5.0 Natural Heritage System

NPCA- Suzanne McInnes, Coordinator of Watershed Planning

5.1 Planning for Natural Heritage

Within Canada, the provinces have authority over natural resources and municipal institutions. All provinces, including Ontario, have a Planning Act that establishes the rules for the operation of a municipal land use system. Each municipality is required to have an overall policy plan (Official Plan) and detailed zoning by-laws that complement the general policies. In Ontario and the rest of Canada, protecting natural areas was not part of the policy concerns of local municipalities prior to 1970 (Eagles, 1984).

In the early 1970's several studies were done in a variety of municipalities (e.g. Haldimand-Norfolk, Waterloo Region, Ottawa Carleton) that identified the possibility of municipalities becoming involved in the protection of local natural areas. This was taking place at the same time as the Province was reorganizing municipal government into a system of regional and local governments. Many of these early environmental studies identified criteria for determining Environmentally Sensitive Areas (ESAs) and mapped the natural features that were later included in Official Plans for the newly created Regional governments (e.g. Haldimand-Norfolk, Hamilton-Wentworth, Waterloo, Halton, Ottawa-Carleton). An Environmentally Sensitive Area Study for Niagara was published in 1980, although policies and detailed mapping were not included in the Region of Niagara's Official Plan at that time.

In 1983, the Province substantially reformed the Planning Act by introducing provisions for provincial policy to guide municipal planning and mandated that decision makers "have regard" to such policy. At the same time, the Province introduced "natural environment" as a provincial interest requiring protection.

The Province became involved in land use planning for the natural environment with Niagara Escarpment Plan. The Niagara Escarpment has long been recognized as an important part on Ontario's natural history. Public concern about its importance increased through the 1960's and in 1973 became governed by the Niagara Escarpment Planning and Development Act (NEPDA). The NEPDA was the first piece of provincial planning legislation with an explicit environmental purpose (Riley, J.L. et al, 1996, p. 8). The Niagara Escarpment Plan in the first large scale environmental land use plan in Canada. The Niagara Escarpment Plan was originally approved on June 12, 1985 and a revised plan signed by the Lieutenant Governor in Council on June 1, 2005.

Between 1994 and 2005, the Province had differing views on the appropriate role of the Province in land use planning, reflecting the government in power at the time. In 1995, the Province renewed their interest in Provincial Planning and consolidated policies into a single Provincial Policy Statement (PPS). Natural Environment was included in the category of "Natural Heritage" and speaks to an ecosystem approach to the protection of natural heritage features and areas. The Planning Act was also amended to reflect the Provinces interest in "the protection of ecological systems, including natural areas, features and functions". The change in Provincial interest from "natural environment" in 1983 to "protection of ecological systems" in 1995 is reflective of the changes in science of conservation biology.

The landscape in the NPCA watershed today is a result of its natural characteristics and the changes influenced by human activities. The landscape of Southern Ontario was influenced by human progress and technical innovations. Niagara is unique for several reasons: it is surrounded by water on 3 sides; transportation needs associated with movement of goods and people, via road, rail and shipping between Canada and the United States; a centre for hydroelectric power generation in Ontario; and its physical location as one of the southern most parts of Canada. The climate allows for growing tender fruit on prime agricultural lands of national and provincial significance. Niagara is home to many plants and animals that are not found in other parts of the country.

The products from this Natural Areas Inventory (NAI) will provide the watershed municipalities with up to date mapping of natural areas to enable them to establish natural heritage systems that will be designed to protect natural heritage features and functions for present and future generations.

5.2 Land Use

The Niagara Region with its proximity to the Great Lakes and its strategic position as an industrial centre and border region leads to the demands of competing land uses. The combination of climate, physiography, soils and location make Niagara one of the most productive agricultural areas in Canada. The physical distinctiveness of the region is what has enabled a unique agricultural industry to develop. (RMN, 2003, p.2.1) For those same reasons the Niagara Peninsula is one of the most ecologically rich areas in Canada. The Niagara Peninsula is located within the northern most range of the deciduous forest region in North America (also referred to as the Carolinian Canada zone). It has the warmest average annual temperatures, the longest frost-free growing season and the mildest winters in Canada. This zone represents 1% of Canada's land area and it has more species of plants and animals than any other ecosystem in Canada (Carolinian Canada website).

5.2.1 Settlement

Settlement tended to follow routes such as old Indian trails. Clearing of the land and timber extraction began for agricultural purposes throughout the region and a string of villages grew up as service centers and early industrial developments. Some of the early settlements were Newark (Niagara-on-the-Lake), Queenston, Chippawa, St. David's, St. Catharines, Jordan, Beamsville, Grimsby, Beaverdams and St. Johns. (Gayler, 1994, p. 243)

Niagara's early settlement, its strategic location in terms of access to the United States and the development of hydroelectric generation lead to the growth of several cities and associated heavy industry. Hamilton, St. Catharines, Thorold, Welland, Niagara Falls and the US cities of Niagara Falls and Buffalo became factory towns for iron, steel, metal fabrication, heavy engineering, abrasive products, pulp and paper, chemicals and auto manufacturing. (Gayler, 1994, p. 6)

5.2.2 Hydro-electric Generation

The value of the Niagara River as a source of industrial power has been recognized since the time of the early settlers. The swiftness of the current above the falls made it ideal for the generation of power, and as a source of fast moving water for mills. The

first small hydro-electric generating unit replacing mechanical water power was built on the American side of the Niagara River in 1882.

The switch to hydroelectricity from fossil fuels was accelerated in part by the strikes of 1902 in Pennsylvania which halted all shipments of coal to Ontario. Canada's dependence on American sources of energy was emphasized and Canadian funded hydroelectric projects began in earnest.

One of the oldest hydroelectric power plants in Ontario, The De Cew Falls Generating Station was built by the Cataract Power Company to supply electricity to Hamilton. Ground was broken on October 5, 1897 and the first transmission was sent from DeCew Falls to Hamilton on August 25, 1898 just over 10 months after construction began.

Sir Adam Beck led the campaign to persuade the provincial government on the Canadian side of the Niagara River to invest in hydro power eventually leading to the creation of the Hydro-Electric Power Commission of Ontario (later known as Ontario Hydro) in 1906. In 1917, the Power Commission started construction on the Queenston Chippawa Development.

The most hydrologically significant aspect of this development was the 13 kilometre long feeder canal from the Welland River transecting the urban area of Niagara Falls to the generating station at Queenston. This supply channel was constructed using the lower 6 kilometres of the Welland River that had originally flowed into the Niagara River. The Welland River underwent extensive dredging and profiling in order to accommodate the reversal of flow and its rerouting into the feeder canal. The water from the Niagara River now flows upstream in the historic Welland River channel to the Chippawa Power Canal where water from both rivers is allowed to mix. This development was completed in 1922 and is still in operation today under the name Sir Adam Beck 1 Generating Station. (Nicholson, 1997, p. 62)

The Second World War increased the demand for electricity and additional diversions of water were required to enable the plant at Queenston to generate the maximum amount of power. A weir was constructed half way across the river just upstream of the falls for the purpose of directing flow of the Niagara River towards the intakes of the feeder canal.

A change in agreements between the American and Canadian regulators of the resources at Niagara Falls paved the way for the construction of a second power generation facility on the River. The construction of Sir Adam Beck 2 Generating Station began in January of 1951. The new facility located beside the Sir Adam Beck 1 station consisted of an intake structure in the upper River, twin 9 kilometre long feeder tunnels built under the City of Niagara Falls, an open cut channel 4 kilometres in length, and a state-of-the-art pumping station.

Currently 1,800 cubic metres of water per second is diverted from the existing twin tunnels and hydro canal. Once the third tunnel (anticipated in 2012) is completed an additional 500 cubic metres of water per second will be diverted for the purpose of generating hydro electric power to an additional 160,000 homes (www.niagarafrontier.com).

5.2.3 Transportation

In the early days of European settlement, it was the rivers of North America that provided the access to its interior. Pioneers and trappers alike used the rivers for transportation and trading. In some cases, long stretches were traveled without hindrance while other areas contained series of rapids and narrow passages that had to be negotiated. Regular portages were established at such places. The Niagara River was one such place where a triple hazard existed of rapids, falls and a narrow gorge. (Nicholson, 1997, p. 40)

5.2.3.1 Shipping

The true importance of this region as a trade and communications route was realized during the War of 1812. It became obvious that a more formal transportation route needed to be built. The building of the Erie Canal on the American side of the border was seen as a threat to gain control over the Great Lakes. The development of new technology and the rising concern over safety of the settlement led to a re-emergence of the canal concept championed by William Hamilton Merritt, a miller in the Region in 1818. (Hadfield in Nicholson, 1997, p. 42)

The first Welland Canal opened in 1829. Construction of the second Welland Canal began in 1842. The third canal was completed in 1881. Each time, many changes took place to accommodate larger shipping vessels. Despite the enlargement of the canal, by the end of the nineteenth century, the ever increasing size of ships necessitated another rebuilding. Construction of the fourth canal began in 1913. The ever-increasing size of the ships travelling the canals system meant that a deeper channel was required to accommodate them. By the 1920's a new solution to the aqueducts had to be found. It was decided that the Welland River would be re-routed under the Canal through a siphon structure (Public Works Canada in Nicholson, 1997, 48). It took nearly twenty years to build this fourth canal because of the interruption of the First World War. The fourth canal opened on August 8, 1932. In 1973 a new section was constructed to by-pass Welland. A second syphon structure was constructed on this canal.

5.2.3.2 Railway

Railways developed after the mid-1830s and again after the mid 1860s to link communities on both sides of the Niagara River. Significant hubs were created where bridges crossed the Niagara River at Niagara Falls and Fort Erie. Hubs were also created where railways converged in Niagara Falls, Buffalo and to a lesser extent in Welland. (Jackson, 2003, p. 164)

Railway connections across the Niagara River were important because it allowed a shorter connection between Detroit and Niagara, and diverted western rail traffic from the longer route in the United States south of Lake Erie.

The railway was also important for tourists travelling from Buffalo to Niagara Falls or Fort Erie (e.g. Crystal Beach and Erie Beach). The connection to Erie Beach was short lived (1885-1910) because a pier was built at Erie Beach for steamer traffic from Buffalo. (Jackson, 2003, p. 167)

During the railway era, 3 bridges were built to cross the Niagara River. The Niagara Suspension bridge was completed in 1855 and was located north of the falls in the City of Niagara Falls. This bridge was replaced after twenty-six years of service in the same location and was renamed the Niagara Steel Arch Bridge. It was later modernized in 1919. The second bridge, the International Bridge, was completed in 1873 and crossed the Niagara River between Fort Erie and Black Rock. The third railway bridge was constructed across the Niagara gorge in 1883 and it was the world's longest double-track truss span. It was replaced in 1925 by the Michigan Central bridge located north of the original structure. Other crossings of the Niagara River were considered but never materialized. The railway bridges played significant roles in the urban development of both Niagara Falls and Fort Erie.

At its peak in the 1950s, the CN yard in Fort Erie was the third largest railyard in Canada. The railroad industry began to decline in the late 1970s in Fort Erie when all eastbound and westbound marshalling was moved to Buffalo. The yard is currently considered a "minor switching yard" for servicing local customers and staging of trains traveling to the United States. (Town of Fort Erie, 2008)

Some railways in Niagara continue to be used today and others have been abandoned in favour of truck transportation. As railways were abandoned, opportunities arose to purchase the rights of way for public multi-use trail purposes (e.g. Friendship Trail in Fort Erie, and the Gord Harry Trail in Wainfleet).

5.2.4 Agriculture

The combination of climate, physiography, soils and location make Niagara one of the most productive agricultural areas in Canada. The Niagara Peninsula is not a true peninsula; it is a narrow feature of land stretching to the Niagara River between Lake Erie and Lake Ontario. Its positioning between two of the largest fresh water lakes in the world gives it a natural advantage for agriculture not only because of the moderating influence of the lakes, but because of the availability of fresh water. (RMN, 2003, p.2.1)

The majority of the Niagara land base (both above and below the Niagara Escarpment) qualifies as prime agricultural land in Canada. In addition to the Class 1, 2 and 3 lands, there are large areas of specialty crop production lying between the Escarpment and Lake Ontario. Other areas of special crop production are the Fonthill Kame and portions of the Wainfleet Marsh, west of Port Colborne. Soil resources and agricultural infrastructure provide the necessary conditions for special crop production. Given that only 5% of the Canadian land base qualifies as prime land, the high incidence of prime land in Niagara is extremely significant.

In Ontario, clay plains like the Haldimand Clay Plain making up much of the study area of the NAI are usually used for farming with emphasis on livestock due to the heavy soils. In the study area, this is not always the case as many of the farms are subsistence in nature and much of the land on this clay plain remains idle. Dairy farming is more prevalent closer to the escarpment in the Haldimand area on better-drained soils. (Chapman and Putnam, 1984, p. 158) The most important crops on the clay plain are hay, corn, oats, wheat and barley with an emphasis in recent years on soya beans.

In 2001, Niagara generated $511.13 million in gross farm receipts. On a national basis,

Niagara generates higher gross farm receipts than any of the Maritime Provinces. The average gross farm re ceipts, in Ontario is $674 per acre, in southern Ontario $995 per acre and in Niagara $2,195 per acre. (RMN, 2003, p.9.5)

5.2.5 Aggregate Extraction

The Niagara Escarpment is an enormous and continuous outcrop of useful rock. Huge quantities of limestone and dolostone are essential to the heavy industry in the Hamilton region since they are used as flux in the smelting of iron ore in the process of steel production. The escarpment rock has been used historically and in present day as one of the primary supplies of building stone to the major cities in Canada. One of the most famous examples is the use of the rose-coloured sandstone in the construction of the Legislative Buildings of Queen's Park in Toronto. (Chapman and Putnam, 1984, p. 120) The shales of the escarpment are used in the making of brick, tile and other ceramic products. The sand and gravel deposits are also extremely important to the production of construction materials such as concrete and asphalt.

5.2.6 Recreation and Tourism

Niagara Falls has long been a tourist attraction however, over time and with changes in available methods of transportation from rail to ship to car to airplane, the tourist has changed from local to international visitors; from those seeking a wilderness adventure to those with more refined tastes. At present, between 12 and 14 million visitors annually make Niagara Falls one of the premier destinations in North America. (Gayler, 1994, p.2)

In addition to the tourist venues immediately surrounding the Falls, there are other amenities that have drawn tourists to the area over the years. The Niagara Parks Commission owns parkland running the length of the Niagara River Parkway from Fort Erie to Niagara-on-the-Lake where they offer various tourist services. The Town of Niagara-on-the-Lake with its rich heritage and theatre has become a destination in and of itself.

The Greater Niagara Circle Route Trails System is over 140 km of mostly off-road, paved trails suitable for walking, cycling or rollerblading. Motorized vehicles are not permitted. The paved trail passes through urban centres, downtowns, the Niagara Escarpment, waterfronts, and rural/agricultural areas. The system includes the Welland Canals Trail which passes alongside parts of the existing and previous canals from St. Catharines on Lake Ontario (north end) through Thorold and Welland to Port Colborne on Lake Erie (south end). The Friendship Trail runs between Port Colborne and Fort Erie (east end). From Fort Erie the Niagara River Recreation Trail follows the Niagara River, through the city of Niagara Falls, to Niagara-on-the-Lake (north end). The Waterfront Trail follows Lakeshore Road from Niagara-on-the-Lake to St. Catharines (west end).

As of 2008, there are more than 45 golf courses in Niagara and another seven in the Haldimand area. They attract additional tourists to the area during the summer months.

5.3 Changes to the Landscape as a Result of Major Infrastructure

5.3.1 Surface Water

As a result of the construction of the Welland Canal, there have been many modifications to the natural environment. For example, several watercourses that originally flowed into the Niagara River that were bisected by the Welland Canal (e.g. Lyons Creek, 10 Mile Creek). There are other areas that have naturalized as a result of the placement of spoils from the excavation of the canal (e.g. the wetland created at Mud Lake in Port Colborne).

The International Joint Commission undertook a study to determine the remedial works necessary to preserve Niagara Falls in 1950. The recommendations of that study were approved July 22, 1953, calling for the construction of a Hydro Control Dam. The subsequent Niagara Diversion Treaty, between Canada and the USA, outlined the priorities for allocation of water for, firstly, the Falls flow, and then for other uses. Once the higher priority uses are fulfilled, water that remains could be diverted from the Niagara River for hydro-generation. The Treaty stated that a minimum of 100,000 cubic feet per second would flow over Niagara Falls during the day (8:00 a.m. to 10:00 p.m.), while at night the flow could be reduced to a minimum of 50,000 cubic feet per second.

The Hydro Control Dam is located just upstream of Niagara Falls and has 18 sluice gates which are used to adjust water levels within allowable tolerances to meet the Treaty principles with respect to supplying the Falls flow. Through the International Niagara Board of Control 1993 Directive, water levels in the Niagara River Grass Island Pool (the pool formed in the Niagara River immediately upstream of the Hydro Control Dam) can vary in any given day by as much as 0.46 m over an operating range of 0.91 m from 170.70 m to 171.61 m (Ontario Hydro, 1991).

The lower portion of the Welland River has been modified for major infrastructure including the Old and New Siphons (which allowed construction of the 3rd and 4th Welland Shipping Canals) and Ontario Power Generation (OPG) facilities along the Niagara River. The lower reach of the Welland River (also referred to as Chippawa Creek) flows from the Niagara River upstream into the Queenston-Chippawa Power Canal. Since 1953, water has been diverted from the Niagara River, up the Welland River, and into the Power Canal. The regulated diversion of water in the lower Welland River creates a pattern of regular diurnal fluctuations in water levels that extends approximately 60 km upstream of the diversion.

Due to the very flat gradient of the Welland River, and as a result of the Hydro Control Dam diverting vast quantities of water from the Niagara River into the Welland River, the water levels within the Welland River are completely controlled by the operating range of the Hydro Control Dam. In essence, the Welland River acts like a linear 60km long reservoir where the water levels are tightly controlled. (Steve Miller, 2009)

While hydro electricity is produced at Niagara Falls, utility corridors are also necessary to distribute the power to other locations in Ontario. As a result, many natural areas are fragmented by hydro right-of-ways. For example, Short Hills Provincial Park has three hydro corridors through it. (Riley, J.L, et al.,1996, p. 49)

5.3.2 Woodlands

Most of the original woodlands in Ontario (south and east of the Canadian Shield) have been removed since European settlement. Around 1920, the availability of coal and electricity began to relieve the pressure for fuel wood consumption in urban and rural areas of Ontario. Over the last 60 years agriculture has become more focussed on the best quality farmlands, allowing marginal farmland to return to a natural state.

In Niagara, the NPCA watershed was almost completely forested prior to European Settlement. "Wet lowland forest prevailed in the lower Welland River, upper Niagara River and Lake Erie watersheds. Moist maple-beech dominant forest occurred for much of the remainder of the area." (RMN, 2003, p.4-12) Given the huge extent of prime agricultural lands in the Niagara Peninsula, particularly north of the Niagara Escarpment there are few remaining woodlands with the exception of those found in valley corridors.

Within the Niagara Escarpment Plan Area, the Niagara Peninsula section is the least forested section. The forested slopes and valleys play a critical role in maintaining linkages between natural habitats on the fragmented landscape. Many of the Escarpment Natural Areas on the escarpment slopes in Niagara are covered in forests that are over 100 years old, originating from stands that were clearcut or heavily logged in the mid-to-late 1800s. There are also some old-growth forests, with trees in excess of 150-200 years old, in the St. John's-Fonthill valley, North Pelham Valley, Niagara Gorge and Beamer Valley. Very few of the forested areas in the Niagara Peninsula Section of the Niagara Escarpment Plan provide large forested interiors because of the fragmentation from roads and hydro lines (Riley et al, 1996, p.48-50).

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