

## 2 Climate and Soil Considerations

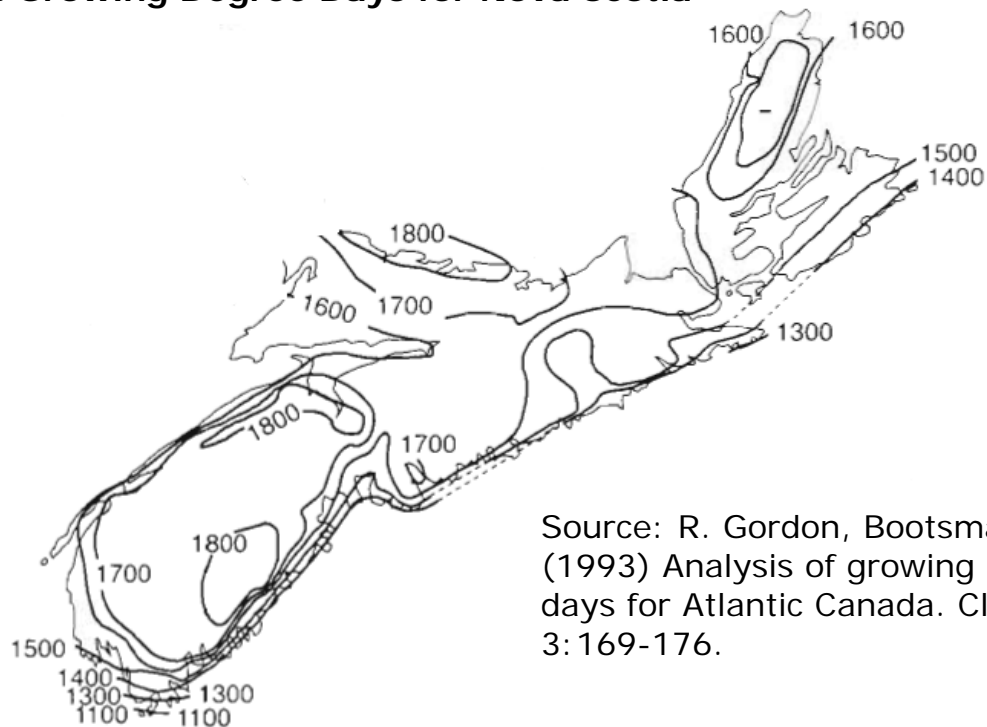
### Resource Kit for Nova Scotia Farmers

The suitability of land for crop production varies throughout Nova Scotia due to differences in topography, soil type, drainage, frost potential, and orientation. While the general climate is fairly consistent throughout the province, microclimatic conditions and soil quality vary from farm to farm. This fact sheet describes some of the things you need to keep in mind when looking for a farm to buy or rent.

#### Climate

The climate in Nova Scotia is strongly influenced by the Atlantic Ocean. Winter temperatures average  $-5^{\circ}\text{C}$  and summers average  $14^{\circ}\text{C}$ , with coastal areas having slightly warmer winters and cooler summers than inland. The growing season in Nova Scotia, ranging from 100 to 200 days, has a well-distributed pattern of high rainfall with mean precipitation of 900mm a year inland and over 1500mm a year on the coast. Typically in Nova Scotia, there is 400-500mm of precipitation distributed evenly during the growing season. However, this high precipitation also means a higher frequency of storms than anywhere else in Canada. Precipitation is slightly greater in late fall and early winter because of the more frequent and intense storm activity.

For crop production, zones have been identified throughout Nova Scotia based on growing degree days. A growing degree day is a measure of accumulated heat (Figure 1). Some crops such as grapes and corn require more growing degree days to mature than crops that are able to withstand a shorter, cooler growing season. The production of these warm-season crops is limited to only certain parts of the province. Some growers may be more familiar with the concept of plant hardiness zones which can range from 6b-6a in areas like the south shore and parts of Cape Breton, to 5b-5a in areas like the Annapolis and Gaspereau Valley and the central part of the mainland (see Plant Hardiness Zones Map of Canada: <http://sis.agr.gc.ca/cansis/nsdb/climate/hardiness/intro.html>). Plant hardiness zones are a measure of an area's winter conditions, and perennial plant varieties are classed based on the lowest temperatures they can withstand before being killed. For example, most grape varieties can withstand a minimum temperature of  $-27^{\circ}\text{C}$  before exhibiting winter damage.

**Figure 1. Growing Degree Days for Nova Scotia**

Source: R. Gordon, Bootsma, A. (1993) Analysis of growing degree days for Atlantic Canada. *Clim. Res.*, 3: 169-176.

Within the broad climatic zones shown in the plant hardiness zones map, there can be many microclimates. For example, a field surrounded by trees or with a south-facing slope will be warmer than a nearby exposed or level field. In addition, many local influences can modify the climate of an area. For example, the southern slope of a hill can sometimes receive enough sunshine to grow grapes, whereas an adjacent level field would not be suitable. The southern slope of the hill has a different climate than the adjacent slope, which is known as a microclimate. Many factors can create microclimates, including surrounding vegetation and land forms.

### Soil Considerations

Soils are a complex integration of mineral material, organic matter, water, air and living organisms. The characteristics of an individual soil are the result of several soil forming factors, including parent material, climate, topography, organisms, ground water, vegetation, time and human activity. Most of Nova Scotia's soils are naturally acidic, low in organic matter and infertile. Nevertheless, the province does have farm land that can be highly

productive under a good management regime. Since soil is the basis of farming, it is essential that you choose a farm with soils suitable for the crops you wish to grow. As there are many different factors influencing the formation of soil, soils differ from region to region and can even be different from field to field or within a field. A map and explanatory chart showing the general agricultural productivity of Nova Scotia soils can be found at: <http://museum.gov.ns.ca/mnh/nature/nhns/t12/t12-9.pdf> The following sections describe the soil characteristics you need to take into consideration when purchasing a farm.

### **Soil pH**

Soil acidity is measured by pH, which can be determined by a soil testing lab or by using a simple pH meter. Soil test results for pH are based on a scale from 0 to 14 where 7 is neutral, below 7 is acidic and above 7 is alkaline. It is not uncommon to find soil pH levels in Nova Scotia lower than 4.5 in unlimed fields. For most crops, a field with a pH of 4.5 would require soil amendments such as lime or wood ash to increase the pH to a suitable level for crop production. However, crops such as blueberries and cranberries prefer a lower soil pH, so it is important to know the crop preference for soil pH.

Soil pH also affects nutrient availability. Soils with a pH below 5.0 are more likely to have levels of aluminum and manganese that are toxic to plant growth. Soil microorganisms involved in the cycling of nitrogen, phosphorus and sulfur tend to be more active as the soil pH increases to near neutral, so the availability of these nutrients increases correspondingly.

### **Soil Organic Matter**

While organic matter, or humus, usually makes up only a small proportion of the soil, it has a significant impact on the soil's productivity. Organic matter can benefit plants in many ways including improving aeration and moisture retention, increasing the nutrient availability and holding capacity of a soil, providing a substrate for microbial activity and improved physical structure. Organic matter fractions can be determined by a soil test and levels of approximately 3% to 5% are considered good for crop production.

### **Soil Texture**

The remaining fraction of solid material in a soil consists of the mineral fraction. The mineral fraction consists of different size particles including clay, silt, sand, and gravel. Soil texture influences a number of properties,

including drainage, aeration, susceptibility to erosion, organic matter content, ability to retain nutrients, pH buffering capacity, and soil tilth. For example, soils with a high clay content will have a great ability to retain nutrients and will drain slower than a sandy soil. Because Nova Scotia receives such high amounts of precipitation, good drainage can be critical for the production of many crops and the most productive soils are usually sandy loams. Drainage can also be improved through the installation of tile drains. (For more information on tile drains, see Fact Sheet #3: Infrastructure Considerations.)

Soil texturing can be done by a simple hand texturing analysis. A soil texture key can be found at:

[http://soils.usda.gov/education/resources/lessons/texture/soil\\_texture\\_hi.jpg](http://soils.usda.gov/education/resources/lessons/texture/soil_texture_hi.jpg)

### **Soil Physical Structure**

A healthy soil has mineral and organic particles clumped together to form soil aggregates. A well-structured soil is important for maintaining good aeration and water holding capacity. Working the soil too often or when wet causes these aggregates to break down and the soil to compact. Finer textured soils (such as clay soils) compact more easily than coarse textured soils. Compacted soils are less productive because they are difficult for plant roots to penetrate and they drain poorly, but are also more drought-prone. Compaction can be corrected by ripping the soil using heavy machinery or through the use of certain cover crops with strong taproots, such as oil radish.

### **What to Look for When Buying a Farm**

Some of the above soil characteristics cannot be altered, while others can. When buying a farm, you need to assess the potential productivity of the soil as well as its current, actual productivity. A farm with well-cared for, highly fertile soil will be productive only in the short-term if it is not managed properly. On the other hand, a farm with degraded soils might come at a lower price and pay off over the long term with some careful soil management, as long as the inherent potential is present. When assessing a potential farm purchase, look for soil conditions that may pose limitations to crop production such as shallow rooting depth, stoniness, topography that might lead to soil erosion, low fertility, wetness or, conversely, lack of moisture.

If you have time to view the land at different times of the season it is important to carefully observe the landscape, the climate, and the vegetation. For example, a quick scan of the landscape to see if there are any areas of pooling water after a heavy rainfall will reveal drainage issues. Observing areas where the snow melt is slower may indicate areas where the soil will be slow to warm up in the spring.

It is important to remember that for small-scale farming the amount of land required to make a decent living is relatively small (<10 acres). With such a small area of land it is possible to alter the soil conditions over time. A major benefit of small-scale farming is that it allows for a heterogeneous landscape and soil type, knowing that farmers can cater particular crops to match the conditions.

### **Soil Testing Services**

Nova Scotia has a provincial soil testing lab at the Nova Scotia Department of Agriculture. This soil test will measure plant available nutrients at the time of sampling, as well as soil pH, organic matter fraction, and cation exchange capacity. The test report will give recommendations on fertility and lime requirements. More information on the provincial lab soil testing services can be found at:

<http://www.gov.ns.ca/agri/qe/labserv/soilsamp.shtml>

### **Soil Maps**

Soil maps of areas within Nova Scotia can be found online. These maps describe the soil characteristics and agricultural capabilities of counties within Nova Scotia. These maps and county descriptions can be found at:

<http://sis.agr.gc.ca/cansis/publications/ns/index.html>

### **Suggested Reading**

Eliot Coleman (1995). *The New Organic Grower: A Master's Manual of Tools and Techniques for the Home and Market Gardener*. White River Junction, Vermont: Chelsea Green Publishing Company.

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