New Brunswick Soil & Crop Improvement Association Inc.
2-150 Woodside Lane Fredericton, NB E3C 2R9
Tel: 506-454-1736 Fax: 506-453-1985 www.nbscia.ca

C1920-0036-Y3 Soil Health Bench Marking-Reference Project

Project leader and collaborators

NBSCIA Club Agrologists; Project Lead Ray Carmichael and Hardy Strom, Soil Health Research Coordinator, PEI Department of Agriculture & Land

Objective

To expand the benchmark data set of soil health values or parameters across a range of soil types and/or management practices common to New Brunswick farm systems to establish a score and rating system to benchmark improvement.

Summary of progress

Field sampling techniques and delivery logistics for this activity followed those developed in 2019 and reported in Project C1920-0036. All field sites were identified in the NBSCIA Geodatabase using the NBARMS field identification system for future reference. To maintain standard reference values, all analysis and reporting followed procedures from the PEI Analytical Laboratory (PEIAL).

The PEI Analytical Laboratory Soil Health package includes soil respiration, aggregate stability, active carbon, biological nitrogen availability, and soil texture with the following standard soil sample analysis: pH, OM, P2O5, K2O, Ca, Mg, Cu, Zn, Fe, Mn, S, B, Na, Al, Lime Index, and CEC. The soil texture classification is calculated from the percent sand, clay and silt values using the USDA Natural Resources Conservation textural classification.

The PEI scoring and rating values reported are derived from a database of 547 samples using a cumulative normal distribution model in which the highest value is 100 and the lowest 0. A similar process will be developed for New Brunswick as the database expands.

Approximately 135 soil health samples were collected for analysis in 2021. Combined with the 95 samples reported in Year 2, this will give a base set of 230 samples from the PEI Analytical Soil Health Laboratory.

As reported in last year's results, differences exist between cropped and non-cropped areas such as fence lines, pastures and forage rotations. A significant differentiation between the potato rotation region of Carleton County and other regions of the province was observed in 2020 data.

To better define the effect of cropping systems and history, a single farm site with a confirmed cropping history in the Carleton region was selected in 2021. As observed in Table 2, (below) active carbon appears similar to samples from a potato rotation, however respiration and aggregate stability are considerably higher.

As reported in the Year 2 update, in-field variability between key soil health indicator parameters exists, like that demonstrated for soil pH, OM and nutrient availability with geo-referenced soil sampling. There does not appear to be a strong correlation in location between the soil health parameters reported. This variability must be accounted for when defining sampling methodology to establish benchmarks to measure remediation procedures to improve soil health.

As critical as soil health measurements may be in managing the adaptation to climate change, based on the limited data available to date there appears to be a significant difference between agricultural regions in New Brunswick and between cropping systems within the regions. Therefore, it may not be possible to establish a province wide soil health rating system in New Brunswick similar to PEI. Compounding the discussion is the lack of consensus among the local academic community and crop consultants. on the "best" method or parameters for measuring and monitoring soil health.

Given the observed variability between New Brunswick agricultural regions, between cropping systems and within fields, it may be impractical to establish a single classification system for the Province or a Region. Although more data is required prior to a final conclusion, the best approach might be for a producer to adopt a lab methodology and measure improvement from a consistent reference point.

C1920-0036-Y3 Référence de la Santé des Sols-Projet de référence

Chef de projet et collaborateurs

Agronomes du club de l'AASCNB; Chef de projet Ray Carmichael et Hardy Strom, Coordonnateur de la recherche sur la santé des sols, Ministère de l'Agriculture et des Terres de l'Île du Prince-Édouard.

Objectif

Élargir l'ensemble de données de référence des valeurs ou des paramètres de la santé du sol à une gamme de types de sols et/ou de pratiques de gestion communes aux systèmes agricoles du Nouveau-Brunswick afin d'établir un système de notation et de notation pour évaluer l'amélioration.

Sommaire des progrès

Les techniques d'échantillonnage sur le terrain et la logistique de livraison pour cette activité ont suivi celles développées en 2019 et rapportées dans le projet C1920-0036. Tous les sites de terrain ont été identifiés dans la géodatabase de l'AASCNB à l'aide du système d'identification des ressources d'agricole (SGRA) pour référence future. Pour maintenir les valeurs de référence standard, toutes les analyses et tous les rapports ont suivi les procédures du Laboratoire d'analyse de l'Î. - P.-É. (PEIAL).

Le kit de santé des sols du Laboratoire d'analyse de l'Île du Prince-Édouard. comprend la respiration du sol, la stabilité des agrégats, le carbone actif, la disponibilité biologique de l'azote et la texture du sol avec l'analyse standard des échantillons de sol suivants: pH, OM, P2O5, K2O, Ca, Mg, Cu, Zn, Fe, Mn, S, B, Na, Al, Indice de chaux et CEC. La classification de la texture du sol est calculée à partir des valeurs en pourcentage de sable, d'argile et de limon en utilisant la classification texturale de conservation des ressources naturelles de l'USDA.

Les valeurs de notation et de notation de l'Île du Prince-Édouard. Rapportés sont dérivées d'une base de données de 547 échantillons utilisant un modèle de distribution normale cumulatif dans lequel la valeur la plus élevée est 100 et la plus faible 0. Un processus similaire sera élaboré pour le Nouveau-Brunswick à mesure que la base de données se développera.

Environ 135 échantillons de santé du sol ont été prélevés pour analyse en 2021. Combiné aux 95 échantillons déclarés au cours de la deuxième année, cela donnera un ensemble de base de 230 échantillons du Laboratoire d'analyse de la santé des sols de l'Île du Prince-Édouard.

Comme indiqué dans les résultats de l'année dernière, il existe des différences entre les zones cultivées et les zones non cultivées telles que les clôtures, les pâturages et les rotations fourragères. Une différenciation significative entre la région de rotation de la pomme de terre du comté de Carleton et les autres régions de la province a été observée dans les données de 2020. Pour mieux définir l'effet des systèmes de culture et de l'historique, un seul site agricole avec un historique de culture confirmé dans la région de Carleton a été sélectionné en 2021. Comme on l'observe dans le tableau 2, (cidessous) le charbon actif semble similaire aux échantillons provenant d'une rotation de pommes de terre, mais la res-piration et la stabilité des agrégats sont considérablement plus élevées.

Comme indiqué dans la mise à jour de l'année 2, il existe une variabilité sur le terrain entre les principaux paramètres des indicateurs de la santé du sol, comme celle démontrée pour le pH du sol, l'OM et la disponibilité des nutriments avec un échantillonnage du sol Géoréférencé. Il ne semble pas y avoir de forte corrélation dans l'emplacement entre les paramètres de santé du sol signalés. Cette variabilité doit être prise en compte lors de la définition de la méthodologie d'échantillonnage pour établir des points de repère pour mesurer les procédures d'assainissement visant à améliorer la santé du sol.

Aussi essentielles que puissent être les mesures de la santé des sols dans la gestion de l'adaptation aux changements climatiques, d'après les données limitées disponibles à ce jour, il semble y avoir une différence significative entre les régions agricoles du Nouveau-Brunswick et entre les systèmes de culture dans les régions. Par conséquent, il n'est peut-être pas possible d'établir un système d'évaluation de la santé des sols à l'échelle de la province au Nouveau-Brunswick semblable à l'Île-du-Prince-Édouard. Le manque de consensus au sein de la communauté universitaire locale et des consultants en cultures complique la discussion. sur la " meilleure " méthode ou les meilleurs paramètres pour mesurer et surveiller la santé des sols.

Étant donné la variabilité observée entre les régions agricoles du Nouveau-Brunswick, entre les systèmes de culture et à l'intérieur des champs, il peut être difficile d'établir un système de classification unique pour la province ou une région. Bien que davantage de données soient nécessaires avant une conclusion finale, la meilleure approche pourrait consister pour un producteur à adopter une méthodologie de laboratoire et à mesurer l'amélioration à partir d'un point de référence cohérent.

Enabling Agricultural Research and Innovation
Interim Report

Element 1, Innovative Research and Development

1. *Project title and project number*: Soil Health Bench Marking-Reference Project C1920-0036-Y3

2. *Project leader and collaborators*:
   NBSCIA Club Agrologists; Project Lead Ray Carmichael
   Hardy Strom, Soil Health Research Coordinator, PEI Department of Agriculture & Land

3. *Specify period of time for which the interim report is being submitted.* April 1, 2021- Mar 2, 2022

4. *Project Objective(s):*
   The objective of this project is to expand the benchmark data set of soil health values or parameters across a range of soil types and/or management practices common to New Brunswick farm systems to establish a score and rating system to benchmark improvement.

5. *Project Deliverable(s):*
   - A definition of soil health values around a specific agricultural systems or management practices in New Brunswick's major commodities and regions.
   - Values defined will lead to soil health reference standards for New Brunswick
   - A final report documenting the project results and recommended protocols.

6. *Summary of Progress:*

Field sampling techniques and delivery logistics for this activity followed those developed in 2019 and reported in Project C1920-0036. All field sites were identified in the NBSCIA Geodatabase using the NBARMS field identification system for future reference. To maintain standard reference values, all analysis and reporting followed procedures from the PEI Analytical Laboratory (PEIAL).

The PEI Analytical Laboratory Soil Health package (Appendix A) includes Soil Respiration, Aggregate Stability, Active Carbon, Biological Nitrogen Availability, and Soil Texture with the following standard soil sample analysis: pH, OM, P2O5, K2O, Ca, Mg, Cu, Zn, Fe, Mn, S, B, Na, Al, Lime Index, and CEC. The soil texture classification is calculated from the percent sand, clay and silt values using the USDA Natural Resources Conservation textural classification.

The PEIAL input sheet was completed to record crop history and crop management practices that impact soil health (below).

PEI Analytical Laboratories — **Soil Health Analysis**

23 Innovation Way
Charlottetown, P.E.I. C1E 0B7

Request Form
www.princeedwardisland.ca/labservices

Farm/Client Name: NB Soil& Crop Improvement Association	Contact Name:	PEIAL Client # or PEI Tax Exempt #: 1607080016
Telephone #: 506-276-3311	Cell Phone #:	
Client Mailing Address: 2-150 Woodside Lane		Preferred Method for Receiving Reports: ☐ Mail ☑ E-Mail ☐ Fax Client E-mail Address: carleton@nbscia.ca
Community/Province: Fredericton, NB	Postal Code: E3C 2R9	Client Fax #
Bill To if different from above: NA.		Additional Name to appear on Report (ie. For clients submitting 3rd party samples)
		Sampling Date: / Forward Results to Nutrient Management Specialist ☐ Yes ☑ No
Copy To: Ray Carmichael		Copy To E-Mail: carleton@nbscia.ca

Sample #	Field ID (Limit of 12 Characters)	Primary Cropping System and/or Crop History (Required for result interpretations)	Tillage Depth	Past Yield For This Field	Is field regularly amended with manures or other amendments (excluding lime)?	Analysis Package
1		☐ Root Crops (potato, carrot, rutabaga) ☐ Grains, Corn, Peas, Beans ☐ Other Vegetables ☐ Forage, Hay, & Pasture (long term) ☐ Fruit & Berries	☐ No till ☐ 1-7 inch ☐ 7-9 inch ☐ >9 inch	☐ Below Avg. ☐ Average ☐ Above Avg.	☐ Yes ☐ No	SH1 Soil Accession #
2		☐ Root Crops (potato, carrot, rutabaga) ☐ Grains, Corn, Peas, Beans ☐ Other Vegetables ☐ Forage, Hay, & Pasture (long term) ☐ Fruit & Berries	☐ No till ☐ 1-7 inch ☐ 7-9 inch ☐ >9 inch	☐ Below Avg. ☐ Average ☐ Above Avg.	☐ Yes ☐ No	SH1 Soil Accession #
3		☐ Root Crops (potato, carrot, rutabaga) ☐ Grains, Corn, Peas, Beans ☐ Other Vegetables ☐ Forage, Hay, & Pasture (long term) ☐ Fruit & Berries	☐ No till ☐ 1-7 inch ☐ 7-9 inch ☐ >9 inch	☐ Below Avg. ☐ Average ☐ Above Avg.	☐ Yes ☐ No	SH1 Soil Accession #

See Reverse Side for Analysis Package and Fee Schedule

Date Rec'd:	# of Samples:	Info Page	Sample Rec'd by: Satisfactory Non-Satisfactory	Soil Health Accession #	Mail-out Ver./Date

PEI results are provided in a report with a provincial rating for each sample, as illustrated below. However, data for NB is insufficient to provide such a comparative rating.

Soil Health Test Report
16-Nov-2020

PEI Analytical Laboratories
PEI Department of Agriculture and Land
23 Innovation Way
PO Box 2000, Charlottetown, PE C1A 7N8
Fax: (902)-368-6299
Telephone: (902)-620-3300

NB Soil & Crop Imp Assoc
Ray Carmichael
2600 Route 560
Williamstown, NB
E7K 1S6

Client No: 1607080016
Accession No: SH200921001
Samples Reported: 16-Nov-2020
Samples Received: 21-Sep-2020

Soil Health #: SH200921001-1	Soil #: S200921016-1	Sample ID: 13
Tillage Depth: 7 - 9 inch Yield: Average	Cropping System: Root Crops	Amendments Applied (manure, etc): ☐ Yes ☐ No

Soil Texture

Sand (%) 29.6
Silt (%) 51.5
Clay (%) 18.8 Soil Texture Class: Silt Loam

Test	Results	Score (out of 100)	Rating
Organic Matter	2.9 %	53	M
Active Carbon	364 µg/g	21	L
Soil Respiration	0.69 mg/g	73	M
Aggregate Stability	33.0 %	28	L+
Biological Nitrogen Availability	12.9 mg/kg	14	L
pH	5.8		
Phosphorous Index (P/Al)	18.15 %		
C:N Ratio	9.33		
Total Carbon	1.68 %		
Total Nitrogen	0.18 %		

http://www.princeedwardisland.ca/labservices

Dates of analysis available upon request.
Organic Matter is calculated from Total Carbon.
ND** - CN ratio could not be accurately calculated due to Total Nitrogen or Total Carbon being below detection limit

Copies To: NB Soil & Crop Imp Assoc
Approved By: HS SHLIC

Methods: SHL_1M Active Carbon, SHL_2M Soil Respiration, SHL_3M Biological Nitrogen Availability, SHL_5M Texture, SHL_4M Wet Aggregate Stability, SFL_22M - pH*, SFL_23M - Organic Matter*, SFL_24M - Nutrients*
* Accredited and NAPT Certified Method

The PEI scoring and rating values reported are derived from a database of 547 samples using a cumulative normal distribution model in which the highest value is 100 and the lowest 0. A similar process will be developed for New Brunswick as the database expands.

Rating	Interpretation
Low (0-25)	The "Low" rating means the test value is among the lowest 25% for all sites sampled across PEI and may be limiting the productivity of the system. Short and long term management strategies should be implemented to build up the soil health within the field.
Low+ (26-50)	The "Low +" rating means the test value is below average of all sites sampled across PEI. Review management practices and consider including additional short and long term management. Re-test again after one full rotation to determine if the field is trending towards improvement or decline.
Medium (51-75)	The "Medium" rating means the test value is above average of all sites sampled across PEI. Consider which practices are currently working on the farm and where areas for improvement may exist. Prioritize this against the status of other tests and fields reported to determine where resources and time should be spent.
High (76-100)	The "High" rating means the test value is among the top 25% of all sites sampled across PEI. Consider field history and previous management practices to identify ways of maintaining the strong rating. If making changes to cropping practices, consider how it may affect soil health and in this event, plan future re-sampling to observe changes or trends. Focus management strategies on other lower-rated soil health test results if they exist.

A detailed interpretation of the PEIAL Soil Health Report is presented in Appendix A.

Approximately 135 soil health samples were collected for analysis in 2021. Combined with the ninety-five samples reported in Soil Health Bench Marking-Reference Project C1920-0036-Y2 from 2020 will give a base set of 230 samples from the PEI Analytical Soil Health Laboratory.

Data for all samples collected in 2020 and 2021 is reported in Appendix C. District average values and standard deviations are presented in Table 1 (below).

As reported in Soil Health Bench Marking-Reference Project C1920-0036-Y2 differences exist between cropped and non-cropped areas such as fence lines, pastures and forage rotations. A significant differentiation between the potato rotation (Carleton) and other regions of the Province was observed in 2020 data. To better define the effect of cropping systems and history a single farm site with a confirmed cropping history in the Carleton region was selected in 2021.As observed in Table 2, (below) Active Carbon appears similar to samples from a potato rotation, however Respiration and Aggregate Stability are considerably higher.

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TABLE 1: Overall and Average Soil Health Values by NBSCIA District

DISTRICT	% SAND	% SILT	% CLAY	OM	ACTIVE CARBON	RESPIR ATION	Aggregate Stability	BNA	pH	P_INDEX	C:N RATIO	% C	% N
Carleton Avg.	29.0	51.2	19.7	5.0	538.3	0.9	49.1	38.6	5.9	11.5	10.6	2.9	0.3
StD.	6.4	5.9	7.6	2.5	231.4	0.5	28.6	32.3	0.5	6.9	2.4	1.4	0.1
Central Avg.	41.6	45.9	12.5	5.8	661.5	1.1	73.4	53.8	5.9	6.6	10.5	3.4	0.3
StD.	17.2	14.1	3.8	2.7	231.8	0.5	15.6	27.0	0.4	5.1	1.9	1.6	0.1
Kings Avg.	48.5	39.7	11.8	5.0	658.3	0.9	50.4	45.3	6.1	9.0	10.4	2.9	0.3
StD.	13.0	10.3	3.6	1.5	184.2	0.3	22.9	20.0	0.5	6.4	1.6	0.9	0.1
Moncton Avg.	45.3	40.6	14.0	5.6	654.6	1.3	60.2	55.6	5.6	8.0	12.0	3.3	0.3
StD.	4.4	5.3	2.6	1.9	189.1	0.8	19.0	25.9	0.8	4.7	1.7	1.1	0.1
Chignetco Avg	38.7	43.8	17.4	7.0	719.2	1.2	63.3	60.2	6.0	6.9	10.7	4.0	0.4
Std.	19.4	12.5	9.6	5.2	292.4	0.4	24.1	32.0	1.0	5.0	1.1	3.0	0.3
Northshore Avg.	31.9	48.7	19.5	7.1	902.4	1.3	67.6	50.8	6.7	12.4	10.8	4.1	0.4
StD.	12.6	10.0	4.4	1.9	187.0	0.3	15.2	19.6	0.3	14.3	0.8	1.1	0.1
Northwest Avg.	33.7	51.4	14.9	7.3	813.3	1.0	77.0	45.9	6.1	11.2	10.3	4.2	0.4
StD.	11.4	8.7	4.5	2.9	249.8	0.5	21.0	21.8	0.7	7.1	0.8	1.7	0.2
2020 Avg of 95	**37.5**	**46.8**	**15.7**	**5.9**	**680.4**	**1.0**	**61.7**	**47.7**	**6.0**	**9.6**	**10.6**	**3.4**	**0.3**

Table 2: Soil Health Parameters from a Non Potato Rotation											
	OM	ACTIVE_CARBON	RESPIRATION	AG_STABILITY	BNA	pH	P_INDEX	C:N	%_C	%_N	
FIELD_ID											Crop History/Description
As Wet	5.8	594	1.61	77.8	98.5	5.5	20.4	9.3	3.4	0.4	Wet spot, very grey soil, no animal traffic, ferns growing.
As-Ls Good	8.1	781	1.32	95.9	82.5	6.1	1.6	39.2	4.7	0.1	Normal part of field, not plowed in at least 40 years, timothy/naturalized stand
As-Ls Bad	8.3	635	1.12	98.1	25.6	5.3	1.0	37.0	4.8	0.1	Barely anything grows, not plowed in at least 40 years, thin grass and junipers growing
As-Tw Good	7	655	1.15	95.1	66.9	5.8	3.6	29.0	4.1	0.1	Normal part of field, not plowed in 20 years, was potatoes before permanent forage, timothy/naturalized grass
As-Tw Bad	5.9	490	0.89	83.2	42.9	5.2	0.8	6.1	3.4	0.6	Barely anything grows, not plowed in 20 years, potatoes prior to permanent forage, thin grass growing here
Heif Wet Spot	9.8	550	1.3	96.3	54.7	5.8	22.9	9.5	5.7	0.6	Wet spot, soil very coarse sand, lots of animal traffic by the looks of it, swamp grass and bullrushes growing
C1 Front	5.3	747	0.65	40.4	43.6	6.5	13.8	11.0	3.1	0.3	Plowed in spring 2021 and planted in soybeans. Previously had timothy but was always quite a thin stand. Not plowed in 15 years. Prior to timothy was a potato crop rotation.
C1 Silage	6.8	800	1.2	78.6	68.2	6.1	8.4	11.3	3.9	0.4	Not plowed in 15 years, timothy/naturalized forage stand. Prior to this it was potatoes
C1 Bad	9	782	1.31	94.8	64.1	5.7	1.2	13.4	5.2	0.4	Not plowed in 15 years. Timothy, goldenrods and bedstraw growing there. No crop ever taken off, just bush hogged each year. Never used for potatoes, just forage and probably never plowed much.
C2 Front	3.7	361	0.45	38	29.8	5.6	15.0	11.3	2.2	0.2	Plowed in spring 2021 and planted in soybeans. Previously had timothy but was always quite a thin stand and not plowed in 15 years. Prior to timothy was potato crop system
Average:	**7.0**	**639.5**	**1.1**	**79.8**	**57.7**	**5.8**	**8.9**	**17.7**	**4.0**	**0.3**	

As reported in Soil Health Bench Marking-Reference Project C1920-0036-Y2 in-field variability between key Soil Health Indicator parameters exists, similar to that demonstrated for soil pH, OM and nutrient availability with geo-referenced soil sampling. There does not appear to be a strong correlation in location between the soil health parameters reported. This variability must be accounted for when defining sampling methodology to establish benchmarks to measure remediation procedures to improve soil health.

As critical as soil health measurements may be in managing the adaptation to climate change, based on the limited data available to date there appears to be a significant difference between agricultural regions in New Brunswick and between cropping systems within the regions. Therefore it may not be possible to establish a province wide soil health rating system in New Brunswick similar to PEI.

Compounding the discussion is the lack of consensus among the local academic community and crop consultants .on the “best” method or parameters for measuring and monitoring soil health. A&L Canada Laboratories Inc., London, Ontario (https://www.alcanada.com/content/solutions/soil-health) is marketing soil health monitoring in Atlantic Canada with a somewhat different approach than the PEI Analytical Soil Health Laboratory. A brief comparison of the methodologies is presented in Appendix B. The A&L methodology has not been calibrated with field trials in New Brunswick. All parameters are based on interpolation or extrapolation from another climatic zone with different cropping systems and by different agrologists from outside of NB.

Given the observed variability between NB agricultural regions, between cropping systems and within fields, it may be impractical to establish a single classification system for the Province or a Region. Although more data is required prior to a final conclusion, the best approach might be for a producer to adopt a lab methodolgy and measure improvement from a consistent reference point.

The PEI Analytical Laboratory Soil Health package (Appendix A) includes Soil Respiration, Aggregate Stability, Active Carbon, Biological Nitrogen Availability, and Soil Texture with the following standard soil sample analysis: pH, OM, P2O5, K2O, Ca, Mg, Cu, Zn, Fe, Mn, S, B, Na, Al, Lime Index, and CEC. The soil texture classification is calculated from the percent sand, clay and silt values using the USDA Natural Resources Conservation textural classification.

7. *Adjustments*:

No significant adjustments are anticipated.

To the extent possible sample locations will be coordinated with consultants and other project operators with on-going trials throughout New Brunswick so that additional information (e.g., yield response, disease pressure) can be brought into the interpretation of the soil health results.

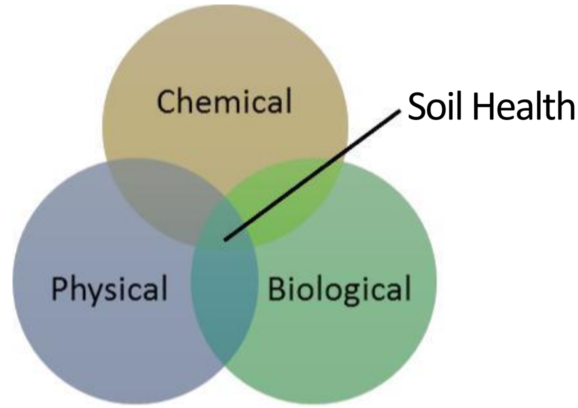
The outcome from this project will be an improved definition of soil health benchmark values provided by PEIAL around specific agricultural systems or management practices in New Brunswick’s major commodities.

Prince Edward Island Canada Agriculture and Land

PEI Soil Health Test - How to Interpret Your Results

September 2019

What is Soil Health?



"Soil health" is a term often used to define the ability of a soil to function. It focuses on all three primary soil properties: the physical, chemical, and biological components and how they affect plant productivity. By testing soil health parameters, we can better understand the limitations and stressors to a soil system, and try to adapt management practices to increase the areas that require improvement.

The chemical, biological, and physical properties of soil work cohesively together. By neglecting one aspect of soil health, you could be limiting other areas.

Section I - Soil Health Indicator Tests

Each soil health test listed below is a useful indicator of one or more soil functions. The active carbon, soil respiration, aggregate stability, and soil texture tests were adapted from the Cornell Soil Health Assessment and Atlantic Soil Health Lab. The biological nitrogen availability test was adapted from the Atlantic Soil Health Lab.

Soil Texture

Soil texture is presented as the percentage of sand, silt, and clay particles found in a soil. Based on those results, your soil falls into one of several soil texture classes. There is no rating associated with soil texture results since texture cannot be altered or influenced through management practices. Generally, soil texture class will not change over time.

Soil texture can strongly influence many soil characteristics, such as the amount of soil organic matter that a soil could potentially contain. Therefore, soil texture can influence soil health test results. With sandy soils like those found on PEI, it can be difficult to build and maintain high levels of soil organic matter, which has the potential to decline faster than other soil types in response to crop management practices. On the other hand, sandy soils generally have better drainage than heavier clay soils.

Soil Organic Matter

One of the best indicators of soil health is soil organic matter content. Soil organic matter, measured as total soil carbon, represents the amount of carbon compounds in the soil that are derived from living and dead organisms and plant tissues. Organic matter exists in various stages of decomposition and is considered vital to soil health because it influences almost every important soil property, including fertility, nutrient cycling, water storage and infiltration, and extreme weather events.

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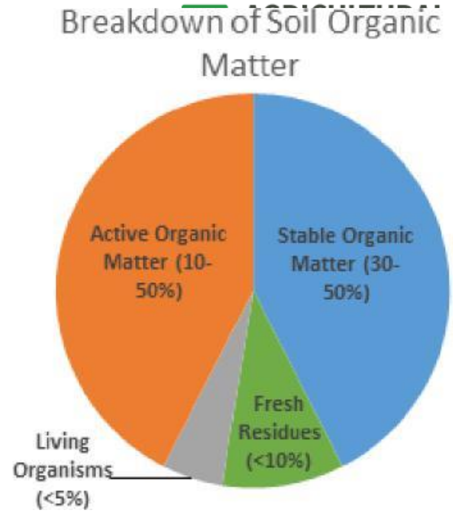
CANADIAN



Atlantic Soil Health Lab, 2018

The total soil organic matter value is reported as a percentage of the overall soil amount. **The higher the value - the better.**

It can take several years to notice an increasing or decreasing trend in soil organic matter levels beyond lab or field variability. This is partially due to the fact that a relatively large portion of soil organic matter is highly inactive and has taken thousands of years to form.

Active Carbon

Soil organic matter can be divided into two different groups: the "stable" fraction and the "active" fraction. The "stable" (or "humus") fraction has formed over thousands of years, is resistant to breakdown, and not usable by plants. It stores carbon and provides an essential role in maintaining soil structure and cation exchange capacity. The "active" soil organic matter fraction is more recently formed (1-5 years) and is more readily available to plants. The active fraction consists of decomposing plant and animal (microbe) tissues and acts to supply and recycle soil nitrogen. The active fraction is also involved in the formation of soil aggregates. The active soil organic matter fraction responds more quickly to crop management changes than the much larger stable soil organic matter in soil. Therefore, being able to evaluate the amount of active carbon is useful for measuring and tracking the impact of soil management practices on organic matter.

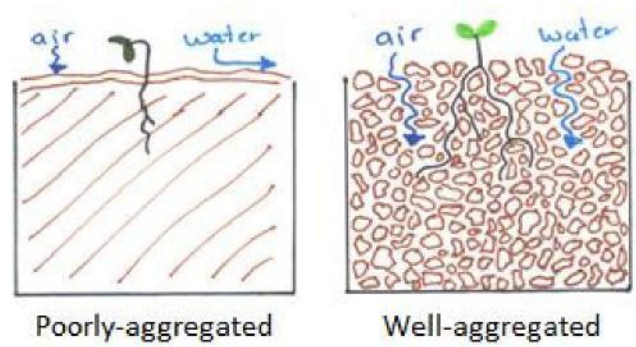
For the active carbon test, the **higher the value - the better.**

Soil Respiration

Microbes, including bacteria and fungi, play a critical role in regulating the carbon cycle and mineralizing nutrients, turning them into plant-available forms. Soil microbes also influence tilth (soil structure) and help protect crops against pests and disease. As the name implies, the soil respiration test assesses microbial activity by measuring the release of carbon dioxide (CO_2) from the soil. CO_2 respiration is a by-product of microbial metabolism, which includes mineralizing nutrients and breaking down residues. This test is a good indicator of overall microbial activity.

The value reported for the soil respiration test is in milligrams of CO_2 per gram of dry soil. **The higher the value - the better.**

Aggregate Stability



Adapted from Sullivan (1999)

Soils are composed of many shapes and sizes of particles (sand, silt, and clay), and these particles form into structures known as "aggregates." These aggregates of soil particles are held together by organic matter, microorganisms, and the compounds these microorganisms produce. Having aggregates of different sizes results in spaces (or pores) between the aggregates, which allows water and air to move through the soil. The structural stability of soil is dependent on how well these aggregates are held together and by the types of particles present in the aggregate. Therefore, the presence and durability of aggregates is key to maintaining good soil structure.

A well-aggregated soil is more likely to maintain its structure in response to physical stress such as tillage, precipitation, and compaction. We measure aggregate stability by testing how well soil aggregates resist breaking apart during a simulated heavy rainstorm event. The value reported is in percentage of stable aggregates. **The higher the value - the better.**

Aggregate Stability Test

On the left, this soil only retained 20% of the soil aggregates on the sieve during the rainfall simulation, whereas the soil on the right retained 63% of the soil aggregates. The higher aggregate stability found in the sample on the right means it will have greater resistance to breakdown during stress (i.e., during extreme weather conditions).

Biological Nitrogen Availability

Nitrogen is stored in the soil in two forms – one is immediately plant available (inorganic), and the other (organic) is tied-up in a variety forms (i.e. in organic matter, microbial organisms, plant and root residues, etc.). Nitrogen becomes plant available when it is broken down (also known as mineralized) into an “inorganic” form, and can then be actively taken up by plant roots. This breakdown process occurs by microbes metabolizing these compounds and releasing nitrogen into a plant available form. This process is driven by microbes and is dependent on soil temperatures and moisture levels.

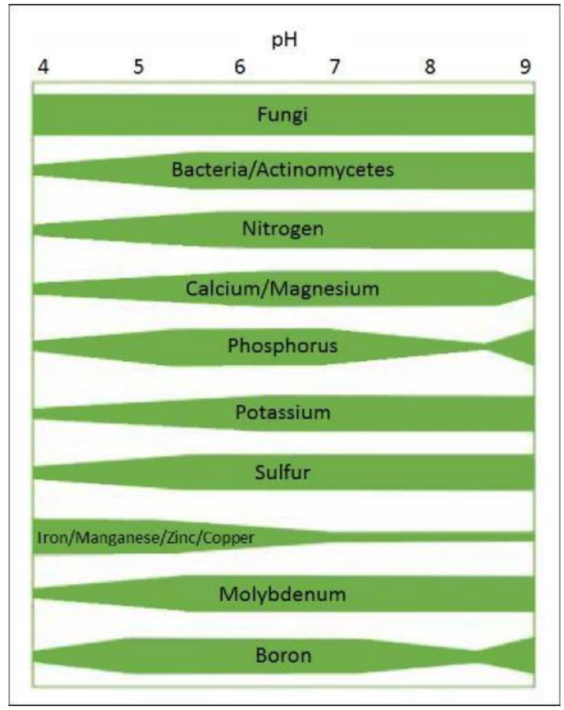
To measure how well your soil can provide plant-available nitrogen during the growing season, the biological nitrogen availability is tested by taking a dry, relatively inactive soil and exposing it to optimum moisture and temperature conditions over two weeks. This allows microbial activity to resume and the amount of nitrogen that gets mineralized into plant-available forms can be measured. The amount of plant-available (inorganic) nitrogen that is mineralized during this period is reported and the **higher the value** – **the better.** This test was adapted for use specifically for PEI producers by the Atlantic Soil Health Lab in Truro, NS.

Soil pH and nutrient availability

Soil pH measures the acidity of the soil. Soil acidity affects many soil processes, including microbial activity and the availability of nutrients to crops. Optimum soil pH can differ by crop type, with most crops having an optimum of 6.2-6.8. However, potatoes and wild blueberries can grow well in lower pH soils.

The image below depicts the availability of different nutrients at various pH levels. The wider the band, the greater the availability of that nutrient. As pH changes, nutrients take on different chemical forms, making them more or less reactive with other compounds. Therefore, at different pH levels some nutrients are more available, and some nutrients are less available.

Crop growth is largely dependent on ensuring adequate nutrients are taken up by the plant, and can be slowed down if nutrients are not in a plant-available form. Nutrients can be referred to as macronutrients if they are required by the plant in a large volume, and micronutrients if they are required in a small amounts. Soil chemistry is an integral component of soil health, which is why the soil health test is accompanied by a full nutrient analysis. Please consult the S3 report accompanying your soil health test for detailed nutrient results for each of your samples.



Moebius-Clune et al. (2016), modified from Brady and Weil (1999).

Phosphorus Saturation Index

Phosphorus is a relatively immobile nutrient within the soil and can be inaccessible to the crop unless it is in a form available for plant uptake. Factors that affect phosphorus plant uptake include organic matter content, fertilizer placement, and pH. Because PEI has slightly acidic soils, iron and aluminum can chemically tie-up "free" phosphorus that would otherwise be plant available at lower pH values. The Phosphorus Saturation Index is a calculation that can help predict the amount of P available to the crop, by accounting for the total amount of phosphorus and iron within the soil, as well as pH. Refer to the table below to determine if the phosphorus saturation (P/Al %) is above or below the critical P-Saturation level for your pH.

pH level of your sample	Critical P-Saturation Level	Interpretation
pH < 5.5	19%	If the P/AL % is above the critical P-saturation level listed for your pH level, then the soil is saturated with excess phosphorus. Therefore, the likelihood that crop yield will be impacted by the addition of phosphorus fertility is very low. Excess phosphorus can cause environmental issues if it moves with soil through erosion to bodies of water. A reduction in your phosphorus fertilization strategy is recommended.
pH > 5.5	14%	

For more information on the P-Saturation Index, please refer to the factsheet "Understanding the factors controlling phosphorus availability" at: https://www.princeedwardisland.ca/en/information/agriculture-and-land/understanding-factors-controlling-phosphorus-availability-crop. Specific phosphorus recommendations using the phosphorus index for potato has been developed for PEI. The P-saturation index is also used to estimate potato P requirements in Quebec (CRAAQ, 2010), and New Brunswick (New Brunswick Department). These recommendations were developed for PEI soils at plot-scale studies and validation of the recommendations for field-scale is in development. For more information see the link below:

https://www.princeedwardisland.ca/sites/default/files/publications/af_nmp_p_fertilization_recommendation.pdf

C:N Ratio

Soil microbes decompose organic materials in search of nutrients and energy sources. The relative amounts of energy (C) and nutrients (N, P, S) will determine whether decomposition will result in removal (immobilization) or release of nutrients (mineralization). Organisms will only use the nutrients needed to meet their growth needs, releasing the excess nutrients into the soil in a plant-available form (mineralization).

The ratio of C:N in the soil therefore reflects the relative amounts of energy (C) and nitrogen (N) in organism matter and whether nitrogen mineralization or immobilization will occur during decomposition. When the ratio of C:N falls below 20:1, decomposition will result in plant available nitrogen being released (mineralization).

The C:N ratio for soil is calculated simply by comparing the total carbon and total nitrogen values of the sample, which are reported below the ratio. Greater soil N supply is expected in soils with a narrow C:N ratio.

APPENDIX B Comparison of the PEI Analytical Soil Health Laboratory and A&L Canada Laboratories Inc Soil Health Methodology and Reporting

Solvita C02 burst:
Measure of C02 released in 24 hrs after soil has been dryed and re-wetted. High correlation to microbial activity in the soil and directly related to soil fertility.

Compares to PEIAL Soil Respiration

Microbes, including bacteria and fungi, play a critical role in regulating the carbon cycle and mineralizing nutrients, turning them into plant-available forms. Soil microbes also influence tilth (soil structure) and help protect crops against pests and disease. As the name implies, the soil respiration test assesses microbial activity by measuring the release of carbon dioxide (CO_2) from the soil. CO_2 respiration is a by-product of microbial metabolism, which includes mineralizing nutrients and breaking down residues. This test is a good indicator of overall microbial activity.

The value reported for the soil respiration test is in milligrams of CO_2 per gram of dry soil. The higher the value - the better.

Reactive C:
Composed of dead and actively decomposing OM in the rhizosphere that will feed microbes. Reactive C is linked to a number of soil processes including microbial biomass, growth and activity, and nutrient cycling. This number should ideally sit between 500-700ppm.

Compares to PEIAL Active Carbon

Soil organic matter can be divided into two different groups: the "stable" fraction and the "active" fraction. The "stable" (or "humus") fraction has formed over thousands of years, is resistant to breakdown, and not usable by plants. It stores carbon and provides an essential role in maintaining soil structure and cation exchange capacity. The "active" soil organic matter fraction is more recently formed (1-5 years) and is more readily available to plants. The active fraction consists of decomposing plant and animal (microbe) tissues and acts to supply and recycle soil nitrogen. The active fraction is also involved in the formation of soil aggregates. The active soil organic matter fraction responds more quickly to crop management changes than the much larger stable soil organic matter in soil. Therefore, being able to evaluate the amount of active carbon is useful for measuring and tracking the impact of soil management practices on organic matter.
For the active carbon test, the higher the value - the better

Soil Health Index:
Scale of 0-60. Used as a snapshot of soil fertility and microbial health. Over 40 is generally good.

This is sort of what PEIAL is getting at with their rating system. However we do not have sufficient NB data to attempt this yet.

Rating	Interpretation
Low (0-25)	The "Low" rating means the test value is among the lowest 25% for all sites sampled across PEI and may be limiting the productivity of the system. Short and long term management strategies should be implemented to build up the soil health within the field.
Low+ (26-50)	The "Low +" rating means the test value is below average of all sites sampled across PEI. Review management practices and consider including additional short and long term management. Re-test again after one full rotation to determine if the field is trending towards improvement or decline.
Medium (51-75)	The "Medium" rating means the test value is above average of all sites sampled across PEI. Consider which practices are currently working on the farm and where areas for improvement may exist. Prioritize this against the status of other tests and fields reported to determine where resources and time should be spent.
High (76-100)	The "High" rating means the test value is among the top 25% of all sites sampled across PEI. Consider field history and previous management practices to identify ways of maintaining the strong rating. If making changes to cropping practices, consider how it may affect soil health and in this event, plan future re-sampling to observe changes or trends. Focus management strategies on other lower-rated soil health test results if they exist.

Water Extracted Carbon/Nitrogen:
Basically a C:N ratio (Haney Test) used to determine microbial activity in the mineralization of N and P. Optimal ratio is between 8:1 and 15:1. A soil C:N ratio above 20:1 generally indicates that no net N and P mineralization will occur and these nutrients are tied up within the microbial cell.
This C pool is 80X smaller than the total organic C pool (%OM) and reflects the energy source feeding microbes. The water extractable organic C reflects the quality of the C in your soil and is highly related to Microbial activity. To put in producer terms: the soil OM is the house the microbes live in, but what this is measuring is the food they eat! Should ideally range from 100-300ppm.

Compares to PEIAL Biological Nitrogen Availability
Nitrogen is stored in the soil in two forms – one is immediately plant available (inorganic), and the other (organic) is tied-up in a variety forms (i.e. in organic matter, microbial organisms, plant and root residues, etc.). Nitrogen becomes plant available when it is broken down (also known as mineralized) into an "inorganic" form, and can then be actively taken up by plant roots. This breakdown process occurs by microbes metabolizing these compounds and releasing nitrogen into a plant available form. This process is driven by microbes and is dependent on soil temperatures and moisture levels.
To measure how well your soil can provide plant-available nitrogen during the growing season, the biological nitrogen availability is tested by taking a dry, relatively inactive soil and exposing it to optimum moisture and temperature conditions over two weeks. This allows microbial activity to resume and the amount of nitrogen that gets mineralized into plant-available forms can be measured. The amount of plant-available (inorganic) nitrogen that is mineralized during this period is reported and the higher the value – the better. This test was adapted for use specifically for PEI producers by the Atlantic Soil Health Lab in Truro, NS

This test requires a two week incubation in the lab.

PEIAL also reports a C:N Ratio which sort of gets at this.
Soil microbes decompose organic materials in search of nutrients and energy sources. The relative amounts of energy (C) and nutrients (N, P, S) will determine whether decomposition will result in removal (immobilization) or release of nutrients (mineralization). Organisms will only use the nutrients needed to meet their growth needs, releasing the excess nutrients into the soil in a plant-available form (mineralization).
The ratio of C:N in the soil therefore reflects the relative amounts of energy (C) and nitrogen (N) in organism matter and whether nitrogen mineralization or immobilization will occur during decomposition. When the ratio of C:N falls below 20:1, decomposition will result in plant available nitrogen being released (mineralization).
The C:N ratio for soil is calculated simply by comparing the total carbon and total nitrogen values of the sample, which are reported below the ratio. Greater soil N supply is expected in soils with a narrow C:N ratio

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CANADIAN AGRICULTURAL PARTNERSHIP

APPENDIX C: Summary of Soil Health Attributes for All Fields and Sample Sites-2019-2020

DISTRICT	FIELD_ID	% SAND	% SILT	% CLAY	TEXTURE	OM	ACTIVE CARBON	RESPIRATION	Aggregate Stability	BNA	pH	P_INDEX	C:N	% C
Carleton	13	29.6	51.5	18.8	Silt Loam	2.9	364	0.69	33	12.9	5.8	18.15	9.33	1.68
Carleton	15	18.5	37.9	43.6	Clay	3	328	0.61	28.3	15.2	5.7	16.87	9.16	1.74
Carleton	17	18.9	38	43.1	Clay	3.6	368	0.75	38.9	14.8	5.6	14.92	9.95	2.09
Carleton	7	34.7	45.9	19.4	Loam	2.9	306	0.77	33.2	14.6	5.9	19.96	9.33	1.68
Carleton	9	32.3	49	18.6	Loam	3.3	368	0.6	40	13.2	5.8	14.09	10.05	1.91
Carleton	11	33.6	50.4	16	Silt Loam	3.1	326	0.69	41.7	12.1	5.8	21.36	9.47	1.8
Carleton	1	31.8	51.5	16.8	Silt Loam	2.8	420	0.58	34.3	14.5	7.2	18.4	9.53	1.62
Carleton	3	37.1	47.1	15.8	Loam	2.8	254	0.85	39.2	15.1	5.5	19.92	9	1.62
Carleton	5	36.7	48	15.3	Loam	4	496	0.84	43.3	24	6	15.41	10.55	2.32
Carleton	19	33.3	49.8	16.9	Loam	4.1	418	0.57	48.5	19.3	5.6	13.13	9.92	2.38
Carleton	21	28	51.9	20.1	Silt Loam	3.3	373	1.16	28.8	23.9	5.8	12.84	10.05	1.91
Carleton	Field 3	29.2	52.1	18.7	Silt Loam	8.8	871	2.09	94.4	63.4	6.6	4.06	10.85	5.1
Carleton	Paul 48-1A	26.4	55.9	17.8	Silt Loam	4.4	487	0.55	25.8	32.3	6.1	7.62	10.62	2.55
Carleton	Home 6	35.1	50.1	14.9	Silt Loam	5.1	676	0.65	16.8	28.7	6.2	10.11	11.38	2.96
Carleton	Home 3	26.6	57.9	15.5	Silt Loam	5	572	0.36	20.9	17.9	5.6	9.91	11.15	2.9
Carleton	CM 3	41.9	46.1	12	Loam	4	541	0.3	23.2	22.2	6.6	15.78	10.55	2.32
Carleton	BP 1	30.7	52.5	16.8	Silt Loam	3.5	428	0.3	23.7	40.8	4.5	12.39	9.23	2.03
Carleton	BP 1 Fence	19.1	60.7	20.2	Silt Loam	6.5	815	1.82	88.9	81.1	6.2	2.18	19.84	3.77
Carleton	KT 1	32.8	51.1	16.1	Silt Loam	3.4	366	0.45	21.6	29.3	5.8	18.92	5.97	1.97
Carleton	KT 1 Fence	26.4	56.1	17.5	Silt Loam	8.1	705	1.47	93.3	62	5.5	5.36	13.82	4.7
Carleton	As Main P	21.7	56.4	21.9	Silt Loam	8.4	791	1.38	89	115.1	5.7	2.45	9.19	4.87
Carleton	As Twin P	27.9	52.4	19.7	Silt Loam	7.5	769	1.48	91.5	87.6	5.8	1.21	10.36	4.35
Carleton	As Twin Low	26.2	54.1	19.6	Silt Loam	7.1	670	1.35	93.3	48.5	5.4	0.72	11.77	4.12
Carleton	As Woods	18.4	63.5	18.2	Silt Loam	12.3	1207	1.68	87.4	116.7	6.2	1.09	12.29	7.13
Carleton Avg.		**29.0**	**51.2**	**19.7**		**5.0**	**538.3**	**0.9**	**49.1**	**38.6**	**5.9**	**11.5**	**10.6**	**2.9**
StD.		**6.4**	**5.9**	**7.6**		**2.5**	**231.4**	**0.5**	**28.6**	**32.3**	**0.5**	**6.9**	**2.4**	**1.4**
Central	BB Pre Fum	71.6	19.3	9.1	Sandy Loam	4	454	0.52	74	22.8	5.4	6.6	10.55	2.32
Central	BB Undist	67.3	22.5	10.2	Sandy	4.8	619	0.55	80	37.1	5.9	3.34	13.9	2.78

					Loam									
Central	Home Farm Frt	39.9	49.5	10.6	Loam	6.6	798	1.43	74.5	48.9	6.2	16.35	10.35	3.83
Central	Home Farm B	35.2	51.7	13.1	Silt Loam	8.4	960	1.52	70.9	55.7	6.5	20.1	11.07	4.87
Central	Tree Line	46.4	44.4	9.3	Loam	7.7	711	0.96	93.1	35.9	5.7	4.2	13.15	4.47
Central	6-May	25.2	55.6	19.2	Silt Loam	8.2	990	1.58	81.7	84	6.3	3.09	11.07	4.76
Central	Treeline 5/6	21.4	59.2	19.4	Silt Loam	7.2	722	1.68	89.4	96.2	5.7	2.92	10.2	4.18
Central	Strip 1	54.1	37.7	8.2	Sandy Loam	1.6	327	0.64	46	29.5	6.1	5.31	7.75	0.93
Central	Strip 2	45.9	43.6	10.5	Loam	2.2	290	0.68	52.7	34.3	6	9.4	8	1.28
Central	Strip 3	39.3	49.8	10.9	Loam	1.9	292	0.64	56.3	37	6	5.58	7.33	1.1
Central	Tree Line	43	46.8	10.2	Loam	3.1	615	1.65	53	53	6.4	3.74	9.47	1.8
Central	Blue After F	71.4	20.9	7.7	Sandy Loam	4.7	519	0.68	65	25.8	5.6	7.27	12.41	2.73
Central	BC 38	33.1	52.9	13.8	Silt Loam	6	718	0.7	68	47.7	6	6.4	9.67	3.48
Central	BC 38 Woods	26	56.6	17.5	Silt Loam	10.2	834	1.63	93.9	111.7	4.8	8.05	12.87	5.92
Central	BC 21	22.7	62.7	14.6	Silt Loam	7.1	787	0.62	82.3	52.1	6.2	2.42	9.36	4.12
Central	BC 21 Woods	22.3	61.4	16.2	Silt Loam	8.9	948	1.36	93.3	88.4	5.9	1.41	10.12	5.16
Central Avg.		**41.6**	**45.9**	**12.5**		**5.8**	**661.5**	**1.1**	**73.4**	**53.8**	**5.9**	**6.6**	**10.5**	**3.4**
StD.		**17.2**	**14.1**	**3.8**		**2.7**	**231.8**	**0.5**	**15.6**	**27.0**	**0.4**	**5.1**	**1.9**	**1.6**
Kings	SUS037	36.2	49.8	14	Loam	5.3	767	0.92	50.2	61.8	6	10.87	8.53	3.07
Kings	SUS037Woods	33.3	52.3	14.4	Silt Loam	6.1	813	1.01	61.2	67.6	6.3	7.03	9.57	3.54
Kings	SPR305	42.5	41.8	15.7	Loam	5.4	599	1.77	74.3	79.6	5.5	1.77	8.94	3.13
Kings	SPR286	55.9	32.7	11.4	Sandy Loam	6.8	706	1.17	78.6	62.8	5.8	3.05	10.94	3.94
Kings	STU261	23.8	59.1	17.1	Silt Loam	5.2	656	0.89	50.2	54.2	6	4.4	9.44	3.02
Kings	DIC457	77.1	17.1	5.8	Loamy Sand	6.2	529	0.36	38.7	8.5	6.2	19.33	12.41	3.6
Kings	ORT011	57.4	31.9	10.7	Sandy Loam	5.4	702	1.13	55.6	58.3	6.2	9.08	10.79	3.13
Kings	BER526	61.9	28.4	9.7	Sandy Loam	1.7	250	0.43	15.6	23.8	6.1	6.6	9	0.99
Kings	PHI351	40.7	41.9	17.3	Loam	4.1	734	0.8	18.5	33.2	6.7	8.41	13.22	2.38
Kings	PHI 351B	39.6	44.7	15.7	Loam	4	498	0.8	46.9	26.9	4.6	2.61	13.65	2.32
Kings	SUS081	43.3	46.9	9.9	Loam	4.6	686	1.03	45.5	60.1	6.3	8.89	9.21	2.67
Kings	BER448	57.8	35.9	6.4	Sandy	6.7	863	0.83	85.2	39.2	6.8	7.58	11.44	3.89

					Loam									
Kings	BER431	48.3	43.5	8.1	Loam	6.2	915	1.02	82.9	45.3	6.4	26.81	10	3.6
Kings	BER478	57.3	31.3	11.3	Sandy Loam	2.8	381	0.34	22.7	17.5	5.9	7.66	9.53	1.62
Kings	SUS308	54.1	35.2	10.6	Sandy Loam	3.2	546	0.65	21.1	34.3	6.3	13.69	9.3	1.86
Kings		47.5	42.5	10	Loam	6.8	888	0.94	59.5	52.4	6.5	5.66	10.65	3.94
Kings Avg.		**48.5**	**39.7**	**11.8**		**5.0**	**658.3**	**0.9**	**50.4**	**45.3**	**6.1**	**9.0**	**10.4**	**2.9**
StD.		**13.0**	**10.3**	**3.6**		**1.5**	**184.2**	**0.3**	**22.9**	**20.0**	**0.5**	**6.4**	**1.6**	**0.9**
Moncton	COR487	49.2	37.5	13.3	Loam	5	751	0.66	32.2	42.4	6.3	17.7	14.5	2.9
Moncton		43.4	38.2	18.4	Loam	9.2	836	2.48	78.8	78.5	4.5	7.43	13.69	5.34
Moncton		47.1	36.8	16.1	Loam	3.3	310	0.7	35.1	22.3	5.3	3.01	12.73	1.91
Moncton	HIL431	45.9	40.9	13.1	Loam	6.3	706	0.72	63.4	43.5	5.2	4.56	10.43	3.65
Moncton	COL184	44.7	40.6	14.7	Loam	5.9	777	1.48	64.5	43.4	6.8	8.65	10.06	3.42
Moncton	URY331	50.2	38.3	11.5	Loam	5.5	724	0.86	71	59.4	5.8	6.68	11	3.19
Moncton		36.9	52.1	11	Silt Loam	4.1	478	2.17	76.3	99.4	5	7.66	11.33	2.38
Moncton Avg.		**45.3**	**40.6**	**14.0**		**5.6**	**654.6**	**1.3**	**60.2**	**55.6**	**5.6**	**8.0**	**12.0**	**3.3**
StD.		**4.4**	**5.3**	**2.6**		**1.9**	**189.1**	**0.8**	**19.0**	**25.9**	**0.8**	**4.7**	**1.7**	**1.1**
Chignecto	ELL113	49.7	35.4	14.9	Loam	5.3	451	1.02	71.8	66.2	5.7	2.66	10.96	3.07
Chignecto	ELL113woods	37.4	42.6	20	Loam	6.1	669	1.68	78.5	69	5.9	2.04	10.41	3.54
Chignecto	WES228	54.5	34.2	11.3	Sandy Loam	4.9	780	1.52	64.8	37.4	6.9	11.4	11.83	2.84
Chignecto	MEI276	54	36	10	Sandy Loam	1.5	276	0.73	10.3	23.1	6.6	16.94	8.7	0.87
Chignecto	COK186	46.1	41.3	12.3	Loam	5.3	850	1.53	78.1	54.8	6.8	7.09	10.59	3.07
Chignecto	GIN770	46.6	39.8	13.6	Loam	6.4	640	0.87	80.9	51	4.9	9.99	11.97	3.71
Chignecto	SAC852	7.8	51.5	40.7	Silty Clay	19.6	1320	1.21	81.1	64.1	4.5	2.95	11.15	11.37
Chignecto		3.8	74.2	22	Silt Loam	9.6	853	1.61	67	135.5	5.3	4.86	9.28	5.57
Chignecto	GIN812	48.7	39.4	11.8	Loam	4.1	634	0.68	37.1	41.1	7.2	3.83	11.33	2.38
Chignecto Avg		**38.7**	**43.8**	**17.4**		**7.0**	**719.2**	**1.2**	**63.3**	**60.2**	**6.0**	**6.9**	**10.7**	**4.0**
Std.		**19.4**	**12.5**	**9.6**		**5.2**	**292.4**	**0.4**	**24.1**	**32.0**	**1.0**	**5.0**	**1.1**	**3.0**
North Shore	DAL949	33	48.5	18.5	Loam	5.9	713	0.93	51.8	22.7	7.1	43.14	9.77	3.42
North Shore	DAL315	22.3	55.6	22.1	Silt Loam	8.9	1109	1.12	81.7	54.4	6.6	2.89	12.59	5.16
North Shore	COL150	46.7	35.2	18.1	Loam	10.1	1087	1.33	61.3	67.6	7.3	28.94	11.27	5.86
North Shore	FRE158	34.9	47.4	17.7	Loam	9.3	1149	1.11	82.3	84.3	6.5	10.41	10.57	5.39

North Shore	NEP076	9.6	69.7	20.8	Silt Loam	5.8	677	1.65	75.1	45.9	6.3	1.58	10.5	3.36
North Shore	CAN041	40.2	41.5	18.3	Loam	5.2	901	1.22	40.2	47.8	6.9	5.49	11.19	3.02
North Shore	CLI247	20.4	51.3	28.4	Clay Loam	6.8	916	1.73	62.8	59.8	6.5	4.54	10.37	3.94
North Shore	LAD038	47.7	40.6	11.7	Loam	4.9	667	0.91	85.4	23.6	6.3	2.07	10.52	2.84
Northshore Avg.		**31.9**	**48.7**	**19.5**		**7.1**	**902.4**	**1.3**	**67.6**	**50.8**	**6.7**	**12.4**	**10.8**	**4.1**
StD.		**12.6**	**10.0**	**4.4**		**1.9**	**187.0**	**0.3**	**15.2**	**19.6**	**0.3**	**14.3**	**0.8**	**1.1**
Northwest	QEU283	32	52.6	15.4	Silt Loam	9.9	1187	0.91	80.2	56.3	6.9	7.37	10.44	5.74
Northwest	DAV253	21.6	61.5	16.9	Silt Loam	3	677	0.48	71.2	37.3	6	13.7	9.67	1.74
Northwest	BOU286	39	47.8	13.2	Loam	9.3	397	0.35	33.4	17.6	6	2.41	11.23	5.39
Northwest		35.9	51	13.2	Silt Loam	4.9	542	0.58	70.6	38.1	5.7	11.79	10.92	2.84
Northwest	BOU380	39.3	46	14.7	Loam	8.8	1050	1.34	87.3	49.9	7.1	27.99	11.09	5.1
Northwest	AMA214	37.5	46.7	15.8	Loam	5.2	678	0.35	61.3	26.6	6.1	5.78	10.07	3.02
Northwest	BEL072	62.1	31.1	6.8	Sandy Loam	6	773	1.03	94.6	25.7	6.8	16.72	10.55	3.48
Northwest	VAN039	50.2	36.3	13.5	Loam	10.6	876	0.94	100	58.6	5.2	3.42	9.46	6.15
Northwest	QEU306	24.4	58.6	16.9	Silt Loam	5.8	851	0.63	52.7	35.6	6	12.24	9.88	3.36
Northwest	VIO230	28.2	53.1	18.7	Silt Loam	10.2	1218	1.51	88	58.8	7	24.23	9.25	5.92
Northwest		24.6	52.1	23.3	Silt Loam	8.7	814	1.2	98.2	69.6	5.7	6.07	11.48	5.05
Northwest	BOU372	20.5	58.4	21.1	Silt Loam	13.5	1092	1.39	97.9	99.3	5.2	4.42	11.51	7.83
Northwest	BEL202	24.9	59.8	15.4	Silt Loam	6.6	825	1.86	90.4	39.7	6.8	10.94	10.35	3.83
Northwest	GOD033	39	48.6	12.4	Loam	3.4	386	0.42	42	15.3	5	13.73	9.85	1.97
Northwest	QUE306	37.6	57.1	5.2	Silt Loam	5.2	936	1.88	95.3	66.8	6.4	9.02	9.74	3.02
Northwest		21.9	61.7	16.4	Silt Loam	5.7	710	0.59	68.6	38.4	5.5	8.83	9.46	3.31
Northwest Avg.		**33.7**	**51.4**	**14.9**		**7.3**	**813.3**	**1.0**	**77.0**	**45.9**	**6.1**	**11.2**	**10.3**	**4.2**
StD.		**11.4**	**8.7**	**4.5**		**2.9**	**249.8**	**0.5**	**21.0**	**21.8**	**0.7**	**7.1**	**0.8**	**1.7**
2020	Average of 95:	37.5	46.8	15.7		5.9	680.4	1.0	61.7	47.7	6.0	9.6	10.6	3.4
2019	Average of 93	46.2	40.0	13.8		5.7	555.0	na	61.5	na	5.9	na	na	na

DISTRICT	FIELD_ID	% SAND	% SILT	% CLAY	TEXTURE	OM	ACTIVE CARBON	RESPIRATION	Aggregate Stability	pH
Carleton										
BRO169	BRO169	36.84	49.07	14.10	Loam	5.7	774		83.50	5.8
BRO168	BRO168	28.86	56.34	14.80	Silt Loam	5.4	664		77.35	5.1

WIL098	WIL098	33.58	51.15	15.28	Silt Loam	4.2	590		22.39	7.1
WHI250-Fence	WHI250	27.05	54.14	18.82	Silt Loam	5.4	707		97.60	5.7
WHI251	WHI251	27.03	53.96	19.01	Silt Loam	3.2	491		31.76	5.1
WHI239-Past	WHI239	49.67	38.80	11.52	Loam	6.2	522		99.53	5.4
TPA116	TPA116	25.97	57.54	16.49	Silt Loam	5.9	485		91.06	5.7
FAR289-New	FAR289-New	27.58	55.12	17.31	Silt Loam	6.2	653		60.68	6.8
FAR289	FAR289	32.08	52.39	15.53	Silt Loam	4.3	407		47.58	6.7
MOO370	MOO370	30.17	52.38	17.45	Silt Loam	5.2	531		60.69	6
POL207	POL207	27.85	53.17	18.98	Silt Loam	6	520		90.52	6.2
POL188	POL188	32.38	47.50	20.12	Loam	4.8	492		37.83	5.7
POL285	POL285	57.20	29.30	13.50	Sandy Loam	6	654		42.82	6.6
POL286	POL286	43.01	37.07	19.91	Clay Loam	8.6	815		75.84	5.9
ESD261	ESD261	47.30	39.64	13.07	Loam	10.3	812		86.69	6.2
NIX242	NIX242	43.64	46.48	9.88	Loam	4.4	534		33.71	6.3
BAT233	BAT233	42.47	46.32	11.21	Loam	4.9	508		53.86	6.1
BAT393	BAT393	32.02	53.63	14.35	Silt Loam	5	474		41.25	6.7
GUI353-New	GUI353-New	20.86	62.80	16.34	Silt Loam	10.6	1060		54.80	6.9
GUI353	GUI353	34.50	52.74	12.76	Silt Loam	4.4	389		38.40	6.3
KNO303	KNO303	31.72	54.18	14.10	Silt Loam	4.1	400		51.80	4.7
FIE070	FIE070	40.03	48.13	11.84	Loam	6.8	430		66.86	5.7
ELM053-1	ELM053-1	39.37	45.47	15.17	Loam	4.9	499		53.95	6.3
ELM053-2	ELM053-2	39.82	44.25	15.94	Loam	4.7	473		44.45	6.2
ELM 053-3	ELM 053-3	41.24	44.01	14.76	Loam	5.2	595		47.08	6.3
ELM 053-4	ELM 053-4	39.12	43.70	17.18	Loam	5.6	551		47.27	6.3
WAT 421	WAT 421	33.33	49.45	17.22	Loam	3.3	503		37.96	5.7
ELM 027-1	ELM027	36.70	46.84	16.47	Loam	3	440		22.29	5.5
CHE409	CHE409	59.19	28.72	12.10	Sandy Loam	2.6	302		41.82	6
CHE404	CHE404	29.83	53.64	16.54	Silt Loam	6.6	549		51.31	6.9

Carleton Avg.		36.3	48.3	15.4	Loam	5.5	560.8	56.4	6.1
StD.		9.0	7.8	2.7		1.8	155.0	22.0	0.6
Moncton									
	HIC887A	34.48	42.96	22.56	Loam	4.6	na	49.82	6
	HIC887B	43.16	38.96	17.87	Loam	3.9	362	38.92	6.6
	URY805	59.86	29.71	10.43	Sandy Loam	3	424	41.61	6
	URY805-BO	52.41	35.27	12.32	Sandy Loam	4.4	na	59.94	6
	JPR246	51.22	33.02	15.76	Loam	3	403	18.46	6.5
	COL373A	42.55	44.16	13.29	Loam	3.2	403	18.40	6.8
	COL373B	41.93	43.34	14.73	Loam	2.8	428	23.83	6.8
	SYN211	11.96	74.04	14.00	Silt Loam	3.1	428	74.71	6.4
	OGD734A				na	4.6	609	68.34	5.1
	OGD734B				na	5.2	na	45.75	5.3
	COK428A	53.17	36.24	10.59	Sandy Loam	4.1	548	54.95	6.2
	COK428B	54.41	35.44	10.15	Sandy Loam	3.8	na	62.52	6.7
	URR192	49.71	32.17	18.11	Sandy Loam	3.7	359	58.28	5.9
	DOR008	53.15	30.69	16.16	Sandy Loam	6.6	na	66.35	6.2
	LAG093A	62.37	23.49	14.14	Sandy Loam	2.9	321	22.53	5.4
	LAG093B	58.70	26.70	14.61	Sandy Loam	3.3	na	32.22	5.8
	GIN730	52.98	32.72	14.31	Sandy Loam	4.6	325	40.00	6
	WES133	61.08	26.31	12.61	Sandy Loam	5	621	62.65	6.3
Moncton Avg.		48.9	36.6	14.5	Loam	4.0	436.0	46.6	6.1
StD.		12.5	11.7	3.2		1.0	102.7	18.1	0.5
Central									

	LAP060	59.44	27.64	12.93	Sandy Loam	8.4	844	85.81	5.7
	GAW132	49.64	40.84	9.52	Loam	9	888	89.64	6.7
	LYN800	64.68	27.58	7.74	Sandy Loam	10.5	926	95.91	5.9
	QUN243	30.96	44.96	24.08	Loam	6.8	615	85.02	6.1
	SHE203	50.19	34.93	14.88	Loam	8.3	821	79.74	5.7
	SHE206	48.20	36.03	15.78	Loam	6.3	548	88.10	5.2
	PRW100	39.27	48.53	12.21	Loam	4.2	681	61.81	6.4
	LAO995	58.79	30.70	10.51	Sandy Loam	10.5	973	96.39	6.4
Central Avg.		48.9	37.2	13.9	Loam	7.6	760.4	83.7	6.0
StD.		11.4	8.1	5.3		2.1	145.4	10.8	0.5
Northshore									
	DAL326				na	18.1	na	63.35	6.4
	DUR093	67.02	22.37	10.61	Loamy Sand	5.2	474	78.52	5.9
	FRE148	39.52	42.51	17.97	Loam	10	627	87.57	5.7
	NEP025				na	6.4	na	58.06	6.9
	SAL298				na	10	701	82.31	6.4
	Egodin	80.79	14.49	4.73	Loamy Sand	3.5	259	70.02	4.3
	MOR355				na	3.7	357	54.16	4.1
	LStewART	77.74	16.41	5.86	Loamy Sand	3.3	322	53.84	4
	BAR188	75.26	18.24	6.50	Sandy Loam	5.8	437	46.80	4.1
	ALePage	75.52	17.51	6.97	Sandy Loam	5.1	439	62.08	4.2
	ESavoie	78.24	14.44	7.31	Loamy Sand	2.8	293	55.07	4.4
	OSE001	67.47	21.11	11.42	Loamy Sand	4.6	277	74.52	4.6
Northshore Avg.		70.2	20.9	8.9	Loamy Sand	6.5	418.6	65.5	5.1

StD.		13.3	9.2	4.3		4.3	149.6	12.9	1.1
Northwest									
	65060-345	42.75	44.32	12.92	Loam	3.7	427	21.25	5.1
	650-66-409	46.82	38.70	14.48	Loam	4.5	518	30.05	5.5
	351-05-733	43.27	37.30	19.42	Loam	6.8	853	89.54	6.2
	352-56-510	52.58	35.53	11.89	Sandy Loam	8.7	835	95.90	5.1
	350-48-107	45.64	40.49	13.88	Loam	9.8	1068	95.53	7
	350-46-651	55.02	32.08	12.91	Sandy Loam	10.7	842	92.62	6.5
	350-31-186	52.34	36.34	11.31	Sandy Loam	8	856	96.17	6.6
	350-23-076	42.87	46.30	10.84	Loam	6.2	na	81.71	5.6
	500-14-133	28.20	52.17	19.63	Silt Loam	5.1	na	82.55	5.6
	500-17-615	38.15	46.59	15.26	Loam	11.3	534	69.17	6.6
	352-13-008	41.10	49.15	9.76	Loam	5.3	805	70.88	6.5
	500-14-257	39.84	44.29	15.87	Loam	6.7	594	77.83	4.9
	650-60-202	44.73	40.09	15.17	Loam	3.7	599	16.65	5.8
Northwest Avg.		44.1	41.8	14.1	Loam	7.0	721.0	70.8	5.9
StD.		7.0	5.9	3.0		2.6	196.1	29.0	0.7
Kings									
	CHA063	41.12	47.87	11.01	Loam	5.6	337	89.74	6.6
	CHA063B	45.15	44.05	10.80	Loam	6.4	680	87.99	6.3
	TIT352	37.09	49.69	13.22	Loam	5.7	625	66.02	6.3
	WIC452	67.28	23.15	9.57	Sandy Loam	5	369	84.99	5.5
	PHI351	57.34	28.01	14.66	Sandy Loam	3.3	na	17.49	6.9
	SUS137	47.34	40.78	11.89	Loam	3.6	369	49.45	6.1
	ORT012	47.64	38.67	13.68	Loam	6.2	560	83.65	6.5
	SUS617	39.30	44.84	15.86	Loam	5.4	481	75.23	6.3
	SUS413	56.08	30.87	13.05	Sandy Loam	3.8	486	51.27	5.8

WFL119	53.80	34.59	11.60	Sandy Loam	8.5	620	96.98	5.7
TIT525	43.90	41.75	14.36	Loam	2.4	261	40.54	5.7
DIC311	69.13	21.70	9.17	Sandy Loam	3.7	417	31.19	5.6
OHN211	52.93	35.38	11.69	Sandy Loam	4.6	394	87.58	5.2
Kings Avg.	50.6	37.0	12.4	Loam	4.9	466.6	66.3	6.0
StD.	10.0	9.0	2.0		1.6	131.2	25.7	0.5