

T12.9 SOIL AND RESOURCES

The soil regions of Nova Scotia are irregular, uneven and reflective of the complex physical and human environments within the province. Distribution, types and quantities of soil influence the availability of plant and animal resources (see T12.10 and T12.11), determine agricultural development and settlement patterns, and contribute to commercial development. For example, early settlers depended on their ability to grow food to support communities involved in the fishery. More recently, soils have helped to determine how we develop housing on nonserviced land.

Human activities are influenced by the availability of soils and also influence the structure, fertility and composition of soils. Some activities, like agriculture, can be directly related to the use of soils as a resource. Other activities, such as land clearing for development, affect soils indirectly.

The relationship is characteristic of the ways through which humans interact with the environment, responding to potentials, recognizing limits and adapting the environment to suit human needs.¹ Human activities have, in turn, changed soil distribution and fertility. Although soil conservation is not as big an issue as in the Prairie provinces, guidelines have been developed to reduce soil degradation in Nova Scotia.

HISTORICAL CONTEXT

1600s and 1700s

Europeans used the soils of tidal marshes for agriculture during the 1600s and early 1700s. The soils were stone-free and rich in organic materials and nutrients. The tidal marshes were dyked (see T12.7), drained and planted—a process that leached salt and other minerals from the soil. After the salt had been leached out of the soils, the remaining mixture of silt, sand, clay and water was very productive for crop growth. Ploughing changed the stratified structure of the original marsh soil. (Soils in the Bay of Fundy are classified today as Acadian soils.) Acadian agricultural practices required no manure, as the fertility of these engineered farmlands was maintained by periodically allowing tides to flood the drained marshland, which could add 2–3 cm of nutrient-rich sediments to dyked land soils. Before the marshes were dyked, water transport deposited the deepest, richest soils adja-

cent to the sea and along rivers. With drainage patterns altered, water from upland areas now tends to collect in the low-lying, inland dyked environs, resulting in a band of freshwater wetlands and shallow lakes, often surrounded by sphagnum bog.

The soil of... Nova Scotia ... is various, being in some parts very rough and barren; in others exceeding pleasant and fertile, as ... round the Bay of Fundy, and on the rivers which fall into it.

Robert Rogers. A Concise Account of North America. London, 1765

As settlement in Nova Scotia grew, there was a need for increased agriculture support to the fishing, lumbering and shipbuilding industries. Most areas capable of supporting agriculture were eventually settled, although some marginal areas were cultivated only briefly.² The main environmental criteria determining settlement were topography, climate and soils, although soil was the most important factor. Isolated from Europe, settlers depended on the ability to grow food to support colonial development.

1800s

In the first quarter of the 1800s, Loyalists settled and farmed land abutting navigable river in areas rich with alluvial soils or land previously farmed by Acadians. By the mid-nineteenth century, settlement patterns corresponded to the bays and inlets around the coast and to the main river valleys stretching inland. The interior of Cape Breton, however, was as well settled as the coastline, owing to the ease of access via the Bras d'Or Lakes.

Drumlins, with their deep till soils, were extensively cleared of stones and trees and farmed, first along the southwest Atlantic Coast and then inland (see T12.4). The soil on the drumlins continued to influence settlement patterns, as they provided islands of fertility in a sea of relatively poor and shallow soils. There was little pioneer settlement after 1850, although land clearance continued in more favoured areas.

In 1912, Fernow³ calculated that 18.4 per cent of the Nova Scotia land base was occupied by farms. By

1958, 10.1 per cent was farmed. In the late 1970s, 6.8 per cent of Nova Scotia was farmed land.⁴ Much of the farmland abandoned during this time has returned to forest through succession dominated by White Spruce or White Pine (see H5.2).

THE USE AND INFLUENCE OF SOILS TODAY

Soil Capability

Interpretive soil-classification systems are ratings based on an intended use, the Canada Land Inventory (CLI) for Agriculture being one example. Soil is classified as suitable for agriculture and other purposes through its relation to geographic location and economic accessibility.

The CLI is a seven-class system where Class 1 is the best and Class 7 the worst. "Best" is defined as the ability to successfully grow a wide range of commercial crops. As the range of crops becomes narrower, more inputs are required or yields become poorer or less reliable, the class is poorer. There are thirteen subclasses, denoted by letter, to describe the kind of limitation present. The best soils in Nova Scotia are Class 2; because of adverse climate, denoted 2C.⁵

Common soil limitations in the province are shallow rooting depth (D), stoniness (P), adverse topography (T), wetness (W), lack of moisture (M) and low fertility (F). About 375,000 ha (seven per cent) of the province has potential for general agriculture as defined by Classes 2 and 3.

Other interpretive classifications are based on growing a single crop, like Alfalfa, or are for a single use, like septic filter fields. These classifications follow similar rules to CLI, but the criteria and class limits change, depending on critical values specific to the intended use.

Agriculture

Glacial scouring has left many areas of Nova Scotia with marginal- to poor-capability soils for agriculture.² Commercially viable soils are generally restricted to lowlands underlain by post-Devonian sedimentary bedrock, such as the Annapolis Valley (District 610) and the Gulf shore lowlands of Region 500. The Annapolis Valley is Nova Scotia's most productive farming area with fertile soils based on glacial-fluvial deposits in the river valley. The drumlin fields on the South and Western Shore (District 430)

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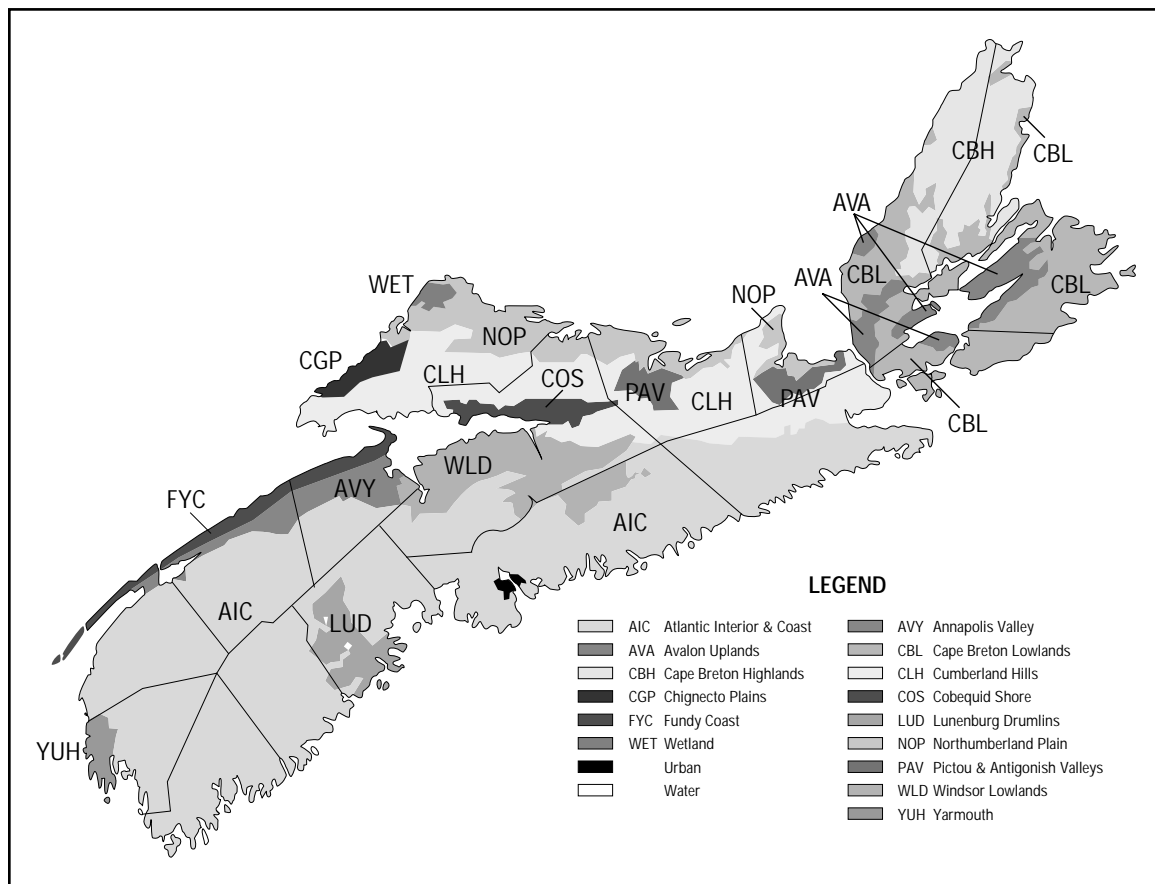


Figure T12.9.1. Agricultural Resource Areas of Nova Scotia

AGRICULTURAL RESOURCE AREA		HECT ARES (000)	SOILS (DOMINANT SOIL SERIES)	SLOPE	CLIMATE*	CLI(Agr)
CODE	NAME (DISTRICT/UNIT)					
AIC	Atlantic Interior and Coast (400, 800)	3258	Well-drained, stony, sandy loams and sandy loams (Halifax, Bridgewater)	4–9%	D,E,H	7: stones, fertility, bedrock
AVA	Avalon Uplands (300)	794	Well-drained, stony, sandy loams (Thom, Wyvern, Kirkmount)	4–15%	B	7: stones, fertility, bedrock, slope
AVY	Annapolis Valley (610)	135	Rapidly drained sands, well-drained sandy loams and gravelly sandy loams (Cornwallis, Woodville, Morristown)	4–9%	F	2–4: fertility, drought
CBH	Cape Breton Highlands (200)	379	Well-drained, stony, sandy loams (unnamed soils)	16–30%	C	7: stones, fertility, bedrock, slope
CBL	Cape Breton Lowlands (510, 520, 530, 550, 560, 580)	325	Imperfectly drained, gravelly, sandy loams and loams (Millbrook, Westbrook, Springhill, Queens)	4–15%	B,D	3–4: wetness
CGP	Chignecto Plains (532)	53	Well-drained, stony, sandy loams (Shulie)	4–9%	B	7: stones, fertility, bedrock
CLH	Cumberland Hills (581)	162	Moderately well-to-imperfectly drained sandy loams and gravelly sandy loams (Westbrook, Debert, Hansford, Pugwash)	4–9%	B	3–4: stones, slope
COS	Cobequid Shore (620)	61	Well-to-imperfectly drained, loamy sands, sandy loams and loams (Truro, Woodville, Debert, Queens)	4–9%	G	2–3: fertility
FYC	Fundy Coast (720)	89	Well-to-imperfectly drained sandy loams and gravelly sandy loams (Rossway, Glenmont)	4–9%	G	7, 2–4: stones, bedrock, slope
LUD	Lunenburg Drumlins (434)	199	Well-drained sandy loams (Bridgewater)	4–15%	E	3–4,7: stones, slope, wetness
NOP	Northumberland Plain (521)	374	Imperfectly drained, sandy loams and loams (Debert, Queens)	4–9%	A	2–4: wetness
PAV	Pictou & Antigonish Valleys (580)	93	Well-to-imperfectly drained, gravelly, sandy loams and loams (Westbrook, Millbrook)	4–9%	B	3–4,7: stones, slope
URB	Urban	13	N/A			
WAT	Water	45	N/A			
WET	Wetland (520, 540)	60	Poorly drained sandy loams and loams (Masstown, Kingsville)	<3%	D,B	5–7: wetness
WLD	Windsor Lowlands (511)	265	Imperfectly drained loams (Queens)	4–9%	D	3–4: wetness
YUH	Yarmouth (820)	28	Imperfectly drained gravelly sandy loams (Springhill)	4–15%	H	4–5,7: wetness

Table T12.9.1 Summary of Agricultural Resource Areas in Nova Scotia

also support soils suitable for commercial exploitation (see T12.4). There is little land that might possibly be suited for agriculture that is not farmed or developed. About three-fourths of the farmland in Nova Scotia has a permanent crop cover. Table T12.9.1 summarizes the distribution and soil types in agricultural areas in the province in the 1990s. See T5.2 for a summary of the dominant climate conditions in different parts of the province.

DEVELOPMENT

The generalized distribution of soils and farming activity (Figure T12.9.1) serves as an indicator of the potential of the environment to support human settlement. Settlement within Nova Scotia is characterized by a pattern of concentration and linear dispersal. Urban regions are areas of popula-

tion concentration, for example, the Halifax-Dartmouth Metro Area. In Nova Scotia, population concentration is focused in areas of relatively low soil quality, such as Halifax. At the same time, linear settlement patterns, with some clustering, are notable for coastal areas and for agricultural regions.^{6,7} Overall, outside of the more substantial urban regions, population densities are low. Higher-quality soils for agriculture allow for slightly higher densities of land occupation. Consequently, the Annapolis Valley (District 610) is more densely inhabited than the highlands (Region 200).

Human interaction with the environment can affect the quality of the environment, including soils. Settlement patterns represent a level of permanent human presence in a region and are an associated indicator of environmental threat. In Nova Scotia, urban development does not appear to be a substan-

tial threat to soil quality. Where density of occupation is coupled with a highly altered landscape (e.g., the agricultural landscape), the potential for soil degradation is greater.⁸

SOIL DEGRADATION

Soil degradation results from the acceleration, by humans, of naturally occurring processes. Soil degradation processes in Nova Scotia include erosion by wind and water, acidification, compaction, contamination and the loss of organic matter.

Erosion

Erosion occurs when soil loses its stability after being stripped of vegetation (see plate T12.9.2). Erosion by water can occur on row-cropped land, highway construction projects and as a result of forest-access roads and clearing trails. Water erosion is greatest on steep land and on soils with slow infiltration rates.

Stream-bank erosion can be accelerated by increasing water-flow rates through a channel as a result of land clearing in the watershed area, e.g., forestry practices (see T12.10). Surface erosion is site-specific and can occur wherever soil is exposed by construction, forestry, clearing, etc.

Wind erosion relates to texture and absence of ground cover. In Nova Scotia, it is an issue only on exposed sandy soils, such as sandy areas in the Annapolis Valley and coastal sand dunes (see T12.7 and H2.6).

There are soil conservation guidelines in Nova Scotia that relate to forestry, construction and agriculture activities.

Acidification

Acid rain is not a soil-acidification problem for most farmers in the province, because they have to apply large quantities of lime to counteract natural acidity. The low buffering capacity of soils, however, makes acid rain a concern for large areas of uncultivated and forested lands in the province, where liming is not a common practice (see T12.8).

When soil pH varies from near neutral, many nutrients become unavailable to plants, while others can be released in toxic amounts. Newly cleared land in Nova Scotia requires 15–30 tonnes of lime per hectare to raise the topsoil pH to near neutral. The initial treatment is carried out in several stages; not all the lime is added at once. About 500 kg per hectare of lime is required annually to maintain the pH.

Compaction

Nova Scotia soils tend to be moist throughout most of the year, making them resistant to wind erosion but susceptible to compaction. Most soils in Nova Scotia have a naturally compact layer starting at 40–60 cm below the surface. Activities that increase overburden, such as filling, construction and walking, aggravate soil compaction, impeding root growth.

Hardpan is a term commonly used to refer to hardened or cemented layers in the soil profile that impede drainage or rooting. There are various theories as to what causes the cementation of soils; however, in Nova Scotia, the main focus has been on how to mix the layers to improve drainage for agriculture. See Figure T9.2.1k, which shows the changes that occur in a typical Cornwallis soil profile before and after cultivation.

Contamination

Soil contamination can occur as a result of toxic spills, excessive use of chemicals, tar ponds, industrial-waste dumps and buried fuel tanks.

Loss of Organic Matter and Nutrients

Soils in Nova Scotia have a low organic-matter content at the surface. Agriculture can add organic content. Loss of organic matter is of concern on annually cultivated land and in clear-cuts. Little is known about the effect of human activities on the biological environment (see T9.3) of soils.

Nutrient loss can also occur from soil-leaching processes and harvesting methods in forestry, which remove tree limbs and foliage as well as logs from cut-over sites, thereby preventing this discarded biomass from decaying and enriching soils. This process can be further accelerated by intensive harvesting techniques. Loss of soil nutrient leads to lower forest productivity.



Associated Topics

T5.2 Nova Scotia's Climate, T9.2 Soil Classification, T9.3 Biological Environments, T12.4 Glacial Deposits and Resources, T12.7 The Coast and Resources, T12.8 Fresh Water and Resources, T12.10 Plants and Resources, T12.11 Animals and Resources

Associated Habitats

H2.6 Dune System, H5.2 Oldfield

References

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- 2 Millward, H. (1994) "Changing patterns of agricultural settlement in the Canadian Maritimes." In K. Beesley and P. MacIntosh (eds.), *Rural Research in the Humanities and Social Sciences: Selected Papers*. Rural Research Centre, Nova Scotia Agriculture College, Truro. pp. 93–111.
- 3 Fernow, B.E. (1912) *Forest Conditions of Nova Scotia*. Canada Commission of Conservation, Ottawa.
- 4 Nova Scotia Dept. of Lands and Forests (1977) *A Book of Maps: Land Use and Natural Resources of Nova Scotia*. Province of Nova Scotia, Halifax.
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- 8 Day, D., ed. (1988) *Geographical Perspectives on the Maritime Provinces*. Saint Mary's University, Halifax.

Additional Reading

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- Patterson, G.T. and M.N. Langman (1992) *Merging Census of Agriculture Data with Agricultural Resource Areas of Nova Scotia*. Nova Scotia Dept. of Agriculture and Marketing, Agriculture Canada, Truro.



Plate T12.9.2: Soil erosion during highway construction in Nova Scotia in the early 1970s. Exposed soil becomes compacted by rain and baked by the sun. Consequently, little rain soaks in and most runs off rapidly, cutting deep gullies and carrying quantities of silt into streams and rivers. Photo: R. Merrick.