rare (GTA)	TRCA
Smooth Rock Cress	<i>Arabis laevigata</i>	Regionally Rare (GTA)	TRCA
Common Polypody	<i>Polypodium virginianum</i>	Locally Rare (York), Regionally Rare (GTA)	TRCA
Sprengel's Sedge	<i>Carex sprengelii</i>	Locally Rare (York)	TRCA
Thinleaf Sedge	<i>Carex cephaloidea</i>	Locally Rare (York), Regionally Rare (GTA)	TRCA
Tower Mustard	<i>Arabis glabra</i>	Locally Rare (York), Regionally Rare (GTA)	TRCA
Woodland Meadow Grass	<i>Poa alsodes</i>	Regionally Rare (GTA)	TRCA
Pointed Tick-trefoil	<i>Desmodium glutinosum</i>	Locally Rare (York), Regionally Uncommon (GTA)	GLL
Black Maple	<i>Acer nigrum</i>	Locally Rare (York)	GLL
White Oak	<i>Quercus alba</i>	Locally Rare (York)	GLL
Running Strawberry	<i>Euonymus obovata</i>	Locally Rare (York)	GLL
Marsh-pennywort	<i>Hydrocotyle americana</i>	Locally Uncommon (York), Regionally Uncommon (GTA)	GLL
Bristly Green Brier	<i>Smilax hispida</i>	Locally Uncommon (York), Regionally Uncommon (GTA)	GLL
Pennsylvania Bitter Cress	<i>Cardamine pennsylvanica</i>	Locally Uncommon (York), Regionally Uncommon (GTA)	GLL
Great Lobelia	<i>Lobelia siphilitica</i>	Locally Uncommon (York), Regionally Uncommon (GTA)	GLL
American Brooklyn	<i>Veronica americana</i>	Locally Uncommon (York), Regionally Uncommon (GTA)	GLL
Marsh Yellow-cress	<i>Rorripa palustris</i>	Locally Rare (York)	GLL
Wood Millet	<i>Milium effusum</i>	Locally Uncommon (York), Regionally Uncommon (GTA)	GLL
Hairy-leaved Sedge	<i>Carex hirtifolia</i>	Locally Uncommon (York), Regionally Uncommon (GTA)	GLL
Hitchcock's Sedge	<i>Carex hitchcockiana</i>	Locally Uncommon (York), Regionally Uncommon (GTA)	GLL
Butternut	<i>Juglans cinera</i>	Nationally and Provincially Endangered	GLL
A. Moss	<i>Astomum muehlenbergianum</i>	Locally Rare (York), Regionally Rare (GTA), Provincially Rare (S2;Ontario)	NHIC
Bee-balm	<i>Monarda didyma</i>	Locally Rare (York), Regionally Rare (GTA), Provincially Rare (S3;Ontario)	NHIC

Note: 1. Plant species status is based on Varga et al. (2000) for local and regional significance.

2.2.1.6 Significance and Sensitivity

The following table (Table 6) summarizes the attributes and functions that are important within the Study Area, and for which consideration should be provided during the planning process.

Table 6. Significance and Sensitivity of Vegetation Features in the City of Vaughan

Attribute	Location	Sensitivity/Significance
Upland Forest Communities	Primarily north of Teston Road and on the Oak Ridges Moraine.	Rare vegetation communities in the subject lands. Are usually the first forests to be removed for agriculture and urban development. Protect remaining patches.
Wetland Communities	Primarily on the Oak Ridges Moraine. Smaller units in southern part of the city within ESAs and in riparian areas associated with Tributaries.	Provide a number of important ecological, economic and social functions. Retain base flow and vegetation units. Provide undesignated units protection.
Provincially, Regionally and Locally Rare Species	23 species. Concentrated in ESA's and narrow vegetated cover west of Pine Valley Drive.	Sensitive to urbanization.

2.2.2 Wildlife

Information has been compiled for all groups of wildlife reported within the Study Area. Standardized methods exist for sampling breeding birds and amphibians. These protocols have been widely applied by many organizations, individuals and agencies, making inventories of birds and amphibians more thorough and complete than those for other wildlife species. Habitat requirements of these two groups are also well understood, thus making them valuable and relatively reliable indicators of habitat quality, function and landscape connectivity. Information on mammals and reptiles can be used to further supplement our understanding of the natural heritage features within the city limits.

2.2.2.1 Breeding Birds

A list of breeding bird species observed in the City of Vaughan within the last 20 years was compiled by referring to the following three resources: 1) Four 10 km² squares surveyed during the second Ontario Breeding Bird Survey (OBBA; 17PJ04, 17PJ05, 17PJ14, 17PJ15) that are encompassed within the subject lands; 2) TRCA data; and 3) Gartner Lee Limited Internal reports. Some of the OBBA squares were only partially encompassed by city limits, resulting in a species list that may include some bird species that were found in the vicinity of, but not necessarily within Study Area.

A total of 127 breeding bird species have been detected in Vaughan, five of which are non-native. One species detected within the Study Area with fledged young, the Trumpeter Swan (*Cygnus buccinator*), is an unexpected breeder in the region. Twelve species were possibly breeding in the Study Area according to observations made during surveys, and the remaining 115 species were confirmed or probable breeders.

Thirty-two area-sensitive bird species have been detected in the Study Area. Area-sensitive bird species either prefer to breed in larger patches of suitable habitat or are found at higher breeding densities in larger habitat patches. Twenty-four of the area sensitive species are forest associates, three are found primarily in marsh habitats and the remaining five species are found in old-fields, thickets and other open habitat communities. Warbler species accounted for 22% (seven species) of the forest area sensitive species, raptors and owls represented an additional 13% (four species), and woodpecker species comprised 9% (three species) of the forest area sensitive bird species observed. The highest concentrations of area sensitive bird species were encompassed within the ESAs to the west of Pine Valley Drive. The vegetation communities protected in the ESAs combine to form large contiguous patches of forest, wetland and meadow. The natural communities bordering the Humber River, north of Nashville Road also provide habitat for a high concentration of area sensitive bird species. Apart from the ESA protected lands, these valleylands are the only other areas that provide large enough habitat patches for species such as the Black-throated Blue Warbler (*Dendroica caerulescens*) and Scarlet Tanager (*Piranga olivacea*).

Local rarity of breeding bird species was evaluated based on information provided by the second Ontario Breeding Bird Atlas. Bird species observed in the Study Area that were reported in less than 25% of the squares in the region were considered locally uncommon (**Table 7**). A total of 11 uncommon species were detected in the subject lands, three of which have also been designated as species at risk or provincially rare (NHIC). Uncommon species were reported in all Ontario Breeding Bird Atlas squares encompassed by the Study Area, and were therefore well distributed.

Table 7. Locally Uncommon Breeding Bird Species

Common Name	Scientific Name	Data Source
Trumpeter Swan*	<i>Cygnus buccinator</i>	OBBA
Wild Turkey	<i>Meleagris gallopavo</i>	OBBA, TRCA
Long-eared Owl	<i>Asio otus</i>	OBBA, TRCA
Northern Saw-whet Owl	<i>Aegolius acadicus</i>	OBBA, TRCA
Acadian Flycatcher*	<i>Empidonax vireescens</i>	OBBA, TRCA
Golden-crowned Kinglet	<i>Regulus satrapa</i>	OBBA, TRCA
Blue-headed Vireo	<i>Vireo solitarius</i>	OBBA
Hooded Warbler*	<i>Wilsonia citrina</i>	OBBA, TRCA, NHIC
Clay-coloured Sparrow	<i>Spizella pallida</i>	OBBA, TRCA
Grasshopper Sparrow	<i>Ammodramus savannarum</i>	OBBA, TRCA
Purple Finch	<i>Carpodacus purpureus</i>	OBBA

Note: * Also designated as a species at risk or provincially rare species.

2.2.2.2 Amphibians and Reptiles

A list of amphibian and reptile species detected in the City of Vaughan was compiled by referring to TRCA data, GLL internal reports and NHIC (Table 8). Eleven amphibian and four reptile species have been reported in the city. Of the 15 species reported in the area, one is a Species at Risk and one is a provincially rare species. The Milk Snake (*Lampropeltis triangulum*) is designated as a species of Special Concern by COSEWIC and OMNR. It was detected in one location in 1999 by TRCA. A Jefferson x Blue Spotted Salamander hybrid (*Ambystoma* hybrid) was detected by TRCA in 2005, and reported to NHIC in the 1970s. This hybrid is provincially imperilled (S2), according to the OMNRs NHIC.

Table 8. Amphibian and Reptile Species Observed in the City of Vaughan

	Common Name	Scientific Name	Data Source
Amphibian	Red-spotted Newt	<i>Notophthalmus viridescens</i>	TRCA
	Jefferson X Blue Spotted Salamander*	<i>Ambystoma hybrid</i>	TRCA
	Spotted Salamander	<i>Ambystoma maculatum</i>	TRCA, GLL
	Eastern Red-backed Salamander	<i>Plethodon cinereus</i>	TRCA, GLL
	American Toad	<i>Bufo americanus</i>	TRCA, GLL
	Gray Treefrog	<i>Hyla versicolor</i>	TRCA, GLL
	Spring Peeper	<i>Pseudacris crucifer</i>	TRCA, GLL
	Western Chorus Frog	<i>Pseudacris triseriata</i>	TRCA
	Wood Frog	<i>Rana sylvatica</i>	TRCA, GLL
	Northern Leopard Frog	<i>Rana pipiens</i>	TRCA, GLL
	Green Frog	<i>Rana clamitans</i>	TRCA, GLL
Reptile	Snapping Turtle	<i>Chelydra serpentina</i>	TRCA
	Eastern Gartersnake	<i>Thamnophis sirtalis</i>	TRCA, GLL
	Northern Red-bellied Snake	<i>Storeria occipitomaculata</i>	TRCA
	Milk Snake*	<i>Lampropeltis triangulum</i>	NHIC, TRCA

Note: * Also designated as a species at risk or provincially rare species.

Ten species of frog and toad are common in south and central Ontario. The detection of seven of these species in the Study Area illustrates the high diversity of amphibians present within the city limits. Wood Frog and Spring Peeper have been reported most frequently. Leopard Frog is uncommon. Frog and toad sampling is conducted according to the Canadian Wildlife Service Marsh Monitoring Program in which the abundances of individual species are recorded on a scale from 0-3, where a code 3 represents a full chorus in which calls are continuous and overlapping. Full chorus', which may be associated with stable populations, have been recorded for Wood Frog, Spring Peeper and Chorus Frog. It is important to note that although there is a low incidence of wetlands in Vaughan, amphibians have been detected in most riparian areas along tributaries.

Although amphibians are widespread in the subject lands, the highest concentration of breeding individuals have been detected in the wetland, meadow and forest communities encompassed by the ESAs west of Pine Valley Drive and the valleylands of the Humber River. Reptiles have also been detected most frequently in these areas.

2.2.2.3 Mammals

A total of 21 mammal species have been detected in the City of Vaughan, two of which are non-native (Coyote and Virginia Opossum; Table 9). Many of these are common urban species that are tolerant to disturbance including the Raccoon (*Procyon lotor*), Eastern Chipmunk (*Tamias striatus*), Eastern Grey Squirrel (*Sciurus carolinensis*) and Eastern Cottontail Rabbit (*Sylvilagus floridanus*). White-tailed Deer

(*Odocoileus virginianus*) and Coyote (*Canis latrans*) are generalists, found in a diversity of habitats including young woodlands, meadows, old fields and valleylands. Mammals such as the Meadow Vole (*Microtus pennsylvanicus*) and Woodchuck (*Marmota monax*) spend most of their time in old fields. Mink (*Mustela frenata*), Beaver (*Castor canadensis*) and River Otter (*Lontra canadensis*) are associated with aquatic habitats (river, pond or lake) within wooded areas. Southern Flying Squirrel (*Glaucomys volans*) and Short-tailed Weasel (*Mustela erminea*) are two forest associates.

Table 9. Mammal Species Observed in the City of Vaughan

Common Name	Scientific Name	Data Source
White-tailed Deer	<i>Odocoileus virginianus</i>	TRCA
Short-tailed Weasel	<i>Mustela erminea</i>	TRCA
Long-tailed Weasel	<i>Mustela frenata</i>	TRCA
Mink	<i>Mustela vison</i>	TRCA
River Otter	<i>Lontra Canadensis</i>	TRCA
Raccoon	<i>Procyon lotor</i>	GLL
Coyote**	<i>Canis latrans</i>	GLL
Porcupine	<i>Erethizon dorsatum</i>	TRCA
Meadow Jumping Mouse	<i>Zapus hudsonius</i>	TRCA, GLL
Meadow Vole	<i>Microtus pennsylvanicus</i>	GLL
Muskrat	<i>Ondatra zibethicus</i>	TRCA, GLL
Beaver	<i>Castor canadensis</i>	TRCA, GLL
Eastern Chipmunk	<i>Tamias striatus</i>	TRCA, GLL
Woodchuck	<i>Marmota monax</i>	TRCA
Red Squirrel	<i>Tamiasciurus hudsonicus</i>	TRCA
Eastern Grey Squirrel	<i>Sciurus carolinensis</i>	GLL
Southern Flying Squirrel*	<i>Glaucomys volans</i>	TRCA
Eastern Cottontail Rabbit	<i>Sylvilagus floridanus</i>	TRCA
Little Brown Bat	<i>Myotis lucifugus</i>	GLL
Virginia Opossum**	<i>Didelphis virginiana</i>	TRCA
Hairy-tailed Mole	<i>Parascalops breweri</i>	TRCA

Notes: * Also designated as a species at risk or provincially rare species
 ** Non-native species

Apart from the common urban tolerant species discussed, mammals are associated with natural cover and are found in their highest densities close to vegetated portions of the city in the north and west.

One mammal species detected in Vaughan, the Southern Flying Squirrel, has been designated as a species of special concern by COSEWIC and OMNR, and is provincially vulnerable (S3) according to NHIC.

2.2.2.4 Significant Species

TRCA, NHIC, the second Ontario Breeding Bird Atlas (OBBA) and Gartner Lee Limited internal reports were consulted to compile a list of wildlife species at risk and provincially rare species observed within the Study Area (**Table 10**).

Nine animal species designated by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), have been observed in the Study Area. COSEWIC is a panel of experts that assess a species' risk of becoming extinct and/or extirpated based on science and Aboriginal/community knowledge. Five of the species designated by COSEWIC are included in Schedule 1 of the federal Species at Risk Act (SARA), which provides them and their habitat legal protection (**Table 10**). Of the species designated by COSEWIC, two are listed as Endangered, two are listed as Threatened and the remaining five species are listed as Special Concern.

Table 10. Significant Wildlife Species in the City of Vaughan

	Common Name	Scientific Name	S-Rank ¹	MNR Rank ²	COSEWIC Rank ³	Data Source
Bird	Least Bittern	<i>Ixobrychus exilis</i>	S3	THR	THR*	TRCA
	Trumpeter Swan	<i>Cygnus buccinator</i>	S2S3	--	--	OBBA
	Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>	S3	SC	SC	OBBA
	Acadian Flycatcher	<i>Empidonax virescens</i>	S2	END	END*	TRCA, OBBA
	Carolina Wren	<i>Thryothorus ludovicianus</i>	S3S4	--	--	OBBA
	Hooded Warbler	<i>Wilsonia citrina</i>	S3	THR	THR*	NHIC, TRCA, OBBA
	Henslow's Sparrow	<i>Ammodramus henslowii</i>	S1	END	END*	NHIC
Odonata	Midland Clubtail	<i>Gomphus fraternus</i>	S3	--	--	NHIC
	Rapids Clubtail	<i>Gomphus quadricolor</i>	S1	--	--	NHIC
	Rusty Snaketail	<i>Ophiogomphus rupinsulensis</i>	S3	--	--	NHIC
Fish	Redside Dace	<i>Clinostomus elongatus</i>	S3	THR	SC	NHIC, TRCA
	Northern Brook Lamprey	<i>Ichthyomyzon fossor</i>	S3	SC	SC	TRCA
Amphibian	Jefferson Salamander x Blue Spotted Salamander	<i>Ambystoma hybrid</i>	S2	--	--	NHIC, TRCA
Reptile	Milk Snake	<i>Lampropeltis triangulum</i>	S3	SC	SC*	TRCA, NHIC
Mammal	Southern Flying Squirrel	<i>Glaucomys volans</i>	S3	SC	SC	TRCA

¹**S-rank:**

The Natural Heritage provincial ranking system (provincial S-rank) is used by the MNR Natural Heritage Information Centre (NHIC) to set protection priorities for rare species and natural communities.

Definitions are as follows:

- S1 Critically Imperilled; extremely rare in Ontario with 5 or fewer occurrences in the province. These species are especially vulnerable to extirpation.
- S2 Imperilled; very rare in Ontario due to restricted range, 20 or fewer populations or steep declines. These species are vulnerable to extirpation.
- S3 Vulnerable; rare to uncommon in Ontario due to restricted range, fewer than 80 populations or recent and widespread declines.
- S4 Apparently Secure; uncommon but not rare. Usually greater than 100 occurrences in the province.
- S5 Secure; common, widespread and abundant in the province.

²**MNR Status:**

Based on consultation with COSSARO (Committee on the Status of Species at Risk in Ontario), which evaluates the conservation status of species occurring in Ontario.

Definitions are as follows:

- EXT Extinct; a species that no longer exists anywhere.
- EXP Extirpated; a species that no longer exists in the wild in Ontario, but occurring elsewhere.
- END Endangered; a species facing imminent extinction or extirpation in Ontario.
- THR Threatened; a species that is at risk of becoming endangered in Ontario if limiting factors are not reversed.
- SC Special Concern; a species with characteristics that make it sensitive to human activities or natural events.

³**COSEWIC rankings:**

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assigns a federal status ranking to all assessed species.

Definitions are as follows:

- EXT Extinct; a species that no longer exists anywhere.
- EXP Extirpated; a species that no longer exists in the wild in Canada, but occurring elsewhere.
- END Endangered; a species facing imminent extinction or extirpation in Canada.
- THR Threatened; a wildlife species likely to become endangered if limiting factors are not reversed.
- SC Special Concern; a species that may become a threatened or endangered species because of a combination of biological characteristics and identified threats.

Species included on Schedule 1 of the federal Species at Risk Act.

In consultation with the Committee on the Status of Species at Risk in Ontario (COSSARO), the OMNR is responsible for the evaluation of species at risk in Ontario. Nine species at risk designated by the OMNR have been observed in the Study Area. In most cases OMNR/COSSARO designations are consistent with COSEWIC designations. This is true for all species at risk in the Study Area, except the Redside Dace which has been upgraded by OMNR/COSSARO from a species of Special Concern to Threatened in Ontario. Two species have been evaluated as Endangered, three species have been evaluated as Threatened and the remaining four species have been listed as species of Special Concern.

A natural heritage provincial ranking system (S-ranks) is used by OMNR's NHIC to set protection priorities for provincially rare species and vegetation communities. S-ranks range from Critically Imperilled (S1) to Secure (S5). Fifteen wildlife species detected in the Study Area have an S-Rank between S1 (Critically Imperilled) to S3 (Vulnerable). Of the 15 provincially rare species, two bird species, all three Odonata (Dragonfly and Damselfly) species and the Jefferson Salamander X Blue Spotted Salamander hybrid are not also designated by COSEWIC and OMNR.

A total of 15 species have been detected in the subject lands that are designated as Species at Risk or provincially rare species. Four of these records are older than 20 years and are therefore considered to be historical. Historical records include observations for the Henslow's Sparrow (1971) and the three Odonata species (1939-1955). Henslow's Sparrow is unlikely to have a breeding population remaining in the City of Vaughan and is believed to be extirpated from the area. Surveys for insect species are not as rigorous as they are for other wildlife, so it is possible that the three Odonata species are still present in the area, but have not been detected in the recent past.

Most of the designated species at risk and provincially rare species were found in protected Environmentally Significant Areas to the west of Pine Valley Drive, or vegetation communities along the Humber River and its tributaries. The combination of natural cover encompassed by the ESAs and valleylands within the City of Vaughan provide a large, contiguous, relatively well connected patch of wildlife habitat that has the potential to support a high diversity of vegetation and wildlife species.

2.2.3 Landscape Connectivity

Landscape connectivity is a very important factor in maintaining species populations and species diversity. Large mammals and birds in particular often require large territories for foraging. It is important that habitat patches are connected to facilitate seed dispersal and the movement of species and the transfer of genetic material between populations.

The landscape of Southern Ontario is highly fragmented, with patches of natural area (forest, wetland, thicket, etc) surrounded by agriculture, roads and development. Improvement of landscape connectivity can be achieved by creating corridors between these habitat patches. In general, agricultural land is less of a barrier to species movement than intensive residential or industrial development.

The Humber River valley provides a substantial amount of natural cover in the Western Vaughan Study Area. In most areas the valleys are treed which provides habitat for terrestrial birds and mammals, but it also provides many ecosystem services, such as slowing runoff and providing shade for streams to maintain coldwater fish habitat. The orientation Humber River valley and its tributaries allows for adequate movement of species in a north-south direction. But unfortunately these corridors are largely isolated from each other, so there is little connectivity in the east-west direction. Highway 400 acts as a major barrier to species movement between the Don and Humber watersheds, and there are many barriers to connectivity in the southern portion of the city including, high intensity development and major roads.

Currently there is little connectivity between the East and Upper Humber River valleys. The northern portion of the Humber watershed affords the best opportunity to improve landscape connectivity. There are numerous isolated woodlots that could be enlarged and connected to other woodlots by planting native shrubs and trees. This would also benefit streams in the area by providing more riparian cover.

2.3 Designated Areas

2.3.1 Wetlands

Wetlands are defined as lands that are either flooded by shallow water or areas where the water table is close to the surface, have soils that are characteristic of water saturation, and have vegetation that has adapted to wet conditions (Mitch and Gosselink 2000). Wetlands are evaluated by the OMNR according to the Ontario Wetland Evaluation System (2002), in which the importance of a wetland is determined based on biological, social, hydrological and special features. Evaluated wetlands are categorized as either provincially or locally significant. These designations protect wetlands from development and alterations according to the Provincial Policy Statement (OMNR 1999). Wetlands on the Oak Ridges Moraine, on Conservation Authority lands, on Federal lands and wetlands associated with valley lands are all protected to some degree.

Wetlands were never common in the City of Vaughan, considering that only up to 5% of the area of the City of Vaughan (roughly 1,375 ha) would have been classified as wetland in 1800 (Snell 1987). This is a relatively small percentage compared with some townships, which would have had more than 60% of the area as wetlands. Only 0.4% of the area in the Western Vaughan Study Area is wetland (43 ha). The lack of wetlands in the Study Area can be attributed to the underlying surficial geology. The Study Area is dominated by sloping till which is not conducive to wetland formation due to low permeability, and to the fact that water does not accumulate, and is shed to the south. The Oak Ridges Moraine extends into the northeast corner of the City. There are several kettle wetland complexes associated with the Oak Ridges Moraine (outside the Study Area). Currently there are only 152 ha of wetland left within the City of Vaughan, only 0.55% of the total area (27,500 ha). This means that over 80% of the wetland area in the City has been lost. There are no provincially evaluated wetlands in the Study Area but there are several Provincially Significant Wetlands to the north of the Study Area, associated with the Oak Ridges Moraine.

2.3.2 International Biological Program Sites (IBP)

Between 1964 and 1974, five biome studies were initiated worldwide, concerned with describing and monitoring productivity of biological resources, environmental change and human adaptability to environmental change (National Academy of Science 2008).

Table 11 lists and describes the two International Biological Program Sites within the subject lands. Boyd Conservation Area was later designated as a Provincially Significant ANSIs.

Table 11. International Biological Program Sites in the City of Vaughan

IBP Site Name	Area (ha)	Site Description
Boyd Conservation Area	74.0	This area contains a diversity of vegetation communities and habitats including upland and riparian deciduous and mixed forest, thicket communities, intermittent swamps and a stream. The area supports a mature American Beech-Sugar Maple-Eastern Hemlock community, and Black Maple specimens are abundant. Moderate to severe harvesting and grazing disturbances are evident throughout the site.
Vellore Tract	35.6	Sugar Maple-American Beech forests of varying age classes dominate this area. Mixed upland forests and open fields are also present. The woodlot is owned and managed by the Faculty of Forestry of the University of Toronto, with varying degrees of harvesting intensity used to demonstrate the effects of silvicultural practices on forest communities.

2.3.3 Areas of Natural and Scientific Interest

An ANSI is defined by the OMNR as an area that contains natural features that are provincially or regionally significant (NHIC). Earth Science ANSIs contain important geological features, and Life Science ANSIs contain representative ecological features. ANSIs are considered to be the best representation of a natural area within each site district and can be considered as an ecological benchmark. Provincially designated ANSIs are protected from development under the PPS, however, regionally designated features are only considered protection from a city (Vaughan) and regional (York) perspective in planning applications.

There are a total of three ANSI's within the subject lands, all of which are Life Science ANSI's. **Table 12** lists the ANSIs and rationale for the sites designation.

Table 12. Areas of Natural and Scientific Interest in the City of Vaughan

Site Name	Designation	Area (ha)	Significance	Reason for Significance
Boyd Conservation Area and Adjacent Lands	Life Science	57.0	Provincial	Supports 30 vegetation communities, three of which are rare: Water-parsnip marshes, a Tussock Sedge meadow marsh and a Speckled Alder organic thicket swamp. This area has been designated as significant because the mature bottomland terrace, valley slope and associated tableland forests containing large trees are the best representation of these features that currently remain on the Peel Plain. This ANSI is also known for its oxbow wetlands (Hanna 1984).
Kleinberg Woodlots	Life Science	50.0	Regional	Composed of four young to mid-aged upland woodlands with two vegetation communities: Sugar Maple-ash-Eastern Hemlock-White Pine and ash-Red Maple-dogwood (Hanna 1984).
Humber River	Life Science	50.0	Regional	A flat-bottomed section of the Humber River. It is composed of a mixture of vegetation communities including wet meadow, goldenrod fields, upland sugar maple mixed forests and willow-poplar-ash-elm floodplain (Hanna 1984).

2.3.4 Environmentally Significant Areas

In Vaughan, an area that has ecological significance may be identified as an Environmentally Significant Area (ESA) and designated for protection by a municipality or Conservation Authority (TRCA). Often times, ESAs overlap with designated ANSIs.

A total of 18 Environmentally Significant Areas are found within the subject lands (**Table 13**). Seventeen are considered to have ecological importance and are therefore designated as Life Science Sites. The remaining site has a geologically important feature, thereby designating it as an Earth Science Site.

Table 13. Environmentally Significant Areas in the City of Vaughan

ESA #	ESA Name	Designation	Criteria Met	Reason for Significance
15	Woodbridge Cut	Earth Science	1	One of three sites that has the most complete record of Pleistocene geology in Canada. It also represents York Till, a Pre-Wisconsin deposit that is very rare in Ontario (TRCA 1982).
16	Clarence Street Forest	Life Science	4,6	This area provides habitat for Canada Waterleaf (<i>Hydrophyllum canadense</i>), a nationally and provincially rare plant species. It is a Sugar Maple-Black Maple forest, which is rare in the region (more common in the Carolinian zone; TRCA 1982).
17	Elder Mills Forest	Life Science	3,5,6	This area contains a diversity of vegetation communities including high quality stands of Eastern Hemlock, Sugar Maple, American Beech and White Pine. This area supports a high diversity of plant and bird species. Historical records of the endangered Acadian Flycatcher also exist for this forest (TRCA 1982).

Table 13. Environmentally Significant Areas in the City of Vaughan

ESA #	ESA Name	Designation	Criteria Met	Reason for Significance
18	Smith's Beech Forest	Life Science	3	This relatively undisturbed mature American Beech-Sugar Maple forest is considered to be of high quality within this landscape (TRCA 1982).
19	Pine Grove Forest	Life Science	3,5	The mature Eastern Hemlock-Sugar Maple forest is uncommon in the region. This area also contains an exceptionally high diversity of vegetation communities for an area of its size (TRCA 1982).
20	Boyd's Rock Cress	Life Science	6	This area provides habitat for the Provincially Threatened Redside Dace (<i>Clinostomus elongates</i>) and regionally rare plant Smooth Rock Cress (<i>Arabis laevigata</i> ; TRCA 1982).
21	Pine Valley Forest	Life Science	3,6	This forest provides habitat for the provincially threatened Redside Dace. The extensive and relatively undisturbed forests have superior Eastern Hemlock and Black Cherry specimens, in addition to healthy regeneration by Eastern Hemlock, Sugar Maple and American Beech (TRCA 1982).
23	Carex Peckii Area No.2	Life Science	6	This area provides habitat for the regionally uncommon Hairy-leaved Sedge (<i>Carex hirtifolia</i> ; TRCA 1982).
24	Graham's Forest	Life Science	4,5,6	This area has a number of Carolinian Tree species such as Hop Hornbeam, Blue Beech, Black Cherry, Black Maple and Bitternut Hickory. This area supports a high diversity of plant species, particularly in the understory, including a species that was considered regionally rare in 1982, False Melic Grass* (<i>Schizachne purpurascens</i> ; TRCA 1982).
25	Graham's Forest Complex	Life Science	3,5	This area supports a high diversity of vegetation communities that results in a moderately high diversity of plant species. The mature, high quality forest units show excellent regeneration and are rare due to the dominance of Hop Hornbeam in the understory layer. In addition, this unit contains an Eastern Hemlock/White Pine stand, which is an uncommon species association in the region (TRCA 1982).
26	McLean's Forest	Life Science	3	These mature forest communities have excellent Eastern Hemlock and Sugar Maple regeneration. The understory is dominated by Hop Hornbeam, which is rare in the region, and a number of Carolinian tree species such as Blue Beech, Bitternut Hickory and Black Cherry are present (TRCA 1982).
27	Graham's Woods	Life Science	3,6	This area is primarily composed of a large mature deciduous forest with large Sugar Maple and Red Oak specimens. This forest supports a number of Carolinian species and the regionally rare Woodland Meadow Grass (<i>Poa alsodes</i> ; TRCA 1982).
28	Kortright Area	Life Science	2c,3,5,6	This area provides an important migratory stopover function. The mature, relatively undisturbed Sugar Maple-Eastern Hemlock-American Beech-White Ash-Ironwood forests are high quality. The area supports a large diversity of vegetation communities, plant and animal species. The area provides habitat for the provincially threatened Redside Dace and regionally rare Common Polypody (<i>Polypodium vulgare</i> ; TRCA 1982).
29	Boyd Forest	Life Science	3,5	This area supports a high diversity of plant and bird species. The mature Sugar Maple-American Beech forest exhibits healthy regeneration and is of high quality (TRCA 1982).
30	McFayden Forest	Life Science	3, 5, 6	The large mature forests of this site support a high diversity of overstory species, resulting in a highly variable ground cover. The high quality, mature Sugar Maple-Eastern Hemlock forest supports three Carolinian tree species: White Oak, Black Cherry and Shagbark Hickory. McFayden Forest provides habitat for the regionally uncommon Hitchcock's Sedge (<i>Carex hitchcockiana</i> ; TRCA 1982).
31	Sprengel's Area	Life Science	3,6	This area provides habitat for the regionally rare Sprengel's Sedge (<i>Carex sprengelii</i>) and the provincially threatened Redside Dace. It also supports a high diversity of plant species in all three strata (TRCA 1982).

Table 13. Environmentally Significant Areas in the City of Vaughan

ESA #	ESA Name	Designation	Criteria Met	Reason for Significance
32	Glassco	Life Science	3, 5, 6	This area provides habitat for the regionally rare Thinleaf Sedge (<i>Carex cephaloidea</i>). The mature deciduous and mixed forests support a diversity of plant and avian species (TRCA 1982).
na	North Woodbridge Ravine	Life Science	na	Information for this feature is not available.

Note: * According to Varga et al.. (2000), these species have no status within York Region.

2.3.4.1 Toronto Region Conservation Authority ESAs

The TRCA (formerly known as MTRCA) undertook an Environmentally Significant Area (ESA) study (1982) in order to “identify areas of environmental significance and to suggest direction for their recognition and management”. The long-term objective was to provide a more comprehensive and consistent approach to resource management within the region.

The designation of an area required the fulfillment of at least one of the following seven criteria:

- Criteria 1:** The area represents a distinctive and unusual landform or feature within the TRCA region, Ontario or Canada.
- Criteria 2:** The ecological function of the area contributes significantly to the healthy maintenance of a natural system beyond its boundaries in at least one of the three following ways:
 - a) area serves as a water storage or recharge area.
 - b) area maintains or provides linkages between ‘significant natural biological systems’; and/or
 - c) area provides essential habitat to support a “significant species and/or significant population or concentration of species”.
- Criteria 3:** The habitats or vegetation communities are evaluated as exceptional and/or of high quality within the TRCA region, Ontario or Canada. Habitats or communities were evaluated as exceptional based on the presence of a number of characteristics including uncommon species associations, superior specimens, exceptional concentrations of species, maturity, diverse species composition, regeneration capabilities, and species associated with undisturbed/high quality habitats.
- Criteria 4:** The area contains either a rare or under-represented ecosystem within the TRCA region, Ontario or Canada; and/or a small remnant of a habitat type that has virtually disappeared from the TRCA region.
- Criteria 5:** The area has an unusually high diversity of biological communities and/or species.
- Criteria 6:** The area provides habitat for regionally rare indigenous species, or species that are at risk either provincially or nationally.
- Criteria 7:** The area is large enough in size to provide habitat for species requiring large blocks of suitable habitat, such as area sensitive species or species with large territories/home ranges.

(TRCA 1982)

2.3.4.2 TRCA Terrestrial Natural Heritage System Strategy

All of the above listed ESAs are encompassed within the TRCAs Terrestrial Natural Heritage System Strategy (TNHS 2007). The objective of the strategy is to identify and evaluate natural heritage features and functions within the landscape, for inclusion in a Natural Heritage System. The TNHS is composed of both Existing Natural Cover and Potential Natural Cover that can be restored to complement existing units. A desktop exercise involving digital mapping was used to identify existing and potential cover within the TRCA jurisdiction. The quality, distribution and quantity of natural cover were evaluated according to scientifically rigorous Landscape Ecological Principles and combined to form a system that considered both feature and function, in existing natural communities and areas that could potentially be restored. Instead of considering natural cover on a patch by patch basis, the TRCA analyzed natural cover from a landscape perspective, which is the scale at which most ecological processes function. This holistic process allowed the identification of areas that should be restored to natural cover to enhance existing features. By securing the Potential Natural Cover areas within the Natural Heritage System, natural cover in the Toronto Region will increase from its current 17% to the goal of 30% cover, and likely improve the overall quality and functioning of cover within their jurisdiction.

2.3.5 Conservation Areas

A Conservation Authority Area is a property owned and managed by the local conservation authority. Some have limited access in order to protect sensitive habitat, however, most are open to the public for recreational and educational purposes.

The Kortright Centre for Conservation is 26.5 ha in size, and is the only Conservation Area within the subject lands. Humber River and Cold Creek run through the property that has a diverse assemblage of vegetation communities including mature mixed Eastern Hemlock-Sugar Maple-American Beech forest, Crack Willow-Balsam Poplar-White Spruce-American Elm scrub communities, swamps, wetlands and old-fields.

3. Conclusions-Overall Sensitivities

The following table (Table 14) provides a summary of the key terrestrial features and land designations identified for the analysis area.

Table 14. Overall Significant and Sensitive Features

Feature and/or Land Designation	Applicable Policy Documents/Policy Implications
Provincially Significant Wetlands (PSW)	<ul style="list-style-type: none"> Protected under the Provincial Policy Statement (PPS).
Locally Significant Wetlands (LSW)	<ul style="list-style-type: none"> Protected under the <i>Conservation Authorities Act</i>. Municipal Official Plan policies may assess impacts of development and public infrastructure projects on LSW and unevaluated wetlands.
Areas of Natural and Scientific Interest (ANSI)	<ul style="list-style-type: none"> Protected under the PPS.
Undesignated Wetland Units	<ul style="list-style-type: none"> Wetland communities are rare in Vaughan. Perform important ecological, social and economic functions.
Upland Forest Units	<ul style="list-style-type: none"> Upland forest communities are rare in Vaughan. Incorporated into TRCA TNHSS.
Interior Forest Habitat/ Area Sensitive Bird Species	<ul style="list-style-type: none"> High quality habitats with relatively minimal anthropogenic disturbance. Potential for high incident of rare or uncommon wildlife.
Species at Risk	<ul style="list-style-type: none"> Protected under the PPS, <i>Species at Risk Act</i> and the <i>Endangered Species Act</i>.

4. Information Gaps and Further Analyses

Although our review of existing secondary information has been thorough, some data gaps still exist. The following information will be needed to provide a complete assessment of natural heritage features within the City of Vaughan:

- a) Groundwater Quality Data;
- b) ELC information to fill in TRCA gaps; and
- c) MNR Wetland Evaluation Reports;

5. References

- AGRA Earth and Environmental Limited, 2001:
OPA 160 Official Plan Review, Kleinburg-Nashville Community Plan, Natural Environment – Background Report.
- AMEC Earth and Environmental, 2002:
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