Nova Scotia Forest Soil Monitoring Program

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Forest Nutrition Mgmt

At NSDNR we are working on several initiatives related to forest nutrition management.

e.g.

Nutrient Budget Model (NBM-NS)
Plantation Liming Amendments
Nutrient Management Decision Support Tools, etc.

All require soils data to varying degrees

Nutrient Budget Model (NBM-NS)

Nutrient Loss Scenario:	Sustainably Operable	Sustainable MAI (m^3/ha/year)	Load New	Refresh
Harvest Deficiency		3.15		

Inventory Data	From Spatial Export		From PTA		Used in Model		Custom Harvest Scenario Removal %		
	Code	%	Code	%	Code	%	Stem	Branch	Foliage
Species 1	RS	8			RS	8	RS 100	0	0
Species 2	BF	2			BF	2	BF 100	0	0
Species 3		0				0	100	0	0
Species 4		0				0	100	0	0

Avg Softwood DBH (cm)	16		16	
Avg Hardwood DBH (cm)	0		0	
Total Merchantable Volume (m3)	180		180	
Stand age (yrs)	60		60	

Site Data	From Spatial Export	From PTA	
Substrate Code (1,2,3,4)	1		1
Soil Rooting Depth (cm)	40		40
Soil % Organic Matter	2.7		2.7
Soil Coarse Fragment Content (%)	32		32
Soil Clay Content (%)	11		11
Soil Bulk Density (kg/m3)	0.97		0.97

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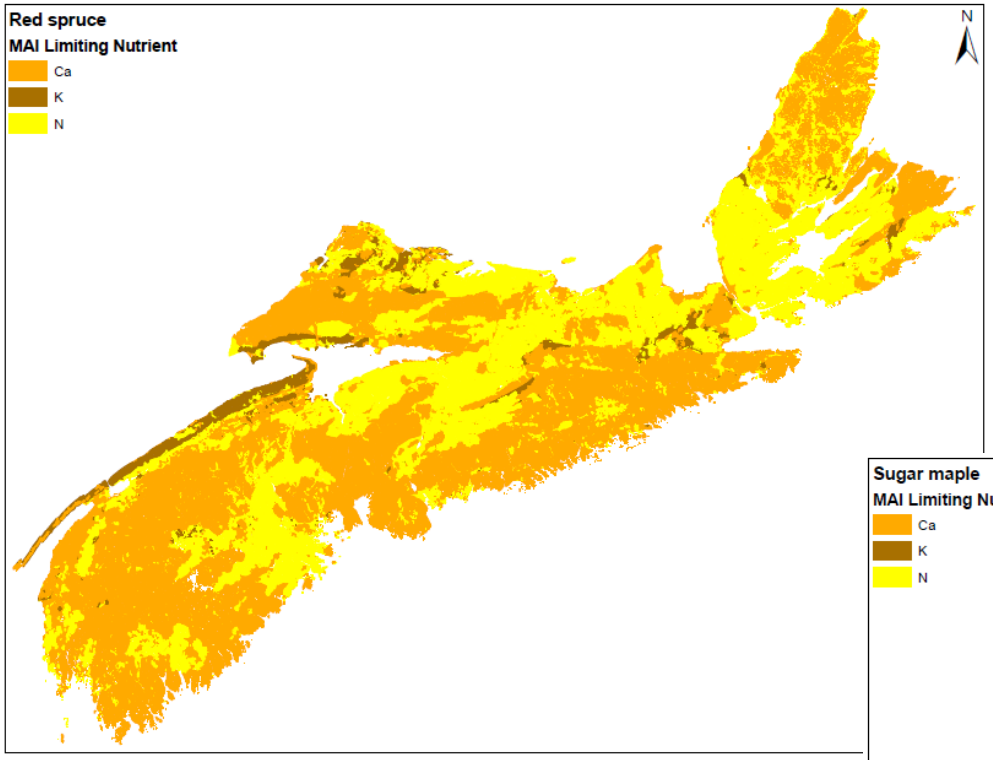
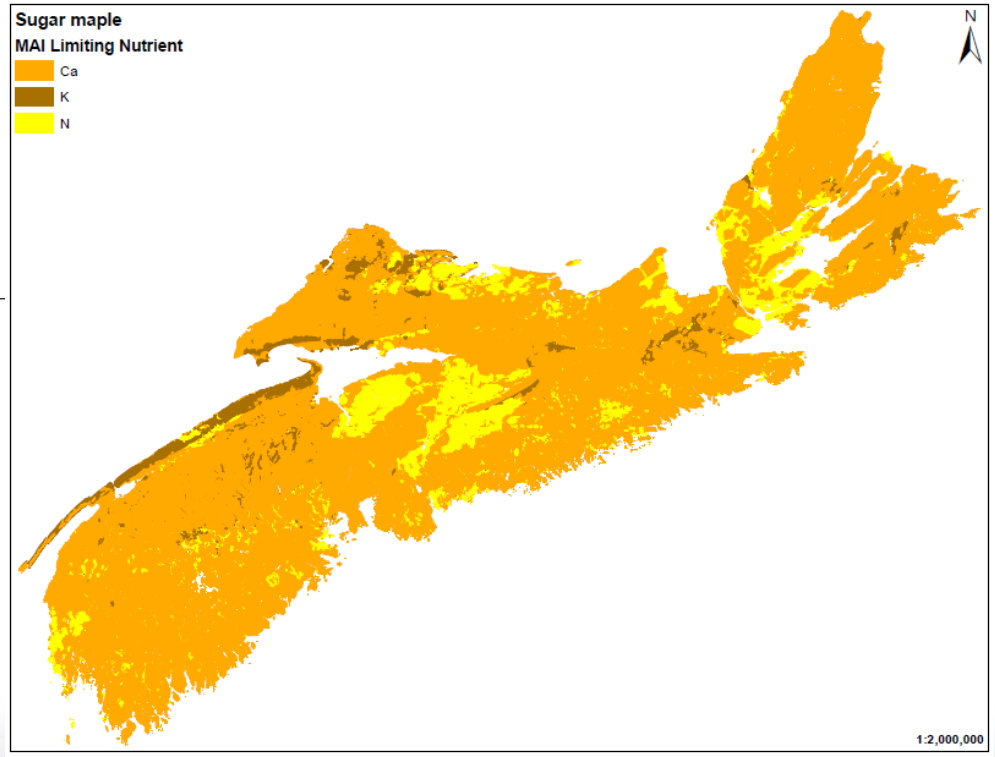

Red spruce
MAI Limiting Nutrient
Ca
K
N
N


Sugar maple
MAI Limiting Nutrient
Ca
K
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1:2,000,000

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Plantation Amendments

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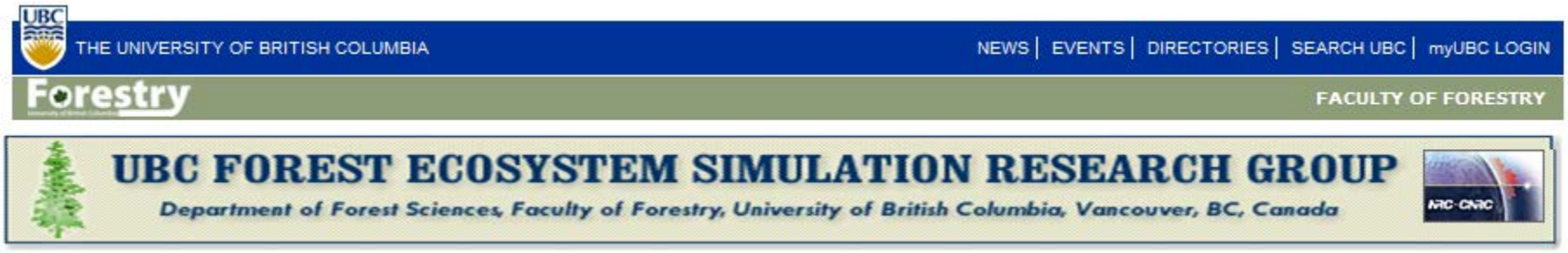
Nutrient Mgmt DST - FORECAST

FORECAST is an ecosystem-based, stand-level, forest growth simulator designed to accommodate a wide variety of harvesting and silvicultural systems in order to compare and contrast their effects on forest productivity



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FORECAST Model

Forecast Soil Data

Soil Data	Scale	Chrono-sequence	Multiple Site Classes
Organic C content by layer (Humus, A, B)	stand-level	N	Y
Clay content (mineral soil)	stand-level	N	Y
Coarse Fragment Content (mineral soil)	stand-level	N	Y
Rooting depth by layer (Humus, A, B)	stand-level	N	N
Soil pH (mineral soil)	stand-level	N	Y
Total N concentration by layer (Humus, A, B)	stand-level	N	N
Bulk density (fines only by layer)	stand-level	N	N

FEC Soil Types

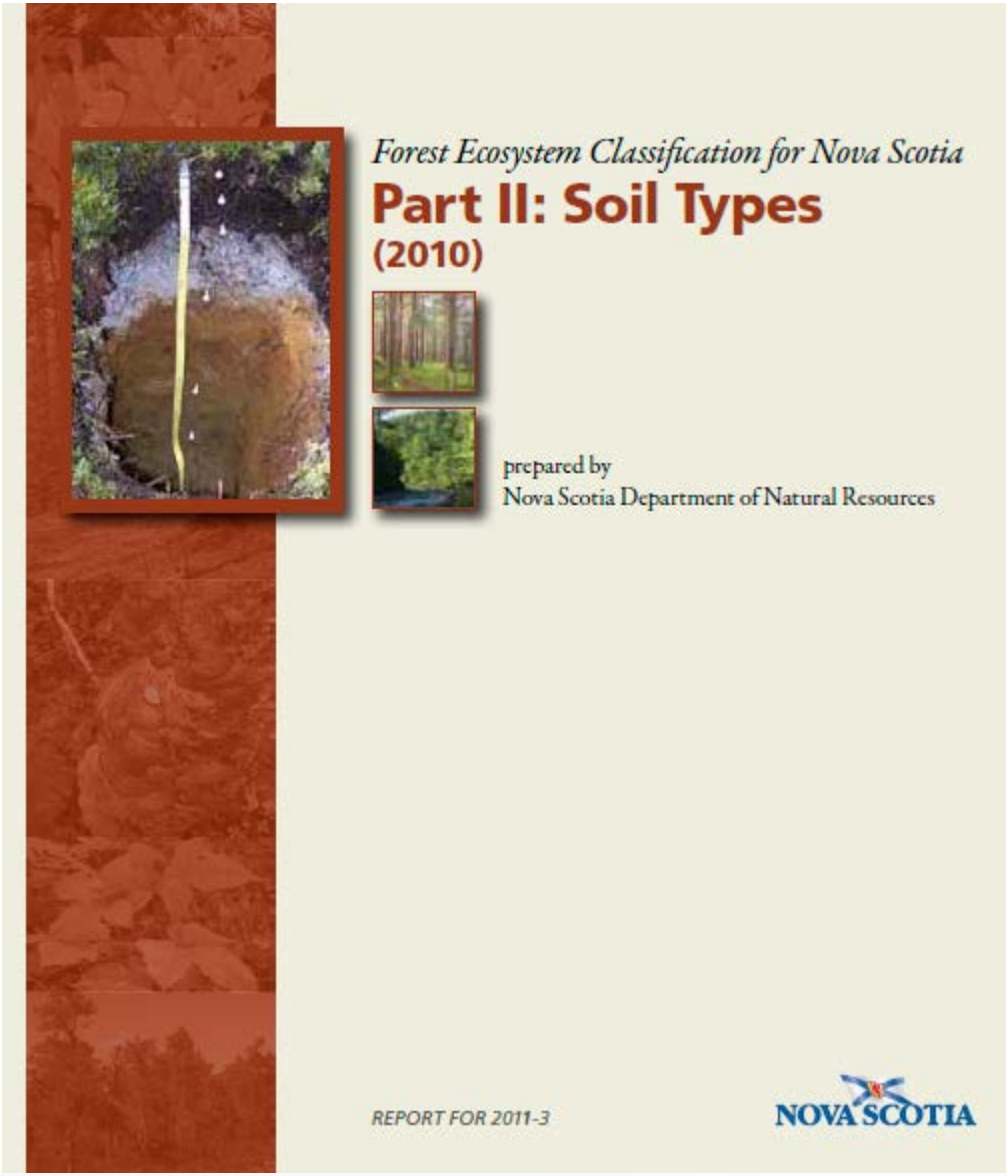
Well over 1,000 soil pits across the province

Good data on morphology

Tie into soil series mapping

But…

No data on chemical properties



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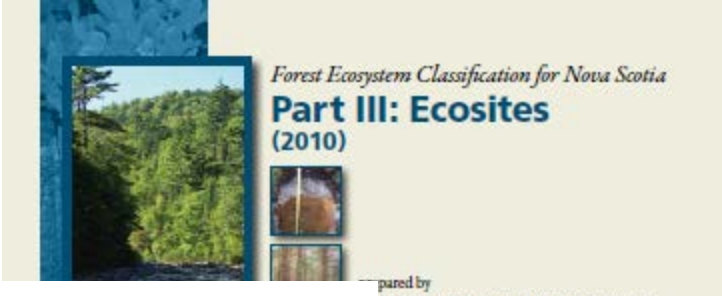
FEC Ecosites



Green = zonal ecosites **Black** = edaphic ecosites
Orange = transitional ecosites which can support both edaphic and zonal vegetation types

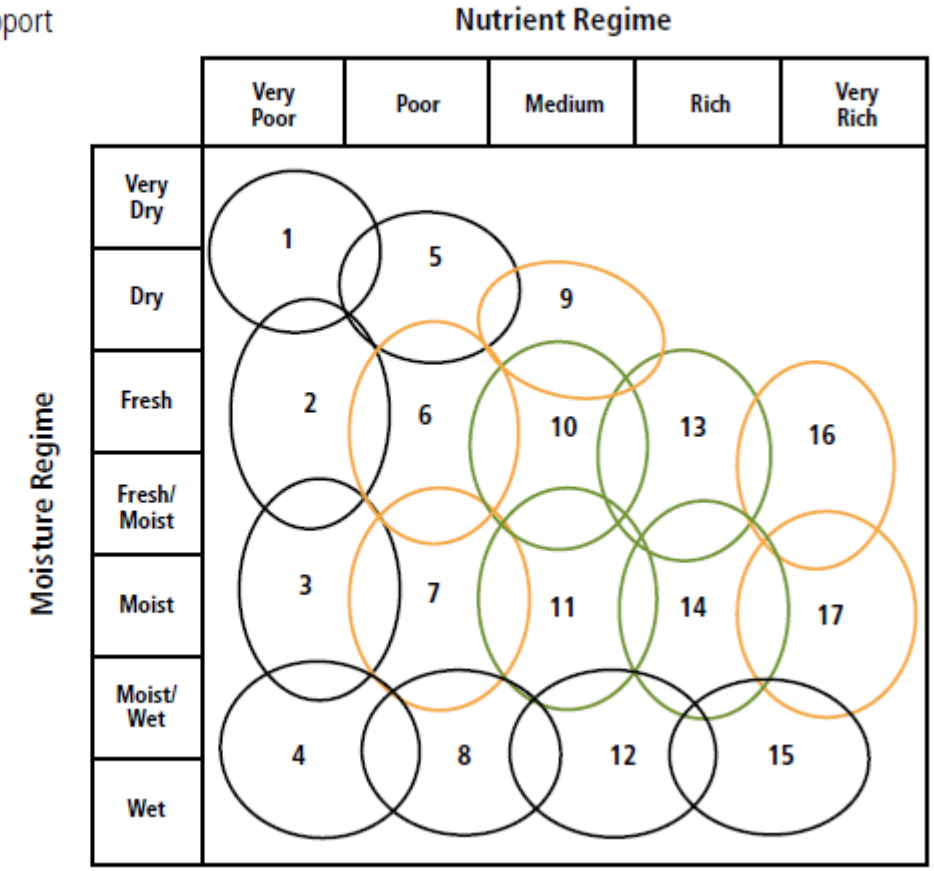
1. Dry-Very Poor / Jack pine-Black spruce
2. Fresh-Very Poor / Black spruce-Pine
3. Moist-Very Poor / Black spruce-Pine
4. Wet-Very Poor / Black spruce-Tamarack

5. Dry-Poor / White pine-Oak
6. Fresh-Poor / Black spruce-White pine
7. Moist-Poor / Black spruce-White pine
8. Wet-Poor / Spruce-Fir-Red maple

9. Dry-Medium / Red maple-Spruce
10. Fresh-Medium / Red spruce-Hemlock
11. Moist-Medium / Red spruce-Yellow birch
12. Wet-Medium / Red maple-White ash-Fir

13. Fresh-Rich / Sugar maple-Beech
14. Moist-Rich / Sugar maple-Yellow birch
15. Wet-Rich /White ash-Red maple

16. Fresh-Very Rich / Sugar maple-White ash
17. Moist-Very Rich / Sugar maple-White ash



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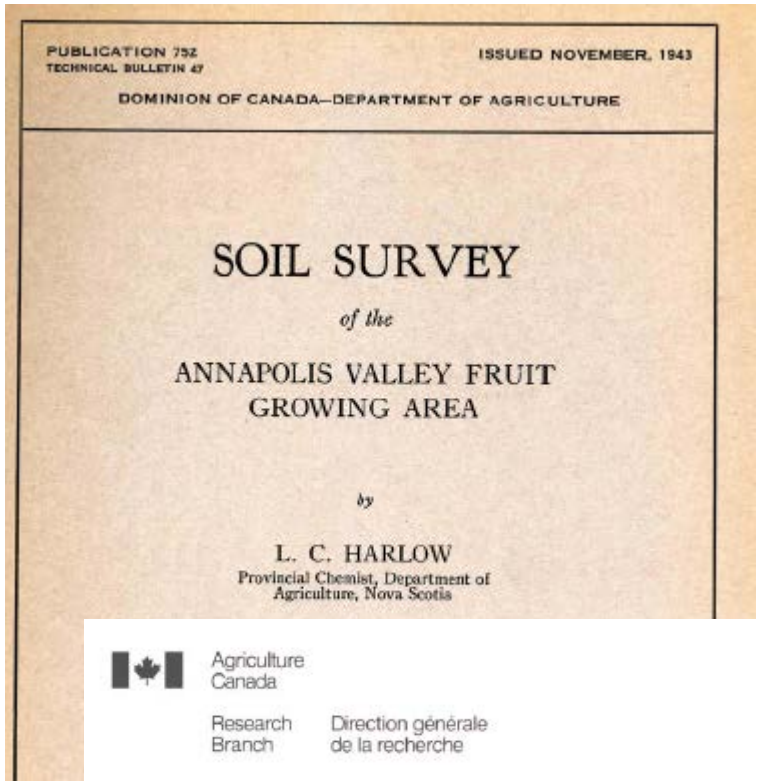
Soil Survey

From mid 1940s to mid 1990s

Most of province covered with reasonable accuracy

But…

Limited and dated chemical data with agricultural bias


PUBLICATION 752
TECHNICAL BULLETIN 47

ISSUED NOVEMBER, 1943

DOMINION OF CANADA—DEPARTMENT OF AGRICULTURE

SOIL SURVEY

of the

ANNAPOLIS VALLEY FRUIT GROWING AREA

by

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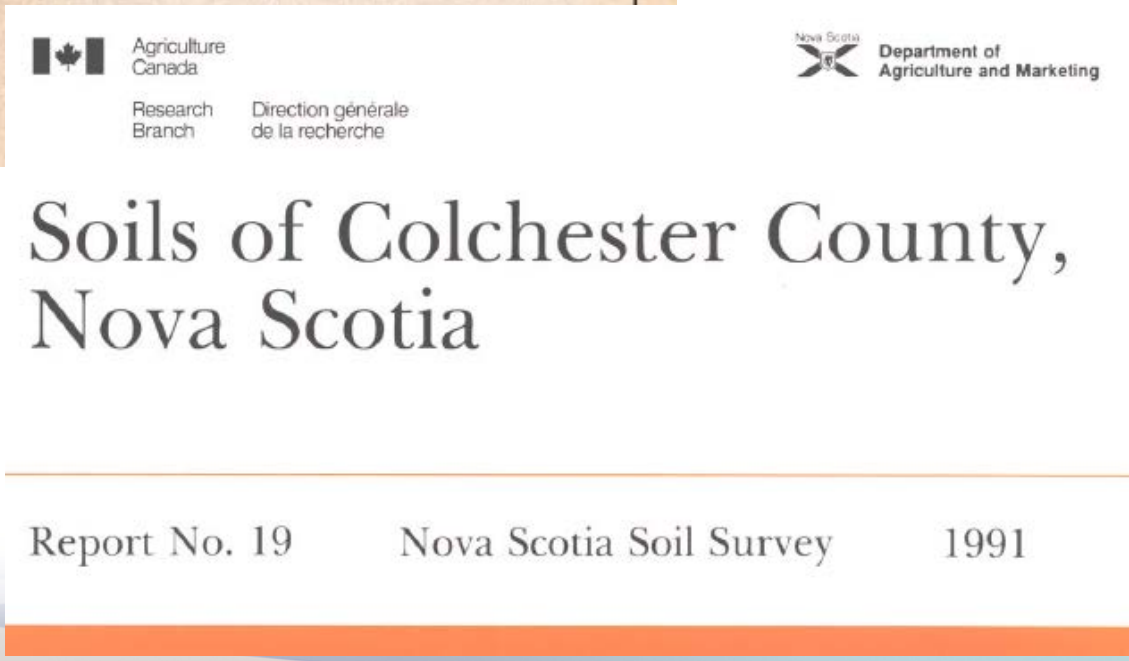
Provincial Chemist, Department of Agriculture, Nova Scotia


Agriculture Canada

Research Branch

Direction générale de la recherche

Department of Agriculture and Marketing

Soils of Colchester County, Nova Scotia

Report No. 19 Nova Scotia Soil Survey 1991

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Forest Soil Sampling Program

- Provide current chemical and physical data for dominant soil series across the province for use in site productivity assessment, nutrient budget modelling, and DST/BMP development.

- Provide benchmark data for ongoing forest soil and ecosystem monitoring with respect to impacts from management activities, climate change, and pollution stress (e.g., acid deposition).

Forest Soil Sampling Program

Lab Analysis	Method	Sample
pH	$CaCl_2$	FF/Min
Total C/N/S	Dry combustion	FF/Min
LOI		FF/Min
Exch. NH_4	KCl	Min
Avail. NO_3	KCl	Min
Exch. SO_4	KCl	Min
Total Ca/Mg/K/Na/P	Digestion	FF
Exch. Ca/Mg/K/Na/P	NH_4Cl	FF/Min
Exch. Acidity	KCl / Titration	FF/Min
Exch. Al	KCl	FF/Min
Exch. H	Calculated	FF/Min
CEC (effective)	Calculated	Min
BS%	Calculated	Min
Db	CF corrected	FF/Min
Texture	Hydrometer	Min

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Forest Soil Sampling Program

- Tied directly to Provincial Inventory PSP system
- Sample about 10% of Inventory PSPs (325 plots) over 5 years (starting 2015)
- Select a subset of these for continuous monitoring on a 10 year cycle (hopefully)
- Sampling by horizon for chemistry (1 FF and 2 Mineral)

Forest Soil Sampling Program

- Partnering with CFS Fredericton and Dalhousie University (Dal-AC) on this project
- Looking at soil archiving, but still need to work this part out
- Also looking at adding tree biomass sampling to the program, but not finalized yet

Nova Scotia Forest Soil Monitoring Program

Discussion...

NSMC Workshop
March 26, 2015

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