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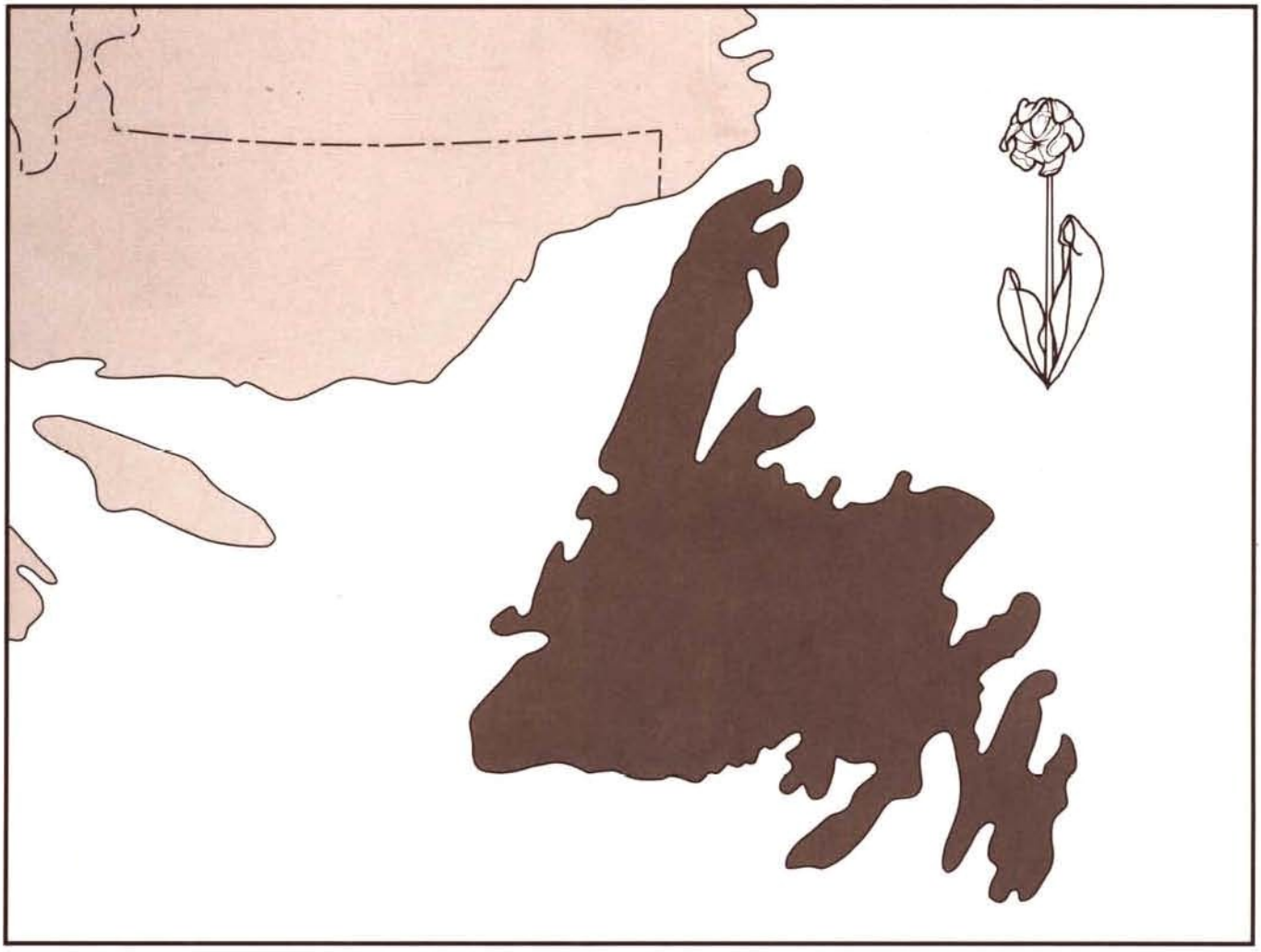
Vegetable Crop Suitability of Organic Soils in Newfoundland

Newfoundland Soil Survey

LRRC Contribution 90-54



Canada

Vegetable Crop Suitability Of Organic Soils In Newfoundland

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VEGETABLE CROP SUITABILITY OF ORGANIC SOILS IN NEWFOUNDLAND

SUMMARY

This proposed organic soil rating system rates the soils in their present form. No consideration is given to such things as distance to market, site development cost and agricultural use following changes in organic soil; subsidence, erosion and biodegradation that could occur through shrinkage. The system applies to all areas of the island of Newfoundland and is suitable for rating sites common to farming systems in Newfoundland.

Seven criteria are considered in the rating:

1. Origin of material and decomposition
2. Wood content
3. Depth of organic material
4. Underlying mineral material
5. Climate
6. Slope
7. Flashets

Each criteria consists of several classes. Each class is assigned a penalty point rating. The penalty points are grouped into 7 suitability classes (1 being the best and 7 being the worst). At each site penalty points are accumulated for the different classes that occur. The points are totaled and this value is then fitted into the nearest class value, which is the suitability class.

It is worth noting at this time that the criteria, classes and penalty point ratings are tentative and subject to further refinement and change after outside testing and/or application. This revision includes an internal field test as well as comments and suggestions from collegues and other interested people.

ACKNOWLEDGEMENTS

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INTRODUCTION

The Island of Newfoundland has limited potential for agricultural development on mineral soils. Less than 0.3% of all the land or approximately 100,000 hectares of mineral soils are suitable for farming. However, there are approximately 2,000,000 hectares of organic soils on the island. Many of these soils can be used for farming and are capable of producing a variety of vegetables and forages.

If Newfoundland could utilize more of its organic soil resource to produce more vegetables and forages it could move closer to achieving self sufficiency in vegetable and forage production. This could reduce the cost of importing those products from the mainland.

The attitudes in Newfoundland have changed recently regarding the use of organic soil. The few farmers who are growing vegetables on organic soil have proven that very high quality and market demanding produce can be grown. Organic soils are being looked upon more as a resource, now, rather than waste land. Interest in farming organic soil is increasing and potential farmers and existing ones are looking towards organic soils to start farming or to expand present holdings.

One of the first things to consider when planning to farm on organic soil is to select a suitable site. It is helpful in achieving this if a soil suitability rating system is in place so that the most suitable soils can be selected for development.

At present we do not have an agricultural rating system in Newfoundland that can be used to properly select and rate our organic soils for agricultural uses. Those farms that exist today were selected either by the farmer himself or with the aid of agricultural employees who used their experience along with any existing helpful information.

Because both the climate and the soils of the island of Newfoundland differ from most of the rest of Canada, it is imperative that we develop a local system which in turn may form a building block or a step in the hierarchy of a national approach.

CRITERIA USED IN VEGETABLE CROP SUITABILITY OF ORGANIC SOILS

The main criteria that have been considered in this rating system for vegetable crop suitability in Newfoundland are: decomposition, wood content, depth of organic material, underlying mineral material, climate, slope and flashets. Those features which occur on the surface and /or subsurface to a depth of 160cm have been described. Many other factors should also be considered in the final assessment of an organic soil before contemplating use. Acidity and nutrient value can easily be ameliorated with proper management and will not be discussed here. Vegetation is important when considering the cost of developing an organic soil, however modern technology is rapidly reducing the vegetational obstacles.

Decomposition

The origin of organic material is important, because it give indication of the nutritient content and the potential rate of decomposition.

Two main sources of peat are considered in this rating system, those developed mainly from sedges and those developed mainly from sphagnum mosses. More emphasis is placed on sphagnum peat in Newfoundland because most of the organic soils are of sphagnum material with lesser amounts of sedges. As well, experience here with sedge peat is that it takes a long time for its fibres to break down, it is difficult to till and manage in the fibric state and the fibres make it difficult to maintain drainage ditches, while the decomposed material often impedes drainage.

The three decomposition classes are: fibric, mesic and humic.

Fibric material can be identified as to its botanical origin. It contains 40% or more of rubbed fiber by volume and has a pyrophosphate index of 5 or more (The Canadian System of Soil Classification). Fibric material is usually

classified in the von Post scale of decomposition as classes 1 to 4.

Mesic material is at an intermediate stage of decomposition between fibric and humic materials. The botanical origin of mesic material can sometimes be difficult to identify. It is usually classified in the von Post scale of decomposition as class 5 or class 6.

Humic material is in an advanced stage of decomposition. The rubbed fiber content is less than 10% by volume and the pyrophosphate index is 3 or less(The Canadian system of Soil Classification). This material contains few recognizable fibres and is usually classified in the von Post scale of decomposition as class 7 to 10.

In contrast to other organic soil capability classifications in which sphagnum peat is rated less favourable for crop production, the Newfoundland system rates it higher because it has been the experience in Newfoundland, particularly in places like Colinet, that fibric sphagnum material can be successfully drained and farmed. It is generally found that if a farmer starts out with a virgin fibric peat (of von Post 1-4) it breaks down and becomes more like a mesic peat during the first few years of drainage and cultivation. If one starts out with a mesic material then it decomposes to a humic material after the first couple of years. The following penalty point have been assigned:

Mostly Sphagnum		Mosses Mostly Sedges	
Decomposition	Penalty Pts.	Decomposition	Penalty Pts
Fibric	0	Fibric	80
Mesic	35	Mesic	35
Humic	50	Humic	50

Wood content

Wood content is important because,depending on the amount present, it can effect cultivation and ditching.

The percentage of wood content is based on the volume percentage of wood greater than 5cm in diameter which occurs within 160cm of the surface for any given site. It can be estimated by using a probe at regular intervals within the site or considering the present tree coverage as an indicator or both.

No distinction has been made for wood content at various depths. Only the total depth of 160cm is considered which includes not only cultivation depth but also drainage ditch depth in most situations.

The classes considered and their penalty point rating are as follows:

Wood content (% volume)	Penalty points
0-5%	0
6-15%	20
16-25%	30
26-50%	50
>50%	90

Depth of peat

Since this classification looks at rating soils as they exist today, there is not a large penalty point rating for what may be considered shallow peat in other provinces. Our higher rainfall and cooler temperatures, compared to most provinces, tend to slow the subsidence and degradation of peat after the first couple years of cultivation. It is worth noting that there are already several successful farmers operating on less than a meter of peat in this province and have been for several years.

The following depth classes and penalty point ratings have been used and apply only to peat deposits which are = <160cm deep:

Depth	Penalty points
101-160cm	0
50-100cm	20
<50cm	40

Underlying mineral material

The classes and penalty point ratings for underlying mineral material have been selected on the basis of local conditions. It is generally accepted that sand and sandy loam underlying organic material can be more beneficial than harmful and have therefore not been assigned any penalty points. Sand and sandy loam can improve the drainage, structure and bearing capacity of the peat. Silt and loam can create some problems in these areas whereas clay can create severe problems. Therefore they receive 20 and 40 penalty points respectively. Gravel can be a problem especially when it has to be rototilled into the peat on shallow bogs. Forty penalty points have been assigned to gravel, while bedrock receives 70. Mineral material layers 20cm or more in thickness are considered the same as mineral material underlying the peat formation and there is no distinction made for the position of a mineral layer or layers within the 160cm control section.

The following underlying mineral material classes and penalty points are used but apply to peat soils that are =<160cm:

Classes	Penalty points
Sand	0
Sandy loam	0
Silt and loam	20
Clay	40
Gravel	40
Bedrock	70

Climate

Pedoclimatic zones represent the highest unit of stratification for soil classification on the island of Newfoundland. The island is divided into ten zones (Figure 1) based upon climatic and vegetative data. Zones are rated for vegetable crop suitability on the basis of the following criteria as shown in Table 1: number of days in vegetative season, number of degree days and the average annual precipitation. These zones are shown as classes with the following penalty points:

Zones	Penalty points	Zones	Penalty points
1	20	5	0
1a	35	6	50
2	30	7	55
3	30	8	25
4	35	9	40

Penalty points for climate were derived by the following method. Each zone was ranked against the others for each of the criteria listed. The best zone received a 1 while the worst was given a 10. These rankings for each zone were then totalled, with the lowest score receiving 0 penalty points and the highest receiving 55 penalty points. The remaining zones were then placed in the 0-55 range based on their final ranking.

Slope

Slope is an important consideration for draining, developing and working with peat in Newfoundland. Peatland occurs on slopes that range from nearly level to more than 10%. A slope of 3-9% is ideal because it will allow drainage without hindering peat development and the operation of machinery. The following slope classes and penalty points are used

Slope Class	Penalty Points
0 - 2 %	20
3 - 9 %	0
> 9 %	40

Flashets

Peat deposits in Newfoundland can range in size from a few hectares or less to over 100 hectares. Flashets (shallow surface water, which persists most of the year) occur on many peatlands, regardless of their size. For this reason, flashets are given special consideration in this rating system. They are important in draining, developing and operating a peat site.

The following classes of percent of surface area covered and penalty point ratings are used:

Surface coverage	Penalty points
<1%	0
1 - 2 %	10
3 - 10 %	20
11 - 20 %	40
20 %	50

Table 2 summarizes the criteria, as well as the associated classes and penalty points used in the vegetable crop suitability classification of organic soils in Newfoundland

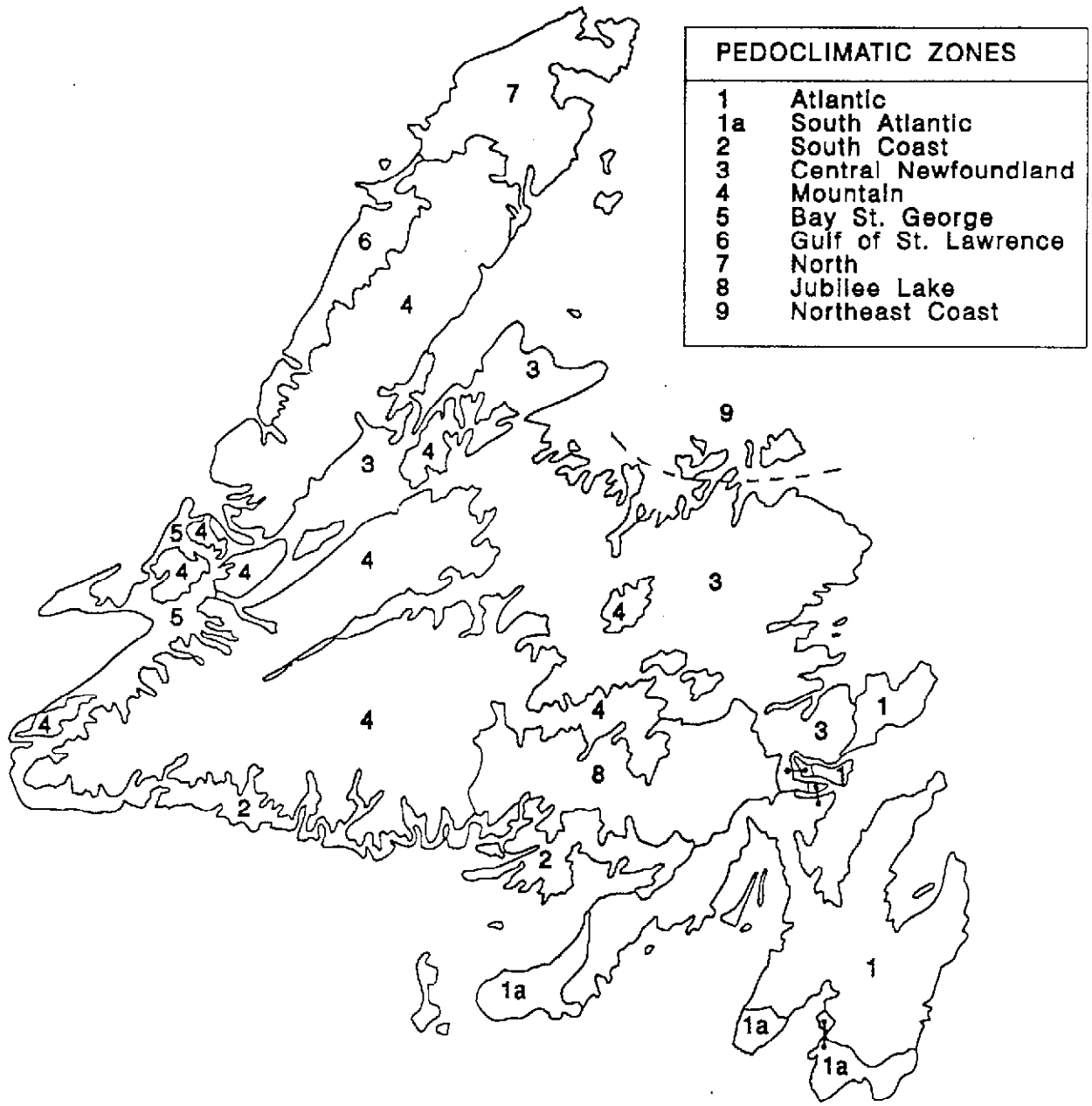

Figure 1: Pedoclimatic Zones of the Island of Newfoundland

Table 1: Pedoclimatic Zone Criteria Used to Differentiate Vegetable Crop Suitability.

Zone	No. of Days Vegetative Season	No. of Degree Days Temp.> 5C	Avg. Ann. Precipitation (mm)
1	150-160	1000-1200	1200-1500
1a	140	900-1000	1500
2	150	1000-1100	1500
3	160	> 1200	1000-1200
4	120-160	1000	1100
5	150-160	1200	1200-1400
6	120-140	800-1000	1000-1100
7	< 100	< 800	1000
8	150-160	1100	1200-1400
9	150	1100-1200	< 1000

Reference: Pedoclimatic Zones of the Island of Newfoundland,
Soil Survey Report No. 32 St. John's, 1987.

TABLE 2: CRITERIA USED IN VEGETABLE CROP SUITABILITY OF ORGANIC SOILS IN NEWFOUNDLAND

		Classes	Penalty Points
1.	Decomposition	Mostly Sphagnum Mosses	
		Fibric	0
		Mesic	35
		Humic	50
		Mostly Sedges	
		Fibric	80
		Mesic	35
		Humic	50
2.	Wood content	0-5%	0
		6-15%	20
		16-25%	30
		26-50%	50
		>50%	90
3.	Depth of peat	101-160 cm	0
		50-100 cm	20
		<50 cm	40
4.	Underlying mineral material*	Sand	0
		Sandy loam	0
		Silt and loam	20
		Clay	40
		Gravel	40
		Bedrock	70
5.	Climate	Pedoclimatic Zones	
		1	20
		1a	35
		2	30
		3	0
		4	35
		5	0
		6	50
		7	55
		8	25
		9	40

*layer 20cm within the 160cm control section

(Table 2 continued)

		Classes	Penalty Points
6.	Slope	0-2%	20
		3-9%	0
		9%	40
7.	Flashets*	<1%	0
		1 - 2 %	10
		3-10%	20
		11-20%	40
		20%	50

* shallow surface water percent of surface covered

VEGETABLE CROP SUITABILITY OF ORGANIC SOILS

This proposal presents a total of 7 vegetable crop suitability classes for organic soils (Table 3). They range from class 1 for the best soil to class 7 for the poorest.

TABLE 3: VEGETABLE CROP SUITABILITY CLASSES FOR ORGANIC SOILS

Class 1 (0 - 15)* Organic soils in this class have the least number of points assigned to them. They have very few minor if any restrictions which would hinder their development for agricultural production.

Class 2 (16 - 30) Organic soils in this class can have up to 30 points applied to them. Restrictions to their development and cultivation are only slight.

Class 3 (31 - 45) Organic soils in this class can have up to 45 points. Restrictions to their development and cultivation are slight to moderate.

Class 4 (46 - 60) Organic soils in this class can accumulate a total of 60 points. Restrictions to development and cultivation are moderate to severe.

Class 5 (61 - 75) Organic soils in this class can have a total of 75 points. Restrictions to development and cultivation are severe.

Class 6 (76 - 90) Organic soils in this class can accumulate a total of 90 points. Restrictions to development and cultivation are severe to very severe and can sometimes render development and cultivation extremely difficult.

Class 7 (91 +) Organic soils in this class can have 91 points or more. Restrictions are so severe that development and / or cultivation, under most situations, would be impossible.

*** This is the class value and is calculated for any particular site by adding all the penalty points for each criteria that occur at a particular site.**

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