

Chapter 2 Niagara Land Base

2.1 Introduction

This chapter provides an overview of the agricultural characteristics of the Niagara region. It is the combination of climate, physiography, soils and location that make Niagara one of the most productive areas in Canada. The physical distinctiveness of the region is what has enabled a unique agricultural industry to develop.

2.2 The Geographic Profile – Niagara Perspective

The Niagara area is best described as lands that extend around the western and southern extent of Lake Ontario encompassing land from Lake Ontario (to the north), Lake Erie (to the south) and the Niagara River (to the east). On the west, the Region shares borders with the City of Hamilton and Haldimand County.

Niagara is not a true peninsula; it is actually a narrow neck 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 ready availability of fresh water.

Niagara is one of the smaller geographic regions in the province. Of the 49 regions, counties, districts and cities in Ontario, it ranks 39th in size. It covers an area of approximately 1,800 square kilometers (715 sq miles) and in 2001, had a population of 410,574¹. Of the 444,349 acres that comprise Niagara, 232,817 acres² of that is farmland.

To assess the status of Niagara as an agricultural area from a resource perspective, three main factors were considered: physiography; soil capability and climate.

2.3 Physiography

Niagara is comprised of three distinct physiographic regions including the Niagara Escarpment, Iroquois Plain and the Haldimand Clay Plain. The Niagara Escarpment effectively divides the physiographic regions by isolating the Iroquois Plain (lower area adjacent to Lake Ontario) from the elevated areas above the lip of the Escarpment.

The Niagara Escarpment extends in a roughly east-west direction through the Niagara area. The Escarpment is a distinctive feature with vertical cliffs along the brow. In some areas, particularly just east and west of St. Catharines, and again near Beamsville, there is a 'bench' area between the brow and the lower areas near Lake Ontario.

The Iroquois Plain lies between the Niagara Escarpment and Lake Ontario. The surface soils from Grimsby eastward comprise sandy textures overlying clay subsoils. West of Grimsby, the soils developed on red clay. These soils are heavy and have low permeability. The heavy clay soils shed water easily and dry out rapidly. These soils contain little organic matter and can be difficult soils to work.

¹ 1995 Ontario Municipal Directory, Ministry of Municipal Affairs and the Association of Municipal Clerks and Treasurers of Ontario, ISBN: 0-921067-00-3

² Census of Agriculture, Statistics Canada 2001, Catalogue #95F0302XIE

The Haldimand Clay Plain lies between the Niagara Escarpment and Lake Erie. The overburden of soil materials is generally less than 15.4 m (50 feet) near the Niagara Escarpment and increases in depth towards the south. The Haldimand Clay Plain is best described as falling into a series of parallel belts with the highest ground adjacent to the Escarpment.

The Haldimand Clay Plain typically has more relief in the western portion than in other areas. The drainage is controlled by ridges which direct surface waters to the east. Some of the streams have carved deep notches in the Escarpment and drain to Lake Ontario.

Within the clay plain are smaller areas of sandy soil materials located near Dunnville. This area is termed the Dunnville Sand Plain and is characterized as wet sandy loam. Adjacent to the Dunnville Sand Plain is an undrained area known as the Wainfleet Bog. This area comprises deeper organic soil deposits overlying the heavy clay soil materials.

Figure 2.1 provides an overview of the physiography of Niagara.

2.4 Soil Capability

The Canada Land Inventory (CLI) System is a soil classification system that ranks mineral soils of a specific area for the production of common agricultural crops. This system assigns classes and subclasses to land based on a standardized rating system. Organic soils are not rated within this system. Organic soils are unique soils that, depending on circumstances, may be extremely useful for agricultural production.

Class 1, 2 and 3 soils, as classified under the CLI, are considered Prime Agricultural Lands as defined within the Provincial Policy Statement (PPS).³ Municipalities use this classification system as the basis to identify lands that will be protected for agriculture. A detailed explanation of the various classes and subclasses under the CLI is provided in **Appendix 5**. The CLI mapping for Niagara is shown on **Figure 2.2**.




As **Figure 2.2** illustrates, the quality of the soil in Niagara is very significant and its importance should not be underestimated. Canada as a country does not contain extensive amounts of agricultural land, only 5% of the land mass is classified as prime land. **Figure 2.3** is a generalized map showing the principal soil zones with agricultural potential in Canada. It does not factor in additional constraints that affect agriculture, such as climate and growing season, and thus does not break down the specific capability of agricultural land. However it does provide a snapshot of the resource and put the importance of the Niagara resource in context.

³ Provincial Policy Statement 1996, (Revised Feb. 1, 1997)

FIGURE 2.3 - Principal Zones of Soil Limitations for Agriculture in Canada



THE PRINCIPAL ZONES OF SOIL LIMITATIONS FOR AGRICULTURE IN CANADA

-  PREDOMINANTLY FROZEN GROUND
-  UNFROZEN, BUT WITH BEDROCK AT OR NEAR THE SURFACE
-  PRINCIPAL ZONES WITH SOIL POTENTIAL FOR AGRICULTURE

Source: <http://geogratis.cgdi.gc.ca/CLI/frames.html>

Niagara has gone beyond most municipalities in identifying and mapping agricultural land. The original soil surveys for Niagara were published in 1935 and 1963 respectively, for the former Counties of Welland and Lincoln. In 1980, being dissatisfied with the level of information available, Regional Council requested upgrades of this information. In response, the soils were resurveyed resulting in a report entitled “The Soils of Regional Niagara 1989”⁴ authored by the former Ontario Institute of Pedology.

This survey is one of the most up to date of any of the soil surveys done for a region in Ontario. According to the Ontario Ministry of Agriculture (OMAF) staff it was conducted at a level of precision that is superior to other soil surveys. It included geological and physiological features; soil groups and types; soil moisture characteristics; drainage and variability; common properties of soil groups; schematic cross sections of relationships and relative depths of soils; climatic zones for grapes and

⁴ Kingston, J.S., and E.W. Presant. The Soils of the Regional Municipality of Niagara. Report No. 60 of the Ontario Institute of Pedology. Volume 1. Queen’s Printer for Ontario. 1989.

tender fruit; agricultural land suitability ratings for certain crops and land use and management comments.

Soil survey intensity levels indicate the precision of detail in a study. Level 1 indicates the precision of a detailed large-scale survey (eg. 1:10,000), Level 5 indicates the precision of a small scale survey (eg. 1:250000). The survey intensity level of the Regional Niagara soil resurvey is a Level 2. When the soil survey was being conducted in 1989, the authors were concerned that the CLI was designed for common field crops, not for the less commonly grown field and horticultural crops found in Niagara. Since a large portion of the Niagara Region was used for growing specialty crops, the study was expanded to include a more detailed suitability rating for these specialty crops.

Niagara used this very detailed work as the basis for their agricultural soil classification map. The Region actually went a step further with the information by grouping the individual soil polygon complex CLI ratings into a single classification to produce the regional map. A copy of this is included as **Figure 2.4**. A review of this mapping indicates that the majority of the Niagara land base (both above and below the Niagara Escarpment) is defined as Canada Land Inventory (CLI) Class 1 – 3 lands.

This mapping also confirms that large areas of specialty crop production occur in an area lying between the Escarpment and Lake Ontario. These are the lands referred to as the grape and tender fruit lands. Other areas of specialty crop production are associated with areas of organic soil such as are found in the Wainfleet Marsh, west of Port Colborne. In specialty crop areas, soil resources and agricultural infrastructure provide the necessary conditions for the specialty crop production.

The extent of the prime soils in Niagara is very significant. As noted previously, only 5% of the Canadian land mass is classified as prime agricultural land. Therefore, Niagara contains a significant resource that is extremely limited on a national basis. In managing this resource, Niagara is fortunate in having one of the most up to date and detailed soil surveys in Ontario. The Region has made good use of this detailed assessment to produce a rigorous, accurate classification of land upon which to base planning policies.

2.5 Climate

Climate is the third factor which elevates the productive capacity of an area. The Region of Niagara is located within the Niagara Fruit Belt and the Lake Erie Counties Climatic Region. The northern portion of the Region of Niagara (between the Escarpment and Lake Ontario) is located within the Niagara Fruit Belt Region. This area is better suited to tender fruit and grape crops than any other area in Ontario. Niagara ranks second in North America in terms of stability for producing stone fruit.

The Niagara Fruit Belt Climatic Region is further subdivided into a number of grape and tender fruit climatic zones. Each zone is identified and numbered for grape and tender crop suitability with the most suitable climatic zone as Number 1 and the least suitable as Number 7. This breakdown is shown on **Figure 2.5**.

Many specialty crops are less hardy than common field crops and have specific moisture requirements. Climatic factors are often as important as soil factors in determining the suitability of areas for specialty crop production. Temperature, precipitation and growing season data suggest that in general, the climate of Niagara (in particular the area adjacent to Lake Ontario) is well suited for a wide range of specialty crop and horticultural crops. This is mainly due to the location and proximity to Lake Ontario.

The Region of Niagara is also located in an area of high Crop Heat Units (CHU). Crop Heat Units are a rating system based on the total accumulated CHU for the frost-free growing season in each area of the Province. The Region of Niagara is divided into two areas: north of the Escarpment to Lake Ontario is rated as 3100 to 3200; and the area from Lake Erie to the Escarpment is rated as 3200 to 3300. These ratings allow for a greater variety or flexibility in the type of crops grown. **Figure 2.6**, which maps the crop heat units for the province, clearly illustrates the advantage Niagara has over other areas in terms of climate.

2.6 Productivity Potential

The productivity potential for any land area depends on many factors and assumptions. It is assumed that 'best management practices' have been employed by the farm operators and that any lands requiring soil drainage and/or irrigation have been modified to incorporate these factors, if it is physically and economically feasible to do so. With this in mind, the above-mentioned factors of climate, soil characteristics and topography will greatly influence the potential productivity of an area.

As mentioned, in the Niagara region, the factor of climate (microclimate with respect to the proximity of Lake Ontario) provides the greatest influence on the land between the Escarpment and Lake Ontario. The height of the Escarpment allows for cold air drainage down the escarpment face and out to Lake Ontario, thereby providing some protection from early frost damage to crops. As a result of this microclimate, the productivity potential of this area is very high.

There are a number of systems available for assessing and ranking the productivity of agricultural lands. These include:

- Microclimate & Micro Soil Classification (agroclimatic resource index)
- Land Suitability Rating System for Spring Seeded Small Grains; and
- LEAR – Land Evaluation and Area Review.

Aspects of each of these approaches have been used in Niagara and have contributed to the designation of agricultural land and the policies designed to manage it. A brief description is provided below of each of these approaches to facilitate an understanding of the very comprehensive approach that Niagara has employed to assess agricultural land in the Region. Although there is always room for improvement, Niagara is far ahead of most other jurisdictions in their approach to the analysis of agricultural land.

2.7 Microclimate & Micro Soil Classification (agroclimatic resource index)

The Agroclimatic Resource Index provides an approximate method for comparing quality of the agroclimate for agriculture in different parts of Canada. It is calculated from information related to growing season length, temperature and moisture as related to forage yields.

This index is based on long-term records of hay yields, since hay is the only crop which is grown across Canada and can potentially use the full growing season. Index values range from 3.00 for southwestern Ontario to a low of 1.00 for the Northwest Territories. The values in Niagara range from 2.5 to 2.83.

Micro soil characteristics include soil texture, drainage and topography. Many specialty crops require coarser soil types and thrive on gravelly and sandy soil materials. Other specialty crops require loamy or sandy materials while other crops will grow well on a broad spectrum of soil textures.

Soil drainage and irrigation may also play a prominent role in specialty crop production. Soil suitability/productivity ratings will decrease in areas of poorly drained soils due to water logging of soils and excess moisture limitations. Soil suitability/productivity ratings will decrease with increasing slope due to erosion and topographic limitations. The rate of decrease varies, depending mainly on slope, soil texture and crop type.

From a microclimate and soil perspective, the area along the Lake Ontario shore to the Escarpment is well suited to the production of specialty crops. The microclimate is influenced by the location, near the temperature moderating waters of Lake Ontario, and the proximity to the Escarpment. The proximity to the Escarpment is important with respect to the cold air drainage down the Escarpment and out to Lake Ontario. Areas such as the Town of Niagara-on-the-Lake have enhanced this natural advantage with comprehensive, municipality supported irrigation programs. All of these factors combine to make the Niagara area a unique zone for the production of fruit and vegetable crops.

2.8 Land Suitability

A Land Suitability Rating System for Spring Seeded Small Grains was completed as a working document in 1992, by the Centre for Land and Biological Resources. This document was created as a procedure for rating the suitability of land for production of spring-seeded small grains in Canada. The system was developed in response to a number of concerns regarding the CLI system, namely:

- the influence of climate on land suitability for crop production was not adequately taken into account;
- organic soils were not included; and
- lack of specificity in definitions and application guidelines had led to inconsistent ratings among land rating practitioners.

While the system referred to above gives a rating for spring-seeded small grains, the underlying procedure can be applied to provide a basic framework for rating the land resource for any crop. It is based on land and environmental factors as they affect agriculture and it assumes current management practices.

Land Suitability ratings for spring seeded small grains in the Niagara area correspond to the lands classified with CLI ratings 1, 2 and 3. As such, under the more rigorous assessment, these lands will retain the designation of Prime Agricultural Lands.

2.9 LEAR – Land Evaluation and Area Review.

A number of municipalities are embarking on a new process to evaluate the agricultural resources within their boundaries. This process, entitled the Land Evaluation (LE) and Area Review (AR) system for agriculture, was created by OMAF for use by municipalities in identifying significant agricultural lands for long term protection.

The Land Evaluation (LE) and Area Review (AR) system for agriculture involves inventorying lands with agricultural potential and identifying the highest priority lands in contiguous designations. The foundation of these studies is an evaluation of the land resource based on the Canada Land Inventory. The existing information is usually presented at an appropriate mapping scale for regional or county level planning decisions. The lands are also reviewed against factors affecting the potential enhancement of agriculture, such as the addition of irrigation systems, tile drainage, the potential to diminish long-term agriculture through property fragmentation and the intrusion of non-farm uses.

The LEAR process is essentially similar to the process that has already been applied in Niagara for designating agricultural land. As stewards of some of the most significant agricultural land in Canada, the Region has set a standard and already employed many of the techniques recommended by LEAR.

2.10 Summary

The physiography, soil capability/suitability and climate that characterize the Niagara Region combine to create a very special agricultural area. Niagara contains sections where the combination of soil characteristics, climate, access to water and topography combine to produce unique areas of specialty crop production. These areas are unique, not just in Ontario, but on the North American continent. Examples of these unique areas mentioned previously include the tender fruit and grape lands between the Escarpment and Lake Ontario and the Wainfleet Marsh.

Once taken out of production, the agricultural land of Niagara cannot be replaced. It is amongst the best of a limited supply. In making decisions that affect the land base, consideration must be given to the value of the resource. Other areas with lower capabilities for agriculture can be cultivated but more resources are required to obtain similar (or lower) production levels. Certain aspects of production in Niagara could not be achieved elsewhere.

To make decisions concerning the removal of land from production, those responsible for the decision must be knowledgeable about the characteristics of the area. Only by understanding the implications of removing the land from production can decision makers properly evaluate the consequences of their decisions and determine if they are appropriate in the long term.