DON RIVER WATERSHED PLAN
BEYOND FORTY STEPS

2009

Prepared by:
Toronto and Region Conservation

theDon

TORONTO AND REGION Conservation
for The Living City

2009

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The data used to create all maps in this document were compiled from a variety of sources and dates. The TRCA takes no responsibility for errors or omissions in the data and retains the right to make changes and corrections at anytime without notice. For further information about the data on these maps, please contact the TRCA GIS Department at (416) 661-6600. All maps created by: Information Systems/ Information Technology.

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Executive Summary

The *Don River Watershed Plan* builds on the hard-won gains made to date in protecting, regenerating and taking collective responsibility for this abused but still beautiful feature of our natural heritage. It marks the next stage in the revitalization of the Don into a healthy urban river that will enhance and support The Living City of the future.

The plan relies on the working partnerships forged over the last 15 years and maintains momentum for many of the important initiatives launched under our first watershed strategy, *Forty Steps to a New Don*. However, our experience and the insight into the workings of the watershed, gleaned since *Forty Steps* was unveiled back in 1994, have made it clear that we must better focus and prioritize our regeneration efforts in the years ahead.

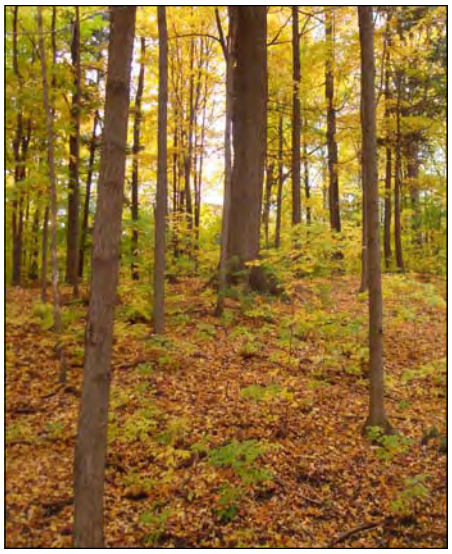
Our primary challenge will be to better manage wet weather flows and to restore a more balanced flow regime to the river and its tributaries. By managing stream flow, we will also address the root causes of many of the environmental problems that afflict the watershed: ongoing flooding and erosion, poor water quality, and deteriorating aquatic and terrestrial communities.

The Don River flows through the heart of central Canada's urban nexus (Figure 1). From its headwaters on the Oak Ridges Moraine and South Slope, its two principal tributaries flow south through the City of Vaughan and Towns of Markham and Richmond Hill, all in the Regional Municipality of York. The East Don and West Don Rivers cross Steeles Avenue into Toronto and join together on the Iroquois Sand Plain south of Eglinton Avenue.

German Mills Creek flows into the East Don River just south of Steeles. Taylor/Massey Creek joins with the East Don River just north of the confluence with the West Don River. And the Lower Don flows south to the outlet of the Keating Channel where it empties into Toronto Harbour and Lake Ontario.

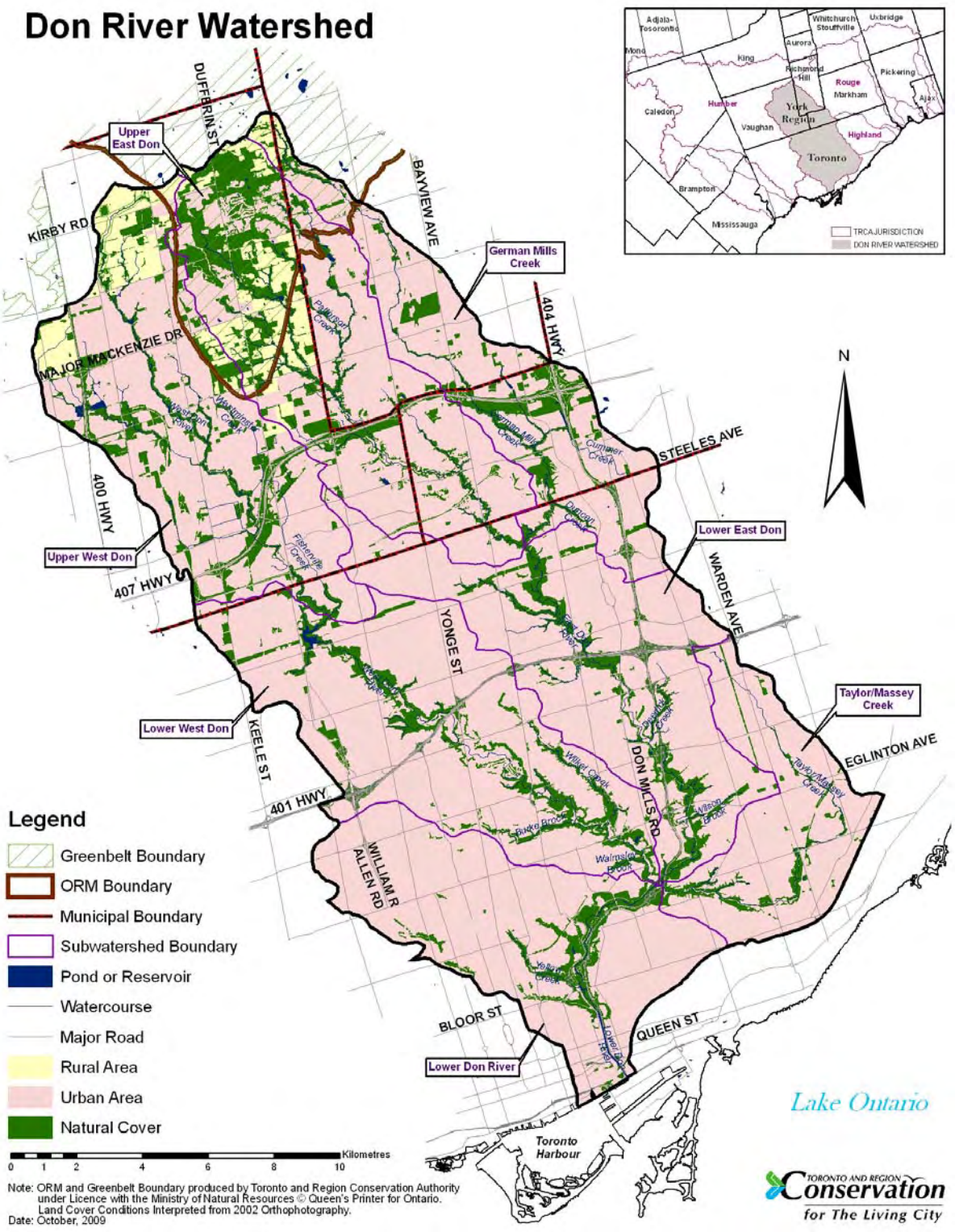
For more than ten thousand years, this network of rivers, streams and valleys has provided an historic highway for the First Nations peoples and, later, the early European explorers, traders and settlers. Subsequent waves of colonization and urbanization have indelibly marked and transformed the aquatic and terrestrial landscape, bequeathing both a rich cultural heritage and some difficult environmental challenges.

Today, almost half of the watershed is devoted to housing, and a fifth to industrial, institutional or commercial development. There is little undeveloped land left. The natural areas and greenspaces of the watershed serve as wildlife refuges and a recreational magnet for the 1.2 million residents that live within its boundaries. Unfortunately, the river also serves as a stormwater conduit, carrying millions of litres of rainwater and snow melt, together with polluted runoff and sewage overflow, south to the lake. And the valley of the lower Don has become a conduit for thousands of cars and trucks heading



Burnett Woods in Toronto (Photo Credit: Kate Hayes)

Figure 1: Don River Watershed



into and out of the urban core every hour of the day and night.

The pressures on the watershed will continue to build as more and more residents settle in the watershed, either in the last areas of greenfield development in the northern reaches, or in the four urban growth centres designated for intensive redevelopment by the Ontario government.

Our review of current conditions in the watershed has helped us plot a path for future action.

The Don River watershed has suffered extensive degradation as natural cover was removed and the hydrologic system altered through the spread of agriculture and subsequent urbanization of the watershed. Lack of stormwater control has resulted in flooding, erosion, poor water quality and degraded terrestrial and aquatic ecosystems. Rising population density has led to expanded areas of impervious cover and heavy use of public greenspaces and natural areas. Concerns about ecological health, the sustainability of our communities, loss of cultural heritage, and the potential impacts of poor air quality and climate change are widespread.

Which brings us to the question, what is the role of this watershed plan?

Specifically, the watershed plan is intended to inform and guide municipalities, provincial and federal governments, TRCA, non-government organizations and private landowners as they update their policies and practices for environmental stewardship. Implementation of these strategies will be most effective if existing partners coordinate their efforts, making creative use of both new and existing tools, as laid out in chapters 5 and 6 of the plan.

This updated watershed plan is part of an adaptive management approach to address the challenges the watershed faces. Since the publication of our first watershed strategy, *Forty Steps to a New Don* in 1994, much has been learned about the watershed from monitoring, research and the experiences of watershed partners. This plan updates the watershed management strategies in *Forty Steps* in light of this new information, a stronger scientific foundation and better understanding of the effects of human actions on the ecosystem.

There is also a need to respond to a number of recent policy and planning initiatives, including the *Oak Ridges Moraine Conservation Plan*, *Growth Plan for the Greater Golden Horseshoe*, *Clean Water Act,* City of Toronto's *Wet Weather Flow Management Master Plan*, stormwater retrofit studies of other municipalities, and TRCA's vision for The Living City.

Our vision for the Don River watershed

The quality of life on Earth is being determined in the rapidly expanding city regions. We envision the future Don as a revitalized urban river, flowing with life-sustaining water through regenerated natural habitats and sustainable human communities, from its headwater tributaries to the mouth of the Don River and into the receiving waters of Lake Ontario. We envision the watershed as an integral contributor to The Living City, where human

To help meet our vision for the Don, a set of three guiding principles and 26 objectives were developed.

This guiding framework builds on the principles and objectives presented in *Forty Steps to a New Don*. The three principles which form the basis for the plan are to: protect and sustain what is healthy; regenerate what is degraded; and take responsibility for the Don. We must take advantage of all opportunities to protect and sustain, regenerate and enhance the Don, from the valleys to the tablelands, and from the natural areas to the urban communities. We must also motivate and facilitate, organize and coordinate all the stakeholders, both public and private sector, throughout the watershed.

The next phase of development and urban intensification provides perhaps a final opportunity to take effective action.

With the build-out of the watershed nearly complete, the Don has been transformed into an almost fully urbanized river. The focus is now shifting from greenfield development towards redevelopment, intensification, infilling and infrastructure renewal to accommodate the anticipated growth of the GTA and neighbouring regions.

This period of urban renewal affords us an opportunity to implement a number of the measures required to restore a more natural water balance in the Don. Stormwater source, conveyance and end-of-pipe controls will contribute to reduced flooding, better water quality, stabilized baseflow levels, increased infiltration and improved groundwater recharge rates. The resulting benefits—reduced erosion and risk to infrastructure and terrestrial and aquatic habitat, and greater flexibility to adapt to climate change—will result in regeneration of a healthier river.

The pathway to a regenerated Don River builds on the following 3 strategic themes:

Strategic Theme # 1:

We must build, re-build and retrofit our communities to restore water balance and improve the sustainability of the urban model.

Redevelopment and intensification, and the remaining greenfield development in the Don River watershed, offer opportunities to improve stormwater management, protect and expand natural cover and the urban forest, regenerate greenspaces and cultural heritage structures, expand trail systems, and improve the sustainability of resource use and consumption within our communities. Many of these same opportunities exist through public and private stewardship and capital projects.

In short, we can achieve cumulative gains in watershed function and condition.

Strategic Theme #2:

We must regenerate the aquatic and terrestrial landscapes.

The concerted work of agencies, organizations and individuals have produced some improvements in watershed conditions. Some water quality parameters have improved, hundreds of thousands of trees, bushes and wetland flora have been planted, some in-stream barriers have been mitigated or removed, and trail systems expanded.

However, continued development and urban intensification will place additional pressures on the ecosystems of the watershed. Future gains will be contingent on maintaining the enthusiasm and support of the local community, businesses and government. In addition to ‘sweat equity’, support must include guaranteed funding to cover the significant capital and on-going maintenance costs of the requisite infrastructure.

Strategic Theme #3:

We must engage the attention, enthusiasm and support of the people of the Don.

The Don River watershed has a long history of grassroots and agency involvement in and advocacy for regeneration. Annual celebrations, such as Paddle the Don and the Richmond Hill Mill Pond Splash, as well as major naturalization and brownfield rehabilitation projects in the lower Don engage the community and provide a wider awareness of the Don.

The time is ripe to capitalize on that interest across the watershed, and reengage the people of the Don to achieve the

vision of a revitalized urban river. The engagement and voluntary uptake of sustainable practices — backyard naturalization, lot level stormwater retrofits, etc. — by residents and businesses in the Don will be essential to achieving the vision. Outreach education to build understanding of the links between landowner actions and watershed health will be key.

We must build an even stronger sense of community and common purpose, from the mouth to the headwaters. If the public doesn't fight to bring back the Don, the other constituencies eventually will lose interest. The most powerful impetus for change occurs when the whole community comes together and demands action.

Our concept site planning exercise was designed to engage local participants in the watershed study and promote innovative approaches. The five concept site plans provide practical representations of how key watershed recommendations could be applied on a local or neighbourhood basis *(See Appendix 6: Concept Site Plans).* The sites were chosen to be typical of locales throughout the watershed and to be representative of common challenges faced in many locations.

We have been afforded an opportunity to build on what has already been accomplished over the last 15 years.

We must allocate the resources, marshal stakeholder support and take the bold steps necessary to adopt effective stormwater controls and implement sustainable green technologies. Only by doing so can we hope to perpetuate and accelerate the process of cumulative gain and ongoing environmental improvement.

If pursued diligently and with the full support of all our partners, the regeneration of the Don River watershed within The Living City will continue to serve as a model for the salvation of other endangered urban rivers.

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1.0 Introduction

It's early fall and a cold mist skates and shivers across the surface of the Don. The only sounds: the soft sploosh as a muskrat slips into the dark water and the murmured conversations from the nearby parking lot. A dozen men and women – all ages, all from the neighbourhood – stamp their feet to stay warm or wrap their chilled fingers tighter around travel mugs of hot coffee. Nearby, the Scouts quietly file out of a borrowed school bus yawning, scuffling for the 'best' shovel, already sneaking treats from packed lunches. The seedlings, their fragile green promise packaged in black plastic pots, are carefully clustered to one side, next to a stack of water buckets and a mound of pungent mulch … waiting for the tree planters.

Ten hours later, the work crews knock the wet muck from their boots and begin to shuffle back to their carpooled vehicles. Muscles aching, hands calloused and sore, dirt smeared across a cheek or the wet knees of a pair of jeans. It's been a long day. But one by one, each volunteer stops and takes a long look back. Row on row, more than 700 new trees are unrolling their roots down into the dark soil of the valley and unfurling their leaves towards the dying light of the day. Nobody sees an empty lot, strewn with scrub and scrap, but a green glade, mature trees lining the riverbank, full branches shading the water rippling below. A place their grandchildren will come to relax and play and dream. And each smiles, then turns towards home.

Just another day in the rebirth of the Don River.

It's said that it takes a village to raise a child. So what does it take to resurrect a river? What does it take to restore and reclaim a sad, tired urban watershed that's suffered more than a hundred years of misuse, over use and development that lacked the benefit of a holistic perspective. It takes you, and you, and you.

The memories of what the Don had been – and what it could be again – have been kept alive and nurtured by an unlikely alliance of visionaries: local

Pioneer Park, Richmond Hill

Success Stories

In 2003, the City of Toronto released a mammoth plan for the **remediation and management of stormwater and combined sewer overflows.** The first 25-year phase of the 100-year plan will control run-off, upgrade sewers and improve end-of-pipe treatment. Assessments are underway for a number of important projects and stormwater management criteria have been developed for both new developments and redeveloped sites.

Some 140 **stormwater ponds** have been constructed or are under development, many in the upper reaches of the Don, to contain run-off, improve river water quality, and moderate the flow in waterways.

A number of dams, culverts and other **in-stream barriers** that blocked the movement of fish and other aquatic species have been removed or reconfigured.

The naturalization of the **Mouth of the Don** will finally restore the broken link between the river valley and the waterfront, while protecting nearby neighbourhoods from flooding. About 60 hectares of derelict land will be transformed into green space, treed enclaves, secluded wetlands and restored streambank habitat.

naturalists and neighbourhood activists, business and municipal leaders, and conservation authority staff. They assembled a coalition of the like-minded, drew up their preliminary plans, attracted more and more volunteers, and prepared to "Protect what is healthy, Regenerate what is degraded, and Take responsibility for the Don."

With the support and guidance of the Toronto and Region Conservation Authority (TRCA), that coalition evolved into the Don Watershed Task Force. Together, the TRCA and the Task Force drafted our first watershed strategy, *Forty Steps to a New Don (*MTRCA, 1994*).* Released in 1994, *Forty Steps* laid out a vision of the future Don as "a revitalized urban river, flowing with life-sustaining water through regenerated natural habitats, as well as human communities."

Building on that engaging vision statement, the Don Watershed Regeneration Council (DWRC), the TRCA, watershed municipalities and their partners from the public and private sectors took on the daunting task of implementing *Forty Steps*. Together, we have toiled to reverse decades of damage and begin to reclaim the aquatic, terrestrial and cultural heritage. There have been some notable successes. As we recounted in our last progress report, 2006's *Forging a New Deal for the Don* (TRCA, 2006), "a walk through the valley today reveals kilometers of new parkland trails and interpretive signs, thousands of fresh plantings and hundreds of nesting boxes for local wildlife. Litter and debris is being collected and hauled away. Abandoned industrial sites are being reclaimed. Stormwater ponds are being created to control flow levels. And dams and weirs reconstructed to allow fish to pass upstream."

But despite the progress made, the pressure on the river and its ecosystems continues to build. When we released *Forty Steps*, there were 800,000 people living in the watershed of the Don. By 2006, there are 1.2 million of us. In ten years' time, that number will have soared ever higher as new development fills in the last few open spaces on the municipal planning maps and urban intensification projects attract ever more residents to the cities of the watershed. Moreover, the demographics of the region are changing as new waves of immigrants settle in the watershed increasing the cultural richness of the community. And each of those residents will impose their expectations on the remaining greenspaces of the watershed, in search of recreational opportunities, nature-based experiences, cultural relevance, or just a quiet place to escape the pressures of urban living.

We aren't just fighting a numbers game. The environmental challenges we face in the watershed continue to increase in both number and complexity. Fifteen years ago, the terms "climate change" and "global warming" were familiar to only a handful of climatologists. We didn't suspect there were long-term health effects associated with endocrine disrupters, ultra fine particulates and common plasticizers. We hadn't yet learned to value the "urban forest" or fear the inevitable "smog days" of summer.

There were also serious gaps in our knowledge of the Don and its complex hydrological, biological and social inter-relationships. When we laid out our first strategic plans, we had almost no solid data on groundwater flow and

recharge rates. We hadn't mapped the in-stream barriers. We were just beginning inventories of the flora and fauna of the watershed.

These information gaps didn't hold us back from taking effective action, especially where the problems were dire and the solutions most obvious. For 15 years, hundreds and eventually thousands of friends of the Don invested their time and determination, their resources and sweat equity to rehabilitation and regeneration projects that are paying immediate dividends. We have also worked with municipal planners, politicians and developers to ensure that the urban projects of today and tomorrow don't repeat many of the same mistakes made in the past. We are, finally, holding the line!

While we haven't sat around waiting for the results of further studies, we have learned a lot more about the complex ecological workings of the watershed. We have much of the technical and environmental knowledge needed to focus our energies and resources on the most serious problems. We have access to green technologies and infrastructure that wasn't available to us when we drafted *Forty Steps*. And we know where our actions will reap the greatest benefits, the biggest bang of the increasingly scarce buck.

Our fundamental vision of a revitalized urban river flowing through The Living City remains unchanged. We still seek to restore natural flow and balance to the waterways of the Don, reducing the destructive flows that accompany every storm and maintaining baseflows that support productive aquatic habitats. We now have the planning tools, the best practices and the technologies — the green roofing systems, permeable parking lots and other sustainable options — we need to achieve that vision. Let's make the rehabilitation of the Don the proving ground for these new, more sustainable tools and technologies.

Today, we are all empowered to reduce the size of our own "environmental footprints". We haul our plastic green bins and blue boxes full of compostable kitchen scraps and yardwaste and recyclable bottles, containers and newspapers out to the curb every week. We line up for the rain barrels and low flow shower heads and backyard composters being distributed at community environment days. We contract to have our downspouts disconnected or sign up for the energy and water conservation audits offered to homeowners.

And perhaps, most important of all, there has been some real progress in pushing environmental issues to the front of the public agenda, capturing the attention of not just the general public — which was always willing to get its hands dirty to help the Don — but of politicians and decision-makers at all levels of government, as well.

When we started our work, there was no legislation protecting the Oak Ridges Moraine, no *Greenbelt Plan*, no *Growth Plan*, no *Environmental Bill of Rights*. Today there is a statutory imperative in place that's designed to give voice to the environmental perspective and place some control over urban sprawl and unfettered development.

Finally, after years of planning and study, years of building effective working relationships and partnerships, years of hard work safeguarding those natural

Success Stories

New **road salt management** plans have been adopted by the municipalities of the watershed to protect aquatic and terrestrial habitats and prevent groundwater contamination.

Following the example set by municipalities to minimize or **ban the cosmetic use of pesticides** on both public and private property and promote chemical free alternatives, the province stepped forward with its regulations in 2007.

The use of stringent **sewer use bylaws**, together with municipal pollution prevention programs, are designed to keep heavy metals, waste oils, solvents and other dangerous toxics out of sewers … and out of the Don.

Coalitions of **local residents, businesses, grassroots groups and municipalities** are working restoration wonders. Hundreds of thousands of trees and bushes have been planted, trails have been expanded and connected, trash has been collected and carted out, nesting boxes set up, and educational signage erected throughout the watershed.

A mix of bylaws and urban forestry plans have been implemented to protect, maintain and expand the **urban forest** on both public and private lands.

Success Stories

Toronto's **new green development standards** — performance targets for site and building design — are intended to better manage storm water runoff, reduce the urban "heat island" effect, conserve energy, and improve access for pedestrians and cyclists.

Draft guidelines have been published for **greening surface parking lots**, while the City of Toronto's **Green Roof Strategy** has used the development approval process to encourage green roofing projects, while providing pilot funding and public education.

Contaminated industrial or "brownfield " sites, like the historic **Don Valley Brick Works**, are being protected and reclaimed. The abandoned factory buildings are being transformed into an environmentally based community centre.

Every spring hundreds of residents **Paddle the Don**, focusing public attention on the natural beauty of the Don and raising money for naturalization and regeneration work.

York Region's "**Planning for Tomorrow**" initiative is designed to accommodate future growth while protecting natural heritage and maintaining the quality of life for residents.

features that were threatened and regenerating those that had been degraded, we are ready to move forward to the next stage.

Stakeholders across the watershed have focused their efforts on taking advantage of the modest regeneration opportunities that presented themselves, but now it's time to do the "heavy lifting". Waterfront Toronto, the City of Toronto and TRCA are tackling the some of the biggest improvements the Don has seen in recent years—upgrading trunk sewers, remediating combined sewer overflows, improving flood controls, and redeveloping and regenerating the Mouth of the Don River. York Region, the City of Vaughan, and the towns of Richmond Hill and Markham are updating the planning and environmental policies that will be needed to accommodate the expected wave of population growth in a way that fosters sustainability. It is progress on these massive, but necessary, undertakings that will set the Don on the course towards regeneration.

This new watershed plan provides the science-based strategic recommendations for continuing the regeneration of the Don. Backed by greater insight into the hydrological and ecological processes at work in the watershed, we can be more strategic in our proposals and more definitive in what needs to be done. Through our watershed planning process we have identified what must be done, what must be done first, and where that work must begin. And equipped with the appropriate technologies and feasible strategies, and buoyed by a sense of common purpose and resolve, we are ready to begin the final transformation of the Don into a viable and healthy urban river.

How was the plan prepared?

The Don River Watershed Plan was prepared by TRCA staff and consultants, with advice from two groups: (1) the Don Watershed Regeneration Council, coordinated by TRCA, with representation from government agencies, academic institutions, not-for-profit organizations, private businesses, and the public; and (2) a Municipal Technical Advisory Committee, composed of representatives from municipal planning, works and parks and forestry departments.

This plan updates *Forty Steps to a New Don* by building on existing information and addressing identified data gaps, particularly with respect to the groundwater system, water budget, water use and terrestrial natural heritage system. The plan has a strong technical foundation, based on several years of monitoring of environmental conditions combined with a leading edge approach to modelling of potential future conditions. A series of management summits was held to convene experts who could help identify best practices and recommendations to achieve watershed objectives. Meetings were held with agencies, other watershed partners and the public to review issues and seek feedback on the plan's recommendations.

Approaches to watershed planning have evolved over the years since Forty Steps was published. It is now possible to take a more integrated approach that focuses on interdependencies among watershed systems and evaluates proposed actions based on their ability to achieve multiple and synergistic benefits. Figure 2 illustrates how the watershed planning process is part of a

continuous cycle of adaptive watershed management whereby a plan is prepared and implemented, progress is monitored, and the plan is updated. The Don watershed has benefited from one complete cycle of watershed planning and this plan represents the beginning of a second cycle. This demonstrates how the plan is a living document that will continue to be revised in the future to reflect changing realities.

How will the plan be used?

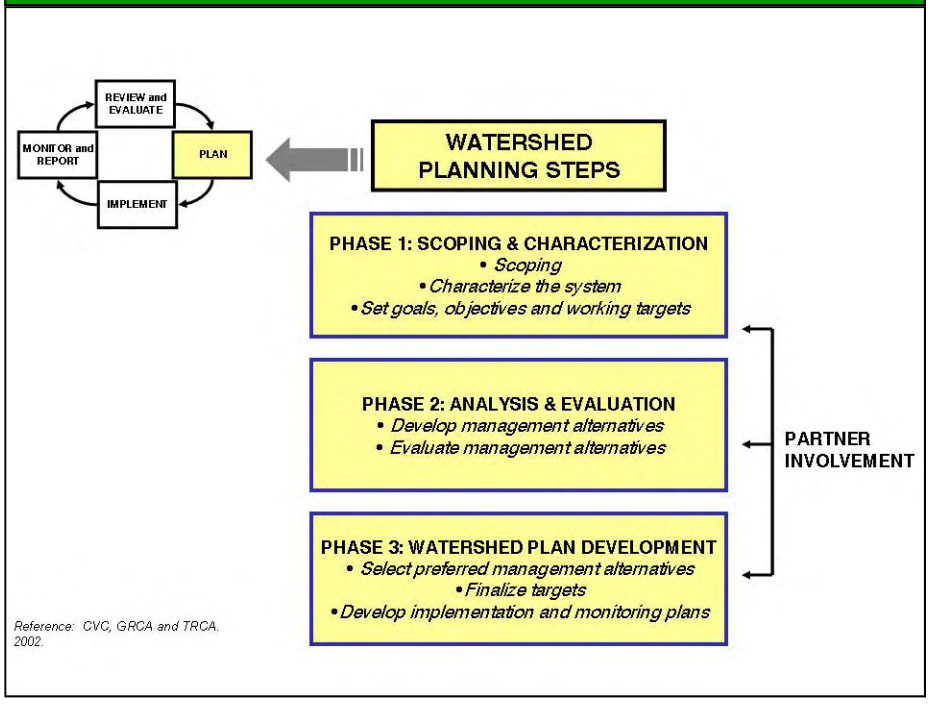
The watershed plan is intended to inform and guide municipalities, provincial and federal governments, and TRCA as they update their policies and programs for environmental protection, conservation, and regeneration within the contexts of land and water use, and the planning of future urban redevelopment and growth.

The plan is a resource for local non-governmental organizations and private landowners with regard to regeneration priorities, best management practices and opportunities for environmental stewardship. Implementation of these strategies will be most effective if existing partners collaborate and coordinate their efforts, making creative use of both new and existing tools, as laid out in chapters 5 and 6 of the plan.

What's in the plan?

Chapter 2 presents the guiding principles and objectives for the Don watershed that form the framework for the plan's strategies and targets. A review of current conditions in the Don watershed in Chapter 3 provides a summary of updated information on geology and groundwater, surface water, aquatic and terrestrial communities, and human heritage and current activities. Key management issues are identified to guide the development of the plan's recommendations. In Chapter 4, possible futures under different environmental management scenarios are considered. Chapter 5 contains management strategies and recommends actions to implement them. In Chapter 6, subwatershed regeneration plans are presented, as are recommendations for implementation relating to stewardship and outreach education, operations and maintenance, and monitoring. Concept site plans are presented in Chapter 7, illustration application of the watershed strategies at a local scale. The final conclusions of this plan outline the overall direction that watershed partners should pursue over the coming decade. The appendices include a list of reference materials, a glossary of terms, a list of regeneration sites of interest, and a summary of the recommendations.

Figure 2: Watershed Planning Process



2.0 Guiding Framework

To help meet our vision for the Don, a set of three guiding principles and 26 objectives were developed. This guiding framework builds on the principles and steps presented in *Forty Steps to a New Don* (MTRCA, 1994), which were updated for this plan to reflect new information and issues, and current approaches to management strategies.

2.1 Vision

The quality of life on Earth is being determined in the rapidly expanding city regions. We envision the future Don as a revitalized urban river, flowing with life-sustaining water through regenerated natural habitats and sustainable human communities, from its headwater tributaries to the mouth of the Don River and into the receiving waters of Lake Ontario. We envision the watershed as an integral contributor to The Living City, where human settlement can flourish forever as part of nature's beauty and diversity.

2.2 Principles

We must take advantage of all opportunities to protect, regenerate and enhance the Don, from the valleys to the tablelands, and from the natural areas to the urban communities. The following regeneration principles, based on those laid out in *Forty Steps to a New Don*, should serve to guide future regeneration of the Don River watershed.

Principle #1: Protect and sustain what is healthy

- ❒ Protect the natural sources of the Don River: its headwaters, groundwaters, creeks and tributaries.
- ❒ Protect the natural linkages that still exist in the Don, its diverse habitats, and the wild life in them.

Principle #2: Regenerate what is degraded

- ❒ Restore the river and its tributaries through actions that re-establish or mimic the natural patterns of the watercourse.
- ❒ Restore clean, life-sustaining water to the river and its tributaries.
- ❒ Nurture degraded habitats backs to health, and reconnect them to each other and to nearby human communities.
- ❒ Restore important reminders of the Don's historical past and encourage activities that reflect our cultural diversity.
- ❒ Require all projects to improve the health of the natural system.

Principle #3: Take responsibility for the Don

- ❒ Be a steward and contribute to a healthy, sustainable natural environment in all daily activities.
- ❒ Help neighbours, governments, and businesses work together to regenerate the Don.
- ❒ Visit the Don and share our enjoyment with others.

Charles Sauriol Reserve in Toronto
(Photography: John Wilson)

2.3 Objectives

The objectives of this plan are grouped under four headings: Caring for Water, Caring for Nature, Caring for Community, and Getting it Done. Associated with the objectives for water, nature and community are indicators and targets for watershed conditions (see Chapter 3).

Caring for Water

1. Protect and restore the quantity and quality of groundwater.
2. Protect and restore the natural variability of annual and seasonal stream flow.
3. Maintain and restore natural levels of baseflow.
4. Eliminate or minimize risks to human life and property due to flooding.
5. Manage stormwater to protect people and health of streams and rivers.
6. Protect and restore surface water quality with respect to toxic contaminants and other pollutants, such as sediment, nutrients, bacteria and road salt.
7. Protect and regenerate the natural form and function of the Don's valley and stream corridors.

Caring for Nature

8. Reduce air pollution to levels that protect human health and natural ecosystems, and do not exacerbate global climate change.
9. Protect, regenerate and enhance the health and diversity of native aquatic habitats, communities and species.
10. Protect and expand the Terrestrial Natural Heritage System and improve connectivity among the watershed's forests, meadows, and wetlands.
11. Regenerate the health of natural areas, and the whole urban landscape, to improve their quality, biodiversity, and ecological function.
12. Manage the impact of human activities and neighbouring land uses in the watershed.

Caring for Community

13. Improve sustainability in urban form at community and building site scales.
14. Practice sustainable resource use by individuals, households, businesses, institutions and governments.
15. Connect people and places in the Don River watershed.
16. Protect and regenerate natural areas and greenspaces for nature-based experiences.
17. Celebrate the natural and cultural heritage of the Don River watershed.
18. Identify, document, protect and celebrate the cultural and heritage resources of the watershed.

Getting it Done

19. Use the Subwatershed Regeneration Plans to integrate and coordinate local regeneration efforts.
20. Encourage grassroots regeneration groups throughout the watershed.
21. Encourage staff at agencies and municipalities to take responsibility for the Don.
22. Fund the Don's regeneration through existing and new sources.
23. Research the effectiveness of different technologies and approaches for regenerating urban watersheds.
24. Undertake demonstration projects throughout the watershed.
25. Make changes in our personal lifestyles and government actions that will help protect and regenerate the Don and the larger ecosystems of which it is a part.
26. Use education, awareness, stewardship and social marketing tools to accelerate regeneration of the Don.

3.0 Current Conditions

This chapter presents an overview of current conditions in the Don River watershed. The descriptions of current conditions, relationships and issues is based primarily on environmental monitoring data collected since the last watershed strategy, *Forty Steps to a New Don* (MTRCA, 1994), was published in 1994. Each section presents a synopsis of our current understanding of the key indicators of watershed health and includes a report card describing the progress made in achieving the targets set for each of these indicators to date. More detail is provided in a series of technical reports on the state of the Don River watershed (TRCA, 2009a-k).

3.1 Watershed Report Card

Whether one employs A-B-C letter grades, percentages, or even a simple 'thumbs up' or 'down', grading can be a difficult exercise. A long daily walk along the banks of the Don, in both rain and sun, will likely tell you much about stream flow and erosion patterns. And a summer spent fishing the pools and tributaries, trading stories with fellow anglers, will provide insight into aquatic population dynamics.

But few if any of us have the necessary time, background or expertise to personally investigate all the physical, biological and cultural dimensions of the Don and form some sort of integrated conclusion about the state of the watershed. This report card provides a summary – in a familiar and user-friendly format – of where we stand today and, by implication, what still needs to be done.

Our report card presents the grades or ratings that have been assigned to a series of key environmental indicators – stream flow, pollutant levels, natural cover, and so on. An indicator is simply a measurable device that tells us something about the physical, biological, or cultural condition of the watershed. Just as blood pressure is one indicator of human health and gross domestic product is a measure of economic health, there are a number of commonly accepted indicators of ecosystem health that may be applied to the watershed.

These indicators are covered in greater depth in a series of 11 technical reports on current watershed conditions, prepared in support of the *Don River Watershed Plan*. These reports, summarized in this document, are intended to:

- ❒ Characterize the watershed's physical, aquatic, terrestrial and cultural systems
- ❒ Identify key issues that may be addressed in the plan
- ❒ Evaluate current conditions according to a set of watershed objectives

Highlights

Historically, much of this highly urbanized watershed was developed without benefit of modern stormwater systems that are designed to protect water quality, modulate flow and control erosion. As a result, most environmental indicators in the watershed are accorded only a 'C' or 'D' grade. However, there has been some good news since the release of *Forty Steps* in 1994:

- ❒ There is growing public support for sustainable community practices, including downspout disconnection, alternatives to pesticides, waste reduction and recycling, the maintenance of the urban forest, and energy conservation.
- ❒ There has been no significant increase in stream flow since 1997, even with continued development in the headwaters areas.
- ❒ Despite generally poor ratings for aquatic indicators, a number of in-stream barriers to fish passage have been removed, salmon are accessing the river, and redside dace still live in the headwaters.
- ❒ Although the woodlands of the riparian zone are still threatened by uncontrolled flows and erosion, relatively little natural cover has been lost in the watershed over the last 10 years.
- ❒ While gaps still exist, the trail systems that provide visitors greater access to natural and recreational areas have expanded.

- ❒ Serve as the basis for developing management strategies under the watershed plan
- ❒ Establish a baseline against which future progress at improving watershed health can be measured

For each indicator or set of closely related indicators there are objective statements and one or more quantitative targets that allow us to grade the current condition of, and track any improvement in, the particular indicator.

The grades for watershed health were assigned by TRCA in consultation with the Don Watershed Regeneration Council. They are based on current watershed science and monitoring data, and informed by anecdotal knowledge where appropriate.

Assigning Grades

In evaluating current conditions in the Don River watershed, a rating system was adopted based on standard letter grades. Each of these categories corresponds with "poor", "fair", "good" and "excellent" levels of condition as shown in the table below. Where the measures and targets were quantitative and data permitted, ratings were assigned, in part, to reflect the percent satisfaction of the target. Comparisons to conditions in other watersheds under TRCA jurisdiction were made and informed evaluations where data were available, to reflect relative conditions. Where measures and targets were qualitative, or data were lacking, evaluations were based on professional judgment. Refer to the technical background reports on current conditions for a detailed explanation of each rating (TRCA, 2009a-k).

Grade	Rank	Percent of Target Achieved
A	Excellent	Better than 80%
B	Good	Between 70 and 79%
C	Fair	Between 60 and 69%
D	Poor	Between 50 and 59%
F	Fail	Below 50% (to indicate extremely poor health)
TBD	To be determined	Further study required; baseline data not available

The Don has been subjected to more than two hundred years of settlement and degradation. The targets upon which our grades are based are relatively modest, set for a disadvantaged urban river with 'special needs'. Our expectations, especially in the short-term, are conservative relative to many of those that may be set for rivers and streams in a rural or natural environment.

Nevertheless, we believe that these targets are tough but achievable. Although the rehabilitation of the Don is undoubtedly a long-term project that will require much time and effort, we do expect to see significantly better grades in the future. To that end, some ambitious works are planned in the near and medium-term in the watershed, notably remediation of combined sewer overflows, improved stormwater controls, and revitalization of the mouth of the Don.

After 15 years of study and hard work on watershed protection and regeneration projects, it is an appropriate moment to gauge the success of these efforts against the generally accepted benchmarks of a healthy ecosystem. There is still more to be learned about the dynamics of a living river and its interaction with the communities through which it flows. However, we hope through our Report Card to summarize the conclusions of lengthy technical reports, to indicate trends and evolving issues, and to stimulate discussion on the most appropriate options for further work.

3.2 Watershed Perspective

A watershed is a complex system whose health depends on the proper functioning of all its parts (Figure 3). Climate and geology are its foundations, regulating the amount and distribution of both surface water and groundwater and the types of vegetation in the watershed. The amount of water and the rate at which it flows through the watershed affect

the shape and size of creek and river channels and their associated floodplains. Different communities of plants and animals live where there are suitable aquatic and terrestrial habitats. While people depend on the resources of the watershed, their activities result in changes to all aspects of the system.

Through the process of agricultural settlement and urbanization, natural habitats have been greatly reduced and fragmented, hydrological patterns have been changed, water quality has become degraded, and many species of plants and animals have disappeared from the watershed, replaced by others that are more tolerant of disturbed and highly urbanized areas.

For the past 200 years, the Don River and its tributaries have slowly changed from a series of relatively healthy watercourses running through and serving a patchwork of agricultural and natural lands, interspersed with rural communities, into an almost completely urbanized river.

For several millennia after the last ice age, vast tracts of forest, interspersed with wetlands and meadows, dominated the Don River watershed. First Nations people used the rich resources of the area, but major conversions of land did not begin until the arrival of European settlers in the late 18th century. They altered the original landscapes, clear-cutting forests for timber and farms, draining wetlands, installing dams for power and building settlements.

Urbanization of the largely agricultural landscape progressed from south to north. It began on the banks of the lower Don in the mid-1800s, continued with the growth of the suburbs in the middle reaches between the 1940s and 1960s, and finally the urbanization of the upper watershed over the last forty years. The most recent wave of greenfield development is drawing to a close as the remaining rural lands unprotected by provincial legislation are being developed.

The evolution of development planning and water management over the course of the urbanization of the Don has had a profound impact on condi-

Regional Watershed Monitoring Program

The Regional Watershed Monitoring Program (RWMP), led by TRCA in partnership with its member municipalities and other monitoring groups, provided a substantial information base for this watershed plan. The RWMP focuses on long-term monitoring of aquatic and terrestrial ecosystems at the subwatershed and watershed scale and across the region as a whole. The RWMP monitors a variety of components including: aquatic habitat and fish communities; terrestrial habitats, communities and species; surface water quality and quantity; fluvial geomorphology; groundwater quality and quantity; and West Nile virus mosquito vector monitoring. The data collected are shared with partner municipalities and other agencies, and are used for planning, implementation and reporting activities.

Indicators

We have analyzed 27 indicators, grouped into nine categories:

Geology & Groundwater:
- ❒ Groundwater levels
- ❒ Groundwater recharge
- ❒ Groundwater chemistry & bacteria

Surface Water Quantity:
- ❒ Stream flow
- ❒ Flooding
- ❒ Stormwater management
- ❒ Channel morphology

Surface Water Quality:
- ❒ Conventional pollutants
- ❒ Heavy metals & organic contaminants
- ❒ Bacteria

Air Quality & Climate Change:
- ❒ Air chemistry
- ❒ Smog

Aquatic Natural Heritage:
- ❒ Benthic invertebrates
- ❒ Fish communities
- ❒ Invasive species
- ❒ Aquatic habitat

Terrestrial Natural Heritage:
- ❒ Quality of natural habitat
- ❒ Quantity of natural habitat
- ❒ Biological diversity

Cultural Heritage:
- ❒ Cultural heritage resources

Nature-Based Experiences:
- ❒ Access to greenspace
- ❒ Provision of formal trails

Land & Resource Use:
- ❒ Transportation
- ❒ Green buildings
- ❒ Water demand
- ❒ Solid waste diversion
- ❒ Energy sources & demand

tions in the watershed. Early development lacked modern stormwater controls, sanitary and storm sewers were combined, and many streams and tributaries were buried and piped, as is evident in the lower Don. In contrast, areas developed after about 1980 have benefited from stormwater management. While this initially focused on the quantity of flows, water quality considerations gained prominence in the early 1990s, and today issues relating to stream morphology and the protection of groundwater resources, and fish and terrestrial habitat are addressed. As a result, more recently developed (and redeveloped) communities in the Don have had fewer hydrologic impacts. Current development planning also allows for natural features protection and habitat and natural corridor restoration. As a result, more small streams and natural cover has been retained in the urbanized northern portion of the watershed than was the case with early development in the south.

Figure 3: Watershed Connections

Key Issues for Geology and Groundwater Resources

- The expansion of 'hard' or impermeable surfaces, including pavement and rooftops, in the Oak Ridges Moraine and south of the Lake Iroquois shoreline is decreasing groundwater recharge rates.
- Threats to groundwater quality include contamination from road salting practices and leachate from closed and abandoned landfill sites.
- There is a need to maintain groundwater recharge to support baseflows in the streams and rivers of the watershed.
- The lack of groundwater data, including water quality information, underscores the need for additional monitoring wells.

3.3 Geology and Groundwater Resources

The Don River watershed covers approximately 36,000 hectares including portions of the City of Toronto and the City of Vaughan, Town of Markham, and Town of Richmond Hill in the Regional Municipality of York. The watershed drains southward from the heights along the Oak Ridges Moraine (ORM) in the north (some 315 metres above sea level) towards Lake Ontario in the south.

The watershed is comprised of four main physiographic regions (Figure 4):

- The ORM, and associated hummocky terrain, which occurs along the northern boundary of the watershed and consists largely of sand and gravel.
- The South Slope area occurring to the south of the ORM and largely consisting of till deposits at the surface.
- The Peel Plain with its veneer of fine-textured lake (lacustrine) deposits.
- The sand, silt and clay deposits of glacial Lake Iroquois occurring immediately north of Lake Ontario.

Geology

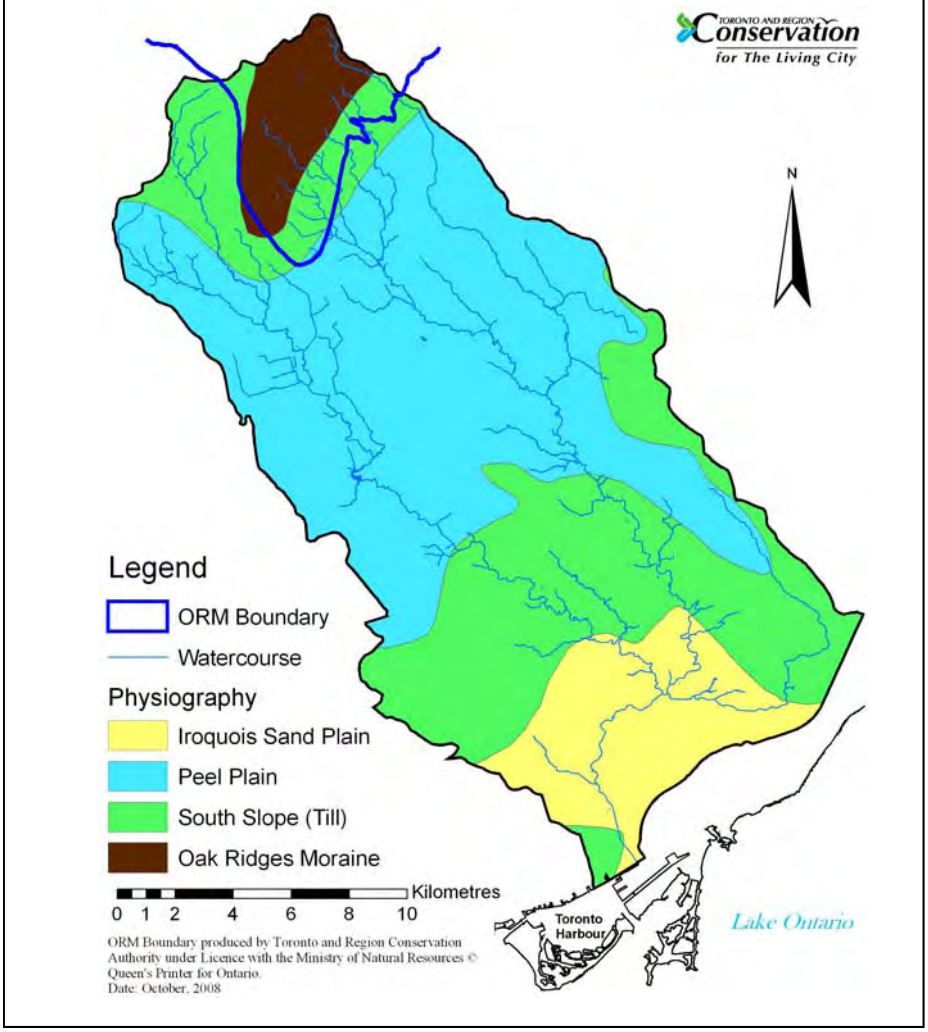
Geology, landform, and soils significantly influence the processes responsible for water movement through the water cycle. The shape of the land, determined by geology and weather, greatly influences vegetation and drainage patterns. Soil types and structures are also dependent, in part, on the underlying geologic formations. For example, fine grained soils, such as silt and clay may reduce infiltration and have higher surface run-off than sandy soils. Soil texture, structure, moisture holding capacity and local topography are also important factors determining the susceptibility of land to erosion.

Facts & Figures

- Three main water-bearing aquifers exist within the watershed: the Oak Ridges Moraine (ORM) Aquifer Complex, the Thorncliffe Aquifer, and the Scarborough Aquifer.
- Depending on the surface conditions, vegetation, soil and geology of a site, groundwater recharge rates can range from about 25 to slightly more than 420 mm/year, with an average value of 123 mm/year.
- The highest recharge rates are found among the hummocks and exposed sand deposits of the ORM in the northeast corner of the watershed.
- Estimates of groundwater discharge for the watershed range from 158 to 174 mm/year (equivalent to a flow rate of between 1.81 and 1.98 cubic metres per second).
- There are few remaining rural wells and no active municipal wells in the watershed.
- The Oak Ridges Moraine is an environmentally sensitive, geological landform. The ORM consists of a ridge of sandy hills that form the headwaters of the Don watershed.

In most of the Don River watershed, the bedrock consists of shale of the Upper Ordovician Georgian Bay Formation. Extensive erosion of this bedrock surface took place over the span of millions of years, resulting in formation of a deep bedrock valley system extending from Georgian Bay to Lake Ontario.

Figure 4: Physiographic Regions



Successive layers of sedimentary materials were deposited over the bedrock over the past 80,000 years, influencing physiography, soil and the movement of water through the subsurface. The sand and gravels that compose the ORM were deposited approximately 12,000 years ago at the meeting place of two glacial lobes. The moraine extends south into the Don River watershed in a formation known as the Maple Spur, mostly in the Upper East Don River subwatershed. The South Slope, covering the mid-to-lower portion of the watershed, is composed primarily of till deposited by glacial ice and is a mixture of materials ranging in size from clay particles to boulders. Former glacial lakes resulted in deposits of silt and clay such as those found in the Peel Plain, laying over the South Slope in the mid-region of the watershed, that retain water and may create suitable conditions for wetlands (most of which have been drained). The more permeable sediments of the Iroquois Plain, in the lower reaches of the watershed, allow for more groundwater recharge.

The sediments range from 2 to 270 metres thick and are stratified, representing at least eight major deposit formations. The overburden is thickest on the ORM and in areas where the bedrock is deep. Many of the sediment layers are fragmented, discontinuous or channelized. Some of these deposits act as groundwater-bearing aquifers, while others act as aquitards, preventing or minimizing the flow of groundwater between layers.

Groundwater

Groundwater is vital to the healthy functioning of a watershed because it provides a constant source of clean, cold water to lakes and streams, and sustains some wetlands. While groundwater is an important source of rural domestic and municipal water supply to the east, west and north of the watershed, groundwater is now primarily used for industrial uses and golf course irrigation in the Don. There are few remaining rural residents on wells in the Don and there are no active municipal wells in the watershed.

The challenges facing groundwater management revolve around the maintenance or enhancement of groundwater recharge rates, as well as the maintenance of groundwater levels, the minimization of groundwater takings (where practical), and the safeguarding and improvement of groundwater quality.

On average, the Don watershed receives 821 mm of precipitation per year. A preliminary water budget (Figure 5) suggests that surface runoff accounts for about 40% of precipitation, while 15% infiltrates to groundwater, and 45% is evapotranspired. Appropriate management of the water balance is important to sustain biological systems, ensure safe flow regimes and protect water supplies. Critical concerns are the impacts on recharge, groundwater levels and runoff that result from the urban development in the headwaters, water withdrawals and climate change. Redevelopment in already urbanized areas offers opportunities to restore a more natural water balance on a site-by-site basis.

Report Card, Groundwater

The management objective related to groundwater resources is:

- ❒ Protect and restore the quantity and quality of groundwater.

Indicators	Targets	Grade
Groundwater levels	❒ No drop in the water levels of monitoring wells	C
Groundwater recharge	❒ Maintain or enhance the average annual groundwater recharge rates	C
Groundwater chemistry and bacteria	❒ Concentrations of bacteria, metals, conventional & organic contaminants in monitoring wells to meet the more stringent of either the MOE Ontario Drinking Water Standards or the Ontario Provincial Water Quality Objectives	B/ TBD[1]

1. Data from the single monitoring well indicate a B grade, but additional wells are needed to assess groundwater conditions in all aquifers.

There are three major aquifer systems in the Don River watershed: the Oak Ridges, Thorncliffe, and Scarborough aquifer complexes or formations (the arrows in Figure 6 indicate where aquifers intersect with the surface and groundwater is discharged). Groundwater generally flows in a southeastwardly direction to discharge into Lake Ontario, but local groundwater flow may be deflected near streams and valleys. Groundwater modelling shows flow from the East Humber River subwatershed area into the northern portions of the Upper West Don River, Upper East Don River and German Mills Creek subwatersheds.

Groundwater Recharge

Recharge or infiltration to the groundwater system occurs through the migration of precipitation through the surface soils. The amount of recharge at a specific site depends on the amount of precipitation that evaporates back into the atmosphere, the amount of water that transpires from the vegetation to the air, site topography, the type of vegetation cover and the surface soil type.

Surface geology also influences recharge rates: areas of hummocky topography exhibit higher recharge rates since water run-off collects in depressions where it can then infiltrate through the soils. A reduction in recharge rates typically occurs in urban settings because water runs off paved driveways and parking lots, roads and impermeable rooftop surfaces into stormsewers, unless mitigated.

Within the watershed, recharge ranges from as low as 25 millimetres per year to slightly in excess of 420 mm/year. The net infiltration rate averages out at 123 mm/year (or 1.41 cubic metres per second).

Groundwater recharge is highest on the ORM due to permeable sediment deposits and the existence of some remaining open, undeveloped land (Figure 7). Recharge is lower on the south flank of the ORM and in the southern portion of the watershed where deposits tend towards silt, clay, and till (with low infiltration rates), and urbanization is widespread which creates large areas of impervious cover. Maintenance of recharge on the ORM is important for protecting stream baseflows and aquatic habitat.

Groundwater Discharge

As part of the water cycle, groundwater is a major contributor to flow in many streams and rivers and strongly influences river and wetland habitats for plants and animals. Groundwater enters the ground in recharge areas and leaves the ground at discharge points. Discharge is continuous as long as sufficient water is available above the discharge point. The most visible evidence of groundwater discharge occurs as seepage or springs along watercourse banks and is also noted within stream beds as upwellings and boiling creek bed sediments.

A recent water budget evaluation provides an estimate of groundwater discharge to streams of 1.69 m^3/s (148 mm/yr). Groundwater discharge primarily occurs along the south slope of the ORM where the ORM aquifer complex intersects the surface. This aquifer is a source of many headwaters streams, as shown in the cross sectional profile of the West Don River (Figure 6). Groundwater discharge accounts for about 49% of total stream flow. Discharge is a chief contributor of baseflow to the ORM subwatersheds, particularly the Upper East Don River subwatershed where it contributes about 65% of total baseflow. In fact, tributaries may be dry during the late summer in the headwaters areas north of the South Slope (north of the toe of the ORM).

A second major groundwater discharge zone may occur in the lower portion of the watershed along and south of the glacial Lake Iroquois shoreline, where the Thorncliffe and Scarborough aquifer complexes discharge as springs or upwelling areas of rivers (e.g., below Eglinton Avenue in the West Don River). The groundwater system in the upper portion of the watershed may be strongly influenced by groundwater pumping at the closed Keele Valley Landfill. Pumping prevents off-site migration of leachate.

Groundwater Quality

Lack of systematic groundwater monitoring across the watershed makes assessment of groundwater quality problems difficult. For instance, the potential impacts of rising chloride levels in surface waters and leachate from abandoned landfills on groundwater quality are unknown. Areas of higher aquifer vulnerability occur where sediments are more permeable, along the ORM and, to a lesser extent, south of the Lake Iroquois shoreline, and in the south central portion of the watershed stretching from the West Don River to

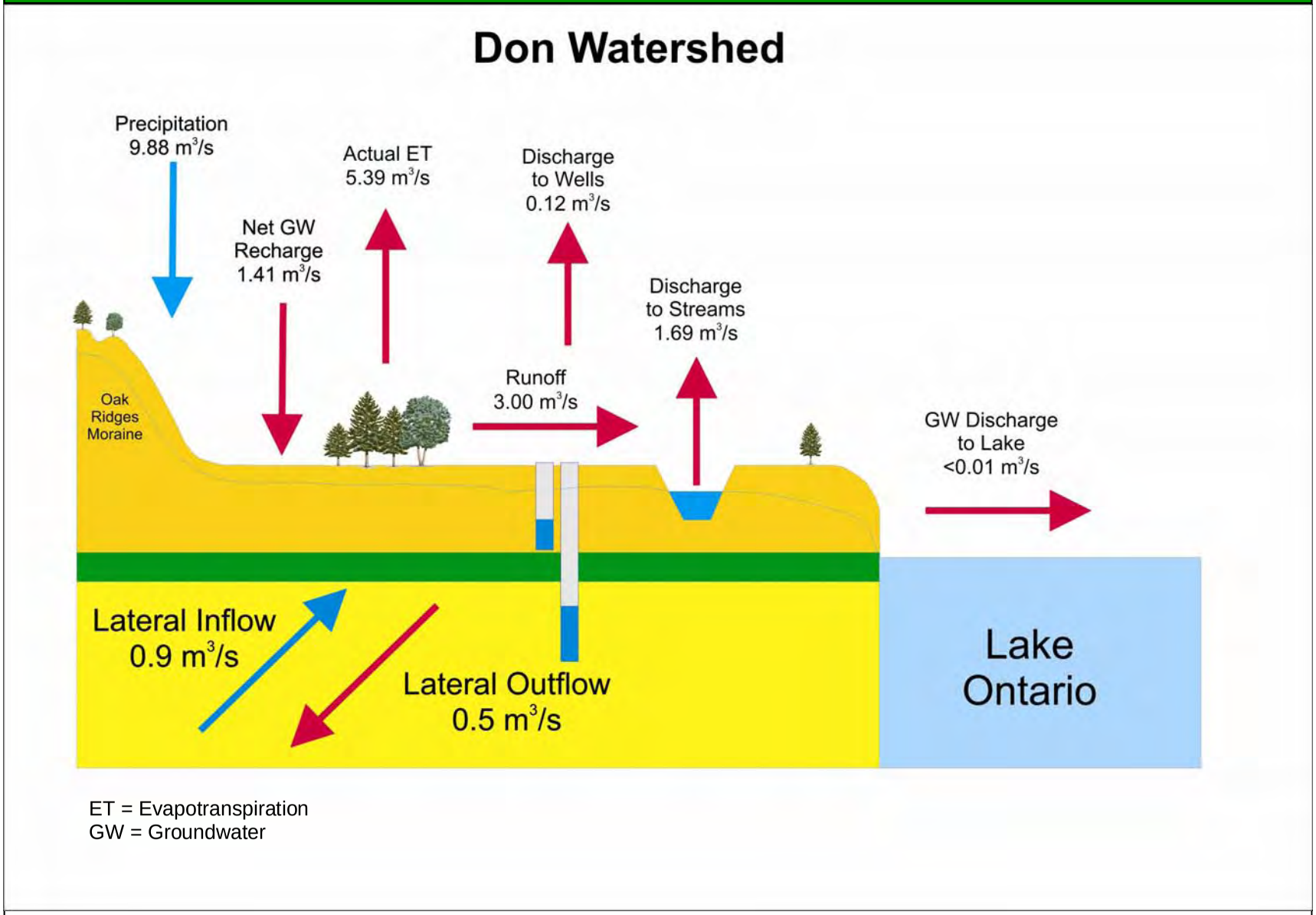
% Impervious Cover by Subwatershed (2002)[1, 2]

Upper West Don River	35 %
Upper East Don River[3]	19 %
German Mills Creek	39 %
Lower West Don River	36 %
Lower East Don River	31 %
Taylor/Massey Creek	43 %
Lower Don River	35 %

1. Impervious cover estimates for the lower subwatersheds include all up-stream areas.
2. For impervious cover calculations as per the Oak Ridges Moraine Conservation Plan, see TRCA, 2007a.
3. Based on approved development as of 2005, impervious cover in the Upper East Don River subwatershed is expected to rise to 25 %.

Maple Valley on the Oak Ridges Moraine

Figure 5: Watershed Water Budget (2002 Conditions)



A water budget for a given area consists of the water inputs, outputs and changes in storage. The inputs include precipitation, groundwater or surface water inflows, and anthropogenic inputs, such as waste effluent. The inputs must equal outputs, which are evapotranspiration, water supply removals or extractions, surface or groundwater outflows, as well as any changes in storage within the area of interest.

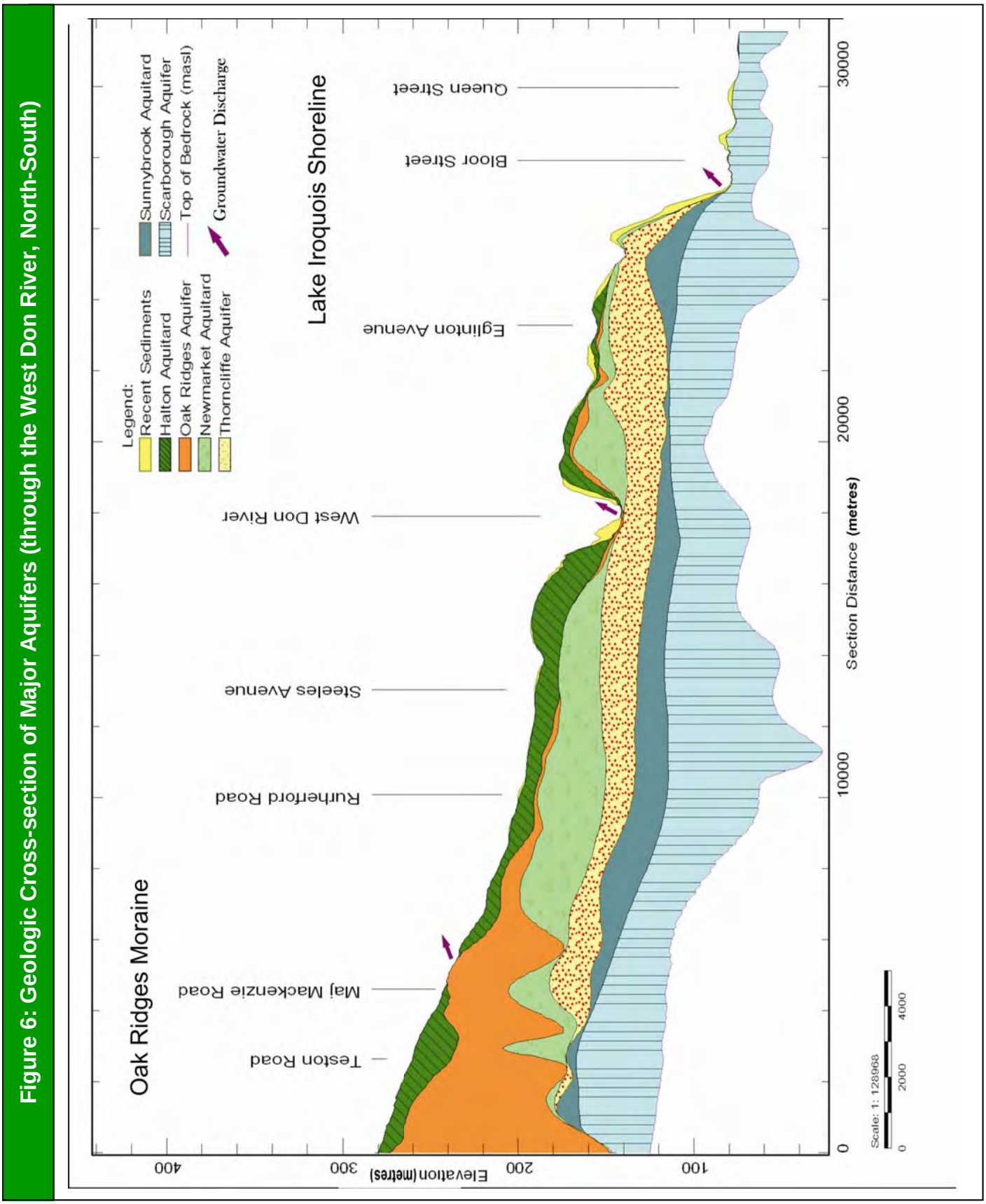
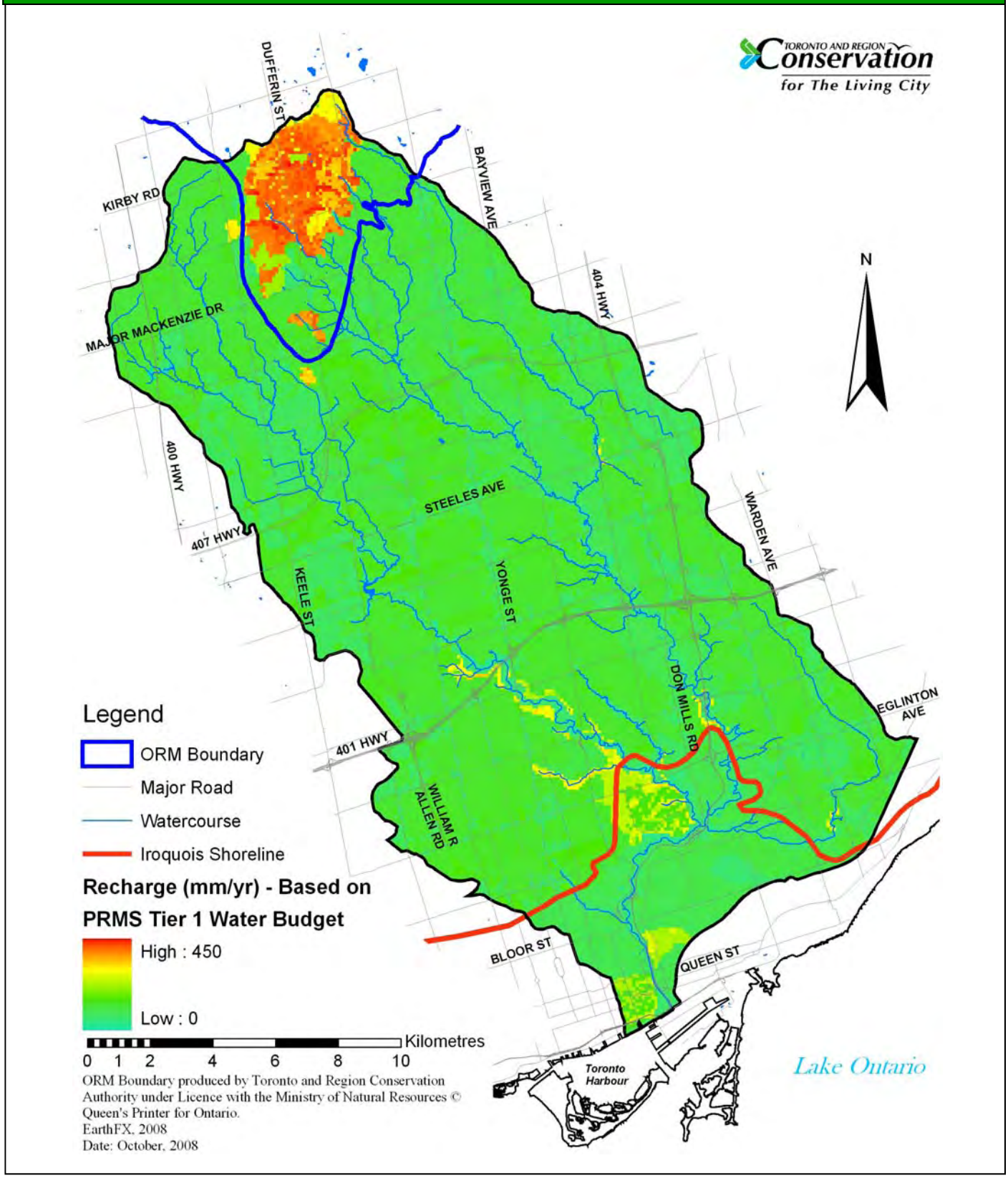


Figure 6: Geologic Cross-section of Major Aquifers (through the West Don River, North-South)

Figure 7: Groundwater Recharge



the East Don River. Groundwater quality conditions are being assessed further as part of TRCA's Source Water Protection program.

The chemical groundwater quality from a sample obtained from the Scarborough Aquifer met the pertinent Ontario Drinking Water Standards except for elevated iron, manganese, total phosphorus and hardness. The elevated iron (2 to 3.05 mg/l), manganese (0.056 to 0.097 mg/l) and hardness (275 to 292 mg/l) concentrations are natural and expected for groundwater in deep overburden glacial aquifer systems. The elevated total phosphorus (0.19 to 0.22 mg/l) concentration may be a result of anthropogenic (human-induced) activities within the watershed up-gradient of the monitoring well.

While there is at least some water quality data available for the deep groundwater within the Scarborough Aquifer, there is a lack of analytical information about the water quality in the two significant overlying aquifers: the Thorncliffe and the ORM Aquifers.

Key Issues for Surface Water Quantity

- Effective stormwater control has not been implemented in 80% of the urbanized area, leading to uncontrolled surface water flows, erosion, and flooding.
- The local impacts of global warming are expected to both reduce baseflows and increase the frequency and severity of storm-related problems, including erosion and flooding.
- Ongoing political, social and financial support is needed for the implementation of stormwater control retrofits, the regeneration of the Don Mouth, and flood control efforts.
- Many stormwater management facilities are in need of maintenance to ensure their designed level of performance.
- There are flood-vulnerable homes, buildings and roads throughout the watershed, notably in the Yonge and Elgin Mills area, Taylor/Massey Creek, Hogg's Hollow and at the Don Mouth.
- Basement flooding in a number of areas can be linked to overloaded storm and/or sanitary sewer systems, overloaded surface drainage systems, low lying areas, and reversed slope driveways.
- Unnaturally high rates of erosion and lack of channel stability are putting infrastructure and private property at risk of exposure, damage or failure.

3.4 Surface Water Quantity

An ecosystem-based management strategy must address all aspects of the surface flow regime, as well as the interconnections among the components of the hydrologic cycle.

The flow regime can generally be subdivided into "high flow" and "baseflow" periods. When rain falls or snow melts, additional water enters the watercourse resulting in higher, stronger and faster flow rates. These high flow conditions can result in erosion, poor water quality and flooding.

The baseflow that sustains the rivers and streams of the watershed between precipitation or snow melt events is supplied, primarily, by groundwater sources as well as the discharge from the few remaining wetlands. It is important to maintain appropriate baseflow levels to sustain ecosystem functioning and satisfy the needs of water users.

The ultimate goal of a flow management strategy is to balance out the highs and lows, restoring the natural storage capacity, slowing rapid runoff into watercourses, and moderating the "flashy" high flow rates that lead to flooding and other problems. Adoption of a water balance approach — maintaining

Facts & Figures

- Stormwater control is lacking in about 80% of the urbanized area.
- Baseflow from groundwater sources accounts for about half of total flow, while runoff and stormwater discharges contribute the rest.
- Approximately 3.2 million cubic meters of water are extracted from surface and groundwater sources each year in the Don watershed.
- The area covered by roads, parking lots, roofs and other 'impervious surfaces' ranges from about 19% in the Upper East Don River subwatershed to 43% in Taylor/Massey Creek subwatershed.
- About 26% of the watershed, largely south of Eglinton Avenue, is serviced by combined sanitary and stormwater sewers.
- There are four main trunk sewers and 33 combined sewer overflow (CSO) outfalls in the Toronto portion of the watershed, where untreated discharges can flow into the Lower Don River and Taylor/Massey Creek.
- The treated discharge from the North Toronto Wastewater Treatment Plant, which is located in the Lower Don, accounts for approximately 11% of the total annual flow of the Don River.

or restoring a more natural, predevelopment water budget —is key to improving the flow regime.

Maintaining Baseflows

The Don River has two principal tributaries. The East Don and West Don rivers have their headwaters on the Oak Ridges Moraine (ORM) and South Slope and join together on the Iroquois Sand Plain south of Eglinton Avenue. German Mills Creek flows into the East Don River just south of Steeles. Taylor/Massey Creek joins with the East Don River just north of the confluence with the West Don River. The Lower Don flows south to the outlet of the Keating Channel where it empties into Toronto Harbour and Lake Ontario.

Prior to settlement, the watershed was served by a network of branching tributaries and wetlands. However, the cutting of forests and the filling of wetlands in favour of farmland altered the watercourse network and the associated flow regime. Riparian vegetation along the banks of the rivers and streams was systematically removed, a number of watercourses were channelized or buried, and pavement and other impervious surfaces spread across the watershed.

The amount of impervious or hard cover ranges from a high of 43% in the Taylor/Massey Creek subwatershed to 19% in the Upper East Don River subwatershed (as of 2002). However, the Upper East Don is urbanizing rapidly and, unless mitigating steps are taken, impervious cover is expected to rise to around 25%. High levels of impervious cover can reduce the interception and infiltration of precipitation into groundwater aquifers and generate more surface runoff. This, in turn, results in higher and more frequent flows in rivers and streams, greater rates of erosion, increased direct discharges from storm and combined sewers, and a greater risk of flooding.

The hydrologic impacts of expansion of impervious cover can be mitigated. For example, a Clean Water Collector System was installed in a development in Vaughan, whereby clean stormwater from building roofs is directed to a perforated pipe below ground and allowed to exfiltrate.

Mean total discharge for the Don River is 3.9 cubic metres per second (m^3/s), or approximately 124 million m^3/year, at Todmorden. Analysis shows that mean annual discharge has been increasing on average by 0.44% per year for more than 40 years (1962-2005). However, it is encouraging that recent data (1997-2008) shows no significant increase in total discharge despite ongoing development in the watershed.

Baseflow accounts for about 49% of the total flow. This means runoff — including discharges from storm sewers, combined sewers and the wastewater treatment plant in the valley — predominates total flow in the watershed. In contrast, baseflow accounts for 72% of total flow in the main branch of the Humber River north of Palgrave. Maintenance of groundwater recharge rates in the Don is important for protecting baseflows, particularly for small or ephemeral streams.

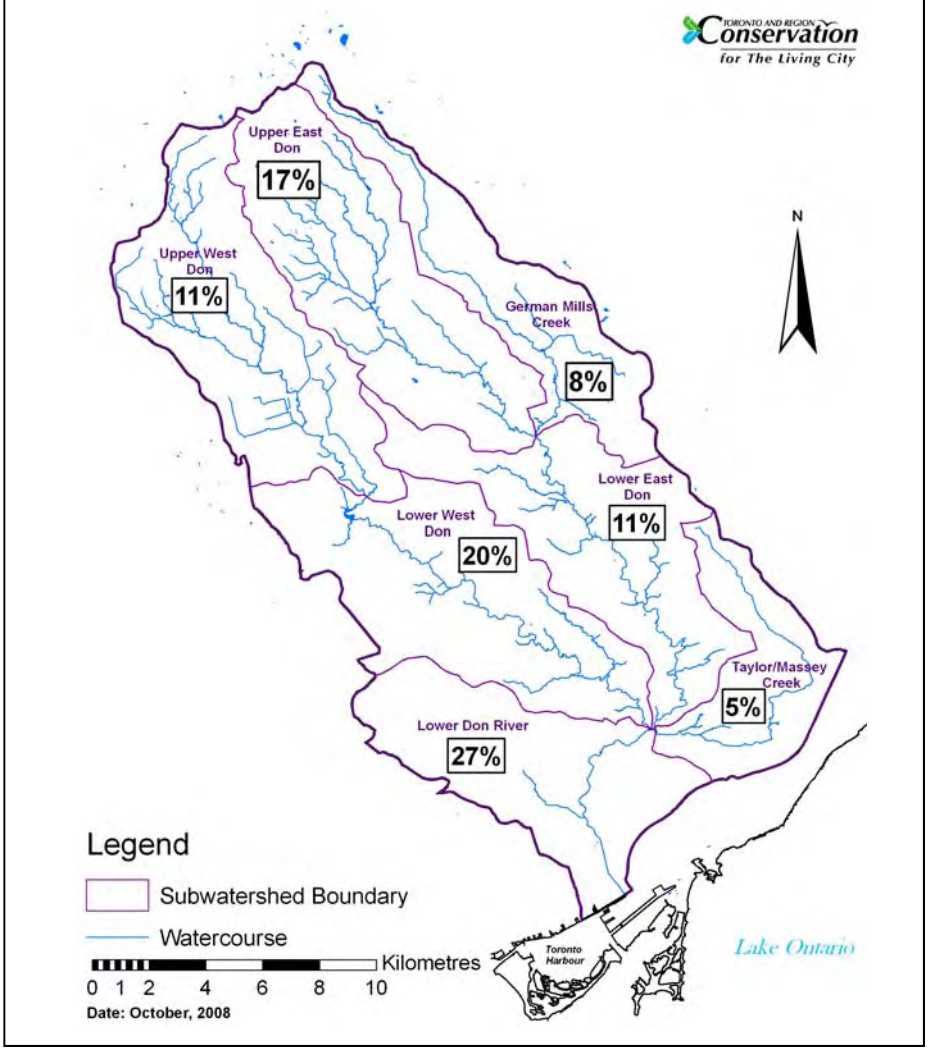
Climate Change

Global climate change could exert extremely disruptive changes in the hydrologic cycle and the ecosystems of the Don watershed. With higher temperatures, we could expect increased evapotranspiration rates, resulting in decreased recharge rates for groundwater aquifers and lower baseflow in rivers and stream. At the same time, we can also anticipate an increase in the frequency of more violent weather events, accompanied by severe erosion and flooding throughout vulnerable areas. In preparing for the local impacts of climate change, we must take a precautionary approach and choose management options that will be both flexible and adaptive.

Rupert's Pond, a retrofitted stormwater management pond in Vaughan

Based on overall baseflow contributions, the Don appears to be a 'bottom-heavy' system (Figure 8). The subwatersheds north of Steeles Avenue appear to contribute less than the southern subwatersheds. According to data collected in 2006, the total contribution calculated from the upper three subwatersheds was 37%, while the remaining 63% was contributed from the four lower subwatersheds. However, stormwater outfalls and wastewater treatment plant discharges influence the lower watershed's baseflow.

Figure 8: Subwatershed Contributions to Baseflow (2006)



Stormwater outfalls in the lower subwatersheds of the Don River complicate the measurement and understanding of baseflow. For example, the Lower West Don River subwatershed was found to be contributing 20% of the Don's total baseflow, a much higher percentage than would be expected under natural conditions, given the subwatershed's location on the Peel Plain and South Slope. Some of the measured baseflow volume may, in fact, result from summer lawn watering and groundwater seepage into sewer pipes through cracks and joints. As a result, groundwater may discharge to local surface water systems in an area where it might naturally remain below the surface. Treated discharge from the North Toronto Wastewater Treatment Plant contributes a portion of baseflow to the Lower Don River.

Managing Stormwater

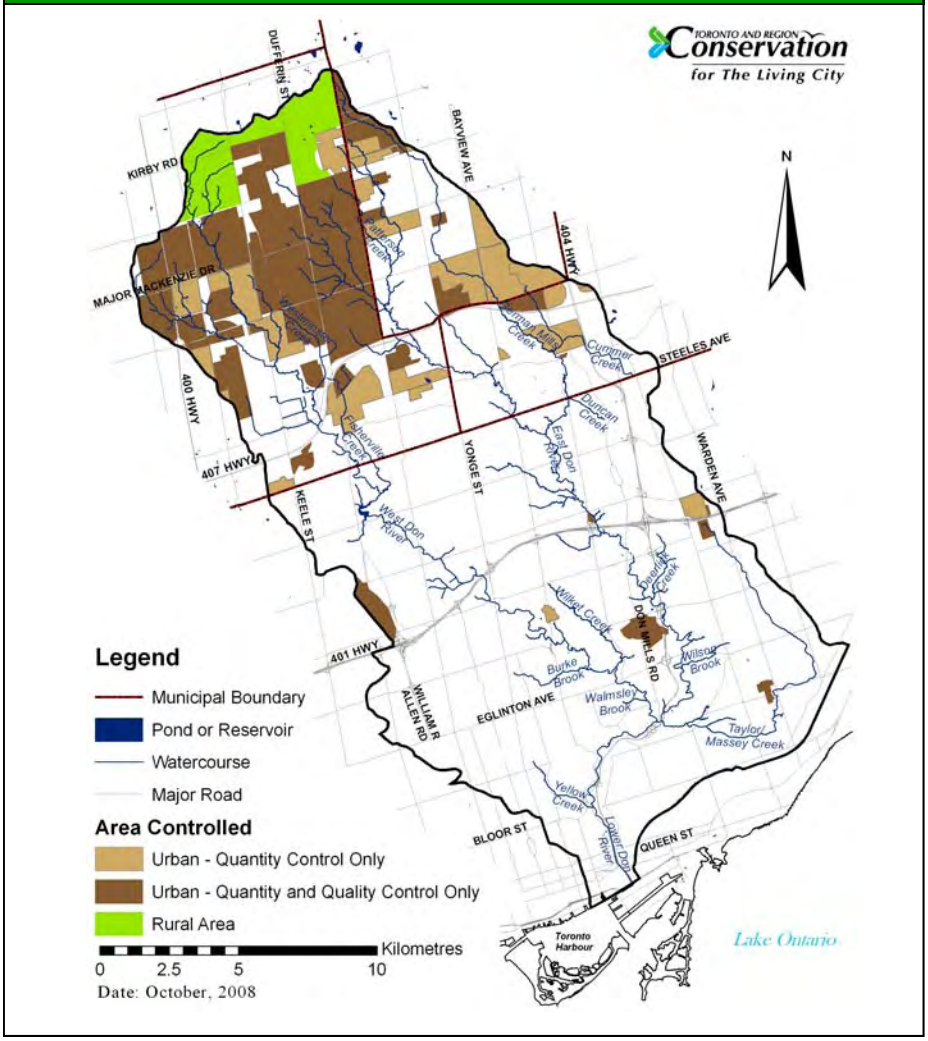
Inadequate stormwater control has led to flooding, erosion, poor water quality, and impacts on valley vegetation. Stormwater management policies were introduced in the 1980s to mitigate the impacts of increased runoff on peak flow rates. Since then, stormwater management policies have evolved to address erosion control, water quality and most recently groundwater concerns. In response to these policies approximately 140 stormwater management ponds have been constructed or proposed in the Don River watershed, as well as numerous other stormwater management facilities such as oil and grit separators, swales, and infiltration facilities. These facilities mitigate the impacts of urban runoff.

The level of stormwater control in place is largely a function of when an area was developed and reflects the management approaches that were in vogue at that date (Figure 9). About 80% of the urbanized area of the watershed, mostly south of Highway 7, has no stormwater control in place. About 7% of the urbanized area has dry ponds or other

stormwater controls for water quantity, and 13% has stormwater control for water quantity and quality. These are located largely in the newer developments in Vaughan, Richmond Hill, and Markham, which have been subject to more stringent stormwater management requirements.

Since the release of the *Forty Steps* watershed strategy in 1994, a number of areas have been retrofitted with improved stormwater controls, including Harding Park, Terraview-Willowfield Park, and Leitchcroft Pond. The municipalities in York Region have undertaken studies to identify opportunities to retrofit existing end-of-pipe facilities, while the City of Toronto's *Wet Weather Flow Management Master Plan* (WWFMMP) (Marshall Macklin Monaghan, 2003) identified opportunities for end-of-pipe, conveyance, and lot level improvements in stormwater management (see Chapter 5).

Figure 9: Stormwater Management Controlled Areas



Monitoring of environmental conditions has shown that even modern storm-water ponds are not adequate to completely protect river systems from negative impacts. Stormwater quality ponds may need maintenance, such as sediment removal, after as little as 10 years. As existing ponds and other facilities age, they should be inspected and operations and maintenance programs implemented.

About 26% of the Don River watershed is serviced by combined sanitary and stormwater sewers, largely south of Eglinton Avenue. In this area of the watershed, many of the streams and tributaries have been channelized or piped underground as part of the storm sewer system. Part of one such stream, Mud Creek, was "daylighted" when the historic Don Valley Brick Works was regenerated.

Preventing Flooding

Flooding is an ongoing problem in the watershed. In 1954, Hurricane Hazel resulted in extensive property damage, personal injury and loss of life. Bridges were destroyed; raw sewage was flushed from the treatment plant in the valley; and roads, railway tracks, utilities, stream banks and trees were damaged.

In response, the G. Ross Lord Dam was built on the West Don River, much of the valley lands south of Steeles entered public ownership, and the river and its tributaries were channelized in some areas where communities were built too close to streams and were vulnerable to flooding (e.g., Yonge/York Mills channel in Hogg's Hollow).

The Don River remains a “flashy” watershed. Because it’s so urbanized, the river swells and rises quickly following even a moderate rainfall. For example, precipitation from an intense storm that occurred August 19, 2005, ranged from over 100 mm in the upper reaches of the Don to less than 30 mm near the lake. The peak rainfall occurred at around 3:30 pm and flooding in the Lower Don began less than one and a half hours later.

Updated hydrology modelling shows peak flows near the mouth of the Don have increased since 1992 by approximately three to six percent for the 2 to 100-year storms. An even more significant increase in peak flows was observed in some upper reaches of the watershed. Times to peak range from under one hour on the tributaries of Taylor/Massey Creek, German Mills Creek, and Wilket Creek, to 6-10 hours on the main Don River.

There are flood vulnerable areas located throughout the watershed, including two Special Policy Areas for flooding: Hogg’s Hollow on the West Don River, and the lower reaches of the Lower Don River, which floods on an almost annual basis (Figure 10). The upper portions of the East Don River and German Mills Creek subwatersheds are susceptible to localized thunderstorm flooding.

There are 2,868 known flood vulnerable structures and road areas in the Don watershed under regional flood conditions. A key concern is managing redevelopment in areas currently vulnerable to flooding (e.g., the Enford Road area in Richmond Hill).

Following a heavy storm in May 2000, the City of Toronto identified 75-80 cluster areas where basement flooding was a problem. The typical causes of basement flooding are overloaded storm and/or sanitary sewer systems, overloaded surface drainage systems, low lying areas, and reversed sloped driveways. Toronto is conducting studies to identify opportunities to remediate basement flooding.

Two major projects are addressing flooding and other concerns in the lower reaches of the Don River. The Lower Don River West Remedial Flood Protection Project involves the creation of a major landform to provide flood protection for 210 ha of land west of the river near Lake Ontario. The Don Mouth Naturalization and Port Lands Flood Protection Project will provide flood protection for 230 ha of the Port Lands area. Completion of these projects will require ongoing political and financial support from all levels of government and the public.

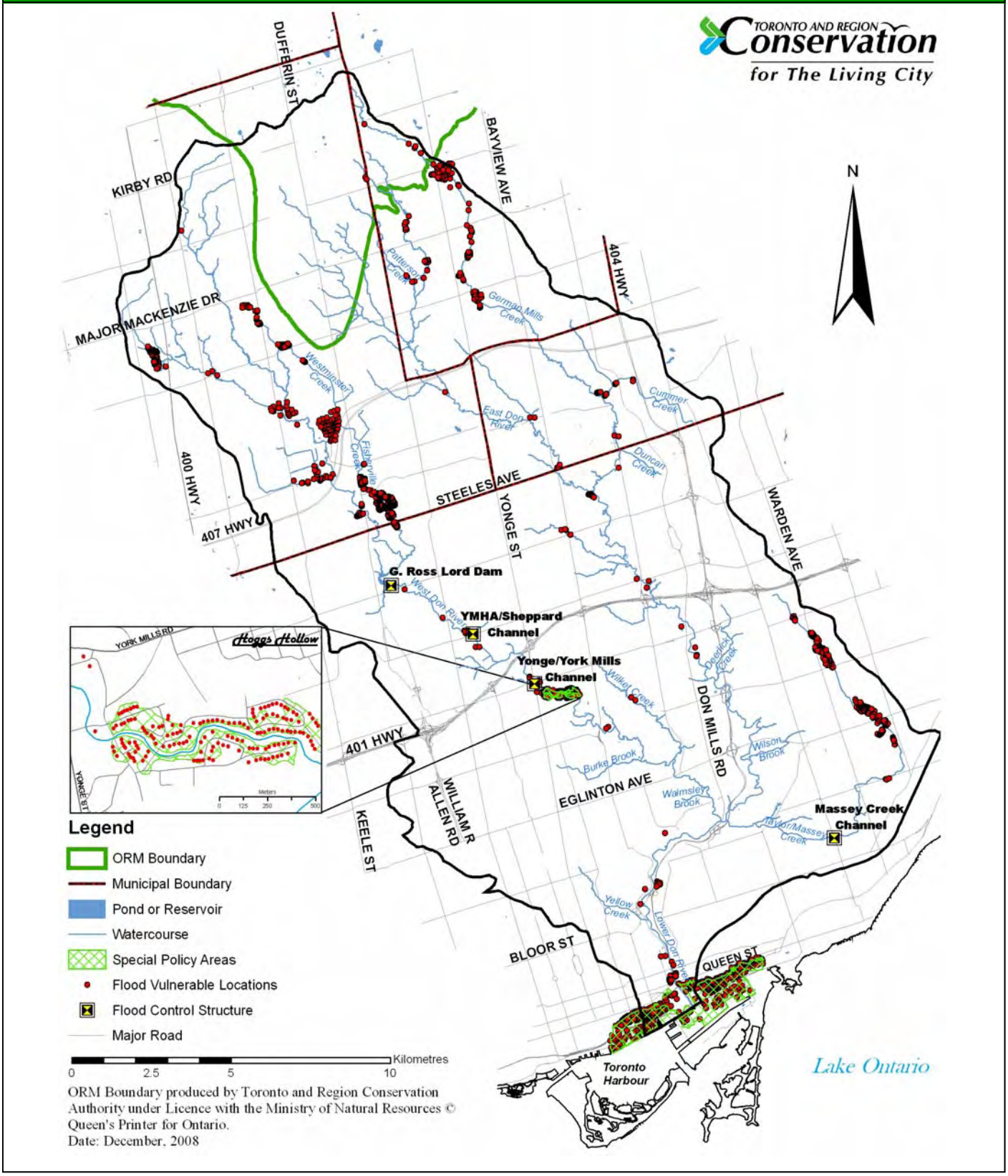
Regulating Water Use

There are a total of 51 licensed water users within the Don River watershed; a number of others withdraw less than 50,000 litres per day and do not need to apply for a Permit To Take Water (PTTW) from the Ontario Ministry of the Environment. The majority of these users (59%) rely on groundwater sources. Users include various industries (29% of total withdrawals) and a firm filtering contaminants from 16 groundwater remediation wells on the now closed Keele Valley Landfill (32%). The remainder – withdrawing water primarily for golf course irrigation (24%), wildlife conservation, flood control or to fill private ponds – rely on surface water sources. Approximately 3.2 million cubic meters of water are extracted from surface and groundwater sources each year in the watershed.

Erosion damage in Wilket Creek, June 2008
(Photography: Peter Heinz)

The majority of water users, some 84%, are located in the northern portion of the watershed in the three upper subwatersheds. The Upper East Don River subwatershed contains the largest number of users with 31, which is more than half of all known users in the Don

Figure 10: Flood Vulnerable Locations and Flood Infrastructure



watershed. There are currently no active municipal wells withdrawing potable supply in the Don River watershed; lake-based supplies from Lake Ontario are the primary source of potable water for residents.

The potential impact of individual surface water withdrawals on base-flow varies across the watershed. In the Upper Don, there are six main areas that were found to have high potential impacts due to surface water use. Of the five identified surface water users in the Lower Don subwatersheds, two had a potential medium impact; two had a low impact; and one was considered to have no known impact.

Stream Form

Stream form refers to the physical form of rivers, creeks, channels, valleys and flood plains. In pristine settings, stream form generally changes in a constant but gradual way, through erosion and deposition in response to natural variations in stream flow. Urbanization throughout the Don watershed has significantly increased runoff and stream flows resulting in rates of stream form change and erosion that are much greater than natural levels. This in turn leads to widening and deepening of the channels, pollution of the water by eroded soil materials and increased sediment loading downstream. As stream bed and bank sediments are scoured away or altered by deposited sediment, bank vegetation washes away. The unstable banks prevent new vegetation from becoming established, and the channel bed and banks lose the variety of physical habitats needed to support many terrestrial and aquatic species. As land is eroded away, property values may be affected and infrastructure such as sewers, pipelines and road crossings can become exposed and damaged.

Report Card, Surface Water Quantity

The management objectives related to surface water quantity are:

- ❒ Protect and restore the natural variability of annual and seasonal stream flow.
- ❒ Maintain and restore natural levels of baseflow.
- ❒ Eliminate or minimize risks to human life and property due to flooding.
- ❒ Manage stormwater to protect people and the health of streams and rivers.
- ❒ Protect and regenerate the natural form and function of the Don's valley and stream corridors.

Indicators	Targets	Grade
Stream flow	❒ No increase in the average annual and seasonal stream flow volumes over 1997 levels ❒ No decreasing trend in the median daily baseflow rate from May to August	C
Flooding	❒ Maintain the baseline peak stream flow rates for two to 100-year storm events ❒ Reduce or maintain the number of existing flood vulnerable areas and roads	D
Storm-water manage-ment	❒ Increase the percentage of the urban area equipped with Level 1 stormwater controls (for improved water quantity, quality and erosion control)	D
Channel morpho-logy	❒ Maintain or restore natural channel structure (as surveyed at Regional Watershed Monitoring Program sites) ❒ Maintain baseline erosion index where stream banks are stable, or decrease erosion index where stream banks are unstable ❒ Maintain baseline stream bank erosion rate	TBD[1]

1. Baseline conditions (2002) have been established and will be used for future evaluations.

In response, channelization and installation of engineered bed and bank stabilization techniques are widespread throughout the Don, intended to facilitate development or protect private property. Many of these works are now failing and in need of maintenance. Very little natural river channel remains except in some headwater reaches of the Upper West Don River, Upper East Don River and German Mills Creek. In these areas, streams in or downstream of newer developments show less direct physical impact but are beginning to exhibit widening and instability in response to an altered hydrologic regime.

Stream channels in the tributaries of the Lower Don River, including Taylor/Massey Creek, Deerlick Creek, Wilket Creek, and Burke Brook, offer some of the most extreme examples of channel degradation and resulting impacts to infrastructure and property in the watershed. Natural riparian vegetation (within 30 metres of the stream bank) is present along only 63% of the river and stream banks in the watershed, indicating that a significant portion of stream banks lack the protection that vegetation can provide.

Key Issues for Surface Water Quality

- Overall, water quality in many parts of the Don River has improved significantly since the 1970s and early 1980s, when there were several sewage treatment plants discharging to the river.
- However, the lack of stormwater controls, illegal cross connections between the storm and sanitary sewers, and combined sewer overflows continue to result in high *E. coli* levels and the flushing of other contaminants.
- High phosphorus levels continue to be a problem in the Lower Don, while chloride levels continue to increase throughout the watershed as a result of road salting. In addition, leachate leaking from closed or abandoned landfills may be entering the river, and spills of oil and other contaminants are occurring at an unacceptably high rate.
- High levels of suspended solids are caused by construction activity, especially in the newly developed areas of the Upper West Don River and Upper East Don River subwatersheds.

3.5 Surface Water Quality

Overall, surface water quality in the Don River reflects a watershed that is heavily urbanized and has relatively few measures in place for the control of stormwater.

Although some progress has been made in recent years on implementing stormwater controls, they are not yet extensive enough to change water quality conditions. In addition, untreated human sewage still occasionally overflows into the lower reaches of the Don from combined sewers.

Chlorides represent a new and rising threat to water quality as some of the last remaining rural lands are developed and improved road salt management programs are still in their early stages. Oil and chemical spills, spills and leachate leaking from closed or abandoned landfills are also potential threats to water quality. Water quality is monitored at four stations across the watershed (Figure 11).

Throughout the watershed, surface water samples have high levels of *E. coli* bacteria and phosphorus. From 2003 to 2005, not one sample from the Upper East Don River met the Provincial Water Quality Objective (PWQO) for *E. coli* and only 12% met the phosphorus objective (Figure 12). The source of the dry weather bacteria in the Upper East Don River needs further study. The Upper West Don River station had the highest concentrations of suspended solids and turbidity, likely due to intense construction activity upstream of that station during the monitoring period (2002 to 2004).

Facts & Figures

- During rainstorms, runoff moves rapidly into storm sewers and, in 80% of the urbanized area, is discharged directly to the river without any treatment.
- The North Toronto Wastewater Treatment Plant discharges treated wastewater directly into the Lower Don River upstream of Pottery Road.
- *E.coli* bacteria in water samples collected between 2003 to 2005 often exceeded provincial guidelines at monitoring stations throughout the watershed.
- Total phosphorus levels failed to meet the guidelines 83 to 87% of the time, while chloride levels failed 24 to 94% of the time at all four monitoring stations.
- Metal levels, in many cases linked to auto exhaust, were lowest in the East Don River and highest at the Pottery Road monitoring station, where just under 50% of samples failed to meet the guideline for copper.
- From 1988 to 2000, there were 2,475 oil spills and 1,584 chemical spills in the 905 region; roughly half drained into nearby rivers, including the Don and its tributaries.
- TRCA is working with neighbouring conservation authorities on drinking water source protection under the *Clean Water Act*.

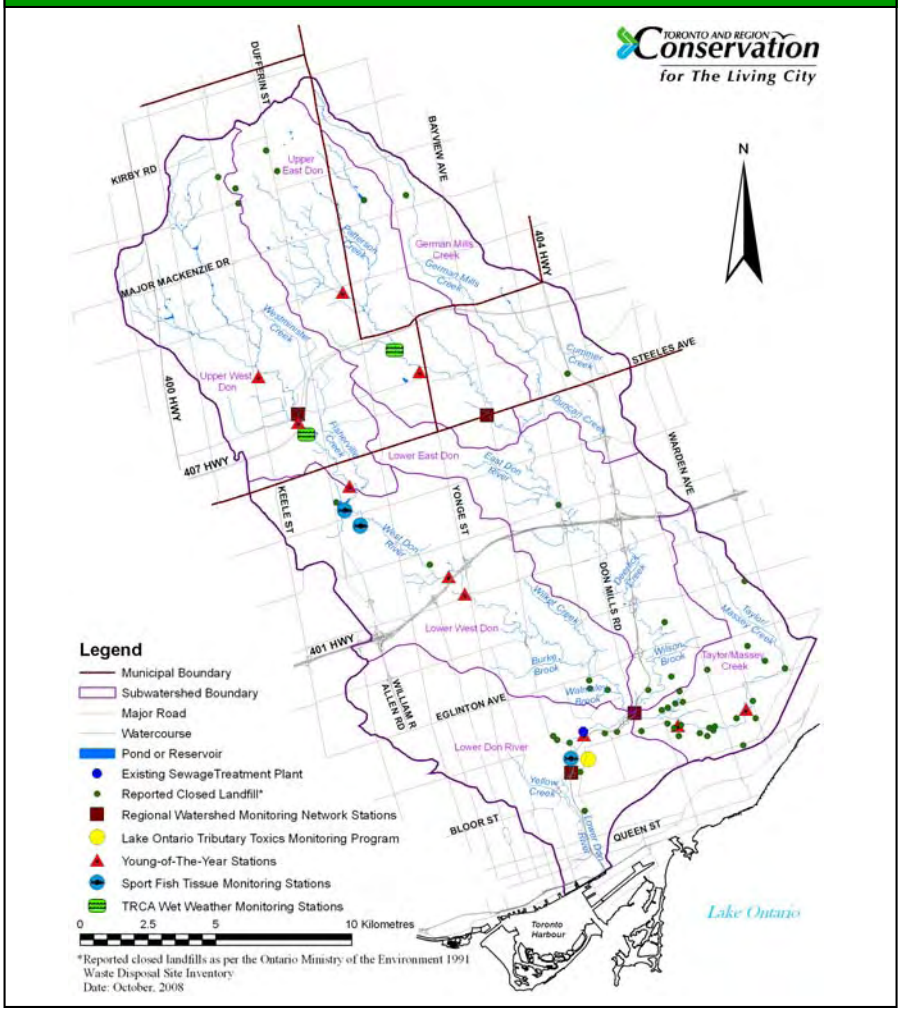
Nutrients

Particularly high levels of nutrients at the Lower Don River monitoring station (Pottery Road) suggest that effluent discharges from the North Toronto Wastewater Treatment Plant and combined sewer overflows (CSOs) may be contributing to water quality impacts in the lower reaches of the watershed. The cause of recent increases and potential solutions to the problem require further investigation.

Phosphorus and un-ionized ammonia levels have decreased significantly since the 1970s due to the removal of phosphorus in detergents and the decommissioning of all but one of the sewage treatment plants in the watershed. However, the provincial objective for phosphorus – established to protect against excessive plant growth in rivers and streams – was exceeded more than 50% of the time at all monitoring stations in the Don.

The limited ability of current stormwater ponds and end-of-pipe management facilities to adequately reduce phosphorus concentrations are likely responsible in the upper portions of the watershed, while fertilizer use on lawns and golf courses, along with combined sewer overflows, may explain the elevated levels in the lower watershed.

Figure 11: Regional Water Quality Monitoring Stations and Potential Sources of Contamination



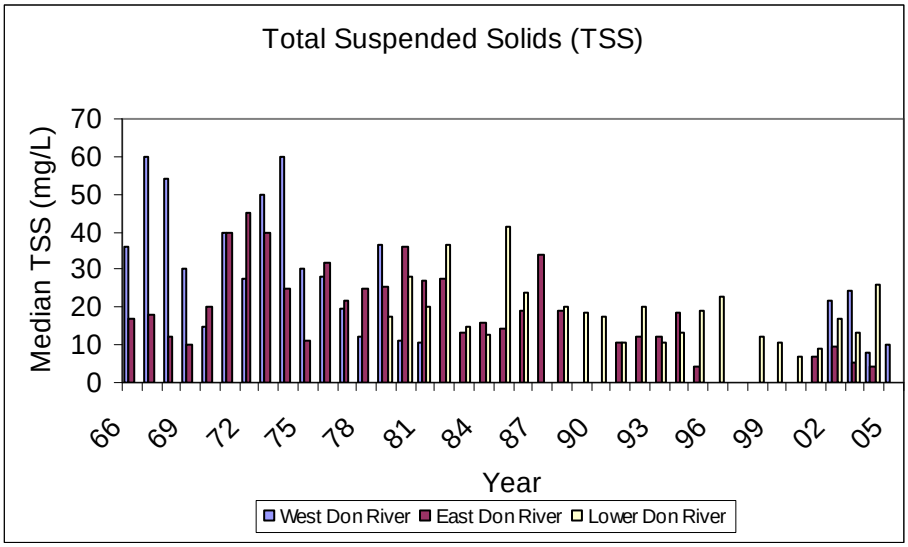
Bacteria

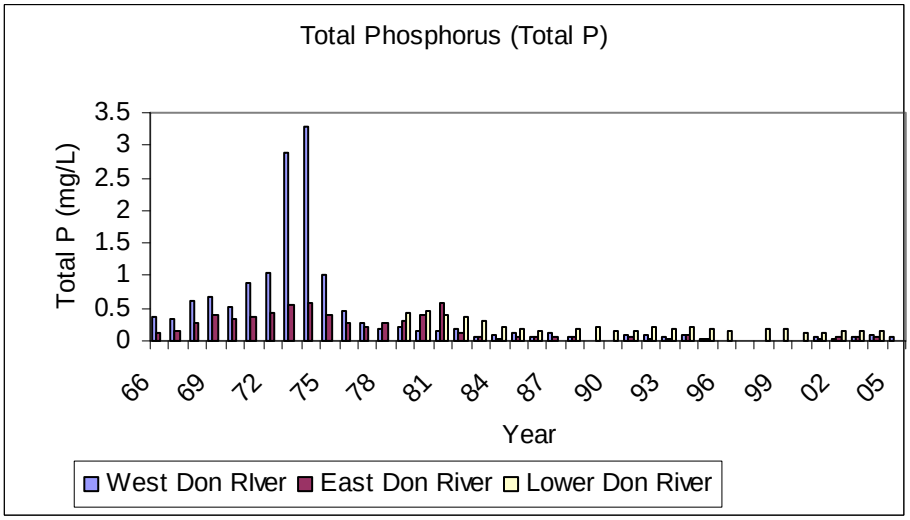
About 26% of the Don River watershed is serviced by combined sanitary and stormwater sewers, largely south of Eglinton Avenue. At the more than 30 combined sewer overflow outfalls, untreated storm and sanitary sewer discharges can flow into the Lower Don River and Taylor/Massey Creek when the capacity of the sewer system is exceeded. CSO discharges result in elevated nutrient and *E. coli* levels.

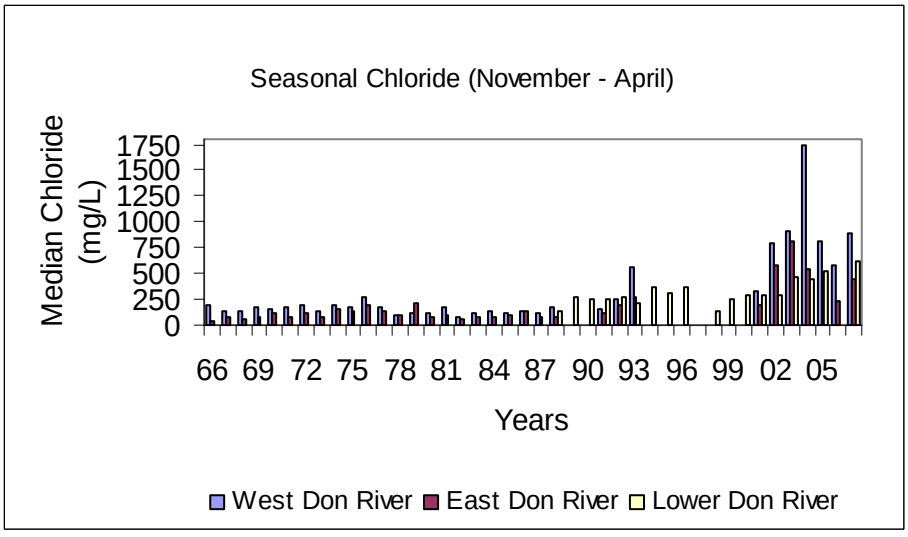
Water samples from Taylor/Massey Creek showed high levels of dry weather bacteria, chloride and nutrients. Ongoing investigations by the City of Toronto have attributed the high dry weather bacteria levels in several of the outfalls discharging to the Creek to illegal cross-connections between the sanitary and stormwater sewer systems.

Even during dry weather periods, *E.coli* concentrations at monitoring stations on Taylor/Massey Creek and the Upper East Don River never met provincial guidelines to protect swimmers. This was unexpected in the Upper East Don which receives relatively clean water from the Oak Ridges Moraine aquifer and much of the stormwater in the area is partly controlled. Further monitoring is underway and must be expanded to help identify the potential sources of

Figure 12: Water Quality Contaminant Trends







contamination and develop effective solutions.

Organic & Inorganic Chemicals

Concentrations of copper and lead declined at all stations during the 1980s, while zinc showed no distinct trend. In 2005 wet weather surveys, lead remained below the PWQO guideline in most samples, but the copper guideline was met only 5% of the time in the West Don River and 30% of the time in the East Don River. Concentrations of PCBs, DDT, or mercury were detected in juvenile fish above current standards at all eight monitoring stations in the Don River, indicating that these contaminants are bio-accumulating in the food chain. There are consumption restrictions on sport fish in and below the G. Ross Lord Dam and in the Pottery Road area on the Lower Don River. Restrictions have increased slightly since 1999.

From 2003 through 2005, there were at least 87 spills or releases of hazardous or potentially toxic material to water in the Don watershed reported to the provincial Ministry of the Environment. Better spill prevention and rapid remediation programs, backed by stepped up enforcement, would help reduce the incidence and environmental severity of accidental releases throughout the watershed.

Atmospheric emissions represent a significant source of water pollution, especially in an urban area. In 2001, less than half of the samples from the Lower Don River met the PWQOs for five polycyclic aromatic hydrocarbons (PAHs), typically released into the environment from residential heating, vehicular exhaust and power generation.

Emerging Pollutants in Rivers & Streams

The emerging pollutants of greatest concern in urban watercourses include pharmaceuticals/personal care products (PPCPs), certain industrial chemicals, and viruses. There is a great deal of uncertainty surrounding these pollutants: they are difficult to monitor and measure, making it difficult to assess risks to human health, aquatic species and ecosystems. Federal and provincial agencies have hosted a number of workshops on research, monitoring, assessment, and management of PPCPs in Canada (see http://www.nwri.ca/ for more information).

Other emerging pollutants include industrial contaminants, such as plasticizers, surfactants and flame retardants (some of which are endocrine disruptors like many PPCPs). These pollutants have been appearing in waters and biota of the Great Lakes system where they have not previously been documented.

Viruses are a component of fecal pollution (like *E. coli*) and like bacteria and other pathogens, they can cause intestinal and respiratory illnesses, and in some cases, death. Although a greater concern in untreated groundwater drinking supplies, viruses also are found in surface waters and represent a potential risk either through recreational contact or compromised surface drinking water systems.

Report Card, Surface Water Quality

The management objective related to surface water quality is:

- ❒ Protect and restore surface water quality with respect to toxic contaminants and other pollutants, such as sediment, nutrients, bacteria and road salt.

Issue	Targets	Grade
Conventional pollutants	❒ Levels of suspended solids, phosphorus, nitrate, ammonia, dissolved oxygen and chloride to meet federal and provincial guidelines in at least 75% of samples	F
Heavy metals and organic contaminants	❒ Concentrations of metals and organic compounds to meet Provincial Water Quality Guidelines ❒ Organic contaminant levels in young-of-the-year fish to meet IJC and CCME guidelines ❒ Restrictions on sport fish consumption not to have increased since 1999	D
Bacteria	❒ Bacteria levels (*E. coli*) in surface water to be lower than observed over the 1991 to 1995 monitoring period (when the last detailed assessment was conducted)	F

Chlorides & Road Salt

With increasing traffic in the headwaters, the impact of road salt applications is a growing challenge. Winter levels of chloride (a primary constituent of road salts) have risen dramatically in the Upper East Don and Upper West Don River subwatersheds since the 1990s. From 2002 to 2005, only 33% of samples from the Upper West Don River met the chloride threshold suggested by the federal government for the protection of sensitive aquatic organisms. Most stormwater management practices are not effective at controlling chloride, leaving more efficient application of road salts and use of alternatives where possible, as the primary tools available in the fight against this pollutant.

Suspended Solids

Elevated levels of suspended solids have been linked to intense construction activity upstream. Since 2005, much of this activity has shifted to the Upper East Don River, which used to be the cleanest of all the sites monitored. Tighter enforcement of erosion and sediment control plans on all construction will be needed to avoid problems.

Key Issues for Air Quality and Climate Change

- Overall, air quality in the Don River Watershed is rated as “fair”. However, “fair” should not be interpreted to mean “acceptable”.
- High levels of ozone and fine particulate matter are linked to a number of serious health consequences, including asthma, bronchitis, heart problems and increased mortality. Excessive ground level ozone also decreases the production of native vegetation.
- Continued population growth in the 905 region is likely to increase reliance on the automobile, with vehicle exhaust continuing to exacerbate local and regional air quality problems.
- Increasing greenhouse gas emissions from vehicles, power production and other sources are contributing to global climate change which could result in more violent unpredictable weather, ecosystem disruption and flooding throughout the watershed.
- Climate change and the urban heat island effect are likely to increase air temperatures, which could aggravate air quality concerns and increase the risks to human health.

Facts & Figures

- In 2006, the Air Quality Index (AQI) for three monitoring stations in and near the Don River watershed was “good” or “very good” 92% of the time.
- However, the AQI in North Toronto entered the “Poor” range for at least an hour on nine separate days in 2006.
- Between 2003 and 2006, the Ministry of the Environment issued, on average, eight smog advisories covering 21 days per year for York Region and the City of Toronto.
- Climate change models predict that, overall, the average temperature of Southern Ontario could increase between 5°C and 10°C by 2080.
- Air quality in the GTA may improve in response to the 2005 closing of the coal-burning Lakeview thermal generating station.
- Each year, Toronto’s urban forest removes an estimated 610 tonnes of ozone, 110 t of sulphur dioxide, 300 t of nitrogen oxide and 450 t of fine particulate matter from the atmosphere.

3.6 Air Quality and Climate Change

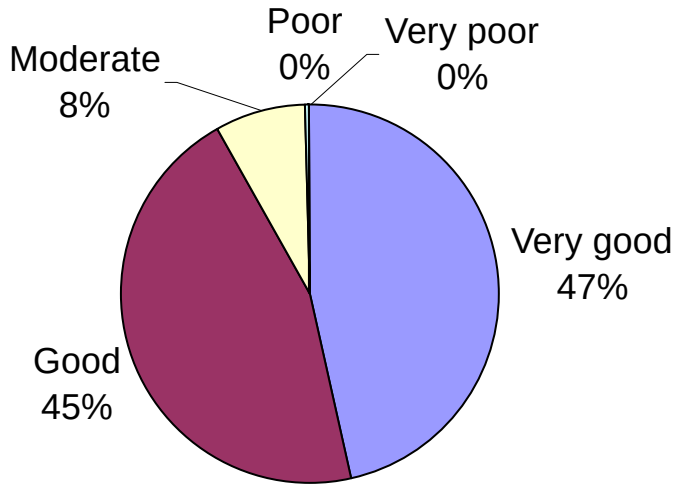
Air quality is affected by the emission of contaminants into the atmosphere from both human and natural sources, as well as from the atmospheric interaction of those pollutants. Although volcanic eruptions, forest fires and other natural sources contribute to global air pollution, the primary contribution comes from local, everyday human activities – the emissions from automobiles and trucks, power plants, factories, smelters, refineries, planes, trains and other vehicles. Pollutants can arise from local, regional and cross-boundary sources, and travel hundreds or thousands of kilometres before reaching the ground, greatly complicating management and control efforts.

Air pollution can affect the health of humans, wildlife and vegetation and the appearance and integrity of buildings and structures. Poor air quality may also contribute to climate change, by increasing the level of greenhouse gases – primarily carbon dioxide, methane, nitrous oxide, ozone and CFCs – in the atmosphere. Many of the chemicals that are emitted to air are carried to the ground, either through precipitation or dry deposition processes, and ultimately enter surface waters and groundwater.

Air Quality Index

The Air Quality Index (AQI) is based on concentrations of six common pollutants – sulphur dioxide, ozone, nitrogen dioxide, total reduced sulphur compounds, carbon monoxide and fine particulate matter – measured in the ambient air at monitoring stations located across the province and operated by the Ministry of the Environment. Calculated and published hourly, the AQI provides a snapshot of local air conditions that could have an impact on human health and the environment. The Index is a sliding scale, with the lowest values representing the cleanest air and rising AQI

Figure 13: Air Quality Index, 2006



values subdivided into five categories of increasingly polluted air:

- ❒ "Very Good" – AQI 1-15
- ❒ "Good" – AQI 16-31
- ❒ "Moderate" – AQI 32-49
- ❒ "Poor" – AQI 50-99
- ❒ "Very Poor" – AQI >100

Smog Advisories

The number of smog advisories issued by the Ontario Ministry of the Environment for the City of Toronto and the regions of York and Durham.

Year	Smog Advis-ories	# Days
1996	2	3
1997	2	5
1998	3	7
1999	5	9
2000	3	3
2001	7	20
2002	9	18
2003	5	12
2004	6	14
2005	14	48
2006	5	11

Each level has an associated effect on human and ecological health. Values under 31 are believed to have few, if any, health effects, while those in the range of 32 to 49 can damage vegetation and cause respiratory irritation in sensitive people when active.

In 2006, the AQI for the three monitoring stations located in and near the Don River watershed indicated air quality was considered either "Good" or "Very Good" 92% of the time (Figure 13). While AQI was "Poor" for less than 1% of the time, on average, this occurred for at least one hour on nine days for the Toronto Downtown monitoring station, nine days for the Toronto East station and five days for the Toronto North station. Ozone and particulate matter were the pollutants responsible for the poor AQI ratings.

High levels of ozone and fine particulate matter are linked to a number of serious health consequences, including heart problems, respiratory conditions, such as asthma and bronchitis, and increased mortality. In addition to impacts on human health, excessive ground level ozone compromises the production of native vegetation.

Smog Advisories

Smog is the most visible form of air pollution. It is a brownish-yellow hazy cloud of ozone, fine particulate and other pollutants. Ground level ozone is formed when sunlight reacts with the nitrogen oxides from vehicle exhaust and industry, and the volatile organic compounds (VOCs) found in many solvents, pesticides and other consumer products. Ontario's smog is produced from both local sources and pollutants blown in from the US.

The resulting mix of toxic chemicals can be dangerous to human health, especially to children, the elderly and people with existing health problems. Smog can also decrease the body's ability to fight off infection. Hospital admissions generally rise on bad smog days.

Report Card, Air Quality

The management objective related to air quality is:

- ❒ Reduce air pollution to levels that protect human health and natural ecosystems, and do not exacerbate global climate change.

Issue	Targets	Grade
Air Chemistry	❒ No Air Quality Index greater than 15 (indicating "Very Good") is issued during the year	C
Smog	❒ No Smog Watches or Smog Advisories are issued during the year	C

A Smog Watch is issued by the Ministry of the Environment when there is a 50% chance that elevated smog levels will occur within the next three days. A Smog Advisory is issued when there is a strong likelihood that elevated smog levels are forecast to occur within the next 24 hours, or immediately if poor AQI readings are taken. The table on the previous page presents a summary of the Smog Advisories issued for the City of Toronto and the regions of York and Durham between 1996 and 2006. While smog conditions are greatly affected by weather conditions, especially hot sunny weather from May to August, the data also show a general increasing trend in the number and duration of smog advisories issued over the last ten years.

Air Quality Concerns

Overall, air quality conditions in the Don River watershed are rated as "fair". However, "fair" should not be interpreted to mean "acceptable". Unacceptably high levels of ozone and fine particulate matter are responsible for a number of serious health consequences, which can increase mortality rates among exposed residents. However, the dramatic environmental shifts that may result from global climate change are even more worrisome.

Poor air quality does not have to be accepted as an inevitable consequence of progress and urban living. Sustainable practices to reduce wastes, conserve water and energy, adopt less toxic alternatives and promote public transit, will also reduce many of the environmental releases that contribute to local and regional air pollution problems. By modifying some of their daily activities, individuals, institutions and businesses can collectively have an impact on the generation of smog and air pollution levels, acid rain, the urban heat island effect, and even the rate of global warming and climate change.

Automobile Use

Suburban development is still the most popular form of urbanization in the GTA, and this low-density land use often situates people's homes far from where they work, shop and play. The result is more people in more cars, and inevitably the release of more air pollution and greenhouse gases. Emissions from private vehicles are the largest source of air pollutants in the Don River watershed. Public transit produces only half as much of the GHG for every kilometre traveled per person, compared to the same trip by car, and cuts the emissions of VOCs and nitrogen oxides by 90%.

Making the streets more welcoming for bikes and pedestrians is another vital component of a clean air strategy. While municipalities across the watershed are working on trail plans, coverage and interconnections are lacking still in some areas.

Heat Island Effect

As a highly developed urbanized area, the Don watershed is a significant contributor to the “heat island effect”. Heat islands develop in cities as naturally vegetated surfaces are replaced with asphalt, concrete, rooftops and other manufactured materials. Waste heat from vehicles, industry, and air conditioners add their warmth to their surroundings. Mitigation strategies that should be implemented include the planting of trees and vegetation, installing green roofs and cool roofs, and implementing alternative pavement technologies. These efforts would also support other programs designed to improve stormwater management, energy efficiency, public health, and the general quality of life. A temperature model of the GTA or watershed would identify those areas that most significantly contribute to increased temperatures.

The Urban Forest

A healthier urban forest will better cool the city, control stormwater run-off, help clean pollution from the air, and help reduce the greenhouse gases that contribute to global warming. Recent research has shown that the City of Toronto’s estimated 7.5 million trees store about 900,000 tonnes of carbon and sequester a net 28,000 tonnes of carbon each year. They also scrub from the atmosphere more than 610 tonnes of ozone, 110 tonnes of sulphur dioxide, 300 tonnes of nitrogen oxide, and 450 tonnes of fine particulate matter per year.

Climate Change

The Don River watershed, like other areas of Southern Ontario, experiences a continental climate moderated by the Great Lakes. The watershed is influenced by warm, moist air masses from the south and cold, dry masses from the north, resulting in a wide range of weather conditions throughout an average year. Summer days are characterized by highs that usually reach the mid to upper 20s (°C), but can rise into the low or mid 30s. During the winter, daytime highs normally fall a few degrees below 0°C, but can fluctuate from above 10°C down to below -30°C.

Since the industrial revolution, significantly greater volumes and concentrations of carbon dioxide, methane, nitrous oxide, ozone and chlorofluorocarbons (CFCs) have been released into the Earth’s atmosphere. These gases not only impact air quality, but also they trap outgoing radiation and raise the temperature of the lower atmosphere by creating a “greenhouse effect”, which could result in dramatic changes to climate. There is some reputable evidence to suggest that climate change is already occurring, resulting in shorter winters, warmer annual average temperatures, shorter duration of lake ice cover, and more frequent heavy rainstorms in the Great Lakes basin.

Global climate change would undoubtedly affect the Don River watershed, along with all the other watersheds and ecosystems in the region. Although specific changes cannot be accurately predicted, climate change models show that, overall, the climate of southern Ontario could increase between 5 and 10°C by 2080. The impact that such a warming trend would have on weather patterns is unclear; some experts extrapolate that precipitation could increase by up to ten percent, while others expect a decrease in rain and snowfall. Despite their differing interpretations of the models, climatologists all agree that the weather in southern Ontario and the GTA would grow more unpredictable, with an increasing incidence of temperature extremes and hot spells, violent storms and periods of drought.

In turn, the changes in regional climate and local weather should affect the hydrological cycle in the watershed, resulting in a cascade of changes throughout the ecosystem. Changes in the mean and seasonal distribution of precipitation would upset the current water balance, groundwater levels and stream flow patterns. Storm surges would affect channel and stream bank stability, and could cause flooding in vulnerable areas. Terrestrial and aquatic habitats would have to adapt to warmer temperatures and changing weather patterns. Some new species (including some serious pests) would invade the watershed to compete for food and habitat niches, while some native species would inevitably decline and disappear.

Climate change could also intensify air pollution-related problems. Higher air temperatures would increase the atmospheric interaction of air contaminants and increase the concentration of ground-level ozone, thereby reducing air quality and exacerbating human respiratory and cardiovascular disorders and allergy problems.

Sunnybrook Park—part of Toronto's urban forest

Key Issues for the Aquatic System

- Altered flow regimes, siltation and turbidity problems, chemical pollution and thermal warming in the upper watershed are all contributing to the decline of a number of aquatic species, including the redside dace, listed as endangered under provincial legislation and a "species of concern" under federal legislation.
- The lower watershed is characterized by low biodiversity of all aquatic species and poor in-stream habitat conditions.
- Land use change is imperiling aquatic habitat and contributing to the declining health of the aquatic system, especially in the upper subwatersheds.
- The loss of stream bank (riparian) vegetation and wetland habitat have reduced aquatic biodiversity.
- Numerous in-stream barriers to fish movement, including weirs, dams, culverts and crossings, have been confirmed and an even larger number of potential barriers must be assessed in the field.
- There is a loss of trophic levels (one or more of the steps in the food-chain) within the fish community structure.

3.7 Aquatic System

Rivers serve the vital function of conveying water in a watershed. They are also intrinsically important as ecosystems, contributing greatly to biodiversity and forming a critical component of a natural heritage system. Through their long inhabitance of the Don River system, aquatic species have adapted to historic patterns of in-stream flow, channel structure, water quality and temperature.

Changes in land use have, and continue to, shift those habitat patterns. The impacts of urbanization can include elevated contaminant levels; removal of riparian buffers, wetlands and small streams; decreases in stream baseflow interspersed with periods of high water flow following storms or rapid snowmelt, both of which have increased erosive potential and affected sediment transport. Other challenges include the historic construction of dams and the introduction of aquatic invasive species. As habitat patterns change, we can track corresponding shifts in the aquatic species that inhabit the river.

The aquatic system can be quite varied and many different species – fish, insects, amphibians – have evolved to take advantage of this diversity, adapting to the range of environmental conditions.

Aquatic studies must consider all these issues and how they influence the aquatic community to determine management strategies that will be effective in protecting diverse and sensitive ecosystems.

Facts & Figures

- There has been a total of 47 fish species documented in the watershed over the past 57 years. 21 species are currently present, of which 17 are native.
- Redside dace remain in Patterson Creek and tributaries of the Upper East Don River.
- The most commonly sampled species across the watershed are creek chub, longnose dace, blacknose dace, fathead minnow, bluntnose minnow and white sucker.
- According to a 2005 survey of stream habitat quality, 64% of the 25 sampling events returned a "poor" rating and 24% rated "fair".
- Chinook salmon and brown trout populations in the watershed are stocked and not naturally sustaining.
- The invasive rusty crayfish has been found recently in the Upper East Don River, possibly dumped as unused bait.
- In surveys of bottom-dwelling "benthic" organisms conducted in 2005, all sampling stations were deemed "potentially impaired", with 87% of the stations dominated by pollution tolerant families of benthic invertebrates.

The health of the aquatic system is monitored and evaluated based on an understanding of physical conditions (such as baseflow, stream temperature and stability, stream bank cover, and in-stream barriers), the stability of fish and bottom-dwelling benthic communities, and the presence of invasive species.

Changing Flow Patterns

While there are many ecological processes that influence the quality and character of in-stream conditions, the groundwater and surface water regimes are the key drivers. Significant reductions in the amount of baseflow or increases in total surface flow can signify degrading habitat conditions for aquatic species. When flow surges following storm events grow stronger, the potential for erosion rises and aquatic species can be washed down past in-stream barriers. Flow gauges in the lower watershed have shown no significant decrease in baseflow in the period 1995 through 2005. However, more long-term data is needed to assess trends in the upper watershed. If baseflows drop during the hot summer months, they will be less effective in moderating high stream temperatures. Currently, the Upper East Don River subwatershed is considered the healthiest of all the Don subwatersheds based on fish community, but may be experiencing significant impacts from the current phase of landscape change.

Aquatic Habitat

Throughout the watershed, uncontrolled flows, in-stream barriers, poor water quality, limited riparian wetland habitat, and lack of streambank vegetation (only 63% of watercourses have cover) are acting to fragment and degrade fish habitat. The net effect on the aquatic system of historic settlement and recent urbanization has been a decline in the diversity of fish communities and in the number of native fish species. However, a number of tolerant native fish species have persisted and there is some evidence of a stable aquatic system in which base levels of aquatic function remain operative in the Don. The dominant species are pollution tolerant generalists, including creek chub, longnose dace, blacknose dace, fathead minnow, bluntnose minnow, and white sucker.

The isolated pockets of higher quality habitat that support redside dace are now under stress from recent development. Opportunistic invasive species, such as common carp and goldfish, which are very tolerant of poor water quality, are found throughout the West Don River and in reaches of the East Don River and German Mills Creek. The presence of introduced salmonid species in the river (chinook salmon, brown trout, rainbow trout) is largely attributed to stocking programs, although populations of brown trout and rainbow trout may have become naturalized. Native Atlantic salmon, historically present in the Don, were extirpated in the late 1800s.

Fish Management Zones

Six Fish Management Zones or FMZs (Figure 14) have been delineated for the watershed, as part of updating the *Don River Fisheries Management Plan* (FMP). These zones are based on relatively homogenous habitat conditions and fish communities as well as the subcatchment drainage areas.

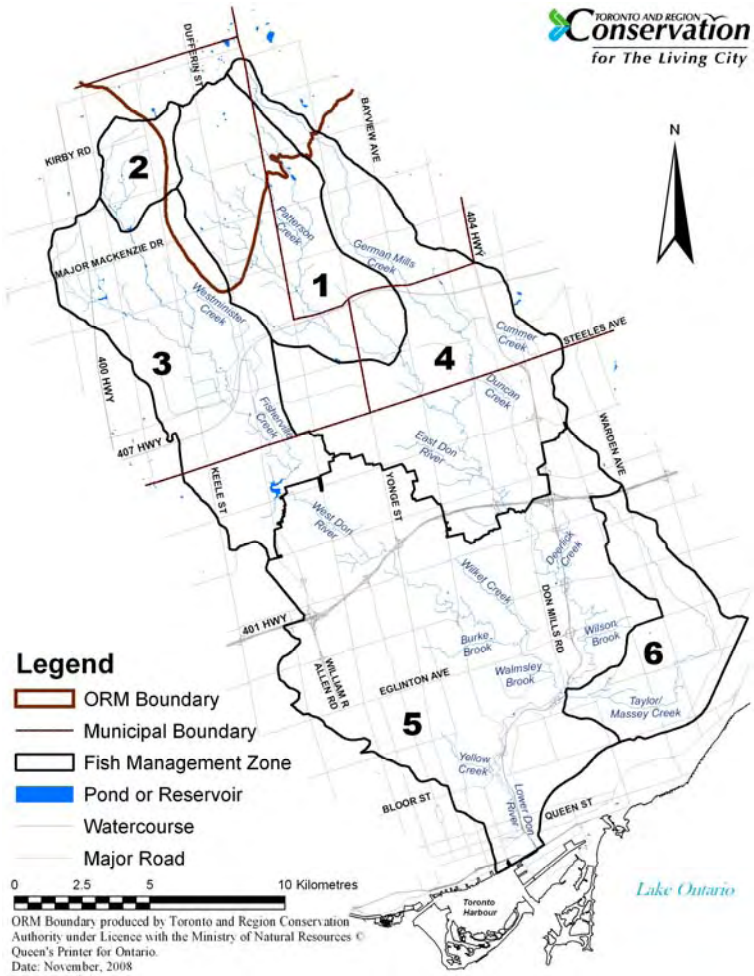
Mottled sculpin

Redside dace

Indices of Biotic Integrity

The Index of Biotic Integrity (IBI) and Benthic Aggregate Assessment (BAA) are ecologically-based measures of the health of a watercourse based on the characteristics and interactions of the fish and benthic invertebrate communities, respectively.

Figure 14: Fish Management Zones (FMZs)



Fish Management Zone (FMZ) is an aquatic management unit that exhibits homogeneous hydrology, geology and thermal regimes. Typically, the fish communities that reside within such a zone are also similar. The Don River watershed has been subdivided into six FMZs.

Fish Management Zone 1

The upper tributaries of the East Don River form FMZ 1. Stream temperature monitoring indicates discreet areas of cold water (Figure 15), likely due to groundwater discharge from the underlying sand deposits of the Oak Ridges Moraine. Areas of warm water occur below on-line ponds. The temperature regime is moderately stable. Some habitat quality (IBI) scores of "fair" indicate that the Upper East Don is a relatively healthy FMZ. Fish communities are more diverse here than lower in the watershed. These tributaries are home to stocked populations of chinook salmon and brown trout, as well as the last known population of redside dace, a species listed as endangered under the provincial *Endangered Species Act* and listed as a species of "special concern" under the federal *Species at Risk Act*. Although much of the natural

Fish Surveys

	Past Records	2002-2005
American brook lamprey		X
American eel	M	
alewife	M	M
gizzard shad	M	M
brook trout	X	
brown trout	X	X
chinook salmon		X
rainbow trout	X	X
northern pike	M	M
white sucker	X	X
northern hog sucker	X	
blacknose dace	X	X
longnose dace	X	X
northern redbelly dace	X	X
redside dace	X	X
bluntnose minnow	X	X
fathead minnow	X	X
brassy minnow	X	
common carp	X	X
common shiner	X	X
golden shiner	X	X
spottail shiner	X	X
emerald shiner	X	X
blacknose shiner	X	X
creek chub	X	X
goldfish	X	X
central mudminnow		X
brown bullhead	X	X
stonecat	X	X
brook stickleback	X	X
threespine stickleback		M
white bass	M	
black crappie	X	
bluegill	X	
smallmouth bass	X	X
largemouth bass	X	X
pumpkinseed	X	X
rock bass	X	X
Johnny darter	X	X
rainbow darter	X	
walleye		M
white perch	M	
yellow perch	X	X
freshwater drum		X
mottled sculpin	X	X
longnose gar	M	
rainbow smelt	M	M

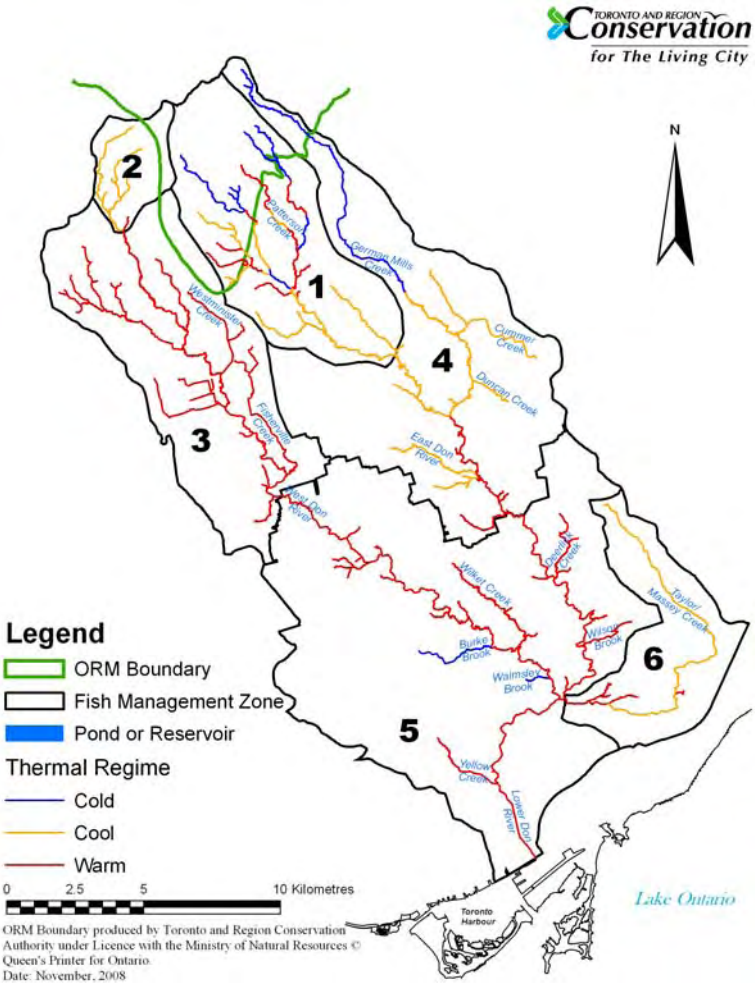
X — present in the watershed
M — lake-based species present at the mouth of the Don

cover along the tributaries is protected under the *Oak Ridges Moraine Conservation Act*, the area is urbanizing rapidly and has been subject to high and frequent sediment loadings during construction. Redside dace may be at risk of further decline due, in part, to habitat fragmentation and degradation, as well as acute impacts from construction activities.

Fish Management Zone 2

The headwaters of the east branch of the upper West Don River (FMZ 2) are located on the last block of rural and potentially developable land in the watershed. Flow in the tributaries is intermittent, but standing pools may be connected during high flows. Little is known about habitat conditions in this zone, as there are no regional monitoring stations located within it. Some limited temperature data, together with the known species in these reaches, including blacknose dace and blacknose shiner, northern redbelly dace, and Johnny darter, mark this zone as a cool to warm water intermittent system. Although currently agricultural, the zone is expected eventually to be at least partially developed for industrial, commercial and mixed use residential land uses.

Figure 15: Thermal Regime



The Don watershed is the most heavily urbanized in southern Ontario, so it's not surprising that only two of 38 sites assessed were deemed to be "thermally stable" . The majority of even coldwater streams fluctuate widely in temperature.

Fish Management Zone 3

The third zone covers the rest of the upper West Don River, down to the G. Ross Lord Dam. Land use in this zone is dominated by industry (29%) and residential development (23%). Water temperatures are warm and moderately stable. In 2002 and 2003, this zone contained the only station at which benthic invertebrate analysis produced two years of "unimpaired" condition, indicating less impact from poor water quality and habitat degradation. However, an "unimpaired" condition was not measured in 2005. "Fair" IBI scores were most prevalent in this zone, ranked as the healthiest system in the watershed.

Fish Management Zone 4

FMZ 4 includes German Mills Creek and a portion of the upper East Don River from Center Street to south of Sheppard Avenue. The dominant land use is residential (55%), with corridors of natural cover along the watercourses. Thermal stability is "moderate" throughout the zone, except for the headwaters of German Mills Creek, which rated "stable" with coldwater conditions in the upper most section of the Creek. The majority of streams through this FMZ are

cool water, leading to warm conditions below Steeles Avenue. IBI scores range from fair (at the confluence of German Mills Creek and the Upper East Don River) to poor. Poor habitat conditions are likely a result of insufficient stormwater control leading to a loss of in-stream habitat and degraded water quality, and flooding due to undersized culverts. Recreational angling of stocked brown trout occurs in this zone. Rusty crayfish, an invasive invertebrate, has recently been found in the zone (2004), possibly resulting from baitfish release. Since barrier mitigation was completed at Pottery Road and in the York Mills area, stocked chinook salmon have reportedly been migrating up through this FMZ to Highway 7. Although stocked chinook salmon are returning to the river to spawn in the fall, there has been no assessment around spawning success or habitat suitability in the Upper East Don River tributaries.

Fish Management Zone 5

The fifth FMZ covers the entire watershed south of the 401, with the exception of Taylor/Massey Creek. There is some limited data to suggest cold or cool water habitat in the lower watershed within the tributaries of the West Don River which may be linked to groundwater inputs coincident with the Lake Iroquois shoreline. The thermal regime is moderately stable north of Lawrence Avenue and unstable in the Lower Don River. IBI scores are "poor" throughout the zone, apart from a “fair” rating at the confluence of Burke Brook and the West Don River. The dominant fish community is of tolerant warm water species (native and invasive). Fish habitat has been impacted by the high degree of urbanization, lack of stormwater control, and combined sewer overflows.

Fish Management Zone 6

The thermal regime of the sixth FMZ, Taylor/Massey Creek, is moderately stable. IBI scores are “poor” throughout the zone. Water quality within

Chinook salmon in the Don

Sensitive Aquatic Species

The fish communities within the Don watershed retain very few sensitive species, and those that remain are being impacted by increased flow velocities, turbidity and siltation. Although the general public may not be familiar with many of these species, they are significant indicators of biodiversity and the ecological integrity of the watershed. The redside dace is the only species in the table afforded official Species at Risk status by provincial and federal authorities.

Species	Sensitivity
American brook lamprey	❒ Turbidity, prefers clean water that’s free of silt ❒ Sensitive to environmental change and thermal warming
blacknose shiner	❒ Turbidity ❒ High flow velocity ❒ Locally rare, and in decline in North America
brook trout[1]	❒ Thermal warming (sensitive to temperatures >20°C, or > 13°C during spawning) ❒ Changes in groundwater discharge ❒ Silting
rainbow darter[1]	❒ Chemical pollution and siltation
redside dace	❒ Turbidity and high flow velocities ❒ Thermal warming (prefer range 24.5-24.7°C, with maximum 32.6°C) ❒ Sensitive to riparian disturbance as they feed on terrestrial insects ❒ Locally rare
mottled sculpin	❒ Temperature preference 16.6°C ❒ Turbidity

1. Indicator species for long-term restoration.

Taylor/Massey Creek is of particular concern. Sewer cross connections and overflows and leachate from closed or abandoned landfills are potential sources of contamination. Extensive channelization has impaired habitat conditions. A few tolerant cool water fish species inhabit this watercourse (including white suckers found spawning here in spring of 2007) which suggests the potential mitigation of poor water quality by groundwater discharges.

In-stream Barriers

There are 62 confirmed in-stream barriers to fish passage (including weirs, dams, pedestrian crossings, road or railway bridges, culverts or natural barriers) in the watershed, Eight of these are located in the Lower East Don River, 20 in German Mills Creek, and 34 in the Upper East Don River. Within the remaining watercourses, another 290 potential barriers to fish passage have been identified by air photo analysis and through site walks conducted in 2007. While the majority are road crossings that should not pose a hindrance to fish passage, field assessment is needed to confirm whether these structures are passable.

The Lower East Don River supports a tolerant, warm water fish community with low species diversity. However it also provides a migratory route for lake-run salmonoids. As a direct result of barrier mitigation projects in the subwatershed, migratory chinook salmon from Lake Ontario were found attempting to spawn in the Upper East Don River for the first time in 2005.

Report Card, Aquatic System

The management objective related to the aquatic system heritage is:

- ❒ Protect, regenerate and enhance the health and diversity of native aquatic habitats, communities and species.

Issue	Targets	Grade
Benthic Invertebrates (worms, insect larva and other organisms that live on the stream bottom)	❒ 10% of Regional Watershed Monitoring Program (RWMP) stations rate "unimpaired" using the Benthic Invertebrate Aggregate Assessment (BAA) ❒ Of the RWMP stations rated "potentially impaired" for BAA, at least 40% are dominated by moderately tolerant families (as opposed to pollution tolerant families[1])	F
Fish communities	❒ 100% of fish management zones (FMZs) have an Index of Biotic Integrity (IBI) rating of 'FAIR' or higher ❒ All near term indicator species of target communities, as identified in the *Don River Fisheries Management Plan* (FMP), are abundant and well distributed within each FMZ, relative to past conditions (see Chapter 5 for species)	F[2] D
Invasive species	❒ No new invasive and exotic species at RWMP and Lakefront Environmental Monitoring Program sites	A[3]
Aquatic habitat	❒ Thermal regime and stability supports the near term indicator species as specified in the *Don River FMP* ❒ Only strategic in-stream barriers remain, while other barriers have been removed or mitigated as identified in the *Don River FMP* ❒ 100% of total potential riparian (stream bank) zone (TPRZ) with natural cover ❒ 55% of TPRZ treed ❒ 35% of TPRZ with meadow vegetation dominant (focus on Upper West and Upper East Don subwatersheds) ❒ 10% of TPRZ with wetland cover	A C[4] C A F F

1. Pollution tolerant families are defined as chironomids, worms (tubificids, naidids),and isopods (asellids).
2. Rating based on only 5 FMZs as there is no RWMP site currently located in FMZ 2.
3. Benchmark for NEW invasive species established by the 2002 RWMP and LEMP sampling events.

Key Issues for the Terrestrial System

- Intensive development and the growing population of the watershed are having both direct and indirect impacts on plants, animals and their habitats.
- The quality and quantity of the terrestrial natural cover is inadequate to support biodiversity and ecosystem functions.
- The urban forest, including street trees, needs to be maintained and expanded, and its health safeguarded. Many urban trees are nearing the end of their lifespan, while invasive pests, pathogens, urban conditions and poor planting practices threaten the current stock.
- Invasive terrestrial species, plants in particular, threaten native ecosystems.
- Flooding and erosion, poor air quality, and increased heat island effects are impacting terrestrial natural cover.
- The potential future impacts of climate change on the terrestrial natural system and other urban vegetation are of concern.

3.8 Terrestrial System

The strength, breadth and diversity of the terrestrial natural heritage system is critical to the health of the watershed. The forests, meadows and wetlands (referred to as “natural areas” in this document) — and the plants and animals that inhabit them — help maintain the water balance and stream stability, protect aquatic ecosystems, provide wildlife habitats, moderate climatic conditions, absorb air pollution, improve aesthetics, provide recreation opportunities and generally improve the quality of life for our communities. The terrestrial natural heritage is the backbone of the watershed’s “green infrastructure”.

To maintain or improve ecological conditions in the watershed, a more robust terrestrial natural heritage system is needed. The overall goal is a natural system capable of supporting, over the long term, populations of the full range of flora and fauna species that occur in the watershed, including those of high sensitivity.

Natural Cover

Prior to European settlement, the Don River watershed was covered almost entirely with forest, interspersed with wetlands and some native meadows. Just over 200 years ago, Elizabeth Simcoe described a wilderness landscape with wolves, bald eagles, and runs of Atlantic salmon up the river.

Today, remote sensing and ground level surveys show that just 16% of the Don River watershed still has some kind of natural cover. Largely second and third growth forest covers 8.2% of the watershed, meadows and patches of

Facts & Figures

- Of the Don River watershed’s 36,000 hectares, just under 16% (or 5,656 ha) is classified as “natural cover”. This includes 3,130 ha of forest, 2,450 ha of meadow and just 77 ha of wetland.
- Since 1997, the woodland cover has grown from 8 to 9% of the watershed, meadow cover has doubled from 3.5 to 7%, and wetland cover has grown slightly from 0.14 to 0.2%.
- From 1996-2005, field staff identified 725 plant species -- 60% native species and 40% alien to the area -- that are regenerating naturally in the Don watershed.
- Invasive plant species that have spread through the watershed include purple loosestrife, European buckthorn, dog-strangling vine, garlic mustard and the common reed.
- TRCA surveys have also documented 109 different species of vertebrates: 83 breeding bird species; 12 types of snakes, frogs and salamanders; and 14 species of mammals.
- Vulnerable species include the porcupine, grey treefrog, spring peeper, wood frog, hooded merganser and veery.
- Over the last six years, an estimated 110,000 native trees, shrubs, wildflowers and aquatic plants have been planted throughout the watershed.

successional lands 7.3%, and the few remaining wetlands just 0.2%. The large scale loss of habitat has led to a decline in biodiversity in the watershed.

Amount of Natural Cover (ha) (2002)				
Subwatershed	**Wood-land**	**Wetland**	**Meadow**	**Total**
Upper West Don River	316	40	790	**1,146**
Upper East Don River	1,024	11	522	**1,557**
German Mills Creek	241	4	467	**711**
Lower West Don River	661	9	222	**891**
Lower East Don River	420	11	247	**678**
Taylor/Massey Creek	164	0.7	80	**245**
Lower Don River	304	2	122	**428**
Don watershed	**3,130**	**77**	**2,450**	**5,656**

Forest cover is greatest in the Upper East Don River (15.6%) and Lower West Don River (10.1%) subwatersheds, and lowest in the Upper West Don River (4.6%) and Taylor/Massey Creek (5.3%) subwatersheds. The two prevailing forest communities are sugar maple (associated with beech, oak and ash) and mixed forest (associated with hemlock, white pine, sugar maple and oak). There are patches of very mature forest and even old growth forest, such as in Sunnybrook Park and Crother's Woods, that play a key role in protecting biodiversity.

Not all the trees grow in the wild and natural areas of the watershed. The City of Toronto has about a 20% urban forest with some of the oaks and maples lining streets or shading backyards over 100 years old. This urban forest plays a valuable role softening the harsh impacts of urban land use on nearby natural areas, providing shade and moderating the urban heat island effect, improving the aesthetic appeal of neighbourhoods, and increasing evapotranspiration and reducing runoff.

Meadows are found in hydro corridors, on vacant properties in industrial areas, and in undeveloped areas in the northern portion of the watershed. They are most common in the Upper West Don River (12.9%) and German Mills Creek (10.9%) subwatersheds, and least common in the Lower Don River (2.5%) subwatershed.

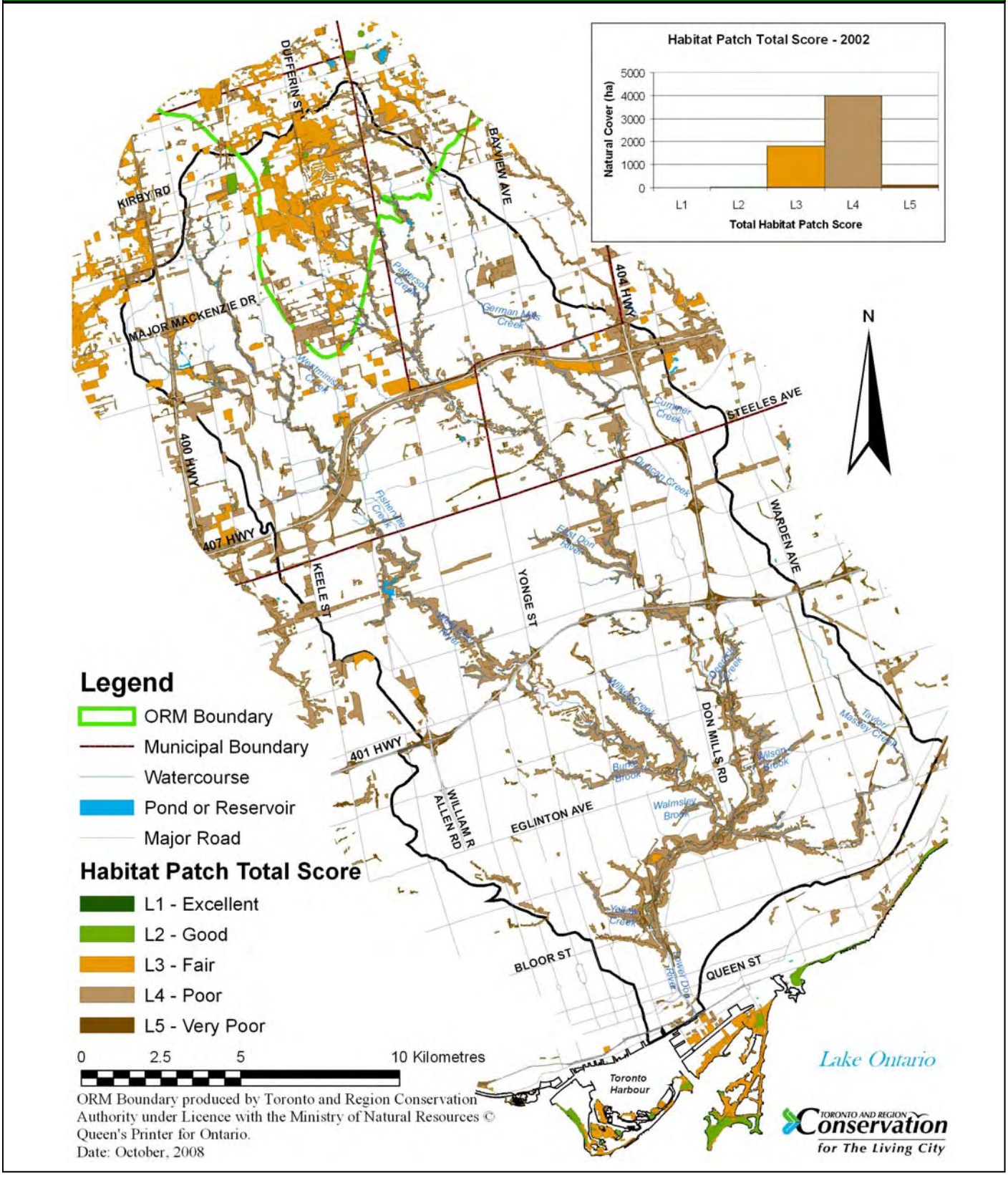
The few remaining wetlands and vernal pools, which survived the twin onslaughts of agriculture and urbanization, are distributed across the watershed. There are swamps and marshes scattered among seepage areas on the Oak Ridges Moraine, small deciduous swamps on the York University campus, and riparian oxbows at Todmorden Mills.

Overall, the quality of habitat in the watershed is considered "poor" (L4 category on Figure 16), based on small and narrow patches of the remaining natural habitat, as well as the negative environmental impacts that encroaching and neighbouring urban areas exert on these surviving ecosystems. Higher quality habitat patches, those ranked as "fair" to "excellent", are found more often in the northern portions of the watershed, where some undeveloped land remains and the *Oak Ridges Moraine Conservation Plan* (ORMCP) designations offer some protection.

Wood frogs are found in the Upper East Don

As population densities rise, natural areas are coming under increased stress by recreation seekers and other urban influences, both within and adjacent to natural areas, including littering and vandalism, dumping and encroachment, visitors trampling flora and compacting soils, predation by off-leash pets, and the ongoing disturbance of nesting and sensitive species.

Figure 16: Quality of the Existing Terrestrial System (2002)



Managing the impact of the surrounding urban matrix on natural areas will be critical to improving the resiliency of the terrestrial system.

Compounded by these stresses, native species are being replaced by exotics. Some 39% of flora species are non-native — including purple loosestrife, European buckthorn, dog-strangling vine, garlic mustard, and hybrid cattails — many of which are out-competing native varieties. Of the natural cover areas evaluated by TRCA staff, 20% were assessed as "severely disturbed" by exotics.

A number of vegetation communities of regional concern — such as examples of Dropseed Sand Barren and White Pine Coniferous forest — are found in the northern subwatersheds on the sandy soils of the moraine. Sensitive flora in the area includes round-branched ground-pine, goldthread, and balsam fir. Butternut, listed as endangered under the federal *Species At Risk Act*, also are found in the watershed. North of Teston Road where the last undeveloped land in the Don is found, fauna sensitive to development include gray treefrogs, spring peepers, and wood frogs.

While highly urbanized, the middle and lower reaches of the watershed still contain examples of vegetation communities of regional concern, including a Shrub Clay Barren on the clay soils of the mid-watershed, and relicts of Red Oak Savannah on the sandy shoreline and plain of glacial Lake Iroquois. Flora and fauna species of regional concern include hooded ladies' tresses in a mineral fen at Taylor/Massey Creek, tamarack in the East Don swamp, and mature forest species such as starflower, Indian pipe, and wood ferns in Sunnybrook Park. Red-backed salamanders are still found in mature forests throughout the watershed, and the steep ravines and valleys of the heavily urbanized middle reaches are home to breeding pairs of pileated woodpecker, pine warbler, and scarlet tanager.

Opportunities for significant additions to the terrestrial natural heritage system are limited and concentrated on the Oak Ridges Moraine and a small part of the South Slope, where provincial legislation currently offers some protection from urbanization through the ORMCP and the *Greenbelt Plan*. Much of the existing natural cover remaining in the watershed is protected via provincial legislation, TRCA's *Valley and Stream Corridor Policy,* and municipal ravine and tree protection bylaws. However, there are opportunities to improve the quality and connectivity of the system throughout; for example, the redevelopment of the West Don Lands and the naturalization works proposed for the mouth of the river.

Quality of the Existing Terrestrial Natural Heritage System

Subwatershed	Quantity						
	Total		L1	L2	L3	L4	L5
	ha	%	ha	ha	ha	ha	ha
Upper West Don River	1,146	19	0	18	149	923	56
Upper East Don River	1,557	25	0	14	751	765	27
German Mills Creek	711	18	0	0	79	579	52
Lower West Don River	891	14	0	0	8	843	39
Lower East Don River	678	12	0	0	2	608	68
Taylor/Massey Creek	245	9	0	0	1	222	23
Lower Don River	428	9	0	0	9	401	19
Don watershed	5,656	16	0	33	998	4,341	284

L# = Local rank, a score of habitat patch "quality" based on size, shape, and matrix influence, ranging from L1 (highest quality) to L5 (lowest quality) (TRCA, 2009g).

Report Card, Terrestrial System

The management objectives related to the terrestrial system are:

- Protect and expand the Terrestrial Natural Heritage System and improve connectivity among the watershed's forests, meadows, and wetlands.
- Regenerate the health of natural areas, and the whole urban landscape, to improve their quality, biodiversity, and ecological function.
- Manage the impact of human activities and neighbouring land uses on natural areas in the watershed.

Indicators	Targets	Grade
Quality of natural habitat	❒ Average total quality score of 7.2, based on habitat patch sizes and shapes, and the influence of the surrounding land use ❒ Maintain or reduce the ratio of natural areas deemed severely disturbed (by trail trampling, trash dumping, exotic species) to the total area	D TBD[1]
Quantity of natural habitat	❒ 13% natural cover across the watershed (minimum long term)	D[2]
Biological diversity	❒ Enhance native habitat and safeguard the presence of communities and flora and fauna species of concern ❒ Maintain viable populations of spring peeper, wood frog, and grey treefrog species in the Upper East Don River subwatershed	TBD[3] D

1. Baseline conditions have been established for 2000-2005 and will be used for future evaluations.
2. In 2002, the watershed had 16% natural cover. The long term target of 13% is reflective of losses in cover since 2002 and the exclusion of some existing cover from the target system (e.g., isolated patches, patches vulnerable to change of use, such as those in utility and highway right-of-ways). See Section 5.2.2 for additional explanation of the target TNH system. A "D" rating has been assigned to reflect the strong need to protect all existing natural areas and to buffer them from surrounding urban land activities.
3. Baseline conditions have been established for 1996-2005 and will be used for future evaluations.

Key Issues for Cultural Heritage

- There is an ongoing need to identify, preserve and celebrate archaeological sites, the watershed's built heritage, heritage trees and cultural heritage landscapes.
- A suitable central facility is needed for the storage, display and research of the archaeological artifacts recovered in the watershed.
- There is only limited public awareness of both the historical and current relationships between people and the watershed.
- Information needs to be shared between heritage professionals and culturally descendant populations regarding the interpretations and cultural significance of the heritage resources being preserved.
- The changing demographics of the region will influence the residents' relationship with the natural and cultural heritage features of the watershed, as well as their expectations for culturally sensitive services and amenities.

3.9 Cultural Heritage

Humankind has always been fascinated with its own history. The remnants of what's past continue to intrigue and educate us. Evidence of earlier human settlement, transmitted through the surviving remains of the built environment, heritage landscapes, archaeological artifacts – and the stories associated with them – is a non-renewable resource that illuminates both our past and present relationship with the environment.

For the purposes of this report, "cultural heritage" also includes living culture pursuits, such as art, performing arts and gardening that are a means of expressing present relationships with our environment.

Just as archaeology provides us with palpable physical evidence of the historic patterns of human habitation in the watershed (Figure 17), cultural ecology illustrates the symbiotic relationship that those people established with the land and water. Human settlement was dictated and directed by the availability of resources. While modern history is witness to the overuse and abuse of a deteriorating resource base, the earlier inhabitants of the watershed lived in greater balance with their environment. In a manner of speaking, the cultural ecology of that era is the study and recognition of prehistoric sustainability.

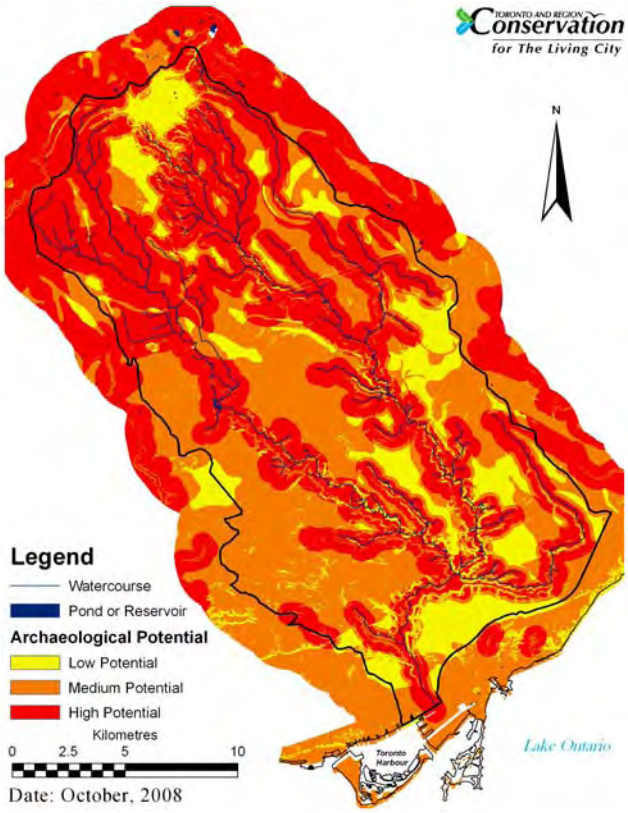
The human cultural heritage of the Don extends back more than 13,000 years to when First Nations groups moved into the watershed following the recession of the glaciers. Over the intervening years, the Don River has witnessed the successive waves of history: Aboriginal hunters and farmers were followed by explorers, traders, missionaries, soldiers and surveyors, and finally,

Facts & Figures

- Human settlement in the Don River watershed extends back 13,000 years to the retreat of the glaciers.
- Currently, there are 193 archaeological sites within the watershed that have been registered with the Ontario Ministry of Culture.
- The majority, 82%, of the 193 sites are aboriginal, while 18% are Euro-Canadian sites. Isolated finds, campsites, and homesteads are the most common sites.
- The Don Cultural Heritage Database lists over 4,900 buildings and other structures of historic interest in the watershed.
- This number has increased ten-fold since the database was established in the early 1990s.
- A majority (65%) of the buildings in the database are designated as protected. Almost all the rest (30%) are "listed" or deemed "of interest" (which is the precursor to listing).

Figure 17: Archaeological Potential
(based on 2003 data)

TRCA archaeologists have developed a model for predicting the archaeological potential of a site based on three variables – slope, drainage and distance from water.



settlers. They all came to rely on the river in some way: to find food, to earn a living, to make it their home.

Today, the river flows through the urban legacy of their cumulative efforts (Figures 17 and 18). But amongst this modern development, or buried beneath it, there still can be found the traces of the successive waves of humanity that passed through the watershed.

Currently, 193 archaeological sites within the watershed are registered with the Ontario Ministry of Culture (see the two tables on page 44). An archaeological site is considered to be “any property that contains an artifact or and other physical evidence of past human use or activity that is of cultural heritage value or interest”.

While many of the sites are isolated finds or small temporary camp sites, other larger sedentary sites may be considered more significant. One such example is the McGaw site in Richmond Hill. A Late Iroquoian Village from the 15th century, the site is unusual in that it was never disturbed by plowing for agriculture.

Many more sites were lost during earlier periods of intensive urbanization. Until relatively recently, construction was seldom preceded by an archaeological survey and site excavation. Current practices require such work to be done in advance of new development; therefore, there is the potential for some new sites to be discovered as greenfield development occurs in the upper reaches of the watershed.

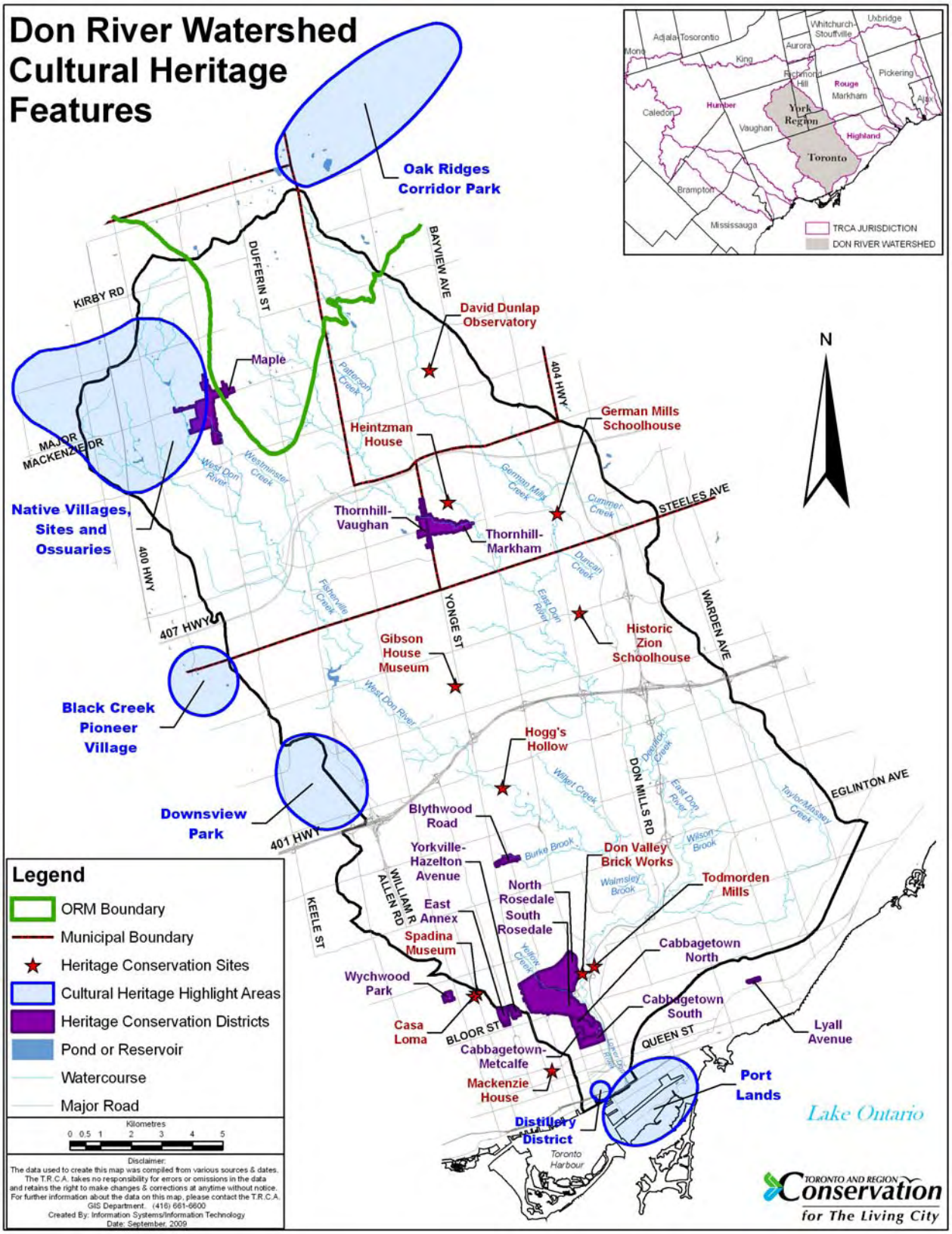
Post-aboriginal settlement has left a legacy of important heritage structures ranging from the Scadding Cabin of

Don Cultural Heritage Database, 2006

Municipality	Designated[1]	Listed	Building of interest[2]	Demolished or relocated	Other[3]	Total
Markham	75	45	-	0	21	141
Richmond Hill	28	230	-	0	39	297
Toronto	3,053	1,028	-	42	146	4,269
Vaughan	86	64	97	0	30	277
Total	3,242	1,367	97	42	236	4,984

1. These numbers may include hundreds of designated cultural heritage buildings that are clustered within the Heritage Conservation Districts.
2. Designation used by City of Vaughan to indicate properties which after further review or research may be determined to have cultural heritage significance; category is not applicable in other municipalities.
3. ‘Other’ built heritage includes parks, greenbelts, schools, cemeteries, mill sites, etc.

Figure 18: Cultural Heritage Features



Archaeological Sites	
Isolated Finds	67
Campsites	55
Homesteads	28
Undetermined Aboriginal	15
Villages	10
Burial sites	6
Middens	4
Cabins	4
Manufacturing site	1
Mill	1
Inn	1
School yard	1
Total	**193**

Cultural Affiliation of Listed Sites	
Archaic	27
Woodland	24
Multi-component	9
Historic, Euro-Canadian	43
Undetermined Aboriginal	90
Total	**193**

Report Card, Cultural Heritage

The management objective related to cultural heritage is:

- ❒ Identify, document, protect and celebrate the cultural and heritage resources of the watershed .

Issue	Target	Grade
Cultural heritage resources	❒ Increase the number of known, listed and designated archaeological and historical sites and built heritage features	C

1794, the oldest existing home in Toronto, to industrial sites like the Don Valley Brick Works and Todmorden Mills, and the various architectural styles in vogue as the original settlement of “muddy York” grew into the mega city of today. The sensitive renovation of the Distillery District has been a model of revitalizing heritage buildings without disturbing their architectural integrity. Another exciting find is the site of the first parliament of Upper Canada, which was burned by American forces during the War of 1812. The 1935 David Dunlap Observatory is a local landmark in German Mills Creek subwatershed. Part of the Observatory lands have been recommended by the Conservation Review Board for creation of a cultural heritage landscape under the *Ontario Heritage Act*.

The Don Cultural Heritage Database lists over 4,900 buildings and other structures of historic interest in the watershed (see the table on the opposite page). The original database, established in the early 1990s by the TRCA, contained just 418 listings. The distribution of listings by municipality is a function of both the cluster of historic districts and the proportion of watershed area that lies within the borders of each municipality.

Municipalities have recognized the importance of heritage sites, compiling lists and designating key sites under the *Ontario Heritage Act.* Whole neighbourhoods of older buildings have been designated as Heritage Conservation Districts, representing the streetscapes of earlier periods of urban growth (in Toronto’s Cabbagetown for example). These districts play a key role in protecting built heritage, as almost 95% of designated structures are located in such areas.

However, listings or designations do not provide irrevocable protection for heritage structures. While amendments to the *Ontario Heritage Act*, made in April 2005, give the Province and municipalities new powers to delay or even stop the demolition of heritage sites, designation by itself cannot prevent demolition. The amendments also increase the ability of the Province to identify and designate sites of Provincial heritage significance and to set clear standards and guidelines for preservation.

As the era of greenfield development of the Don draws to a close, the main thrust of the cultural heritage work will begin to shift from development-driven surveys and finds to preservation, interpretation and celebration of known cultural heritage resources.

Education is also a vital component in protecting the watershed's cultural heritage features. Improved public awareness of heritage resources and the stories they tell about the historic and current relationships between people and the watershed could help to build commitment to preserving heritage features.

Gibson House, an early Victorian farm house on Yonge Street

Living Culture

Not all our cultural heritage is historic. The Don River watershed contains hundreds of contemporary cultural resources. Some are facilities – pools, arenas, churches, hospitals, government buildings, golf courses, and parks – which provide services that meet individual and community needs and interests. Many other types of features and events also contribute to our contemporary cultural heritage: architectural landmarks, art galleries, libraries, museums, botanical gardens, cinemas, community centers, fairgrounds and festivals, and so on. In addition, special events, such as Paddle the Don and Richmond Hill's Mill Pond Splash, are annual events that celebrate and support the Don River through public and corporate participation.

The Evolving Mosaic

The role and impact of immigration continues to be seen in the changing cultural fabric of the watershed's residents. The evolving demographics of the region will influence the residents' relationship with the natural and cultural heritage features of the watershed, as well as their expectations for culturally sensitive services and amenities.

The prevalent ethnic origins of the watershed's 1.15 million residents are Canadian or British (30%), followed by Jewish (11%) and Chinese (11%) (2001 data). Of the recent immigrants to the Don (i.e., those who immigrated to Canada between 1996 and 2001), the predominant countries of origin were: China (14%), Iran (8%), Philippines (7%), Russia (6%), and Pakistan (6%). The remaining new immigrants came from over 35 different countries. Many new Canadians celebrate their cultural heritage and continue to practice their traditions. They are common users of local tourist destinations and natural spaces, and are often eager volunteers in events, such as tree planting, where they can begin to develop a sense of community.

Key Issues for Nature-based Experiences

- Rising population densities and limited opportunities for new or expanded parks are increasing the demand for and the pressure on existing greenspaces.
- Heavy use is negatively impacting sensitive areas, while disputes over conflicting or incompatible human uses are increasing.
- There is a lack of greenspace connectivity and gaps in the trail system both east-west and to the Oak Ridges Trail and the waterfront.
- Amenities should reflect the changing preferences of the new demographic — an aging population with increased cultural diversity.
- A desire for more sustainable community practices and a trend to live closer to work and schools will increase the demand for trails.
- There is a need to incorporate cultural heritage interpretation themes into nature-based experience programs.

3.10 Nature-based Experiences

With 1.2 million people currently residing in the watershed (2006) of the Don River, access to public greenspace is in high demand. The trails, parks and natural spaces, located primarily along the river and its tributaries, play many roles in the lives of local residents. Greenspaces provide a unique opportunity for observing and enjoying plants and wildlife 'up close', a vibrant venue for physical activity and recreation, and a calming environment for pursuing aesthetic enjoyment and spiritual renewal.

Available to everyone, public greenspace is also integral to the varied social and socio-economic landscape of the modern urban community. These areas may be especially important for residents – whether low income families or recent immigrants or high rise dwellers – who may not have the financial means, capacity or time to travel and who seek new and interesting activities closer to home. Whether it's hiking or biking, skiing in the winter or golfing in the summer, bird watching, practicing tai chi or simply enjoying a picnic, the greenspaces of the Don River watershed offer a low cost and convenient alternative to expensive cottages, vacations or club memberships.

People prefer to live close to greenspace areas. A survey of new home buyers in the GTA found that 77% ranked proximity to parks, outdoor or natural areas among the top factors in deciding where to live. Current public use trends also show that people are seeking individual unstructured activities that fit into their busy lifestyles such as hiking, running, and biking. Recreational activities carried out within greenspace and natural areas are expected to increase in popularity and the demand for such activities within urban areas is expected to surpass the supply.

Generally speaking, greenspaces are more natural and less disturbed in the

Facts & Figures

- Publicly owned valley and stream corridors and municipal parks currently cover some 2,850 hectares or 8.0% of the watershed.

Markham	178 ha
Richmond Hill	294 ha
Vaughan	299 ha
Toronto	2,080 ha

- If you include golf courses, hydro corridors and other private sites, there are more than 6,000 ha potentially available for nature-based experiences.
- There are about 2.5 ha of public greenspace per 1,000 watershed residents (based on 2001 population), considerably lower than the 22.6 ha for every 1,000 residents in the Rouge River watershed.
- Currently, 83.5% of the watershed's residential areas are located within two kilometres of a greenspace at least 10 ha in size.
- According to a recent GTA-wide poll of new home buyers, 88% of respondents cited walking and hiking as their favorite outdoor activities.
- There are 143 kilometres of publicly owned trails in the watershed: 13 km in Markham, 32 km in Richmond Hill, 26 km in Vaughan, and 72 km in Toronto.
- There are 12 golf courses in the watershed, covering a total of 412 ha of land.

northern reaches of the watershed, compared to the more urbanized mix of cultural and natural heritage landscapes in the south. However, relatively undisturbed areas including remnant old growth forests can be found in the ravines of the City of Toronto, well south of Steeles Avenue.

The nature-based experiences found in the Don watershed can be classified into three relatively distinct types (Figure 19):

The **Headwaters Forests** offer some of the most beautiful vistas and unspoiled natural areas in the watershed, including Maple Nature Reserve and the Baker Sugar Bush. However, development has progressed rapidly here in recent years and the remaining patches of greenspace are becoming surrounded by residential development. High levels of private land ownership will make the addition of new recreation areas problematic.

The **Valley-based Recreation Areas** provide a wide variety of environments, ranging from the dense, wilder landscapes of ravine parks, such as Sunnybrook Park, to the more open, regenerated industrial and residential areas through which the Bartley-Smith Greenway meanders. These greenspaces are among the most heavily used and are likely to see increased demand as population densities rise.

What is Greenspace?

"**Greenspaces**" are defined as all *publicly-owned* land available for nature-based recreation, including municipal parks and conservation lands, and valley and stream corridors. This does not include golf courses, cemeteries, and municipal parks intended for intensive recreational use. Golf courses are addressed in the section on Land and Resource Use. "**Natural areas**" are defined as areas with natural cover – forests, meadows and wetlands – regardless of land ownership.

Industrial Heritage Sites, such as Todmorden Mills, the Don Valley Brick Works and the Port Lands, are often the ideal location for environmental education and stewardship programming, as well as community events and festivals. Redevelopment of former industrial sites allow us to celebrate our cultural heritage, regenerate greenspaces, and showcase the links between the historical development of our communities and the Don River.

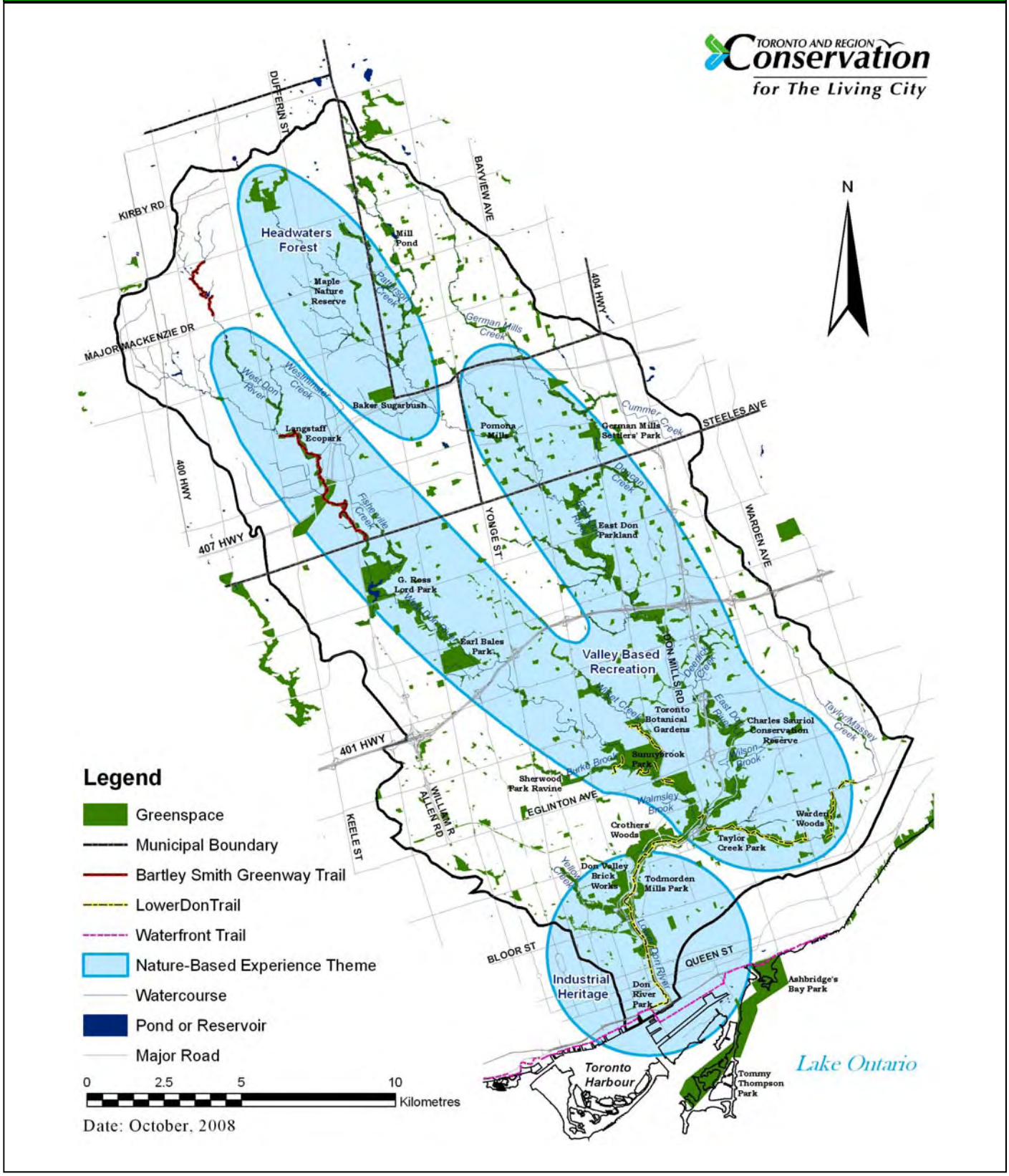
There is more greenspace in the southern portion of the watershed than in the north. Because that greenspace tends to be located in ravines and valley lands, and the southern watershed is marked by wider and deeper valleys, development was difficult and much of this land has remained available for greenspace. In the northern, upstream areas of the watershed, the valley corridors are more narrow and shallow, relative to those in the south.

Overall, access to greenspace is better in the lower watershed than in the upper. In order to maintain adequate access, the existing greenspace must be protected and, where possible, expanded. Preservation and on-going maintenance of those greenspaces will be vital as increasing population densities increase the pressures on those lands.

One of the most popular places to experience the natural environment and to be physically active is the trail system. Some even use the trails to get to and from work or school by bicycle or foot. Improving the network will facilitate a shift to active forms of transportation and connect residents with the watershed as a whole. A continuous trail system that stretches north-south as well as east-west will provide users with the most rewarding experiences. Gaps in the trail system, particularly around golf courses and other private lands, need to be addressed.

New signage for watercourse crossings in the Don

Figure 19: Nature-based Experience Theme Areas and Existing Inter-regional Trails



Report Card, Nature-based Experiences

The management objectives related to nature-based experiences are:

- ❒ Connect people and places in the Don River watershed.
- ❒ Protect and regenerate natural areas and greenspaces for nature-based experiences.
- ❒ Celebrate the natural and cultural heritage of the watershed.

Issue	Targets	Grade
Access to greenspace	❒ Maintain or increase the number of hectares of greenspace per 1,000 residents. ❒ Maintain or increase the percentage of residential areas within two kilometres of greenspaces at least 10 ha in size.	C
Provision of formal trails	❒ Approve and build 100% of planned local trails. ❒ Create connections between trails in adjacent watersheds, the Oak Ridges Moraine and Lake Ontario waterfront.	C

Increased Demand

Increasing pressure on the watershed's greenspaces is anticipated as development intensifies and population densities continue to rise in the region. More intense use of a limited resource will exacerbate the already difficult challenges of maintaining park and trail facilities, mediating conflicts between user groups, and protecting the ecological integrity of natural areas.

Ten years ago, 800,000 people lived in the watershed of the Don River. By 2006, that number had grown to 1.2 million. At the same time, opportunities for adding new greenspace are limited. While some future land acquisitions are still possible in the northern sections of the watershed, expansion of greenspace in the already-built majority of the watershed is unlikely. In the southern reaches, access to the Lower Don Trail is severely limited and users have cut holes in the fencing to access the greenspace.

Addressing this challenge will require creativity in finding ways to increase our supply of greenspace. One consideration will be looking at multi-use facilities where there are competing interests for the same location. For example, a green roof design for an apartment complex could include picnic space or a running track to provide recreation value to residents. Managers must also be prepared to cope with evolving patterns of user preferences as a result of changing population demographics and an increased focus on adopting a healthier lifestyle.

Tread a Little More Lightly

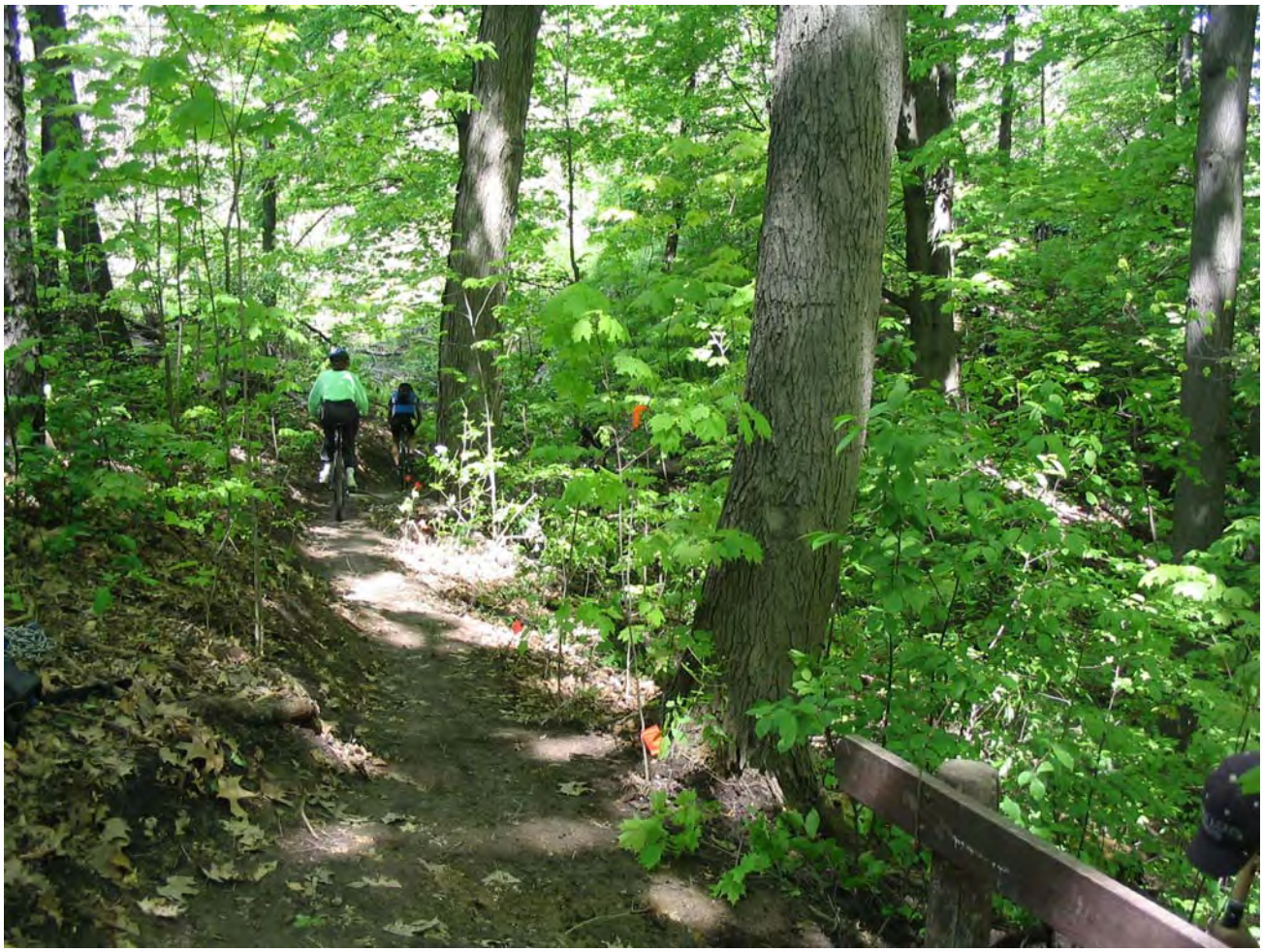
Too many people crammed into too few greenspaces can trample plants, compact soils, erode unstable stream banks and otherwise damage the natural environment. In addition, heavy park use inevitably increases littering, uncollected pet wastes and the threat of vandalism. Informal hiking and bike trails have proliferated in some areas; these need to be identified and steps taken to reduce their impact on sensitive natural areas evaluated.

Reconcile Multiple Uses

Some visitors come to a park for solitude and quiet; others come for boisterous picnics and energetic family fun. Where uses collide, there can be ongoing conflicts between, for example, hikers and mountain bikers, team sports and bird watchers, dog walkers and people uncomfortable with unleashed pets, and even between park users and neighbouring land owners. As the population of the region continues to grow both older and more culturally diverse, parks must also strive to continue to meet the changing and evolving expectations of users.

And Make a Green Connection

The aim is to create a network of interconnected trails across the watershed that links together local and regional trails. There is also a need to improve connections with trails in the neighbouring Humber and Rouge watersheds, with the Oak Ridges Trail to the north, and with the Lakefront Trail to the south.



Bikers enjoying a trail through Crothers' Woods in Toronto (Photo credit: Keri McMahon)

Key Issues for Land and Resource Use

- Redevelopment and intensification projects, including those in the four urban growth centres identified by the Province, pose the greatest threat to the environment of the watershed, but also pose the greatest opportunities for net gain in environmental condition.
- The sustainability of the urban form must be considered and improved during development, redevelopment and infilling, as well as during infrastructure replacement and repair.
- Competition for land means there is little left for expanding the natural heritage system and improving stormwater management in redevelopment areas.
- Development in the northern areas of the watershed is compromising headwater drainage features and threatening small streams.
- Widespread medium-density residential development has increased dependency on cars, traffic congestion and vehicle emissions.
- Greater attention to sustainable resource use would produce both direct and indirect environmental benefits throughout the watershed.

3.11 Land and Resource Use

Approximately 80% of the Don River watershed is now devoted to various urban land uses, with 4% remaining in rural use and about 16% under natural cover. The watershed extends over 36,042 ha (about 36000 ha or 360 km^2), covering parts of the City of Toronto, as well as the City of Vaughan, the Town of Markham and the Town of Richmond Hill in the Regional Municipality of York. Steeles Avenue is the boundary between the City of Toronto and York Region, running east-west through the center of the watershed.

According to the 2006 census, the watershed is home to 1.2 million residents. Between 2001 and 2031, the City of Toronto's population is expected to grow by about 20% and York Region's population is expected to double. Much of this population growth is expected to be accommodated through intensification and redevelopment projects in existing urban areas. The province's *Growth Plan for the Greater Golden Horseshoe* (Ontario Ministry of Public Infrastructure Renewal (OMPIR), 2006) designates four urban growth centres within the watershed: Downtown Toronto, the Yonge-Eglinton Centre, North York Centre and Richmond Hill-Langstaff Gateway (Figure 20).

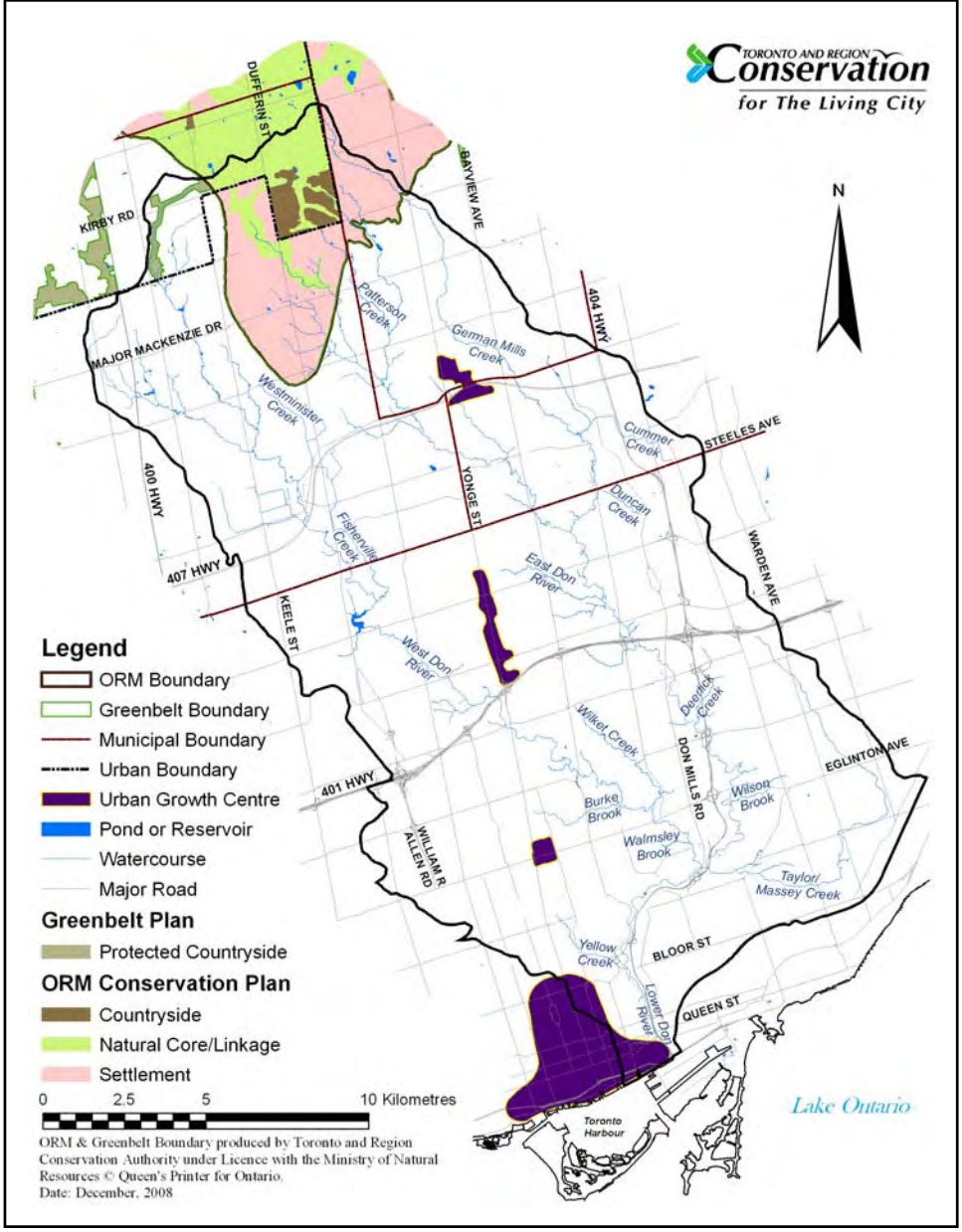
In total, 46.8% of the watershed is already devoted to residential development (Figures 21 and 22), which is fairly evenly distributed. Medium-density residential areas, including single detached homes, semi-detached homes, and townhouse complexes, cover 41.2% of the watershed. High-density residential lands, including townhouses, apartments and condominium complexes cover another 5.6%.

Facts & Figures

- Since 1994, the population of the Don River watershed population has grown from 800,000 to 1.2 million.
- Between 2001 and 2031, the City of Toronto's population is expected to grow by about 20%, and York Region's should double.
- Almost half of the watershed is already devoted to housing, and a fifth to industrial, institutional or commercial development.
- Ontario has designated four urban growth centres within the watershed: Downtown Toronto, the Yonge-Eglinton Centre, North York Centre and Richmond Hill-Langstaff Gateway.
- There is little undeveloped land left in the watershed. Agricultural and vacant lands covered just 7.7% of the watershed in 2002.
- According to Statistics Canada (2001), over 80% of York Region residents drive a car, truck or van to get to work. The percentage drops to 52% in Toronto.
- Public transit was used by 33% of Toronto residents and 9% of York residents.
- By 2006, York Region had increased its waste diversion rate to 41%. In 2005, Toronto's diversion rate was 40%.
- The City of Toronto treats 1.3 billion litres of wastewater daily, at four wastewater treatment plants, only one of which is located in the watershed.

At 15.7%, the next most prevalent type of land use in the watershed is natural heritage, consisting of forests, meadows, successional lands, and wetlands. Forests are generally found along the valley and stream corridors, while meadows and successional lands tend to be located near industrial areas and along transportation corridors. Wetlands are rare in the watershed, having largely been drained or developed.

Figure 20: Special Land Use Policy Areas



Various industrial uses account for 11.4% of land cover. Industrial areas are characterized by large warehouses, combined industrial/commercial buildings with flat roofs, storage yards and transfer stations, and large parking and circulation areas. Industrial development dominates in the western portion of the watershed, as far south as Eglinton Avenue and north to Rutherford Road in Vaughan. Additional industrial parks are found along valley corridors in the City of Toronto, mainly south of Highway 401 and in a patch at the eastern edge of the watershed north and south of Steeles Avenue. Notably, the watershed hosts a portion of the Port Industrial Area of Toronto in the Lower Don.

Together, institutional and commercial land uses cover another 9.4% of the watershed and are fairly evenly distributed. These include office buildings, big-box store complexes, variety stores, restaurants, and public facilities. Many of these facilities are characterized by vast parking areas and manicured greenspace. York University, located along the western edge of the watershed, and the Canadian National Institute for the Blind, both in the Lower West Don River subwatershed, are the largest institutional uses.

Urban open space covers 2.9% of the watershed, encompassing manicured and maintained urban areas, including some treed areas, open park areas and large boulevards. An additional 1.5% of the watershed is devoted to recreational land uses, including recreation centres, sports play complexes, and their grounds. Golf courses cover 1.1% of the watershed's land area, and are all located adjacent to watercourses.

Figure 21: Land Use in the Don River Watershed (2002)

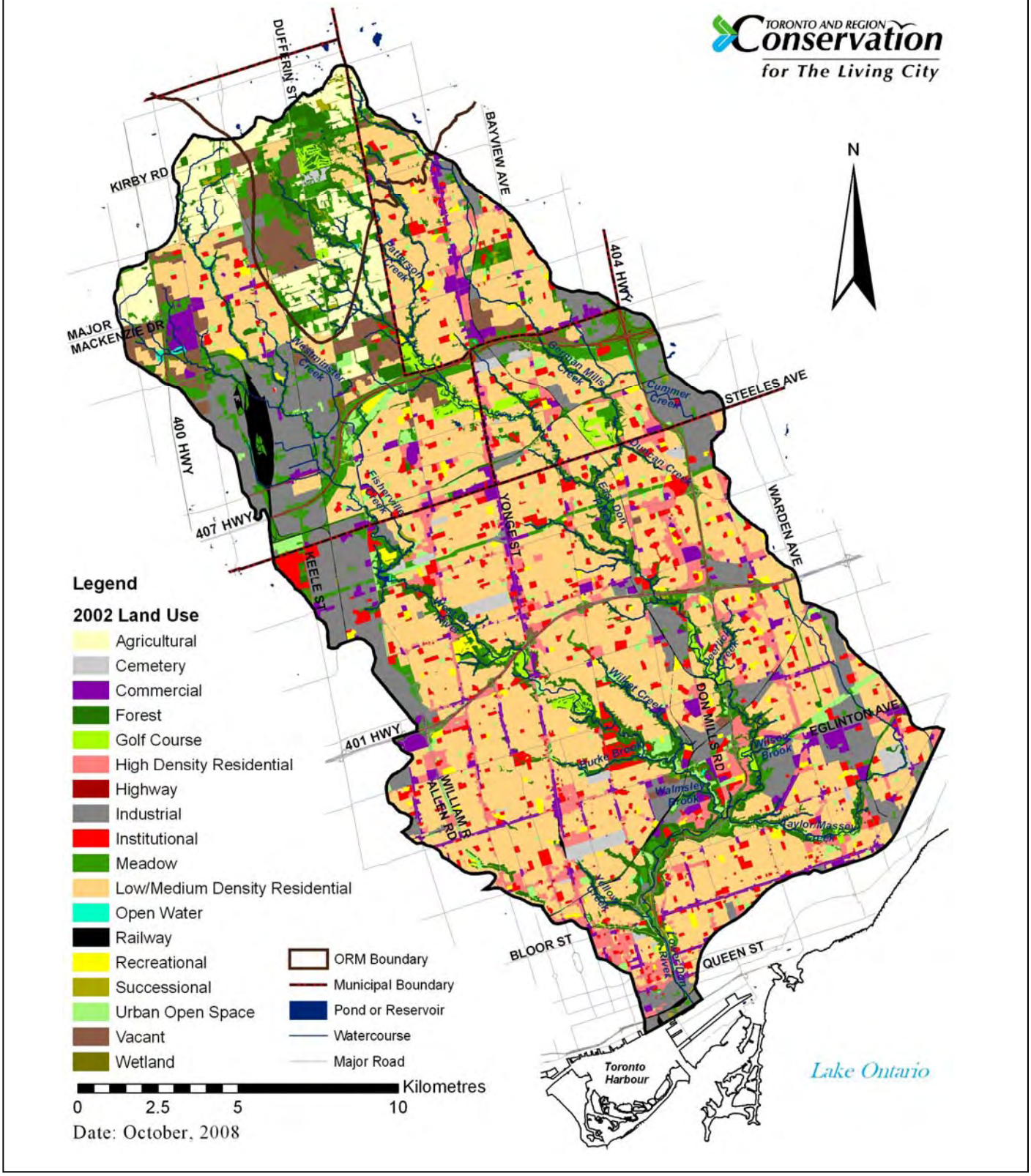
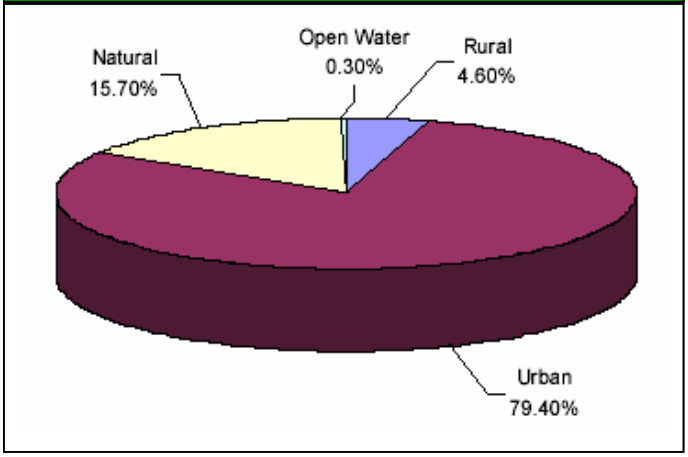


Figure 22: Land Use (2002)



Land Use (2002)

Land Use	Hectares	Percent
Medium-density residential	14,850	41.2
High-density residential	2,009	5.6
Residential, Total	**16,859**	**46.8%**
Industrial	4,096	11.4
Institutional	1,796	5.0
Commercial	1,585	4.4
IC&I, Total	**7,477**	**20.8%**
Forest	2,936	8.2
Successional	191	0.5
Meadow	2,452	6.8
Wetland	77	0.2
Total, Natural Heritage	**5,656**	**15.7%**
Agricultural, cultivated	1,382	3.8
Agricultural, pasture	282	0.8
Vacant	1,104	3.1
Total, Undeveloped Land	**2,768**	**7.7%**
Urban open space	1,041	2.9
Recreational	559	1.5
Golf course	412	1.1
Cemetery	375	1.0
Open water	106	0.5
Total, Other	**2,493**	**7.0%**
Highway	430	1.2
Railway	359	1.0
Total, Transportation	**789**	**2.2%**
Total, Watershed	**36,042**	**100%**

Many major transportation routes pass through the Don River watershed. The 400 series highways, rail lines, and rail transfer stations account for 2.2% of land use in the watershed. The Don Valley Parkway runs through the river valley itself from the mouth to Don Mills.

There is little undeveloped land left in the Don River watershed. Agricultural lands covered just 4.6% of the watershed in 2002; vacant lands accounted for 3.1%. Construction is underway on already-approved development on at least 2,155 ha of land (6% of the watershed) shown as undeveloped or rural in 2002.

The remaining rural areas consist of two full blocks east of Dufferin Street, both north of Teston Road), and three partial blocks (all on the northern side of Kirby Road), in the upper part of the watershed. There are no “greenfield” land parcels available for new development in the Toronto portion of the watershed.

Unless the sustainability of the urban form receives far greater consideration and support, the development of the few remaining vacant patches in the northern reaches of the watershed, coupled with the redevelopment of existing urban areas, is certain to place increasing negative pressure on the ecosystems of the Don River watershed.

Improving Sustainability

More and more, the challenge is shifting from promoting sustainable forms of new development to encouraging retrofit of existing development, as well as supporting the application of state-of-the-art green building practices during redevelopment and infilling. With little undeveloped land left in the Don, the best opportunities for improving stormwater control, protecting and enhancing terrestrial natural cover, remediating flood vulnerable areas, creating new greenspaces and trails, and reducing resource use, will come during redevelopment.

While much of this work involves the support and participation of municipal, regional and provincial authorities, valuable contributions can be made by local businesses and residents. Each of us can reduce the size of our environmental ‘footprint’ by, for example:

- ❒ Considering more naturalized landscaping and alternative plantings.

- ❒ Disconnecting downspouts and investing in stormwater management systems.
- ❒ Planting trees to maintain and expand the existing urban forest.
- ❒ Storing and using rainwater for lawn watering and irrigation.
- ❒ Installing porous surfaces (flagstone, gravel, slated wood decking, etc.) and using mulch, where appropriate.
- ❒ Supporting public transit, car pooling, bike lanes and other means of reducing reliance on the automobile.
- ❒ Investigating energy conservation, new 'green roof' technologies and other sustainable building practices.

As stated above, the top land use challenge is to incorporate improved stormwater management facilities into the new development, redevelopment and intensification planned for the watershed. Each new project should also accommodate adequate protections and allowances for the terrestrial, aquatic and cultural heritage of the watershed, as detailed in this document. Additional land use challenges to be met include the following.

- ❒ There are limitations on redevelopment and intensification in flood prone areas, such as Enford Road in Richmond Hill.

Report Card, Land and Resource Use

The management objectives related to land and resource use are:

- ❒ Improve sustainability in urban form at community and building site scales.
- ❒ Practice sustainable resource use by individuals, households, businesses, institutions and governments.

Indicators	Targets	Grade
Transportation	❒ Increase the number of public transit trips per person, per year ❒ Decrease the percent of single person trips to work made by car, truck or van	C C
Green buildings	❒ 100% of new or retrofit public buildings designed to achieve green building certification	C
Water demand	❒ Less than 10% of mean annual base flow allocated for withdrawal ❒ No known risks associated with surface water takings ❒ Reduce peak and average day demand by municipalities by at least 10% of projected levels	B C C
Solid waste diversion	❒ 60-75% of residential solid wastes in York Region, and 100% in City of Toronto diverted from landfill by 2010	C
Energy sources and demand	❒ Meet Ontario target of 10% of total energy demand from renewable sources ❒ Reduce energy demand by 15% per capita per year	C C

- ❒ There is a need to protect headwater drainage features and small streams during the remaining greenfield development.
- ❒ Top soil stripping is exacerbating erosion and runoff: Development on large "greenfield" sites is typically preceded by site preparation works that entail stripping top soil often long before construction commences, leaving land vulnerable to the effects of wind and rain that carry sediment to adjacent watercourses and other natural features. In addition, sediment control on infill sites is important.

- Development is not public transit friendly: The substantial proportion of single family low density residential developments in the upper part of the Don watershed has resulted in subdivision designs and population densities that cannot easily support public transit. Often, adequate public transit is not provided until long after residents have moved into a new subdivision. This contributes to traffic congestion, poor air quality, and the proliferation of impervious surfaces associated with roads, driveways, and parking areas. Planned improvements to transportation in the Don (e.g., expansion of a subway line into Vaughan, the Highway 407 Transitway, and Light Rail Transit in Toronto) and will help to mitigate the current situation.

- Watercourse road crossings may hinder natural form and function: Many existing crossing structures were designed and constructed with narrow openings that did not accommodate regional storm flood flows, pedestrian passage, wildlife passage, or the natural meander belt of the subject stream. New crossings are encouraged to span the meander belt to address these concerns.

Newly developing residential communities on and just south of the Oak Ridges Moraine are higher density than many older residential developments

4.0 Future Conditions

The Don watershed offers unique opportunities, most notably regeneration and revitalization of the Mouth of the Don at the centre of the Greater Toronto Area. The Don is well positioned to become a high profile, internationally-recognized testing ground for new technologies and practices in urban watershed regeneration.

Currently, natural systems are degraded and municipal infrastructure (water, sanitary sewers, stormwater sewers and facilities, trails) – the backbone of our communities – continues to be threatened by age, lack of maintenance, and erosion and degradation in the valleys. Further changes to stream form are expected in already built areas, because the stream banks are still adjusting to new patterns of stream flow caused by previous development. Approved development in the upper subwatersheds continues to be built up to the boundaries of the Oak Ridges Moraine protected areas. The “whitebelt” blocks north of Teston Road and west of Keele Street are the only portion of the watershed currently outside the urban boundary, and those lands are likely to be at least partially urbanized to accommodate growth mandated by the Province’s *Growth Plan for the Greater Golden Horseshoe* (OMPIR, 2006).

Municipalities in the watershed are already working to address the most pressing challenges in the Don – improving stormwater management and protecting and enhancing natural areas and greenspaces. Redevelopment of existing urban areas – in particular associated with the four provincially-designated Urban Growth Centres (Figure 20) – offers opportunities for sustainable technology demonstration and evaluation and improvement in watershed conditions. Municipal growth planning and sustainability initiatives aim to use new techniques to soften the impact of growth and intensification on the watershed and its communities.

These opportunities provide us with valuable tools to help address concerns with current watershed conditions, manage negative impacts from future land use changes, and adapt to the uncertainties associated with global climate change.

Management Options

To help develop an understanding of how the watershed might react to changes in environmental practices and land use in the future, two potential future scenarios were developed, modelled and analyzed, to compare their impacts on watershed conditions and assess the relative effectiveness of management approaches. The modelling focused on the portion of the watershed north of Steeles Avenue, as the City of Toronto’s *Wet Weather Flow Management Master Plan* (WWFMMP) (MMM, 2003) incorporated extensive modelling of the Don watershed south of Steeles Avenue (see Chapter 5 for a summary of WWFMMP priorities).

The land use scenarios included existing (2005) land uses, and full build-out

Highlights

- The era of greenfield development is drawing to a close as the watershed approaches full "build-out".
- Redevelopment and intensification of development is expected throughout the watershed, but is likely to be concentrated in the watershed's four provincially-designated Urban Growth Centres.
- Watershed conditions continue to degrade in response to current levels of urbanization.
- Long-term implementation of sustainable practices (such as stormwater source, conveyance and end-of-pipe controls, and the protection and expansion of the urban forest) through retrofits and redevelopment could improve the water balance, with resulting benefits to water quality, flood control, fish habitat, and infrastructure at risk from erosion.
- Implementation of sustainable practices also may aid adaptation to changing conditions as a result of global climate change.

Management Options

Scenario #1: Future Conventional Stormwater Management Scenario (FC)

- ❒ New urban development with "business as usual" end-of-pipe stormwater controls, such as ponds
- ❒ No stormwater management retrofit measures (source, conveyance or end-of-pipe) within existing built up areas (except approved infiltration practices existing on the ORM)
- ❒ Protection of natural cover (13% of watershed, based on the Target Terrestrial Natural Heritage System (Figure 25))

Scenario #2: Future Sustainable Community Scenario (FSC)

- ❒ Stormwater source control measures implemented within existing built-up and newly developed areas (including green roofs, rainwater harvesting, and the engineered infiltration of runoff from roof, parking and roadway surfaces)
- ❒ Pollutant reduction from source controls
- ❒ New urban development with end of pipe storm-water controls, such as ponds
- ❒ Stormwater pond retrofits within existing built up areas as identified in municipal studies
- ❒ Protection of natural cover (13% of watershed, based on the Target Terrestrial Natural Heritage System (Figure 25)), expansion of the urban forest, and backyard naturalization

More detailed information on assumptions made for Scenario #2 is in Appendix H.

of approved development as per existing official plans, including a partial build-out of the "whitebelt" lands not protected by the *Greenbelt Plan* and *Oak Ridges Moraine Conservation Plan* (Figure 20). Environmental measures such as enhanced stormwater management and protection and expansion of natural cover were super-imposed on a future land use scenario.

The two scenarios modelled for the upper Don River watershed were the Future Conventional Stormwater Management Scenario (FC), also known as the "business as usual" scenario, and the Future Sustainable Community Scenario (FSC). Each are summarized in the sidebar above. More details on the characteristics and assumptions in the FC and FSC scenarios are available in a separate report (*Upper Don River Watershed Sustainable Stormwater Management Study*, XCG Consultants Limited, 2009) and in Appendix H (FSC Scenario).

The intent of the modelling studies was not to predict specific future conditions, but rather to help us compare different management scenarios, ascertain the types of change that might occur and identify areas of relative sensitivity in the watershed. Modelling was just ONE source of information. To complement it, we examined existing conditions and trends in the watershed, reviewed watershed research in other areas, and used the best professional judgment of a range of experts in many fields. This multi-faceted process of analysis and synthesis increased our understanding of possible future conditions. Here are some of the highlights. For more detailed results, consult the technical report (XCG Consultants Limited, 2009).

Future Conventional Stormwater Management Scenario

Most urban growth in the next five to ten years will occur in the Upper East Don River subwatershed, as already approved development is built on the Oak Ridges Moraine, and in the whitebelt land in the Upper West Don River subwatershed (north of Teston Road). New development is largely expected to be residential, with some open space and mixed commercial land uses. Redevelopment will occur throughout the watershed, but probably most noticeably in

the provincial Urban Growth Centres, one of which, Richmond Hill-Langstaff, is located in the Upper East Don River subwatershed at Yonge Street and Highway 407 (Figure 20). The remaining three Centres are in the City of Toronto.

As shown in Chapter 3, the key to understanding environmental conditions in the watershed is to understand the water budget, or the annual balance between infiltration, evapotranspiration and surface runoff. Because urbanization increases the amount of impermeable (or hard) surfaces, it alters the water balance by intercepting precipitation that would otherwise infiltrate and become groundwater or evaporate into the air, and converting it to surface runoff. This results in major increases in the amount of flow in rivers and streams.

The modelling study in the upper Don watershed shows that the following changes can be expected as a result of using conventional approaches to stormwater management and development. They apply to build-out according to municipal official plans, approved development, and projected "whitebelt" development:

- Rising imperviousness of land cover to highs over 60% in some industrial sub-basins. Under this scenario, all but one sub-basin in the Don would exceed the 10% imperviousness threshold generally associated with "non-supporting" stream quality (Center for Watershed Protection, 2003). Increased imperviousness has been associated with altered stream flows, increased downstream flooding, destruction of habitat, alteration of streambeds, increased erosion and sedimentation, widening of stream channels and degraded water quality.

- Increases in total annual flow volumes in rivers and streams due to increased runoff in proportion to the degree of upstream development and impervious cover. The largest increases in flow are expected in the "whitebelt" and in tributaries draining off the Oak Ridges Moraine, where some of the remaining high quality fish habitat currently remains.

- Increases in erosion potential by as much as 60%, despite implementation of stormwater ponds in new development. Percent increases were highest in the tributaries of the Upper East Don River draining off the Oak Ridges Moraine. This will affect channel stability, create new erosion sites and exacerbate existing problem sites, further threatening infrastructure in the valleys.

- Minor changes in water quality in streams and rivers, with marginal increases in loading of total suspended solids and *E. coli.*

Future Sustainable Community Scenario

The combination of implementing sustainable community initiatives in both existing urban areas and new greenfield development, enhanced stormwater management and increased natural cover, as applied in the Sustainable Community scenario, could reduce the negative effects of urbanization described above, but will not fully offset them. The following changes can be expected as a result of implementing an aggressive suite of stormwater source controls and expanding the urban forest.

The Sustainable Community scenario is expected to improve the water balance by enhancing groundwater recharge and reducing surface water flows, as follows:

- Increases in recharge (over existing 2005 conditions) are highest (over 50%) in industrial sub-basins, where mitigation of hard surfaces is widest spread. Improvements (over 25% increase) also are expected in residential sub-basins (e.g., north German Mills Creek, Pomona Creek, and a tributary of the West Don River running off the Moraine) where soils are more conducive to infiltration. Improved recharge will help to maintain baseflow and water temperature regimes, and support stream habitat.

- Surface runoff is reduced (over existing 2005 conditions) by over 20% in industrial sub-basins in the Upper West Don River and German Mills Creek subwatersheds, Reductions in runoff over the FC scenario are expected in sub-basins where existing populations of redside dace (a species listed as endangered under provincial legisla-

tion), are found (e.g., 10% reduction in flows in tributaries of the Upper East Don River on the Oak Ridges Moraine and 15% reduction in Patterson Creek). Improved water balance in these tributaries will help to maintain habitat relied upon by the redside dace.

Moderate reductions or more modest increases (than the FC scenario) in erosion potential are expected – most notably south of Highway 407. While erosion will remain a problem, reductions in erosion potential may delay or moderate impacts on municipal infrastructure (e.g., water and sewer mains, trails), channel stability and aquatic habitat, as substantial implementation of the scenario is achieved in the long run.

Under the Sustainable Community scenario, enhanced infiltration and evapotranspiration could result in reductions in the "effective" imperviousness of several sub-basins (i.e., offsetting). Effective imperviousness estimates attempt to account for the fact that where surface runoff from impervious surfaces is redirected into infiltration or evapotranspiration technologies (as is the case in the FSC scenario), then such impervious areas no longer have the same direct impact on local watercourses. Effective imperviousness may be held below or close to the 10% threshold for aquatic system health (Center for Watershed Protection, 2003) in northern tributaries of the Upper East Don River (5-9%), which may in the future serve as recovery habitat for redside dace, and in the whitebelt (11-15%) where aquatic habitat is currently high quality. Maintaining these headwater systems will help to maintain aquatic biodiversity and have downstream benefits.

Substantial reductions in peak stream flow rates and possibly in severity of flooding in flood prone areas could be realized. Relative to the FC scenario, the Sustainable Community scenario resulted in modelled reductions in peak flows of up to 18% for frequent storms (2-year design rainfall event) and up to 11% for the 100-year storm. Benefits were strongest in the Upper West Don River subwatershed.

Modest improvements to water quality (at Steeles Avenue):

- Concentrations of *E. coli* exceed Provincial Water Quality Objectives 100% of the time in all subwatersheds for all scenarios (including current conditions). The Sustainable Community scenario reduces median concentrations relative to the FC scenario by 40% in the Upper West Don River, 31% in the Upper East Don River, and 37% in German Mills Creek. Total annual loads were reduced by 29% in the Upper West Don River, 36% in the Upper East Don River, and 37% in German Mills Creek.

- Reduced annual loadings of total suspended solids (TSS) (relative to the FC scenario) by about 30% in all three major subwatersheds. Improvements in TSS are particularly important for long-term aquatic indicator species sensitive to sediment (e.g., rainbow darter, a long term indicator species for many FMZs in the watershed (see Chapter 5)).

- Reduced annual loadings of phosphorus (relative to the FC scenario) by over 20% in the Upper East Don River and German Mills Creek.

- Reductions in the amount of time the Provincial Water Quality Objective for copper is exceeded (relative to the FC scenario) in the Upper East Don River (from 24% of the time to 16%) and German Mills Creek (from 32% to 24%).

- The FSC scenario is complementary to the City of Toronto's WWFMMP. Reduced loadings of pollutants to the Don River may have downstream benefits to the City of Toronto and Lake Ontario. Any improvements seen in the Lower Don River, as a result of implementation of the FSC scenario, would increase the odds of successful implementation of Toronto's WWFMMP.

Results of the Sustainable Community scenario modelling have helped to identify priority sub-basins for implementation of stormwater source controls (e.g., rain harvesting, green roofs, infiltration) (see Chapters 5 and 6). Chapter 5 also presents a summary of recommended stormwater source and conveyance controls for the City of Toronto portion

of the Don River watershed, as detailed in Toronto's *Wet Weather Flow Management 25 Year Implementation Plan* (City of Toronto, 2003).

Implementing the Sustainable Community scenario is expected to have further benefits not modelled in this study.

Urban redevelopment offers the opportunity to make improvements in aspects of our communities that influence quality of life, including transportation (e.g., high density development is more supporting of public transit), resource use (e.g., water and energy conservation through green building retrofits), and air emissions. If redevelopment is undertaken on the basis of sustainability principles, the new communities will facilitate sustainable choices (e.g., reduced vehicle use, water re-use, and alternative energy use), foster awareness and appreciation of cultural and natural heritage, and create improved environments for human health, as well as address water management issues.

Implementation of the Sustainable Community scenario also may result in potential mitigation of flood and urban heat island impacts of climate change. Climate change scenarios formed part of the modelling completed for the Rouge River and Humber River watershed plans. However, due to limitations in the science of current climate change prediction, the modelling could not account for the increase in frequency and intensity of major storms, which is a likely outcome of climate change and would probably result in short periods of significant flow volumes with corresponding spikes in flooding and erosion potential. We expect that climate change may exacerbate the negative impacts of stresses already at work in the Don River watershed, including fragmentation of the landscape; land, water, and air pollution and disruption of natural system functions. This highlights the need to take actions that will increase the resilience of natural systems and reduce the potential future costs of addressing environmental issues.

Our analysis of potential future scenarios also helped us to consider the likely relationships between environmental conditions and human communities in the watershed. For example, an increasing population will place additional stress on existing nature-based recreational resources and create demand for additional resources. This is expected to be a particular challenge for parks and trails in close proximity to provincial Urban Growth Centres where intensification is anticipated.

5.0 Management Strategies

The Don watershed continues to show signs of stress on its environmental systems and quality of community life. With the projected population growth of another 4.5 million people in the Greater Toronto Area over the next 20 years (Hemson, 2005), the watershed will experience additional urban development pressures through intensification and redevelopment.

Today, the watershed faces ongoing urban growth pressures combined with an urgent need to improve sustainability of existing urban areas and restore degraded streams. Clearly, we need a new approach to address these challenges. Fortunately, our understanding of watershed management has improved over the past two decades, and we can draw upon a considerable body of science, technical advances and real life examples to show a better way forward.

We believe that this new approach must be rooted in the concept of sustainability because it provides a comprehensive framework for meeting multiple objectives, not only for a healthy environment, but also for economic vitality and community health and well-being. The diagram on the next page provides a way of visualizing the relationships among these three major systems. The biosphere includes all living organisms on earth, together with their physical environments. The natural systems are the non-human elements of the biosphere. Human social systems are dependent on the natural ones for their health and survival. Economic systems are embedded within the social systems.

Increasingly, public agencies in the watershed and in other regions across the country are recognizing the interdependencies of our environment, our economy and our communities. Examples include sustainability strategies developed by the City of Toronto and York Region, the sustainability framework developed by Toronto Waterfront for regeneration of the waterfront and TRCA's vision for The Living City. All these initiatives are working towards a healthy, attractive, sustainable urban region. They are rooted in the understanding that sustainability means "meeting the needs of the present generation without compromising the ability of future generations to meet their needs" (World Commission on Environment and Development, 1987). They guide us to change our approaches to watershed management:

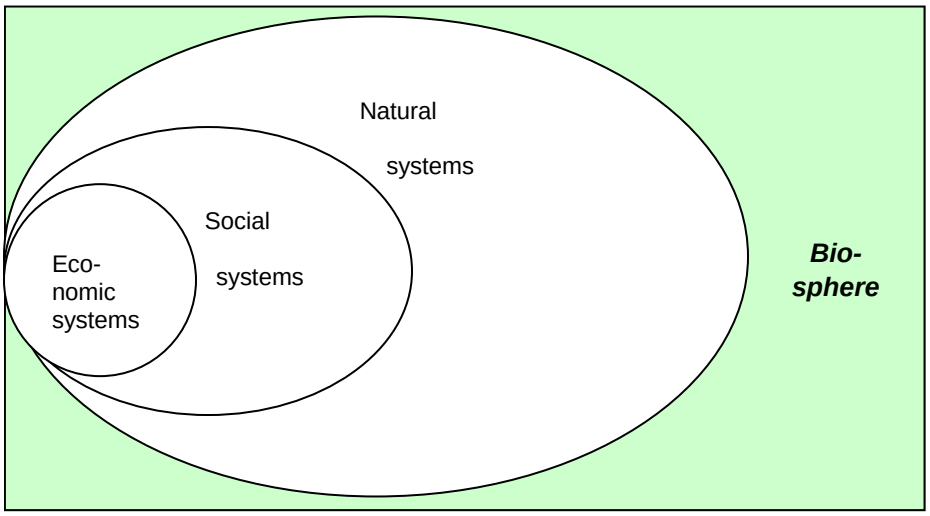
- From mitigation to prevention
- From degradation to restoration and net gain
- From end-of-pipe to source control
- From waste to resource
- From single focus to multiple benefit
- From piecemeal to integrated management

What Will this Mean for the Watershed?

First, it means that we need to understand and manage for the integration and interdependencies among systems and at all scales in the watershed. Efforts must begin by regenerating and protecting a healthy, functioning natural system as the basis for a sustainable community. Then sustainability concepts must be applied at all scales (community, lot, building, and individual) such that the matrix supports the broader system and the built forms facilitate sustainable choices.

This *Don River Watershed Plan* provides specific guidance for development and urban retrofits for sub-watersheds, communities and individual properties.

The specific strategies described throughout this chapter are designed to restore a more natural water balance and



remediate degraded rivers and streams. They show how redevelopment and new development areas can be planned and managed differently from past and current practices. The strategies also address ways to accommodate human activities to capitalize on the rich natural and cultural heritage of the watershed while protecting its resources.

How Were the Strategies Developed?

The management and implementation strategies are based on a collaborative approach involving TRCA staff, the Don Watershed Regeneration Council, a municipal technical advisory committee, stakeholders, and consultants over a three year timeframe. Following a review of current conditions and identification of key issues and management objectives, scenario modeling was undertaken to predict the response of the watershed to potential future conditions. Experience from other watershed jurisdictions was reviewed. A list of potential management actions was developed to achieve the objectives and targets. Finally, a series of management summits was held to identify key management strategies and refine the specific actions.

The integrated approach taken in this management plan means that each management strategy may address a number of different goals. For example, the management strategy for stormwater retrofits addresses goals for groundwater, surface water, fluvial geomorphology and aquatic communities. Generally, we grouped strategies according to the primary goal they would accomplish, and cross-referenced to other goals where relevant.

The following sections describe management and implementation strategies under three broad headings: Caring for Water, Caring for Nature and Caring for Community. A summary of recommendations can be found in Appendix G. Subwatershed regeneration plans, concept site plans, and recommendations relating to stewardship and outreach education, operations and maintenance, and monitoring and further study are presented in Chapter 6.

5.1 Caring for Water

The water balance is crucial to the health and functioning of the entire watershed ecosystem. In order to achieve our goals and objectives, we need to restore and maintain, to the extent possible, an appropriate annual and seasonal balance as well as the quality of groundwater and surface water. Improvements to the water balance will benefit flooding, water quality, erosion, and habitat conditions.

Our review of current conditions highlighted issues relating to groundwater, surface water quality and quantity and stream form, described in Chapter 3. Many of these issues will continue to worsen, even if there was no more development in the watershed, because the streams have not finished responding to the altered flows caused by existing development. So they will continue to erode, widen and deepen. While improvements have been made in some water quality parameters, challenges remain, particularly in areas of poor stormwater control. In other areas, contaminants such as chlorides are growing concerns. The uncertainties of climate change will add further stresses to the system.

However we know that final build out and redevelopment of the Don watershed will continue through the implementation of existing official plans and growth planning exercises. Clearly we need new approaches to restore and maintain an appropriate water balance for a healthy watershed. But first, it is helpful to review what we have learned from previous approaches to stormwater management.

Stormwater management

Over the past six decades, different approaches to stormwater management have been applied in an effort to address downstream conditions resulting from urbanization. Following the devastating effects of flooding caused by Hurricane Hazel in 1954, the primary approaches were to prevent building in floodplains, and to convey water away from urban areas as quickly as possible. Urban design standards required lot grading to maximize runoff from each building site so that roadways, ditches and storm sewers could transfer water to streams and rivers. In some cases, watercourses were straightened, enlarged and lined with concrete or stone to accommodate the increased runoff volumes and velocities. In the early 1980s it was recognized that these measures actually worsened downstream flooding and erosion. In response, there was a move to direct water from subdivisions to detention ponds that reduced the peak stream flows from major storm events.

In the early 1990s, the design of stormwater ponds was modified in an attempt to treat water quality and reduce downstream erosion by increasing detention times, providing more time for pollutants to settle and reducing outflow rates. Experience has shown that such ponds can be an adequate means of improving water quality and managing flood risks, when combined with strong floodplain management policies. However emerging monitoring studies in the Don watershed and elsewhere shows that they are insufficient to reduce erosion and impacts on aquatic habitats caused by an increase in stormwater runoff volume.

The realization that urban stormwater runoff has been contributing to serious declines in river system health has lead to a significant shift in approach towards urban stormwater management. The new philosophy takes a more holistic

Management Objectives, Water

- ❒ Protect and restore the quantity and quality of groundwater.
- ❒ Protect and restore the natural variability of annual and seasonal stream flow.
- ❒ Maintain and restore natural levels of baseflow.
- ❒ Eliminate or minimize risks to human life and property due to flooding.
- ❒ Manage stormwater to protect people and health of streams and rivers.
- ❒ Protect and restore surface water quality with respect to toxic contaminants and other pollutants, such as sediment, nutrients, bacteria and road salt.
- ❒ Protect and regenerate the natural form and function of the Don's valley and stream corridors.

approach aimed at achieving multiple benefits including control of flooding, protection of water quality and aquatic and terrestrial habitats, reductions in in-stream erosion, maintenance of groundwater recharge and avoidance of groundwater contamination by pollutants. The thrust of this new philosophy is an integrated, landscape-based approach to stormwater management planning.

Sediment build up in a stormwater management pond – ongoing maintenance is critical to maintaining function

This landscape-based approach to stormwater management planning is founded on the principle that development form, servicing and stormwater management strategies should be defined by the biophysical, hydrological and ecological attributes of the landscape (Aquafor Beech Limited, 2008). This approach has regard for the environmental context of a specific site within the matrix of the larger landscape, including the features, functions and systems that are situated well beyond the limits of the site. The aim of the landscape-based approach to stormwater management planning is to enhance the ecological integrity of the site, rather than simply maintaining it. The application of this approach to stormwater management planning requires a comprehensive understanding of the features and functions of the site (Aquafor Beech Limited, 2008), including the following:

- ❒ Biophysical, hydrological, hydrogeological and natural heritage features
- ❒ The interrelated functions of these features
- ❒ Modifying factors (such as climate)
- ❒ Temporal factors (such as seasonal changes, life cycles and successionary processes)

The landscape-based approach to stormwater management planning and design is also founded on a recognition of the value of land, both as a commodity and as the fundamental basis of a sustainable ecosystem. The approach is focused on utilizing land efficiently and where possible overlaying more than one function on any given piece of land.

Effective stormwater management strategies employ a ‘treatment train’ approach that combines a suite of source controls, conveyance controls and end-of-pipe facilities to treat runoff efficiently (Aquafor Beech Limited, 2008). At the present time, reliance on larger end-of-pipe pond facilities as the primary component of a stormwater management strategy is the norm. This compromises the opportunities to enhance the performance of stormwater management systems and the resultant benefits to the ecological sustainability of the landscape that may ensue from use of the landscape-based stormwater management approach to planning. Treatment train strategies that use a full suite of stormwater management facilities as an integrated system have the potential to achieve a broad range of benefits including:

- ❒ Maintaining and enhancing shallow groundwater levels and interflow patterns
- ❒ Maintaining predevelopment discharge patterns at receiving watercourses
- ❒ Moderating run off velocities and discharge rates
- ❒ Improving water quality

- ❒ Enhancing evapotranspiration
- ❒ Maintaining soil moisture regimes to support the viability of existing vegetation communities
- ❒ Maintaining surface and groundwater supplies to support existing wetland, riparian and aquatic habitats

Sometimes referred to as “Low Impact Development”, this approach for protecting and managing the natural heritage and hydrological systems is an integral part of our broader sustainable community concept.

Infill and redevelopment presents the most complex challenges with respect to integrating landscape-based solutions for stormwater management (Aquafor Beech Limited, 2008). This is because:

- ❒ Sites are typically constrained with respect to the extent of potential open space available
- ❒ There is typically limited flexibility to manipulate topography since grades around the perimeter of the site are fixed
- ❒ Service infrastructure around the site, including stormwater conveyance systems are typically fixed in terms of location, depth and capacity
- ❒ The presence of other service infrastructure beneath and around the site may limit potential excavation depths and opportunities for infiltration

Current Initiatives

The City of Toronto's *Wet Weather Flow Management Master Plan* (MMM, 2003) recommends retrofits to existing stormwater systems to improve control of runoff that flows to the Don River south of Steeles Avenue. Related Toronto programs include the Mandatory Downspout Disconnection program for the combined sewer service area, Eco-Roof Incentive Program, and basement flooding studies. The *Wet Weather Flow Management Guidelines* (City of Toronto, 2006) identify water balance objectives for new developments and redevelopments. The City of Toronto is addressing combined sewer overflows (CSOs) through plans to improve CSO treatment in the Lower Don River and along the waterfront, and by monitoring outfall water quality in Taylor/Massey Creek.

North of Steeles, Vaughan, Richmond Hill and Markham have prepared stormwater pond retrofit plans. The Town of Richmond Hill has a ten-year capital infrastructure program to identify and prioritize capital projects related to existing stormwater management facilities.

Work continues under the Sustainable Technologies Evaluation Program (STEP), led by TRCA, to monitor and evaluate clean water technologies in the areas of stormwater management, stream restoration, water conservation, community wastewater treatment, and construction sediment control. For instance, there is currently a rainwater harvesting project underway near Yonge and Eglinton. Innovation will be a necessity in the Don – this watershed could be positioned as a “proving ground” for new sustainable technologies and urban form designs (e.g., permeable pavement, green roofs, clean water collector, major regeneration projects).

Flood control and major regeneration works are planned for the lower Don under the Lower Don River West Remedial Flood Protection Project and the Don Mouth Naturalization and Port Lands Flood Protection Project (led by Waterfront Toronto and TRCA).

As a result, the exploration of stormwater management solutions for infill and redevelopment sites requires a high level of imagination, ingenuity and creativity (Aquafor Beech Limited, 2008).

Specific stormwater management criteria for new and re-developments in the Don River watershed can be found in TRCA's *Stormwater Management Criteria* document and City of Toronto's *Wet Weather Flow Guidelines* (November 2006) (as updated).

Implementation of strategies to remediate environmental conditions caused by previous development is a long-term and costly endeavour. For example, the City of Toronto estimates a cost of $40 million/year over 100 years to retroactively implement such strategies through its *Wet Weather Flow Management Plan* (MMM, 2003), and even then it will not be possible to return to pre-development environmental conditions. As development continues in the Don watershed, it is now obvious that it will be more cost effective, and less harmful to the environment, if we can apply this new approach to any redevelopment or new developments to improve conditions and partially offset future remediation needs.

Our analysis showed that in order to avoid further impacts, and in some cases achieve improvements over existing conditions, it will be necessary to apply an integrated suite of measures: improvements to stormwater management (at the lot level and with selected end-of-pipe retrofits in existing urban areas), increased natural cover and sustainable community initiatives, both to retrofit existing urban areas and to develop new greenfield areas.

Recommended Management Strategies

Strategy #1: Implement source, conveyance and end-of-pipe stormwater management facilities (retrofit and new) and maintain existing stormwater facilities across the watershed

Uncontrolled surface water flows and associated erosion and water quality impacts are the greatest challenge in the Don River watershed, limiting regeneration potential for aquatic systems and terrestrial natural cover in valleys, and impacting human communities (e.g., risks to property and infrastructure, trails in valleys). Enhancement of stormwater management and reduction of "effective" imperviousness are the essential prerequisites for effecting significant improvement in watershed environmental conditions and addressing risk to property and infrastructure.

Each development (redevelopment or greenfield) offers an opportunity to improve the sustainability of the urban form. With four provincially designated Urban Growth Centres in the watershed (Figure 20), municipal plans to redevelop other areas, and ongoing improvements to water, wastewater and transportation infrastructure, there is potential to minimize the extent of impervious land covers, and improve the water balance. Modelling for the watershed plan, described in Chapter 4, has helped to identify priority sub-basins for implementing stormwater source controls.

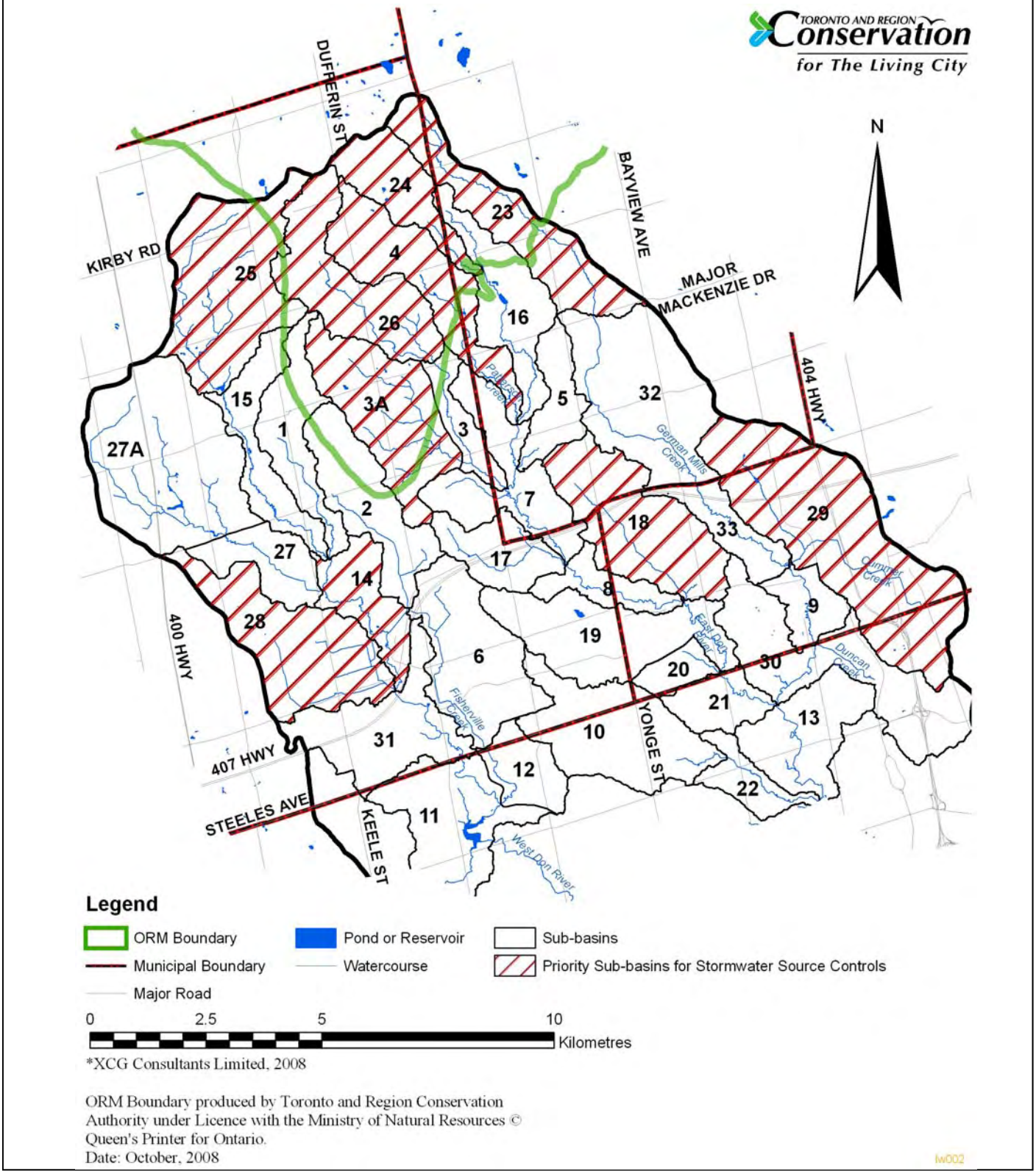
In 2003, there were about 112 existing or proposed stormwater management facilities in the Don. Many of the existing facilities have been in place for several decades and need to be cleaned out (sediments removed) so that they continue to help control flooding, water quality, and erosion. Failure to do so could exacerbate or create new flooding, erosion and water quality problems. Opportunities to make minor modifications to improve performance should be investigated. Other stormwater infrastructure facilities, such as catchbasins, swales and oil/grit separators, also need improved maintenance to ensure that they function as effectively as possible.

A shift is needed, both in the form of urban design and those professionals working in the field, and in watershed residents and businesses, to begin to consider stormwater as a resource, rather than a waste to be disposed. The results of our social marketing study, *Action Plan for Sustainable Practices* (Freeman Associates, 2006), are encouraging. The study shows that there is a modest basis of understanding and support for adopting sustainable practices (e.g., source controls, backyard naturalization), but the public needs more specific information, marketing campaigns and assistance to inspire action. It also highlighted a number of barriers that reduce opportunities for businesses to adopt sustainable practices.

Strategy 1 Actions

- ❒ Improve water balance and manage stormwater volumes through implementation of stormwater source controls (infiltration, evapotranspiration, re-use) in new and re-development. Priority sub-basins have been identified to protect aquatic habitat for Indicator Species (see Section 5.2.1), protect regionally significant groundwater recharge, and mitigate watercourse erosion and flood risk (Figure 23):
    - Tributaries of the Upper West Don River north of Major MacKenzie Drive (sub-basin 25) to protect aquatic habitat supporting aquatic species that are habitat specialists and regionally significant groundwater recharge
    - Industrial lands west of Dufferin Street to mitigate flood risk (reduce peak flows) and improve habitat for long term indicator species (rainbow darter) (sub-basins 14, 28)
    - Patterson Creek and the western tributaries of the Upper East Don River to protect existing and recovery redside dace habitat and regionally significant groundwater recharge (sub-basins 3A, 26, 4, 24)
    - Pomona Creek to mitigate watercourse erosion and improve long term potential for aquatic habitat regeneration for migratory species (contingent on barrier mitigation). Source controls should be considered in redevelopment of the Richmond Hill-Langstaff Urban Growth Centre (sub-basin 18)
    - Cummer Creek to mitigate flood risk and watercourse erosion and improve long term potential for aquatic habitat regeneration for migratory species (contingent on barrier mitigation) (sub-basin 29)
    - German Mills Creek north of Major MacKenzie Drive to mitigate flood risk (reduce peak flows) and maintain regionally significant groundwater recharge (sub-basin 23)
    - Priority areas in the City of Toronto as outlined in the *Wet Weather Flow Management Master Plan* (see box on page 5-9 and Figure 24)
- ❒ Implement City of Toronto's *Wet Weather Flow Management Master Plan* according to the *25-year Implementation Plan*, starting with improvements to the Earl Bales Park stormwater management facility.
- ❒ Continue to identify and implement opportunities to remediate combined sewer overflows (e.g., as per City of Toronto's Don and Waterfront Trunk Sewers and CSO Control Strategy Class Environmental Assessment and the North Toronto Treatment Plant Full Scale Implementation of High Rate Treatment study).
- ❒ Implement end-of-pipe stormwater retrofits (outfalls and ponds) as outlined in City of Vaughan, Town of Richmond Hill, and Town of Markham retrofit studies, starting with Pioneer Park stormwater pond.
- ❒ Provide stormwater control for Highways 401, Highway 404/Don Valley Parkway (as per the City of Toronto's Don Valley Parkway Stormwater Management Project Municipal Class Environmental Assessment for the portion of the DVP south of the confluence of the East Don River and Taylor/Massey Creek), and the Allen Expressway.
- ❒ Continue to develop and implement operation and maintenance programs for stormwater management infrastructure (e.g., ponds, catchbasins, swales, oil-grit separators and retrofit projects).
- ❒ Formalize programs to monitor the performance of existing stormwater management ponds and identify "recommissioning opportunities" through minor modifications that could optimize their performance with respect to water quality and erosion control.
- ❒ Investigate innovative financing mechanisms for stormwater infrastructure maintenance and upgrades/retrofits, such as: stormwater management fees associated with municipal water and sewer bills; binding covenants requiring maintenance of Low Impact Development features; and credits or tax incentives/exemptions for property

Figure 23: Priority Basins for Implementation of 'At-Source' Stormwater Management in the Upper Don Watershed



Stormwater Management Recommendations for the City of Toronto

In 1997, the City of Toronto initiated development of a *Wet Weather Flow Management Master Plan* (WWFMMP) (MMM, 2003) to guide improvements to stormwater management and stream restoration across the City, including both the separated and combined sewer (south of Eglinton Avenue) portions of the Don River watershed. The Plan's recommendations are guided by the principles of using rainwater as a resource and applying a hierarchy of stormwater management approaches, starting with source controls (managing rainwater where it falls on the ground), followed by conveyance controls and end-of-pipe controls.

A preferred strategy for addressing wet weather flows was selected, based on implementation of enhanced levels of source, conveyance and end-of-pipe control measures to strive towards achieving significant environmental improvements, such as achieving Provincial Water Quality Objectives. In the combined sewer area, sewer separation (including road sewer separation) is expected to occur where it is needed to eliminate known areas of basement flooding, and elsewhere on an opportunistic basis where soil conditions permit. Implementation of the preferred strategy is anticipated to take 75 to 100 years at an estimated cost of $12 billion (for the entire City of Toronto) (City of Toronto, 2003). A *25-Year Implementation Plan* has been developed, including the following actions for the separated sewer portion of the Don River watershed:

- 108,000 downspouts to be disconnected
- 27,000 rain barrels to be installed
- 120 km of exfiltration systems to be installed under public roadways as road and sewer infrastructure is replaced
- 20 oil/grit separation to be continued
- 43 stormwater management facilities to be constructed
- 41 fish barriers to be removed
- 18 km of streams to be restored
- Basement flooding in 1,400 homes to be eliminated

Figure 24 identifies priority areas in the Don from the *25-year Implementation Plan* for:

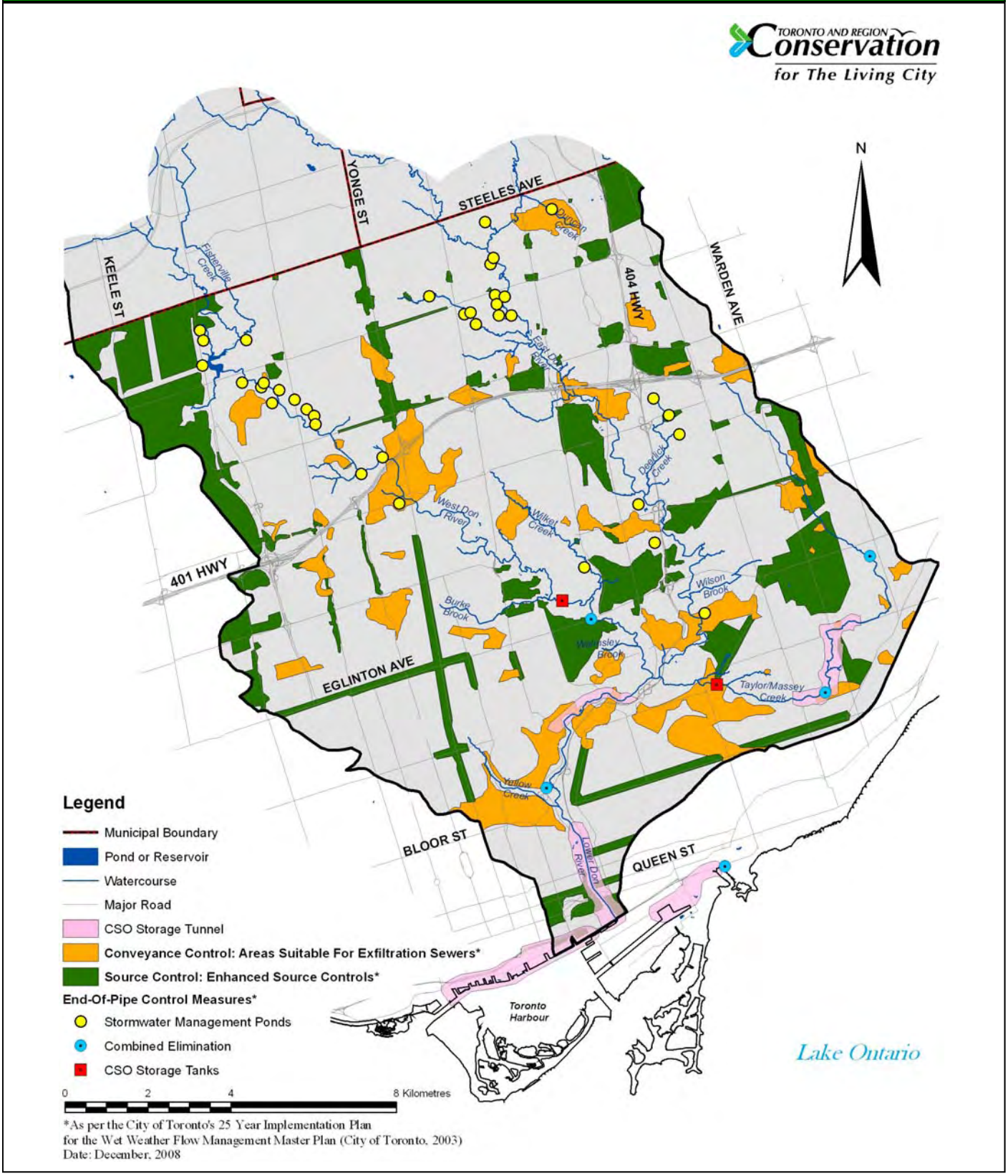
- "Enhanced" uptake of stormwater source controls through incentive programs (monetary or strict enforcement of policies and bylaws)
- Implementation of stormwater conveyance controls (perforated sewer systems installed under public roads as road reconstruction is occurring) where soil conditions are suitable
- Proposed end-of-pipe stormwater facilities (stormwater ponds, CSO storage tanks and tunnels, and combined elimination)

Major wet weather flow projects currently underway in the Don include the Don and Waterfront Trunk Sewers and CSO Control Strategy Class Environmental Assessment and the North Toronto Treatment Plant Full Scale Implementation of High Rate Treatment study.

owners who undertake good stormwater management practices.

- Implement TRCA's and the City of Toronto's water management criteria and guidelines for redevelopment and new development which require stormwater volume and peak flow control (as updated) (City of Toronto, 2006; Aquafor Beech Limited, 2008).
- Municipalities should collaborate with TRCA to identify the range of sustainable technologies appropriate for various site conditions during redevelopment and new development.
- Maintain and expand, where possible, urban vegetation (e.g., natural cover, urban canopy, plantings, greenspaces) to enhance evaporation and infiltration of stormwater.
- Encourage behavioural shifts and innovative urban design forms that minimize impervious areas and aim to

Figure 24: Priority Areas for Implementation of City of Toronto's WWFMMP



*As per the City of Toronto's 25 Year Implementation Plan for the Wet Weather Flow Management Master Plan (City of Toronto, 2003)
Date: December, 2008

achieve pre-development rates of infiltration, evapotranspiration and surface run-off, in new developments and redevelopments (see Aquafor Beech Limited, 2008).

- ❒ Create incentives for residents, businesses and institutions to implement enhanced stormwater management controls that minimize and treat runoff (e.g., rain gardens, infiltration trenches, rainwater harvesting cisterns and green roofs).

- ❒ Identify mechanisms to promote dual plumbing installations for new construction to reduce future retrofit costs of rainwater harvesting and greywater recycling.

- ❒ Adopt a policy requiring replacement of topsoil and subsoil and reduce on-site compaction during new development, to ensure the site is amenable to restoration and supportive of lot-level stormwater management.

Strategy #2: Manage flood risks

Flood risk management is achieved through various means including planning and development legislation and municipal programs such as infrastructure improvements. Under the *Planning Act*, municipalities must be consistent in their land use decisions with the Natural Hazards policies of the *Provincial Policy Statement* (PPS) to ensure that any new development is directed away from areas where there is an unacceptable risk to public health, safety or property damage. Complementary to the PPS, TRCA administers the *Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation* (Ontario Regulation 166/06 under the *Conservation Authorities Act*) and TRCA's Valley and Stream Corridor Management Program.

Through the provisions of the PPS, the Ministers of Natural Resources (MNR) and Municipal Affairs and Housing (MMAH) have designated two Special Policy Areas (SPAs) for flooding in the Don River watershed – Hogg's Hollow (West Don River) and the lower reach of the Lower Don River. Any change within an SPA, above and beyond what has already been approved by the Province, must be supported by both the MMAH and MNR based on a comprehensive risk assessment plan. To be sustainable, these areas must be disaster resilient. The challenge will be to balance the need to accommodate an increasing population in a sustainable way, and to do so in a way that manages the risks that relate to flooding.

In addition to the two SPAs, there are over 2,800 road sections and residential, commercial and industrial structures in the Don that are considered flood vulnerable under Regional Storm conditions (100-year storm, or Hurricane Hazel). Key concerns are intensification and redevelopment in areas known to be susceptible to flooding, such as the Enford Road area of Richmond Hill. Redevelopment and intensification will be expected not to exacerbate current flood vulnerability.

Flooding also is a problem in urban areas outside of the flood plain (i.e., not associated with the river). Poor drainage and lot grading combined with overloading of storm and sanitary sewers can cause localized ponding of water and basement flooding (e.g., area north of Highway 401 between Bathurst and Yonge streets in Toronto). The City of Toronto is conducting studies on basement flooding in key problem areas.

Two major projects are addressing flooding and other concerns in the lower reaches of the Don River. The Lower Don River West Remedial Flood Protection Project involves the creation of a major landform to provide flood protection for 210 ha of land west of the River near Lake Ontario. The Don Mouth Naturalization and Port Lands Flood Protection Project will develop a preferred alternative for the naturalization of the Don River mouth and flood protection for 230 ha of land to the east and south of the River (Riverdale and Port Lands). These projects are notable examples of integration of environmental, economic and social aspects of urban regeneration. Completion of the Don Mouth project will require ongoing political, social, and financial support from all levels of government and the public.

To further inform municipal growth management, advancements in the prediction of regional and local climate change should be tracked, and impacts on local flood risk assessed, such that local stormwater and flood plain management

approaches can be modified as required. This is especially important given the anticipated increase in the intensity and severity of storm events due to climate change that could affect peak flows and related flood risk.

Exposed sewer manhole at risk from erosion

Strategy 2 Actions

- ❒ Continue implementation of the Lower Don River West Remedial Flood Protection Project.
- ❒ Implement the preferred alternative in the Don Mouth Naturalization and Port Lands Flood Protection Project.
- ❒ Encourage and support municipalities in completing drainage studies (as are underway in the City of Vaughan and Town of Markham).
- ❒ Encourage and support municipalities in completing basement flooding studies and implementing remediation programs.
- ❒ Continue to maintain flood control infrastructure, including channels and G. Ross Lord Dam, and mitigate flood vulnerable areas.
- ❒ Work with the Province, municipalities and developers to reconcile the conflict inherent in intensifying development in flood prone areas, through flood risk assessment plans, flood remediation and flood proofing measures, as well as seeking opportunities for intensification outside the flood plain.
- ❒ In coordination with municipalities, use recommendations from the on-going study of flood vulnerable areas and roads in the Don Watershed, in support of the TRCA Flood Protection and Remedial Capital Works Prioritization Project, to prioritize flood remediation work over the next ten years.
- ❒ Continue to operate the flood forecasting and warning program.
- ❒ Continue to develop and enhance the real time precipitation and stream gauge network for use in the TRCA Flood Warning Program.
- ❒ Seek Federal and Provincial funding to track advancements in the prediction of regional and local climate change (e.g. predicting change to frequency and/or severity of extreme storm events and downscaling of data from global climate models for use at the watershed or regional scale). Assess impacts on local flood risk so that local stormwater and flood plain management approaches can be modified as required.
- ❒ Continue to maintain and upgrade the flood vulnerable site database to assist municipal emergency response.
- ❒ Seek funding to map engineered flood plains where only estimated flood plain mapping is available.
- ❒ Educate homeowners regarding flood risks associated with improper practices such as backyard dumping and impediments to water movement.
- ❒ Restore natural cover in the catchments upstream of flood vulnerable areas (SPAs and others) to help attenuate flood flows (e.g., no mow zones, riparian plantings, grass swales).
- ❒ Undertake comprehensive flood risk assessment plans to define how additional flood risk created through proposed land use changes in Special Policy Areas can be managed.

- ❒ Update zoning bylaws and official plans to restrict development in flood plains.
- ❒ Develop and/or update flood emergency response plans.
- ❒ Incorporate opportunities to remediate flood vulnerable roads or sites when designing infrastructure improvements to service, such as watercourse crossings.

Strategy #3: Protect groundwater recharge and discharge areas

It is essential to protect groundwater recharge, a key element in managing the water budget, supporting baseflow and sustaining fish habitat. Most of the highest recharge areas in the Don watershed are located in the Settlement Area of the Oak Ridges Moraine (ORM) (north of Rutherford Road, between Keele Street and Bathurst Street) (Figure 20) which is currently under development. It is especially important in the remaining undeveloped areas on the ORM and other higher recharge areas to protect natural cover, use low impact development design and implement state of the art stormwater management that infiltrates clean runoff (e.g., the clean water collector in Block 12 in Vaughan). Recharge also should be protected and, where possible, enhanced, throughout the watershed during redevelopment and infill development where soil conditions allow and where enhanced recharge will not exacerbate basement flooding.

Interbasin groundwater flow is interpreted to occur from the Humber River watershed (East Humber sub-watershed) into the northern portion of the Upper West Don River, the Upper East Don River and the German Mills Creek sub-watersheds.

Strategy 3 Actions

- ❒ Identify and protect recharge and discharge as well as subsurface flow directions through municipal plans, policies and regulations.
- ❒ Implement technologies and practices to infiltrate clean stormwater in new and redevelopment in high recharge areas (e.g., permeable paving, bioswales).
- ❒ Maintain complex groundwater flow directions, particularly where groundwater is believed to be flowing across watershed boundaries.
- ❒ In developments where the water table is shallow, convey cool, clean groundwater collected by foundation drains directly to watercourses or wetlands rather than stormwater management ponds, to avoid contamination and increases in temperature.

Strategy #4: Improve erosion and sediment control and site regeneration

Even with controls, construction activities can result in considerable soil erosion, higher runoff, and harmful effects on watercourses due to increased flows and sedimentation. Sediment and erosion control should be approved and managed throughout all phases of work in the watershed, including:

- ❒ Topsoil stripping, grading and stabilization
- ❒ Servicing
- ❒ Home building
- ❒ Decommission and rehabilitation

Greenfield development opportunities are limited in the Don River watershed. However, over the next few years, the last of the unprotected lands in the Don's headwaters may be graded and developed. Proper erosion and sediment control is essential in these areas as they are home to some of the last remaining good habitat for aquatic species and

a remnant population of redside dace (listed as endangered under provincial legislation). Erosion and sediment control also is important during redevelopment.

In 2006, an *Erosion and Sediment Control Guideline for Urban Construction* was prepared for the Greater Golden Horseshoe Area Conservation Authorities (GGHACA) (GGHACA, 2006) . TRCA is evaluating the effectiveness of erosion and sediment control practices and implementation of the Guideline on a construction site in the City of Vaughan (Humber River watershed). The study findings will help to "ground truth" the new Guideline and provide training of personnel involved in development, implementation and enforcement of erosion and sediment control plans.

Strategy 4 Actions

- ❒ Municipalities should adopt the *Erosion and Sediment Control Guideline for Urban Construction* (GGHACA, 2006).
- ❒ TRCA and its partners should continue to monitor the effectiveness of erosion and sediment control practices and the Guideline, and update as needed.
- ❒ Conduct regular training seminars for municipal and conservation authority staff, consultants and contractors to promote awareness of best practices and application and testing of innovative, environmentally-friendly products for erosion control and site remediation.
- ❒ Seek support for a certification program in erosion and sediment control.
- ❒ Develop new provincial standards for various technologies and practices to encourage product manufacturers to improve them (e.g., filtering capacity of sediment devices).
- ❒ Improve site maintenance and restoration during and following construction.
- ❒ Require use of native species in site restoration planting plans and require sign-off by qualified professional on "as-installed" site.
- ❒ Identify mechanisms for requiring long-term monitoring and replacement of stabilization measures until sites are restored as planned (e.g., through subdivision agreements and securities).

Strategy #5: Improve stream form

The protection of streams from erosion and sedimentation was addressed in the strategies above regarding stormwater management, recharge, and erosion and sediment control. In addition, a number of legislative and regulatory tools exist to protect natural stream form as part of the natural heritage system. They include the TRCA's Valley and Stream Corridor Management Program and Ontario Regulation 166/06, municipal official plan policies, the *Fisheries Act*, the *Oak Ridges Moraine Conservation Plan* and the *Greenbelt Plan.*

Protection of the hydrologic and fish habitat functions of headwater drainage features is believed to be essential to watershed integrity (TRCA, 2007e). Improvement of stream form also contributes to enhancing linkages between upstream and downstream aquatic and terrestrial habitat.

When rivers and streams move across their flood plains, they expose infrastructure that is located in valley corridors to risk of damage or failure (e.g., bridge abutments, watermains, sanitary sewers, natural gas pipelines, trails). Infrastructure is at risk due to erosion throughout the watershed. For example, the August 19, 2005 storm resulted in erosion that badly damaged bridge abutments in G. Ross Lord Park and trails in Wilket Park. Reach walks conducted by TRCA staff identified numerous locations where erosion related stream movement has resulted in exposure of storm and/or sanitary manholes, now located in the centre of watercourses. Large flood events can accelerate this process, creating the need for immediate emergency projects that do not allow adequate time for planning.

Municipalities and other agencies maintain an inventory of "at-risk" infrastructure and conduct regular monitoring of many of these sites, so that they can initiate proactive planning for remediation projects. These projects should incorporate opportunities for net gain in achieving objectives of this watershed plan.

Strategy 5 Actions

- ❒ Remediate priority erosion sites under the *Markham Erosion Restoration Implementation Plan* (Aquafor Beech Limited, 2007) and erosion risk associated with infrastructure (see municipal and TRCA inventories).
- ❒ Implement stream restoration as per City of Toronto's *Wet Weather Flow Management Master Plan* (MMM, 2003).
- ❒ Coordinate stream restoration activities with water management objectives.
- ❒ Protect natural stream form, using TRCA's Valley and Stream Corridor Management Program (or as updated) and Ontario Regulation 166/06, municipal official plan policies, the *Fisheries Act*, the *Oak Ridges Moraine Conservation Plan* and the *Greenbelt Plan*.
- ❒ DFO, conservation authorities and municipalities should continue to work in partnership to apply interim guidelines for assessing the function and appropriate treatment of headwater drainage features through the development planning process and refine them where necessary (*Evaluation, Classification and Management of Headwater Drainage Features: Interim Guidelines*, Credit Valley Conservation and TRCA, 2007).
- ❒ Investigate opportunities to acquire lands in strategic locations to allow stream corridors to evolve naturally, without impacting property or infrastructure.
- ❒ Road crossings over watercourses should be sized appropriately and sited at appropriate locations to minimize potential for alterations to channel form and allow for natural movement of the channel within the flood plain (for example, not on a meander).
- ❒ Maintain an inventory of "at-risk" infrastructure, conduct regular monitoring and undertake proactive planning for remediation projects incorporating opportunities for net gain in achieving objectives of this watershed plan.

Strategy #6: Prevent and remediate pollution

We need to prevent pollution to improve and protect surface water and ground water quality. Potential sources of pollution in the Don include discharges from stormwater and combined sewer outfalls, sewage treatment plant effluents, erosion from construction sites, road salt applications, spills, residential activities, and potentially leachate from closed landfills. There is a need to develop, communicate and enforce bylaws and regulations to control the use, storage and management of potential pollutants, and to engage watershed residents in Best Management Practices. This will require coordinated actions by the Province and municipalities.

Strategy 6 Actions

- ❒ Municipalities should retrofit existing stormwater management facilities to incorporate water quality and erosion control as per municipal retrofit studies.
- ❒ Continue monitoring of stormwater outfall water quality in Taylor/Massey Creek (City of Toronto's Taylor/Massey Creek Storm Outfall Monitoring Program) and create a similar program to identify the source of high dry weather *E. coli* levels in the Upper East Don River subwatershed.
- ❒ Implement high rate treatment at the North Toronto Wastewater Treatment Plant CSO storage tank and consider additional options for mitigating the impact of effluents from the Plant on water quality (nutrients) in the Lower Don River.

Goose Management in the GTA

Canada geese are a common sight in wetlands, lakes, stormwater ponds and adjacent parklands in the Don watershed and throughout the GTA. During their nesting and moulting phases, geese congregate in these areas to feast on the tender shoots exposed by newly mown grass and take cover from predators in nearby waterbodies.

Large populations of geese present a number of problems for local communities. An adult goose can consume four pounds of food and produce two pounds of waste per day during the moulting phase. All that waste is a source of water-polluting bacteria and nutrients.

An ad hoc goose management committee was established in the GTA in the early 1990's to review the problem and develop strategies for goose management. The primary consensus of this committee was that a comprehensive and coordinated approach must be undertaken by all neighbouring municipalities negatively affected by Canada Geese.

One of the recommendations was the undertaking of egg oiling as a means of managing local resident geese. Egg oiling has been identified as an effective technique on a site specific level. It directly reduces the recruitment of young birds into specific areas in the short-term which, may in turn, reduce the number of nesting adults returning to the Toronto waterfront in the long-term.

In 1998, a comprehensive approach to locating and oiling Canada goose eggs within the City of Toronto was initiated. The City of Pickering, the Town of Ajax, the City of Vaughan and the City of Brampton have also been included in the oiling program. The Town of Richmond Hill has its own strategy for managing geese in its parks, undertaken by its Parks Planning and Natural Heritage Section.

Other measures that may be used to manage geese populations include:

Relocation of Canada geese
Geese are rounded up during their flightless period and relocated to another area. This is an effective way of dealing with moulting goose populations. The necessity of a roundup permit and highly experienced staff restrict round ups to areas where safety can become an issue.

Habitat modification
Intense planting along shorelines, fencing off large manicured lawn areas where geese tend to feed may help to deter nesting Canada geese.

Education
Signs and information pamphlets educating the public on the negative effect of feeding waterfowl may help deter this behaviour among park users.

- ❒ Continue to identify opportunities and implement plans to remediate combined sewer overflows (e.g., as per City of Toronto's Don and Waterfront Interceptor Trunk Capacity and CSO Control Class Environmental Assessment and the Scarborough Waterfront Combined Sewer Overflows and Stormwater Outfalls Control Study Class Environmental Assessment).
- ❒ Municipalities should provide routine staff training for spills prevention and control programs.
- ❒ Municipalities should encourage programs to control, minimize and treat runoff (e.g., green roofs).
- ❒ Municipalities should promote education and awareness programs, such as Healthy Yards and Yellow Fish Road, in cooperation with TRCA and other community partner groups.
- ❒ Municipalities should naturalize stormwater ponds to discourage use by Canada geese and provide educational signage advising the public not to feed the geese.
- ❒ Municipalities should ensure that sewer use bylaws are up to date including application to storm sewers and regional roads, requirements to prepare pollution prevention plans, and provisions for the establishment of an inspection program.
- ❒ Municipalities should establish award incentives for each target audience (i.e., residents, businesses,

government), such as “Most Environmentally-Friendly Design”.

- ❒ Conduct monitoring study to determine impact of closed landfills on surface and ground water quality in the Don.
- ❒ Continue to implement the City of Toronto’s Old Landfills Remediation Program and encourage York Region municipalities to adopt a similar proactive program for identifying, assessing, and remediating old landfill sites.
- ❒ TRCA should continue to track research on emerging pollutants (e.g., pharmaceuticals, personal care products, industrial chemicals, viruses) and their potential impacts in the Don River watershed.

Salt Management

- ❒ Form partnerships to conduct additional research on the life cycle costs, benefits, and collective and individual effectiveness of salt management best management practices at key locations (e.g., snow storage sites, major highways), including salt application techniques, and temporary storage tanks.
- ❒ Conduct research on the potential impacts of future climate change on winter maintenance practices in the Don River watershed.
- ❒ Draining of existing stormwater ponds for maintenance or redesign should be undertaken during dry weather in the late summer or early fall seasons, to minimize discharge of high concentrations of salts to streams.
- ❒ The design of stormwater ponds should aim to minimize chemostratification of chloride by eliminating or reducing dead storage zones (e.g., increasing length-to-width ratio, including bottom draw outlet).
- ❒ Develop monitoring programs to identify opportunities to minimize the impact of salt management operations on vulnerable resources: track the amount, timing and distribution of road salt applications; identify the major point sources of chloride discharges to the Don River and its tributaries; and evaluate receiving stream capacity for chlorides in sensitive areas, starting with Patterson Creek (redside dace).
- ❒ Encourage adoption of technologies and methods for optimizing salt applications (dry, pre-wet, direct liquid), and use of alternatives to salt for winter maintenance, where appropriate.
- ❒ Review and implement snow disposal and road salt management plans, prepared in response to the Federal designation of road salt as a toxic substance under the *Environmental Protection Act*, with special consideration for roads on vulnerable aquifer recharge areas on the Oak Ridges Moraine.
- ❒ Encourage the Ontario Ministry of the Environment to update its *Guidelines for Snow Disposal and Deicing Operations in Ontario* (1994).
- ❒ Form multi-agency partnerships to develop winter maintenance outreach and education programs for individuals, public properties, and contractors.
- ❒ Establish a voluntary contractor certification program for salt management.

Strategy #7: Monitor, evaluate and adjust

It is important to monitor the effects of new and retrofitted urban development design and stormwater management practices to provide a basis for adaptive management.

The Regional Watershed Monitoring Program (RWMP), led by TRCA in partnership with its member municipalities and other monitoring groups, provides a substantial information base for the Don watershed. The RWMP was developed based on regional and watershed scales, and to the extent possible, the subwatershed scale. During the

preparation of this Plan, it was found that additional information is needed at both the watershed and subwatershed scales to fully understand systems in the Don watershed and track changes.

In addition, TRCA's Sustainable Technologies Evaluation Program (STEP) provides a valuable forum for coordinated performance monitoring and evaluation among a number of agencies and private partners.

Strategy 7 Actions

- ❒ Monitor the effects of new and retrofitted urban development design and stormwater management practices and implement adaptive management where necessary, including:
    - Require developers to undertake or contribute to compliance monitoring and enforcement to ensure approved stormwater management facility design performance targets are met.
    - Conduct monitoring studies at the site and subwatershed scales to determine the extent to which community design standards and innovative stormwater management practices mitigate the cumulative effects of urban development on the water balance and aquatic systems.
    - Continue to monitor stream flow, groundwater levels, and precipitation in the Don, as part of the Regional Watershed Monitoring Program and add stations in strategic locations (see Section 6.5).
    - Identify indicators, establish baselines and set targets for a natural range of variation of stream flow.
    - Evaluate the effects of new and retrofitted stormwater management practices on baseflow and water quality and revise the management recommendations and criteria of this plan as necessary.
    - Adopt modified management strategies, criteria and guidelines, as necessary.
- ❒ Test, evaluate and promote innovative approaches and technologies using the Sustainable Technologies Evaluation Program (STEP):
    - Develop policies, guidelines and design standards/specifications for new technologies such as green roofs and permeable pavement, and assess barriers to implementation.
    - Arrange for third-party verification of technology performance.
    - Implement and evaluate innovative technologies using pilot projects.
- ❒ Communicate results through seminars / publications
- ❒ Encourage developers and municipalities to partner in monitoring programs at the "block" scale and at the regional scale, and incorporate adaptive management in the planning process (e.g., letter of credit at Master Environmental Servicing Plan (MESP) stage).

5.2 Caring for Nature

5.2.1 Aquatic System

The aquatic system includes the physical and chemical conditions and the communities of fish, invertebrates and other animals and plants that live in the streams, rivers and wetlands of the Don watershed. Its health is very dependant on the status of other elements of the watershed, especially the water cycle and natural cover.

Our review of current conditions in the watershed showed that, despite a decline in native species diversity, a number of tolerant native fish species have persisted and there is some evidence of a stable aquatic system in which base levels of aquatic function remain operative. Key issues are summarized in Section 3.7. Patches of relatively high quality fish habitat are found in the upper subwatersheds. Small populations of redside dace remain in Patterson Creek and tributaries of the Upper East Don River. Under the provincial *Endangered Species Act*, redside dace is listed as endangered. Redside dace is currently listed as a species of "special concern" under the federal *Species at Risk Act*, but has been re-assessed as "endangered" by the Committee on the Status of Endangered Wildlife in Canada (2007) and is being considered for "up-listing" to endangered under the Act. Mitigation of fish barriers since *Forty Steps to a New Don* has resulted in expansion of the range of migratory chinook salmon (a stocked species), among other species of fish.

Looking ahead to potential future conditions, our analysis showed that continued business as usual urban development will result in further deterioration of aquatic communities, with the likely loss of cold and cool water fisheries and additional reductions in species diversity. Improved water balance and stormwater control is needed to moderate the impact of urbanization by maintaining and enhancing groundwater recharge, mitigating uncontrolled flows, and improving water quality. Maintenance and enhancement of natural cover and riparian vegetation also is essential.

Recommended Management Strategies

The *Don River Fisheries Management Plan* (FMP) (in progress) provides detailed strategies and implementation recommendations for each of the six Fish Management Zones (FMZs) (Figure 14). This watershed plan provides a summary geared towards protecting, regenerating and enhancing the health and diversity of native aquatic habitats, communities and species. Protection of the groundwater system, base flows and surface water flows, combined with protection and expansion (where possible) of a robust terrestrial natural heritage system with a strong riparian component, will help to maintain and improve the integrity of aquatic ecosystems.

Therefore the thrust of our management recommendations is to protect and improve water balance and habitats throughout the watershed, but starting in

Management Objectives, Aquatic System

- ❒ Protect, regenerate and enhance the health and diversity of native aquatic habitats, communities and species.

Detailed Management Objectives from the *Don River Fisheries Management Plan*:

1. Protect and improve in-stream habitat for native fish communities and Species at Risk, and increase biodiversity.
2. Restore the trophic status within the aquatic community, inclusive of benthic invertebrates through to top predator fish species.
3. Reduce the negative influence of stormwater flows (volume, water quality, erosion) on in-stream habitat and aquatic community assemblages.
4. Improve water quality and clarity in all Fish Management Zones.
5. Achieve coordinated involvement of stakeholders, interest groups and general public in the implementation of recommended management strategies.
6. Provide for sustainable fishing opportunities and the safe consumption of fish.

Current Initiatives

The updated *Don River Fisheries Management Plan* (FMP) (in progress), prepared by the Ontario Ministry of Natural Resources (MNR), Fisheries and Oceans Canada, and Toronto and Region Conservation Authority, includes recommendations for implementation by a range of interest groups and agencies, under the guidance of an Implementation Committee.

Among a wide variety of fisheries considerations, the FMP Technical Advisory Team is moving forward with management recommendations including habitat regeneration for target fish communities and indicator species (short and long-term), redside dace protection, prioritization of barrier management in areas where assessment has been made and data collection for identified gaps.

Other valuable initiatives to guide improvements to the aquatic system are: the *Markham Small Streams Study* (Schollen and Company Inc. *et al*., 2006), the City of Toronto's *Wet Weather Flow Management Plan* (MMM, 2003), and the environmental assessment for the Don Mouth Naturalization and Port Land Flood Protection Project (led by Waterfront Toronto and TRCA).

the upper subwatersheds to support a healthy, functional ecosystem for redside dace and other native species. Management in support of these Indicator Species of target aquatic communities will provide conditions that are suitable for other species that require stable, cold or cool water habitats. Overall, maximizing the diversity of species and habitats will help to mitigate the expected effects of urbanization and climate change.

In order to address the key issues and move towards our objectives for the aquatic system, we have identified the following priority strategies. More detailed management strategies can be found in the *Don River Fisheries Management Plan*.

1. Implement Redside Dace Recovery Team recommendations (in development) to investigate the existing redside dace population status and habitat improvement and protection opportunities (in FMZ 1 where this species is currently known to occur and in FMZs 2 and 3 where a population may be recovered).

2. Protect and improve instream habitat for the Indicator Species (Figure 25), as per recommendations in Chapter 6 of this watershed plan and the FMP.

3. Create or enhance riparian wetlands, with focus on reaches that still support aquatic communities that rely on this habitat (e.g., known populations of brassy minnow), as per recommendations in Chapter 6 of this watershed plan and the FMP.

4. Complete an instream barrier assessment for the entire watershed and identify priority barrier mitigations that would achieve the most improvement to fish passage and habitat.

5. Improve the water balance (surface water and groundwater regimes) and stormwater management (quality and quantity), and identify aquatic standards and best management practices to guide the work (see management strategies under Caring for Water in Section 5.1).

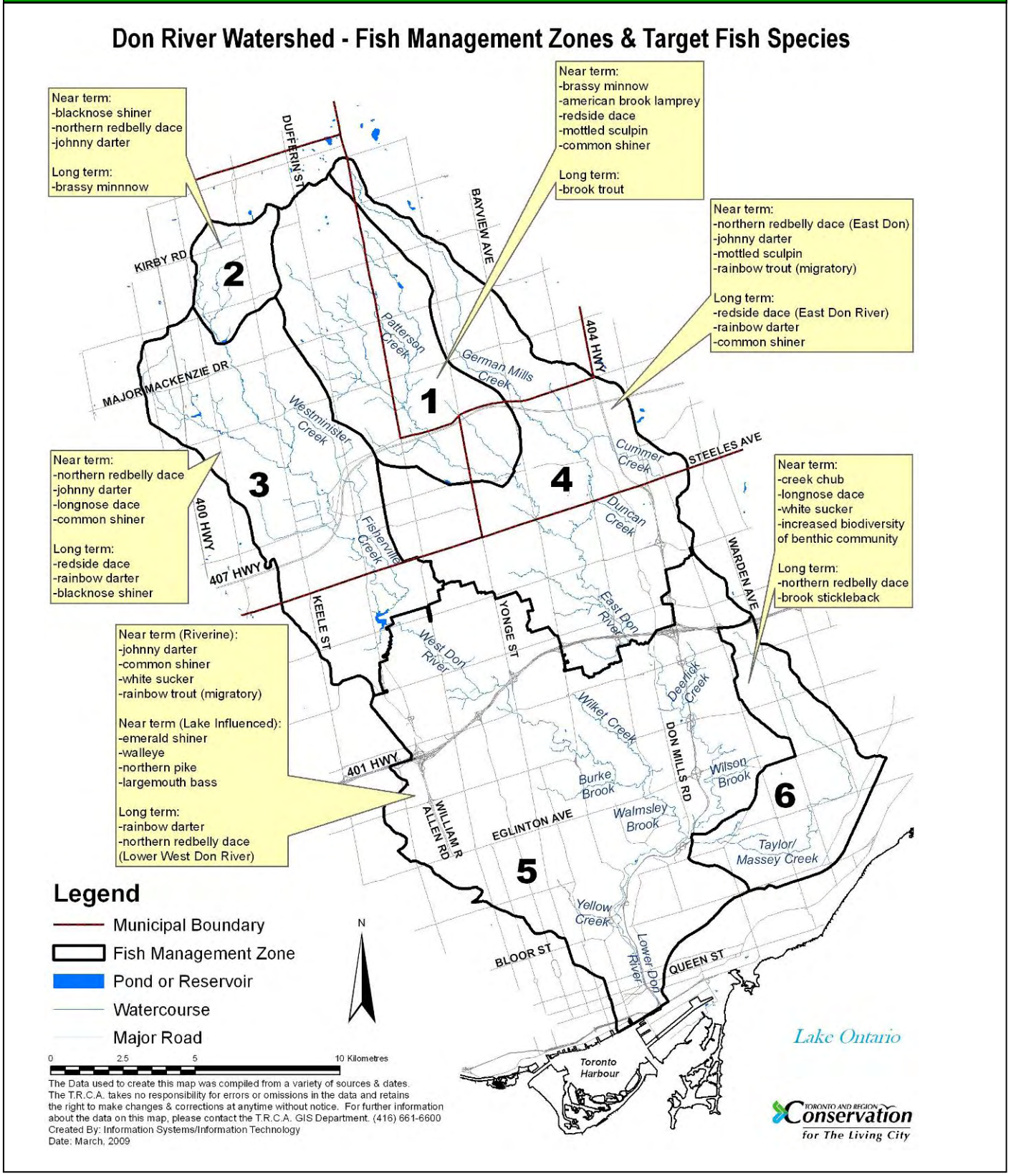
6. Establish an Implementation Committee for the updated *Don River Fisheries Management Plan*.

7. Improve monitoring of fish communities and habitat, particularly for existing populations of redside dace and walleye.

8. Develop education and stewardship programs to address invasive species awareness (round goby, common carp, rusty crayfish) and the potential for invasive species transfer between watersheds (e.g., bait fish transfer between Humber and Don rivers), the role of fish as indicators of riverine health, and best management practices to protect and regenerate the aquatic system (especially riparian plantings) targeted at landowners and land maintenance staff.

Additional management strategies have been identified for each FMZ. More detailed recommendations can be found in the FMP.

Figure 25: Target Aquatic Community Indicator Species



FMZ 1: Upper Tributaries of the East Don River

Target Community: Indicator Species

Near term: brassy minnow, American brook lamprey, redside dace, mottled sculpin, common shiner

Long term: brook trout

Target Community: Indicator Species

Near term indicator species of target aquatic communities are either currently present in the FMZ or have been sampled in the recent past.

Long term indicator species are not currently present in the FMZ and will require significant habitat regeneration to be reestablished.

Objectives

1. Protect and restore the habitat and existing remnant redside dace population.
2. Protect and improve habitat for existing communities of mottled sculpin and American brook lamprey.
3. Reestablish the past distribution of common shiner.
4. In the long term, restore coldwater habitat for brook trout.

Recommended Management Strategies

In addition to the general recommended management strategies:

- ❒ Protect and regenerate habitat for Indicator Species according to the *Don River Fisheries Management Plan* and regeneration priorities identified in Chapter 6 of this document.
- ❒ Complete a stocking assessment to determine the extent of naturalization of brown trout and potential negative competitive interactions in those areas of overlap with redside dace.
- ❒ Consider moving the stocking of brown trout ("put and take" fishery for recreational angling) to downstream of the Ladies Golf Club of Toronto in FMZ 4.
- ❒ Evaluate the potential for retaining strategic instream barriers as a species partition to separate stocked brown trout and redside dace populations.
- ❒ Mitigate the thermal impacts (T) and improve fish passage (P) in on-line ponds, including Redelmeier Pond (T), Rumble Pond (T), Pioneer Pond (T, P), the former MNR Hatchery Pond (T, P), Mayvon Pond (T, P) and Mill Pond (T, P). Where feasible, take on-line ponds off-line and restore riparian vegetation to improve the thermal regime.
- ❒ Conduct a survey to determine the distribution of rusty crayfish and consider an eradication or confinement program, if it is determined that this species is still contained in its original detection location.

FMZ 2: Headwaters of the West Don River

Target Community: Indicator Species

Near term: blacknose shiner, northern redbelly dace, Johnny darter

Long term: brassy minnow

Objective

1. Protect and maintain habitat for existing fish communities of blacknose shiner, northern redbelly dace, and Johnny darter.

Recommended Management Strategies

In addition to the general recommended management strategies:

- ❒ Protect and regenerate habitat for Indicator Species according to the *Don River Fisheries Management Plan* and regeneration priorities identified in Chapter 6 of this document.
- ❒ Expand terrestrial natural heritage (TNH) cover, as per the refined target TNH system (see Section 5.2.2).
- ❒ Protect headwater drainage features through the development planning process by adopting the *Evaluation, Classification and Management of Headwater Drainage Features: Interim Guidelines* (Credit Valley Conservation and TRCA, 2007).
- ❒ City of Vaughan should work with TRCA and OMNR to protect this FMZ (e.g., restrictions on development) during its Official Plan update. At minimum, maintain pre- to post-development groundwater recharge during any future development.
- ❒ Create a new Regional Watershed Monitoring Program monitoring station within the FMZ.
- ❒ Investigate the role of "pond hopping" and connectivity of standing pools during seasonal high flows and storms in providing refuge habitat and recruitment for this FMZ.

FMZ 3: Upper West Don River

Target Community: Indicator Species

Near term: northern redbelly dace, Johnny darter, longnose dace, common shiner

Long term: redside dace, rainbow darter, blacknose shiner

Objectives

1. Protect, maintain, and enhance habitat for all indicator species.
2. Maintain existing species diversity and improve native species diversity, abundance and distribution.
3. Identify recovery potential for redside dace.
4. Improve fish passage above G. Ross Lord Dam.

Recommended Management Strategies

In addition to the general recommended management strategies:

- ❒ Protect and regenerate habitat for Indicator Species according to the *Don River Fisheries Management Plan* and regeneration priorities identified in Chapter 6 of this document.
- ❒ Determine the need to mitigate or improve the function of the fish bypass channel at MacKenzie Glenn Pond (north

of Major MacKenzie, east of Jane).

- ❒ TRCA, the Ministry of the Environment, City of Toronto and City of Vaughan should partner to track the potential impact of leachate from former landfill sites on fish habitat.
- ❒ Seek funding opportunities for inventories of aquatic invasive species distribution (round goby, koi, other carp species).
- ❒ Establish a stewardship-based monitoring and detection program for aquatic invasive species in reaches that are currently free of invasives.
- ❒ TRCA should partner with major private landowners (e.g., Canada's Wonderland, CN rail yards) to implement stewardship initiatives addressing water conservation and aquatic invasive species management.

FMZ 4: German Mills Creek and Middle Reaches of the Upper East Don River

Target Community: Indicator Species

Near term: northern redbelly dace (East Don River), Johnny darter, mottled sculpin, rainbow trout (migratory)

Long term: redside dace (East Don River), rainbow darter, common shiner

Objectives

1. Protect, maintain and enhance habitat for all indicator species.
2. Maintain existing species diversity and improve native species diversity, abundance and distribution.
3. Identify recovery potential for redside dace in the middle reaches of the Upper East Don River.
4. Promote recreational angling opportunities for brown trout and chinook salmon in the middle reaches of the Upper East Don River.

Recommended Management Strategies

In addition to the general recommended management strategies:

- ❒ Protect and regenerate habitat for Indicator Species according to the *Don River Fisheries Management Plan* and regeneration priorities identified in Chapter 6 of this document.
- ❒ Seek funding opportunities for inventories of aquatic invasive species distribution (rusty crayfish).
- ❒ Relocate brown trout stocking activities from FMZ 1 to this FMZ.
- ❒ Assess brown trout for migratory behaviour and the ability to achieve the Lake-wide management objectives established for a migratory fishery.

FMZ 5: Lower East Don River, Lower West Don River and the Lower Don River

Target Community: Indicator Species

Near term:

Riverine: Johnny darter, common shiner, white sucker, rainbow trout (migratory)

Lake influenced: emerald shiner, walleye, northern pike, largemouth bass

Long term: rainbow darter, northern redbelly dace (Lower West Don River)

Objectives

1. Protect, maintain and enhance habitat for all indicator species.
2. Maintain existing species diversity and improve native species diversity, abundance and distribution.
3. Maintain migratory route for the lake-run salmonids.

Recommended Management Strategies

In addition to the general recommended management strategies:

- ❒ Protect and regenerate habitat for Indicator Species according to the *Don River Fisheries Management Plan* and regeneration priorities identified in Chapter 6 of this document.
- ❒ Sample fish communities (spring surveys) to determine the extent of walleye populations and potential spawning activity in the Lower Don River.
- ❒ Develop and implement a volunteer monitoring program to track potential walleye spawning activity in the long term.
- ❒ Implement the Lower Don River West Remedial Flood Protection Project and the Don Mouth Naturalization and Port Lands Flood Protection Project.
- ❒ Implement the City of Toronto's *Wet Weather Flow Management Master Plan* according to the *25-year Implementation Plan*.
- ❒ Continue to identify and implement opportunities to remediate combined sewer overflows (e.g., as per City of Toronto's Don and Waterfront Trunk Sewers and CSO Control Strategy Class Environmental Assessment and the North Toronto Treatment Plant Full Scale Implementation of High Rate Treatment study).
- ❒ Continue chinook salmon stocking in the Lower East Don River to support recreational angling in Lake Ontario and the East Don River.

FMZ 6: Taylor/Massey Creek

Target Community: Indicator Species

Near term: creek chub, longnose dace, white sucker, increased biodiversity of benthic community*

Long term: northern redbelly dace, brook stickleback

* The rationale for a benthic invertebrate target for this FMZ is related to measurability of improvements in conditions. Uncontrolled surface water flows and poor water quality are the limiting conditions in this FMZ. Improvements in water quality are expected to be the most achievable objective in the near term (due to mitigation of CSOs). The very limited distribution of the fish community in FMZ #6, and its relative pollution tolerance, limits its utility as a target for measuring improvements across the system. This is not the case in other FMZs where fish are the optimal target. In contrast, benthic invertebrates are found throughout this FMZ and are sensitive to improvements in water quality, making benthic invertebrate biodiversity an appropriate near term target.

Objectives

1. Maintain and improve habitat for existing indicator species to increase their relative abundance and distribution.
2. Expand the potential range of migratory white sucker through instream barrier mitigation.
3. Improve the diversity of the benthic invertebrate community through habitat improvements that target stream substrate structure.

Recommended Management Strategies

In addition to the general recommended management strategies:

- ❒ Protect and regenerate habitat for Indicator Species according to the *Don River Fisheries Management Plan* and regeneration priorities identified in Chapter 6 of this document.
- ❒ Continue monitoring of stormwater outfall water quality in Taylor/Massey Creek (City of Toronto's Taylor/Massey Creek Storm Outfall Monitoring Program).
- ❒ Implement the City of Toronto's *Wet Weather Flow Management Master Plan* according to the *25-year Implementation Plan*.
- ❒ Continue to identify and implement opportunities to remediate combined sewer overflows (e.g., as per City of Toronto's Don and Waterfront Trunk Sewers and CSO Control Strategy Class Environmental Assessment).

5.2.2 Terrestrial System

The terrestrial natural heritage (TNH) system includes forests, meadows and wetlands, and the plants and animals that inhabit them. However, in a highly urbanized watershed with little natural cover, like the Don River, it is especially important to improve the ecological function of the urban landscape as a whole. Hence, the objectives and strategies apply both to the terrestrial natural heritage system and, as guiding principles, give direction to urban design and land use in the rest of the land base that makes up the majority of the watershed. The urban landscape forms a kind of continuum of ecological function ranging from the terrestrial natural heritage system through parklands, treed residential areas, higher density neighbourhoods, to completely built and paved areas with minimal ecological function. Each can be improved in itself, while at the same time improving the "matrix influence" or impacts on nearby natural areas.

Management Objectives, Terrestrial System

- Protect and expand the Terrestrial Natural Heritage System and improve connectivity among the watershed's forests, meadows, and wetlands.
- Regenerate the health of natural areas, and the whole urban landscape, to improve their quality, biodiversity, and ecological function.
- Manage the impact of human activities and neighbouring land uses in the watershed.

Terrestrial Natural Heritage System

The terrestrial natural heritage system provides many benefits that are critical to the health of the watershed. It helps maintain the water balance and stream stability, protect aquatic ecosystems, provide wildlife habitats, moderate climatic conditions, absorb air pollution, improve aesthetics, provide recreation opportunities and generally improve the quality of life for watershed residents. The TNH system is the backbone of the watershed's "green infrastructure".

The natural heritage system in the Don faces a number of challenges, including loss and fragmentation of cover due to past and current urbanization (including ongoing intensification and infill development), incompatible uses (such as dumping and proliferation of informal trails), loss of flora and fauna resulting from stream bank erosion and collapse of forests, spread of invasive species, and protection of endangered species (e.g., butternut is listed as endangered under federal legislation). Key issues are further described in Section 3.8. Climate change will add further stresses to the system resulting in probable losses of native species and increases in invasive, non-native species. Much of the remaining natural cover (currently covering 16% of the watershed) is concentrated along the valleys, which see intense public use. Protection and ongoing care and management of existing natural areas will be essential to maintaining and enhancing the robustness of the natural heritage system.

Opportunities for significant additions to the terrestrial natural heritage system are limited and concentrated on the Oak Ridges Moraine and a small part of the South Slope, where provincial legislation currently offers some protection from urbanization through the *Oak Ridges Moraine Conservation Plan* and the *Greenbelt Plan*. A Target Terrestrial Natural Heritage System has been developed to assist in identifying lands for acquisition or natural cover regeneration.

The Urban Landscape

With limited potential for expanding the TNH system, it is important to better integrate the urban forest with the remaining natural areas. The urban forest consists of publicly and privately owned trees outside the terrestrial natural heritage system, mostly found lining streets and in parks and back yards.

Air quality, soil quantity and quality, tree care effort, climate, weather events, and pathogens and pests all influence urban tree health. Additionally, many urban trees (both old native pre-development specimens such as oaks, and

Matrix Influence
The surrounding land use context (i.e., agriculture, forest, transportation, recreation, residential, commercial and industrial land uses) for natural habitats is referred to as the matrix. It influences the value of the habitat to native species through such influences as predation, competition, disturbance and encroachment.

street trees planted in the early 20th century such as silver maple) are nearing the end of their natural lifespan. Some neighbourhoods are at risk of becoming denuded over a short period of time because they have an urban canopy of older trees all the same species and age. The goal is to create a sustainable urban forest through actions that will ensure regenerating, long living, healthy trees.

The urban forest has the ability to reduce some of the negative "matrix" influence on the terrestrial natural heritage system. A dense urban forest is better able to regulate temperature and reduce the urban heat island effect that may limit ravine vegetation health and diversity. Hydrology impacts are also less severe with increased tree cover and more permeable surfaces. Urban trees, especially in conjunction with ground-layer plantings, can improve connectivity between natural areas. The canopy also provides a stop over for migratory birds and, provided that original pre-development native trees exist, can furnish a seed source for native plant regeneration. For example, many old oak trees line the streets of neighbourhoods along the Iroquois Plain. Trees are valuable to urban communities for many reasons, including their aesthetic appeal, shade, and for nature-based enjoyment.

Urban vegetation is not limited to trees. Gardens and green roofs can include native shrubs, wildflowers, and grasses.

Current Initiatives

Many tools are available to guide the protection and management of the terrestrial system. They include legislation for the Oak Ridges Moraine and Greenbelt, TRCA's *Terrestrial Natural Heritage System Strategy* (TRCA, 2007b), and municipal plans and policies. The City of Toronto with input from TRCA has identified policy and mapping for an expanded natural heritage system for the City in its Official Plan. Toronto's Ravine by-law supports the implementation of this policy. The Region of York's *Greening Strategy* aims to ensure that York's natural heritage is maintained for future generations and provides a context for policy and implementation decisions that affect natural heritage features. The *Greening Strategy* includes a range of activities including greening targets for York Region, securement of priority greenlands, naturalization and rehabilitation, community education and urban forest management. The City of Vaughan, under its Green Directions Strategy, plans to undertake an Urban Forest Strategic Plan to set targets and develop implementation plans. York Region, Richmond Hill, Markham and Vaughan all have tree preservation by-laws.

Land acquisitions have contributed to securement of the TNH system. For example, the McMillan Property and much of the former Maple MNR lands have entered public ownership. Many agencies and nongovernmental groups are engaged in various initiatives to regenerate natural cover in the watershed, and more is planned (e.g., naturalization of the Don Mouth, Carscadden Greenbelt, McMillan Property, East Don Parklands Greenbelt). Many programs are available to assist private landowners to restore and manage natural cover, including municipal and conservation authority stewardship programs (e.g., Healthy Yards). Tree planting occurs on both public and private lands, through the City of Toronto's Tree Advocacy Planting Program and LEAF (Local Enhancement and Appreciation of Forests).

Stewardship groups are active in plantings, wetland creation, clean-ups and habitat projects, including Friends of the Bartley Smith Greenway, Task Force to Bring Back the Don, East Don Parkland Partners, Friends of the Don East, Sherwood Park Advisory Committee, Toronto Green Community, and Taylor Massey Project, among others. Municipalities also are active in planting, for example the Town of Markham aims to plant 75,000 trees by 2010 under its Tress for Tomorrow program.

Monitoring activities are undertaken throughout the watershed by municipalities, agencies and community groups. The TRCA's Regional Watershed Monitoring Program conducts field inventories of flora and fauna in partnership with volunteers.

Recommended Management Strategies

Strategy #1: Improve ecological function of the entire urban landscape, from the natural areas to the built areas, by increasing vegetation cover through better urban design and land management

Enhancing the urban forest through plantings of trees and other vegetation, along with compatible landscape design and building practices such as green roofs, can have a significant benefit in reducing matrix impacts on the natural system while increasing the ecological value of the whole watershed.

Strategy 1 Actions

- ❒ Develop urban forest management plans addressing planting and maintenance conditions of street trees, yard trees, and trees in parks and ravines, understory conditions and other issues.
- ❒ Expand natural cover on manicured lands, including large public and private properties, such as industries, institutions, golf courses, transportation corridors and large residential lots.
- ❒ Encourage naturalized landscaping during urban redevelopment.
- ❒ Encourage "soft" backyard landscaping that minimizes impervious surfaces and incorporates native plants.
- ❒ Continue to implement City of Toronto's Green Roof Incentive Program and develop similar programs in other municipalities.
- ❒ Restore and maximize habitat connectivity, especially east-west corridors across tableland.
- ❒ Increase representation of upland communities and wetlands on tableland.
- ❒ Create ecopassages for amphibians and other wildlife crossings of streets in greenfield development areas.

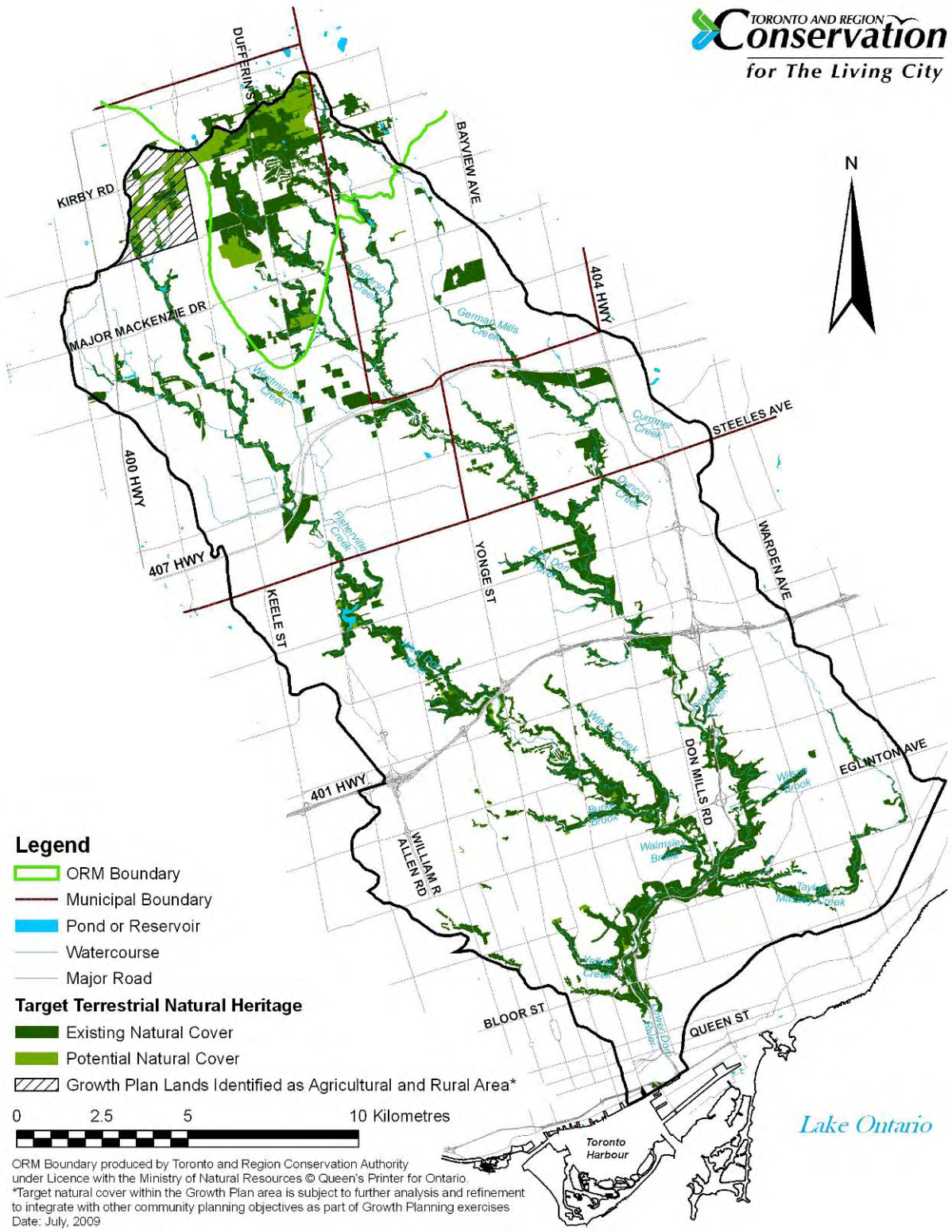
Naturalizing Urban Landscapes

Southern Ontario's native plants existed here for thousands of years before European settlement. This diverse group of plants evolved, together with native wildlife and insects, to the local climate and soil conditions. As areas become more urbanized, this collection of native plants is replaced by manicured lawns and gardens that offer little support to wildlife and often require irrigation and fertilizer to survive.

Naturalization, the conversion of manicured areas to native vegetation communities, is one way to help reconnect natural areas and soften the effects of urbanization. It can be done in a public setting such as a park or golf course or on a smaller scale in an urban yard or boulevard. Passive naturalization of an area can be achieved by halting maintenance of a mown area and allowing it to regenerate to a meadow or forest over time. This approach is best suited to areas where a good local seed source is already present (i.e. areas near existing greenspace) where neighbour concerns about tidiness are not likely to be a problem. The regeneration process can be accelerated by planting native trees, shrubs or wildflowers.

Homeowners with small yards may prefer to naturalize sections of their property by using native plants in more formal gardens. There are many good resources available to help gardeners "go native" in their yards. TRCA's Healthy Yards program has fact sheets and workshops on topics such as butterfly gardens, beneficial insects, getting started with naturescaping and attracting birds to your garden. A number of local municipalities also offer programs and resources to encourage naturalized gardens. Visit TRCA's Healthy Yards webtool to get connected with resources in your local area—www.trca.on.ca/yards.

Figure 26: Refined Target Terrestrial Natural Heritage System



Target Terrestrial Natural Heritage System							
Subwatershed	Quantity						
	Total		L1	L2	L3	L4	L5
	ha	%	ha	ha	ha	ha	ha
Upper West Don River	720	12	0	73	220	414	13
Upper East Don River	1436	23	0	552	381	478	25
German Mills Creek	464	12	0	60	111	282	11
Lower West Don River	805	13	0	0	0	804	1
Lower East Don River	583	10	0	0	5	564	14
Taylor/Massey Creek	202	7	0	0	0	190	11
Lower Don River	403	8	0	0	0	390	12
Don watershed	4611	13	0	685	718	3122	86

L# = Local rank, a score of habitat patch "quality" based on size, shape, and matrix influence, ranging from L1 (highest quality) to L5 (lowest quality) (TRCA, 2009g).

- ❒ Continue to implement, review and update tree preservation bylaws (and penalties for non-compliance) and consider expansion to trees on private lands (as has been done by Toronto).
- ❒ Develop urban design guidelines addressing urban forest targets and implementation requirements.

Strategy #2: Secure the Target Terrestrial Natural Heritage System (Figure 26) and look for additional opportunities for expansion (e.g., additional lands identified in City of Toronto's Official Plan, Map 9)

Urbanization has left little natural cover in the Don River watershed. Protection of the remaining natural cover is essential. Opportunities for expanding the terrestrial natural heritage system are modest and are concentrated on the Oak Ridges Moraine and in the upper reaches of the headwaters subwatersheds. Our target terrestrial natural heritage system identifies lands that should be secured or enhanced through protective policy, acquisition, easements, or stewardship agreements (Figure 26). The total refined target system for the Don watershed is 13% of the total land base.

This target represents an apparent 3% decline in the system from the 16% TNH system that was existing in 2002, the baseline year. About 20% of the decline is a result of losses in natural cover since 2002 due to approved development. The remaining 80% of the apparent decline does not reflect actual losses, but rather exclusion of some existing cover from the target system (e.g., isolated patches, patches vulnerable to change of use, such as those in utility and highway right-of-ways). More than 80% of this excluded cover is very low-functioning cultural meadow (i.e., areas of meadow dominated by invasive species that may be regularly maintained (e.g., mowed) after deforestation or other disturbance) not expected to contribute to future improvements in the function of the Don TNH system. Nevertheless, these low functioning, disturbed areas of natural cover may continue to be a visible presence in the Don and play a role in supporting the natural heritage system. More information on the refinement of the target system for the Don can be found in a technical background report (TRCA, 2009g).

Municipalities should recognize the Terrestrial Natural Heritage System (TNHS) for the Don River watershed, as refined for this Watershed Plan. Further, TRCA staff should continue to promote the regional *Terrestrial Natural Heritage System Strategy* (TNHSS) to demonstrate the importance of the entire system and to mitigate the impacts of development. To this end, TRCA staff should support municipal plans that identify an expanded natural heritage system based on the ecological principles and criteria of the TNHSS and contain policies that require protection of the system in

public ownership. Moreover, where it has been demonstrated that impacts to the system are unavoidable, a net environmental gain should be provided. There will be challenges to achieve the target terrestrial natural heritage system together with the assigned Provincial growth targets. However, new approaches being undertaken toward more integrated community planning and design, whereby the environmental and services objectives are considered early in the community planning process, suggest greater likelihood of achieving improved outcomes overall as compared to past approaches. Therefore, it is expected that the target system for the watershed will undergo further analysis and refinement at more detailed scales to integrate it with other community planning objectives as part of local planning exercises which will aim to optimize lands for all uses.

Additional opportunities to expand the natural system beyond the target also exist on manicured lands in the park system and on larger properties, especially institutional lands. Such opportunities should be identified and pursued and could result in a natural system that is more than 13% of the land base in the watershed.

Strategy 2 Actions

- ❒ Start securing the target system with unprotected lands subject to greenfield development or intensification, lands in the Protected Countryside areas of the *Greenbelt Plan/Oak Ridges Moraine Conservation Plan* (ORMCP), and lands in the Natural Core and Linkage areas of the ORMCP (Figures 20 and 26).
- ❒ Define and designate Terrestrial Natural Heritage systems in all watershed municipal Official Plans and policies.
- ❒ Continue monitoring the terrestrial natural heritage system under the Regional Watershed Monitoring Network.

Strategy #3: Regenerate and enhance the quality of the natural system by increasing natural cover quantity, improving patch size and shape, and managing invasive species

The focus should be on regeneration of the urban landscape. Any and all opportunities for managing, enhancing and regenerating the landscape should be taken advantage of, as they arise. Priority regeneration sites have been identified within the TNH System (Figure 27). Priority sites were selected to enhance and buffer existing higher quality sites meeting the following criteria:

- ❒ High density of flora or fauna species of concern or vegetation communities of concern (known or modeled)
- ❒ Presence of forest interior habitat
- ❒ Old growth (forest age)
- ❒ Protecting policy areas
- ❒ Potential for connectivity
- ❒ Recent high loss of natural cover in the subwatershed

Priority sites may be improved through a variety of management, regeneration and enhancement activities, including:

- ❒ Improving patch size and shape
- ❒ Removal of invasive flora species
- ❒ Decommissioning of informal trails or building boardwalks over sensitive habitat features
- ❒ Creating seasonal no-trespass zones to protect nesting habitat for sensitive breeding fauna
- ❒ Restricting off-leash pet access

- ❒ Mitigating encroachments (e.g., mowing, dumping, litter)
- ❒ Reestablishing natural or historically present vegetation communities
- ❒ Plantings
- ❒ Enhancing habitat structures

The function of natural habitat patches in a fragmented landscape is affected by their size and shape. Large patches function better than smaller patches. Round patches function better than linear ones because they have a smaller edge-to-interior ratio. Thus, in general, larger, rounder patches are more protected from "edge effect" disturbances that are so prevalent in the urban landscape: for example, heat, dryness, predation by pets and certain urban wildlife such as raccoons, invasive species, and dumping. Some forest patches in the Don watershed have forest interior of 100 m or more, which provides a more sheltered environment for relatively sensitive flora and fauna.

Opportunities for increasing natural cover (whether or not in the immediate target system) can be identified and, once identified, can be assessed for their contribution to patch size and shape improvement.

Strategy 3 Actions

- ❒ Take advantage of any and all opportunities for regeneration in the Don River watershed. When possible, target regeneration of natural cover in priority sites (Figure 27). The highest priority areas are: Block 27 in the City of Vaughan, the Sunnybrook – Glendon – Wilket Creek area, the Maple Uplands area, Block 28 in the City of Vaughan, G. Ross Lord Park, and the E.T. Seton Park – Thorncliffe area.

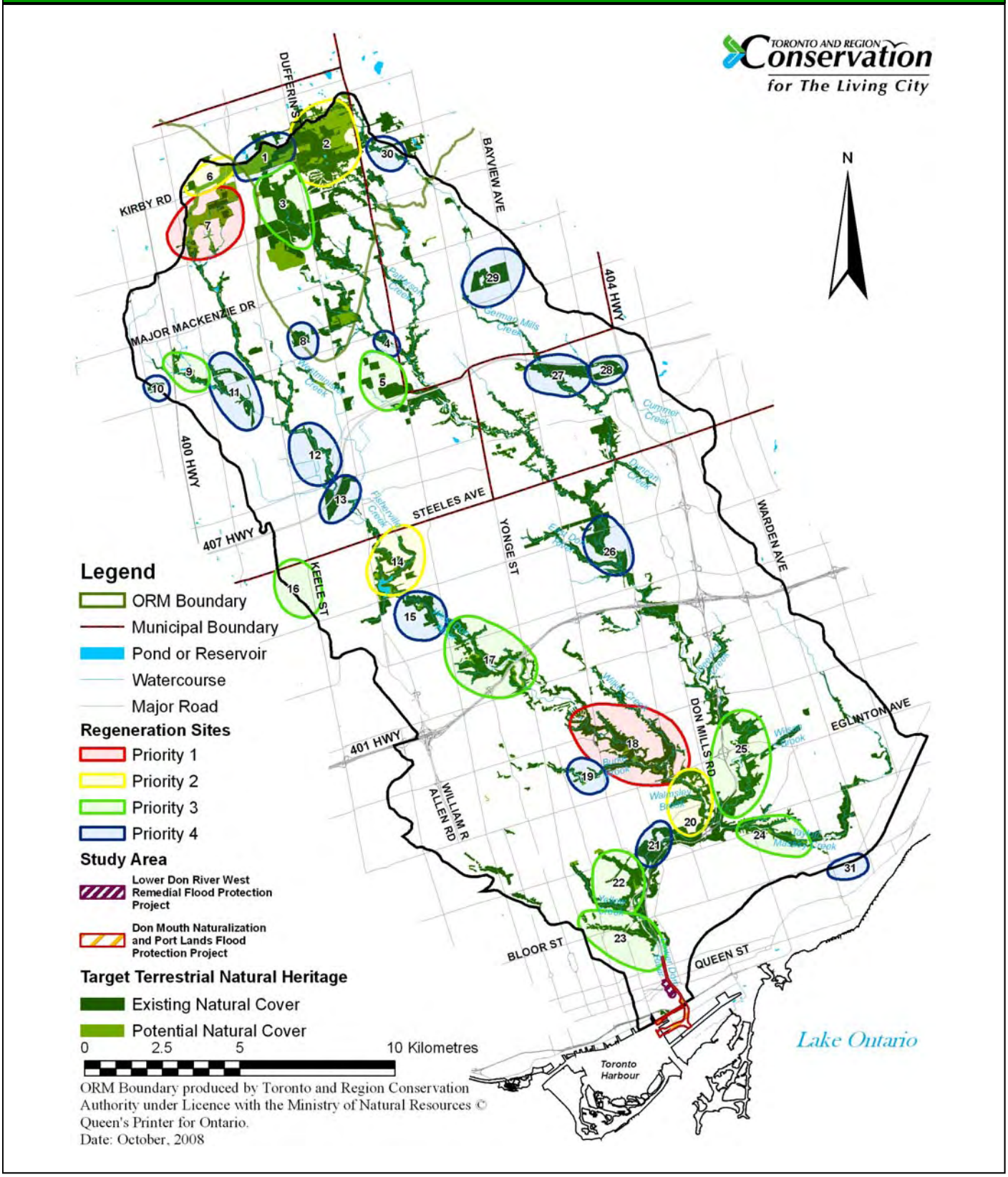
Priority Terrestrial Natural Heritage Regeneration Sites[1]

Site	Site Name	Rank
7	Block 27	1
18	Sunnybrook - Glendon - Wilket	1
2	Maple Uplands - McGill	2
6	Block 28	2
14	G Ross Lord Park	2
20	E.T. Seton Park & Thorncliffe	2
3	Maple Uplands - Teston Road	3
5	Baker's Woods (incl. satellites)	3
9	Canada's Wonderland	3
16	York U woodlots (not in target sys)	3
17	Earl Bales (inc Hinder & Sandring)	3
22	Moore Pk/Brick Works/Park Drive	3
23	Castle Frank / Riverdale	3
24	Taylor Creek Park	3
25	Charles Sauriol Reserve	3
1	Maple Uplands - Kirby Road	4
4	Waldorf School	4
8	Block 18 woodlot complex	4
10	Vellore Woods	4
11	CNR marshalling yards	4
12	Langstaff Eco-Park	4
13	Concord - 407 corridor	4
15	West Don Parklands	4
19	Sherwood Park	4
21	Crothers Woods	4
26	Finch Swamp	4
27	Huntington Park	4
28	404 / 407 lands	4
29	Dunlap Observatory lands	4
30	German Mills headwaters	4
31	Gerrard Prairie	4

[1] See Figure 27.

- ❒ Monitor and control terrestrial invasive species (e.g., buckthorn and dog strangling vine) and eradicate any Asian Longhorn Beetle found in the watershed. Share monitoring data with partner organizations.
- ❒ Include native species planting lists in the *Toronto Green Standard* and the chapter of the Toronto Municipal Code addressing Green Roof Construction Standards (as updated).

Figure 27: Priority Terrestrial Natural Heritage Regeneration Sites



- ❒ Remove invasive exotic species (e.g., Norway maple) (and cultivars of native or exotic species) from municipal planting lists.
- ❒ Develop and adopt planting guidelines for Low Impact Development that address urban site, planting and maintenance conditions (e.g., *Low Impact Development Stormwater Management Manual*, CVC and TRCA, 2008 Draft, as updated).
- ❒ Address encroachment in ravines through enforcement, education and stewardship.
- ❒ Ensure natural recruitment of native species and communities in regeneration plans.
- ❒ Develop recovery plans for species and vegetation communities at risk or of conservation concern (e.g., butternut is endangered under the federal *Species At Risk Act*, oak woodlands).
- ❒ TRCA should identify the Asian Longhorn Beetle problem during permit and planning applications that involve the movement of wood through, or out of, the area regulated for the ALHB by the Canadian Food Inspection Agency.
- ❒ Continue to partner with grassroots, community and non-profit groups, as well as the business sector, to implement habitat regeneration projects.

Strategy #4: Mitigate the impact of human activities on natural areas by developing a broader understanding of ecosystem health and a commitment to stewardship among the public and businesses

A number of activities commonly pursued around urban areas increase the stress upon sensitive flora and fauna in the natural areas. These include various forms of recreation such as unrestrained off-road hiking and biking that remove ground vegetation and cause erosion, off-leash pets that disturb wildlife, and dumping, particularly the dumping of yard waste containing invasive species into ravines.

Directing activities in parks and ravines so as to minimize the impacts on natural areas will improve the ecological function of the Don watershed and the target system. It requires careful planning and good will among the citizens who value the natural beauty of the Don.

The success of regeneration efforts can be enhanced if people are aware of natural areas, native species, and how to maintain regeneration sites and the urban forest. Stewardship can range from adopting a regeneration site in a ravine to maintaining street and backyard trees to gardening with native plants and using rainwater collection for watering.

Strategy 4 Actions

- ❒ Create and fence designated off-leash pet areas and educate pet owners on minimizing impacts.
- ❒ Limit public access to sensitive areas.
- ❒ Involve private landowners in land stewardship through incentives, awards, and education.
- ❒ Support regeneration efforts and plantings of grassroots community groups and individuals.
- ❒ Involve the public in monitoring and controlling the spread of invasive exotic species.
- ❒ Continue to implement Healthy Yards programs.
- ❒ Enhance public awareness and develop marketing programs to enhance voluntary uptake of sustainable practices by home owners and businesses (e.g., backyard naturalization, rain gardens) as outlined in the *Action Plan for Sustainable Practices* (Freeman Associates, 2006).

5.3 Caring for Community

5.3.1 Cultural Heritage

Management Objective, Cultural Heritage

- ❒ Identify, document, protect and celebrate the cultural and heritage resources of the watershed.

Human cultural heritage has a long history in the Don River watershed. Understanding cultural heritage helps to define our sense of place and provides insights into today's landscapes, environmental conditions, and human-environment relationships. For the purpose of this plan, cultural heritage includes archaeological resources, built heritage, cultural heritage landscapes as well as the stories associated with them. It also includes living culture pursuits, such as art, performing arts and gardening that are a means of expressing present relationships with our environment.

The main thrust of the cultural heritage work in the Don is beginning to shift from development-driven surveys and finds to preservation, interpretation and celebration of known cultural heritage resources. Celebration of human heritage and the interrelatedness of human history and the natural environment already is a focus at some well known sites, such as the Port Lands, Todmorden Mills and the Don Valley Brick Works, but there are many more opportunities to tell the story of the cultural heritage of the Don River watershed. Our review of current conditions illustrated the rich human history and diverse cultures of today's communities in the Don watershed. It also highlighted some key issues to be addressed in the Watershed Plan (Section 3.9).

Recommended Management Strategies

Strategy #1: Identify, investigate and conserve cultural heritage prior to changes in land use or redevelopment

The remaining rural lands in the Don, both on and off the Oak Ridges Moraine, may contain significant cultural heritage resources. For instance, an Iroquoian Village and associated ossuary have been identified in the headwaters near what is now Jane Street and Teston Road; with the guidance of the living descendants, it is a highly culturally sensitive area with great potential for protection and celebration of the past peoples in that area.

Little is known about the cultural heritage resources of the land protected as Natural Core and Natural Linkage areas on the Oak Ridges Moraine. The remaining rural lands and historic farmsteads present some of the last opportunities to preserve rural countryside areas in the Don.

Redevelopment in the City of Toronto may offer opportunities to explore the Don's industrial and commercial heritage. Adaptive re-use of heritage buildings and outreach education is needed to keep the Don's heritage alive in the hearts and minds of watershed residents.

Observatory on the David Dunlap lands in Richmond Hill

Strategy 1 Actions

- ❒ Review municipal Official Plans to ensure that objectives and cultural heritage conservation policies and approval procedures, as outlined in the *Planning Act*, are adopted that protect cultural heritage resources, including demolition control by-laws, interim control by-laws, subdivision

Current Initiatives

Amendments to the *Ontario Heritage Act* (April 2005) give the Province and municipalities new powers to stop demolition of heritage sites. They also increase the ability of the Province to identify and designate sites of Provincial heritage significance and to set clear standards and guidelines for preservation.

Regionally, TRCA continues to undertake archaeological surveys, update heritage inventories and assess properties for archaeological resources prior to making any site alterations. All municipalities in the Don River watershed have heritage committees and are working to record, categorize and update their heritage inventories. Toronto, Vaughan, Markham and Richmond Hill have Archaeological Master Plan studies and, recently, Toronto and Vaughan have provided an on-line searchable database and interactive map of their heritage properties. Some municipalities, such as Toronto, use mapping of the potential for archaeological finds to inform the development planning process.

A cultural heritage study was conducted in the Lower Don as part of the *Environmental Assessment for the Naturalization and Flood Protection for the Lower Don River* (TRCA, 2004). The study inventoried existing cultural heritage resources through a combination of fieldwork and a review of historical records, and identified 61 human heritage features in the study area, including two archaeological sites. Many of the heritage features are reflective of early Toronto's industrial and commercial history, although there is some potential for future identification of additional heritage structures, cultural heritage landscapes and archaeological sites that would represent other historical aspects of the area.

Ongoing Official Plan reviews in some watershed municipalities (Richmond Hill, Markham, Vaughan) offer an opportunity to update cultural heritage policies and requirements for heritage investigations during development planning (new and redevelopment). Richmond Hill is updating its Archaeological Master Plan as part of this process.

development agreements, financial incentives, and requirements for heritage impact assessments and conservation plans.

- ❒ Apply the conservation measures outlined in the *Ontario Heritage Act* as a component of the municipal planning process, namely property listing and designation, protective easements, architectural design guidelines, the support role of municipal heritage committees, and grants, loans, and incentives for heritage conservation.

- ❒ Strengthen and expand the documentation process for culture and heritage to improve effectiveness and consistency throughout the watershed.

- ❒ Conduct thorough archaeological assessments in remaining areas potentially subject to greenfield development, and minimize impacts to cultural heritage landscapes resulting from future development, as per the mandate of the Provincial Policy Statement (2005) and the directives of the *Planning Act* and the *Environmental Assessment Act*. These reviews should incorporate field investigations and evaluation of 19th century farm, industry, and community features and built heritage, as well as identification, preservation, and interpretation of below ground and marine archaeological resources.

- ❒ Retain Aboriginal archaeological sites as greenspaces, to the extent possible, with limited investigative excavations, preserved and protected as designated properties or cultural heritage landscapes under the *Ontario Heritage Act*.

- ❒ Conduct archaeological field surveys in protected areas of the Oak Ridges Moraine so that knowledge of the cultural history is watershed-wide rather than limited to built areas.

- ❒ Exclude sacred sites, including locations of human burials, from developing areas and permanently protect them

under the *Ontario Heritage Act* or the *Cemeteries Act*. These sites include, but are not limited to, Aboriginal burial grounds and villages, and Euro-Canadian pioneer burials and cemeteries.

- ❒ Promote information sharing among heritage professionals and culturally descendant populations regarding the interpretations and cultural significance of the heritage resources being preserved.

- ❒ Establish a permanent centralized repository (for the Greater Toronto Area) for storage of archaeological artifacts, with participation by Aboriginal representatives. The repository should provide secure artifact storage and community-friendly spaces, and include places for researchers to work, artifact layout space, and flexible areas for public use. Culturally descendant populations should be consulted on the location and nature of the repository(ies) (e.g., access to interact with artifacts, special considerations for artifacts of ceremonial or special ideological significance). Funding strategies could include box levies on the remover (e.g., landowner or project proponent) of the artifact. A trustee approach can be encouraged if ownership (e.g., of Aboriginal artifacts) is an issue.

- ❒ Maintain the countryside character of sections of the remaining rural roads, such as Kirby Road, as part of the cultural heritage landscape. Associated historic farmsteads could be maintained or adapted for future uses.

- ❒ Promote adaptive re-use of heritage buildings during redevelopment or infill development. To the greatest extent possible, 19th and early 20th century residential, industrial, and commercial complexes should be researched, submitted to the municipality for designation under the *Ontario Heritage Act*, and incorporated into designs for future redevelopment. Wherever possible, entire features, or at least elements of the features, should be kept in their original context.

- ❒ Through the extensive redevelopment and naturalization opportunity near the mouth of the Don River, Waterfront Toronto should set an example for best management practices in such situations through archaeological assessments in all locations planned for physical modification, the identification of opportunities to preserve and interpret important heritage resources for public education, and the creation of promotional materials (e.g., self-guided walking tour brochure) for the public that highlight areas of historical interest that identify educational and recreational opportunities.

- ❒ Promote the Canada's Historic Places initiative, which includes standards and guidelines to protect historic places and the relationship between conserving historic places while reducing the effects of climate change.

Strategy #2: Establish a comprehensive communication plan with Aboriginal (First Nations and Métis) groups and other more recent descendant populations

There is a need and opportunity to enrich our celebration of heritage through improved relationships with Aboriginal groups and other culturally descendant groups (e.g., descendants of 18th and 19th century non-Aboriginal settlers). Although there are no lands governed directly by modern Aboriginal groups in the watershed, the Don is part of traditional hunting and transportation territories for several living Nations. Traditional and sacred spaces in the watershed continue to be of great importance to modern descendant populations. A communications plan could identify key stakeholder groups and contacts as well as partnership opportunities for investigation/discovery, interpretation and awareness programs, viewing of artifacts, program development, education and events. It would benefit the broader watershed population, as well as the culturally descendant groups that have ancestral ties and other interests in the Don River area. Through this process, modern descendant groups can contribute to a greater understanding of past peoples' lives and movements through the watershed, beyond what archaeological and other studies can discover.

Strategy 2 Actions

- ❒ Identify culturally descendant groups and other stakeholders, and develop contact information.

- ❒ Nurture relationships and partnership opportunities for investigation/discovery, interpretation and celebration of cultural heritage resources, viewing of artifacts, program development, education and events.

- ❒ Continue to consult with relevant First Nations groups about the preservation and interpretation of Pre-Contact burial and village sites found in the Don headwaters.
- ❒ The Ontario Ministry of Culture should establish a system of Nation-to-Nation two-way meaningful consultation that individual archaeologists and Aboriginal communities can follow to share information with each other.

Strategy #3: Fill gaps in archaeological knowledge

A program including but beyond the limits of the Environmental Assessment process should be developed to fill gaps in our archaeological knowledge and improve our understanding of early human cultures. There are a number of heritage sites and stories that could be further studied, interpreted and celebrated, including:

- ❒ Undiscovered cultural heritage of lands on the Oak Ridges Moraine.
- ❒ Sites with ties to the Underground Railroad (e.g., Thornton-Blackburn site near the waterfront).
- ❒ The historic Irish community near the mouth of the Don.
- ❒ The historic Pennsylvania Dutch influence along German Mills Creek.

Strategy 3 Actions

- ❒ Optimize the information gathered through the Environmental Assessment process.
- ❒ Conduct detailed reviews of archaeological potential as part of the master planning process.
- ❒ Conduct strategic archaeological field studies of uninvestigated areas that are identified for future growth or redevelopment in Official Plans
- ❒ Develop a program that enables a regular compilation of the results of archaeological assessments (those conducted as components of Environmental Assessments, development proposals, etc.), and disseminates the information to researchers and the general public.
- ❒ Update Archaeological Master Plan studies for the Town of Markham and Town of Richmond Hill.
- ❒ Secure funding to continue to identify and fill the gaps in our archaeological knowledge.

Strategy #4: Develop and support existing active and participatory programs to increase awareness of cultural heritage and living culture

As the era of Greenfield development draws to a close and new finds become fewer, the cultural heritage focus in the watershed needs to shift to interpretation and celebration of known cultural history and artifacts, and living culture. The most effective means to increase awareness are those that actively engage participants (both adults and youth) in ways that bring heritage to life and incorporates it into daily activities. Successful programs exist in the watershed, such as those at Todmorden Mills and the Don Valley Brick Works. Existing programs should be supported and promoted and new active and participatory programs should be developed to provide learning opportunities and increase awareness of cultural heritage (e.g., heritage walks, bus tours, field courses, audio/visual/oral histories). Special attention should be given to reaching out to new Canadians. Living culture, such as photography, drawing, painting and performance arts should be incorporated. User-pay approaches are expected to be a feasible means of supporting these programs.

A living cultural heritage program could enhance interpretive and tourism opportunities in the watershed. It would draw upon the databases and inventories of cultural heritage, including built structures and cultural heritage landscapes. It would identify architectural assets in need of restoration and look for opportunities to revitalize heritage properties by

forming partnerships to increase revenue and explore adaptive re-use options, such as community centres, art centers, pubs, restaurants, and other businesses.

We should expand the public's general understanding of what constitutes an archaeological site or cultural heritage landscape to include features from the past not traditionally studied or mapped in archaeological surveys. For example, many of the Don's tributary streams have been piped or buried. Some of these tributaries are the subject of "Lost Rivers" walks. Mud Creek, formerly buried, was daylighted during regeneration of the Don Valley Brick Works site.

Cultural heritage and natural heritage are inextricably linked in the Don River watershed. These linkages should be highlighted in order to strengthen the rationale for protection of both resources.

Strategy 4 Actions

- ❒ Encourage municipal heritage committees to raise awareness among watershed residents of the procedures and benefits of identifying and protecting heritage resources, and to exchange information with other committees about their strategies.
- ❒ Promote and support existing and develop new active and participatory programs (e.g., Lost Rivers walks, heritage walks, Doors Open, bus tours, field courses, audio/video/oral histories) to provide learning opportunities and increase awareness of cultural heritage and living heritage.
- ❒ Partner with Aboriginal groups and other culturally descendant groups to develop programs to interpret and celebrate both cultural heritage and living heritage.
- ❒ Formally name and sign all the tributaries of the Don River.
- ❒ Develop "quality of place" by designating new Heritage Conservation Districts and Cultural Heritage Landscapes under the *Ontario Heritage Act* (such as Maple, Thornhill and Thornhill-Markham).
- ❒ Develop community-based projects to incorporate cultural heritage values and themes into the local community fabric. For example, install signage for communities, streets, and public buildings with historic names, and the Don River and its tributaries. Create trail guides, maps and public art.
- ❒ Promote links between natural heritage and human heritage, for example with interpretive signs about the influences of human activities on historic and current environments.
- ❒ Promote the economic values of culture and heritage resources and develop revenue-producing facilities and programs, following the examples provided by the Canada's Historic Places initiative.
- ❒ Assist schools with programs and materials to implement the 2006 Ontario school curriculum on First Nations and pioneer life.
- ❒ Conduct a feasibility study for continuing education courses for adults to learn practical skills, such as archaeological field work, artifact analysis, site interpretation, and archival research.

5.3.2 Nature-based Experiences

Management Objectives for Nature-based Experiences

- Connect people and places in the Don River watershed.
- Protect and regenerate natural areas and greenspaces for nature-based experiences.
- Celebrate the natural and cultural heritage of the Don River watershed.

With over a million residents in the watershed, access to public greenspace is in high demand. The trails, parks and natural spaces of the Don River watershed are popular locations for nature-based experiences and recreational activities, and often serve as daily transportation routes for commuters on foot and bicycle.

The character of the Don's greenspace is variable and unique nature-based experiences can be had across the watershed. Headwaters greenspaces are home to more of the watershed's tableland wetlands and woodlots with interior habitat, intensively-used valley lands can be found throughout the watershed, and regenerated industrial heritage sites are concentrated in the south, although built heritage, such as old mill sites, add character to greenspaces all over the watershed.

Municipal sports fields, golf courses, cemeteries, utility corridors and other private lands play important roles in linking public greenspaces and providing additional opportunities for outdoor experiences. Heritage buildings and landscapes, such as the Don Valley Brick Works, draw many visitors and often serve as visible links to our past relationships with the environment and the watershed's resources.

Public greenspaces and trails play many roles in the lives of residents of urban areas, including providing opportunities for physical activity and recreation, aesthetic enjoyment, spiritual renewal, and environmental education. In a highly urbanized watershed like the Don, local parks and trails become popular locations for tai chi, yoga, and recreation and education programs that traditionally use indoor spaces. Stewardship and planting events in local greenspaces become key nature-based experiences. It is well documented that an active population is healthier both physically and mentally, and that active lifestyles promote a sense of well-being. As such, access to beautiful public greenspaces contributes to the quality of life of watershed residents.

With such a wide variety of uses occurring on a small land base, conflicts – among user groups (e.g., mountain biking and hiking), between people and the environment (e.g., off-leash pets in environmentally sensitive areas), and from simple overcrowding – are a growing problem. Population growth and demographic changes (age, cultural diversity) will make it challenging to continue to provide adequate access to public greenspace that meets residents' needs and to protect environmentally sensitive areas. Limited budgets for operations and maintenance of greenspaces and their facilities is a further complication, likely to be exacerbated by the rising intensity of use of public greenspaces.

The Province has designated several "urban growth centers" in the watershed: Downtown and along Yonge Street at Eglinton Avenue, Sheppard Avenue, and Highway 7 (Figure 20). These growth centers may become "hot spots" for intensification of use of local greenspaces, such as the Don Valley Brick Works, Moore Park Ravine, Sherwood Park Ravine, Sunnybrook Park, Earl Bales Park, Pomona Mills Park, Doncrest Valley, and South Richvale Greenway. Redevelopment of existing urban areas may present opportunities to create new greenspaces and trails, and enhance the terrestrial natural heritage system. Creation of a new Don River Park as part of the waterfront regeneration will draw visitors from far a-field.

Use of public trails and greenspaces for "active transportation", such as walking, biking, and rollerblading, may increase as population density rises and people search out sustainable modes of transportation as alternatives to driving private automobiles. Improving the inter-regional trail network will facilitate a shift to active forms of transportation and provide better access to nature-based experiences. A summary of key issues is presented in Section 3.10.

Current Initiatives

Planning for nature-based experiences and greenspaces is largely undertaken by lower tier municipalities in the Don, as there are no formal Conservation Areas managed by TRCA or regional forests managed by York Region in the watershed. Planning occurs at the strategic level, such as the City of Toronto's strategic plan for urban canopy, parks, and public open spaces called Our Common Grounds. Richmond Hill, Vaughan, and Markham all have, or have underway, master plans for recreation, culture and parks. All watershed municipalities have been active in developing and implementing plans to address the growing demand for trails and pathways for active transportation (walking, cycling).

A growing trend is planning to address incompatible uses, such as:

- The City of Toronto is developing a management master plan for Crothers' Woods to manage impacts on an environmentally sensitive area and manage conflicting public uses.
- Municipalities are beginning to establish dog off-leash areas in an effort to redirect dog off-leash use from ecologically sensitive areas (e.g., Richmond Hill's draft Off Leash Area Policy).

Regeneration at the Don Mouth will create additional opportunities for trails and nature-based recreation through development of the Don River Park.

A number of ongoing events and initiatives exist to encourage the public to celebrate, enjoy and understand the natural features of the Don Watershed. Some of these initiatives include annual events such as the Richmond Hill Mill Pond Splash and the Paddle the Don event, while a number of guided and interpretive walk opportunities are provided through organizations such as the Don Watershed Regeneration Council, Friends of the Don East, the Taylor Massey Project, the Town of Richmond Hill (Walks on the Wild Side) and the City of Toronto (Discovery Walks). Lost Rivers walks are organized by Toronto Green Community and the Toronto Field Naturalists. Meanwhile, municipalities, including City of Toronto and Town of Richmond Hill have implemented programs to celebrate and identify the watercourses in their jurisdiction by providing signs at all river and stream crossings of major roads.

Recommended Management Strategies

Strategy #1: Protect and enhance the quality and extent of public greenspaces throughout the watershed, and, in particular, in areas of increasing population density and redevelopment

Greenspace currently covers about 8 % of the Don River watershed, largely in publicly owned valley and stream corridors. Maintaining the extent and quality of the existing greenspace system is paramount to meeting current and future watershed residents' demand for access to nature-based experiences.

Erosion and risk to infrastructure, garbage, unauthorized trails, invasive species, and incompatible public uses present ongoing challenges for operation and maintenance (O&M) of greenspaces. Intensification of use of greenspaces, in particular in response to rising population density, will exacerbate these problems and further stretch limited O&M dollars.

As the potential for greenfield development is nearly exhausted, large increases in the regional greenspace system are not expected. However,

What is Greenspace?

"**Greenspaces**" are defined as all *publicly-owned* land available for nature-based recreation, including municipal parks and conservation lands, and valley and stream corridors. This does not include golf courses, cemeteries, and municipal parks intended for intensive recreational use. Golf courses are addressed in the section on Land and Resource Use. "**Natural areas**" are defined as areas with natural cover – forests, meadows and wetlands – regardless of land ownership.

opportunities for small additions may exist, mostly through redevelopment or changes in land ownership and access. For instance, the West Don Lands project is creating the Don River Park, an 18 acre public greenspace, by transforming abandoned industrial land near the mouth of the River. Smaller redevelopments may present opportunities for creation of smaller greenspaces or retrofits to existing greenspaces (e.g., Yonge Steeles Corridor Study in Markham, Langstaff area of Thornhill, redevelopment of former landfill sites).

There is a need to develop operational agreements among TRCA, York Region and local municipalities for public lands in York Region, specifying clear maintenance and enforcement responsibilities and providing for sufficient financial and other resources for implementation. The existing agreement between the TRCA and City of Toronto could be used as a model.

Strategy 1 Actions

- ❒ Protect existing greenspace lands and add to the greenspace system, where possible, during redevelopment and greenfield development.

- ❒ Develop a "Growth Plan" for greenspaces to ensure protection of the integrity of greenspaces and natural areas, with consideration for growth plan population density projections and anticipated intensification of use. High priority sites are the Don Valley Brick Works and other parks near the provincially designed urban growth centres.

- ❒ Develop new funding mechanisms for operations, maintenance and retrofit of existing greenspaces (e.g., capital facilities such as land and improvements to valleys and the urban forest under section 37 of the *Planning Act)* during redevelopment and intensification.

- ❒ Review and establish management and operational agreements on public lands in City of Toronto and York Region, to address operations and maintenance, regeneration, and signage.

- ❒ Map known and suspected problem areas relating to mountain biking in sensitive natural areas and parks. Develop strategies for addressing mountain biking in existing and anticipated future problem areas across the watershed, as was done by City of Toronto for Crothers' Woods, including Maple Nature Reserve in Vaughan, and the following locations in Toronto: north of Sunnybrook Park, E.T. Seton Park, Sherwood Park Ravine, and the Parkview Hills area.

- ❒ During parks redevelopment, consider opportunities to incorporate stormwater control, as per Toronto's *Wet Weather Flow Management Master Plan*, and retrofit studies by municipalities in the 905 area.

- ❒ Develop and implement regeneration or redevelopment plans for high-use parks and public lands in need of revitalization. Plans could address visions and themes for the park, associated infrastructure needs, habitat regeneration opportunities, stewardship and outreach to neighbouring communities and visitors, and maintenance and operations issues. Consider starting with:

    - In Toronto: Wilket Creek Park and Taylor Creek Park Wetland.

    - In Markham: Pomona Mills Creek (Erosion Restoration and Habitat Enhancement Study) and the closed landfill lands adjacent to German Mills Settler's Park.

    - In Vaughan: Maple Nature Reserve and adjacent former Avondale composting site and former Keele Valley Landfill site, MacMillan Nature Reserve, Baker Sugar Bush, and Bartley Smith Greenway.

    - In Richmond Hill: Richvale Greenway and Richvale Athletic Field, Lennox Park, Pioneer Park and Hunter's Point Park.

- ❒ Improve public accessibility to non-traditional greenspace lands, such as utility corridors, and key connecting

private lands, such as golf courses and school grounds. In particular, off-season access through golf course lands should be pursued.

- ❒ Acquire land for greenspaces and trails in priority areas, including David Dunlap Observatory in Richmond Hill. This site is one of the few large blocks of natural cover in the German Mills Creek subwatershed and also has significant cultural heritage features. Lands needed for key trail connections are also an acquisition priority.

- ❒ Develop an education and stewardship program to build community interest in, and support for, ongoing care of local greenspaces, including:

    - Designate formal pet off-leash areas outside of sensitive environmental areas.
    - Implement Park Ambassador programs across the watershed, as has been done in Vaughan, to enhance monitoring and care of greenspaces.
    - Create signage for trails and greenspaces that encourages users to be good stewards of the areas (e.g., dogs on leash, stay on trails, no picking of flora, don't release pet turtles or goldfish).
    - Develop corporate sponsorships for key parks improvements. For example, sponsorship for "pet waste control" stations with bags and waste bins.

- ❒ Monitor trail use (recreational and commuter) and participation rates in activities such as birding, fishing and picnicking to assist in planning and regulating public activities.

- ❒ Municipalities and TRCA should identify and evaluate existing and proposed formal and informal trails, and consider decommissioning trails impacting sensitive natural areas.

- ❒ Continue to develop and implement plans for the Don River Park at the Mouth of the Don.

Strategy #2: Expand the network of formal trails to connect key destinations and improve connectivity with neighbouring watersheds, the Oak Ridges Moraine, and the waterfront

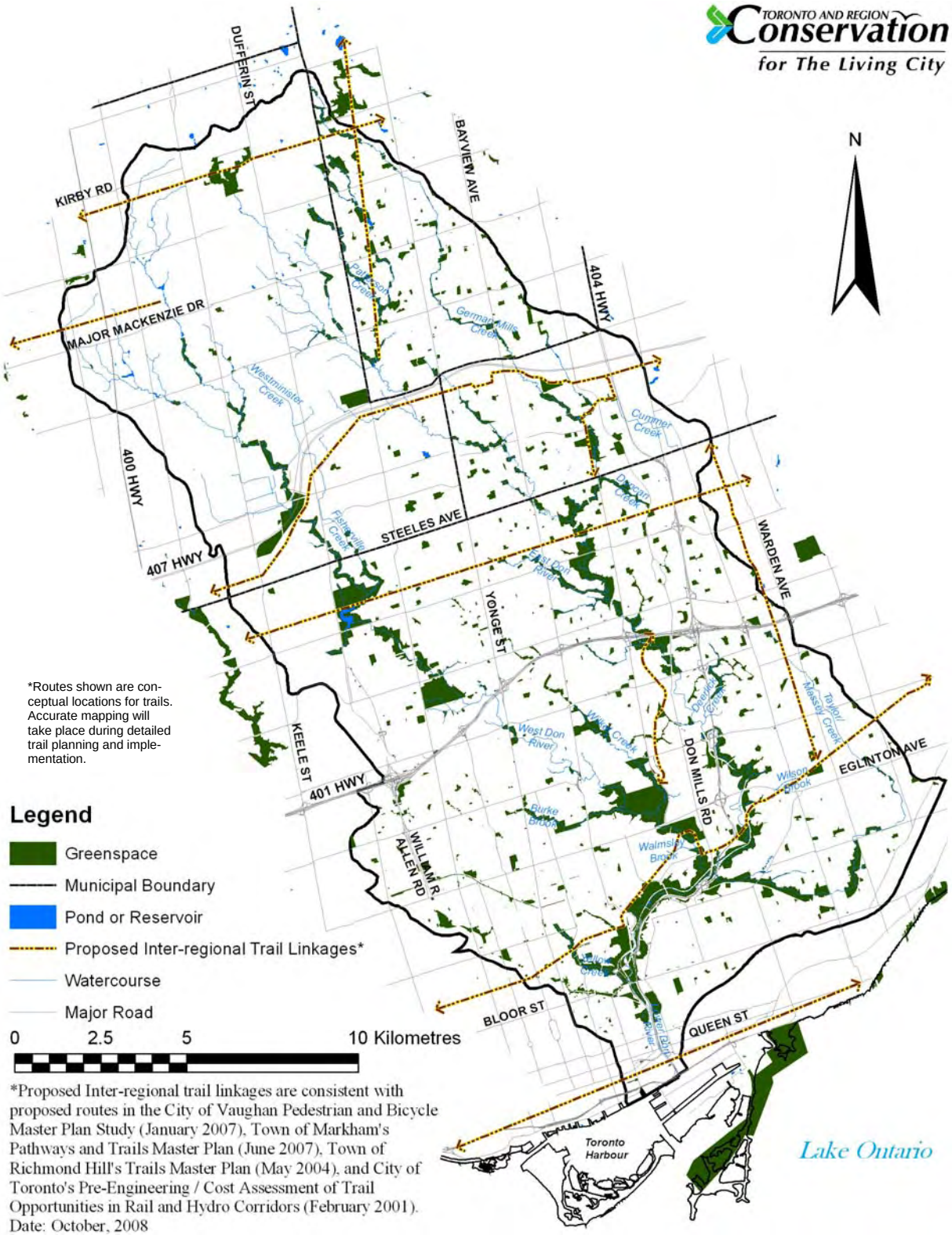
Trails are the gateway to the Don's valleys and greenspaces. Since *Forty Steps to a New Don*, major expansions have been made and planned for the inter-regional trail network in the Don. The first sections of the Bartley Smith Greenway, a natural corridor running through the Upper West Don River valley, were opened to the public in 2001. The 15 km trail linking the headwaters and the G. Ross Lord Dam is almost complete and much restoration work has been undertaken to enhance natural cover and habitat, remove garbage, and improve education and trail facilities. More opportunities exist to improve the inter-regional trail network in the Don River watershed. The proposed inter-regional trail network would link the headwaters on the Oak Ridges Moraine to the mouth of the Don and provide east-west access among branches of the Don River and to neighbouring watersheds via trails along utility corridors. This network should be implemented, as proposed on the Don River Watershed Inter-regional Trails Plan (Figure 28). At the local scale, municipalities should continue to develop and implement their trails and cycling master plans and build linkages among public transit, sidewalks, trails, and cycling lanes.

Strategy 2 Actions

- ❒ Municipalities and TRCA should continue to expand the inter-regional trail network by creating the required north-south and east-west linkages (Figure 28).

    - In Vaughan, along a completed Bartley Smith Greenway from Teston Road to south of Steeles Avenue
    - In Richmond Hill, along the east branch of the Upper East Don River from the Oak Ridges Moraine to South Richvale Greenway

Figure 28: Proposed Inter-Regional Trail Plan



- In Markham, from Huntington Park through the East Don Parkland in Toronto, down to Sunnybrook Park
- In Toronto, along the Warden Hydro Corridor from the east-west Finch Avenue Hydro Corridor to Wexford Park.
- In the headwaters, along the Trans-Canada Pipeline south of Kirby
- In the middle of the watershed along the Highway 407 and Finch Hydro Corridors
- In the southern watershed along rail lines and hydro corridors
- Across the waterfront connecting to the proposed Don River Park

❒ Municipalities should continue to implement their trails and cycling master plans.

❒ Municipalities and TRCA should collaborate with golf course operators and other private landowners to ensure compatibility of public uses on or adjacent to their properties and to secure trail easements where appropriate.

❒ Municipalities and TRCA should develop a way-finding signage program in order to help formalize existing trail networks, assist trail users to orient themselves, and provide information about trail and user safety.

❒ Promote active transportation (walking, cycling, roller blading) on hard surface trails in the Don as part of a sustainable lifestyle and alternative to private vehicle use.

Strategy #3: Promote the natural and cultural heritage of the watershed and engage the community in their protection, regeneration, and celebration

Encouraging the enjoyment and celebration of the natural and cultural heritage of the Don watershed is essential for promoting sustainable stewardship of these resources. Engagement of watershed residents in special events also may contribute to fundraising for regeneration activities, as is the case with the popular Paddle the Don event in the spring.

Recognition programs can play a key role in celebrating proper care of natural and cultural heritage features. For example, Markham's Susie Garden Awards recognize eco-friendly gardens in the town.

Signage of key cultural and natural features of interest can help to educate the public about the watershed's heritage. For instance, Richmond Hill and Toronto have implemented programs to install signs at all watercourse crossings. Signage of trails also serves to improve accessibility, navigation and safety.

Partnerships should be formed with the community across the watershed to assist with raising public awareness, creating trail associations, special events, fundraising, recruiting volunteers for restoration projects and ecological monitoring. Partners could include NGOs, user groups (e.g., trails, heritage, naturalists, etc), organized Aboriginal group representatives, residents and ratepayers associations.

Engagement of the watershed community could be enhanced through creation of a Don River Learning Trail (Pollution Probe, 2008). The trail would be based on existing and new inter-regional trails and incorporate signage and new educational centers and opportunities at key locations throughout the watershed, such as at a headwaters trailhead, the Ontario Science Centre, Todmorden Mills, the Don Valley Brick Works, or the Mouth of the Don. These centers could profile implementation of wet weather flow improvements and innovative urban water management (from the Don and international examples), showcase demonstration projects of all sorts, make connections to air quality and climate change issues, and highlight local cultural and industrial heritage.

Strategy 3 Actions

- ❒ Create a Don River Learning Trail.
- ❒ Support existing programming celebrating the natural and cultural heritage of the Don River watershed.
- ❒ Improve and develop interpretive signage of existing trails, streams, and natural and cultural features.
- ❒ Form community partnerships to implement natural and cultural heritage programs.

Canoeists enjoying the scenery at the annual Paddle the Don event in Toronto.

5.3.3 Land and Resource Use

Since development of the last watershed strategy in the early 1990s, the northern portion of the watershed has largely been urbanized. Construction of the last few blocks of approved greenfield development is underway and few opportunities remain for additional greenfield development. Historic approaches to environmental management during urban development have not been sufficient to maintain a healthy, functioning ecosystem. Key issues relating to land and resource use are described in Section 3.11. Future land use trends are discussed in Chapter 4.

While we need to promote sustainable forms of new development, it is most important to encourage retrofit of existing development and application of state-of-the-art green building practices during redevelopment and infilling. The best opportunities for improving stormwater control, protecting and enhancing terrestrial natural cover, remediating flood vulnerable areas, creating new greenspaces and trails, and reducing resource use, will come during redevelopment.

Management Objectives for Land and Resource Use

- Improve sustainability in urban form, design and development at community and building site scales.
- Practice sustainable resource use by individuals, households, businesses, institutions and governments.

Sustainable communities aim to enhance livability through consideration of the interrelationships among environment, society, and economy. Many municipalities have sustainability initiatives, including the *York Region Sustainability Strategy: Towards a Sustainable Region* and the City of Toronto *Strategic Plan*. Over the past decade, a number of initiatives have been developed that guide urban growth and improve environmental protection. They include the *Oak Ridges Moraine Conservation Plan*, the *Greenbelt Plan*, the revised *Provincial Policy Statement*, the *Growth Plan for the Greater Golden Horseshoe* (OMPIR, 2006), the *Clean Water Act* and Ontario Regulation 166/06. The strategies presented earlier for water and nature will further help to protect and regenerate natural systems. Ecological health and robust natural heritage are important foundations for a sustainable urban community.

Looking ahead, we foresee a number of challenges. Addressing sustainability issues in growth and intensification, protecting and regenerating natural systems, and adapting to future climate change may be made more challenging by an uncertain economic climate. However, the Canadian federal government's response to the economic downturn focuses on investments in infrastructure (water, sewer, transportation, recreation, and neighbourhood regeneration) and green technologies (e.g, clean energy technologies) (Canada, 2009; Department of Finance Canada, 2009). These investments will offer opportunities to achieve net gain in natural systems and sustainable communities.

Recommended Management Strategies

In order to address key issues relating to sustainable land and resource use, and to move towards achieving the management objectives, we have identified management strategies grouped under the following two themes: (1) Implement sustainable urban form, infrastructure, and transportation, and (2) Practice sustainable resource use.

Implement sustainable urban form, infrastructure, & transportation

Strategy #1: As municipal Official Plans are updated across Don watershed municipalities, TRCA should work with municipalities to incorporate watershed plan strategies into these plans and to encourage strategic planning in advance of redevelopment, to enhance the sustainability of urban form and resource use

Municipalities across the watershed are currently updating their planning and policy documents, presenting a timely opportunity to work together to incorporate watershed plan recommendations into these documents and improve strategic planning and environmental policies. York Region, the City of Vaughan and Town of Richmond Hill are all engaged in Official Plan reviews and updates, while the Town of Markham is working on an Environmental Policy Review and Consolidation Study. The Ontario Municipal Board partially approved the City of Toronto's new Official Plan in 2006. The City is continuing to work on implementation of its *Wet Weather Flow Management Master Plan* and Phase 2 of its Natural Heritage Study. Overall, all of the Don watershed municipalities are developing sustainability plans/ environmental design standards in order to ensure services and amenities are at adequate levels to accommodate

Current Initiatives

As discussed in the introduction to this chapter, the emergence of new approaches to living more sustainably provide us with a template to design and manage our communities so that we address these challenges, enhance quality of life, provide economic opportunities and protect ecological integrity. These approaches are being implemented world wide. They include eco-villages, transit-oriented compact communities, co-housing, low impact development and green building design.

Policies and guidance toward more sustainable community planning are also provided by the Provincial *Growth Plan for the Greater Golden Horseshoe* (OMPIR, 2006) as well as federal and provincial programs associated with gas tax revenue sharing. The revised *Provincial Policy Statement* (2005) under the Ontario *Planning Act* provides guidance for a better balancing of economic, social and environmental policies and requires municipalities to set targets for intensification within built up areas as a pre-requisite to expanding urbanization. York Region's Planning for Tomorrow initiative aims to make future growth more sustainable by addressing population and employment forecasts, use of vacant lands, natural heritage protection and climate change

TRCA's Living City programs have gathered information, established local partnerships and developed networks with world leaders in sustainable community design. Example activities include the Sustainable House Architectural Design Competition and Demonstration Building constructed at the Kortright Centre for Conservation. TRCA also participates on a national committee of the Canada Green Building Council to develop certification standards for LEED for Neighbourhoods.

Many municipal initiatives complement the objectives of the *Don River Watershed Plan*. For example, the City of Toronto's *Green Development Standard* (July, 2006) provides a "Made in Toronto" set of integrated targets for site and building design to guide development of City-owned facilities and to encourage sustainability in the private sector. The document addresses air quality, greenhouse gas emissions, energy efficiency, light pollution, water quality and efficiency, solid waste, the urban forest and wildlife habitat. Toronto also has a Green Roof Bylaw for new buildings. Markham's *Sustainable Development Standards and Guidelines* outline a set of development and building construction techniques and design standards that promote sustainability. Richmond Hill has developed a document called *Official Plan Guiding Principles based on principles of sustainable development* to inform its official plan update. The Town of Richmond Hill and Town of Markham offer Healthy Yards Programs which provide information to support private stewardship.

anticipated new and redeveloped areas of growth. TRCA should work with municipalities to integrate the findings of the watershed planning study with their work on growth planning, to ensure that redevelopment in Urban Growth Centres and greenfield development in the remaining "white belt" serves to achieve net gain in environmental health and sustainable communities. White belt areas are potential future urban growth areas not yet designated for urban settlement in municipal official plans and not within the boundaries of the Province's Greenbelt Plan.

Strategy #2: Master Environmental Servicing Plans (MESPs) for redevelopment areas and regeneration areas should be required to coordinate property redevelopment and regeneration in a comprehensive way

An MESP ensures that the form and layout of development is viewed in a broad context, rather than as individual properties considered in isolation of the larger system. Providing a comprehensive assessment of the limits and opportunities to development within the redevelopment area, MESPs identify issues such as transportation and servicing requirements (sanitary, water, and stormwater), effects on management of natural features (i.e., green infrastructure) and natural hazards, and the use of open space.

Redevelopment is liable to proceed in a piecemeal fashion across the watershed without the coordination that MESPs could provide. Improvements in stormwater control, flood risk, terrestrial natural heritage, and the greenspace and trails networks often are considered infeasible during site-by-site redevelopment, but may be achieved through careful planning of larger redevelopment areas.

Planning triggers for redevelopment MESPs could include designation of intensification and/or redevelopment areas (including provincial Urban Growth Centres and municipally identified areas), single or multiple planning applications in an area, an environmental assessment, a major regeneration project, identification of a problem area (e.g., areas in need of flood mitigation), or identification of a sustainable neighbourhood retrofit location. The appropriate study area of redevelopment MESPs should be determined in part by the planning trigger (above) and informed by natural and human system boundaries (e.g., surface hydrology, sewershed, Urban Growth Centre area, secondary plan area, etc.). The scale should allow for consideration of the cumulative as well as upstream and downstream effects of all proposed redevelopment in the study area.

MESPs should be created for the following known redevelopment areas:

- ❒ Designated Urban Growth Centres under the Province's *Growth Plan for the Greater Golden Horseshoe*: Downtown Toronto, Yonge – Eglinton Centre, North York Centre, and Richmond Hill – Langstaff Gateway (Figure 20).
- ❒ Redevelopment areas identified in municipal Official Plans and growth planning strategies.

The sidebar on the next page lists the components that should be covered in a MESP.

In a highly urbanized watershed like the Don, where undeveloped lands are minimal, major opportunities to improve stormwater management, terrestrial natural cover, greenspace and trails networks, and cultural heritage are largely tied to redevelopment of existing urban areas. While improvement in one of these objectives often enhances the condition of another (e.g., naturalized landscaping may contribute to improved stormwater management), limited space for improvements makes it difficult to satisfy all objectives. As development intensifies and infilling becomes more common, space available for improvements will become even more limited. Municipalities will continue to implement high-priority regeneration projects – such as the *Wet Weather Flow Management Master Plan* and natural heritage strategies. A communications protocol will be needed to identify regeneration priorities on a site-by-site basis, involving staff from municipal Works, Parks, and Planning departments and TRCA staff. The protocol should allow for identification and substantiation of priorities and benefits, to build a "business case" for the preferred approach.

- ❒ Develop cooperative working arrangements among municipal and conservation authority staff for resolving potential conflicts and creating synergies among opportunities for stormwater management, terrestrial natural cover,

Contents of MESPs

A Master Environmental Servicing Plan (MESP) for Redevelopment should include water resource system studies to address and confirm:

- ❒ Groundwater recharge and discharge areas, flow rates and flow paths;
- ❒ Aquifer vulnerability;
- ❒ Water balance;
- ❒ Flood and erosion risks and controls;
- ❒ Geomorphic analysis to identify least risk areas for infrastructure stream crossings; and
- ❒ A conceptual water management strategy describing the stormwater drainage design including source, conveyance and end-of-pipe measures to be utilized in proposed developments including approximate locations and preliminary sizing.

Terrestrial natural heritage system studies to address and confirm:

- ❒ The extent and composition of the existing natural heritage system;
- ❒ How the Target Terrestrial Natural Heritage System may be refined and implemented based on locally identified opportunities and the most current field data; and
- ❒ The functional relationship and interdependencies of the water resources system and the natural heritage system.

The MESP should also address at the appropriate level of detail:

- ❒ Implementation of transportation strategies and master plans relative to minimizing the number of crossings of the natural heritage system and stream corridors and avoidance of significant recharge areas;
- ❒ Implementation of water and energy conservation strategies;
- ❒ Establishment of the pre-development baseline monitoring program; and
- ❒ Cultural heritage and archaeological investigations and consultation requirements.

greenspace and trails networks, and cultural heritage during infrastructure EAs, redevelopment, infilling, and retrofit, using the initial guidance on priorities as set out in the watershed plan

Strategy #3: Implement sustainable urban form and adopt green development standards for neighbourhoods, sites, and buildings

Sustainable neighbourhood development standards are currently being developed by a number of agencies, incorporating both “smart growth” and green building concepts. Achievement of standards for new and retrofit neighbourhoods, subdivisions and sites will help to address key issues relating to the urban form, such as development density, proximity to transit, mixed use, mixed housing types, and pedestrian- and bicycle- friendly design. Improvements in these areas will go a long way to enhancing the sustainability of the urban form and resource use (e.g., energy).

Adopting green building standards for proposed new and retrofitted buildings under *Planning Act* applications or the Ontario Building Code will help achieve the objectives to improve the sustainability of urban form and resource use. Through conversion of existing buildings to green buildings, improvements in environmental performance can be achieved, incrementally, across the watershed. Stormwater can be better managed and treated as a resource at the lot level. Water and energy use can be reduced to more sustainable levels and production of air pollutants and solid waste can be minimized. Quality of life can be enhanced through improvements in pedestrian and cycling infrastructure, and landscaping.

Industrial, commercial, and institutional land uses cover approximately 21% of the Don River watershed. Many of these land uses are associated with large expanses of impermeable parking lots. Upon the proposed installation of a new lot or a proposed expansion and/or repair to an existing parking lot, an opportunity arises for retrofitting to improve on-site stormwater management across the watershed. These improvements could be achieved through incorporation of designs that encourage infiltration, evapotranspiration, and water re-use.

A recent study provided valuable insights into the design and likely success of programs to encourage naturalization and lot level stormwater management by residents and businesses across TRCA's jurisdiction – the *Action Plan for Sustainable Practices – Implementation Strategies for the Residential and Business Sections in the Greater Toronto Area* by Freeman Associates (2006). The study found that municipal and conservation authority approvals are a principal driver for the design of buildings and on-site stormwater management systems in the commercial and light industrial sectors. Longer municipal approvals timelines were a significant barrier to adoption of green building and site designs. This barrier must be overcome to capitalize on the current atmosphere of competitive adoption of green designs in the development sector.

The study also provided valuable insights into the design and likely success of programs to encourage naturalization and lot level stormwater management by residents and businesses across TRCA's jurisdiction. The study identified a deeply held aesthetic motivation that leads homeowners to unsustainable practices as a major barrier to uptake of lot level sustainable practices. However, residents were generally supportive of reusing rainwater for irrigation, and when shown photographs of partially naturalized landscapes, their misperceptions of naturalized landscapes were challenged. These barriers could be overcome by developing a social marketing program in partnership with key stakeholders, notably big-box retailers, such as Home Depot and Canadian Tire, and garden centres/nurseries, with the following elements:

What is LEED?

The Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ is a benchmark for the design, construction, and operation of high performance green buildings. It encompasses sustainable site development, water savings, energy efficiency, materials selection, and indoor environmental quality. LEED for Neighborhood Development (LEED-ND) includes compact design, proximity to transit, mixed use, mixed housing type, and pedestrian- and bicycle-friendly design.

What is Energy Star?

Natural Resources Canada provides standards for residential energy efficiency that are 40% more efficient than current Ontario Building Code Standards.

- ❒ A multi-media marketing campaign focusing on messages and positioning to dispel residents' negative perceptions of naturalized landscapes;
- ❒ A landscape advisory service (stewardship and education);
- ❒ Demonstration projects; and
- ❒ Incentives to purchase more sustainable landscape-related products (e.g., native and drought tolerant plants, porous landscaping materials, products for minimizing lawn and garden water use, rain barrels and supplies for rain gardens).

Strategy 3 Actions

- ❒ Adopt Sustainable Neighbourhood Development guidelines and encourage certification (e.g., LEED for Neighbourhood Developments) for all new and retrofit neighbourhoods, subdivisions, and sites.
- ❒ At the community scale, implement innovative design during retrofit and greenfield development to achieve more pedestrian oriented, transit supportive, ecologically sustainable, mixed use communities, including:

- Protect and enhance terrestrial natural heritage systems and urban forest (see Terrestrial System strategies)
- Protect and interpret cultural heritage (see Cultural Heritage strategies)
- Implement multi-use of public sector lands for infiltration and stormwater management to complement lot level practices (e.g., along road rights of way, along trails, in parks, on municipal properties)
- Re-use stormwater (e.g., for irrigation of landscapes)
- Develop and implement renewable energy sources and district energy schemes, supported by by-laws such as Toronto's Renewable Energy By-law that gives as of right permission for installation of renewable energy devices.
- Adopt smaller lot sizes and increased building density
- Minimize impervious surfaces including reduced street widths in low traffic areas, innovative road network designs, shared and underground parking
- Adopt mixed use development to reduce travel needs
- Adopt wildlife policies similar to Toronto's "*Bird Friendly Development Guidelines*"
- Promote vigorous implementation of existing regional and municipal transportation strategies, particularly the transit, high occupancy vehicle, cycling and pedestrian components, to improve the sustainability of the transportation system
- Adopt York Region's design guidelines for 6-lane regional streets (*Towards Great Regional Streets – A Path to Improvement*) for all proposed regional street widenings, to create pedestrian scale streetscapes that promote walking, biking, social interaction, and treed boulevards, and include a two-lane transit-right of-way
- Make provisions for community gardens to promote local food security and celebrate the cultural diversity of watershed residents by providing opportunities to grow a new range of crops sought after by new Canadians

❒ All new or retrofitted public, commercial, multi-residential, or mixed-use buildings should be designed to achieve the standards of a green building certification (e.g., LEED (Leadership in Energy and Environmental Design), Green Globes, Toronto Green Standard, or equivalent).

❒ At the scale of the individual building site, minimize resource use, aim to achieve pre-development rates of infiltration, evapotranspiration and surface run-off, and improve environmental quality, by implementing:

- Lot level and conveyance stormwater management
- Incentives for builders to promote green building design such as Toronto's new Development Charges By-law which provides a 20% refund of development charges for new development achieving Tier 2 of the Toronto Green Standard
- Building orientation to maximize sunlight, passive solar energy, wind shelter and natural ventilation
- Landscaping to reduce energy needs, water use and urban heat island effect

- Dual plumbing to use recycled water for toilet flushing or irrigation
- Building design for multiple uses and diverse densities to increase life span and maximize land use efficiency

❒ Adopt green design standards (e.g., City of Toronto's *Design Guidelines for "Greening" Surface Parking Lots*, or equivalent) for all new and retrofitted parking lots to improve on-site stormwater management.

❒ Develop protocols for an expedited approvals process for development applications incorporating green design standards.

- Consider additional incentives for adoption of green development practices, including reduced development charges for applications that meet green development standards, limiting servicing of greenfield sites unless green development standards are adopted by developers, and marketing incentives through private sector retail partnerships.
- Identify and resolve potential barriers to sustainable practices, such as the lack of municipal policies and bylaws addressing alternative energy sources.
- Increase awareness among developers and builders of new approaches and successful experiences from other jurisdictions.
- Offer sustainable development training courses for municipal staff to build capacity to support expedited approval process

❒ Form strategic partnerships with key businesses to enhance voluntary uptake of lot-level best management practices for stormwater management (e.g., rain gardens, permeable pavement) and backyard naturalization in residential areas, targeting neighbourhoods where rebuilds and renovations are common

❒ Increase awareness and information for homebuyers to help them make sustainable purchasing decisions, and encourage residents to make sustainable choices in all aspects of their lifestyles.

❒ Recognize, celebrate and promote sustainable practices through recognition awards for residents, businesses, agencies and institutions.

❒ Continue to evaluate the performance of new sustainable practices and techniques through the Sustainable Technologies Evaluation Program (STEP).

Strategy #4: Improve planning for and continue implementation of flood remediation

Although most municipal official plans have "hazard land" designations in place for their flood vulnerable areas that restrict new development from locating in the Regulatory Flood Plain, often a municipality's zoning by-law is not up-to-date and therefore not consistent with these official plan restrictions. In municipalities where this is the case, an application for new or redevelopment that does not require an official plan amendment will be permitted under the zoning by-law. Therefore, the hazard land issues are likely not brought to the attention of the proponent until it is circulated to the conservation authority. This inconsistency can cause confusion and delay for the proponent with respect to what they can or cannot develop on a site.

Some future redevelopment and intensification areas are located wholly or partially within flood vulnerable areas (e.g., Enford Road area in Richmond Hill). In advance of establishing where, what, and how much development can be introduced into these areas, a master plan for flood remediation should be completed. These strategies would set out solutions for eliminating the flood risk in its entirety, or for reducing the risk (with respect to both depths and velocity of flooding), without affecting communities upstream or downstream.

The Lower Don River West Remedial Flood Protection Project and the Don Mouth Naturalization and Port Lands Flood Protection Project are flagship regeneration projects long envisioned for the Don River watershed. They will improve water management, redevelop old industrial lands, regenerate natural areas, and create greenspaces, recreational space, and economic and tourism opportunities for GTA residents and visitors alike. Phased implementation of these projects will require firm and enthusiastic support from local, provincial, and federal politicians, as well as the community, over many years.

Strategy 4 Actions

- ❒ Work with municipalities to update their zoning by-laws where restrictive zoning for flood vulnerable areas is not in place
- ❒ Master Plans for flood remediation should be created for flood vulnerable areas and Special Policy Areas in advance of contemplating new land uses for areas designated for redevelopment and intensification
- ❒ Build and maintain political and community support for implementation of major redevelopment projects, including the Lower Don River West Remedial Flood Protection Project and the Don Mouth Naturalization and Port Lands Flood Protection Project

Strategy #5: Terrestrial natural cover on historical lots of record that extend into ravines should be protected from loss during redevelopment or intensification by designating it "open space" in municipal official plans and conforming zoning designations

As the financial benefit to landowners of allowing intensification on their properties rises, some of the watershed's remaining terrestrial natural cover may be threatened. In particular, some historical lots of record in the City of Toronto extend into the forested ravines – key elements of the terrestrial natural heritage system and home to some of the watershed's species of conservation concern. To avoid expending limited resources in responding to inappropriate development applications, these resources should be protected in municipal official plans through "open space" designations.

Strategy #6: Explore opportunities to secure financial resources for creating new greenspaces and supporting regeneration, operations and maintenance of existing greenspaces from development charges when areas are subject to growth through intensification

As population density increases with intensification-related growth, the watershed's greenspaces, parks, and trails will experience a rising intensity of use with the associated impacts of trampling of sensitive flora, garbage, dumping, and spread of invasive species. Resources for operations and maintenance of existing greenspaces and recreation facilities are already strained, and current challenges will be exacerbated by infilling and intensification. There is a need to develop creative solutions for funding regeneration and maintenance of existing greenspaces, as well as creation of new greenspaces, where opportunities are identified. Greenspaces should be considered an asset, part of the "green infrastructure" of the urban area.

Strategy #7: Implement sustainable infrastructure planning, implementation and monitoring

During the infrastructure planning and improvement process, interrelationships among infrastructure systems and natural system functions should be considered (e.g., linkages among bridges, storm drainage and water quality). Infrastructure improvements – whether for roads, transit, water, wastewater or stormwater – result in the regular reconstruction of municipal roadways and sidewalks. Together, these improvements offer the opportunity to achieve gains in stormwater management through proactive incorporation of infiltration and evapotranspiration techniques.

Strategy 7 Actions

- ❒ Establish baseline environmental conditions early in the planning stages for infrastructure projects and make informed choices among alternatives to avoid or minimize impacts to natural systems and achieve net gain wherever possible through innovative design
- ❒ Road infrastructure projects that entail expansion of an existing service should provide full stormwater management for not just the new infrastructure but for the existing infrastructure as well, i.e., for a road widening, SWM should treat both the old and new sections of road
- ❒ Municipalities and TRCA should strengthen policies to direct infrastructure outside of natural areas for new development and encourage opportunities to remove existing infrastructure from natural areas when redevelopment occurs.
- ❒ Institute life cycle planning for all infrastructure (water, stormwater, wastewater, bridges, roads), including "green infrastructure" such as greenspaces and terrestrial natural heritage

Practice Sustainable Resource Use

Strategy #8: Increase water efficiency and conservation

Water conservation contributes to the protection of aquatic ecosystems, protection of drinking water sources and cost effectiveness of public services. It postpones the need for water supply infrastructure expansion, as new growth/ intensification can be accommodated within the present supply. Conservation also reduces the energy costs associated with excessive pumping from Lake Ontario up to the headwater service areas and the associated energy and other costs of wastewater treatment, as the consumed water is discharged through the sanitary sewage system.

The Region of York and City of Toronto have well established and successful water efficiency programs that have set targets for water conservation, as part of their long term water supply strategies and the associated supportive studies that considered effects on the local environment. These programs involve comprehensive public education and awareness initiatives, including incentives for implementing water conservation practices. We strongly support the continuation of these important programs and recommend additional considerations. We recommend that municipalities use targets and information provided in this watershed plan as a guide in any future updates of the water supply and water efficiency strategies.

With respect to use of municipal and well water supplies, we recommend measures to promote water conservation and alternate sources of water suited to end-use quality needs and which pose less stress on natural systems. These include:

- ❒ Support the continued implementation of the Region of York's Water for Tomorrow program and the City of Toronto's Water Efficiency Program
- ❒ Promote the role of rain-harvesting as a water conservation mechanism.
- ❒ Monitor indoor and outdoor water use over time.
- ❒ Monitor rates of water use by local service area and evaluate trends over time.
- ❒ Support pricing incentives as a potential component in future updates to water efficiency plans.

- ❒ Incorporate relevant findings and recommendations from the *Action Plan for Sustainable Practices* to improve rates of participation in water conservation programs by residents and businesses.
- ❒ Raise awareness of water conservation practices and technologies through partnerships with schools and community groups (e.g. ultra low flush toilets, low flow shower heads, rain sensor switches for automated irrigation systems).
- ❒ Adopt policies that allow rain harvesting and use within buildings for non-potable uses.
- ❒ Improve public confidence in the public water supply to reduce demand for bottled water, and promote free water refill stations for refillable water bottles.
- ❒ Investigate water pricing in combination with stormwater management fees as tools to provide incentives for more efficient water use (e.g., use of rainwater on site as a resource to offset potable water needs).
- ❒ Adopt xeriscaping and naturalize lawns and parks with use of native species that are more drought tolerant.

With respect to surface water takings, we recommend that the baseline baseflows be defined through further monitoring and be used to determine the baseflow threshold below which no surface water may be drawn from a watercourse, as per the Ontario Ministry of Environment's protocol for water takings, unless detailed studies are undertaken to support other withdrawal volumes. Water users should install fixed intakes, to prevent withdrawals below the baseflow threshold. Irrigation water supply systems should be retrofitted to replace stream sources with rainwater from surface water storage reservoirs, where possible.

We also recommend that efforts should be made to work with MOE to ensure that all required water users have a valid permit to take water and monitor their withdrawals, and that applications for permit renewals are reviewed regularly for consistency with the directions of this watershed plan. Improved coordination among MOE, municipalities and TRCA in the Permit to Take Water process is needed.

Strategy #9: Reduce energy use and increase non-fossil fuel alternatives

Overall energy use should be reduced and the use of non-fossil fuel and green power sources should be increased:

- ❒ Promote partnerships between utilities, municipalities and the private sector to facilitate the use of district energy schemes and renewable energy sources as part of redevelopment designs.
- ❒ Identify opportunities and incentives for micro-scale energy generation (including energy generation from waste streams).
- ❒ Encourage public transit use, walking, cycling and other alternatives to the private vehicle.
- ❒ Provide incentives for use of hybrid or non-fossil fuel powered vehicles.
- ❒ Continue the GTA Mayors' Megawatt Challenge and TRCA's sector-based greening programs under The Living City (e.g., Greening Health Care, Greening Retail, Sustainable Schools).
- ❒ Provide incentives for the retrofit of buildings to improve energy efficiency to 30% or more energy efficient than the model National Energy Code for Buildings.
- ❒ Require all new homes to meet standards such as EnergyStar Certification requirements or an EnerGuide rating greater than 80.
- ❒ Increase application of energy conservation technologies and practices (e.g., visual monitoring systems that

allow users to see energy use; discontinue bulk metering, photosensor and motion sensor controls; lower speed limits for commercial vehicles and transit).

- ❒ Promote in house, grid-tied energy generation capacity using renewable energy sources, with surplus energy purchased by the utility at the market rate.

Strategy #10: The amount of waste generated should be reduced and wherever possible, "waste" should be used as a resource

- ❒ Reduce, reuse, and recycle.
- ❒ Reduce packaging.
- ❒ Foster partnerships between waste generators and waste re-users.
- ❒ Re-use or recycle construction and demolition waste to meet or exceed the Canadian Green Building Council's target for 20% or less construction waste to landfills (currently 35% goes to landfills).
- ❒ Establish programs to test the performance of products made with re-used materials.
- ❒ Incorporate recycling areas throughout buildings with a central collection area to make source-separation convenient.
- ❒ Standardize requirements for minimum recycled aggregate material.
- ❒ Encourage installation of waste and recycling bins in parks, trails and greenspaces where appropriate.
- ❒ Turn organic wastes into compost.
- ❒ Expand compost waste collections programs to all municipalities.

6.0 Implementation

We have outlined many specific strategies to achieve the goals and objectives of this watershed plan. Implementation of the plan will now rely on the adoption of supportive policies, programs and practices by the various partners. The watershed plan is intended to inform and guide municipalities, provincial and federal governments, and TRCA as they update their policies and programs for environmental protection, conservation, and regeneration within the contexts of land and water use, and the planning of future urban redevelopment and growth.

The plan provides direction to local non-governmental organizations and private landowners with regard to regeneration priorities, best management practices and opportunities for environmental stewardship. Implementation of these strategies will be most effective if existing partners coordinate their efforts, and make creative use of existing tools, as well as some new ones, as outlined in this section.

1. Existing policies and programs
2. Subwatershed Regeneration Plans
3. Stewardship and outreach education
4. Operations and maintenance
5. Monitoring and further study

"Getting it Done" Management Objectives

- ❒ Use the Subwatershed Regeneration Plans to integrate and coordinate local regeneration efforts.
- ❒ Encourage grassroots regeneration groups throughout the watershed.
- ❒ Encourage staff at agencies and municipalities to take responsibility for the Don.
- ❒ Fund the Don's regeneration through existing and new sources.
- ❒ Research the effectiveness of different technologies and approaches for regenerating urban watersheds.
- ❒ Undertake demonstration projects throughout the watershed.
- ❒ Make changes in our personal lifestyles and government actions that will help protect and regenerate the Don and the larger ecosystems of which it is a part.
- ❒ Use education, awareness, stewardship and social marketing tools to accelerate regeneration of the Don.

6.1 Existing Policies and Programs

Many stakeholders, including federal and provincial governments, municipalities, TRCA, the Don Watershed Regeneration Council, NGOs (e.g., Taylor Massey Project, Friends of the Don East, Toronto Green Community), industry/business (golf courses, developers) and citizens will be able to play a role in implementation of this watershed plan. Many of these partners already have policies and programs in place and the capacity to implement aspects of the plan. We recommend that all partners use the information and recommendations of the watershed plan to inform their ongoing programs and decision making. Where necessary, we ask partners to consider opportunities to update and amend their programs with new information in our plan.

Implementation Guide

As a starting place for discussion between implementation partners, we have prepared a companion document to the watershed plan, the Implementation Guide, which sets out priorities for implementation over the next ten years. The Guide organizes the watershed plan recommendations according to relevant implementation tools and assembles additional information to inform initial action. Like the watershed plan the Implementation Guide is intended to inform and guide the ongoing implementation and development of programs and policies. The proposed projects contained in the Guide are intended to serve as a basis for discussion among implementing partners and as a source for the further development of individual partners' own long term work plan and budget preparations.

The following section identifies key existing organizations and provincial and federal initiatives that influence management of the Don River watershed.

Don Watershed Regeneration Council

The Don Watershed Regeneration Council (DWRC) was established by TRCA in 1995 with a mandate to implement *Forty Steps to a New Don* and act as a link among governments, interested citizens, and members of the general public. The Council consists of representatives from TRCA, regional and local municipalities, City of Toronto community councils, watershed residents, community groups, senior government agencies, watershed businesses, and academic institutions. This broad membership connects the Council to many other watershed partners, helping to disseminate information and encourage action by governments, businesses, and communities. The Council also publishes report cards and progress reports to help evaluate successes and highlight priorities for further work.

Municipal Initiatives

The local and regional municipalities in the Don are actively working on many projects that will advance the objectives of the watershed plan in the years to come. The City of Vaughan, Town of Richmond Hill, Town of Markham and Region of York are all working on or have recently completed official plan updates that incorporate watershed plan policy recommendations. The City of Toronto has shown strong leadership in facilitating the implementation of green technologies through initiative such as the Toronto Green Standard, Bird Friendly Development Guidelines, Design Guidelines for Greening Surface Parking Lots and a Green Roof By-law.
More information about the range of sustainability initiatives underway in municipalities across the Don watershed can be found in the "Current Initiatives" boxes in Chapter 5 of this plan.

Federal & Provincial Initiatives

Federal and provincial initiatives – the *Remedial Action Plan*, the *Greenbelt Plan, Growth Plan for the Greater Golden Horseshoe, Oak Ridges Moraine Conservation Plan* and Source Water Protection programs – provide a broad context for the protection and sustainable use of natural resources and a framework for development and investment. This watershed plan provides more specific guidance for their implementation.

Remedial Action Plan (RAP)

The Great Lakes RAP Program was created in 1987 and formalized into Annex 2 of the *Great Lakes Water Quality Agreement* between Canada and the United States. Under Annex 2, 43 Areas of Concern (AOC) were identified, including the Toronto AOC. A RAP has been developed that guides restoration and protection efforts in the AOC. The ultimate goal is to implement the Plan and "de-list" the AOC when regeneration has occurred and goals have been met. Implementation of the subwatershed regeneration plans presented in this chapter, along with the targets for environmental condition set out in Chapter 3, may help to achieve improvement in the Toronto AOC.

Oak Ridges Moraine Conservation Plan (ORMCP)

Section 24 of the *Oak Ridges Moraine Conservation Plan* requires every upper-tier municipality and single-tier municipality to begin preparing a watershed plan, for every watershed whose streams originate within the municipality's area of jurisdiction. The objectives and requirements of each watershed plan are to be incorporated into the municipality's official plan, and major development within the ORMCP area commenced after April 23, 2007 is prohibited unless it conforms with the watershed plan. We therefore request the Region of York, City of Vaughan, Town of Richmond Hill, and Town of Markham to recognize and act on the Don River Watershed Plan's recommendations as per section 24 of the ORMCP.

Much of the area of the Oak Ridges Moraine in the Don watershed is designated as Settlement Area, the boundary of

which generally follows the urban/rural boundary set out in York Region's Official Plan (OP) (Figure 20). Settlement areas are designated for urban development according to the mix of residential, commercial, industrial, and institutional land uses permitted by municipal official plans. A large, contiguous Natural Core Area runs from north to south along the Moraine in the City of Vaughan, following tributaries of the Upper East Don River. This Natural Core Area incorporates lands identified as provincial Areas of Natural and Scientific Interest (ANSI) and Environmentally Sensitive Areas (ESAs) in York Region's OP. There are Natural Linkage Areas flanking the Natural Core areas in the east and west. Land uses are restricted in Natural Core and Natural Linkage areas to protect and restore the ecological integrity of the areas. Development associated with planning applications grandfathered under the Act is currently being built and few opportunities remain for greenfield development on the Moraine in the Don River watershed.

Greenbelt Plan

In the Don, outside of the areas covered by the *Oak Ridges Moraine Conservation Plan*, there is an additional narrow strip of greenbelt classed Protected Countryside running along a tributary of the Upper West Don River north of Teston Road (white belt area) (Figure 20). Protected Countryside areas are intended to protect agricultural and natural systems. The *Greenbelt Plan* is an important mechanism for protecting the terrestrial system.

Growth Plan for the Greater Golden Horseshoe (GGH)

The *GGH Growth Plan* (OMPIR, 2006) covers those areas outside the Protected Countryside of the *Greenbelt Plan*, and requires municipalities to amend their official plans to comply with growth planning targets. The Growth Plan identifies four Urban Growth Centres for intensification and redevelopment in the Don River watershed: Richmond Hill/ Langstaff (Yonge and Highway 407), Yonge-Eglinton, North York (Yonge and Sheppard), and a portion of downtown Toronto (Figure 20). Coordinated, planned redevelopment (e.g., through MESPs for Redevelopment) in these areas could result in net gains in environmental conditions and the sustainability of communities.

Source Water Protection Planning

The *Clean Water Act* sets direction for the preparation of source water protection plans within each source water protection planning region in Ontario. TRCA is the lead conservation authority for the Credit Valley – Toronto – Central Lake Ontario (CTC) Region. The watershed planning study and source protection planning initiatives have benefited from shared information regarding broader watershed functions. We request that the CTC Source Protection Committee be advised of the *Don River Watershed Plan* and its recommendations.

6.2 Subwatershed Regeneration Plans

For the purposes of this watershed plan, regeneration comprises "in the ground" works, on either publicly owned or large tracts of privately owned land, that address the following objectives:

- ❒ Water quality and quantity management (e.g., SWM retrofit projects)
- ❒ Aquatic and terrestrial habitat enhancement (e.g., tree planting, wetland creation, fish barrier mitigation)
- ❒ Flood and erosion risk remediation (e.g., culvert enlargements, infrastructure protection)
- ❒ Trail development and infrastructure support for nature-based recreation
- ❒ Infrastructure support for achieving cultural heritage objectives

Recommendations for operations and maintenance, monitoring, and complementary stewardship, education and awareness priorities are presented in other sections of this Chapter.

Regeneration Themes for the Watershed

Three strategically important themes have been adopted for regeneration across the Don River watershed (Figure 29).

1. Improve management of wet weather flows across the watershed
2. Build the integrity of the natural systems and greenspaces of the watershed
3. Encourage individuals, grassroots groups, businesses, and organizations to take responsibility for the Don

This watershed plan lays out targets for regeneration of the Don River watershed (see Chapter 3 and the reports on current watershed conditions TRCA, 2009a-k). Some targets have been set at the watershed scale, others have been set for the subwatershed scale, and still others are established for other sub-areas, such as Fish Management Zones.

Figures 30 to 36 illustrate the regeneration plans for each subwatershed. They were developed by (1) identifying key subwatershed regeneration issues and challenges, based on the watershed planning study directions and multi-stakeholder input; (2) creating a long list of candidate regeneration actions; and (3) evaluating and ranking candidate regeneration actions according to three criteria:

Urgency: consideration of current watershed and site conditions and thresholds; potential threats to human health, safety, and property; and the level of vulnerability to anticipated future stresses.

Scale: consideration of the geographic extent (e.g., area or length of stream or trail) that would benefit from the action and the magnitude of anticipated improvement.

Multiplicity of Benefits: consideration of the number of key subwatershed regeneration issues that the action would address and the number of watershed system components (e.g., groundwater, surface water, terrestrial and aquatic systems) that would benefit.

This method was based on a modification of a principles-based methodology for prioritizing actions developed for a highly urbanized watershed (TRCA, 2007c and Water's Edge Ltd. and Hugh Whiteley, 2007). The regeneration plan identified in these maps forms the basis for developing an implementation work plan for regeneration priorities arising from the *Don River Watershed Plan*.

Figures 30 to 36 are intended for use by a range of stakeholders and for a variety of purposes, including:

- Practitioners and implementers – municipalities, NGOs, local interest groups, TRCA, other agencies, and individuals. The maps serve as a preliminary guide to regeneration opportunities across the watershed and at the local scale. The subwatershed-scale maps help to identify ways to integrate and co-ordinate local undertakings to ensure that regeneration activities are complementary, rather than conflicting. Working from a common set of priorities will enhance the likelihood that multiple benefits will be achieved. In practice, funding for implementation may be pursued at the reach scale by partnerships of stakeholders.
- Policy makers and planners: The maps provide guidance on approaches to achieve net gain when required for planning applications or major infrastructure planning (e.g., EAs).

Watershed Planning Documents

More detail on the regeneration actions identified on the maps can be found in the separate watershed planning documents, including:

- ***The Don River Watershed Reports on Current Conditions*** provide more information about current watershed functions and conditions (TRCA, 2009a-k).
- ***The Don River Watershed Sustainable Stormwater Management Study*** provides an assessment of the predicted watershed response to future management approaches and therefore provides guidance as to the relative sensitivity of different regions within the watershed to change and the relative effectiveness of management approaches (XCG Consultants, 2009).
- ***The Don Watershed Terrestrial Regeneration Priorities*** report provides more information on the methodology used for prioritizing areas for regeneration (TRCA, 2007d).
- ***The Don River Fisheries Management Plan*** (TRCA, in progress) contains a series of much more detailed maps and recommendations specific to fisheries management and regeneration of the aquatic habitat.
- ***The Action Plan for Sustainable Practices – Implementation Strategies for the Residential and Business Sectors in the Greater Toronto Area*** (Freeman Associates, 2006) provides guidance on social marketing considerations for implementing regeneration actions in partnership with business and residential sectors.

6.2.1 Upper West Don River Subwatershed

The Upper West Don River subwatershed covers 6,133 ha of land draining from north of Kirby Sideroad to the inflow point of the G. Ross Lord Reservoir. The majority of the subwatershed is in the City of Vaughan, with the southern tip extending across Steeles Avenue into the City of Toronto. About 25.0% of the subwatershed is devoted to medium-density residential land use. Much of the central and western portion of the subwatershed is industrial in nature (20.4%); CN's MacMillan Yard (rail marshalling yard) is located in this part of the subwatershed. Much of the remaining land is meadow (12.9%), agriculture (12.7%), or vacant land (6.8%). Construction is underway on already-approved development on at least 624 ha of the lands shown as undeveloped in 2002 (Figure 21) (10.2% of the subwatershed), largely for medium-density residential, but also for commercial and industrial, and urban open space and recreational uses. The existing urban boundary runs from the west along Teston Road and north up Keele Street, leaving blocks 27 and 28 as the remaining undeveloped land in the subwatershed. This area is part of the "whitebelt" that is likely to accommodate the growth outlined in the Province's *Growth Plan for the Greater Golden Horseshoe* (OMPIR, 2006).

Past regeneration activities have included development of the Bartley Smith Greenway, including creation of Keffer Marsh, Langstaff EcoPark, and Rupert's Pond (a *Forty Steps to a New Don* concept site).

Regeneration Drivers

Greenfield development of the whitebelt and voluntary implementation of regeneration activities and sustainable practices in existing residential and industrial areas will drive regeneration. The key influences on the identification of regeneration priorities are:

- Whitebelt development potential north of Teston Road – last opportunity for state of the art greenfield development
- High concentration of existing industrial and commercial land uses presents the opportunity to explore regeneration within those land uses
- Stormwater management lacking south of Rutherford Road
- Flood vulnerable areas in Fisherville Creek, Westminster Creek and industrial lands north of Highway 7 and east of Keele Street.
- Contains half of the watershed's higher quality terrestrial habitat and some of the best opportunities to add natural cover
- Whitebelt area (north of Teston Road) contains aquatic habitat supporting some of the few remaining habitat specialists.

Figure 30 presents the subwatershed regeneration plan for the Upper West Don River.

Regeneration Goals

- State-of-the-art sustainable greenfield development that protects and enhances natural systems.
- Industrial retrofits and best practices that improve the flow regime and fish habitat.

Key Statistics

Natural cover: 19%
- Forest: 5%
- Meadow: 13%
- Wetland: 1%

Impervious cover: 35%

Urban lands with no stormwater control: 39%

Urban lands with stormwater control for quality & quantity: 38%

6.2.2 Upper East Don River Subwatershed

The Upper East Don River subwatershed covers 6,265 ha and includes all the lands that drain from the headwaters on the Oak Ridges Moraine (ORM) north of Elgin Mills Road, south to Cummer Avenue (just downstream of Steeles Avenue), and generally between Keele Street to the west and Bayview Avenue to the east. The majority of the subwatershed lies in the City of Vaughan, including most of the portion of the Don Watershed that lies on the ORM. Significant portions of the subwatershed are also found in the towns of Richmond Hill and Markham, and a very small portion lies in the City of Toronto. The dominant land use is medium-density residential development, covering 35.7% of the subwatershed, largely in the south and east. The northern and western portions of the subwatershed, in the City of Vaughan, were largely characterized by agriculture, vacant land, forest, and meadow lands in 2002 when the aerial ortho images on which the land use data is based were taken. Construction is underway on already-approved development on at least 1,424 ha (22.7% of the subwatershed) of the vacant and agricultural land shown as undeveloped in 2002. More than half of the new development is to be medium-density residential; other major planned land uses include urban open space, golf course, commercial, and institutional. This subwatershed includes the Richmond Hill/Langstaff Urban Growth Centre (at Yonge and Highway 407), identified in the Province's *Growth Plan for the Greater Golden Horseshoe* as a target area for redevelopment and intensification (Figure 20).

Past regeneration activities have included purchase of the Baker Sugarbush (an Environmentally Significant Area), the retrofit of Pioneer Park, and the ongoing regeneration of Pomona Mills (a *Forty Steps to a New Don* concept site).

Regeneration Goals

- Protection of ecosystem function on the Oak Ridges Moraine to enhance habitat for redside dace, a species at risk.
- Green retrofit in redevelopment areas to improve the sustainability and livability of communities

Key Statistics

Natural cover: 25%

Forest:	16%
Meadow:	8%
Wetland:	0%

Impervious cover: 19%

Urban lands with no stormwater control: 51%

Urban lands with stormwater control for quality & quantity: 32%

Regeneration Drivers

A key driver for regeneration will be redevelopment associated with intensification in the Richmond Hill/Langstaff Urban Growth Centre (Yonge Street and the 407), successful monitoring of sustainable practices integrated into the recently developed areas (e.g., clean water collector technology), and implementation of the City of Vaughan's *Maple Nature Reserve Master Plan*. The key influences on the identification of regeneration priorities are:

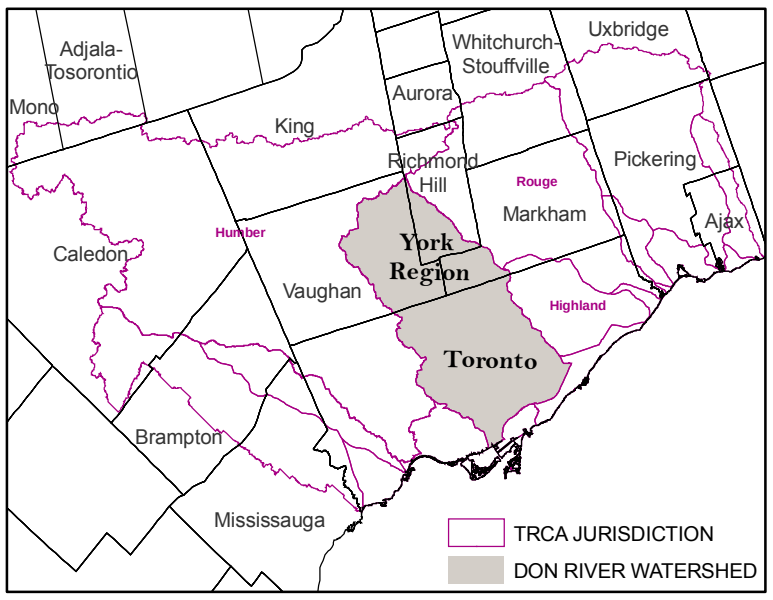
- Subwatershed has urbanized rapidly over the last few years
- Provincially designated Richmond Hill/Langstaff Urban Growth Centre
- About one-third of the watershed is on the Oak Ridges Moraine where soils are more permeable
- Regionally significant groundwater recharge
- Remnant population of redside dace (listed as endangered under provincial legislation) in Patterson Creek and the tributaries on the ORM north of Rutherford Road

FIGURE 29: DON RIVER WATERSHED
Regeneration Plan

Greenfield Development Area
- Maintain pre-development groundwater recharge
- Expand natural cover and enhance connectivity to the East Humber River subwatershed
- Create riparian wetland habitat for blacknose shiner
- Adopt sustainable technologies and practices during Greenfield development

Oak Ridges Moraine
- Maintain regional groundwater recharge
- Enhance habitat for endangered redside dace
- Expand natural cover to improve biodiversity and protect vulnerable habitats
- Add to the public greenspace

Existing Developed Area
- Improve stormwater management
- Mitigate flooding, erosion and risk to infrastructure in valleys
- Enhance terrestrial and aquatic habitat to support biodiversity
- Regenerate greenspaces and connect inter-regional trails
- Adopt sustainable technologies and practices during redevelopment and intensification in Urban Growth Centres and other areas



Upper East Don
Upper West Don
Lower East Don
Lower West Don
German Mills Creek
Taylor/Massey Creek
Lower Don River
Toronto Harbour
Lake Ontario
DUFFERIN ST
KIRBY RD
BAYVIEW AVE
404 HWY
MAJOR MACKENZIE DR
400 HWY
STEELES AVE
WARDEN AVE
407 HWY
YONGE ST
KEELE ST
DON MILLS RD
401 HWY
WILLIAM R ALLEN RD
EGLINTON AVE
BLOOR ST
QUEEN ST
East Don River
Patterson Creek
German Mills Creek
Westminster Creek
Fishervile Creek
Cummer Creek
Duncan Creek
West Don River
Wilket Creek
Derrick Creek
Wilson Brook
Taylor Massey Creek
Burke Brook
Walmsley Brook
Yellow Creek
Lower Don River
N

Legend

- Watercourse
- Piped/Buried Streams
- Municipal Boundary
- Greenbelt Boundary
- Oak Ridges Moraine Boundary
- Pond or Reservoir
- Urban Growth Centre

Potential New & Retrofit Stormwater Ponds

North of Steeles*
- Existing Pond with Retrofit Potential
- Existing Outfall with New Pond Potential

South of Steeles*
- SWM Ponds (Off-line/Valley)
- Interior SWM Facilities (Underground)
- End Of Pipe - Underground

Terrestrial Natural Heritage Regeneration Sites
- Priority 1
- Priority 2
- Priority 3
- Priority 4

Refined Target Terrestrial Natural Heritage System**
- Existing Natural Cover
- Potential Natural Cover

0 1 2 4 6 8 10 Kilometres

*Potential retrofit stormwater management facilities as per City of Toronto's Wet Weather Flow Management Master Plan (2003) and stormwater retrofit studies by the Town of Richmond Hill (2002), Town of Markham (1999), and City of Vaughan (2008).
**The Refined Target Terrestrial Natural Heritage System is composed of areas of existing terrestrial natural cover and areas of potential terrestrial natural cover. The system will be further refined at the local level with consideration for site specific field conditions and planning objectives.

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FIGURE 30: UPPER WEST DON RIVER SUBWATERSHED
Regeneration Plan

Water

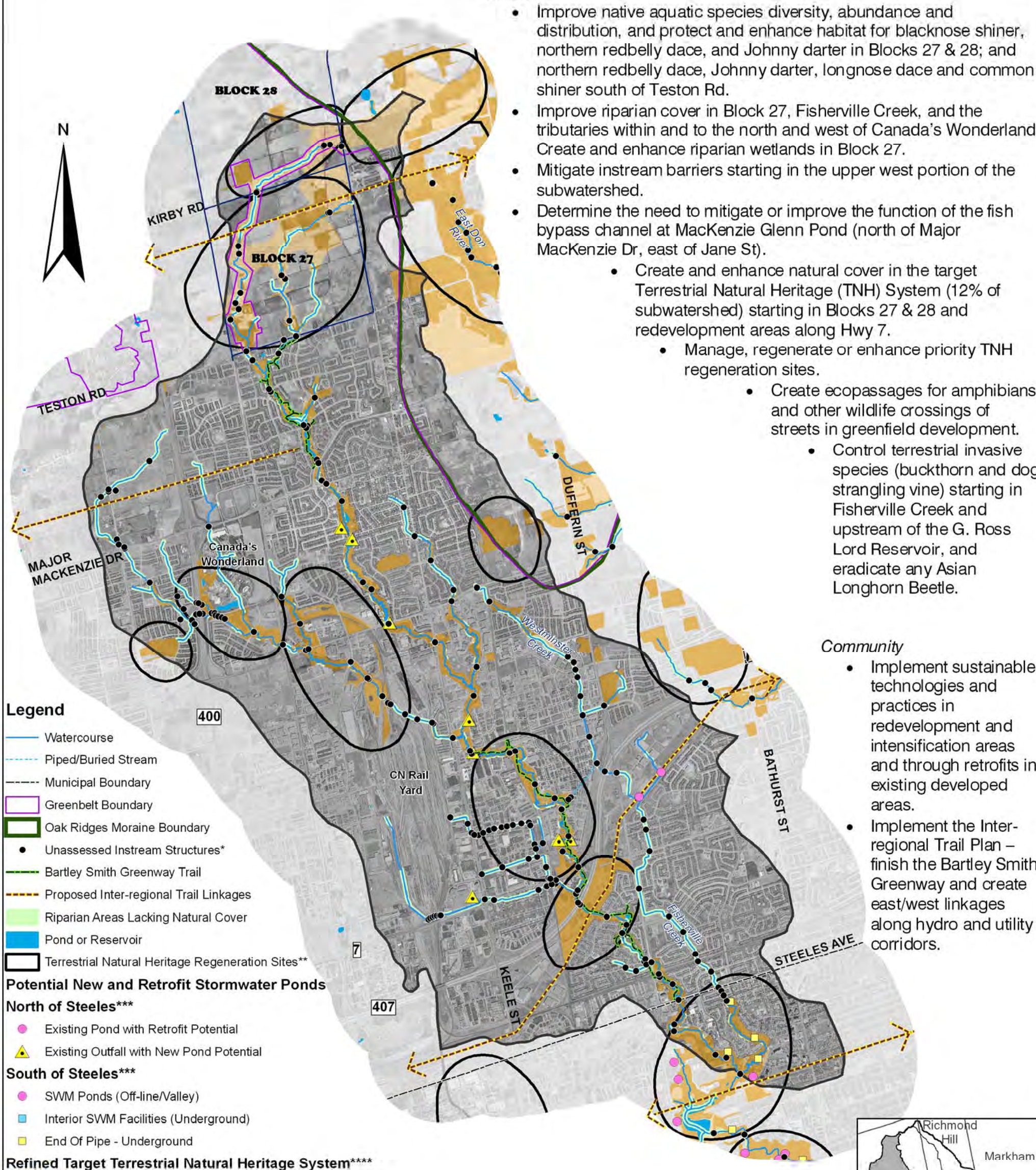
- Improve water balance and stormwater management through outfall and pond retrofits identified by municipalities and lot level source controls (infiltration, evapotranspiration, reuse) in priority sub-basins: tributaries of the Upper West Don River north of Major MacKenzie Dr (Block 27) and in the industrial lands west of Dufferin St.
- Maintain pre- to post- development groundwater recharge in Block 27.
- Remediate flood risk starting with the lower reaches of Fisherville and Westminster creeks.
- Remediate flood and erosion risk in the tributaries south-east of the CN Rail Yard.

Nature

- Improve native aquatic species diversity, abundance and distribution, and protect and enhance habitat for blacknose shiner, northern redbelly dace, and Johnny darter in Blocks 27 & 28; and northern redbelly dace, Johnny darter, longnose dace and common shiner south of Teston Rd.
- Improve riparian cover in Block 27, Fisherville Creek, and the tributaries within and to the north and west of Canada's Wonderland. Create and enhance riparian wetlands in Block 27.
- Mitigate instream barriers starting in the upper west portion of the subwatershed.
- Determine the need to mitigate or improve the function of the fish bypass channel at MacKenzie Glenn Pond (north of Major MacKenzie Dr, east of Jane St).
- Create and enhance natural cover in the target Terrestrial Natural Heritage (TNH) System (12% of subwatershed) starting in Blocks 27 & 28 and redevelopment areas along Hwy 7.
- Manage, regenerate or enhance priority TNH regeneration sites.
- Create ecopassages for amphibians and other wildlife crossings of streets in greenfield development.
- Control terrestrial invasive species (buckthorn and dog strangling vine) starting in Fisherville Creek and upstream of the G. Ross Lord Reservoir, and eradicate any Asian Longhorn Beetle.

Community

- Implement sustainable technologies and practices in redevelopment and intensification areas and through retrofits in existing developed areas.
- Implement the Inter-regional Trail Plan – finish the Bartley Smith Greenway and create east/west linkages along hydro and utility corridors.



*See the Don River Watershed Based Fisheries Management Plan for more detailed information on regeneration priorities for the aquatic system.
**See Figure 28 for watershed-scale priority ranking
***Potential retrofit stormwater management facilities as per City of Toronto's Wet Weather Flow Management Master Plan (2003) and stormwater retrofit studies by the Town of Richmond Hill (2002), Town of Markham (1999), and City of Vaughan (2008).
****The Refined Target Terrestrial Natural Heritage System is composed of areas of existing terrestrial natural cover and areas of potential terrestrial natural cover. The system will be further refined at the local level with consideration for site specific field conditions and planning objectives.

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6.2.3 German Mills Creek Subwatershed

The German Mills Creek subwatershed extends over 3,880 ha from its headwaters north of 19th Avenue to its confluence with the East Don River at Cummer Avenue (north of Finch Avenue). Most of the subwatershed is located in the Town of Richmond Hill, with significant portions in the Town of Markham and City of Toronto, and a very small area in the City of Vaughan. The ORM portion of the subwatershed is the northern most finger which lies in the City of Vaughan and the Town of Richmond Hill. As is the case in the Upper East Don, land use is dominated by medium-density residential development (39.7%). Other major land uses include a large industrial block in the south-east portion of the watershed (17.4%) and natural cover (18%). Construction is underway on already-approved development on at least 106 ha of land (2.7% of the subwatershed) shown as undeveloped in 2002, largely for medium-density residential and commercial uses.

Past regeneration activities have included retrofit of the stormwater ponds in Harding Park (a *Forty Steps to a New Don* concept site).

Regeneration Drivers

Key drivers of regeneration will be voluntary implementation of regeneration activities and sustainable practices in existing residential and industrial areas, and opportunities relating to the future use of the David Dunlap Observatory lands. The key influences on the identification of regeneration priorities are:

- ❒ Some of the highest levels of groundwater discharge in the watershed
- ❒ Permeable soils on the Oak Ridges Moraine
- ❒ Stormwater control is patchy
- ❒ Flood vulnerable areas south of Elgin Mills Road and along Cummer Creek
- ❒ Opportunity for natural heritage enhancement and cultural heritage preservation at the David Dunlap Observatory
- ❒ Riparian cover lacking north of the 407

Figure 32 presents the subwatershed regeneration plan for the German Mills Creek subwatershed.

Regeneration Goals

- ❒ Stormwater retrofits and green renovations to mitigate flood risk and improve the sustainability of communities
- ❒ Celebration of the cultural heritage of the David Dunlap Observatory

Key Statistics

Natural cover: 18%

Forest:	6%
Meadow:	12%
Wetland:	0%

Impervious cover: 39%

Urban lands with no stormwater control: 64%

Urban lands with stormwater control for quality & quantity: 9%

Harding Park stormwater management pond

- Some of the highest levels of clean groundwater discharge in the watershed
- Stormwater management lacking east of Bathurst Street
- Flood vulnerable areas in Thornhill (Vaughan and Markham)
- Contains half of the watershed's higher quality terrestrial habitat and some of the best opportunities to add natural cover

Figure 31 presents the subwatershed regeneration plan for the Upper East Don River subwatershed.

FIGURE 31: UPPER EAST DON RIVER SUBWATERSHED
Regeneration Plan

Water

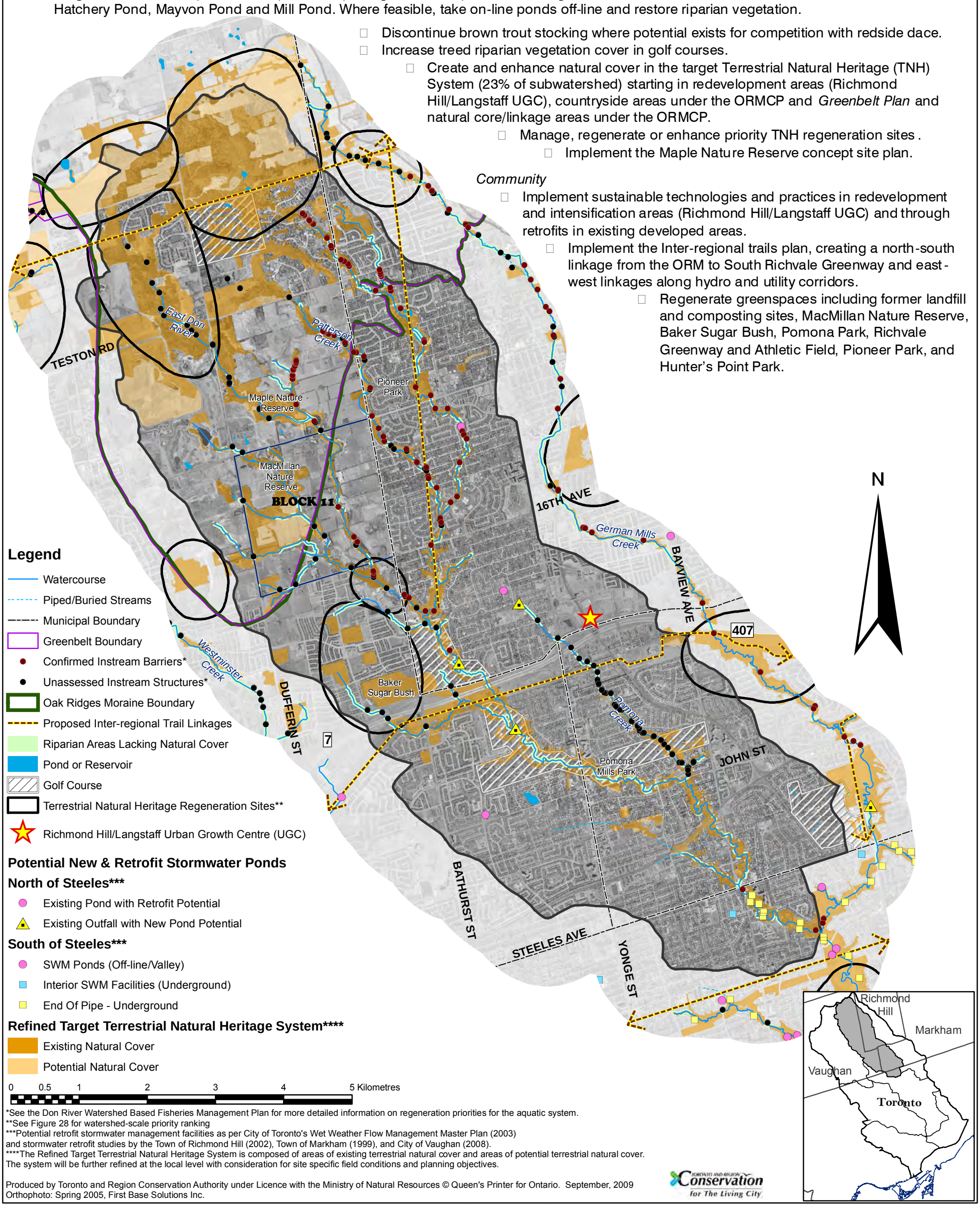
- Improve water balance and stormwater management through outfall and pond retrofits identified by municipalities (start with Pioneer Park) and lot level source controls (infiltration, evapotranspiration, reuse) in priority sub-basins: Patterson Creek and the western tributaries of the Upper East Don River, and Pomona Creek.
- Remediate flood risk starting with Patterson Creek and adjacent eastern tributary, and the Upper East Don River south of Steeles Ave.
- Remediate priority erosion sites under the *Markham Erosion Restoration Implementation Plan* and erosion risk associated with infrastructure.

Nature

- Improve native aquatic species diversity, abundance and distribution, and protect and enhance habitat for brassy minnow, American brook lamprey, endangered redside dace, mottled sculpin and common shiner north of John St; and northern redbelly dace, Johnny darter, mottled sculpin and rainbow trout south of John St.
- Enhance aquatic habitat with overhanging grassy meadow vegetation for endangered redside dace in Patterson Creek and the tributary to the east. Improve sediment control in Block 11 to protect redside dace habitat.
- Create and enhance riparian wetlands for brassy minnow starting in the tributaries off the Oak Ridges Moraine (ORM) north of 16th Ave between Dufferin and Bathurst Sts.
- Mitigate the thermal impacts and improve fish passage in on-line ponds, including Redelmier Pond, Rumble Pond, Pioneer Pond, the former MNR Hatchery Pond, Mayvon Pond and Mill Pond. Where feasible, take on-line ponds off-line and restore riparian vegetation.
- Discontinue brown trout stocking where potential exists for competition with redside dace.
- Increase treed riparian vegetation cover in golf courses.
  - Create and enhance natural cover in the target Terrestrial Natural Heritage (TNH) System (23% of subwatershed) starting in redevelopment areas (Richmond Hill/Langstaff UGC), countryside areas under the ORMCP and *Greenbelt Plan* and natural core/linkage areas under the ORMCP.
    - Manage, regenerate or enhance priority TNH regeneration sites .
      - Implement the Maple Nature Reserve concept site plan.

Community

- Implement sustainable technologies and practices in redevelopment and intensification areas (Richmond Hill/Langstaff UGC) and through retrofits in existing developed areas.
  - Implement the Inter-regional trails plan, creating a north-south linkage from the ORM to South Richvale Greenway and east-west linkages along hydro and utility corridors.
    - Regenerate greenspaces including former landfill and composting sites, MacMillan Nature Reserve, Baker Sugar Bush, Pomona Park, Richvale Greenway and Athletic Field, Pioneer Park, and Hunter's Point Park.



*See the Don River Watershed Based Fisheries Management Plan for more detailed information on regeneration priorities for the aquatic system.
**See Figure 28 for watershed-scale priority ranking
***Potential retrofit stormwater management facilities as per City of Toronto's Wet Weather Flow Management Master Plan (2003) and stormwater retrofit studies by the Town of Richmond Hill (2002), Town of Markham (1999), and City of Vaughan (2008).
****The Refined Target Terrestrial Natural Heritage System is composed of areas of existing terrestrial natural cover and areas of potential terrestrial natural cover. The system will be further refined at the local level with consideration for site specific field conditions and planning objectives.

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FIGURE 32: GERMAN MILLS CREEK SUBWATERSHED
Regeneration Plan

Water

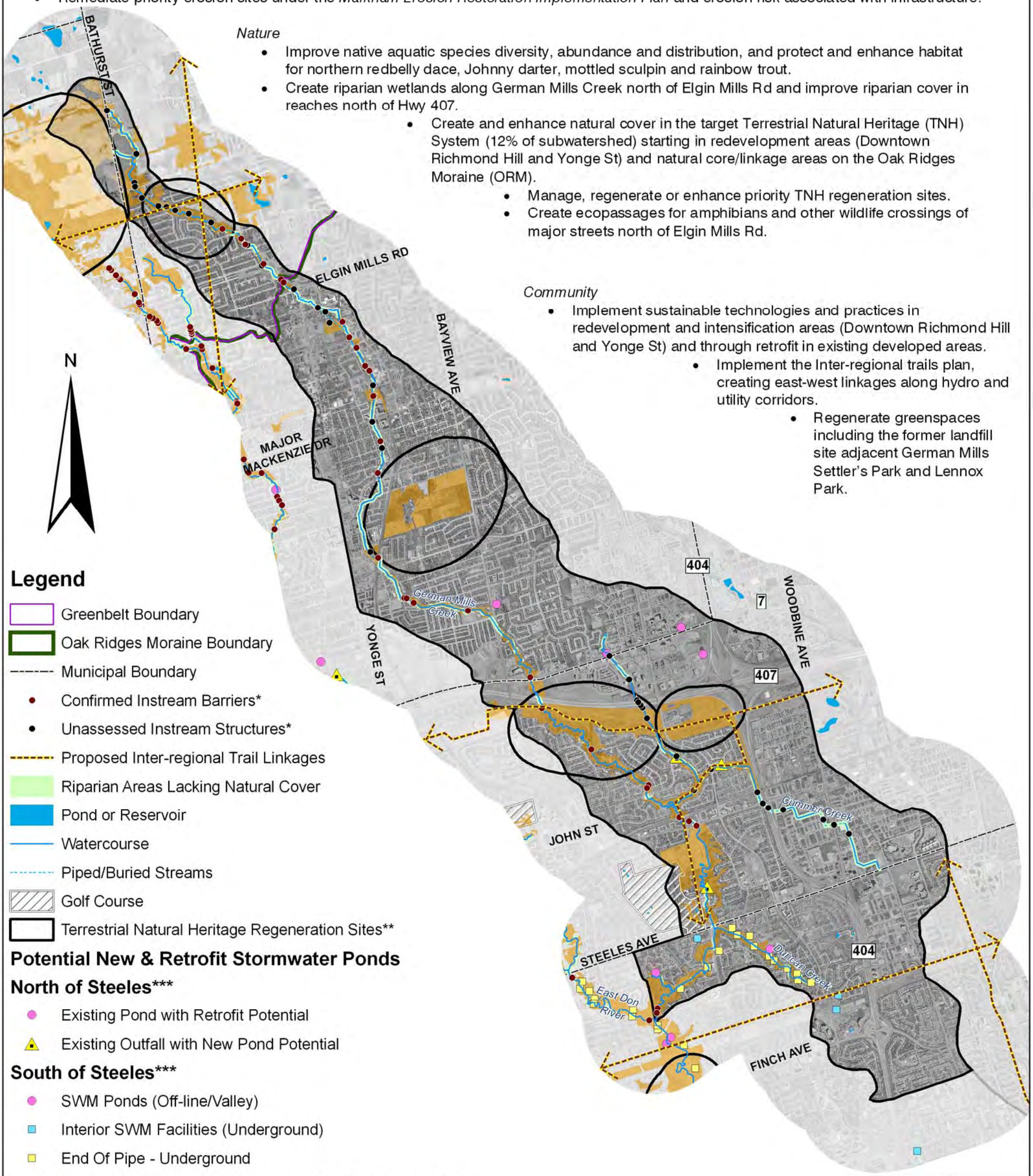
- Improve water balance and stormwater management through outfall and pond retrofits identified by municipalities and source controls (infiltration, evapotranspiration, reuse) in priority sub-basins: Cummer Creek and German Mills Creek north of Major MacKenzie Dr.
- Remediate flood risk starting with German Mills Creek between Steeles Ave and John St and the Enford Rd area, and along Cummer Creek/Don Mills Ditch.
- Mitigate the impacts of potential high impact surface water users (golf courses)
- Remediate priority erosion sites under the *Markham Erosion Restoration Implementation Plan* and erosion risk associated with infrastructure.

Nature

- Improve native aquatic species diversity, abundance and distribution, and protect and enhance habitat for northern redbelly dace, Johnny darter, mottled sculpin and rainbow trout.
- Create riparian wetlands along German Mills Creek north of Elgin Mills Rd and improve riparian cover in reaches north of Hwy 407.
- Create and enhance natural cover in the target Terrestrial Natural Heritage (TNH) System (12% of subwatershed) starting in redevelopment areas (Downtown Richmond Hill and Yonge St) and natural core/linkage areas on the Oak Ridges Moraine (ORM).
- Manage, regenerate or enhance priority TNH regeneration sites.
- Create ecopassages for amphibians and other wildlife crossings of major streets north of Elgin Mills Rd.

Community

- Implement sustainable technologies and practices in redevelopment and intensification areas (Downtown Richmond Hill and Yonge St) and through retrofit in existing developed areas.
- Implement the Inter-regional trails plan, creating east-west linkages along hydro and utility corridors.
- Regenerate greenspaces including the former landfill site adjacent German Mills Settler's Park and Lennox Park.



*See the Don River Watershed Based Fisheries Management Plan for more detailed information on regeneration priorities for the aquatic system.
**See Figure 28 for watershed-scale priority ranking
***Potential retrofit stormwater management facilities as per City of Toronto's Wet Weather Flow Management Master Plan (2003) and stormwater retrofit studies by the Town of Richmond Hill (2002), Town of Markham (1999), and City of Vaughan (2008).
****The Refined Target Terrestrial Natural Heritage System is composed of areas of existing terrestrial natural cover and areas of potential terrestrial natural cover. The system will be further refined at the local level with consideration for site specific field conditions and planning objectives.

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6.2.4 Lower West Don River Subwatershed

The Lower West Don River subwatershed extends over 6,353 ha from the G. Ross Lord Park and reservoir to its confluence with the East Don River at the Don Valley Parkway. The subwatershed is almost entirely located in the City of Toronto. Land use is dominated by medium-density residential development (44.8%). Other major land uses include a large industrial block in the north-west (14.0%) and natural cover (13.7%) following the course of the river valley. This subwatershed includes the North York Urban Growth Centre identified in the Province's *Growth Plan for the Greater Golden Horseshoe* as a target area for redevelopment and intensification.

Work is underway on a planned retrofit to the stormwater pond at Earl Bales Park (a *Forty Steps to a New Don* concept site). The E.P. Taylor Canadian Film Centre site has been identified as a candidate site for implementation of "at source" stormwater management controls.

Regeneration Drivers

Key drivers for regeneration will be redevelopment associated with intensification in the North York Urban Growth Centre (Yonge Street and Sheppard Ave), implementation of Toronto's WWFMMP, and voluntary implementation of regeneration activities and sustainable practices in existing residential and residential areas. The key influences on the identification of regeneration priorities are:

- ❒ High level of urbanization
- ❒ Provincially designated North York Urban Growth Centre
- ❒ Older development with little stormwater control and combined storm and sanitary sewers south of Eglinton Avenue
- ❒ Flooding in Hogg's Hollow
- ❒ Mature treed ravines with high recreational use

Figure 33 presents the subwatershed regeneration plan for the Lower West Don River subwatershed.

Regeneration Goals

- ❒ Stormwater control and green retrofit in redevelopment areas, to improve the sustainability and livability of communities.
- ❒ Regeneration of valley parks and natural areas for long term ecosystem function and community enjoyment.

Key Statistics

Natural cover: 14%

Forest:	10%
Meadow:	3%
Wetland:	0%

Impervious cover (cumulative): 36%

Urban lands with no stormwater control: 97%

Urban lands with stormwater control for quality & quantity: 2%

Planting event at Earl Bales Park in Toronto

6.2.5 Lower East Don River Subwatershed

The Lower East Don River subwatershed extends over 5,558 ha from north of Steeles Avenue in Markham to its confluence with the West Don River at the Don Valley Parkway. The subwatershed is almost entirely located in the City of Toronto. Land use is dominated by medium (46.6%) and high density (11.2%) residential development. Other major land uses include industrial blocks at various locations along the River (8.9%) and natural cover (12%) following the course of the river valley. The river valley is a green corridor of parks and natural areas.

Recent regeneration activities have included a stormwater pond retrofit in Moccasin Trail Park and master planning for Milne Hollow. Cummer's Mill was a concept site under *Forty Steps*.

Regeneration Drivers

Key drivers for regeneration will be voluntary implementation of regeneration activities and sustainable practices in existing residential and residential areas, and implementation of TO's *Wet Weather Flow Management Master Plan*. The key influences on the identification of regeneration priorities are:

- ❒ High level of urbanization
- ❒ Older development with virtually no stormwater control and combined storm and sanitary sewers south of Eglinton Avenue
- ❒ More permeable soils on eastern side of subwatershed
- ❒ Mature valleys with high recreational use

Figure 34 presents the subwatershed regeneration plan for the Lower East Don River subwatershed.

Regeneration Goals

- ❒ Stormwater control, and green retrofit in redevelopment areas, to improve the sustainability and livability of communities.
- ❒ Regeneration of valley parks and natural areas for long term ecosystem function and community enjoyment.

Key Statistics

Natural cover: 12%
- Forest: 7%
- Meadow: 4%
- Wetland: 0%

Impervious cover (cumulative): 31%

Urban lands with no stormwater control: 97%

Urban lands with stormwater control for quality & quantity: 2%

FIGURE 33: LOWER WEST DON RIVER SUBWATERSHED
Regeneration Plan

Water

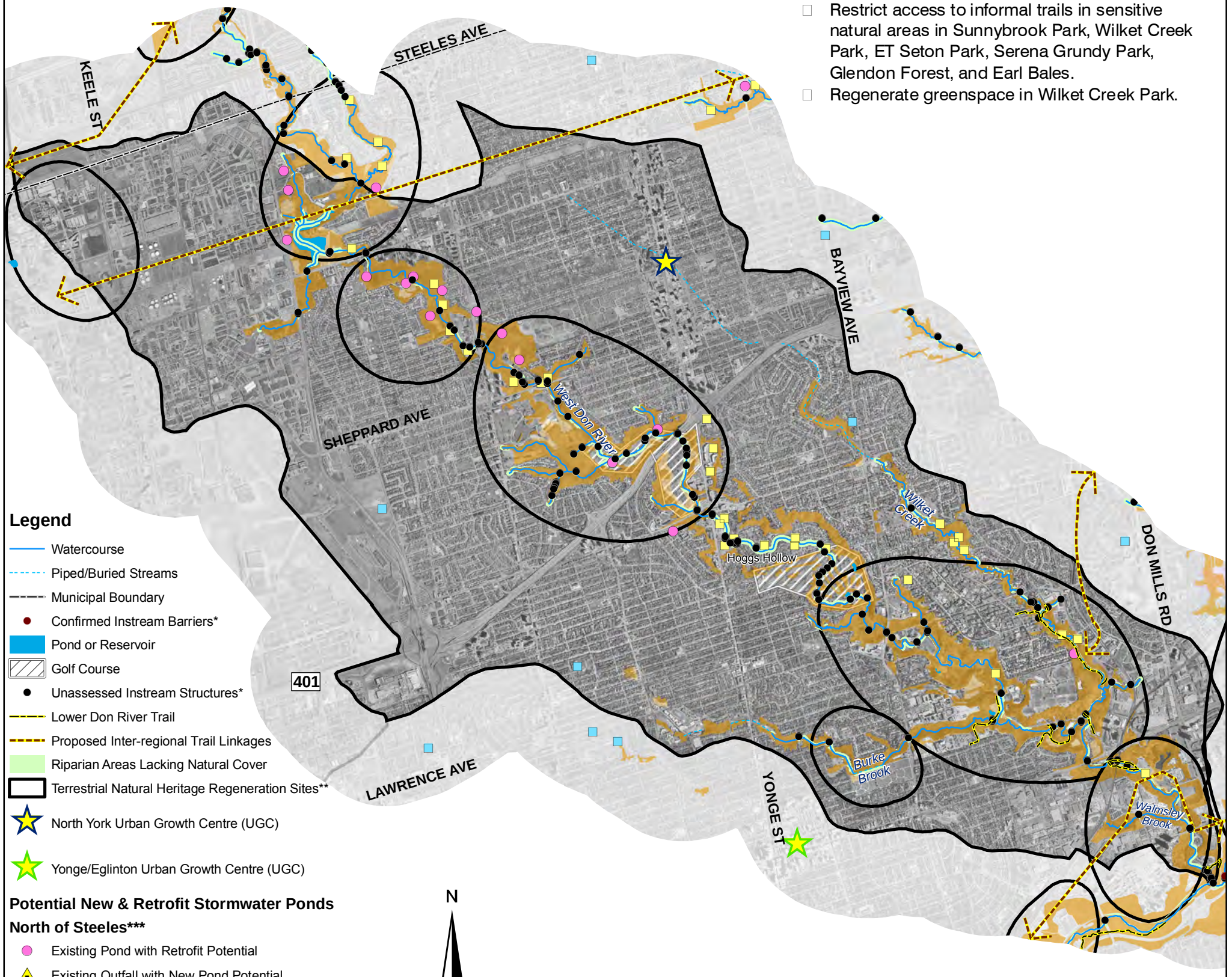
- Implement City of Toronto's *Wet Weather Flow Management Master Plan* according to the 25 Year Implementation Plan including stormwater control retrofits and stream restoration, starting with improvements to the Earl Bales stormwater facility.
  Improve stormwater control for Highway 401 and Highway 404/Don Valley Parkway
- Remediate combined sewer overflows. (Toronto's *Don River and Central Waterfront Project*)
- Maintain flood control infrastructure and channels, starting with the York Mills Channel in Hoggs Hollow.
- Mitigate the impacts of potential medium impact surface water users – primarily golf courses.
- Remediate ravines and sites where infrastructure is at risk of erosion (see municipal and TRCA inventories), starting with Wilket Creek

Nature

- Improve native aquatic species diversity, abundance and distribution, and protect and enhance habitat for Johnny darter, common shiner, white sucker and rainbow trout.
- Create riparian wetlands along Wilket Creek and Burke Brook and the West Don River upstream of Bayview Ave.
- Create and enhance natural cover in the target Terrestrial Natural Heritage (TNH) System (12% of subwatershed) and additional lands identified in Toronto's Official Plan starting with redevelopment and intensification areas (North York UGCs).
- Manage, regenerate or enhance priority TNH regeneration sites. Complete fencing of the "off-leash" area in Sunnybrook Park.
- Designate and restrict public access to protected areas for shoreline bird habitat at G. Ross Lord Dam and stormwater ponds.

Community

- Implement sustainable technologies and practices in redevelopment and intensification areas (North York UGCs) and through retrofit in existing developed areas.
- Implement the Inter-regional trails plan creating east-west linkages along hydro corridors, and partner with golf courses to complete trails along the West Don River (connect Earl Bales Park and York Mills Valley Park through the Don Valley Golf Course, link York Mills Valley Park to Glendon Forest through Rosedale Golf Club).
- Restrict access to informal trails in sensitive natural areas in Sunnybrook Park, Wilket Creek Park, ET Seton Park, Serena Grundy Park, Glendon Forest, and Earl Bales.
- Regenerate greenspace in Wilket Creek Park.



*See the Don River Watershed Based Fisheries Management Plan for more detailed information on regeneration priorities for the aquatic system.
**See Figure 28 for watershed-scale priority ranking
***Potential retrofit stormwater management facilities as per City of Toronto's Wet Weather Flow Management Master Plan (2003) and stormwater retrofit studies by the Town of Richmond Hill (2002), Town of Markham (1999), and City of Vaughan (2008).
****The Refined Target Terrestrial Natural Heritage System is composed of areas of existing terrestrial natural cover and areas of potential terrestrial natural cover. The system will be further refined at the local level with consideration for site specific field conditions and planning objectives.

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FIGURE 34: LOWER EAST DON RIVER SUBWATERSHED
Regeneration Plan

Water

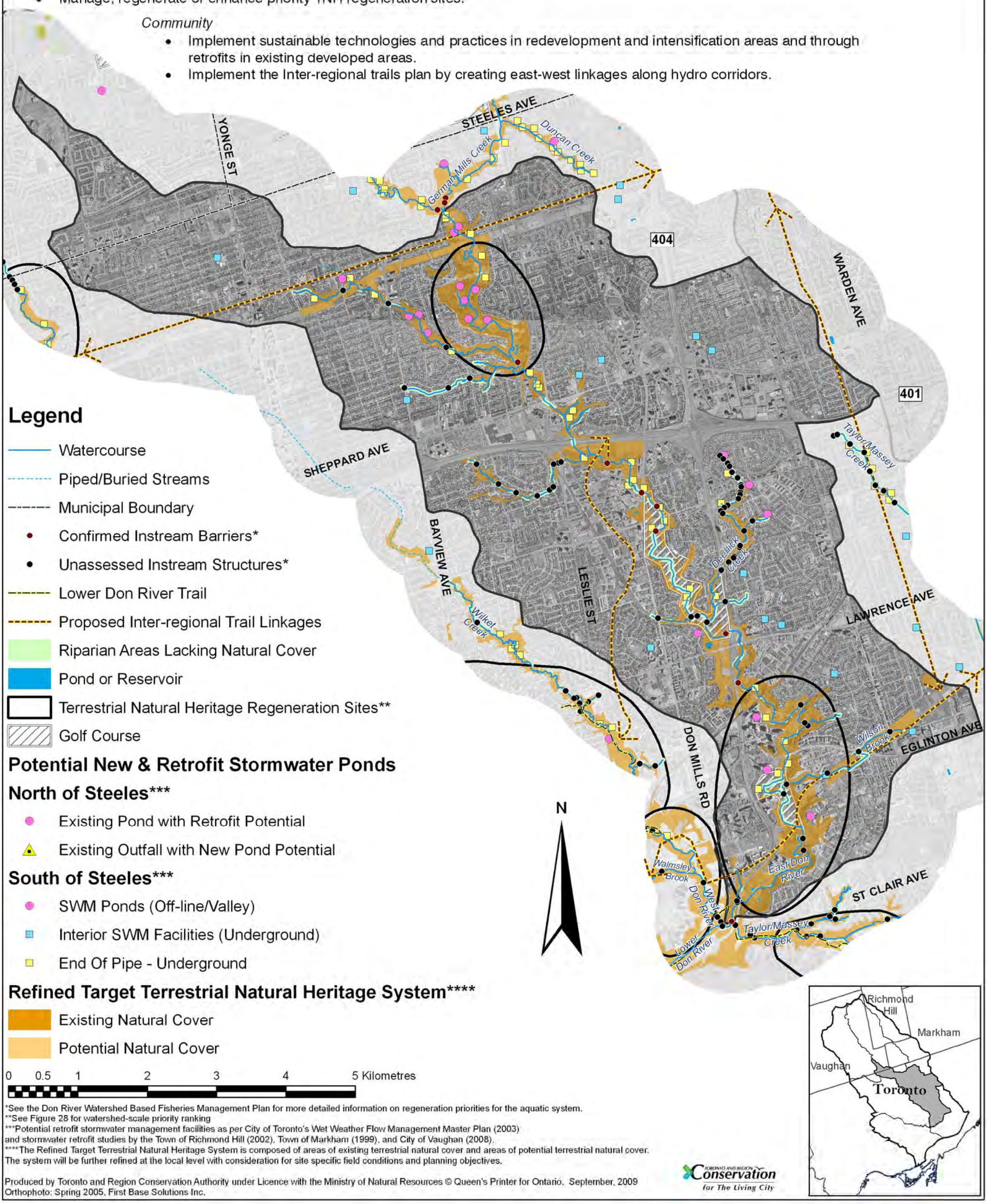
- Implement Toronto's *Wet Weather Flow Management Master Plan* (as updated) including stormwater control retrofits and stream restoration. Improve stormwater control for Hwys 401 and 404/Don Valley Parkway.
- Remediate combined sewer overflows per Toronto's *Don River and Central Waterfront Project.*
- Remediate flood risk starting south of Eglinton Ave.
- Mitigate the impacts of potential medium impact surface water users (golf courses).
- Remediate ravines and priority erosion control sites starting with Deerlick and Newtonbrook creeks.

Nature

- Improve native aquatic species diversity, abundance and distribution, and protect and enhance habitat for northern redbelly dace, mottled sculpin, rainbow trout and Johnny darter north of Hwy 401; and Johnny darter, common shiner, white sucker and rainbow trout south of the 401.
- Create riparian wetlands in Deerlick Creek and other tributaries north of Sheppard Ave and west of Leslie St.
- Work with golf courses to regenerate riparian cover.
- Create and enhance natural cover in the target Terrestrial Natural Heritage (TNH) System (10% of subwatershed) and additional lands identified in Toronto's Official Plan, starting with redevelopment and intensification areas.
- Manage, regenerate or enhance priority TNH regeneration sites.

Community

- Implement sustainable technologies and practices in redevelopment and intensification areas and through retrofits in existing developed areas.
- Implement the Inter-regional trails plan by creating east-west linkages along hydro corridors.



*See the Don River Watershed Based Fisheries Management Plan for more detailed information on regeneration priorities for the aquatic system.
**See Figure 28 for watershed-scale priority ranking
***Potential retrofit stormwater management facilities as per City of Toronto's Wet Weather Flow Management Master Plan (2003) and stormwater retrofit studies by the Town of Richmond Hill (2002), Town of Markham (1999), and City of Vaughan (2008).
****The Refined Target Terrestrial Natural Heritage System is composed of areas of existing terrestrial natural cover and areas of potential terrestrial natural cover. The system will be further refined at the local level with consideration for site specific field conditions and planning objectives.

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6.2.6 Taylor/Massey Creek Subwatershed

The Taylor/Massey Creek subwatershed extends over 2,859 ha from Highway 401 to the Forks of the Don at the Don Valley Parkway. The subwatershed is entirely located in the City of Toronto. Land use is dominated by medium-density residential (49.2%) and industry (15.0%). The subwatershed has 9% natural cover, with most of the cover in Taylor Creek Park and Warden Woods. This is the most urbanized and impacted subwatershed in the Don.

Past regeneration has included regeneration of Terraview Willowfield (a *Forty Steps to a New Don* concept site) and plantings and clean ups by Willowfield School and NGOs such as Taylor Massey Project and Friends of the Don East. City of Toronto's plans to address combined sewer overflows could substantially improve water quality in the Creek. Taylor Massey Project is developing a set of reach-by-reach regeneration recommendations for the Creek.

Regeneration Drivers

Key drivers for regeneration will be implementation of Toronto's WWFMMP and remediation of CSOs, and voluntary implementation of regeneration activities and sustainable practices in existing residential areas. The key influences on the identification of regeneration priorities are:

- ❒ Highest level of urbanization in the watershed
- ❒ Older development with virtually no stormwater control and combined storm and sanitary sewers south of Eglinton Avenue
- ❒ Flood vulnerable areas north of Lawrence Avenue
- ❒ More permeable soils
- ❒ Poor water quality (*E. coli*, chloride, nutrients, metals)
- ❒ Extensive concrete channels with riparian cover lacking
- ❒ Extremely limited aquatic habitat and fish communities

Figure 35 presents the subwatershed regeneration plan for the Taylor/Massey Creek subwatershed.

Regeneration Goals

- ❒ Regeneration of an urbanized Creek through personal, household, and corporate stewardship.
- ❒ Improved wet weather flow management to mitigate flooding, erosion and water quality problems.

Key Statistics

Natural cover: 9%

Forest:	5%
Meadow:	3%
Wetland:	0%

Impervious cover: 43%

Urban lands with no stormwater control: 98%

Urban lands with storm-water control for quality & quantity: 2%

Terraview Park in Toronto.

6.2.7 Lower Don River Subwatershed

The Lower Don River subwatershed extends over 4,993 ha from south of Highway 401 to the Mouth of the Don at Lake Ontario. The River runs alongside the Don Valley Parkway to the Keating Channel, with its outlet into the Harbour. The subwatershed is entirely located in the City of Toronto. Land use is dominated by medium (54.1%) and high density (11.8%) residential development. Other major land uses include industrial, commercial and institutional which together cover 16.9% of the subwatershed. Natural cover accounts for 9% of the subwatershed, concentrated in the river valley. This subwatershed is home to Toronto's downtown core and historic Don Valley Brick Works, the Port Lands, and part of the Distillery District. Two Urban Growth Centres have been identified in the Province's *Growth Plan for the Greater Golden Horseshoe* as target areas for redevelopment and intensification – Downtown and Yonge/Eglinton.

Past regeneration has included mitigation of the Pottery Road weirs for fish passage, Chester Springs Marsh restoration, and regeneration of historic Don Valley Brick Works. Two major projects are underway to bring new life to the Lower Don River. The Lower Don River West Remedial Flood Protection Project involves the creation of a major landform to provide flood protection west of the River near Lake Ontario. The Don Mouth Naturalization and Port Lands Flood Protection Project will ultimately develop a preferred alternative that will transform the existing mouth of the Don River including the Keating Channel, into a healthier, more naturalized river outlet to the lake, while at the same time, removing the risk of flooding to part of the Port Lands area.

Regeneration Drivers

Key drivers for regeneration will be redevelopment associated with revitalization of the Don Mouth, intensification in the Yonge/Eglinton and Downtown Toronto Urban Growth Centres, and voluntary implementation of regeneration activities and sustainable practices in existing residential and residential areas. The key influences on the identification of regeneration priorities are:

- ❒ High level of urbanization
- ❒ Two provincially designated Urban Growth Centres – Yonge/Eglinton and Downtown Toronto
- ❒ Older development with virtually no stormwater control and combined storm and sanitary sewers throughout
- ❒ Poor water quality (*E. coli*, nutrients)
- ❒ Higher permeability soils on Iroquois Sand Plain
- ❒ Major regeneration projects at the Don Mouth

Figure 36 presents the subwatershed regeneration plan for the Lower Don River subwatershed.

Regeneration Goal

- ❒ Revitalization of the Mouth of the Don as the jewel in the centre of the City.
- ❒ Improved wet weather flow management to mitigate flooding, erosion and water quality problems.

Key Statistics

Natural cover: 9%
- Forest: 6%
- Meadow: 2%
- Wetland: 0%

Impervious cover (cumulative): 35%

Urban lands with no stormwater control: 100%

Urban lands with stormwater control for quality & quantity: 0%

FIGURE 35: TAYLOR/MASSEY CREEK SUBWATERSHED
Regeneration Plan

Water

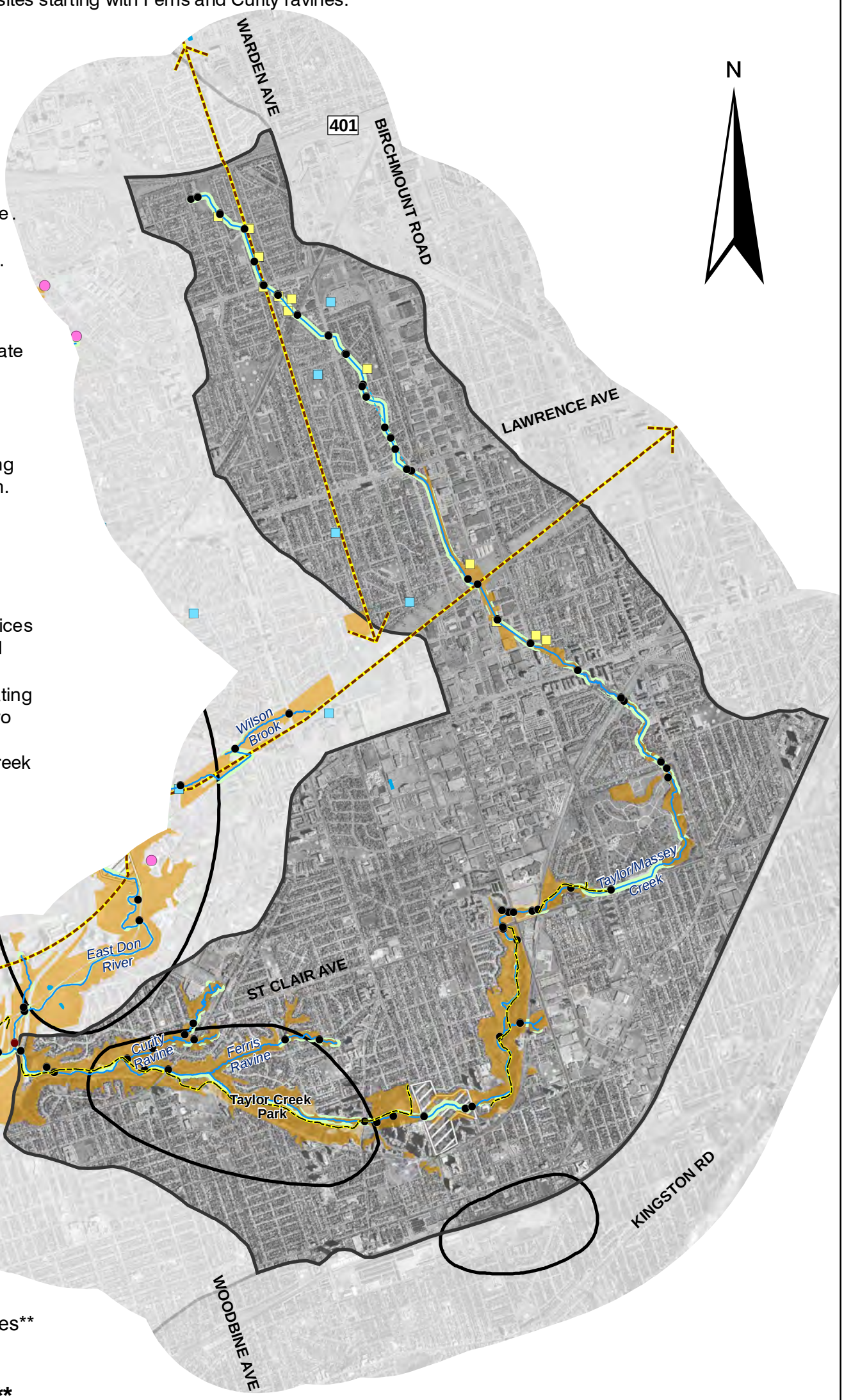
- Implement Toronto's *Wet Weather Flow Management Master Plan* (as updated) including stormwater control retrofits and stream restoration. Improve stormwater control for Hwy 401.
- Remediate combined sewer overflows per Toronto's *Don River and Central Waterfront Project.*
- Remediate flood risk starting with the reaches north of Lawrence Ave and south of the Gatineau hydro corridor.
- Remediate ravines and priority erosion control sites starting with Ferris and Curity ravines.

Nature

- Improve native aquatic species diversity, abundance and distribution, and protect and enhance habitat for white sucker, creek chub, longnose dace, and the benthic community.
- Create wetlands where groundwater seeps are prevalent starting in Taylor Creek Park and the reach between Birchmount Rd and Warden Ave.
- Improve riparian cover starting with the reach from Lawrence Ave south to the hydro corridor.
- Improve instream bed structure in the Creek starting in the reach north of the east-west Gatineau hydro corridor.
- Complete an instream barrier survey and mitigate perched culverts where possible.
- Create and enhance natural cover in the target Terrestrial Natural Heritage (TNH) System (minimum 7% of subwatershed) and additional lands identified in Toronto's Official Plan starting with areas of redevelopment and intensification.
- Manage, regenerate or enhance priority TNH regeneration sites.

Community

- Implement sustainable technologies and practices in redevelopment and intensification areas and through retrofits in existing developed areas.
- Implement the Inter-regional trails plan by creating north-south and east-west linkages along hydro corridors.
- Regenerate greenspace starting with Taylor Creek Park.
- Implement the Warden Woods Residential Neighbourhood concept site.



Legend

- Confirmed Instream Barriers*
- Unassessed Instream Structures*
- Pond or Reservoir
- Watercourse
- Piped/Buried Streams
- Golf Course
- Lower Don River Trail
- Proposed Inter-regional Trail Linkages
- Riparian Areas Lacking Natural Cover
- Terrestrial Natural Heritage Regeneration Sites**

Potential End of Pipe Stormwater Management Retrofits South of Steeles***

- SWM Ponds (Off-line/Valley)
- Interior SWM Facilities (Underground)
- End Of Pipe - Underground

Refined Target Terrestrial Natural Heritage System****

- Existing Natural Cover
- Potential Natural Cover

0 0.5 1 2 3 4 5 Kilometres

*See the Don River Watershed Based Fisheries Management Plan for more detailed information on regeneration priorities for the aquatic system.
**See Figure 28 for watershed-scale priority ranking
***Potential retrofit stormwater management facilities as per City of Toronto's Wet Weather Flow Management Master Plan (2003) and stormwater retrofit studies by the Town of Richmond Hill (2002), Town of Markham (1999), and City of Vaughan (2008).
****The Refined Target Terrestrial Natural Heritage System is composed of areas of existing terrestrial natural cover and areas of potential terrestrial natural cover. The system will be further refined at the local level with consideration for site specific field conditions and planning objectives.

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FIGURE 36: LOWER DON RIVER SUBWATERSHED
Regeneration Plan

Water

- Implement Toronto's *Wet Weather Flow Management Master Plan* (as updated) including stormwater control retrofits and stream restoration. Improve stormwater control for Hwys 401 and 404/Don Valley Parkway.
- Remediate combined sewer overflows per Toronto's *Don River and Central Waterfront Project* and the *North Toronto Treatment Plant Full Scale Implementation of High Rate Treatment* study.
- Continue implementation of the *Lower Don River West Remedial Flood Protection Project.*
- Implement the preferred alternative in the *Don Mouth Naturalization and Port Lands Flood Protection Project.*
- Remediate ravines and priority erosion control sites starting with Yellow and Mud creeks.

Nature

- Improve native aquatic species diversity, abundance and distribution, and protect and enhance habitat for Johnny darter, common shiner, white sucker and rainbow trout in the river and emerald shiner, walleye, northern pike and largemouth bass at the Mouth of the Don.
- Create riparian wetlands and fish habitat associated with the Mouth of the Don.
- Create and enhance natural cover in the target Terrestrial Natural Heritage (TNH) System (23% of subwatershed) and additional lands identified in Toronto's Official Plan starting with areas of redevelopment and intensification (Yonge-Eglinton and Downtown Toronto UGCs). Create linkages in natural cover from the Don Narrows to Tommy Thompson Park.
- Manage, regenerate or enhance priority TNH regeneration Sites. Address encroachment in ravines.
- Implement the Crothers' Woods Management Plan.

Community

- Implement sustainable technologies and practices redevelopment and intensification areas (Yonge-Eglinton and Downtown Toronto UGCs) and through retrofits in existing developed areas.
- Implement the Inter-regional trails plan creating east-west linkages along hydro corridors and the waterfront.
- Regenerate greenspaces including the proposed Don River Park and Don Greenway at the Mouth of the Don and the Don Valley Brick Works.
- Implement the Mud Creek Neighbourhood concept site.

401
LAWRENCE AVE
Burke Brook
West Don River
Walmsley Brook
East Don River
WILLIAM R ALLEN RD
BAYVIEW AVE
North Toronto Wastewater Treatment Plant
DUFFERIN ST
ST CLAIR AVE
Don Valley Brick Works
Yellow Creek
DANFORTH AVE
WOODBINE AVE
BLOOR ST
Lower Don River
DUNDAS ST
YONGE ST
KING ST
Toronto Harbour
Tommy Thompson Park
N

Legend

- Watercourse
- Piped/Buried Streams
- Confirmed Instream Barriers*
- Unassessed Instream Structures*
- Lower Don River Trail
- Waterfront Trail
- Proposed Inter-regional Trail Linkages
- Riparian Areas Lacking Natural Cover
- Pond or Reservoir
- Terrestrial Natural Heritage Regeneration Sites**
- Yonge/Eglinton Urban Growth Centre (UGC)
- Downtown Toronto Urban Growth Centre (UGC)

Potential End of Pipe Stormwater Management Retrofits

South of Steeles***

- SWM Ponds (Off-line/Valley)
- Interior SWM Facilities (Underground)
- End Of Pipe - Underground

Study Areas

- Lower Don River West Remedial Flood Protection Project
- Don Mouth Naturalization and Port Lands Flood Protection Project

Refined Target Terrestrial Natural Heritage System****

- Existing Natural Cover
- Potential Natural Cover

0 0.5 1 2 3 4 5 Kilometres

*See the Don River Watershed Based Fisheries Management Plan for more detailed information on regeneration priorities for the aquatic system.
**See Figure 28 for watershed-scale priority ranking
***Potential retrofit stormwater management facilities as per City of Toronto's Wet Weather Flow Management Master Plan (2003) and stormwater retrofit studies by the Town of Richmond Hill (2002), Town of Markham (1999), and City of Vaughan (2008).
****The Refined Target Terrestrial Natural Heritage System is composed of areas of existing terrestrial natural cover and areas of potential terrestrial natural cover. The system will be further refined at the local level with consideration for site specific field conditions and planning objectives.

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6.3 Stewardship & Outreach Education

A recurring theme in this plan is the need for initiatives to increase awareness and provide more information about ways that individuals, businesses and governments can contribute to regenerating a healthy, sustainable watershed. The watershed plan also highlights the urgency of this shift to sustainable behaviour, not just to reduce our present impact on the watershed, but to create an accepting market for innovative community designs which will be the basis of redeveloping more sustainable communities as population density continues to rise. How our neighbourhoods and lots are redeveloped and renovated will determine the watershed's long term health.

The *Action Plan for Sustainable Practices – for Residential and Business Sectors in the GTA* (Freeman, 2006) recommends a multi-pronged marketing campaign aimed at homeowners and builders in the GTA. For businesses, a package of measures is proposed, including stream-lined approvals, regulatory changes, financial incentives, information tools, awards and a corporate leaders program.

TRCA's Stewardship and Outreach Education section implements various programs that support this shift to sustainable behaviours, including:

- In-class school programming, such as Watershed on Wheels, Yellow Fish Road and Aquatic Plants.
- Community stewardship involving family nature events, hands-on volunteer regeneration, habitat creation, maintenance and monitoring (e.g., Bartley Smith Greenway initiative). A new community stewardship program is being proposed for the Don River watershed, focusing on walks in local communities, a "headwaters to mouth" hike, and aquatic and wetland planting events.

Behavioural Shifts

The overall theme for stewardship and education programs is to encourage behavioural shifts to sustainable practices. This can include:

- Backyard and front yard naturalization
- Organic lawn care
- Planting drought tolerant, native trees, shrubs and wildflowers
- Control of invasive alien species
- Stewardship of natural areas and greenspaces (including garbage clean up, community monitoring of regenerated areas, tree tending, and addressing encroachment issues)

- Energy conservation, water conservation and waste reduction
- Production and purchase of locally grown food
- Naming and signage for Don River and all its tributaries
- Awareness of cultural heritage
- Integrated pest management for golf courses

- Importance of lot level (at source) stormwater management
- Pollution prevention (including salt management)
- Spills prevention and management
- Avoidance of practices that aggravate flood risk
- Erosion and sediment control and site restoration practices for construction sites

- ❒ Private stewardship, such as Healthy Yards programs on natural lawn and garden care, multicultural environmental stewardship programming (e.g., softening the impact of religious offerings in rivers), and Oak Ridges Moraine landowner contact.

Some of the stewardship and outreach education programs run by municipalities and other organizations are identified in Chapter 5. Existing programming addressing the topics outlined in the box on the previous page should continue to be implemented throughout the watershed.

Detailed recommendations for stewardship, awareness and outreach education for all agencies can be found in the management strategies (see Chapter 5). Key subjects for development and implementation of outreach education and stewardship programming targeting private landowners in all sectors are:

- ❒ Enhance public awareness and develop marketing programs to enhance voluntary uptake of sustainable practices by home owners and businesses, including:
    - Backyard naturalization
    - "At source" stormwater controls
    - Water and energy conservation
    - Winter maintenance (salt management)
- ❒ Develop and deliver outreach education programs to address on-going care and maintenance issues relating to "at source" stormwater controls in private properties.
- ❒ Promote stewardship of public greenspaces and natural areas, including addressing:
    - Encroachment (e.g., dumping, mowing)
    - Incompatible recreational uses, off-leash pets
    - Best management practices for terrestrial and aquatic habitat regeneration (riparian plantings, naturalized plantings)
    - The spread of terrestrial and aquatic invasive species
    - Ongoing operations and maintenance challenges
    - Celebration of natural heritage, cultural heritage and living culture

The following are priority areas in which to begin implementation of many of the above-mentioned outreach education and stewardship initiatives.

Private Land Campaigns

- ❒ Water balance and adoption of "at source" stormwater controls on private properties in the priority basins identified in Figure 23 and enhanced source control areas in Figure 24.
- ❒ Naturalization and expansion of the urban forest on private lands in and adjacent to the Target Terrestrial Natural Heritage System (Figure 26).

- Private land stewardship to encourage native plant landscaping in golf courses, schools, cemeteries, and residential areas across the watershed, but starting in those areas that could buffer existing high quality habitat, such as the "whitebelt" (if developed), newer residential areas on the Oak Ridges Moraine, properties adjacent to ravines in the City of Toronto, and Warden Woods.
- Private land stewardship and awareness campaigns targeted towards industrial, commercial, and institutional lands to prevent encroachment and dumping, starting by extending the Langstaff Eco-Park to the north, businesses that back onto Garthdale Ravine, golf courses and businesses northwest of Hogg's Hollow, and properties near Sunnybrook Park.
- Addressing encroachments and implementing Healthy Yards in residential neighbourhoods, starting with Taylor/Massey Creek from Ellesmere Road to Lawrence Avenue, south of Eglinton Avenue.
- Pollution prevention including direct advertising in the developing residential areas in the Upper West Don, Upper East Don and Patterson Creek, where awareness could focus on protection of redside dace; and in industrial areas south of Lawrence Avenue in Taylor/Massey Creek subwatershed.
- Water conservation awareness for large private water users with provincial Permits to Take Water (mostly golf courses) on the Oak Ridges Moraine and South Slope (Upper East Don and Upper West Don subwatersheds), and north of Elgin Mills in German Mills Creek. Maintaining baseflows in these areas is important for protection of redside dace populations.
- Work with large water takers on the Oak Ridges Moraine to implement fixed intakes above baseflow levels and create off-line ponds as reservoirs, where appropriate, to minimize impact of water takings on baseflows during low flow months.
- Awareness campaign to address aquatic invasive species, starting with Canada's Wonderland and CN Rail.

Greenspace and Natural Area Campaigns

- Stewardship of public greenspaces and natural areas, starting with those located in or near Urban Growth Centres (Figure 20) that will see rising use in the near future.
- Outreach education and control of terrestrial invasive species: (1) in the Upper West Don River subwatershed (part of the Canadian Food Inspection Agency's regulated area for Asian Long-Horned Beetle), (2) throughout the watershed where invasive exotic flora species threaten high quality natural areas (e.g., Sunnybrook Park, Taylor Creek Park), and (3) where public use is high (e.g., golf courses, Richvale Greenway, Mill Pond, Serena Gundy Park, Edwards Gardens, G. Ross Lord Park, Earl Bales Park, and the Don Valley Brick Works).

6.4 Operations and Maintenance

Property managers responsible for operations and maintenance of public property such as roads, parks and infrastructure, or private property such as golf courses, cemeteries or commercial/industrial lots, should consider ways they can incorporate the watershed plan's directions into their ongoing practices and programs.

Life cycle planning should be undertaken for all infrastructure – stormwater, wastewater, drinking water, roads and bridges, trail systems, and green infrastructure (e.g., terrestrial natural heritage, parks and greenspace). These systems are interrelated, largely located in the Don's valleys, and as such are subject to the same threats, including flooding, erosion, and overuse (in the case of trails and parks). Long term planning and capital budgeting for operations, maintenance, repair and replacement is essential to meet watershed management objectives. Operations and maintenance recommendations can be found in Chapter 5. Key operations and maintenance concerns include:

- ❒ Long term planning and capital budgeting for operations, maintenance, repair and replacement of stormwater management facilities (source, conveyance, and end-of-pipe)
- ❒ Optimize winter maintenance (salt management, snow management) operations on public and private properties
- ❒ Long term planning and capital budgeting for operations, maintenance and ongoing care and regeneration of greenspaces and their facilities

6.5 Monitoring and Further Study

Ongoing monitoring will be essential to identify whether the management strategies in this watershed plan are effective and adapt them if necessary. For example:

- ❒ Are the management measures performing as designed?
- ❒ How are environmental conditions responding?
- ❒ Do we need to change our strategies and if so, how?

Ambient Watershed Conditions – Long Term Trends

The Regional Watershed Monitoring Program (RWMP), led by TRCA in partnership with its member municipalities and other monitoring groups, provided a substantial information base for this watershed plan. The RWMP was developed based on regional and watershed scales and to the extent possible at the subwatershed scale. During the preparation of this plan, it was found that additional information is needed at both the watershed and sub-watershed scales to fully understand systems in the Don watershed.

Additional detail on recommendations for modifications to the Regional Watershed Monitoring Program (RWMP) and other suggestions for further monitoring and study can be found in Chapter 5 of this document, the Implementation Guide, and the *Don River Fisheries Management Plan*. The following adjustments are proposed for the RWMP:

- ❒ Addition of a fish monitoring station in Fish Management Zone 2.
- ❒ Additional groundwater monitoring wells (Provincial Groundwater Monitoring Network) for monitoring levels and quality in the Oak Ridges Moraine Aquifer Complex and Thorncliffe Aquifer Complex
- ❒ Install a new long term stream flow gauge in the Wilket Creek tributary (Lower West Don River subwatershed).
- ❒ Install a new long term stream flow gauge at the outflow of the Upper East Don subwatershed to allow for interpretation of historic baseflow trends and manage Oak Ridges Moraine contributions to baseflow.

Further Study

The following are recommendations for further study (see Chapter 5 for more detail).

Water Management

- ❒ Test and evaluate clean water technologies in the areas of stormwater management, stream restoration, water conservation, community wastewater treatment, and construction sediment control
- ❒ Monitor the effects of new and retrofitted urban development design and stormwater management practices
- ❒ Conduct synoptic dry weather outfall monitoring in the older parts of Richmond Hill and Markham to help identify

potential sources of bacterial contamination

- ❒ Conduct monitoring study to determine impact of closed landfills on surface and ground water quality in the Don
- ❒ Evaluate receiving stream capacity for chlorides in sensitive areas, starting with Patterson Creek (redside dace)
- ❒ Research salt management and winter maintenance best management practices, and the potential impacts of climate change.

Aquatic System

- ❒ Survey spawning populations of Chinook salmon, rainbow trout, walleye, and brown trout.
- ❒ Evaluate habitat use of the Lower Don by walleye for activities relating to spawning, nursery, and feeding areas for young of the year.
- ❒ Complete comprehensive in-stream barrier survey .
- ❒ Survey invasive aquatic species, including round goby, koi, sea lamprey, and rusty crayfish.
- ❒ Survey the distribution of native mussel species.
- ❒ Complete a stocking assessment to determine the extent of naturalization of brown trout and potential negative competitive interactions with redside dace. Develop a monitoring program to evaluate receiving stream capacity for chlorides in Patterson Creek, and identify strategic recommendations for salt management to protect fish communities.
- ❒ Investigate the role of “pond hopping” and connectivity of standing pools during seasonal high flows and storms in providing refuge habitat and recruitment for Fish Manaement Zone 2.
- ❒ Assess brown trout for migratory behaviour and the ability to achieve the Lake-wide management objectives established for a migratory fishery.
- ❒ Develop ongoing volunteer monitoring programs to track potential walleye spawning activity in the Lower Don River and track introductions and expansions in range of aquatic invasive species.

Terrestrial Systems

- ❒ Develop recovery plans for species and vegetation communities at risk or of conservation concern (e.g., butternut, oak woodlands)
- ❒ Develop forest management plans addressing planting and maintenance of the urban forest

Human Communities

- ❒ Develop marketing programs to enhance voluntary uptake of sustainable practices by private landowners
- ❒ Conduct a feasibility study for continuing education courses for adults to learn practical skills, such as archaeological field work, artifact analysis, site interpretation, and archival research
- ❒ Conduct archeological field surveys in protected areas of the Oak Ridges Moraine (ORM) and in the remaining areas (on and off the ORM) potentially subject to greenfield development
- ❒ Study new funding mechanisms for operations, maintenance and retrofit of greenspaces and natural areas

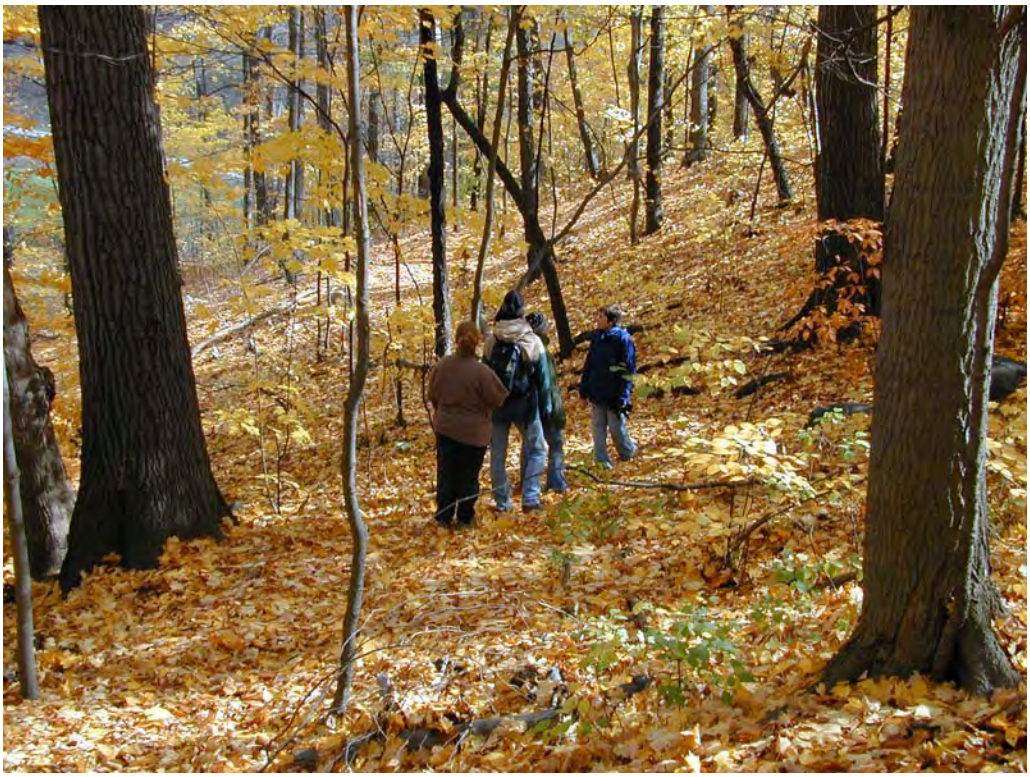
- ❒ Evaluate the impacts of existing and proposed formal and informal trails on greenspaces and natural areas
- ❒ Monitor trail use and participation rates in recreational activities

Evaluation of Innovative Technologies

TRCA's Sustainable Technologies Evaluation Program (STEP) is described in Chapter 5, although the program addresses other monitoring besides water (e.g., air). Chapter 5 recommends long-term support to ensure that it continues to provide a valuable forum for co-ordinated performance monitoring and evaluation among a number of agencies and private partners.

Adaptive Management

The *Don River Watershed Plan* recommends an adaptive management program that will use feedback from monitoring activities to make adjustments to policies, plans and programs to ensure that our goals, objectives and targets are met.



Hikers exploring Crothers' Woods — ongoing monitoring of recreational activities in popular natural areas like this one is recommended to help to protect them from negative impacts associated with overuse. (Photo credit: Krzysztof Duniec)

7.1 Concept Site Plans

There is nothing like getting your hands dirty to focus the mind. The concept site planning exercise is designed to engage local participants in the watershed study, raise awareness of the watershed plan, promote innovative approaches, and kick start the implementation of the plan. Each of the concept site plans provides practical representations of how key watershed recommendations/strategies/actions could be applied on a local or neighbourhood basis. The concept sites were chosen to be typical of locales throughout the watershed that are targeted for regeneration and retrofit attention. Many of the components in the preliminary designs presented in this section could be replicated time and again, tailored to meet local needs and expectations, during the implementation of the Don River Watershed Plan.

Concept site plans were a notable feature of the previous Don River watershed study, *Forty Steps to a New Don* (1994). That strategy suggested a number of specific "shovel in the ground" actions that addressed multiple broad objectives, but focused on site-specific subwatershed projects. Each concept site project was aimed at addressing one or more of four key objectives: the creation of aquatic habitat, the creation of terrestrial habitat, the improvement of water quality, and/or the control of water quantity.

Six of the subwatershed plans presented in *Forty Steps to a New Don* included a "concept site plan" to demonstrate regeneration techniques at a local level:

- ❒ Rupert's Pond (Upper West Don)
- ❒ Pomona Mills Park (Upper East Don)
- ❒ Harding Park (German Mills Creek)
- ❒ G. Ross Lord Park (Lower West Don)
- ❒ Cummer's Mill (Lower East Don)
- ❒ Terraview Park & Willowfield Gardens Park (Taylor/Massey Creek)

No concept sites were included in the Lower Don subwatershed plan because several promising regeneration projects — including the Don River Brick Works park, were already underway. A description of the successful work undertaken at the Don Valley Brick Works, Harding Park in Richmond Hill, and Terraview/Willowfield Gardens in Scarborough follows this introductory section.

Success Story #1: Greening a Brownfield
Don Valley Brick Works, Toronto

Once a derelict industrial brownfield, this site is being regenerated into a showcase for ecological rebirth, environmental sustainability and innovative green design. The former quarry and grounds have been contoured and replanted to reflect the native flora of the Lower Don watershed. The runoff flowing through Mud Creek is being cleaned in a series of stormwater ponds and wetland features. The historic buildings are being restored to recall the industrial heritage of the site and to host a number of environmental, educational and cultural experiences.

The 16-hectare Don Valley Brick Works is located in the watershed of the Lower Don, four kilometres north of Lake Ontario. It is hemmed by the curving Bayview Extension to the south and east and by the long-established residential areas that rim the valley to the north and west. The Don River and Don Valley Parkway parallel the site to the east of Bayview.

For almost 100 years, the Brick Works provided the tiles, bricks and other clay products used to construct many of Toronto's homes, public buildings and institutions. When TRCA acquired the site in 1987, it began an ambitious regeneration and water management project, in partnership with the City of Toronto, that has restored the native habitat and attracted wildlife. The park, opened in 1997, features:

- a series of five new ponds and wetlands that hold and filter the inflowing water from Mud Creek before discharge to the Don, while providing habitat for frogs and other amphibians, fish and water birds;
- a re-naturalized quarry featuring native gardens and wildflower meadows that contain the grasses and other plants common to southern Ontario;
- a protected valley wall that shows the fossil-rich layers of shale and limestone that underlie much of Toronto; and
- a network of walking trails, viewing areas and interpretive signs.

With the help of Evergreen, the Brick Works is being further transformed into a premier environmental education and cultural centre. A number of exciting projects are under development, including: the creation of the Centre for Urban Sustainability that will bring environmental innovators, educators and leaders together; a series of eco-pavilions that will host youth programs to connect children with nature in the city; a year-round market, stores and restaurants featuring the produce of local farmers and artisans; and the restored heritage brick factory that will provide meeting areas, gallery space, and displays of the industrial heritage of the site.

With on-going involvement of many partners, including Evergreen, the City of Toronto, TRCA and the community, the future looks bright for this ecological gem in the heart of the city.

Evolution of the Brick Works

***Top**: the old quarry before restoration began;*
***Middle**: aerial photo after the habitat restoration project was implemented;*
***Bottom:** design rendering of the planned Green City Garden (*Image credit: Claude Cormier architectes with Ferruccio Sardella*.)*

Success Story #2: A Fresh Approach to an Urban Park

Harding Park, Richmond Hill

The transformation of Harding Park represents a fresh approach to urban park planning and a blueprint for other stormwater management projects. The traditional detention ponds were naturalized so that runoff would also be filtered and cleaned before discharge into German Mills Creek. Native terrestrial and in-stream habitats were re-established, while trails and recreational facilities were constructed. Today, Harding Park is a successful example of a quantity-to-quality stormwater pond retrofit project and illustrates the effectiveness of pond-wetland systems. It has also become a much-loved natural refuge in a very busy urban area.

Located to the east of Yonge Street and south of Major MacKenzie Drive in the heart of Richmond Hill, Harding Park is surrounded on all sides by established residential neighbourhoods, condos and commercial areas. There were two standard stormwater detentions ponds, one located on each side of German Mills Creek, as well as a manicured playing field on the east side of the creek, a playground at the north end of the site, and a bicycle trail. Busy Weldrick Road borders the south side of the park.

Constructed in two phases by TRCA and the Town of Richmond Hill, the work was completed in 1996. The old stormwater ponds were re-naturalized with multi-cell wetland filters to improve the quality of the stormwater collected from the area's houses and roads. New marshland and water-tolerant plants also created a more diverse habitat for birds, amphibians and other wildlife. In addition, small sediment basins were constructed at the inflow points to each detention pond to collect coarse grit, and the ponds were excavated to increase capacity. The surrounding parkland was regraded to encourage the infiltration of precipitation.

The site was planted with thousands of native flowers, shrubs, grasses and other plants to re-establish a more natural terrestrial habitat. Native trees and shrubs were planted around the perimeter of the wetland ponds. Transition buffer zones were also created where residential properties backed onto the park. Sections of the stream were naturalized to create riffles, pools and riparian cover to improve in-stream fish habitat. New trails and interpretive signage provide access and awareness of the diverse new habitat areas.

The water quality improvements have been significant: 2002 monitoring data showed the stormwater ponds and wetlands are removing up to 86 per cent of phosphates, 80 per cent of total suspended solids and lesser amounts of other contaminants. They are also effective in detaining the peak flow of stormwater to German Mills Creek.

Ongoing study has taught some valuable lessons that are being implemented in other stormwater naturalization projects. For example, it is estimated that the ponds will have to be dredged to remove accumulated silt every 13 to 22 years. A number of other technical upgrades to increase retention time and further improve water quality have also been identified.

Harding Park is a great place to go for a secluded walk, to play baseball and other sports, or just to relax and watch the cedar waxwings feasting on berries and listen to green frogs crooning for female company.

Success Story #3: The Rebirth of a Concrete Creek

Terraview Park & Willowfield Gardens Park

This stunning retrofit project, undertaken in the mid-1990s, liberated the headwaters of Taylor/Massey Creek from its barren concrete channel. Today, the creek meanders through the two adjacent parks, while a series of green wetlands, pools and stormwater management ponds collect and settle much of the sediment and other pollutants carried in by runoff and outfalls. The stormwater control facilities also reduce peak flows, maintain baseflows, and reduce the risk of erosion and flooding. The surrounding community now enjoys a series of new bike and walking trails, sports facilities, a playground and a water play area. The *Forty Steps* concept site illustrates the need to engage the neighbourhood and local government in creating and realizing an innovative regeneration plan.

Before, during and after construction of the stormwater components of the park

Situated in west Scarborough, the two parks hug Taylor/Massey Creek as it flows south of Highway 401, just east of Pharmacy Avenue. The contiguous parks are surrounded, primarily, by residential neighbourhoods of single family detached homes, with some commercial and industrial properties nearby. Penworth Road separates Terraview Park in the north from Willowfield Gardens Park in the south. The southeastern edge of Willowfield connects with an Ontario Hydro corridor (north of Japonica Road).

Developed in the 1950s, the area does not meet current standards for stormwater drainage and management. In the headwaters region alone, there are ten storm sewer outfalls between Pharmacy Avenue and Japonica Road. As was common practice during the period, the creek was channeled through a 0.6 kilometre, straightened concrete channel and served as a simple ditch to carry runoff downstream. As a result, concentrations of suspended solids, nutrients and coliform bacteria in the creek frequently exceeded provincial guidelines.

To improve water quality, regulate peak flows and mitigate erosion, a naturalization and stormwater retrofit program was planned and implemented The concrete lined channel was removed and replaced with a meandering stream bed. A ‘plunge’ pool, two wetlands with small islands, and an innovative peat bog were created, while the flood plain was widened to provide additional stormwater storage. A stormwater detention facility was constructed to catch and clean runoff from the highway, oil\sediment separators were installed in the storm sewer system, and a subsurface stormwater filter system was built under a new soccer field.

A variety of urban tolerant, aquatic vegetation was planted to uptake nutrients and improve water quality, while providing habitat for birds, amphibians and other wildlife. The community has actively participated in the planting program, while school children monitor water quality improvements. The regeneration project has served as a springboard to the continuing stewardship of the naturalized stream and park.

7.2 Concept Sites under the Don River Watershed Plan

The successful implementation of the concept site plans developed under *Forty Steps to a New Don* has helped encourage, stimulate and guide additional regeneration activity throughout the watershed and beyond. Subsequent TRCA watershed strategies for the Humber River watershed and Etobicoke and Mimico creeks have also incorporated the concept site idea (termed Community Action Sites in these plans) to address multiple watershed planning objectives at the local site scale.

For the new Don River Watershed Plan, the goal is to raise the bar and create the "next generation" of concept site plans. These new plans demonstrate innovative water management techniques, strengthen the link between sustainable community actions and environmental health; and illustrate how single actions may contribute to multiple benefits.

Although each concept site has its own distinctive objectives, they collectively illustrate the common and over-riding themes of the watershed plan. These include the integral role of sustainable urban communities in promoting and protecting ecological health, the application of innovative water management techniques in regenerating landscapes, and the need for active and on-going community engagement. The concept sites also provide a unique opportunity to communicate the integral linkages between community, health and the environment and to show how watershed management actions help in our adaptation to climate change.

Each of the following concept sites was chosen to be representative of common challenges faced in many locations across the watershed.

- ❒ Ravine Challenges — Mud Creek (Toronto);
- ❒ Regenerating Natural Heritage—Maple Nature Reserve Quonset Hut Site (Vaughan);
- ❒ Building Sustainable Neighbourhoods—Warden Woods Residential Area (Toronto);
- ❒ Sustainability Makeover— a generic commercial/ Industrial example
- ❒ Taking Bold Steps—the Mouth of the Don (Toronto).

Concept plans for each site were developed based on input received during meetings with municipal staff, community leaders, Don Watershed Regeneration Council (DWRC) representatives and TRCA staff, as well as public open houses.

The plan for the Mouth of the Don concept site has been developed independently of the other four sites as a part of a larger initiative to revitalize the Toronto waterfront and remediate chronic flooding concerns.

A modeling exercise was completed for three of the concept sites that contain significant stormwater management components: Mud Creek in the Lower Don River subwatershed, the Warden Woods residential area surrounding Taylor/Massey Creek, and a generic commercial/industrial site representative of many established throughout the watershed.

Themes

The retrofit and regeneration activities undertaken on a concept site are selected to showcase promising techniques and to provide hands-on experience that can applied throughout the watershed.

A number of over-riding themes will guide the rehabilitation of the concept sites selected under the Don River Watershed Plan.

- ❒ Build sustainable urban communities (by promoting green building and energy conservation, maintaining and extending the urban forest, celebrating cultural heritage, etc.)
- ❒ Regenerate landscapes (by implementing innovative water management and naturalization projects)
- ❒ Engage the community through stewardship actions
- ❒ Forge integral linkages between community, health and environment
- ❒ Undertake watershed management actions that help in our adaptation to climate change.

For each of the three sites, three scenarios were modeled: pre-development agricultural conditions, existing conditions and proposed conditions that incorporated the source control measures outlined in the concept site plans. The three modeling exercises showed that implementation of the concept site plans would result in more resilient stormwater systems that are better able to accommodate the impacts of climate change.

In all cases, proposed conditions from the plan would reduce both peak release rates and total flow volumes generated during all the rainfall events modeled, with the greatest improvements seen for the storms <20mm. In Toronto 90 per cent of rainfall events produce less than 20 milllimetres of precipitation in a 24 hour period. More effective management of the stormwater produced by these 'smaller' storms will significantly mitigate erosion and water quality issues in the Don River watershed. In addition, the repercussions of larger storms — of a scale that would impact municipal infrastructure and private property or cause river valley flooding — are also reduced at all sites under the proposed concept plan scenarios.

The following pages summarize the five final concept site plans developed under the new Don River Watershed Plan. These summaries include the primary objectives or themes for each concept site plan, a description of the site and the challenges it presents, the general approaches to be used, and the specific initiatives proposed for each site. Summaries of the stormwater engineering analysis are included in the concept site plan summaries for Mud Creek, the Warden Woods residential area, and the generic commercial/industrial site.

Toronto addresses Climate Change

The City of Toronto is one of 16 world cities partnering with the Clinton Climate Initiative (CCI) in a global Energy Efficiency Building Retrofit Program. Under the program, participating cities will develop a program to make their municipal buildings more energy efficient and provide incentives for private building owners to retrofit their buildings with energy saving technologies. In addition, local banks and companies will be invited to contribute to the funding pool and to expand the list of green products used in retrofits.

Launched in August 2006, the CCI applies a business-oriented approach to the fight against climate change and the reduction of greenhouse gas (GHG) emissions in practical, measurable and significant ways.

"In Toronto we know that 60 per cent of our greenhouse gas emissions come from the heating and cooling of buildings so an initiative like this one is tremendously important to doing what we can to reduce the city's environmental footprint," says Toronto Mayor David Miller.

The CCI complements Toronto's Better Buildings Partnership. Since 1996, the city program has encouraged and facilitated energy efficiency retrofits in buildings through technical assistance, funding for new construction projects and extending loans to public sector buildings for retrofits. In addition, the mayor's Tower Renewal project is designed to improve energy efficiency, lower operating costs and reduce GHG emissions from Toronto's aging apartment buildings.

Concept Site #1: Ravine Challenges

Mud Creek, Toronto

The erosion problems evident in Mud Creek — caused by ineffective stormwater control and exacerbated by heavy pedestrian traffic on formal and informal trails and the actions of neighbouring homeowners — are typical of those seen in many other ravines throughout the lower part of the watershed.

The concept site plan would address wet weather flow control by creating a series of flow regulating structures and water holding ponds (attenuation areas) upstream of each piped segment of the creek. In addition, a new surface baseflow channel would be created along the entire length of the ravine. The currently deteriorating gabions along the exposed stream banks would be replaced with biotechnical stabilization works such as stone in-laid with vegetation, and the failed grade control structures near the Don Valley Brick Works site would be replaced and upgraded. A number of additional initiatives would be undertaken to increase the ravine's biodiversity, improve the trail system, protect at-risk environmental components, and expand public outreach through interpretive signage. These on-site solutions would be reinforced through community outreach and education initiatives designed to manage stormwater at the lot level on neighbouring properties and eliminate en-

From its headwaters beneath Downsview Park, Mud Creek emerges from a culvert at Moore Avenue in the north and stretches 2.5 kilometres past the Don Valley Brick Works to the Don River in the south. The deeply sided ravine is almost completely hemmed in to the east and west by long-established Toronto neighbourhoods, including Moore Park and Rosedale, and is crossed by the bridges associated with Governors Road, the railway and Heath Street. The Belt Line Trail traverses the length of the ravine.

The Mud Creek concept site is situated in an area of Toronto serviced by combined sewers. Heavy stormwater runoff can overload the sewer system during large storms, leading to combined sewer overflows (CSOs) that can negatively impact water quality within the Don River and Lake Ontario.

High peak flows also make erosion a serious and on-going problem. While the banks along segments of the watercourse have been armoured with gabion baskets, the majority of these structures are leaning or undermined. In some locations, they have collapsed. Just upstream of the point where the creek joins with the outlet to an upper pond on the Brick Works site, a former gabion and concrete grade control structure has failed, leading to headcutting and incision of the channel within the floodplain.

Over the years, segments of the creek have been enclosed and buried in pipes so that today only disparate sections flow above the surface. Where the creek surfaces, the exposed channel is highly eroded exhibiting the

Themes

The concept site plan for the Mud Creek site is designed to:

- ❒ Improve stormwater management through conveyance and end-of-pipe measures
- ❒ Mitigate the threats to infrastructure and rehabilitate the legacy of on-going erosion in the ravine
- ❒ Improve biodiversity through the riparian and bottomland plantings
- ❒ Create a continuous low flow surface channel that will also provide viable fish habitat
- ❒ Upgrade the trail system, while protecting sensitive vegetation from heavy pedestrian traffic
- ❒ Encourage residential neighbourhood stewardship and lot level stormwater source controls
- ❒ Tie-in education efforts with development of Don Valley

Partners

- ❒ TRCA
- ❒ City of Toronto – Parks
- ❒ City of Toronto – Water
- ❒ Evergreen at Don Valley Brick Works
- ❒ Lost Rivers Walks

A number of activities or conditions are adversely affecting the ravine environment, including:

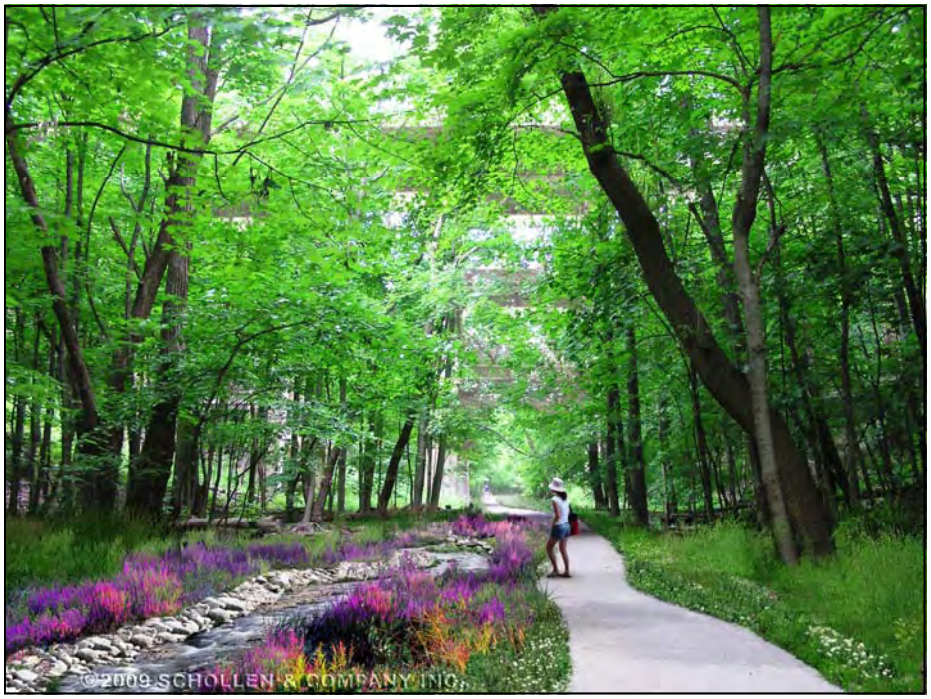
- ❒ the prevalence of off-leash dogs throughout the valley
- ❒ dumped trash and debris
- ❒ vandalism of signage, bridges and structures
- ❒ the presence of Norway maple and other invasive plant species
- ❒ the proliferation of ad-hoc trails within the valley
- ❒ the widening of defined trails (often to avoid eroded or poorly drained areas)
- ❒ damage to trees and limb breakage

'downcutting' and widening typical of a sediment starved urban watercourse that is subject to intense peak flows. Pipe inlets often clog with debris during heavy storms, contributing to flooding and erosion. The piped sections have served, by default, as grade control structures, fixing the elevation of the bed of the channel at locations along the length of the watercourse and mitigating further serious degradation of the watercourse and destabilization of the valley.

The rear yards of single detached residential lots line both sides of the valley at the top of bank. In some cases, these yards encroach beyond the crest of the valley and natural vegetation has been removed to make way for manicured lawns, gardens, pools and other structures. Tile drains extend down to the valley floor from several properties on the west wall of the valley downstream of Moore Avenue. These drainage pipes may connect to roof leaders and pool pump outlets, discharging into the creek below.

Transforming a Buried Creek

Existing: the trail traveling north towards the Governors Road bridge. The hard-packed trail has encroached into the surrounding forest and a number of dead limbs and fallen trunks pose a threat to trail users.



Prospective: The trail has been narrowed, surfaced and repositioned alongside the new surface channel which carries the baseflow of Mud Creek. The channel banks are protected by stone interspersed with native vegetative plantings.

The Don Valley Brick Works is located at the south end of the ravine. The Brick Works includes the Weston Quarry Garden, the Evergreen Brick Works, and the Natural Environment and Community Programs Office of the City of Toronto. The Brick Works is being developed into a state-of-the-art centre for environmental stewardship, community outreach and public education.

There are two distinct plant communities in the valley corridor: the valley floor supports a forest comprised largely of moisture-loving softwood trees, including willow and Manitoba maple, while the forests of the valley walls contain oak, maple, hemlock and beech. Many of the trees in the valley floor show signs of stress and dieback. Trees have been uprooted along the failed banks of the watercourse and soil compacted along the widened trail is impacting the health of the trees in the vicinity. There is no viable fish habitat currently within Mud Creek.

General Approach

The regeneration concept plan is designed to contribute to the overall revitalization of the Lower Don River subwatershed through the improvement of wet weather flow management. The initiatives proposed would assist in mitigating flooding, erosion and water quality problems within Mud Creek, as well as further downstream in the Don River.

The existing piped segments will be retained. However, a series of control structures would be located along the length of Mud Creek within the ravine. Upstream of each of these structures, water retention ponds would be created to temporarily store and slowly release stormwater during peak flow periods. Over time, these retention areas will evolve into wetlands with a permanent water depth of approximately 0.3 metres.

Under dry weather conditions, baseflow will be conveyed around the attenuation areas in a newly constructed low flow channel. The attenuation areas would remain dry. During wet weather, the control structures at the upstream end of each piped section will hold back stormwater runoff, creating ponds in the topographic depressions that exist in the valley. After the rainfall event subsides, stormwater will be detained in the attenuation areas and discharged slowly as baseflow.

These engineered solutions will be augmented and supported by a community outreach and awareness program. Residents in the surrounding neighbourhoods would be encouraged to undertake ‘lot level’ activities to control stormwater at source. Education programs would also include information on improving energy and water efficiency for homeowners.

Specific Initiatives

Wet Weather Flow Management

The following components of the concept plan would address erosion and instability problems along Mud Creek:

- The inlet to each piped segment of the creek would be retrofitted with a flow control structure to regulate the rate of discharge into the pipe. The

Additional Study Required

Prior to moving forward with the detailed concept design, additional studies will be required to determine the required size, volumetric capacity and depth of the wetland cells, as well as to inform the structural design of the proposed weirs, by-pass low flow channel and stream bank stabilization works. The catalogue of studies should include:

- Geotechnical investigations to characterize soil composition, structure and permeability and assess slope stability
- Structural investigations to assess the condition of storm sewers and other structures within the ravine
- Hydrological studies to confirm runoff volumes, discharge rates and flood characteristics.
- Fluvial geomorphological studies to assess stream processes within Mud Creek and inform the design of the low flow channel and bank stabilization works

retention area upstream of each control structure would flood the valley floor to a prescribed elevation, giving rise to a rejuvenated and diverse bottom land vegetation community.

- The existing topography will remain unchanged; water depths in the retention areas and wetland configurations will be dictated by existing grades up-slope of the proposed control structures.
- A new channel would be created on the valley floor running in parallel to the modified creek/piped waterway. Flow within this channel will be limited to baseflow discharged from the culvert at Moore Avenue and groundwater discharged from the valley wall adjacent the low flow channel. The implementation of the new low flow channel would also create viable fish habitat.
- A flow splitter would be located downstream of the Moore Avenue culvert to divert low flow to the channel and direct storm flows into the main channel and series of attenuation areas.
- The failed grade control structures near the Brick Works will be replaced with new grade control and flow control structures to moderate flows and divert appropriate volumes of flow to the Brick Works pond system.
- Failed armouring and stream bank gabions will be replaced with biotechnical stabilization works, comprised of stone in-laid with vegetation.

Environmental Protection and Restoration

In conjunction with the wet weather flow control projects, a number of additional initiatives would be undertaken to increase the ravine's biodiversity , improve the trail system, protect at risk environmental components, and expand public outreach through interpretive signage.

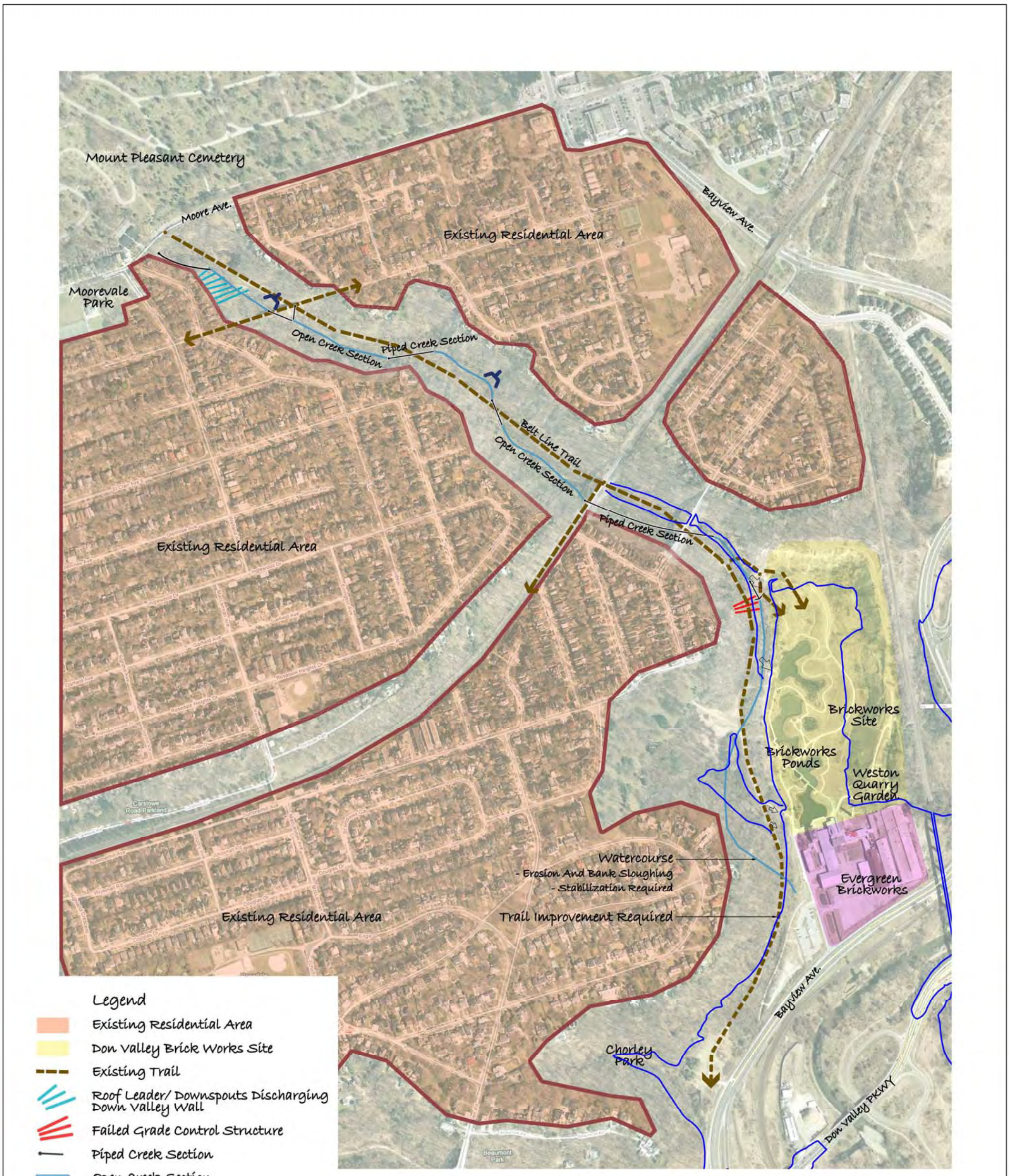
- The existing vegetation within the areas to be inundated – primarily willow and Manitoba maple – are moisture tolerant and adaptable to bottomland / wetland conditions. However, the vegetation community may also evolve to include more wetland and moisture-loving species. This transformation would present the opportunity to enhance the biodiversity of the valley through new plantings of desirable bottomland species.
- Segments of the existing trail would be relocated in accordance with the placement of the new low flow channel. Trails could also be realigned and narrowed in places to better avoid sensitive areas within the valley. Dead or hazardous trees that pose a risk to trail users would be removed. Restoration planting would be undertaken along the length of the trail. Trail access would be improved.
- Barriers and barrier plantings would be installed to prohibit public access to sensitive areas within the ravine
- Riparian and bottom land species would be planted to regenerate the valley floor area and stabilize the banks of the creek
- Interpretive signage would be installed to enhance appropriate recreational opportunities and heighten public awareness of the history and

Stormwater Control

Computer modeling results indicate that the stormwater management components in the Mud Creek site plan will reduce peak flows and flow volume for both smaller storm events and the larger, less common storms.

The proposed enhancements to the stream channel will attenuate peak flows and reduce erosion in the creek. However, Mud Creek is only a small contribution to the larger flow volume in the Don River. Better management of stormwater in the concept site will not significantly impact the flood vulnerable area at the Brickworks or further downstream of the confluence with the Don River. Continued efforts at flood risk mitigation and awareness will be important.

Figure 37: Ravine Challenges, Mud Creek — Site Characterization



Site Characterization Plan

MUD CREEK
TORONTO, ONTARIO

0 10 25 50 100 200 300M

N

Toronto and Region Conservation for The Living City

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Figure 38: Ravine Challenges, Mud Creek — Concept Plan Dry Conditions

Thematic Concept - Dry Weather Condition

MUD CREEK
TORONTO, ONTARIO

0 10 25 50 100 200 300M

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Figure 39: Ravine Challenges, Mud Creek — Concept Plan Wet Conditions

Thematic Concept - Wet Weather Condition

MUD CREEK
TORONTO, ONTARIO

0 10 25 50 100 200 300M

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sensitivities of the Mud Creek ravine.

Community Outreach

Beyond the boundaries of the ravine, a number of community-based initiatives are proposed that are aimed at managing stormwater at source, encouraging infiltration, improving energy efficiency and mitigating the impact of the adjacent residential communities on the health and stability of the ravine. This array of community-based initiatives includes:

- ❒ The installation of permeable pavement to replace conventional asphalt on boulevard driveways
- ❒ Additional downspout disconnection (Although existing disconnection rates within the community are relatively high as a result of previous work completed by the City of Toronto, additional downspout disconnection will moderate discharge rates into Mud Creek and encourage infiltration. This initiative will implement the City's mandatory downspout disconnection program that was approved in November in 2007 and requires that all residential downspouts be modified to discharge to grade instead of the storm or combined sewer system.)
- ❒ Promotion of the use of rain barrels and cisterns to store and recycle rainwater
- ❒ Encouragement of the installation of photovoltaics on rooftops
- ❒ The installation of permeable pavement and infiltration galleries at strategic locations within the street network to intercept and infiltrate runoff.
- ❒ Exploration of the potential to retrofit infiltration galleries into strategic locations at the north end of the ravine and Moorevale Park.
- ❒ Promotion of a back yard naturalization program aimed at extending the native vegetation community beyond the top of bank at residential rear yards.
- ❒ The distribution of a homeowner information package to encourage residents of the Rosedale and Governors Bridge communities to implement actions aimed at mitigating runoff, managing invasive vegetation and reducing physical impact on the ravine.
- ❒ Promotion of the use of solar hot water heaters
- ❒ Promotion of various technologies to enhance the efficiency of residential dwellings including energy efficient light and appliances, high efficiency windows and doors, solar swimming pool heaters and programmable lighting and HVAC control systems.

The proximity of the Brick Works complex to the concept site makes it well positioned to be the venue for communicating with area residents regarding the benefits of lot level installations such as rain gardens, alternative energy technologies and efficiency upgrades. The Brick Works site could accommodate demonstration installations of various techniques to manage stormwater runoff on residential lots, implement naturalized landscaping and achieve reductions in energy and water consumption.

Concept Site #2: Regenerating Natural Heritage

The 'Quonset Hut', Vaughan

The rehabilitation of this site in the Maple Nature Reserve offers an opportunity to enhance the watershed's natural cover and restore aquatic habitat, while integrating additional recreation and environmental education features for local residents. The site plan illustrates how naturalization efforts can create valuable wildlife habitat and expand the traditional amenities provided by urban parklands.

The Quonset hut and the associated wood-framed buildings on the site of a former forest research station would be demolished and the site restored to enhance local biodiversity and complement the surrounding Maple Uplands Environmental Significant Area (ESA) in Vaughan. The Quonset hut site is located on the edge of a "core forest" and the initiative would add approximately one hectare of additional forest habitat, expanding the core area to more than 10 hectares. Regeneration of the site would also entail the grading of the property to restore the original undulating topography, the creation of several small ponds, wetlands, thickets and forested areas, and the construction of associated trails, viewing areas and interpretive signage. The restored habitat would provide additional breeding grounds for amphibians, including wood frogs, support rare plant species and interior-forest birds. To engage the growing community around this site, the City of Vaughan and TRCA will undertake a number of outreach and community stewardship initiatives to raise awareness of the ecological significance of the reserve and the role they play in ensuring its protection.

Themes

The concept site plan for the Quonset hut site is designed to:

- ❒ Regenerate the terrestrial natural heritage and expand the core forest area
- ❒ Restore amphibian breeding grounds, and the habitat of rare plants and sensitive birds
- ❒ Support and extend a major terrestrial natural heritage linkage on the Oak Ridges Moraine to the adjacent Humber River watershed
- ❒ Create public trails, viewing sites and interpretive signage
- ❒ Facilitate public outreach and education efforts

Partners

- ❒ City of Vaughan
- ❒ TRCA
- ❒ Economic Action Plan Infrastructure Stimulus Fund (Federal and Provincial Government)

The 'Quonset hut' site is located within the Maple Nature Reserve, a 54.6 hectare property owned by the City of Vaughan, in the subwatershed of the Upper East Don River. The reserve is comprised of two parcels of land located on opposite sides of Dufferin Street, south of Teston Road. The Quonset hut regeneration site is located in the southern end of the parcel on the east side of Dufferin Street. The site is set in the midst of a rapidly urbanizing area; it is bordered by (planned) residential developments to the south and east and by a golf course located on the west side of Dufferin Street.

A quonset hut is a prefabricated building, which has a distinctive semi-circular cross section and is made of corrugated steel. The hut on the Maple Nature Reserve, together with several smaller buildings, were used as a forest research facility by the Ministry of Natural Resources. After the City of Vaughan came into ownership of the property in 1997, the buildings and associated parking areas were used for storage purposes.

The Maple Nature Reserve forms part of the Maple Uplands Environmental Significant Area (ESA) and is designated as an Area of Natural and Scientific Interest, Life Science (ANSI) in the Region of York Official Plan. The lands immediately adjacent to and to the south of the site are part of the designated ESA. The lands in the vicinity of the site have been graded flat; however, the surrounding ravine topography is undulating and covered by forest and meadows. The valley walls above the site are steep-sided and well forested, with the Little Don River watercourse flowing to the south

of the site in a southeasterly direction. The site is accessed by an asphalt driveway that connects to the main access road system that served the compound.

General Approach

According to the *Maple Nature Reserve Master Plan*, produced by the City of Vaughan in 2003, the Quonset hut, the other buildings on the site and the asphalted areas are to be demolished and the site regenerated. The concept site plan offers a more detailed vision for the regeneration of the site. While meeting the recommendations of the Master Plan and restoring the ecological function of the site, the concept site plan also provides opportunities for recreation, public education and interpretation.

The preliminary concept plan envisions the restored site as a diverse assemblage of ephemeral wetlands, thicket and forest ecotones (or transition zones) that will support, diversify and complement the function of the existing forest and the ESA. The concept plan incorporates a trail loop that would provide views of the various component habitats and opportunities to learn more about the history and ecological significance of the restored landscape.

Specific Initiatives

- ❒ The existing Quonset hut, associated buildings, asphalt parking areas and driveway would be demolished and existing services decommissioned. The granular sub-base materials would be retained as fill or to surface the trails.
- ❒ The site would be graded to remove the existing level storage areas and create a foundation for the establishment of the proposed ephemeral wetlands and varied topography.
- ❒ The following habitat features would be constructed: (1) ephemeral wetlands to support reptile and amphibian breeding, supplement forest functions and contribute to the sustenance of baseflow to the watercourse; (2) thicket areas around the perimeter of the wetlands to provide cover and mitigate human intrusion; (3) a fill mound comprised of harvested granular material and rubble to provide space for small mammals to build dens; and (4) tree and shrub plantings to restore the understorey around the disturbed Quonset hut site and diversify existing forest community.

Current Conditions

Current views of the "Quonset Hut" site buildings and main access driveway

- The following recreational and interpretive features would be constructed: (1) a looped trail, following the alignment of the existing driveway, to provide access to the site from the main driveway; (2) a raised overlook area to afford views over the restored landscape; and (3) linear hedgerow plantings that would trace the footprint of the removed Quonset hut and would invoking its presence on the site in perpetuity.
- Interpretive signage would be installed to promote public education and stewardship. The signage could describe the ecological importance of the Quonset hut site, including its contribution to downstream coldwater habitat and the overall biodiversity of the natural heritage system. The signage could also describe the history and cultural heritage of the Quonset hut site, the surrounding Maple Nature Reserve lands and the Upper East Don River.

The design, construction and patterns of use of the site should be compatible with the protection of wood frogs and their habitats. The specific locations of existing ponds and vernal (springtime) pools would be mapped and incorporated into the detailed design for the restoration of the site.

In conjunction with the restoration of the Quonset hut site, TRCA and the City of Vaughan would undertake outreach programs aimed at enhancing public education and promoting community stewardship of the Maple Nature Reserve. Residents of the new communities that are emerging around the reserve may be provided with an information package to educate homeowners about the sensitivity of the Maple Nature Reserve and promote environmentally responsible behaviour. The TRCA and City of Vaughan would work in partnership to promote environmental stewardship through the delivery of several programs aimed at homeowners, schools, community groups and private landowners.

Wood frogs and other amphibians would benefit from the habitat enhancements proposed at this concept site.

Figure 40: Regenerating Natural Heritage, Quonset Hut site — Site Characterization

Site Characterization Plan

QUONSET HUT SITE REGENERATION
MAPLE NATURE RESERVE,
VAUGHAN, ONTARIO

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Figure 41: Regenerating Natural Heritage, Quonset Hut Site — Concept Plan

Preliminary Concept Plan

QUONSET HUT SITE REGENERATION

MAPLE NATURE RESERVE,
VAUGHAN, ONTARIO

0 2 5 10 25 50M

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Concept Site #3: Building Sustainable Neighbourhoods

Warden Woods Residential Area, Toronto

The 1950s suburban single family housing that covers much of the Warden Woods area is typical of many older residential areas throughout the watershed. The concept site plan will showcase how such older housing stock can be made more sustainable by improving energy efficiency and water conservation, and implementing other green retrofits.

Diverting stormwater from the combined sewer system will also reduce overflows into Taylor/Massey Creek, mitigate erosion and improve downstream water quality. Under the site plan, improved stormwater management and water infiltration/attenuation techniques would be implemented. The valley parks and other natural areas would be protected and regenerated to restore ecosystem functionality and improve community enjoyment. In addition to promoting a more sustainable community, the site plan would: restore vegetation and enhance the tree canopy; mitigate the urban heat island effect; enhance public awareness of environmental/ conservation practices; and improve the streetscape and pedestrian realms.

Themes

The concept plan for the Warden Woods is designed to:

- ❒ Implement source controls and lot level initiatives at a community-wide scale to moderate runoff rates, enhance water quality and encourage ground water recharge
- ❒ Install site-specific conveyance and end-of-pipe stormwater management retrofits to achieve stormwater management objectives
- ❒ Promote initiatives on private residential properties that support naturalization and enhance energy efficiency

Partners

- ❒ TRCA
- ❒ City of Toronto
- ❒ Residents
- ❒ Taylor Massey Project

The Warden Woods Residential Area encompasses approximately 120 hectares in Scarborough . It is covered by, primarily, older single family homes constructed in the 1950s, as well as several new infill housing developments. The older residential area is comprised of typical suburban bungalows or 1½ storey homes on lots that are 12-15 metres wide. The majority have driveways that have been widened to accommodate more than one car, and many have additions that increase lot coverage. There are also two high rise apartment complexes within the concept site, as well as two small commercial areas (on Pharmacy Avenue), the Regent Heights Jr. Public School, the West Scarborough Neighbourhood Community Centre, the Dawes Road Cemetery, two parks, and a large area of open space. The site is bounded on the east by Warden Avenue, on the west by Pharmacy Avenue, on the north by St Clair Avenue East and on the south by Byng Park and Taylor/Massey Creek.

The concept site is serviced with a combined storm and sanitary sewage system. Consequently, there is the potential for combined sewer overflows to occur, impacting water quality within Taylor/Massey Creek and downstream all the way to Lake Ontario. Toronto's Don River and Central Waterfront Project is examining opportunities to integrate wet weather flow control projects to mitigate CSO's in the study area.

It is estimated that within the older residential neighbourhood, the roof leaders from just 20 to 30% of homes have been disconnected from the storm sewers. Even in cases where downspouts have been disconnected, the discharge

may be directed onto driveways or other impervious surfaces. Roof leaders at the community centre, school, commercial sites and high-rise apartments are also connected to the sewer system. Within the newer infill developments, all roof leaders drain to the surface.

With the exception of the recent infill residential development, the majority of the buildings within the site are not constructed in accordance with current standards for energy conservation and efficiency. This presents the potential to implement relatively modest upgrades that could accrue significant benefits if applied at a site-wide scale.

The Warden Woods ravine is the most significant area of open space within the site. Taylor/Massey Creek flows southward through a steep-sided ravine, which is heavily forested and encompasses swamp and marsh communities as well. The ravine contains a formal trail, a number of ad-hoc trails, flood plain wetlands, regeneration areas and areas in need of restoration.

Areas of shallow groundwater discharge are evident in the ravine and these contribute to baseflow and support the wetland habitats. A number of stormwater outfalls and a CSO outfall also discharge into Taylor/Massey Creek which, as a result, is subject to frequent high flow events and exhibits signs of erosion.

The interface between the residential community and the Warden Woods valley corridor is varied. The property lines of more recent developments have been set back from the top-of-bank along the valley corridor, and restoration plantings has been implemented within the setback area. However, within the original residential area, lot lines coincide with the

Transforming a 1950s Suburban Community

Existing: The right-of-way bordering the Dawes Road Cemetery. Note, the roadside swale which enhances the potential for stormwater infiltration.

Prospective: A more attractive, pedestrian friendly streetscape. Additional native trees have been planted. Low-maintenance “rain gardens” are designed to encourage water infiltration. A new, more efficient biofilter system has replaced the swale.

top-of-bank and there are numerous encroachments into the valley, including stairways and gardens.

In addition, a number of ad-hoc trails have been created, including a BMX course within the lower part of the ravine, which have resulted in soil compaction, loss of ground flora and negative impacts on forest communities.

In addition to the Warden Woods ravine, two smaller parks are located within the study site: one abuts the Warden Woods ravine at the east limit of the site and the second, Byng Park, is found at the south limit of the site.

General Approach

The goal of the concept site plan is to encourage local residents, both collectively and on a lot level basis, to adopt environmentally responsible and sustainable behaviours and, where appropriate, implement green retrofits. Redirecting stormwater through downspout disconnects, the use of rain barrels and other measures would reduce the negative impacts of stormwater outflows on Taylor/Massey Creek and the downstream watercourse. The reuse of stormwater on residential properties would reduce water demand, saving money for both residents and the city In addition, diverting stormwater from the combined sewer system will reduce treatment costs and reserve greater wastewater capacity for future development and intensification.

New approaches to landscaping and planting would soften the interface between developed and natural areas. The majority of the measures proposed would need to be implemented on private lands.

The ability to achieve these regeneration goals will be determined, in large part, by the extent of community support and involvement. Community engagement will be key to drive the lot level initiatives that are proposed to manage stormwater runoff, enhance habitat, improve energy efficiency and establish an appropriate interface between the community and the ravine lands.

The on-going work of non-governmental organizations (NGOs) is of critical importance in promoting community-based action. NGO sponsored initiatives, such as hosting nature walks, planting native species on public and private properties and sponsoring clean up, education and stewardship events, all contribute to the successful implementation of regeneration initiatives.

Parking lot makeover

The existing parking lot at the community centre has traditional paving (top photo). Replacing it with permeable pavement (as shown in lower photo) will allow precipitation to infiltrate rather than running off into the storm sewer system.

City and TRCA sponsored initiatives, such as the "Healthy Yards" program, will also encourage the implementation of environmental stewardship and conservation initiatives on private residential properties.

Specific Initiatives

Residential Initiatives

Lot level initiatives are aimed at attenuating and infiltrating stormwater, implementing green retrofits to conserve energy and water, enhance the urban tree canopy, and reduce intrusions into the neighbouring ravine and parkland areas. Specific initiatives proposed within the area would include:

- Mandatory downspout disconnection through the application of a community-wide inspection program in accordance with the City of Toronto's by-law.
- Installation of permeable pavement on boulevard driveways to enhance infiltration and moderate runoff rates. An incentive program to expand the program to private driveways would be explored.
- Rain barrel program to encourage water conservation and recycling.
- Water conserving planting beds known as "rain gardens" or "storm gardens" to reduce water consumption and encourage infiltration.
- Naturalized landscaping to enhance the healthy and sustainability of individual properties, including incentives to encourage native tree plantings along the border with Warden Woods ravine.
- Tree canopy enhancement through private lot tree planting programs like LEAF's backyard tree planting program.
- Education program to minimize encroachment beyond the ravine slope and encourage the implementation of naturalized landscaping on lots that interface with the Warden Woods ravine.
- Energy efficient doors and windows and enhanced insulation to improve the overall efficiency of building stock.
- Photovoltaic systems on rooftops to contribute to reduced electrical energy consumption.
- Additional initiatives that can be implemented by homeowners to mitigate impacts on the environment related to dumping, encroachment, planting of invasive species, etc. through the distribution of a homeowners' guide.

Site Specific Initiatives

The management of stormwater at source will improve the baseflow in Taylor/Massey Creek, reduce the amount of runoff and pollution carried downstream, and help control erosion. Stormwater management will also improve the general resiliency of the system, mitigating the future impacts of climate change. The following retrofit installations are proposed for specific sites within the Warden Woods neighbourhood:

- **Biofilter System** – Runoff is directed into the planting zone that filters out pollutants and then drains into a granular fibre-filled gallery that encourages infiltration into the underlying soil. Such a system is proposed along the east side of Herron Avenue, south of Florens Road, to replace the existing swale around the cemetery.

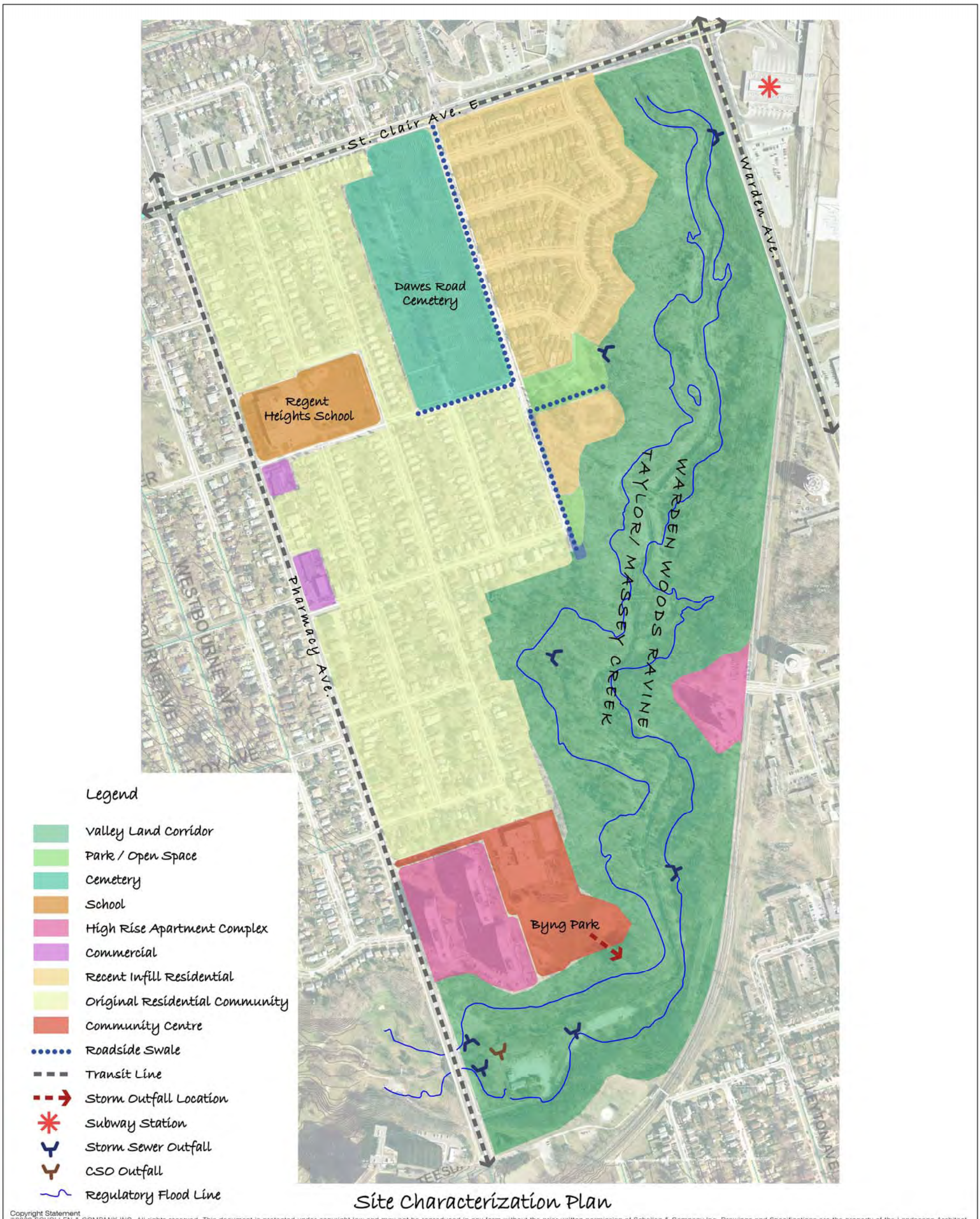
Stormwater Control

Computer modeling results indicate that the stormwater management components in the Warden Woods site plan will reduce peak flows and flow volume for both the smaller storm events and the larger, less common storms. However, even full implementation will not restore pre-urbanization run-off and flow conditions.

For the most frequent category of storms (resulting in 5-25 mm of precipitation), peak flows were reduced 40-45% and run-off volume is decreased by about 20-45%. This decrease in runoff would help to reduce many of the erosion and water quality concerns in this section of Taylor/Massey Creek.

Peak flows from larger storm events (i.e., those that would occur in the 5-100 year time-frame) would also be reduced by 20-35%. This scale of storm is likely to become more frequent as the effects of climate change become more apparent in this area. The concept site plan would, therefore, improve the resiliency of the system and help mitigate the impacts of climate change.

Figure 42: Building Sustainable Neighbourhoods, Warden Woods Residential Area — Site Characterization



Site Characterization Plan

WARDEN WOODS RESIDENTIAL AREA
TORONTO, ONTARIO

0 10 25 50 100 200M

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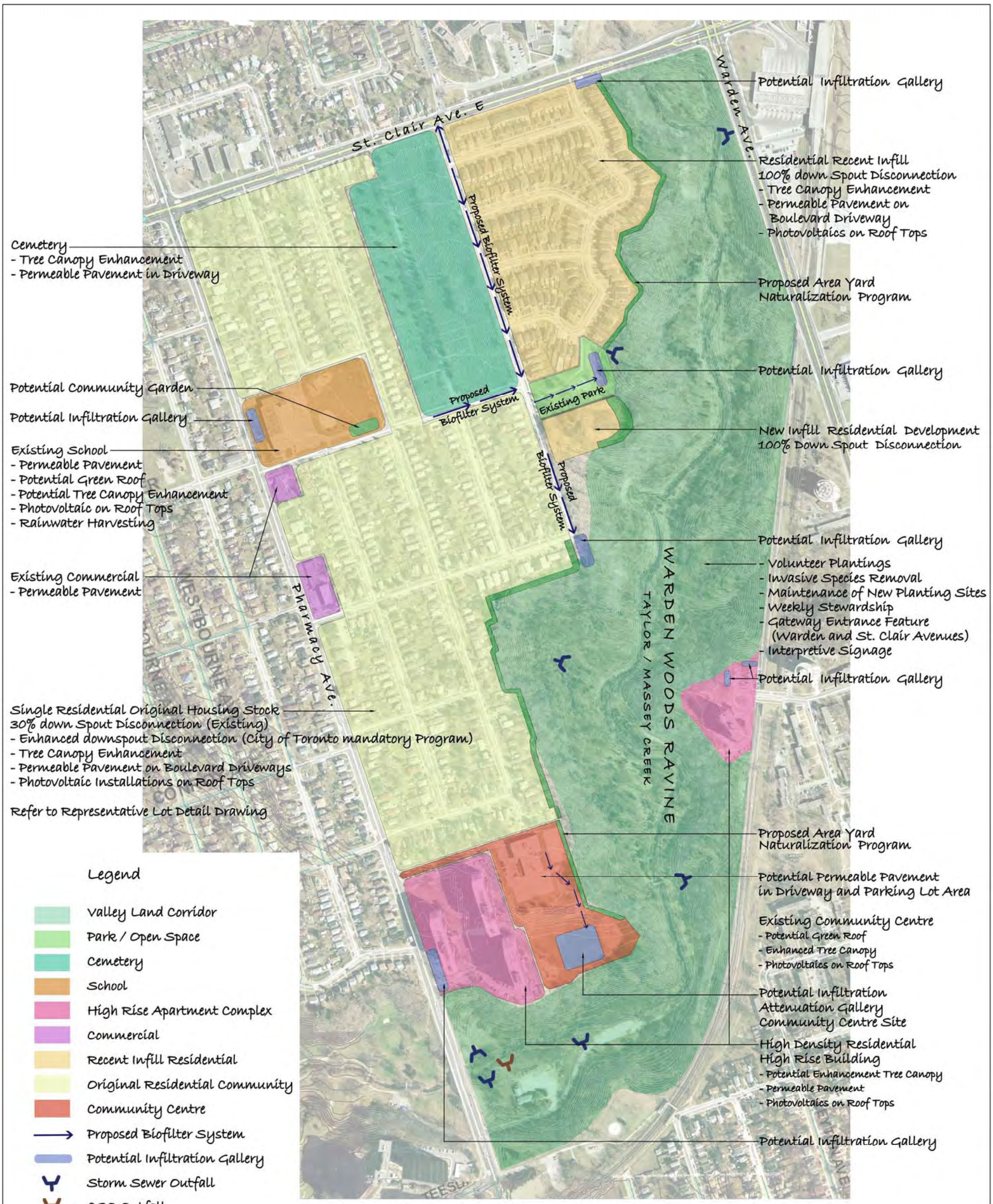
Figure 43: Building Sustainable Neighbourhoods, Warden Woods Residential Area — Concept Plan



Preliminary Concept Plan

WARDEN WOODS RESIDENTIAL AREA
TORONTO, ONTARIO

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- **Infiltration Galleries** – These subsurface installations allow stormwater runoff to percolate into the subsoil. A number of potential sites have been identified, including: the east side of Herron Avenue adjacent to the ravine; the east end of the park that fronts on Herron Avenue; the south side of St Clair Avenue East, east of the Moreau Trail intersection (replacing an existing asphalt swale and catchbasin inlet); the front yard of Regent Heights School; the Pharmacy Avenue frontage of the high rise apartment complex at the south end of the study area; and the north end of the high rise apartment complex located on the east side of the ravine.
- **Infiltration/Attenuation Gallery** – This type of facility is designed to detain stormwater within a subsurface gallery/ pipe system, allowing the water to infiltrate over or extended period of time. It could be installed in an open field in Byng Park to intercept, treat and infiltrate stormwater runoff prior to discharge into Taylor/Massey Creek.
- **The West Scarborough Neighbourhood Community Centre** – The building and grounds have the potential to be retrofitted through the following: installation of permeable pavement to replace all existing driveway and parking lot areas; installation of a green roof; photovoltaics and/or a wind turbine on the rooftop; naturalized landscaping; regeneration/reforestation plantings in the vicinity of the ravine; enhancement of the tree canopy around the community centre and within Byng Park; and a ground source well field to supply the HVAC system.
- **Dawes Road Cemetery** – The following initiatives could be taken: additional tree planting to enhance tree canopy cover; naturalized landscaping around the perimeter of the site; and replacement of the existing asphalt driveway with permeable pavement.
- **Regent Heights School** – The school and property could be retrofitted with: permeable pavement, photovoltaics/ wind turbine on rooftop, a ground source well field, biofilters in parking areas, a green roof, an enhanced tree canopy, naturalized landscaping, garden plots/community garden, an infiltration gallery, and solar-powered lighting.
- **High-Rise Apartment Complexes** – Many of the initiatives proposed for the school site could be applied to the apartment complex sites.
- **Commercial Properties** – While there are limited opportunities to retrofit these properties, potentially feasible initiatives include: the installation of permeable pavement in selected areas; the installation of photovoltaics on rooftops; additional tree plantings; and the installation of oil/grit separator catchbasins.

Regeneration of Natural Areas

A number of regeneration initiates are proposed within the Warden Woods ravine. These initiatives are aimed at: stabilizing eroding banks; enhancing wetlands; managing non-native species; mitigating encroachment and dumping at the interface between the ravine and private residential properties; enhancing trails and improving signage; and providing natural and cultural heritage interpretive signage

- A gateway feature would be constructed at the intersection of Warden Avenue and St. Clair Avenue and interpretive signage would be erected throughout Warden Woods to heighten public awareness of the sensitivity of the environment.
- Byng Park, the public school site and the cemetery do not support extensive tree populations and would be good candidate areas for tree planting. Additional tree planting may also be undertaken within road right-of-ways throughout the community.
- There is also a need to aggressively manage invasive plants through on-going monitoring, control and public education. New and more effective removal techniques will need to be developed and field tested. Treated areas will need to be replanted with native vegetation to avoid re-infestation.

Concept Site #4: A Sustainability Makeover

Generic Commercial / Industrial Area

The generic commercial / industrial site is representative of many sites throughout the watershed built prior to the establishment of current standards for sustainability. Many of these aging sites are due for redevelopment, presenting an excellent opportunity to work with private sector and municipal partners to give these sites a sustainability makeover. TRCA will continue to search for a suitable demonstration site to implement the concept site plan in partnership with local business groups and the municipality.

The concept plan is focused on rebuilding/retrofitting the study area to restore water balance, mitigate flooding, improve water quality and enhance overall environmental sustainability. The plan addresses the needs of a generic industrial park, typical of many across the watershed, that were built in the 1960s without consideration of modern stormwater management or energy efficiency standards. Many of these areas are currently in transition, with facilities being upgraded and retrofitted to meet modern business requirements. The remaking of an aged, inefficient industrial area will demonstrate the feasibility and benefits of both

This concept study is generic and does not relate to any specific land holding; the concept plan was prepared for demonstration purposes only. However, this site is representative of a host of older commercial/industrial areas within the Don River watershed, including the Jane/Langstaff area in Vaughan, Cummer Creek (located northeast of Highway 404 and Steeles Avenue in Markham), the Newkirk Business Park in Richmond Hill, the Leaside Business Park in Toronto, and the Golden Mile area (Warden Avenue and Eglinton Avenue East) in Scarborough.

The demonstration site represents a typical industrial park, as built in the 1960s, that contains a mix of light industry, warehouse and office uses. Relatively flat, it covers 120 hectares and is bounded on the north by a major highway, on the east and south by arterial roads and on the west by a railway corridor. Adjacent land uses include: residential neighbourhoods to the south; commercial and high density residential to the east; industrial to the west; and residential and industrial to the north. A small watercourse runs through the site and continues southward through an open space corridor.

The concept site presents challenges faced in commercial/industrial areas of similar vintage throughout the Don watershed. These areas were usually developed with inadequate stormwater management and drained by conventional storm sewers. As a result, runoff contributes to the impairment of water quality and exacerbates flood flows downstream. This can result in erosion, loss of aquatic habitat and public safety issues. Areas within the demonstration site are prone to flooding when runoff rates overwhelm the conveyance capacity of the watercourse crossings. In addition, roof leaders are typically connected to the storm sewer system, eliminating opportunities for infiltration

Themes

The concept site plan for the generic industrial is designed to:

- ❒ Undertake source control and community-scale stormwater management measures to achieve water quality, quantity control and water balance objectives.
- ❒ Retrofit buildings to enhance energy efficiency, incorporate photovoltaics, wind turbines, solar water heaters and green roofs
- ❒ Explore opportunities for cooperative green undertakings to create a “eco-business” zone
- ❒ Reduce the extent of impervious areas by organizing parking and storage areas more efficiently
- ❒ Restore the watercourse to a more natural form to mitigate local flooding, enhance the stream’s ecological function and improve connectivity to the downstream valley
- ❒ Establish a multi-modal transportation system that includes trails, bikeways, sidewalks and a permeable road network linked to existing public transit

Partners

- ❒ TRCA
- ❒ local business associations
- ❒ municipalities

of roof runoff. These types of developments are characterized by high levels of impervious cover in the form of roofs, paved parking lots and paved outdoor storage areas, contributing to high runoff rates and a low potential for infiltration and groundwater recharge.

The building stock is inefficient and not up to current performance standards in terms of energy efficiency, insulation and building envelope. There are few trees and much of the open space is paved. There are few sidewalks, no designated bicycle routes or trail systems to assist in off-setting reliance on the automobile.

General Approach

The implementation of the initiatives illustrated on the concept plan will yield benefits related to energy conservation and a resultant reduction in carbon emissions that will in-turn assist in mitigating climate change. Enhanced water conservation, infiltration and evapotranspiration will also contribute to the achievement of water budget objectives and will enhance baseflow in the receiving watercourse. Restoring the watercourse to replicate a more natural geometry and providing a broad valley corridor to encompass the floodplain will enhance ecological function, reduce the instance of flood damage to buildings and improve connectivity to the downstream valley system. Increases in the extent of urban tree canopy cover achieved through additional landscape and streetscape plantings will contribute to a reduction in urban heat island effect while contributing to the sequestering of carbon, which in-turn will result in air quality improvements. If applied at the broad scale, improvements to air and water

Transforming an Industrial Enclave

Existing: Typical of many low rise industrial areas across the watershed, hard and impermeable surfaces predominate which encourages rapid runoff and potential flooding. The tree canopy is largely absent, the streetscape bleak, and there are few alternatives to truck and car transport.

Prospective: Trees and low maintenance native vegetation have been planted along the right-of-way, while a public transit route and bike lanes are added. Solar panels have been installed on the large flat roof of the closest facility. Where feasible, parking lots and driveways are retrofitted with semi-permeable surfaces.

quality will benefit the health and

wellness of residents of the watershed and assist in alleviating risks to the public and private property as a result of flooding.

Specific Initiatives

Initiatives may include: “reskinning” of existing buildings to improve insulation and building envelope performance; refitting buildings to incorporate solar walls, passive ventilation technology and energy efficient fixtures and lighting; or demolishing existing buildings and replacing them with new structures that incorporating state-of-the-art green building technologies. Specific initiatives may include:

- Removing existing buildings that encroach upon the valley corridor and flood prone areas and relocating these building/complexes to vacant lands. These replacement buildings would be designed to achieve “green” building objectives and intensification will be encouraged.
- Exploring the opportunity to implement a district energy system to serve existing retrofitted buildings and new buildings proposed for the infill areas.
- Utilizing a system of biofilters, enhanced swales, infiltration galleries and ponds to treat stormwater prior to discharge into the receiving watercourse and to assist achieving water balance objectives.
- Implementing car-share and local transit shuttle systems to collectively serve businesses within the area with the objective of reducing the reliance on the automobile.
- Exploring opportunities for businesses within the area to achieve beneficial synergies with respect to waste reduction, recycling and the purchase of high efficiency products.
- Exploring the potential to incorporate mixed use or live/work blocks into the area to enhance intensification and achieve a balance of residential / employment uses.
- Implementation of several end-of-pipe stormwater management facilities to mitigate flooding, enhance water quality and improve downstream channel stability.
- Implementation of rainwater harvesting and recycling systems, utilizing lot level tanks or end-of-pipe facilities such as the proposed stormwater management ponds, for irrigation, process water or HVAC equipment cooling purposes.
- Installation of on-site oil/grit separators and other stormwater best management practices to reduce reliance on, and extend the service life of, end-of-pipe facilities such as the proposed stormwater management ponds.
- Pilot projects could focus on site management, such as alternatives to conventional de-icing salt to address snow and ice control, as well as construction projects, such as wind turbines, aimed at providing an

Stormwater Control

Computer modelling results indicate that the stormwater management components in the generic industrial / commercial site plan will reduce peak flows and flow volume for both smaller storm events and the larger, less common storms.

This site showed the greatest post-condition reduction in peak flow rates (ranges from 30% for a 100 year storm event to 80% for a 5 mm storm) and total run-off volumes (20-85% reductions) of all the concept sites. Much of the site is currently blanketed by hard and impervious surfaces — roadways, roofs, parking lots and storage areas. The plan shows that significant benefits that can result from retrofitting existing industrial developments with source control projects.

A water budget analysis evaluated the impact of the conceptual source control measures on stormwater runoff volumes and potable water usage. City of Toronto design criteria were used to estimate average annual potable water use and calculate an estimated reduction based on the rainwater harvest proposals in the concept plan. The modeling predicts a 30% reduction in potable water use once the rainwater harvesting is implemented. This reduction in water use also saves energy costs associated with pumping and treating water.

Figure 44: Sustainability Makeover — a Generic Industrial/Commercial Example
Site Characterization

GENERIC COMMERCIAL / INDUSTRIAL EXAMPLE
RETROFIT DEMONSTRATION

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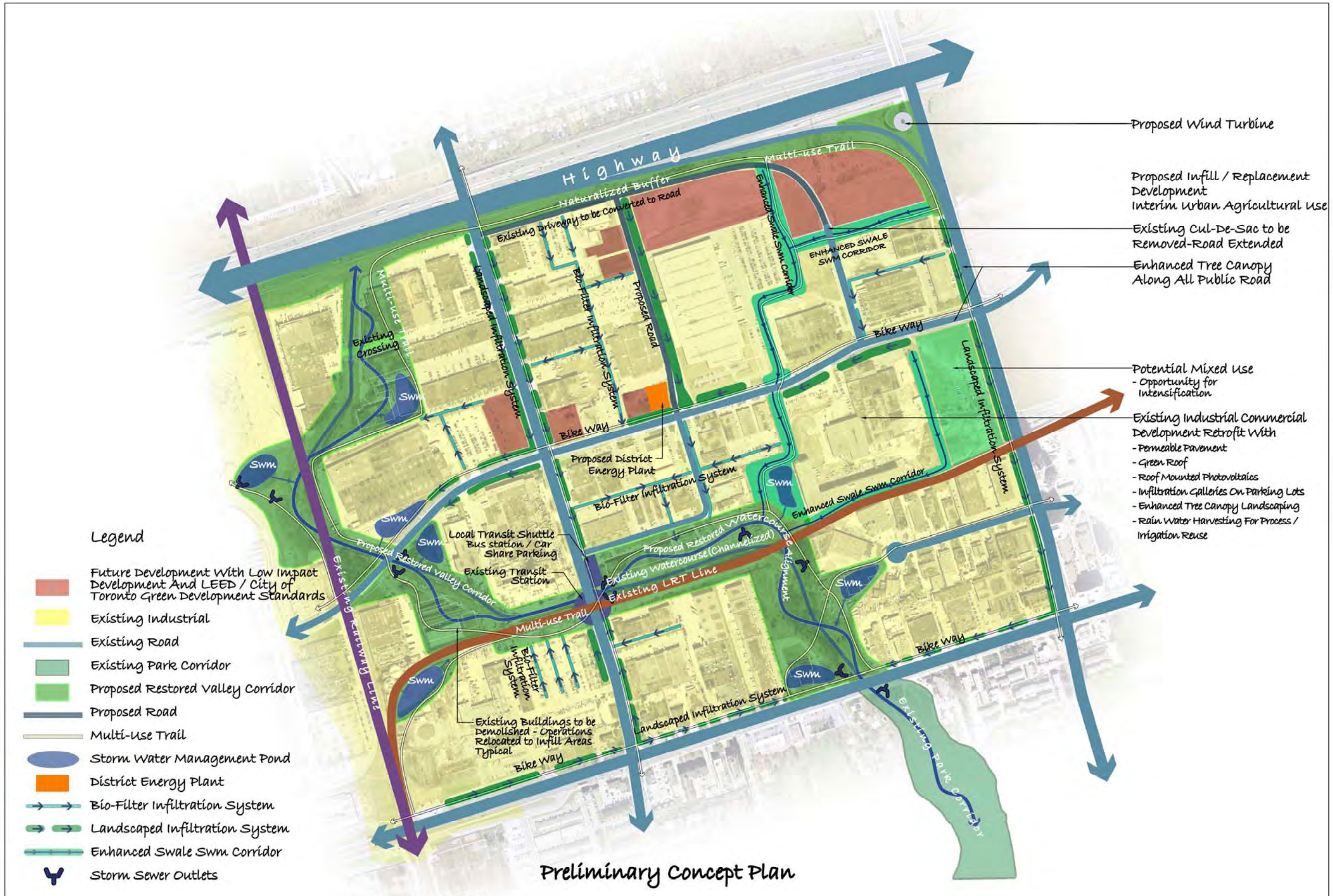
Figure 45: Sustainability Makeover — a Generic Industrial/Commercial Example Concept Plan



GENERIC COMMERCIAL / INDUSTRIAL EXAMPLE
RETROFIT DEMONSTRATION

0 10 25 50 100 200 400M

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alternative power source for several businesses.

The successful of application of the initiatives proposed for a given commercial/industrial area will be determined in large part by the ability to mobilize private landowners, industries and commercial operations. An engagement program aimed at providing landowners and businesses with information on the various initiatives and their respective benefits, both environmental and economic, will be an essential tool to catalyze change. The program should also be aimed at identifying opportunities for synergies between businesses and collective initiatives (such as district energy, shared use of land and cogeneration) that will enhance efficiency, reduce costs and accrue environmental benefits.

Example of a bioretention facility installed in an existing parking area

Concept Site #5: Taking Bold Steps
The Mouth of the Don, Toronto

The entire Lower Don Lands are in the process of being transformed into an urban estuary and sustainable "green" city district where city, lake and river will interact in a dynamic and balanced relationship. In addition, the Don Narrows will be naturalized, flooding problems will be minimized, and the public will regain access to a revitalized swathe of its waterfront heritage.

Innovative ecological regeneration practices and sustainable city building models will be employed to rehabilitate the underutilized and largely desolate brownfield area. Plans include re-naturalizing the Don River mouth, re-routing it to address flood protection, and creating wetlands and natural green spaces in a new urban estuary. The revitalized river will be the centerpiece of a new sustainable community offering an integrated mix of open space, housing, green businesses and institutional infrastructure. Connections to the surrounding city will be enhanced by a network of pedestrian, bike, transit and vehicular right of ways. New bridges, waterways and a continuous riverfront park system will provide strong linkages to the Don River Park, the Martin Goodman Trail, and the Don River trail system.

The Lower Don River flows south towards Lake Ontario, hemmed in by vertical walls of concrete or sheetpile and bounded by expressways, rail lines and roads. The area on both sides of the river is dominated by commercial/industrial facilities and undeveloped brownfields. Prior to reaching the lake, the river is forced into a hard 90 degree turn to the west and passes through the Keating Channel before emptying into the Inner Harbour and Lake Ontario. Usually silt-laden and sluggish, water levels can rise quickly following storms as the river swells with run-off and the outfall from storm and combined sewers. Heavier rains can flood the surrounding neighbourhoods and transportation corridors.

The Don Narrows is the two-kilometre long section of the river immediately upstream of the Keating Channel. Straightened and widened over the years, it is bounded on the east by the Don Valley Parkway; on the west by the Don Watershed Trail, the Bala Subdivision railway tracks and Bayview Avenue; in the north by Riverdale Park; and in the south by CN's Kingston Subdivision railway crossing the Don.

The Lower Don Lands is a 125-hectare brownfield waterfront site east of downtown Toronto. It is bounded by Lakeshore Avenue in the north; by Toronto's Inner Harbour in the west; by the Ship Channel in the south; and by the Don Roadway running through the Lower Don Lands in the east.

While the Lower Don River has come to epitomize many of the environmental problems that plague the watershed, it also offers tremendous opportunities for rehabilitation and renewal. In February 1997, Waterfront Toronto, in

Themes

The concept site plan for the mouth of the Don River is designed to:

- ❒ Naturalize and rehabilitate the mouth of the Don River with a mix of aquatic, wetland and upland communities
- ❒ Protect human life and property by providing permanent flood protection for 210 hectares in Spill Zones 1 and 2 to the west and south of the Keating Channel
- ❒ Manage the sediment, debris and ice that washes down the river and accumulates in the mouth
- ❒ Integrate existing infrastructure that could not be reasonably moved or removed
- ❒ Encourage recreation, cultural heritage opportunities and public/handicap accessibility
- ❒ Contribute to revitalization and sustainability of the waterfront area
- ❒ Design and implement the project in a sustainable manner

cooperation with TRCA and the City of Toronto, launched the Innovative Design Competition to invite renewal and reclamation ideas for the Lower Don Lands.

The primary goal was to produce a unifying concept for several projects planned for this long-neglected area and to provide common ground for three concurrent environmental assessments: the Don Mouth Naturalization and Port Lands Flood Protection EA, the Queens Quay Boulevard Extension, and the Lower Don Transportation Infrastructure. The latter two projects were combined into a single EA, the Lower Don Lands Infrastructure Municipal Class EA, in the spring of 2008. This EA is assessing the transit and servicing infrastructure needs for the new community. The Don Mouth Naturalization and Port Lands Flood Protection EA, currently being led by TRCA, is assessing the preferred alternative for the river that will remove the risk of flooding and create a healthier and more naturalized outlet to the lake. TRCA hopes to submit the EA for this project by early 2010.

The winning design, by Michael Van Valkenburgh Associates, Inc. (MVVA), was chosen because it provided a naturalized mouth and iconic identity for the Don River, while creating a comprehensive plan for addressing urban design, transportation, naturalization, sustainability and other ecological issues. The detailed plans for transforming the Lower Don Lands were released in May 2009. The renderings and map were prepared by MVVA, 2009.

Flood risk Spill Zones in the lower Don.

Prospective Renderings

A pedestrian bridge over the re-naturalized river mouth

The Martin Goodman Trail crosses the new Trinity Street bridge over the Keating Channel south to Promontory Park. The central waterfront boardwalk provides easy access for pedestrians.

The Keating Channel from the realigned Cherry Street Bridge, facing west towards the Inner Harbour.

Don Mouth Naturalization and Port Lands Flood Protection Project

General Approach

The primary objective of the Don Mouth Naturalization and Port Lands Flood Protection Project is to establish and sustain the form, features, and functions of a natural river mouth within the context of a revitalized city environment while providing flood protection up to the regulatory flood line. A natural, functioning wetland will be re-established at the mouth of the Don River, while a series of levees, spillways, holding areas and wetlands will protect approximately 230 hectares of land south and east of the existing Keating Channel from flood damage.

Under the plan, the river's original passage through the Keating Channel will be closed and the river would loop through a new, more natural and serpentine channel that would be created through the largely derelict port lands to the south of the Keating Channel. Seepage and lake-fed wetland areas will parallel the main channel. Two flood spillways would provide relief during 25-year flood events: one into the east end of Keating Channel and a second, the new Greenway wetland/floodway, spilling into the Ship Channel to the south. A large levee would normally separate the river from the floodway, which would be fed directly by lake water from the Ship Channel.

The Keating Channel would be retained as an open water reach and also serve as a spill overflow channel in the case of flood conditions. The immediate areas parallel to the north and south of the Keating Channel would be developed into a mixed use urban community that will offer a mix of residential, employment and retail environments. A school, day care centres and recreation facilities would also be constructed. The 16.6 hectares of the new Keating Channel Precinct will be almost evenly divided between developed blocks of property and open or green areas.

Flood Control

Flooding remains a real and serious threat to the low lands bordering the Lower Don along the southern, largely industrial fringe of Toronto. With flow volumes augmented by numerous storm sewers and combined sanitary sewer outflows throughout the watershed, the flow patterns can be very "flashy". These problems are especially evident in the lower reaches of the river. Even small or moderate-size rain events will cause a significant and rapid increase in water levels. During low flow, dry weather conditions, lake effect backwaters will frequently

Keating Channel community plans win international design award

On June 16, 2009, the Keating Channel Precinct, the first planned community in Waterfront Toronto's Lower Don Lands plans, received the "Best Futuristic Design Award" in a sustainability-focused design competition. The annual Building Exchange (BEX) International Awards, held in partnership with the World Green Building Council, promote global standards for environmentally sound buildings, large-scale developments and infrastructure.

"This award emphasizes the importance of investing in sustainable communities to help reduce carbon emissions, prioritize transit as a mode of transportation, and improve energy efficiency," said John Campbell, President & CEO of Waterfront Toronto.

The Keating Channel neighbourhood is designed to optimize the climatic effects from sun and wind, to incorporate strategies for water re-use, and to support sustainable living and working.

The design for the Lower Don Lands has also received the 2008 Honor Award for Analysis and Planning from the American Society of Landscape Architecture, the 2008 Sustainable Development Award from the Royal Architectural Institute of Canada, and a 2007 Toronto Urban Design Award.

South view of the Cherry Street Bridge in the planned Keating Channel community. The steps lead from the LRT platform down to the channel

Current and Prospective Views of the Lower Don Lands: This artist's rendering is an aerial view from the approximate position of the CN Tower facing southwest. It shows the revitalized Keating Channel Precinct and to the south, the newly developed Don River Park system and re-naturalized mouth of the Don. In the distance, the Leslie Street Spit lies beyond the Outer Harbour.

extend upstream through the Don Narrows to Gerrard Street.

In any given year, there is a 50 per cent chance that flood waters will overtop the river's sheetpile walls and flood sections of the Don Valley Parkway to the east and Bayview Avenue and the Bala Subdivision rail line to the west. A storm of Hurricane Hazel proportions would flood an estimated 230 hectares to the east and south of the Keating Channel in Spill Zones 1 and 2, and another 210 hectares of land to the west of the Lower Don in Spill Zone 3.

Under the existing conditions, floodwaters are split by the ramps of the Gardiner Expressway south to Lake Shore Avenue or southeast into the eastern Port Lands / Film Port area. The floodwaters that flow south to the Lake Shore are either diverted westward and into the Inner Harbour or top the south wall of the Channel and flow south and west through the western Port Lands area. Flooding in Spill Zones 1 and 2 would be addressed by the Don Mouth Naturalization Project. Key components include:

- ❒ removal of a utility bridge downstream from the elevated railway crossing;
- ❒ widening and deepening of the river channel north of Lake Shore Blvd.;
- ❒ lengthening of the Lake Shore Blvd. bridge;
- ❒ a flood protection landform east of Don Roadway between the elevated railway and Lake Shore Blvd.;
- ❒ weirs upstream and downstream of Lake Shore Blvd.; and
- ❒ two flood spillways, one into the Keating Channel and the second through the new Greenway wetland to the Ship Channel.

In Spill Zone 3, some 172 hectares have been designated a Special Policy Area (SPA) which allows new development to occur after appropriate flood proofing measures have been approved and incorporated into the design. The remaining 38 hectares, located immediately west of the Don River between the CNR bridge and Queen Street have been designated a "Holding Area". At very high risk of flooding, no redevelopment may take place on these lands until a comprehensive flood protection solution for all 38 hectares can be implemented.

The Lower Don River West Remedial Flood Protection Project (LDRW) serves to remove approximately 210 hectares of land west of the Don River from the

Lower Don Lands will be designed to generate zero carbon emissions

The Lower Don Lands has been selected as one 16 model projects for a global initiative to demonstrate sustainable urban growth and address climate change. The Climate Positive Development Program, a project of the Clinton Climate Initiative (CCI) and the U.S. Green Building Council, supports the planning and implementation of large urban developments that achieve zero carbon emissions. It also establishes standards for measuring climate positive outcomes.

As part of the CCI, Waterfront Toronto and the other participating partners will seek to reduce the net greenhouse gas (GHG) emissions of their projects to below zero. This will be accomplished through economically-viable green construction practices, the generation of clean energy, and innovative approaches to waste management, water management and transportation.

The design will achieve climate-positive goals using passive design, optimizing climatic effects from sun and wind, and prioritizing transit and multi-mode transportation options. The design also includes strategies for water re-use and leading edge information technology to support sustainable living and working.

Night view of the South Esplanade of the Keating Channel.

regulatory flood plain. The natural, cultural, social and economic conditions of the study area have been taken into account in eliminating the risk of flooding to this area. The study for this project began May 2003 and received EA approval October 6, 2005.

Construction of a large land form, which essentially extends the western valley wall of the Don River from Queen Street to the elevated railway in the south, was initiated in early 2006 and is anticipated to be completed in late-2010. The railway bridge over the Don was also lengthened as part of the flood protection works, in order to reduce the bottleneck on flood flows under this structure. Construction occurred on the bridge between May 2006 and the end of 2007.

Naturalization of the Mouth of the Don

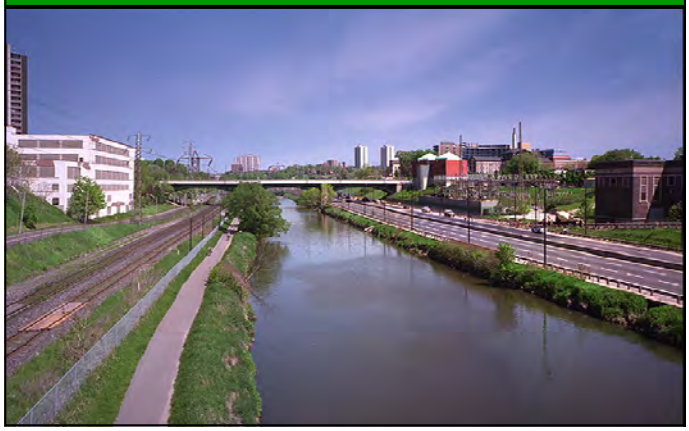
The contoured shape of the valley and new river channel would serves three basic purposes: (1) to reduce the risk of flooding; (2) to provide a mix of aquatic, wetland, and upland habitat; and (3) to provide enhanced public use and recreation opportunities. A mosaic of ecosystems will be established, including:

- ❒ open space and terrestrial habitat;
- ❒ a valley slope transition zone, comprising riparian and forest vegetation;
- ❒ a levee zone, comprising thick swamp and meadow marsh vegetation;
- ❒ a lake-connected wetland zone, comprising emergent marsh, submergent marsh and meadow marsh vegetation;
- ❒ seepage wetlands, comprising treed swamp, thicket swamp and meadow marsh vegetation; and
- ❒ an aquatic zone.

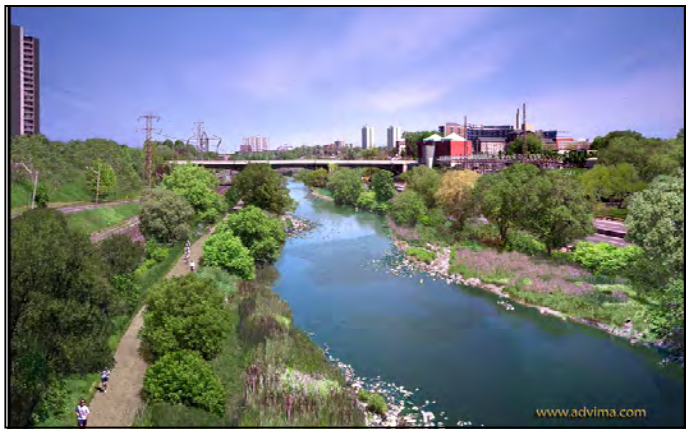
The renaturalization of the mouth would entail the following specific components:

- ❒ Levees will provide physical barriers between the river channel and the lake-connected wetlands.
- ❒ Smaller feeder channels through the levees will provide hydraulic connections between the lake and smaller plain wetlands.
- ❒ A large levee will separate the Greenway wetland/ floodway from the river to around the 25-year flood level.
- ❒ A range of wetland access controls will be considered to reduce the presence of invasive species to the lake-connected wetlands.

Prospective 'Before and After' Photos



Existing: The straight channel of the Lower Don trapped between walls of corrugated steel sheet pile and concrete.



Prospective: Shows the dramatic impact of the strategic placement of artificial bars and hooks, which act to redirect flow, trap sediments, encourage vegetation, and provide pools for fish.

The elevated Don Valley Trail facing south toward the narrows.

The existing dock walls of the Keating Channel will be stabilized and reinforced with sloping stone revetments, and flow levels through the channel will be maintained by lowering the bottom elevation. By deepening, changing the profile and adding some structure to the sides of the channel, valuable fish habitat will be created. In addition small boat launches and docking for larger boats will be built.

Debris and Sediment Removal

The waters of the Lower Don is very murky and so sediment-laden that light can penetrate only the top 50 cm or so of the water column. Approximately 40,000 cubic metres of sediment — primarily sand and coarse silt — are removed by clamshell dredges from bottom of the Keating Channel every year. Finer silts and clay particles are carried by the river on into the Inner Harbour. Removed sediments are transported to Tommy Thompson Park for disposal.

With the Don to be redirected through a new channel and wetland complex, a new sediment and debris collection and management system is required. A management work area will be established adjacent to the west bank of the river between Lake Shore Blvd. and the elevated CN Kingston Subdivision railway crossing. Key elements of the management program will include the following:

- A sediment trap (a two to three metre-deep hole in the river bed) upstream of the management area will collect the majority of the bedload (sand).
- The suspended silt and clay will continue downstream as presently occurs.
- A barge with a hydraulic dredge will be located north of Lake Shore Blvd. A hydraulic dredge is essentially a large vacuum cleaner with a beater bar used to suck up sand and water from the bottom of the sediment trap.
- A flexible pipe will connect the hydraulic dredge barge to a hard, fixed pipe that will run south along the Don Roadway to the Ship Channel, where a transportable dewatering plant will separate the water from the sand that was sucked up by the dredge. The dewatering plant will also allow the sand to be sorted by size in order to allow the larger sediment particles to be reused as fill, while the smaller silts will continue to be transported to Tommy Thompson Park for disposal in the containment cells.
- A series of floating barriers will span the river adjacent to the sediment trap area to collect the tonnes of debris that flow down the Don on a regular basis. This debris will be removed and reused or disposal of as appropriate. Debris removal is critical to maintaining safe navigation in the Inner Harbour.
- Ice jam management activities will take place between the new Commissioners Street and Lake Shore Blvd. crossings.

The Naturalization of the Don Narrows

Until the mid-1800s, the lower Don River followed a meandering path before emptying into the Ashbridge's Bay wetlands. This changed in 1887-1890 when the lower river was straightened and widened and its banks encased in wooden pilings to prevent ice jams and provide flood protection.

Today, the Don Narrows are typically 35 to 40 metres wide, encased within sheetpile walls that extending four to six metres above the channel bed. In some areas, sediment deposition has formed low lying vegetated banks. These are generally overgrown with disturbance resistant trees, such as Manitoba maple and crack willow, and other invasive species, such as Japanese knotweed and dog-strangling vine.

Overall, the Don Narrows has been severed from its flood plain, resulting in relatively barren terrestrial and aquatic habitats. The bed structure is relatively flat and sandy, providing little structure or cover for aquatic communities. The flows are both flashy and murky, laden with sediments and urban pollutants. There is little vegetative cover along the banks.

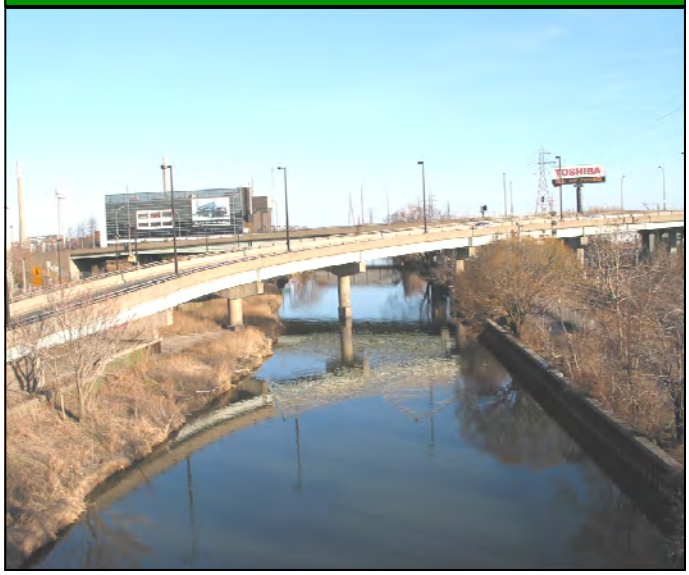
Opportunities for enhancements are limited to the channel area between the east and west banks and to the narrow strips of vegetation that border the river. These lie between the top of the bank and the Don Valley Parkway in the

east, and between the top of the bank and the Don Watershed Trail in the west.

While the possible naturalization options will require further study to determine their feasibility and possible impacts on the surrounding urban infrastructure, they include the following:

- ❒ The strategic placement of artificial bed structures (bar deposits, estuary stone hooks, etc.) in areas that are less prone to flooding.
- ❒ The creation of off-line backwater areas within the sheetpile banks.
- ❒ Active vegetative management and plantings to gradually phase out invasive species and reintroduce native species along the tops of banks and along the inside of sheetpile areas.
- ❒ The identification of areas where sheetpile walls may be replaced with alternate bank protection measures that improve habitat structure, but do not threaten the stability or transportation and utility infrastructure.

Naturalizing the river banks



Typical engineered banks: The view south toward the ramp from the Gardiner Expressway onto the Don Valley Parkway. Note the vertical sheetpile wall, sluggish murky water, and general lack of riparian vegetation.

Bioengineered banks: Where possible, the sheetpile wall is replaced or augmented with protective rock and new plantings that provide a more varied and diverse shoreline and aquatic habitat.

8.0 Conclusions

To reclaim the Don, we must preserve what's still unspoiled in the aquatic and terrestrial landscape and regenerate what's been degraded. We must build and retrofit our communities to become more sustainable. And we must continue to engage the people of the watershed in common cause to realize the Don's potential and to safeguard its future. These are the three strategic themes that inform and direct the *Don River Watershed Plan*.

Without minimizing the depth of the environmental damage or underestimating the extent of the work that's still to be done, it's important to recognize the gains that have been made since the publication of our first watershed strategy, *Forty Steps to a New Don*, back in 1994. Based on the environmental studies conducted over the last 15 years, it may be concluded that we are, at last, "holding the line" on the further degradation of the watershed.

- Ponds and other stormwater controls are routinely being incorporated into new developments in the headwater region, while combined sewers are to be upgraded and replaced in the urban heart of the watershed.
- Modeling results in the upper watershed show that strong intervention efforts, undertaken now, could hold the line on future degradation, and mitigate some of the impacts of past development in some areas.
- Municipal decision-makers are adopting sustainable strategies with, for example, programs to reduce the use of road salt, to eliminate the application of pesticides for ornamental or landscaping purpose, and to protect and defend the urban forest.
- Green roofs, permeable parking lots and other innovative technology is being supported and applied in both pilot and full-scale applications, throughout the watershed.
- And coalitions of local residents, businesses and municipal agencies have undertake stewardship programs to protect natural areas and to rehabilitate important ecological features that have been impacted by years of misuse or overuse.

Vision

The quality of life on Earth is being determined in the rapidly expanding city regions. We envision the future Don as a revitalized urban river, flowing with life-sustaining water through regenerated natural habitats and sustainable human communities, from its headwater tributaries to the mouth of the Don River and into the receiving waters of Lake Ontario. We envision the watershed as an integral contributor to The Living City™, where human settlement can flourish forever as part of nature's beauty and diver-

Going forward, our primary challenge will be to better manage wet weather flows and to restore a more balanced flow regime to the river and its tributaries.

Historically, development has failed to accommodate the basic ecological imperatives of a healthy watershed. Over 80% of the urban area lacks modern and effective stormwater controls: the detention ponds, grassed swales, infiltration devices, rain gardens and other systems designed to moderate stream flow, control erosion and preserve water quality.

Exacerbating the runoff problems, some 35% of the watershed's surface has been covered with hardened or impervious surfaces — roadways and parking lots, sidewalks, roof tops, patios and courtyards — that disrupt runoff and infiltration patterns and block precipitation and melting snow from replenishing ground-

Strategic Theme # 1: Build, re-build and retrofit our communities to restore water balance & improve sustainability

The *Don River Watershed Plan*, especially the wet weather flow control aspects of the Plan, must be implemented during the development of the remaining greenfield areas, redevelopment and infilling projects, and the retrofit of existing built areas within the watershed.

Balancing the flow regime of the Don and it tributaries through stormwater source control will yield a number of associated benefits. The reduction of peak flows following storms and the maintenance of adequate baseflow between events will reduce the risk of flooding and erosion-related damage, while supporting the protection and regeneration of healthy aquatic and terrestrial habitats.

Development / redevelopment throughout the watershed will also provide additional opportunities to protect greenspaces and cultural heritage structures, expand the trail system and urban tree canopy, undertake energy and water conservation measures, and, otherwise, achieve incremental, cumulative gains in watershed function and condition.

water reserves.

We must achieve the highest standard of stormwater control in both greenfield development and urban intensification projects — especially those in the four designated urban growth centres. In addition, we must retrofit stormwater management systems in older, developed areas to better manage flows and improve water quality. This will require the implementation of the City of Toronto's *Wet Weather Flow Management Master Plan* (WWFMMP), as well as source, conveyance, and end-of-pipe stormwater improvements in Vaughan, Richmond Hill, and Markham. In addition, many stormwater management facilities are in need of on-going maintenance, monitoring and renewal to ensure their desired level of performance.

While stormwater control is the top priority, we must also take concerted and coordinated action on a number of other fronts:

- ❒ We must take steps to improve flood control in vulnerable areas across the watershed.
- ❒ We must safeguard any areas that retain their natural cover, expand and regenerate the urban forest wherever possible, and strive to soften the impacts of surrounding urban land uses on natural areas by naturalizing nearby manicured areas.
- ❒ We must protect, regenerate and expand (where possible) existing greenspaces.
- ❒ And we must continue to build and connect the trail system, facilitate nature-based experiences, protect cultural heritage resources, and strive to meet the evolving expectations of a growing and diverse population.

Any endeavour, if it is to be successful, requires the favourable alignment of three factors: motivation, opportunity and means.

As a society, we certainly have the necessary motivation to undertake and complete the regeneration of the watershed of the Don. Never before, have all the major constituencies — local residents and business leaders, non-governmental organizations and government agencies, and decision-makers at all three levels of government — been so attuned to the environmental prerogatives.

Competing strategies to address global warming are being debated by federal and provincial governments. Similarly, ambitious programs to minimize or phase out the continued use of especially toxic compounds, promote waste diversion, and support energy and water conservation are underway.

It is no longer necessary to argue whether environmental action is necessary. The discourse has advanced to the stage of determining which remedies are the most effective and when they should be

implemented.

We have also been afforded an opportunity to implement a number of the measures required to restore and normalize the recharge and flow rates in the Don. With the build-out of the watershed — and the transformation of the Don into an almost fully urbanized river — nearly complete, the focus is shifting from greenfield development towards redevelopment, intensification, infilling and infrastructure renewal to accommodate the anticipated growth of the GTA and neighbouring regions.

It is during this period of urban renewal that we have an opportunity to 'get it right': to plan and implement those systems and practices needed to ensure the sustainability of the urban model. Green roofing technologies, semi-permeable parking lots, rainwater reuse projects, effective stormwater controls and the separation of combined sewer outflows will allow us, as a society, to reduce our collective environmental footprint in the watershed.

We cannot take a 'one-size-fits-all' approach. Technologies and practices need to be tailored to local conditions. They must accommodate not only the prevailing soil and water table structure, and the current built environment, but even the level of political and social support. Priority areas for stormwater source control have been identified (see Chapter 5).

Measures to stabilize baseflow levels, reduce runoff, increase infiltration and improve groundwater recharge rates will also serve to control flooding in vulnerable areas, reduce erosion, protect habitat, and improve water quality indicators. In addition, more robust infrastructure will better withstand the destructive influence of those extreme weather events anticipated to increase in frequency due to the local influence of climate change.

However, it is the provision of the third factor — the necessary means or the lack thereof — that is worrisome. The long-term funding and administrative support needed to ensure the success of watershed regeneration and environmental protection efforts may not be readily forthcoming in the current climate of economic uncertainty and upheaval.

Strategic Theme #2: Regenerate the aquatic and terrestrial landscapes

The concerted work of agencies, organizations and individuals have produced some improvements in watershed conditions. Some water quality parameters have improved, tens of thousands of trees and aquatic flora have been planted, some in-stream barriers have been removed, and trail systems expanded. However, continued development and urban intensification will place additional pressures on the ecosystems of the watershed.

Future gains will be contingent on maintaining the enthusiasm and support of the local community, businesses and government. In addition to 'sweat equity', support must include guaranteed funding to cover the significant capital and on-going maintenance costs of the requisite infrastructure.

Efforts to undertake the naturalization of the Mouth of the Don provide a timely warning. Despite receiving the endorsement of environmentalists, the local community and government bureaucrats, committed funding for the project will only cover the planning and environmental assessment phases. Once these stages are completed, there is no additional money allocated to this vital work.

We will need to overcome the strictures and constraints of 'silo' funding if we are to wring guarantees for long-term, sustainable financing for the actions outlined in the *Don River Watershed Plan*. We will have to make a convincing and scientifically reputable argument that projects to mend the battered environmental parameters of an urban river yield a multitude of interconnected benefits. For example, programs designed to improve water use and energy efficiency will also address climate change; stormwater source controls protect aquatic habitat; and funding green roofs prevents flooding and saves energy.

Strategic Theme #3: Engage the people of the Don

The Don River watershed has a long history of grassroots and agency involvement in and advocacy for regeneration. Annual celebrations, such as Paddle the Don and the Richmond Hill Mill Pond Splash, as well as major naturalization and brownfield rehabilitation projects in the lower Don engage the community and provide a wider awareness of the Don.

The time is ripe to capitalize on that interest across the watershed, and reengage the people of the Don to achieve the vision of a revitalized urban river. The engagement and voluntary uptake of sustainable practices — backyard naturalization, lot level stormwater retrofits, etc. — by residents and businesses in the Don will be essential to achieving the vision. Outreach education to build understanding of the links between landowner actions and watershed health will be key.

Despite the economic and political uncertainties, now is not the time to pull back on regeneration activities. The job will require both big investment AND big personal commitment. We must employ education and outreach programs to mobilize and focus the public's support for environmental protection programs within the watershed. And we must encourage, support and promote the uptake and implementation of sustainable lot level practices — from downspout disconnects, to rain barrels and other reuse systems, to more natural plantings and chemical-free landscaping to the use of semi-permeable surfaces for decks and patios — by watershed residents and businesses.

We must build an even stronger sense of community and common purpose, from the mouth to the headwaters. If the public doesn't fight to bring back the Don, the other constituencies eventually will lose interest. The most powerful impetus for change occurs when the whole community comes together and demands action.

Partnerships will be the key to the success of the Plan. Municipalities, the conservation authority, provincial and federal agencies and the building sector must coordinate their efforts with local businesses and grassroots organizations to realize the regeneration of the Don. While planning has been conducted on a watershed scale, all of these stakeholders must work together — on a local, reach-by-reach basis — to implement the *Don River Watershed Plan*.

Municipalities must incorporate watershed considerations into their planning processes, while governments at all levels must work to dismantle any administrative barriers, including planning, approval and building code requirements, that may block or hinder the fulfillment of the watershed plan.

There is a high level of motivation to move forward among the communities of the watershed. And there is a unique opportunity to take effective action during the final stages of urban development and coming period of redevelopment and intensification. We must not let the regeneration and reclamation of the Don flounder due to a lack of sufficient short-term vision and long-term funding.

We have been afforded an opportunity to build on what has been already accomplished over the last 15 years. We must allocate the resources, marshal stakeholder support and take the bold steps necessary to adopt effective stormwater controls and implement sustainable green technologies. Only by doing so can we hope to perpetuate and accelerate the process of cumulative gain and ongoing environmental improvement.

If pursued diligently and with the full support of all our partners, the regeneration of the Don River watershed within The Living City will continue to serve as model for the salvation of other endangered urban rivers.

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Appendix B: Glossary

Adaptive management: The use of feedback from monitoring activities to make adjustments to policies, plans and programs to ensure that goals, objectives and targets are met.

Air Quality Index: An indicator of air quality based on hourly ambient concentrations of six key pollutants that are known to have adverse effects on human health and the environment: sulphur dioxide, ozone, nitrogen dioxide, total reduced sulphur compounds, carbon monoxide, and suspended particles.

Aquatic system: An ecological unit composed of living (e.g. fish, insects, amphibians, reptiles, plants) and nonliving (e.g., sediment, woody and rocky materials) elements, and related ecological processes that interact in an aqueous medium (e.g. river, lake, wetland).

Aquifer: A body of permeable rock saturated with water and through which groundwater moves.

Aquitard: A body of low permeability rock that inhibits the movement of groundwater.

Archaeological resources: Artifacts, archaeological sites, and marine archaeological sites.

Baseflow: The component of streamflow that comes from groundwater sources.

Baseline: Initial conditions from which deviations are assessed.

Benthic invertebrates: Organisms living near or at the bottom of streams or lakes for at least part of their life cycle; including crayfish, leeches, clams, snails and the larval stages of insects.

Biodiversity: Biodiversity (biological diversity) is the variability among living organisms from all sources including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems (Secretariat of the Convention on Biological Diversity, 2005).

Built heritage resources: Involving one or more significant buildings, structures, monuments, installations or remains associated with architectural, cultural, social, political, economic or military history and identified as being important to the community.

Carrying capacity: The ability of air, land, and water to absorb the impacts of human use.

Cultural heritage landscape: A defined geographical area of heritage significance which has been modified by human activities and is valued by a community. A landscape involves a grouping(s) of individual heritage features such as structures, spaces, archaeological sites and natural elements, which together form a significant type of heritage form, distinctive from that of its constituent elements or parts. Examples may include, but are not limited to, heritage conservation districts designated under the Ontario Heritage Act; and villages, parks, gardens, battlefields, mainstreets and neighbourhoods, cemeteries, trailways and industrial complexes of cultural heritage value.

Ecological footprint: A resource management tool that measures how much land and water area a human population requires to produce the resources it consumes and to absorb its wastes under prevailing technology.

Ecosystem management: An approach that addresses natural environmental, social, cultural and economic issues and focuses on their linkages, relationships and dynamic nature.

End-of-pipe stormwater management: Constructed facilities such as ponds or wetlands that receive stormwater at the end point of a conveyance system such as a ditch or sewer and control its flow and quality before it reaches the stream or lake.

Eutrophic: Fresh waters that are highly productive and often display overgrowth of algal and/or aquatic plant growth as a result of an abundant supply of nutrients (e.g. phosphorus and nitrogen).

Evaporation: Water that leaves the surface water flow system and enters the atmosphere as water vapour.

Evapotranspiration: Water that leaves the soil zone and enters the atmosphere as water vapour through both evaporative and plant-based mechanisms (transpiration).

Fish Management Zone: An area of the watershed that exhibits or has relatively homogeneous hydrogeological characteristics and ecological functions and supports a characteristic fish community.

Flood vulnerable area: Represents any site where a structure or building is located within the regulatory floodline. Each structure, depending on its location, is associated with varying degrees of flood risk (i.e. 2 yr. 25 yr, 100 yr storm). Flood vulnerable roads – are sites where a road may be inundated with water under various storms.

Fluvial: Relating to a stream or river.

Fluvial geomorphology: The study of landform evolution related to flowing watercourses and the physical forms and processes of rivers and streams.

Glaciation: The covering of an area or the action on that area, by an ice sheet or by glaciers.

Greenspace: All *publicly-owned* land available for nature-based recreation, including municipal parks and conservation lands, and valley and stream corridors. This does not include golf courses, cemeteries, and municipal parks intended for intensive recreational use.

Groundwater: Water that exists below the earth's surface in the spaces between soil grains or in open spaces in rock.

Groundwater discharge: Water that flows from an aquifer into the surface water flow system.

Habitat patch: A contiguous (or unbroken) extent of one habitat type, either forest, wetland or meadow.

Heritage conservation districts: Any aggregate of buildings, structures and open spaces that as a group is a collective asset to the community and which may have architectural, historical, archaeological or scenic value. Districts may be found in urban and rural environments, and may comprise residential, commercial or industrial areas, landscapes or entire villages. Heritage Conservation Districts are designated by municipal by-law, under Part V of the *Ontario Heritage Act*.

Index of biotic integrity (IBI): An ecologically based index to measure “stream health” that uses fish community data and summarizes them as ecological metrics that can be classified into four categories: species richness, trophic composition, local indicator species and fish abundance.

Infill: Development on empty lots of land within an urban area rather than on new undeveloped land outside the city or town.

Infiltration: Water entering the pores of the earth’s surface.

Interior forest: A forest area that is not influenced by edge effects.

Lacustrine: Pertaining to a lake (i.e., lacustrine silt, lacustrine ecosystem).

Lot level stormwater management: Controls that are applied at the individual residential, commercial, industrial or institutional lot level to detain, infiltrate, or evaporate stormwater. Sometimes referred to as source controls, these measures are intended to reduce peak runoff rates, provide water quality treatment, and/or maintain the pre-development water balance.

Matrix influence: The surrounding land use context for natural habitats is referred to as the matrix. It influences the value of the habitat to native species through such influences as predation, competition, disturbance and encroachment.

Meander: A loop-like bend in a stream or river that develops when a watercourse flows through level land and erodes its floodplain.

Natural areas: Areas with natural cover – forests, meadows and wetlands – regardless of land ownership

Naturalization: The conversion of urban or agricultural lands to natural cover (see also Restoration).

Precautionary principle: Taking a conservative approach and/or incorporating contingencies and backups on decisions involving uncertainty.

Precipitation: Water that leaves the atmosphere and enters the surface water system in the form of liquid (rain) or solid (snow, sleet, etc.).

Quadruple bottom line: An approach to reporting and accounting that considers social, economic, environmental and cultural performance, benefits and impacts.

Rain-harvesting: Collection of rainwater for beneficial uses; a form of water conservation.

Recharge: Precipitation that enters the groundwater flow system.

Regional storm: The maximum historical rainfall on record. Hurricane Hazel (1954) is the regional storm in the Toronto Region.

Restoration: The act of repairing or re-establishing functioning ecosystems, which may be a defined, native, historic ecosystem; or a specified ecosystem suited to the conditions. Passive restoration allows lands to recover on their own whereas active restoration is assisted by human management activities.

Retrofit: Installation of new stormwater management measures or upgrades to existing infrastructure at the lot level, conveyance system or at end-of-pipe, in order to improve the level of stormwater management.

Riparian (cover/habitat): Riparian vegetation provides habitat, food and shelter, assists in stabilizing soils and contributes to both the adjacent aquatic and terrestrial ecosystems. The riparian area is located immediately landward of watercourses or shorelines characterized by soils that exhibit signs of regular saturation and vegetation tolerant of periodic inundation.

Runoff: The portion of precipitation that enters the surface water flow system.

Salmonids: Fish of the fish family Salmonides; for example salmon, trout and chars.

Sediment load: Volume of sediment carried by the stream or river.

Special Policy Area (SPA): SPAs are portions of a community that have historically existed in the flood plain and are intended to provide for the continued viability of existing uses, provided there is compliance with site-specific flood hazard management policies such as flood-proofing, flood remediation and risk reduction measures.

Stormwater: Rain and snowmelt that runs off urban surfaces such as roads, roofs, and paved areas and that may be conveyed by engineered drainage systems to lakes and rivers.

Subwatershed: A sub-section of a watershed. A region or area bounded peripherally by a water parting and draining ultimately to a tributary of a larger watercourse or body of water.

Surface water: Precipitation which does not soak into the ground or return to the atmosphere by evaporation or transpiration and is stored in, and flows through, streams, lakes, wetlands and reservoirs.

Sustainable development: Development that meets the needs of the present without compromising the ability of future generations to meet their needs (World Commission on Environment and Development, 1987).

Target community, indicator species: Species or assemblage of species which are primarily sought in a fishery as indicators of a target aquatic community. Species most sensitive to change such that management for their survival will also ensure the health of the rest of the community.

Target terrestrial natural heritage system: Consists of existing natural cover and potential natural cover delineated in our management strategy (Chapter 5), as a basis for supporting objectives for biodiversity.

Terrestrial: Living on or growing on land.

Transpiration: The process whereby water leaves plant tissues by evaporation through small openings called stoma.

Triple bottom line: An approach to reporting and accounting that incorporates performance in societal and environmental as well as economic terms, recognizing the interdependence of these three elements. See also quadruple bottom line.

Water budget: A summary of the quantity of water in the atmosphere, the surface water flow system and the groundwater flow system within a watershed. This can be examined on any time scale from hourly to annually.

Water balance: This term is often used interchangeably with water budget. More correctly, this term applies to the concept of maintaining the various water budget components after urban development. For example, if the baseline recharge for a site is 150 mm/yr, maintaining the water balance would require the post development recharge for the site to be 150 mm/yr.

Watershed: The total area of land that drains to a river or other large body of water.

White belt: Potential future urban growth areas not yet designated for urban settlement in municipal official plans and not within the boundaries of the Province's Greenbelt Plan.

Appendix C: Don Watershed Regeneration Council Members

Don Watershed Regeneration Council Members, 2007-2009

Chair:	Phil Goodwin, resident, City of Toronto
Municipal and Regional	
Councillors (ex-officio):	Brenda Hogg, Regional Municipality of York
	Erin Shapero, Town of Markham
	Jack Heath, Town of Markham
	Nick Papa, Town of Richmond Hill
	Alan Shefman, City of Vaughan
	John Parker, City of Toronto, Toronto and Region Conservation Authority Board
	Janet Davis, City of Toronto
	Norm Kelly, City of Toronto
Public Agencies (ex-officio):	Kristin Geater, Environment Canada
	John Almond, Ontario Ministry of Natural Resources
Academic Institutions:	Jennifer Bonnell, PhD Candidate, University of Toronto
	Carmela Canzonieri, Professor, York University
	Nina-Marie Lister, Professor, Ryerson University
Community Groups:	James McArthur, Friends of the Don East
	John Routh, (alternate member) Friends of the Don East
	Joe Agg, Richmond Hill Naturalists
	Janice Palmer, Task Force to Bring Back the Don
	John Wilson, (alternate member) Task Force to Bring Back the Don
	Margaret Buchinger, Toronto Green Community
	Cheryl Shour, (alternate member), Toronto Green Community

Residents and Business

Representatives:

Sue Arndt, resident, City of Toronto

Alex Brunton, Baird & Associates

Shan Dhingra, resident, Town of Richmond Hill

George Fells, resident, City of Toronto

Michael Halder, resident, City of Toronto

Moyra Haney, resident, City of Toronto

Kate Hayes, resident, City of Toronto

Peter Heinz, resident, City of Toronto

Catherine Kurucz, resident, City of Toronto

Vivien Lee, resident, City of Toronto

Brenda Lucas, resident, City of Toronto

Catherine Marsden, Dillon Consulting Limited

Marg McRae, resident, City of Toronto

Douglas Obright, resident, City of Toronto

Leah Weller, CH2M Hill Canada Limited

Andrew Wickens, resident, City of Toronto

David Yudelman, resident, City of Toronto

Appendix D: Technical Support

Technical support in undertaking the Don River Watershed Planning Study was provided by the following team of staff and consultants:

Toronto and Region Conservation Authority Staff:

Mike Bender, Manager, Conservation Land Planning Group

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Jamie Duncan, Water Resources Data Management Analyst

Elyssa Elton, Land Management Technician

Don Ford, Manager, Geoenvironmental

Adele Freeman, Director, Watershed Management

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Janet Ivey, Watershed Planning Coordinator

Steve Joudrey, Land Management Technician

Cindy Kambeitz, Water & Air Quality Analyst

Margie Kenedy, Assistant Archaeologist

Bill Kiru, Manager, Development, Planning and Regulation

Dave Lawrie, Aquatic Systems Analyst 2

Dena Lewis, Manager, Terrestrial and Aquatic Ecology

Deborah Martin-Downs, Director, Ecology

Sonya Meek, Manager, Watershed Planning

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Ryan Ness, Manager, Water Resources

Leslie Piercey, Supervisor, Planning Ecology

Kelly Purves, Field Biologist

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Freeman Associates

J.D. Power and Associates

Schollen & Company International Incorporated

The Municipal Infrastructure Group

XCG Consultants Limited

Water's Edge Limited

Appendix E: Municipal Technical Advisory Committee Members

Garth Armour, City of Toronto

Laura Atkins-Paul, Regional Municipality of York

Karen Boniface, Town of Markham

Tony Ching, City of Vaughan

Maria Flores, Town of Richmond Hill

Paul Gardner, City of Vaughan

Janette Harvey, City of Toronto

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Tracy Manolakakis, City of Toronto

Frank Milkovich, City of Vaughan

Learie Miller, Town of Markham

John Nemeth, Town of Richmond Hill

Azadeh Rashvand, Town of Richmond Hill

Soran Sito, Town of Markham

Bill Snodgrass, City of Toronto

Stephanie Snow, City of Vaughan

Jane Weninger, City of Toronto

Observers:

Sandra Kok, Environment Canada

Margaret Buchinger, Don Watershed Regeneration Council

Shan Dhingra, Don Watershed Regeneration Council

Appendix F: Don Watershed Sites of Regeneration Interest

Throughout the watershed planning study, neighbourhoods, subbasins, sites, and individual properties have been identified by agency staff and other watershed stakeholders as being sites of interest for regeneration action. The “long list” below is a compilation of the identified sites. Sites were proposed for a variety of purposes and to address a range of regeneration objectives. Planning and/or implementation of regeneration works is already underway on many of these sites. The concept sites described in Chapter 6 were selected from this long list of sites.

Upper West Don River Subwatershed

Development blocks 27 and 28, City of Vaughan (whitebelt)

Commercial lands at Major MacKenzie and Weston, City of Vaughan

CN Rail Yards and neighbouring industrial area, City of Vaughan

Waterside Marsh, City of Vaughan

Bartley Smith Greenway, City of Vaughan

Upper East Don River Subwatershed

Maple Nature Reserve, City of Vaughan

McMillan Property, City of Vaughan

Pomona Mills Park/Royal Orchard Park, Town of Markham

Patterson Creek subbasin, City of Vaughan and Town of Richmond Hill

Pioneer Park, Town of Richmond Hill

Newly developing lands on the Oak Ridges Moraine, City of Vaughan

Pearson Avenue stormwater outfall, Town of Richmond Hill

Former landfill sites

German Mills Creek Subwatershed

East Don Parkland—Bestview Forest, City of Toronto

Doncrest Valley, Town of Markham

German Mills Settlers Park/Maple Valley Park, Town of Markham

David Dunlap Observatory, Town of Richmond Hill

Enford Road/Elgin Mills industrial area, Town of Richmond Hill

Cummer Creek subbasin, Town of Richmond Hill and City of Toronto

Lennox Park, Town of Richmond Hill

Lower West Don River Subwatershed

Sunnybrook Park/Glendon Forest/Edwards Gardens complex, City of Toronto

E.P. Taylor Canadian Film Centre site, City of Toronto

Earl Bales Complex and Burnett Woods, City of Toronto

Carscadden Greenbelt, City of Toronto

Bathurst Hydro Fields, City of Toronto

G. Ross Lord Park/Garthdale Park, City of Toronto

E.T. Seton Park and Thorncliffe, City of Toronto

Leaside business area, City of Toronto

Cedarvale Ravine, City of Toronto

Wilket Creek, City of Toronto

Lower East Don River Subwatershed

Moatfield Farm Park, City of Toronto

East Don Parkland, City of Toronto

Alomosa Wetland, City of Toronto

Newtonbrook Creek subbasin, City of Toronto

Lesmill Road commercial area, City of Toronto

Taylor/Massey Creek Subwatershed

Taylor Creek Park, City of Toronto

Warden Woods and surrounding residential area, City of Toronto

Terraview-Willowfield, City of Toronto

Warden Hydro Corridor, City of Toronto

Eglinton Reach, City of Toronto

Underwriters' Reach, City of Toronto

Ferris and Curity Ravines, City of Toronto

Lower Don River Subwatershed

Mud Creek subbasin, City of Toronto

Don Valley Brick Works, City of Toronto

Don Narrows, City of Toronto

Mouth of the Don, City of Toronto

Pottery Road Snow Dump site, City of Toronto

Appendix G: Summary of Recommendations

See Chapter 5 for rationale, background, actions, and roles and responsibilities. More details about how to implement these recommendations can be found in the *Don River Watershed Plan Implementation Guide*.

CARING FOR WATER (Section 5.1)

1. Implement source, conveyance and end-of-pipe stormwater management facilities (retrofit and new) and maintain existing stormwater facilities across the watershed
2. Manage flood risks
3. Protect groundwater recharge and discharge areas
4. Improve erosion and sediment control and site regeneration
5. Improve stream form
6. Prevent and remediate pollution
7. Monitor, evaluate and adjust

CARING FOR NATURE—AQUATIC SYSTEM (Section 5.2.1)

1. Implement Redside Dace Recovery Team recommendations (in development) to investigate the existing redside dace population status and habitat improvement and protection opportunities (in FMZ 1 where this species is currently known to occur and in FMZs 2 and 3 where a population may be recovered)
2. Protect and improve instream habitat for the Target Community Indicator Species (Figure 25), as per recommendations in Chapter 6 of this watershed plan and the Fisheries Management Plan (FMP)
3. Create or enhance riparian wetlands, with focus on reaches that still support aquatic communities that rely on this habitat (e.g., known populations of brassy minnow), as per recommendations in Chapter 6 of this watershed plan and the FMP
4. Complete an instream barrier assessment for the entire watershed and identify priority barrier mitigations that would achieve the most improvement to fish passage and habitat
5. Improve the water balance (surface water and groundwater regimes) and stormwater management (quality and quantity), and identify aquatic standards and best management practices to guide the work (see management strategies under Caring for Water in Section 5.1)
6. Establish an Implementation Committee for the updated Don River Fisheries Management Plan
7. Improve monitoring of fish communities and habitat, particularly for existing populations of redside dace and walleye
8. Develop education and stewardship programs to address invasive species awareness (round goby, common carp, rusty crayfish) and the potential for invasive species transfer between watersheds (e.g., bait fish transfer between Humber and Don rivers), the role of fish as indicators of riverine health, and best management practices to protect and regenerate the aquatic system (especially riparian plantings) targeted at landowners and land maintenance staff

CARING FOR NATURE—TERRESTRIAL SYSTEM (Section 5.2.2)

1. Improve ecological function of the entire urban landscape, from the natural areas to the built areas, by increasing vegetation cover through better urban design and land management
2. Secure the Target Terrestrial Natural Heritage System (Figure 26) and look for additional opportunities for expansion (e.g., additional lands identified in City of Toronto's Official Plan, Map 9)
3. Regenerate and enhance the quality of the natural system by increasing natural cover quantity, improving patch size and shape, and managing invasive species
4. Mitigate the impact of human activities on natural areas by developing a broader understanding of ecosystem health and a commitment to stewardship among the public and businesses

CARING FOR COMMUNITY—CULTURAL HERITAGE (Section 5.3.1)

1. Identify, investigate and conserve cultural heritage prior to changes in land use or redevelopment
2. Establish a comprehensive communication plan with Aboriginal (First Nations and Métis) groups and other more recent descendant populations
3. Fill gaps in archaeological knowledge
4. Develop and support existing active and participatory programs to increase awareness of cultural heritage and living culture

CARING FOR COMMUNITY—NATURE-BASED EXPERIENCES (Section 5.3.2)

1. Protect and enhance the quality and extent of public greenspaces throughout the watershed, and, in particular, in areas of increasing population density and redevelopment
2. Expand the network of formal trails to connect key destinations and improve connectivity with neighbouring watersheds, the Oak Ridges Moraine, and the waterfront
3. Promote the natural and cultural heritage of the watershed and engage the community in their protection, regeneration, and celebration

CARING FOR COMMUNITY—LAND AND RESOURCE USE (Section 5.3.3)

1. As municipal Official Plans are updated across Don watershed municipalities, TRCA should work with municipalities to incorporate watershed plan strategies into these plans and to encourage strategic planning in advance of redevelopment, to enhance the sustainability of urban form and resource use
2. Master Environmental Servicing Plans (MESPs) for Redevelopment areas and regeneration areas should be required to coordinate property redevelopment and regeneration in a comprehensive way
3. Implement sustainable urban form and adopt green development standards for neighbourhoods, sites, and buildings
4. Improve planning for and continue implementation of flood remediation
5. Terrestrial natural cover on historical lots of record that extend into ravines should be protected from loss during redevelopment or intensification by designating it “open space” in municipal official plans
6. Explore opportunities to secure financial resources for creating new greenspaces and supporting regeneration, operations and maintenance of existing greenspaces from development charges when areas are subject to growth through intensification
7. Implement sustainable infrastructure planning, implementation and monitoring
8. Increase water efficiency and conservation
9. Reduce energy use and increase non-fossil fuel alternatives
10. The amount of waste generated should be reduced and wherever possible, “waste” should be used as a resource

FUTURE SUSTAINABLE COMMUNITY scenario: Stormwater SOURCE CONTROLS in NEW URBAN DEVELOPMENT Areas:

	Residential			Institutional	Indust. /Comm.	Transportation
	Low	Medium	High			
	TSI= 35% RGR = 0.3	TSI= 53% RGR=0.6	TSI=67% RGR=1.1	TSI=46% RGR = 0.2	TSI= 93% RGR=4.9	Arterial Roads & Highways
Infiltration Measures						
1. Roof drainage infiltration (% of roof area)	100% (soils A.B) 50% (soils C,D)	80% (soils A.B) 40% (soils C,D)	20% (soils A.B) 0% (soils C,D)	30%	30% (soils A.B only)	-
2. Parking lot infiltration (% of parking lot area)	-	-	-	60% (soils A,B) 30% (soils C) 0% (soils D)	60% (soils A,B) 30% (soils C) 0% (soils D)	-
3. Infiltration of roadway and driveway runoff (% of roadway and driveway area)	40% (soils A,B) 20% (soils C) 0% (soils D)	40% (soils A,B) 20% (soils C) 0% (soils D)	40% (soils A,B) 20% (soils C) 0% (soils D)	40% (soils A,B) 20% (soils C) 0% (soils D)	40% (soils A,B) 20% (soils C) 0% (soils D)	40% (soils A,B) 20% (soils C) 0% (soils D)
Runoff Reduction and ET Increase						
4. Green Roofs (% of roof area)	0%	0%	25%	25%	25%	-
5. Rainwater harvesting (roof drainage to rain barrels or cisterns)	10% (soils A,B) 50% (soils C,D)	30% (soils A.B) 50% (soils C,D)	40%	40%	40%	-
Pollutant Reduction						
6. By improved roadway operations and maintenance, including reduced winter salting and sanding, and intensified street sweeping; and by reduced use of herbicides, pesticides and lawn fertilizers on public and private properties	Assumed following reductions in average pollutant concentrations in surface runoff: TSS 10%, Nutrients 10%, Metals 10%, E.coli 10% (same as Toronto WWFMMP)					

FUTURE SUSTAINABLE COMMUNITY scenario: Stormwater SOURCE CONTROLS in EXISTING BUILT-UP areas

	Residential			Institutional	Indust. /Comm.	Transportation
	Low TSI= 35% RGR = 0.3	Medium TSI= 53% RGR=0.6	High TSI=67% RGR=1.1	TSI=46% RGR = 0.2	TSI= 93% RGR=4.9	Arterial Roads & Highways
Infiltration Measures						
1. Roof drainage infiltration	100% (soils A.B) 50% (soils C,D)	60% (soils A.B) 30% (soils C,D)	20% (soils A.B) 0% (soils C,D)	30%	20% (soil A,B only)	-
2. Parking lot infiltration	-	-	-	60% (soils A,B) 30% (soils C) 0% (soils D)	60% (soils A,B) 30% (soils C) 0% (soils D)	-
3. Infiltration of roadway and driveway runoff (only where soils A or B)	25% (soils A,B) 15% (soils C) 0% (soils D)	25% (soils A,B) 15% (soils C) 0% (soils D)	25% (soils A,B) 15% (soils C) 0% (soils D)	25% (soils A,B) 15% (soils C) 0% (soils D)	25% (soils A,B) 15% (soils C) 0% (soils D)	25% (soils A,B) 15% (soils C) 0% (soils D)
Runoff Reduction and ET Increase						
4. Green Roofs	0%	0%	25%	25%	25%	-
5. Rainwater harvesting (roof drainage to rain barrels or cisterns)	10% (soils A,B) 50% (soils C,D)	30% (soils A.B) 50% (soils C,D)	30%	30%	30%	-
6. Increased tree and shrub plantings in natural and landscaped green areas	Applied in all residential areas. Assumed to increase rain interception over vegetated areas by 25%. (same as Toronto WWFMMP)			Same as in residential areas.	Not applied.	Not applied.
Pollutant Reduction						
7. By improved roadway operations and maintenance, including reduced winter salting and sanding, and intensified street sweeping; and By reduced use of herbicides, pesticides and lawn fertilizers on public and private properties	Assumed following reductions in average pollutant concentrations in surface runoff: TSS 10%, Nutrients 10%, Metals 10%, E.coli 10% (same as Toronto WWFMMP)					

Appendix I: List of Supporting Documents

Watershed Plan

Toronto and Region Conservation Authority. 2009. *Don River Watershed Plan*.

Supporting Documents

Toronto and Region Conservation Authority. 2009. Don River Watershed Plan Reports on Current Conditions - Geology and Groundwater Resources; Fluvial Geomorphology; Aquatic System; Surface Water Hydrology/Hydraulics and Stormwater Management; Baseflow and Water Use; Surface Water Quality; Terrestrial Natural Heritage (and refinement of the Target System); Land and Resource Use; Nature-based Experiences; Cultural Heritage; and Air Quality.

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