

Simcoe, east to Lake Scugog, and south to Lake Ontario, and they left behind the fertile soils characteristic of much of the area.

In the northern part of the bioregion, the retreating glaciers left in their path the hilly Oak Ridges Moraine, a unique formation of sand and gravel deposits. For thousands of years, rainwater has filtered downwards through the moraine, migrated laterally, and then discharged upwards to form wetlands — the headwaters of virtually all the rivers flowing south and north in the area. As the ice age loosened its frigid grip and temperatures rose, river valleys were flooded and fertile marshes developed at river mouths. Natural forces left us a unique, varied, and complex bioregion.

The second great force shaping the Greater Toronto Bioregion has been human habitation. Although settlement likely began about 11,000 years ago, humans had little impact on the area until the arrival of Europeans in the 18th and 19th centuries. Settlement first occurred along the water's edge, because Lake Ontario provided water to drink and fish and waterfowl for the table. Moreover, water was a highway: with dense and seemingly impenetrable forests hindering road building, all goods and people had to be transported by water.

However, once the boreal and Carolinian forests were cleared for agricultural use, settlement soon crept northwards, rivers were dammed, and towns and roads were built. Subsequent industrialization and urbanization dramatically altered the physical form of the bioregion: recent satellite photos show clearly the urbanized areas that stretch ever-north from the shores of Lake Ontario, and the network of roads, rail lines, and hydro corridors that criss-cross the region to service its needs.

Today, about 25 per cent of the Greater Toronto Area is covered by cities and towns. Despite extensive (and intensive) urbanization, significant environmental diversity remains: about half the land base can still be categorized as "agricultural" or "rural"

in nature, although not all of this rural land is farmed. More than 216,000 people live in the rural areas of the GTA, but as few as 15,000 are involved in farming. Nonetheless, there are some 5,000 farms in the GTA, and in 1986, these farms produced eight per cent of the agricultural goods sold in Ontario.

At the same time, loss of farmland in the GTA has been significant: federal statistics show that, between 1981 and 1986, about eight per cent of the total agricultural acreage — much of it prime agricultural land — was lost. With continued expansion of urban populations, the pressures on agricultural land can be expected to increase in the future.

Despite the widespread clearing of forests over the last 200 years, one-fifth of the GTA — including parks, Crown land, and private woodlots — remains forest-covered today. There is disturbing evidence, however, that these trees and their urban cousins are under significant stress from drought, salt, and pollutants such as acid rain. Conditions facing newly planted trees in Metro Toronto are so harsh that in some areas their life span is estimated to be no more than ten years.

Glacial deposits of sand and gravel in the bioregion provide extensive aggregate resources — a fifth of all that produced in the province. It is no small irony, however, that the areas richest in aggregates — the Niagara Escarpment and the Oak Ridges Moraine — are the most sensitive to its extraction. Aggregate extraction on the escarpment threatens its integrity as a unique landform, while that in the moraine interferes with its hydrogeological function as the site of headwaters of rivers.

There are 16 major rivers flowing into Lake Ontario in the Greater Toronto Bioregion, and approximately 65 river valley systems in the area. Although few of the river valley systems are in a totally natural state, they continue to fulfil important functions for human activity (including recreation) and as corridors or links for the movement of wildlife.

Wetlands provide rich habitats for wildlife, and act as nature's filters to clean surface waters. It is only recently that the importance of wetlands in ecosystems has been recognized, long after human settlement has dramatically altered the number and quality of wetlands in Ontario. It is estimated that as many as 2.4 million hectares (5.9 million acres) of southern Ontario were originally covered by wetlands, and that 70 to 80 per cent of these have been severely altered or destroyed. It is also estimated that more than half the wetlands and marshes in the GTA have already been lost, and today, only one significant coastal marsh — Rattray Marsh— exists in the long stretch between Toronto and Burlington.

In more than 200 years of human activity, wetlands have been drained for farms, bulldozed for housing, or infilled to provide land for industrial or transportation use. Many of today's remaining wetlands in the bioregion have been degraded as the result of upstream pollution or surrounding land uses, and are subject to intense pressure by increased urbanization.

Human influences have extensively altered the geography of the shoreline of Lake Ontario from Burlington to Newcastle. A network of highway and rail corridors runs along the waterfront's edge, while the underwater contours of the lake have been altered by stonehooking (the collection of rock for building) and dredging. Lakefilling programs dating back to the end of the 19th century have filled marshes, created harbours, and been used to establish recreational parks.

In Toronto, for example, all the land south of The Esplanade was created by lakefilling for port and transportation use. Toronto's Port Industrial Area is built on land reclaimed from the Ashbridge's Bay marsh, which was at the mouth of the Don River. The Leslie Street Spit (Tommy Thompson Park), which stretches southward from the Port Industrial Area, was created by the Toronto Harbour Commissioners, using fill



Our deepest folly is the notion that we are in charge of the place, that we own it and can somehow run it. We are beginning to treat the earth as a sort of domesticated household pet, living in an environment invented by us, part kitchen garden, part park, part zoo. It is an idea we must rid ourselves of soon, for it is not so. It is the other way around. We are not separate beings. We are a living part of the earth's life, owned and operated by the earth, probably specialized for functions on its behalf that we have not yet glimpsed.

Thomas, L. 1985. In *Dwellers in the land: the bioregional vision*, K. Sale. 191. San Francisco: Sierra Club.

over a period of 30 years, originally to provide an expansion of harbour facilities. The Metropolitan Toronto and Region Conservation Authority has created four parks from lakefill, and has plans to create two more.

Such parks create recreational space for humans and habitat for wildlife, especially



*Transportation corridor, Metro Toronto*



*Saw-whet Owl*

fish, but not without cost to the environment. One concern is the impact on water quality from contaminants in the fill, and chemicals and metals in sediments that are resuspended during the lakefilling process itself. Another worry is that lakefill adversely affects coastal processes — the currents that move and deposit sand, and which, if unimpeded, naturally cleanse the shorelines of pollutants. Finally, such alterations to the natural shoreline have degraded, and in many places destroyed, valuable wildlife habitats.

In some places, the soils of the bioregion contain chemical pollution, the legacy of

**The environment and the economy must be put on an equal footing, to be weighed and measured together as the basis for development decisions. This will require governments, industry, and individuals alike to integrate environmental and economic decision making.**

1990. *Great Lakes, great legacy?*, T. E. Colborn, A. Davidson, S. N. Green, R. A. Hodge, I. C. Jackson and R. A. Liroff. 230. Baltimore: The Conservation Foundation and the Institute for Research on Public Policy.

human industrial activities. Studies have shown, for example, that the soils of Toronto's Central Waterfront — in many cases the same areas that were created by lakefilling — contain heavy metals and organic chemicals deposited over 100 years of unwittingly careless transportation, industrial activity, lakefilling, and waste dumping.

The extent of soil contamination in areas of historical industrial use elsewhere in the region is not known, although the City of Toronto has been preparing an inventory of old industrial sites where contamination may have taken place. The Royal Commission's audit of Toronto's Port Industrial Area indicates the types of industry where soil contamination is likely to be found; one such category is old refineries — and there are half a dozen old refineries along the Greater Toronto Waterfront.

Although technology exists to clean up contaminated soils, the cost of remediation is high. What is less clear is the environmental costs of not cleaning them up.

More information exists about historical solid waste landfills than about soil contamination at old industrial sites: as many as 276 abandoned landfill sites dot the GTA. However, because waste dumping was essentially unregulated until about 20 years ago, it is difficult to say what materials were deposited in any particular landfill and there is little information about the extent of soil and groundwater contamination that may be occurring around such sites.

### **Human Activity**

The land base of the Greater Toronto Bioregion represents about one per cent of Ontario, and is home to about four million people — fully 40 per cent of Ontario's population. The GTA population is one-third greater than that of British Columbia, and almost twice that of Alberta. The number of people living in the area began to increase dramatically in the post-war industrial boom. In the 25 years between 1961 and 1986, for example, the GTA's population

grew by 1.6 million people, a rate of about nine per cent per annum— three times that in the rest of the province.

Significant numbers of people continue to be attracted to the area — net migration is about 60,000 people a year (the equivalent of the population of Kingston). More than half of all immigrants coming to Canada end up in the GTA. Although the rates of migration and population growth are expected to slow in future, the population of the GTA is expected to increase to as much as 5.4 million by 2011, mostly in the regions outside Metro Toronto.

In 1986, the population on the Greater Toronto Waterfront (defined as the first two census tracts north of the water's edge) was about 366,000 people, or roughly ten per cent of the total population of the GTA. Redevelopment and changes in land use have meant significant growth in housing on the waterfront since 1987 — from 1987 to 1989, a total of 7,860 housing units were built on the waterfront. Only 15 per cent of them were assisted or market rental units, the balance being homeowner condominium units, mostly one-bedrooms and bachelors. The result has been an imbalance in waterfront housing starts between condo and other housing types — an imbalance that, to a large degree, excludes families and moderate-income households.

The population explosion in the GTA has been both a causal factor and a consequence of the substantial economic growth in the bioregion. The GTA has been called the "economic engine that drives the nation", and is currently the fastest-growing urban area in North America. Home to about 16 per cent of the nation's population, the area generates about 20 per cent of its personal income. The region generated some \$100 billion of Gross Provincial Product (GPP) in 1988, two-thirds of that of Quebec and 25 per cent larger than that of British Columbia. Half the income tax paid to the federal and provincial governments from Ontario comes from the GTA.

In the Toronto Census Metropolitan Area (CMA), which is smaller than the GTA, unemployment rates in 1988 and 1989 were less than half the national average. The Toronto CMA remains the manufacturing capital of Canada and also offers substantial numbers of jobs in a variety of sectors: business, personal, and community services; trade and commerce; finance, insurance, and real estate; and transportation, communications, and utilities.

Keeping the GTA economic engine running requires large amounts of energy: transportation and heating; and residential, institutional, and industrial cooling and lighting, which require 275 gigajoules of energy per capita per year (the equivalent of 8,000 litres of gasoline). Some electricity is generated in the GTA, notably at the Lakeview Generating Station in Mississauga and the Pickering Nuclear Plant. In general, however, the area imports more electricity



*The Niagara Escarpment, Mount Nemo Conservation Area*

In fact, employment growth in the area has been strong since 1981 and, by 1986, there were 2.1 million jobs in the GTA. Some 370,000 jobs were created between 1983 and 1989 and predictions are that employment growth will continue to increase and will reach 3.5 million jobs by 2031. Most growth is expected to occur by the turn of the century and, as in the case of population growth, is expected to occur in the regions outside Metro Toronto — unless population patterns change.

from distant hydro-electric and nuclear sources than it produces.

Although there are some petroleum refineries in the GTA, all the crude oil and natural gas used comes from outside the area and is transported into it by tanker truck or pipeline. In sum, the GTA is a net energy importer, and to a large degree, the environmental costs of energy production are borne elsewhere.

Canadians produce more solid waste (garbage) per capita than any other people



in the world. The four million residents of the GTA produce about 4.5 million tonnes of waste annually — more than a tonne per person. Forty per cent of that waste comes from homes; the rest is produced by institutions, industries or commercial establishments. The amount being recycled ranges from eight to about 20 per cent across the GTA, with the remainder taken to landfill

*Autumn in the Oak Ridges Moraine*

disposal sites, most of which are in the GTA. (The exception is the Region of Halton, which has no landfill site, and which ships its garbage to St. Catharines and Niagara Falls, New York for disposal.) The regions of the GTA face a major garbage crisis: landfill capacity for the area will be exhausted by

mid-1993. The five regions joined together in 1989 to explore development of a long-term waste management system for the GTA.

It is not known how much hazardous waste, which, according to provincial regulations, must be specially treated, is produced by the 6,000 industries and commercial establishments in the GTA. The GTA, however, has no facilities for the special treatment of hazardous wastes, and such wastes are sent for treatment and disposal to facilities in Quebec, Samia, and the United States. Small quantities of hazardous wastes are exempted from government regulation, and are often dumped into sewage treatment systems of the GTA.

Because sewage treatment plants (STPs) are not designed to deal with organic chemicals and heavy metals, much of this toxic load ends up in the waters of Lake Ontario. The precise amount coming from industry is unknown, and there are substantial (though unknown) quantities of “household hazardous waste” — cleaners, pesticides, solvents, and paints — being poured down residential sinks in the area.

Four million people also produce a lot of human waste and a vast amount of wastewater. Across the bioregion, a network of sewers collects and transports this wastewater to 11 STPs for treatment. The network is vast — Metro alone has 336 kilometres (210 miles) of sewers — and, especially in older areas, repairs or replacement of crumbling and leaking pipes are needed. Some sewage treatment plants are under-sized and expansion of capacity at Metro’s Main STP, in order to meet existing and future needs, is expected to cost \$1.5 billion. Almost half of the flow into Lake Ontario in the Toronto area comes through the sewage treatment plants (the rest is from rivers in the area) and the plants are responsible for high loadings of nutrients to the nearshore areas of Lake Ontario.

A typical rainfall in the Toronto area dumps approximately 4.5 billion litres (one billion gallons) of water that rushes off roofs, roads, and parking lots into sewers,

and often into combined storm and sanitary sewer lines. This sudden pulse of water can cause several problems: stormwater, already contaminated with animal droppings, oil,



*The heart of the Central Business District, City of Toronto*

grease, metals, and other contaminants, mixes with untreated human sewage. The noxious brew enters the rivers in the area or descends on sewage treatment plants designed to carry only some of the extra burden. In order to prevent flooding at the plants, the sewage/stormwater mixture is given only partial treatment and is diverted into the lake. The resulting high level of bacteria is largely responsible for the beach closings along the Greater Toronto Waterfront every summer.

One solution to the problem of combined sewers is to separate them into sewage lines and stormwater lines. In Metro, this work has been under way in the various municipalities for many years, but the task remains