Forest Soil Datasets in Ontario – Fact Sheets

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Introduction

This report presents a compilation of forest soil datasets across Ontario. Curating legacy forest soil data in Ontario is critical to support initiatives and applications that require soil information, such as Digital Soil Mapping (DSM). DSM, or predictive soil mapping is the computer-assisted production of digital maps of soil properties by developing quantitative relationships between spatial predictor layers (e.g., geology, topography) with field observation data. DSM within forested landscapes has been challenged because there is no central repository for forest soil data, which were collected and analyzed by many different agencies and for many purposes. Curating forest soil data is a key first step to advancing DSM tools and creating products to map soils at higher resolution for use in forest resource inventory, operational forest management planning, and decision-making.

This document summarizes 22 forest soil data sources and 94 650 data points collected over the past 50 years and analyzed for research projects conducted by various agencies, industry, and universities. Many projects were collaborations, and we thank all those who helped to retrieve and explain the datasets. Since the focus is on forest soils, most studies/projects were conducted primarily within the province's managed forest region (i.e., Area of the Undertaking).

Accurate site and soil information is critical for practical site- and stand-level management planning and operations. A summary of the limitations of these data sets is discussed, including the precision of geolocation information and varied methods for recording, collecting, and analyzing soil samples. As a result of reviewing these forest soil datasets, the next steps include data cleaning (quality checking) and standardization. Currently, these datasets are housed in different repositories. As data-sharing agreements allow, these datasets will be housed on a national soil data portal currently under development.

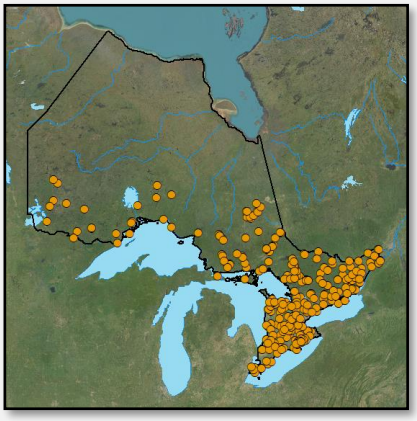
Forest Soil Datasets in Ontario

Acid Precipitation in Ontario Study (APIOS)

Project Details

Acid Precipitation in Ontario Study (APIOS) was established in 1979 by the Ontario Ministry of the Environment (MOE) to determine the effects of acidic deposition on terrestrial ecosystems. The database is a digital compilation of the data presented in the APIOS - Ontario Soil Baseline Survey. The principal objective of the baseline program was to establish a uniform database for soils across the province. The database 1) provided data to identify future trends, 2) enabled the development of laboratory experiments which define soil sensitivity criteria to acidic precipitation, and 3) provided information required for sensitivity mapping of soils throughout Ontario. Note that many of these plots are not in forest soils. Reports and data available through Ontario GeoHub at:
https://geohub.lio.gov.on.ca/datasets/a9d3c2f21f824e9eba071124ec053875/about

Plot Map



Dataset Information

Project Year(s): 1979-83

 # Plots: 315

Data Format: Excel spreadsheet

Data Steward: Daniel Saurette, Land Resource Specialist, OMAFRA email: omafra.gis@ontario.ca

Partners: OMAFRA, MOE

Soil Data Attributes

✓ - Site specific details
✓* - Plot specific details

SITE INFORMATION	
Location (coordinates, ecodistrict, township, etc.)	✓*
Plot or Polygon ID	✓
Year	✓*
Elevation	
Site Treatment / Disturbance	

SOIL SAMPLING	
Soil Sampling Method	
Sampled by Horizon	✓*
Sampled by Depth or Layer	
Archived Samples	

SOIL PHYSICAL FIELD CHARACTERISTICS			
Mode of Deposition	✓	Drainage Class	
Topographic details	✓	Pore pattern	
Landform	✓	Humus form	
Stone/Rock outcrop		Structure	
Ecosite		Boundary	
Texture (family, effective texture)		Roots	
Plot depth details (depth to bedrock, water table, mottles, etc.)	✓*	Coarse Fragment Content	
Moisture Regime		Colour	✓*
Seepage		Presence of carbonates	

SOIL PROPERTIES	
Bulk Density	
Sand Silt Clay	✓*
pH	✓*
C, organic C	✓*
Total N	✓*
C/N ratio	✓*
CEC	✓*
Exchangeable cations	✓*
SO4	✓*
Phosphorus	✓*
Other elements	✓*
Soil Biology	

Publications

Acid Precipitation in Ontario Study (APIOS)

Publications

Chan, W.H., Tang, A.J.S., Chung, D.H.S. and N.W. Reid. 1987. An analysis of precipitation chemistry measurements in Ontario. Environ. Sci. Technol. Vol. 21, No. 12, 1987.

Griffiths, M.A., Spires, T, and P. Barclay. 1984. Ontario Soil Baseline Survey. Analytical Data 1980-1981. Volume 1: Soil Baseline Program. Terrestrial effects program acidic precipitation in Ontario study (APIOS). Ontario Ministry of the Environment.

Griffiths, M.A., Spires, T, and P. Barclay. 1984. Ontario Soil Baseline Survey. Analytical Data 1980-1981. Volume 2: Analytical Data for Southern Ontario. Terrestrial effects program acidic precipitation in Ontario study (APIOS). Ontario Ministry of the Environment.

Griffiths, M.A., Spires, T, and P. Barclay. 1984. Ontario Soil Baseline Survey. Analytical Data 1980-1981. Volume 3: Analytical Data for Northern Ontario. Terrestrial effects program acidic precipitation in Ontario study (APIOS). Ontario Ministry of the Environment.

Griffiths, M.A., Spires, T, and P. Barclay. 1983. Ontario Soil Baseline Survey. Analytical Data 1980-1981. Volume 1: Soil Baseline Program. Terrestrial effects program acidic precipitation in Ontario study (APIOS). Ontario Ministry of the Environment.

Griffiths, M.A., Spires, T, and P. Barclay. 1983. Ontario Soil Baseline Survey. Analytical Data 1980-1981. Volume 2: Analytical Data for Southern Ontario. Terrestrial effects program acidic precipitation in Ontario study (APIOS). Ontario Ministry of the Environment.

Griffiths, M.A., Spires, T, and P. Barclay. 1983. Ontario Soil Baseline Survey. Analytical Data 1980-1981. Volume 3: Analytical Data for Northern Ontario. Terrestrial effects program acidic precipitation in Ontario study (APIOS). Ontario Ministry of the Environment.

Griffin, H.D. (ed.). 1983. Procedures manual terrestrial effects acidic precipitation in Ontario study (APIOS). APIOS Report No. 007/83. Technical Subcommittee, Terrestrial Effects Working Group. Ontario Ministry of the Environment.

Linzon, S.N. 1986. Activities and results of the terrestrial effects program: Acid precipitation in ontario study (APIOS). Water Air Soil Pollut 31, 295–305 (1986). https://doi.org/10.1007/BF00630845

Linzon, S.N. (ed.), Gizyn, W.I. and Griffith, M.A. 1981. An Annotated Bibliography – Terrestrial Effects of Acidic Precipitation. Report No. APIOS 003/81, Ontario Ministry of the Environment, Toronto, Canada, pp. 1-181.

Acid Precipitation in Ontario Study (APIOS)

Publications

Yap, D. and J. Kurtz. 1986. Meteorological analyses of acidic precipitation in Ontario. Water Air Soil Pollut 30, 873-878 (1986).

Zeng, Y. and P.K. Hopke. 1989. A study of the sources of acid precipitation in Ontario, Canada. Atmospheric Environment (1967) Vol. 23, Issue 7, 1989, pp. 1499-1509.

Zeng, Y. and P.K. Hopke. 1994. Comparison of the source locations and seasonal patterns for acidic species in precipitation and ambient particles in Southern Ontario, Canada. Science of the Total Environment. Vol. 143, Issues 2-3, 15 April 1994, pages 245-260.

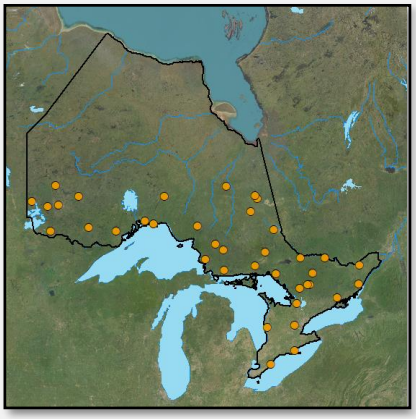
Forest Soil Datasets in Ontario

Acid Rain National Early Warning System (ARNEWS)

Project Details

This dataset contains information collected from The Acid Rain National Early Warning System (ARNEWS) network of plots that was deployed in 1984, when the Canadian Forest Service looked for signs of damage across the country inflicted on Canada's forests by air pollution. As Canada's national forest health monitoring plot network, more than 150 such plots were established across the country to monitor changes to vegetation and forest soils caused by air pollution and environmental change. This dataset includes soil plot information from 39 ARNEWS stations in Ontario.

Plot Map



Dataset Information

Project Year(s): 1984-1995

 # Plots: 195 soil plots (39 stations in Ontario)

Data Format: Excel spreadsheet

Data Steward: Rob Fleming, Research Scientist, NRCan (GLFC) email: rob.fleming@nrcan-rncan.gc.ca

Partners: NRCan

Soil Data Attributes

✓ - Site specific details
✓* - Plot specific details

SITE INFORMATION	
Location (coordinates, ecodistrict, township, etc.)	✓*
Plot or Polygon ID	✓
Year	✓*
Elevation	
Site Treatment / Disturbance	

SOIL SAMPLING	
Soil Sampling Method	
Sampled by Horizon	✓*
Sampled by Depth or Layer	
Archived Samples	

SOIL PHYSICAL FIELD CHARACTERISTICS			
Mode of Deposition		Drainage Class	
Topographic details		Pore pattern	
Landform		Humus form	
Stone/Rock outcrop		Structure	✓*
Ecosite		Boundary	✓*
Texture (family, effective texture)	✓*	Roots	✓*
Plot depth details (depth to bedrock, water table, mottles, etc.)	✓*	Coarse Fragment Content	
Moisture Regime		Colour	✓*
Seepage		Presence of carbonates	

SOIL PROPERTIES	
Bulk Density	
Sand Silt Clay	
pH	✓*
C, organic C	✓*
Total N	✓*
C/N ratio	✓*
CEC	✓*
Exchangeable cations	✓*
SO4	✓*
Phosphorus	✓*
Other elements	✓*
Soil Biology	

Publications

Acid Rain National Early Warning System (ARNEWS)

Publications

Addison, P.A. 1989. Monitoring the health of a forest: A Canadian approach. Environ Monit Assess 12, 39-48. https://doi.org/10.1007/BF00396727

Batigelli, J.P and Marshall, V.G. 1993. Relationships between soil fauna and soil pollutants. In: Proceedings of the Forest Ecosystem Dynamics Workshop, February 10-11, 1993. FRDA II report 210. Government of Canada, Province of British Columbia. Pp. 31-34.

Bowers, W.W., and Hopkin, A. 1997. ARNEWS and North American Maple Project (NAMP) 1995. Canada: N.p., 1997. Web.

D'Eon, S.P. and J.M. Power. 1989. The Acid Rain National Early Warning System (ARNEWS) plot network. Forestry Canada, Petawawa Natl. For. Inst., Chalk River, Ont. Inf. Rep. PI-X-91 119p.

D'Eon, S.P., Magasi, L.P., Lachance, D., DesRochers, P. 1994. ARNEWS: Canada's national forest health monitoring plot network. Manual on plot establishment and monitoring (Revised). Natural Resources Canada, Canadian Forest Service, Petawawa National Forestry Institute, Chalk River, Ontario. Information Report PI-X-117.

DesRocher, P. 2003. Forest monitoring: ARNEWS and NAMP. Branching out from the Canadian Forest Service, Laurentian Forestry Centre. No. 7.

Enns, K.A. 1991. Mineral contents of coniferous foliage from forestry Canada's ARNEWS plots, Pacific and Yukon region. FIDS report No. 91-10. Canada. N. p., 1991. Web.

Fenech, G. 1998. The Canadian acid rain strategy. Environmental Science & Policy Vol. 1 Iss. 3, August 1998, pages 261-267.

Fournier, R.E., Morrison, I.K, Hopkin, A.A. 1994. Short range variability of soil chemistry in three acid soils in Ontario, Canada, Communications in Soil Science and Plant Analysis, 25:17-18, 3069-3082, DOI: 10.1080/00103629409369247

Hall, J.P. 1990. ARNEWS Annual Report 1990. Forestry Canada, Ottawa, Ont. Inf Rep ST-X-1. 17p.

Hall, J.P. 1991. ARNEWS annual report 1990. Forestry Canada, Headquarters, Ottawa. Info Rep ST-X-1.

Hall, J.P. 1993. Acid Rain National Early Warning System (ARNEWS) Annual Report 1992. Forestry Canada, Ottawa, Ont. Inf Rep ST-X-71.

Acid Rain National Early Warning System (ARNEWS)

Publications

Hall, J.P. 1994. Forest Health Monitoring by the Canadian Forest Service: Now and the Future. In: Percy, K.E., Cape, J.N., Jagels, R., Simpson, C.J. (eds) Air Pollutants and the Leaft Cuticle. NATO ASI Series, vol 36. Springer, Belin, Heidelberg. https://doi.org/10.1007/978-3-642-79081-2_34

Hall, J.P. 1995. ARNEWS assesses the health of Canada's forests. The Forestry Chronicle. October 1995. https://doi.org/10.5558/tfc71607-5

Hall, J.P. 1995. Forest health monitoring in Canada: How healthy is the boreal forest? Water Air Soil Pollut 82, 77-85. https://doi.org/10.1007/BF01182821

Hall, J.P. and P.A. Addison. 1994. Response to air pollution: ARNEWS assesses the health of Canada's forests (English and Russian editions). Natural Resources Canada, Canadian Forest Service, Headquarters, Science and Sustainable Development Directorate, Ottawa. Information Report DPC-X-34. 12 p.

Hall, J.P. and B.A. Pendrel. 1991. ARNEWS Annual Report 1991. Forestry Canada, Headquarters, Ottawa. Information Report ST-X-5. 48 p.

Hall, J.P. and G.A. Van Sickle. 1994. ARNEWS: Annual report 1993. Information report No. ST-X-9

Hopkin, A., Fenech, A., Liljalehto, H. et al. 2001. The Ontario Forest Health Data Co-Operative. Environ Monit Assess 67, 131-139 https://doi.org/10.1023/A:1006474205223

Magasi, L.P. 1988. Acid rain national early warning system: Manual on plot establishment and monitoring. Can For Ser, Ottawa, Ont, Inf Rep DPC-X-25

Morrison, I.K 1999. In The Contribution of Soil Science to the Development of and Implementation of Criteria and Indicators of Sustainable Forest Management, Adams, M.B., Ramakrishna, K., Davidson, E.A. (eds) Vol 53, Chapter 4: Can a Plot-Based Forest Health Monitoring System Contribute to Assessment of Soil Pollution Indicators in Canada? SSSA Special Publications 01 January 1999.

Skelly, J.M. 1998. A brief assessment of forest health in Northeastern United Sates and Southeastern Canada. Northeastern Naturalist, Vol.5, No.2 (1998), pp. 137-142. https://doi.org/10.2307/3858584

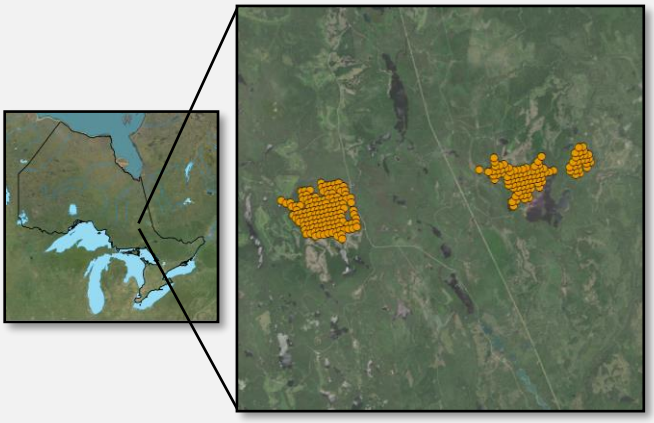
Forest Soil Datasets in Ontario

Enhanced Forest Productivity Project (EFP)

Project Details

This data was collected as part of the Implementation of Enhanced Forest Productivity: A Pilot Project on the Romeo Mallette Forest. The Forestry Research Partnership (FRP) had initiated a series of demonstration areas as part of their strategy to increase wood supply in an ecologically sustainable context. FRP products are being incorporated and implemented with existing state-of-the-art knowledge and tools as harvest-to-harvest sequences of silvicultural best-practices to maximize productivity. This project aimed to act as a catalyst for enhanced productivity on the Romeo Malette Forest and other forests across Ontario.

Plot Map



Dataset Information

Project Year(s): 2005-2008

 # Plots: 240

Data Format: Excel spreadsheet

Data Steward: Michael Hoepting, Silviculture Research Forester, NRCan (CWFC) email: Michael.Hoepting@nrcan-rncan.gc.ca

Partners: NRCan (CWFC), MNRF, Tembec Industries, Forest Research Partnership (FRP)

Soil Data Attributes

✓ - Site specific details
✓* - Plot specific details

SITE INFORMATION	
Location (coordinates, ecodistrict, township, etc.)	✓*
Plot or Polygon ID	✓*
Year	✓*
Elevation	
Site Treatment / Disturbance	✓*

SOIL SAMPLING	
Soil Sampling Method	
Sampled by Horizon	✓*
Sampled by Depth or Layer	
Archived Samples	

SOIL PHYSICAL FIELD CHARACTERISTICS			
Mode of Deposition		Drainage Class	
Topographic details	✓*	Pore pattern	
Landform	✓*	Humus form	
Stone/Rock outcrop	✓*	Structure	
Ecosite	✓*	Boundary	
Texture (family, effective texture)	✓*	Roots	
Plot depth details (depth to bedrock, water table, mottles, etc.)	✓*	Coarse Fragment Content	
Moisture Regime	✓*	Colour	
Seepage		Presence of carbonates	

SOIL PROPERTIES	
Bulk Density	
Sand Silt Clay	
pH	
C, organic C	
Total N	
C/N ratio	
CEC	
Exchangeable cations	
SO4	
Phosphorus	
Other elements	
Soil Biology	

Publications

Enhanced Forest Productivity Project (EFP)

Publications

Forest Research Partnership. 2006. Implementation of Enhanced Forest Productivity: A Pilot Project on the Romeo Malette Forest – Partners Report 2005 – Field Season. FRP Project 120- 501, Catalogue RP-03, Forest Research Partnership, Mattawa, ON. 23 pp.

Forest Research Partnership. 2007a. Implementation of enhanced forest productivity: a pilot project on the Romeo Malette Forest – Partners Report – 2006 Field Season. FRP Project 120- 501, Catalogue RP-036, Forest Research Partnership, Mattawa, ON. 59 pp.

Forest Research Partnership. 2007b. Effects of early herbaceous and woody vegetation control on eastern white pine - Partners Report 2006 Field Season. FRP Project 160-005, Catalogue RP-037, Forest Research Partnership, Mattawa, ON. 5 pp.

Forest Research Partnership. 2008a. Implementation of enhanced forest productivity: a pilot project on the Romeo Malette Forest – Partners Report – 2007 Field Season. FRP Project 6251, Catalogue RP-039, Forest Research Partnership, Mattawa, ON. 38 pp.

Forest Research Partnership. 2008b. Effects of herbaceous vegetation control and aspen stem density on boreal mixedwood stand development - Partners Report 2008 Field Season. FRP Project 130-301, Forest Research Partnership, Mattawa, ON. 6 pp.

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Pitt, D., Hoepting, M., Thompson, D., Venier, L., Leach, J., Morandin, L., Simis, D., Hall, M., Isaac, R., Pickering, S., McPherson, S., Stinson, A., Kilgour, M., Millson, S., Joron, M., and J. Morris. 2009. Implementation of Enhanced Forest Productivity: A pilot project on the Romeo Malette and Cordon Cosens Forests. Partners Report – 2008 Field Season (FRP Project 6251).

Rouillard, D. and T. Moore. 2008. Patching together the future of forest modelling: Implementation of Patchworks in the 2009 Romeo Malette Forest Management Plan. For. Chron. 84(5): 718–730.

Insley, M., Fox, G., and Rollins, K. 2002. The Economics of Intensive Forest Management. A Stand Level Analysis for the Romeo Malette Forest in Ontario. A Report prepared for Tembec Inc., the Ontario Ministry of Natural Resources, and ULERN.

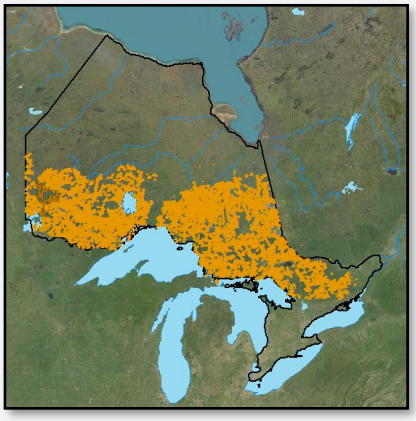
Forest Soil Datasets in Ontario

Enhanced Forest Resource Inventory (eFRI)

Project Details

This dataset contains the information collected for the enhanced Forest Resource Inventory (eFRI) program run by the MNRF. The merchantable forest in Ontario, or Area of Undertaking (AOU) has 42 Forest Management Units (FMU). Soils were surveyed to determine the ecosite (Forest Ecosystem Classification or Ecosystem Land Classification) in locations along the plot transects.

Plot Map



Dataset Information

Project Year(s): 2007-ongoing

 # Plots: 83076

Data Format: ArcMap shape files

Data Steward: Ken Smith, GIS Officer, Science and Research Branch, MNRF, ken.smith@ontario.ca

Partners: MNRF

Soil Data Attributes

✓ - Site specific details
✓* - Plot specific details

SITE INFORMATION	
Location (coordinates, ecodistrict, township, etc.)	✓*
Plot or Polygon ID	✓*
Year	✓*
Elevation	✓
Site Treatment / Disturbance	

SOIL SAMPLING	
Soil Sampling Method	✓
Sampled by Horizon	✓*
Sampled by Depth or Layer	
Archived Samples	

SOIL PHYSICAL FIELD CHARACTERISTICS			
Mode of Deposition		Drainage Class	
Topographic details		Pore pattern	
Landform		Humus form	
Stone/Rock outcrop	✓	Structure	
Ecosite	✓*	Boundary	
Texture (family, effective texture)	✓*	Roots	
Plot depth details (depth to bedrock, water table, mottles, etc.)	✓*	Coarse Fragment Content	
Moisture Regime	✓*	Colour	
Seepage		Presence of carbonates	✓*

SOIL PROPERTIES	
Bulk Density	
Sand Silt Clay	
pH	
C, organic C	
Total N	
C/N ratio	
CEC	
Exchangeable cations	
SO4	
Phosphorus	
Other elements	
Soil Biology	

Publications

Forest Soil Datasets in Ontario

Enhanced Forest Resource Inventory (eFRI)

Publications

Barolet, P., 1993. Investigating a Predictive Linkage of Forest Resource Inventory Polygons and the Northwestern Ontario Forest Ecosystem Classification of the Jack Pine-black Spruce/blueberry/lichen Vegetation Type (Doctoral dissertation, Lakehead University).

Bell, F.W., Baker, J.A., Bruemme, G., Pineau, J., and Stinson, A. 2008. The Canadian Ecology Centre – forestry research partnership: implementing a research strategy based on an active adaptive management approach. The Forestry Chronicle, Vol.84, No.5, October 2008.

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Coops, N., McCartney, G., and Queinnec, M. 2020. Development of a forest inventory using 2018 single photon LiDAR and assessing decadal forest change.

Cyr, D., Gauthier, S., Etheridge, D.A., Kayahara, G.J. and Bergeron, Y., 2010. A simple Bayesian Belief Network for estimating the proportion of old-forest stands in the Clay Belt of Ontario using the provincial forest inventory. *Canadian Journal of Forest Research*, *40*(3), pp.573-584.

Davies, G.E., 2009. Ontario using Ontario's forest resource inventory, Abitibi-Bowater's continuous forest inventory and stepwise discriminant function analysis.

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Goodbody, T.R.H., Coops, N.C., Hermosilla, T., Tompalski, P., McCartney, G., and MacLean, D.A. 2018. Digital aerial photogrammetry for assessing cumulative spruce budworm defoliation and enhancing forest inventories at a landscape-level. ISPRS Journal of Photogrammetry and Remote Sensing. Vol. 142, August 2018, pp 1-11.

Hogg, A. and Potter, B. 2018. Chapter 2.2.11 – Development and preliminary tests of remotely based imagery, digital databases, and GIS methods and tools to identify wetlands and selected functions and values in Ontario, Canada. In (Academic Press) Wetland and Stream Rapid Assessments. Development, Validation, and Application. Pp173-187.

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Forest Soil Datasets in Ontario

Enhanced Forest Resource Inventory (eFRI)

Publications

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Loranger, B. 2018. eFRI and Growth & Yield in Ontario: A literature review. Undergraduate Thesis, Faculty of Natural Resources Management, Lakehead University.

Lusignan, E.K. 2011. Ontario eFRI's digital surface model: characteristics and uses in Forest Management related measurements and visualizations. Diss. Lakehead University, 2011.

Man, R. and Rice, J.A., 2010. Response of aspen stands to forest tent caterpillar defoliation and subsequent overstory mortality in northeastern Ontario, Canada. *Forest Ecology and Management*, *260*(10), pp.1853-1860.

Maxie, A. J., Hussey, K. F., Lowe, S. J., Middel, K. R., Pond, B. A., Obbard, M. E., & Patterson, B. R. (2010). A comparison of forest resource inventory, provincial land cover maps and field surveys for wildlife habitat analysis in the Great Lakes–St. Lawrence forest. *The Forestry Chronicle*, *86*(1), 77-86.

Newaz, Md.S., Mackereth, R.W., Mallik, A.U., and McCormick, D. 2020. How much boreal alke shoreline is burned by wildfire? Implications for emulating natural disturbance in riparian forest management. Forest Ecology and Management Vo. 473, 118283.

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Pope, G.W. 2012. LiDAR and WorldView-2 satellite data for leaf area index estimation in the boreal forest. Dissertation, Queen's University. MS26111.

Queinnec, M., White, J.C., and Coops, N.C. 2021. Comparing airborne and spaceborne photon-counting LiDAR canopy structural estimates across different boreal forest types. Remote Sensing of Environment, Vol262, 1 September 2021, 112510.

Sweeney, R. 2019. A script for the automatic delineation of canopy gaps from raster images and incorporation of analysis with Ontario's FRI datasets. Undergraduate thesis, Lakehead University.

Forest Soil Datasets in Ontario

Enhanced Forest Resource Inventory (eFRI)

Publications

Treitz, P., Lim, K., Woods, M., Pitt, D., Nesbitt, D., and Etheridge, D. 2012. LiDAR sampling density for Forest Resource Inventories in Ontario, Canada. Remote Sens. 2012, 4(4), 830-848. https://doi.org/10.3390/rs4040830

Van Ewijk, K. 2015. Estimating forest structure from LiDAR and high spatial resolution imagery for the prediction of succession and species composition. Thesis, Queen's University.

Van Ewijk, K.Y., Randin, C.F., Treitz, P.M., and Scott, N.A. 2014. Predicting fine-scale tree species abundance patterns using biotic variables derived from LiDAR and high spatial resolution imagery. Remote Sensing of Environment Vol. 150, July 2014, pp120-131.

Van Ewijk, K., Tompalski, P., Treitz, P., and Coops, N.C. 2020. Transferability of ALS-derived forest resource inventory attributes between an Eastern and Western Canadian boreal forest mixedwood site. Can. J. of Remote Sensing, Vol 46, 2020, Issue 2.

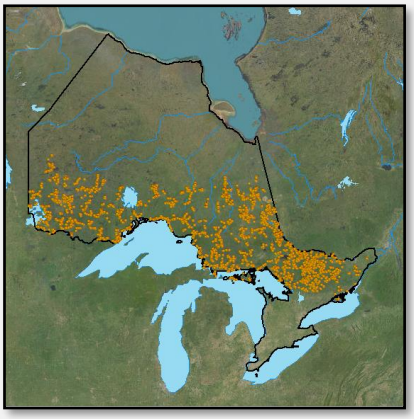
Forest Soil Datasets in Ontario

Forest Ecosystem Classification/Ecosystem Land Classification (FEC/ELC)

Project Details

Ontario's ecological land classification system is founded on Angus Hills' Site regions and Districts, first adopted in the 1950's. The Ministry of Natural Resources has continued to develop and refine the province's ecological divisions, enhancing their compatibility with national and continental classification systems (Ecological Land Classification Primer, 2007). The data includes 6644 ecological plots from eleven different projects across Ontario conducted between 1980 and 2005. Soil chemistry data is available for some plots.

Plot Map



Dataset Information

Project Year(s): 1980-2005

 # Plots: 6644

Data Format: Electronic Data Repository (EDR) database in Microsoft Access

Data Steward: Natural Heritage Information Centre (NHIC) email: NHICrequests@ontario.ca

Partners: MNRF

Soil Data Attributes

✓ - Site specific details
✓* - Plot specific details

SITE INFORMATION	
Location (coordinates, ecodistrict, township, etc.)	✓*
Plot or Polygon ID	✓*
Year	✓*
Elevation	✓*
Site Treatment / Disturbance	

SOIL SAMPLING	
Soil Sampling Method	
Sampled by Horizon	✓*
Sampled by Depth or Layer	
Archived Samples	

SOIL PHYSICAL FIELD CHARACTERISTICS			
Mode of Deposition	✓*	Drainage Class	✓*
Topographic details	✓*	Pore pattern	✓*
Landform	✓*	Humus form	✓*
Stone/Rock outcrop		Structure	✓*
Ecosite	✓*	Boundary	
Texture (family, effective texture)	✓*	Roots	✓*
Plot depth details (depth to bedrock, water table, mottles, etc.)	✓*	Coarse Fragment Content	✓*
Moisture Regime	✓*	Colour	
Seepage	✓*	Presence of carbonates	✓*

SOIL PROPERTIES	
Bulk Density	✓*
Sand Silt Clay	✓*
pH	✓*
C, organic C	✓*
Total N	✓*
C/N ratio	✓*
CEC	✓*
Exchangeable cations	✓*
SO4	✓*
Phosphorus	✓*
Other elements	✓*
Soil Biology	

Publications

Forest Soil Datasets in Ontario

Forest Ecosystem Classification/Ecosystem Land Classification (FEC/ELC)

Publications

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Forest Ecosystem Classification/Ecosystem Land Classification (FEC/ELC)

Publications

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Forest Soil Datasets in Ontario

Forest Ecosystem Classification/Ecosystem Land Classification (FEC/ELC)

Publications

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Forest Ecosystem Classification/Ecosystem Land Classification (FEC/ELC)

Publications

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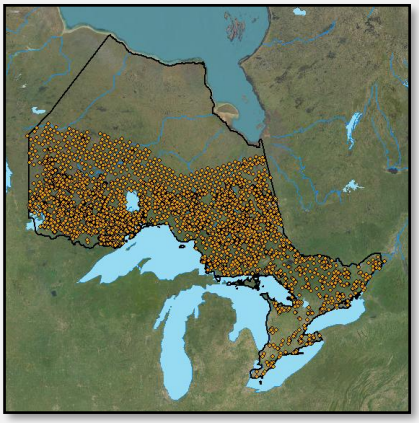
Forest Soil Datasets in Ontario

Growth and Yield

Project Details

The Growth and Yield program in Ontario maintains a network of thousands of permanent plots. The plots are used for recurring data collection on forest growth, productivity, and dynamics. Data is collected from plots in targeted forest conditions in managed forests both on and off Crown land. Data is used to develop prediction tools and models needed for forest management planning and operations (*from* www.data.Ontario.ca).

Plot Map



Dataset Information

Project Year(s): 1992-ongoing

 # Plots: 2000

Data Format: SQL database, soil parameters downloaded into excel spreadsheet

Data Steward: Christopher Stratton, Growth and Yield MNRF email: Christopher.Stratton@ontario.ca

Partners: MNRF

Soil Data Attributes

✓ - Site specific details
✓* - Plot specific details

SITE INFORMATION	
Location (coordinates, ecodistrict, township, etc.)	✓*
Plot or Polygon ID	✓*
Year	✓*
Elevation	
Site Treatment / Disturbance	

SOIL SAMPLING	
Soil Sampling Method	✓*
Sampled by Horizon	✓*
Sampled by Depth or Layer	
Archived Samples	

SOIL PHYSICAL FIELD CHARACTERISTICS			
Mode of Deposition	✓*	Drainage Class	✓*
Topographic details	✓*	Pore pattern	✓*
Landform	✓*	Humus form	✓*
Stone/Rock outcrop		Structure	✓*
Ecosite	✓*	Boundary	✓*
Texture (family, effective texture)	✓*	Roots	✓*
Plot depth details (depth to bedrock, water table, mottles, etc.)	✓*	Coarse Fragment Content	✓*
Moisture Regime	✓*	Colour	✓*
Seepage	✓*	Presence of carbonates	✓*

SOIL PROPERTIES	
Bulk Density	
Sand Silt Clay	
pH	
C, organic C	
Total N	
C/N ratio	
CEC	
Exchangeable cations	
SO4	
Phosphorus	
Other elements	
Soil Biology	

Publications

Forest Soil Datasets in Ontario

Growth and Yield

Publications

Anyomi, K.A., Lorenzetti, F., Bergeron, Y. and Leduc, A., 2015. Stand dynamics, humus type and water balance explain aspen long term productivity across Canada. Forests, 6(2), pp.416-432.

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Forest Soil Datasets in Ontario

Growth and Yield

Publications

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Forest Soil Datasets in Ontario

Growth and Yield

Publications

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Forest Soil Datasets in Ontario

Growth and Yield

Publications

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Forest Soil Datasets in Ontario

Growth and Yield

Publications

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Woods, M.E. and Robinson, D.C., 2007, February. Development of FVSOntario: a Forest vegetation simulator variant and application software for Ontario. In Third Forest Vegetation Simulator Conference, Fort Collins, CO (pp. 212-224).

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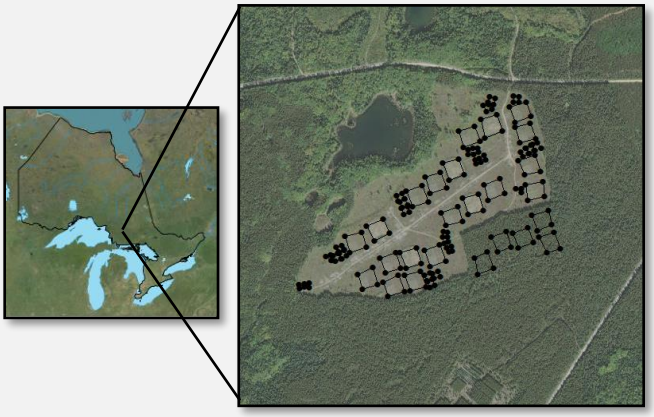
Forest Soil Datasets in Ontario

Island Lake Biomass Harvest Research and Demonstration Area

Project Details

The Island Lake Biomass Harvest Research and Demonstration Area near Chapleau, ON, was developed to study the impact of intensified biomass harvesting on forest sustainability, specifically stand growth, soil productivity and forest biodiversity. It builds on the success of the multi-agency North American Long-Term Soil Productivity (LTSP) experiment. This dataset is a summary of the pre-harvest soil physical and chemical properties on 51 plots, including 10 deep soil pits dug across the site and data from 41 shallow soils from each plot.

Plot Map



Dataset Information

Project Year(s): 2011-ongoing

 # Plots: 51

Data Format: Island Lake Microsoft Access database

Data Steward: NRCan (GLFC)

Partners: NRCan (GLFC), MNRF

Soil Data Attributes

✓ - Site specific details
✓* - Plot specific details

SITE INFORMATION	
Location (coordinates, ecodistrict, township, etc.)	✓
Plot or Polygon ID	✓*
Year	✓*
Elevation	✓
Site Treatment / Disturbance	

SOIL SAMPLING	
Soil Sampling Method	✓*
Sampled by Horizon	✓*
Sampled by Depth or Layer	
Archived Samples	

SOIL PHYSICAL FIELD CHARACTERISTICS			
Mode of Deposition		Drainage Class	
Topographic details		Pore pattern	
Landform		Humus form	
Stone/Rock outcrop		Structure	
Ecosite		Boundary	
Texture (family, effective texture)		Roots	
Plot depth details (depth to bedrock, water table, mottles, etc.)		Coarse Fragment Content	✓*
Moisture Regime		Colour	
Seepage		Presence of carbonates	

SOIL PROPERTIES	
Bulk Density	✓*
Sand Silt Clay	✓*
pH	✓*
C, organic C	✓*
Total N	✓*
C/N ratio	
CEC	
Exchangeable cations	✓*
SO4	
Phosphorus	✓*
Other elements	
Soil Biology	

Publications

Island Lake Biomass Harvest Research and Demonstration Area (pre-harvest soils)

Publications

Anna, M., François, L., Aubin, I., Venier, L.A., Hébert, C., Fortin, D. and Angélique, D., 2022. Towards a better understanding of the effect of anthropogenic habitat disturbance on the invasion success of non-native species: slugs in eastern Canadian forests. Biological Invasions, 24(5), pp.1267-1281.

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Forest Soil Datasets in Ontario

Island Lake Biomass Harvest Research and Demonstration Area (pre-harvest soils)

Publications

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Venier, L.A., Work, T.T., Klimaszewski, J., Morris, D.M., Bowden, J.J., Kwiaton, M.M., Webster, K. and Hazlett, P., 2017. Ground-dwelling arthropod response to fire and clearcutting in jack pine: implications for ecosystem management. Canadian Journal of Forest Research, 47(12), pp.1614-1631.

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Island Lake Biomass Harvest Research and Demonstration Area (pre-harvest soils)

Publications

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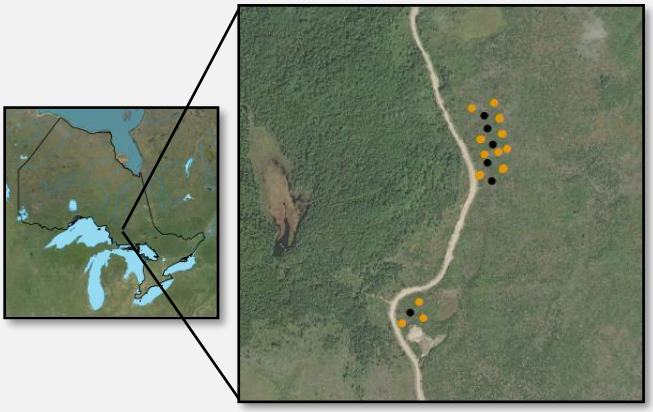
Forest Soil Datasets in Ontario

Ripple Lake (Island Lake Fire Site)

Project Details

Ripple Lake area was a young jack pine plantation that had burned a couple years after the establishment of the Island Lake Biomass Harvest Research and Demonstration Area near Chapleau, ON. Plots were set up as a "wildfire control" area in terms of objective to add to data from Island Lake. Three large soil pits and 18 mini pits were dug in 2013 and samples collected for chemical analysis. The 3 large pits were dug between the main plot centers (black dots on map), and no coordinates noted. The 18 minipits were geolocated and are on the corresponding map.

Plot Map



Dataset Information

Project Year(s): 2013, ongoing

 # Plots: 21

Data Format: Excel spreadsheet

Data Steward: Stephanie Nelson, Ecosystem Biologist, NRCan (GLFC) email: stephanie.nelson@nrcan-rncan.gc.ca

Partners: NRCan (GLFC), MNRF

Soil Data Attributes

✓ - Site specific details
✓* - Plot specific details

SITE INFORMATION	
Location (coordinates, ecodistrict, township, etc.)	✓*
Plot or Polygon ID	✓*
Year	✓*
Elevation	
Site Treatment / Disturbance	✓*

SOIL SAMPLING	
Soil Sampling Method	✓*
Sampled by Horizon	✓*
Sampled by Depth or Layer	
Archived Samples	

SOIL PHYSICAL FIELD CHARACTERISTICS			
Mode of Deposition		Drainage Class	
Topographic details		Pore pattern	
Landform		Humus form	
Stone/Rock outcrop		Structure	
Ecosite		Boundary	✓*
Texture		Roots	✓*
Soil Profile Depth details (depth to bedrock, water table, mottles, etc.)	✓*	Coarse Fragment Content	✓*
Moisture Regime		Colour	✓*
Seepage		Presence of carbonates	

SOIL PROPERTIES	
Bulk Density	✓*
Sand Silt Clay	✓*
pH	✓*
C, organic C	✓*
Total N	✓*
C/N ratio	✓*
CEC	✓*
Exchangeable cations	✓*
SO4	✓*
Phosphorus	✓*
Other elements	✓*
Soil Biology	

Publications

Ripple Lake (Island Lake Fire Site)

Publications

Kwiaton, M., Hazlett, P.W., Morris, R., Fleming, R.L., Webster, K.L., Venier, L.A. and Aubin, I., 2014. Island Lake biomass harvest research and demonstration area: establishment report. Information Report GLC-X-11.

Smenderovac, E.E., Webster, K., Caspersen, J., Morris, D., Hazlett, P. and Basiliko, N., 2017. Does intensified boreal forest harvesting impact soil microbial community structure and function?. Canadian Journal of Forest Research, 47(7), pp.916-925.

Venier, L.A., Work, T.T., Klimaszewski, J., Morris, D.M., Bowden, J.J., Kwiaton, M.M., Webster, K. and Hazlett, P., 2017. Ground-dwelling arthropod response to fire and clearcutting in jack pine: implications for ecosystem management. Canadian Journal of Forest Research, 47(12), pp.1614-1631.

Work, T.T., Morris, D.M., Loboda, S., Klimaszewski, J., Wainio-Keizer, K. and Venier, L., 2023. Cumulative effects of biomass harvesting and herbicide application on litter-dwelling arthropod communities in jack pine-dominated forests: 7th year postharvest assessment. Canadian Journal of Forest Research.

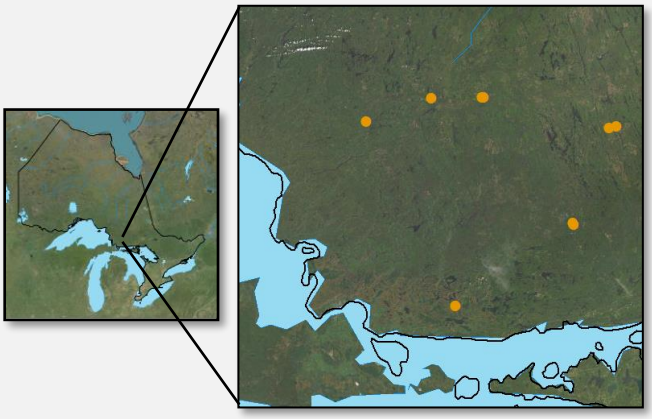
Forest Soil Datasets in Ontario

Jack Pine Long Term Soil Productivity (Pj LTSP)

Project Details

This project was initiated to determine the effects of a range of biomass removals on long-term productivity of jack pine ecosystems. It established a series of experimental sites, in a range of Plonski's site classes, in north central Ontario jack pine ecosystems. Baseline data collection methods included pre- and postharvest stand and site characteristics including preharvest soil sampling, seedbed, and natural regeneration assessments (Tenhagen *et al.* 1996). Nine mature stands were studied with 15 (30mx30m) plots in each, 3 of which were control plots. Two soil pits were dug pre-harvest in buffer zones in each site, totaling 18 pits. Further soils collection (auger or pits) and analyses available for control plots over 20 years.

Plot Map



Dataset Information

Project Year(s): 1993-95, 2006, ongoing

 # Plots: 9 pre-harvest stands (18 soil pits)

Data Format: Excel spreadsheet

Data Steward: Rob Fleming, Research Scientist, NRCan (GLFC), rob.fleming@nrcan-rncan.gc.ca

Partners: NRCan (GLFC), MNRF

Soil Data Attributes

✓ - Site specific details
✓* - Plot specific details

SITE INFORMATION	
Location (coordinates, ecodistrict, township, etc.)	✓
Plot or Polygon ID	✓*
Year	✓*
Elevation	✓
Site Treatment / Disturbance	✓*

SOIL SAMPLING	
Soil Sampling Method	
Sampled by Horizon	
Sampled by Depth or Layer	✓*
Archived Samples	✓*

SOIL PHYSICAL FIELD CHARACTERISTICS			
Mode of Deposition		Drainage Class	
Topographic details		Pore pattern	
Landform		Humus form	✓*
Stone/Rock outcrop		Structure	
Ecosite	✓*	Boundary	
Texture (family, effective texture)	✓*	Roots	
Plot depth details (depth to bedrock, water table, mottles, etc.)	✓*	Coarse Fragment Content	✓*
Moisture Regime	✓*	Colour	
Seepage		Presence of carbonates	

SOIL PROPERTIES	
Bulk Density	
Sand Silt Clay	
pH	✓*
C, organic C	✓*
Total N	✓*
C/N ratio	✓*
CEC	✓*
Exchangeable cations	✓*
SO4	
Phosphorus	✓*
Other elements	✓*
Soil Biology	

Publications

Jack Pine Long Term Soil Productivity (Pj LTSP)

Publications

Hazlett, P.W., Emilson, C.E., Morris, D.M., Fleming, R.L., Hawdon, L.A., Leblanc, J.D., Primavera, M.J., Weldon, T.P., Kwiaton, M.M. and Hoepting, M.K., 2021. Effects of harvesting intensity, vegetation control and fertilization on 5–20 year post-harvest N availability in boreal jack pine and black spruce forest soils in northern Ontario, Canada. Forest Ecology and Management, 497, p.119483.

Hazlett, P.W., Morris, D.M. and Fleming, R.L., 2014. Effects of biomass removals on site carbon and nutrients and jack pine growth in boreal forests. Soil Science Society of America Journal, 78(S1), pp.S183-S195.

Fleming, R.L., Leblanc, J.D., Hazlett, P.W., Weldon, T., Irwin, R. and Mossa, D.S., 2014. Effects of biomass harvest intensity and soil disturbance on jack pine stand productivity: 15-year results. Canadian Journal of Forest Research, 44(12), pp.1566-1574.

Fleming, R.L., Leblanc, J.D., Weldon, T., Hazlett, P.W., Mossa, D.S., Irwin, R., Primavera, M.J. and Wilson, S.A., 2018. Effect of vegetation control, harvest intensity, and soil disturbance on 20-year jack pine stand development. Canadian Journal of Forest Research, 48(4), pp.371-387.

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Fleming, R.L., Powers, R.F., Foster, N.W., Kranabetter, J.M., Scott, D.A., Ponder Jr, F., Berch, S., Chapman, W.K., Kabzems, R.D., Ludovici, K.H. and Morris, D.M., 2006. Effects of organic matter removal, soil compaction, and vegetation control on 5-year seedling performance: a regional comparison of Long-Term Soil Productivity sites. Canadian Journal of Forest Research, 36(3), pp.529-550.

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Kishchuk, B.E., Morris, D.M., Lorente, M., Keddy, T., Sidders, D., Quideau, S., Thiffault, E., Kwiaton, M. and Maynard, D., 2016. Disturbance intensity and dominant cover type influence rate of boreal soil carbon change: A Canadian multi-regional analysis. Forest Ecology and Management, 381, pp.48-62.

Jack Pine Long Term Soil Productivity (Pj LTSP)

Publications

Kreutzweiser, D.P., Hazlett, P.W. and Gunn, J.M., 2008. Logging impacts on the biogeochemistry of boreal forest soils and nutrient export to aquatic systems: A review. Environmental Reviews, 16(NA), pp.157-179.

Morris, D.M., Fleming, R.L. and Hazlett, P.W., 2020. Ontario, Canada's LTSP experience: forging lasting research partnerships and the adaptive management cycle in action. Journal of Forestry, 118(3), pp.337-351.

Morris, D.M., Hazlett, P.W., Fleming, R.L., Kwiaton, M.M., Hawdon, L.A., Leblanc, J.D., Primavera, M.J. and Weldon, T.P., 2019. Effects of biomass removal levels on soil carbon and nutrient reserves in conifer-dominated, coarse-textured sites in northern Ontario: 20-year results. Soil Science Society of America Journal, 83, pp.S116-S132.

Morris, D.M., Kwiaton, M.M. and Duckert, D.R., 2014. Black spruce growth response to varying levels of biomass harvest intensity across a range of soil types: 15-year results. Canadian Journal of Forest Research, 44(4), pp.313-325.

Morris, D.M., Kwiaton, M.M., Kahkonen, E. and Duckert, D.R., 2016. Are shallow-soiled sites sensitive to increased biomass removals? An operational, paired-wise comparison approach. Forest Ecology and Management, 377, pp.192-204.

Page-Dumroese, D.S., 2010. the North-American long-term soil productivity Study: concepts and literature. Scientific Background for Soil Monitoring on National Forests and Rangelands, p.43.

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Ponder Jr, F., Fleming, R.L., Berch, S., Busse, M.D., Elioff, J.D., Hazlett, P.W., Kabzems, R.D., Kranabetter, J.M., Morris, D.M., Page-Dumroese, D. and Palik, B.J., 2012. Effects of organic matter removal, soil compaction and vegetation control on 10th year biomass and foliar nutrition: LTSP continent-wide comparisons. Forest Ecology and Management, 278, pp.35-54.

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Puddister, D., Dominy, S.W.J., Baker, J.A., Morris, D.M., Maure, J., Rice, J.A., Jones, T.A., Majumdar, I., Hazlett, P.W., Titus, B.D. and Fleming, R.L., 2011. Opportunities and challenges for Ontario's forest bioeconomy. The Forestry Chronicle, 87(4), pp.468-477.

Jack Pine Long Term Soil Productivity (Pj LTSP)

Publications

Rousseau, L., Venier, L., Fleming, R., Hazlett, P., Morris, D. and Handa, I.T., 2018. Long-term effects of biomass removal on soil mesofaunal communities in northeastern Ontario (Canada) jack pine (Pinus banksiana) stands. Forest Ecology and Management, 421, pp.72-83.

Reynolds, P.E., Brand, G., Weldon, T. and Foster, N., 2009. Vegetation Management to Optimize Carbon Assimilation and Ameliorate Cli-mate Change–Canada's Long-term Soil Productivity (LTSP) Project. Forest Vegetation Management–Towards Environmental Sustainability, (35-2009), p.29.

Rousseau, L., Venier, L., Fleming, R., Hazlett, P., Morris, D. and Handa, I.T., 2018. Long-term effects of biomass removal on soil mesofaunal communities in northeastern Ontario (Canada) jack pine (Pinus banksiana) stands. Forest Ecology and Management, 421, pp.72-83.

Smenderovac, E.E., Webster, K., Caspersen, J., Morris, D., Hazlett, P. and Basiliko, N., 2017. Does intensified boreal forest harvesting impact soil microbial community structure and function?. Canadian Journal of Forest Research, 47(7), pp.916-925.

Tenhagen, M.D., Jeglum, J.K., Ran, S., Foster, N.W., 1996. Effects of a range of biomass removals on long-term productivity of jack pine ecosystems. Canadian Forest Service, Great Lakes Forestry Centre, Information Report No. O-X-454.

Venier, L.A., Aubin, I., Webster, K., Rive, A., Morris, D.M., Rice, J.A. and Hazlett, P., 2014. Developing research approaches to understand biodiversity response to biomass removal. Natural Resources Canada, Canadian Forest Service, Great Lakes Forestry Centre.

Webster, K.L., Hazlett, P.W., Brand, G., Nelson, S.A., Primavera, M.J. and Weldon, T.P., 2021. The effect of boreal jack pine harvest residue retention on soil environment and processes. Forest Ecology and Management, 497, p.119517.

Wiebe, S., 2013. The distribution and role of downed woody debris in nutrient retention and cycling during early stand establishment (Doctoral dissertation).

Wiebe, S., Morris, D., Luckai, N. and Reid, D., 2012. Coarse woody debris dynamics following biomass harvesting: Tracking carbon and nitrogen patterns during early stand development in upland black spruce ecosystems. International Journal of Forest Engineering.

Wilhelm, R.C., Cardenas, E., Leung, H., Maas, K., Hartmann, M., Hahn, A., Hallam, S. and Mohn, W.W., 2017. A metagenomic survey of forest soil microbial communities more than a decade after timber harvesting. Scientific data, 4(1), pp.1-8.

Jack Pine Long Term Soil Productivity (Pj LTSP)

Publications

Work, T.T., Morris, D.M., Loboda, S., Klimaszewski, J., Wainio-Keizer, K. and Venier, L., 2023. Cumulative effects of biomass harvesting and herbicide application on litter-dwelling arthropod communities in jack pine-dominated forests: 7th year postharvest assessment. Canadian Journal of Forest Research.

Work, T.T., Morris, D.M., Loboda, S., Klimaszewski, J., Wainio-Keizer, K. and Venier, L., 2023. Cumulative effects of biomass harvesting and herbicide application on litter-dwelling arthropod communities in jack pine-dominated forests: 7th year postharvest assessment. Canadian Journal of Forest Research.

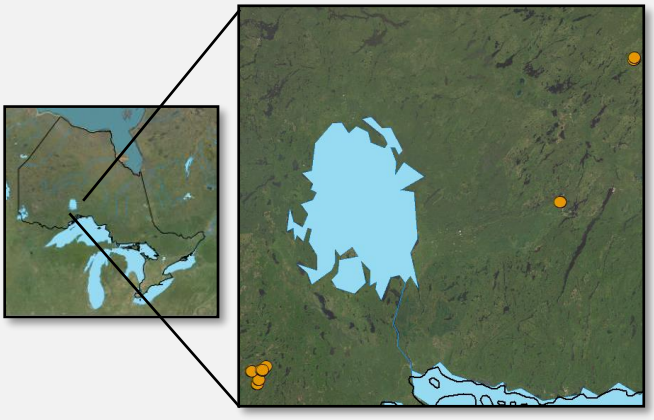
Forest Soil Datasets in Ontario

Black Spruce Long Term Soil Productivity (Sb LTSP)

Project Details

The study sites are part of the North American LTSP network. They represent a productivity gradient of upland boreal sites in northwestern (NW) Ontario. Stands were undisturbed, fire-origin boreal conifer-dominated forest ranging in age from 57 to 125 years, with sites in the NW comprised predominantly of an overstory of black spruce. The national program of Long-Term Soil Productivity (LTSP) research was established to address both short- and long-term consequences of site and soil disturbance on fundamental forest productivity. This dataset contains the information collected in the NW (black spruce).

Plot Map



Dataset Information

Project Year(s): 1993-ongoing

 # Plots: 28

Data Format: Excel spreadsheet

Data Steward: Dr. Dave Morris, Research Scientist, Forest Stand Ecology, Centre for Northern Forest Ecosystem Research, MNRF email: dave.m.morris@ontario.ca

Partners: MNRF, NRCan (GLFC)

Soil Data Attributes

✓ - Site specific details
✓* - Plot specific details

SITE INFORMATION	
Location (coordinates, ecodistrict, township, etc.)	✓*
Plot or Polygon ID	✓*
Year	✓*
Elevation	
Site Treatment / Disturbance	✓*

SOIL SAMPLING	
Soil Sampling Method	✓
Sampled by Horizon	✓*
Sampled by Depth or Layer	
Archived Samples	✓*

SOIL PHYSICAL FIELD CHARACTERISTICS			
Mode of Deposition	✓*	Drainage Class	✓*
Topographic details		Pore pattern	✓*
Landform		Humus form	
Stone/Rock outcrop		Structure	
Ecosite		Boundary	
Texture (family, effective texture)	✓*	Roots	
Plot depth details (depth to bedrock, water table, mottles, etc.)	✓*	Coarse Fragment Content	✓*
Moisture Regime	✓*	Colour	✓*
Seepage	✓*	Presence of carbonates	

SOIL PROPERTIES	
Bulk Density	
Sand Silt Clay	✓*
pH	✓*
C, organic C	✓*
Total N	✓*
C/N ratio	✓*
CEC	✓*
Exchangeable cations	✓*
SO4	
Phosphorus	✓*
Other elements	
Soil Biology	

Publications

Forest Soil Datasets in Ontario

Black Spruce Long Term Soil Productivity (Sb LTSP)

Publications

Duckert, D.R. and Morris, D.M. 2001. Impacts of harvest intensity on long-term site productivity on black spruce ecosystems: An establishment report. Ont. Min. Nat. Resourc., CNFER Tech. Rep. TR-008.

Fleming, R.L., Powers, R.F., Foster, N.W., Kranabetter, J.M., Scott, D.A., Ponder Jr., F., and Berch, S. 2006. Effects of organic matter removal, soil compaction, and vegetation control on 5-year seedling performance: A regional comparison on long-term soil productivity sites. Can. J. For. Res. 36:529-550.

Hazlett, P.W., Emilson, C.E., Morris, D.M., Fleming, R.L., Hawdon, L.A., Leblanc, J-D., Primavera, M.J., Weldon, T.P., Kwiaton, M.M., and Hoepting, M.K. 2021. Effects of harvesting intensity, vegetation control and fertilization on 5-20year post-harvest N availability in boreal jack pine and black spruce forest soils in northern Ontario, Canada. Forest Ecology and Management, Vol.497, 1 Oct. 2021, 119483.

Morris, D.M. 1997. The role of long-term site productivity in maintaining healthy ecosystems: A prerequisite of ecosystem management. For. Chron. 73:731-740.

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Morris, D.M., Fleming, R.L and Hazlett, P.W. 2020. Ontario, Canada's LTSP Experience: Forging Lasting Research Partnerships and the Adaptive Management Cycle in Action. Journal of Forestry, Volume 118, Issue 3, May 2020, Pages 337-351. https://doi.org/10.1093/jofore/fvaa002

Morris, D.M, Kwiaton, M.M. and Duckert, D.R. 2013 Black spruce growth response to varying levels of biomass harvest intensity across a range of soil types: 15-year results. Can. J. For. Res. 44:313-325.

Morris, D.M, Kwiaton, M.M., Kahkonen, E., and Duckert, D.R. 2016. Are shallow-soiled sites sensitive to increased biomass removals? An operational, paired-wise comparison approach. For. Ecol. Manag. 377:192-204.

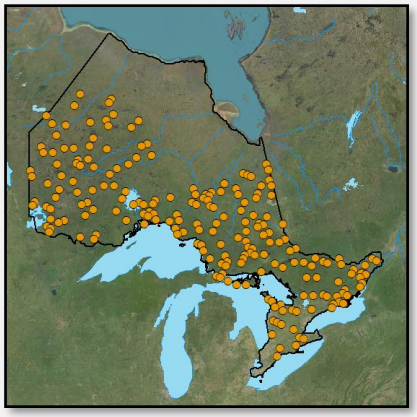
Forest Soil Datasets in Ontario

National Forest Inventory (NFI)

Project Details

This dataset includes the Ontario ground plots that are assessed for the ongoing National Forest Inventory (NFI) sampling program that was originally established between 2003 and 2006. The NFI program is a joint effort between federal, provincial, and territorial governments, and plot remeasurements are spread over a 10-year cycle. The 212 Ontario plots were assessed for 25 key attributes as well as for additional variables that met provincial growth and yield requirements. The NFI program in Ontario is a component of the Ontario Growth and Yield program led by the MNRF.

Plot Map



Dataset Information

Project Year(s): 2003-2016, ongoing

 # Plots: 212

Data Format: SQL database, soils data downloaded to excel spreadsheet

Data Steward: Christopher Stratton, Growth and Yield, MNRF email: Christopher.Stratton@ontario.ca

Partners: NRCan, MNRF

Soil Data Attributes

✓ - Site specific details
✓* - Plot specific details

SITE INFORMATION	
Location (coordinates, ecodistrict, township, etc.)	✓*
Plot or Polygon ID	✓*
Year	✓*
Elevation	✓*
Site Treatment / Disturbance	

SOIL SAMPLING	
Soil Sampling Method	
Sampled by Horizon	✓*
Sampled by Depth or Layer	
Archived Samples	✓*

SOIL PHYSICAL FIELD CHARACTERISTICS			
Mode of Deposition		Drainage Class	✓*
Topographic details	✓	Pore pattern	✓*
Landform	✓	Humus form	
Stone/Rock outcrop	✓	Structure	
Ecosite		Boundary	
Texture (family, effective texture)	✓*	Roots	
Plot depth details (depth to bedrock, water table, mottles, etc.)	✓*	Coarse Fragment Content	✓*
Moisture Regime	✓*	Colour	✓*
Seepage	✓*	Presence of carbonates	

SOIL PROPERTIES	
Bulk Density	✓*
Sand Silt Clay	✓*
pH	✓*
C, organic C	✓*
Total N	✓*
C/N ratio	✓*
CEC	
Exchangeable cations	
SO4	
Phosphorus	
Other elements	
Soil Biology	

Publications

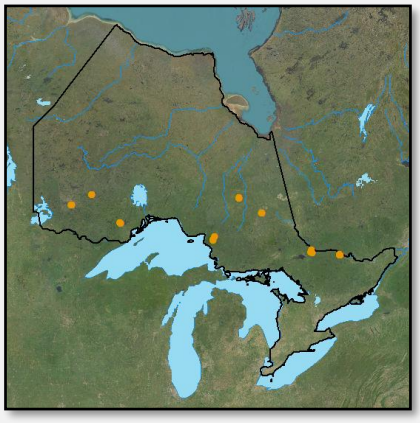
Forest Soil Datasets in Ontario

The NEBIE Plot Network

Project Details

The Intensive Management Science Partnership: NEBIE (Natural disturbance, and Extensive, Basic, Intensive, and Elite silviculture) plot network is a stand-scale, multi-agency research project designed to compare the ecological effects of a range of silvicultural treatments in northern temperate and boreal forest regions of Ontario. It was established in 2001 with randomized complete block experiments installed at eight sites. Each NEBIE treatment was replicated at least three times at each site, using large experimental units (2-ha plots) (Bell, F.W., Shaw, M., Dacosta, J., and Newmaster, S.G., 2017).

Plot Map



Dataset Information

Project Year(s): 2001-ongoing

 # Plots: 160

Data Format: Excel spreadsheets

Data Steward: F. Wayne Bell, Forest Monitoring and Research Section, MNRF (OFRI) email: wayne.bell@ontario.ca

Partners: MNRF, CFS (GLFC), University of Guelph, University of Western, Industry partners

Soil Data Attributes

✓ - Site specific details
✓* - Plot specific details

SITE INFORMATION	
Location (coordinates, ecodistrict, tow nship, etc.)	✓*
Plot or Polygon ID	✓*
Year	✓*
Elevation	
Site Treatment / Disturbance	✓*

SOIL SAMPLING	
Soil Sampling Method	✓*
Sampled by Horizon	✓*
Sampled by Depth or Layer	
Archived Samples	

SOIL PHYSICAL FIELD CHARACTERISTICS			
Mode of Deposition		Drainage Class	✓*
Topographic details	✓	Pore pattern	✓*
Landform		Humus form	✓*
Stone/Rock outcrop		Structure	
Ecosite	✓*	Boundary	
Texture (family, effective texture)	✓*	Roots	
Plot depth details (depth to bedrock, water table, mottles, etc.)	✓*	Coarse Fragment Content	✓*
Moisture Regime	✓*	Colour	
Seepage	✓*	Presence of carbonates	✓*

SOIL PROPERTIES	
Bulk Density	
Sand Silt Clay	✓*
pH	✓*
C, organic C	✓*
Total N	✓*
C/N ratio	✓*
CEC	
Exchangeable cations	✓*
SO4	
Phosphorus	✓*
Other elements	
Soil Biology	

Publications

Forest Soil Datasets in Ontario

The NEBIE Plot Network

Publications

Baker, J.A., Bell, F.W. and Stinson, A., 2008. Ontario's Forestry Research Partnership: Progress and next steps. The Forestry Chronicle, 84(5), pp.756-763.

Bell, F.W., 2015. Effects of intensification of silviculture on plant diversity in northern temperate and boreal forests of Ontario, Canada (Doctoral dissertation, University of Guelph).

Wayne Bell, F., 2017. Forestry is a dynamic discipline!/La foresterie: une discipline en constante évolution!. The Forestry Chronicle, 93(2), pp.84-85.

Bell, F.W., Dacosta, J., Newmaster, S.G., Mallik, A., Hunt, S., Anand, M., Maloles, J., Peng, C., Parton, J., McLaughlin, J. and Winters, J., 2017. The NEBIE plot network: Highlights of long-term scientific studies. The Forestry Chronicle, 93(2), pp.122-137.

Bell, F.W., Deighton, H.D., Antunes, P.M., Dacosta, J. and Newmaster, S., Patterns and Drivers of Exotic Plant Establishment in Managed Northern Temperate and Boreal Forests. Available at SSRN 4005770.

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Bell, F.W., Deighton, H.D., Dacosta, J., Aubin, I., Newmaster, S.G., Searle, E.B. and Hunt, S., 2023. Individual response traits of understory plants vary along linked-press and compounded-pulse disturbance gradients in northern temperate and boreal forests. Forest Ecology and Management, 540, p.121021.

Bell, F.W., Hunt, S., Dacosta, J., Sharma, M., Larocque, G.R., Winters, J.A. and Newmaster, S.G., 2014. Effects of silviculture intensity on plant diversity response patterns in young managed northern temperate and boreal forests. Écoscience, 21(3-4), pp.327-339.

Bell, F.W., Lamb, E.G., Sharma, M., Hunt, S., Anand, M., Dacosta, J. and Newmaster, S.G., 2016. Relative influence of climate, soils, and disturbance on plant species richness in northern temperate and boreal forests. Forest Ecology and Management, 381, pp.93-105.

Bell, F.W., Parton, J., Stocker, N., Joyce, D., Reid, D., Wester, M., Stinson, A., Kayahara, G. and Towill, B., 2008. Developing a silvicultural framework and definitions for use in forest management planning and practice. The Forestry Chronicle, 84(5), pp.678-693.

Forest Soil Datasets in Ontario

The NEBIE Plot Network

Publications

Bell, F.W., Pitt, D.G. and Wester, M.C., 2006. Is Intensive Forest Management a misnomer? An Ontario-based discussion of terminology and an alternative approac. The Forestry Chronicle, 82(5), pp.662-674.

Bell, F.W., Shaw, M., Dacosta, J. and Newmaster, S.G., 2017. The NEBIE plot network: Background and experimental design. The Forestry Chronicle, 93(2), pp.87-102.

Cole, H.A., Newmaster, S.G., Bell, F.W., Pitt, D. and Stinson, A., 2008. Influence of microhabitat on bryophyte diversity in Ontario mixedwood boreal forest. Canadian Journal of Forest Research, 38(7), pp.1867-1876.

Henry, T., 2016. GLS-corrected RLQ analysis: a new multivariate method for incorporating spatial and phylogenetic information into trait-environment analyses (Doctoral dissertation, University of Guelph).

Maloles, J.R., 2015. The effects of the intensification of silvicultural practices on seed bank diversity in the boreal and northern temperate forests (Doctoral dissertation, University of Guelph).

Petersen, L.R., 2006. Allowable cut effects in Ontario's boreal forest (Doctoral dissertation, University of Guelph).

Rapai, S., 2014. Revegetation of Mining-Disturbed Lands in Ontario Using Arbuscular Mycorrhizal Fungi (Doctoral dissertation, University of Guelph).

Rapai, S.B., McMullin, R.T., Maloles, J.R., Turgeon, M.H. and Newmaster, S.G., 2018. An ecological restoration approach to biological inventories: A case study in the collection of a vegetation biolayer that will inform restoration planning. Ecological Restoration, 36(2), pp.116-126.

Schram, L., 2014. The effect of silvicultural and environmental conditions on the lichen biota of residual trees in managed forests in Ontario, Canada (Doctoral dissertation, University of Guelph).

Searle, E.B., Bell, F.W., Larocque, G.R., Fortin, M., Dacosta, J., Sousa-Silva, R., Mina, M. and Deighton, H.D., 2021. Simulating the effects of intensifying silviculture on desired species yields across a broad environmental gradient. Forests, 12(6), p.755.

Searle, E.B., Bell, F.W., Dacosta, J. and Deighton, H.D., 2022. Effects of silvicultural treatments on post-harvesting residual tree mortality. Forest Ecology and Management, 506, p.119974.

Set, P.I., 2003. Intensive forest management science partnership: NEBIE plot network.

Forest Soil Datasets in Ontario

The NEBIE Plot Network

Publications

Simpson, L.E., 2012. Growth and photosynthetic responses of white spruce seedlings to levels of trembling aspen and red raspberry cover. Growth, 1, pp.1-1.

Smeekens, J., 2009. The Effect of Silviculture Intensity on Density and Stocking of Three NEBIE Sites (Doctoral dissertation, Lakehead University).

Smith, G.K., Pineau, J.F. and Bell, F.W., 2008. Knowledge transfer and extension in the Canadian Ecology Centre–Forestry Research Partnership: From awareness to uptake. The Forestry Chronicle, 84(5), pp.748-755.

Webster, N., 2013. Forest Management Does Not Emulate Natural Disturbance with Respect to Plant Diversity and Forest Community Composition (Doctoral dissertation, University of Guelph).

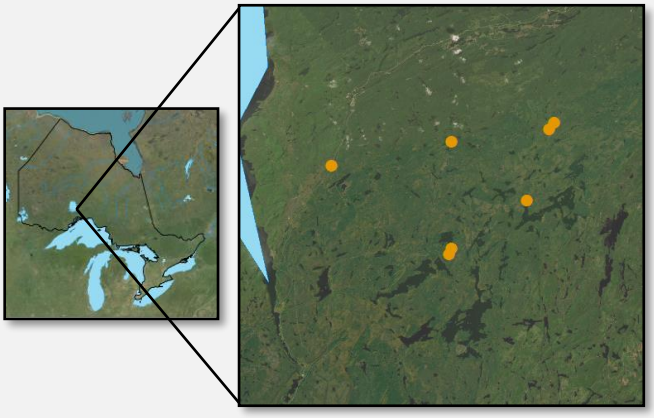
Forest Soil Datasets in Ontario

Nipigon Strip Cuts

Project Details

A study of factors affecting regeneration in alternate strip clearcutting in shallow-soil upland black spruce near Nipigon, ON. Soils and soil chemistry were assessed prior to harvesting. Locations are general with no specific coordinate information as soils were sampled in quadrants along the strip cuts. Ecosystem Land Classification information was added years after research based on soil data that was collected.

Plot Map



Dataset Information

Project Year(s): 1974-1980

 # Plots: 24

Data Format: Excel spreadsheet

Data Steward: Rob Fleming, Research Scientist, NRCan (GLFC) email: rob.fleming@nrcan-rncan.gc.ca

Partners: NRCan, MNRF

Soil Data Attributes

✓ - Site specific details
✓* - Plot specific details

SITE INFORMATION	
Location (coordinates, ecodistrict, township, etc.)	✓*
Plot or Polygon ID	✓*
Year	✓*
Elevation	
Site Treatment / Disturbance	✓

SOIL SAMPLING	
Soil Sampling Method	✓*
Sampled by Horizon	✓*
Sampled by Depth or Layer	
Archived Samples	✓*

SOIL PHYSICAL FIELD CHARACTERISTICS			
Mode of Deposition		Drainage Class	✓*
Topographic details		Pore pattern	
Landform	✓	Humus form	
Stone/Rock outcrop	✓	Structure	
Ecosite	✓*	Boundary	
Texture (family, effective texture)	✓*	Roots	
Plot depth details (depth to bedrock, water table, mottles, etc.)	✓*	Coarse Fragment Content	✓*
Moisture Regime	✓*	Colour	✓*
Seepage		Presence of carbonates	

SOIL PROPERTIES	
Bulk Density	✓*
Sand Silt Clay	✓*
pH	✓*
C, organic C	✓*
Total N	✓*
C/N ratio	✓*
CEC	✓*
Exchangeable cations	✓*
SO4	
Phosphorus	✓*
Other elements	
Soil Biology	

Publications

Nipigon Strip Cuts

Publications

Fleming, R.L. and R.M. Crossfield. 1984. Strip Cutting in shallow-soil upland black spruce near Nipigon, Ontario. III: Windfall and mortality in the leave strips: preliminary results. Environment Canada, Canadian Forestry Service, Northern Forest Research Centre.

Jeglum, John K. 1987. Alternate Strip Clearcutting in Upland Black Spruce II. Factors Affecting Regeneration in First-cut Strips. The Forestry Chronicle December 1987. pp. 439-445.

Jeglum, J.K. 1980. Strip Cutting in shallow-soil upland black spruce near Nipigon, Ontario. I. Study establishment and site conditions. Report, Great Lakes Forest Research Centre Sault Ste. Marie, Ontario 1980 No. 0-X-315. pp.vi+73pp.l ref.46

Jeglum, J.K. 1982, August. Changes in tree species composition in naturally regenerating strip clearcuts in shallow-soil upland black spruce. In Conference Proceedings: Resources and Dynamics of the Boreal Zone, Aug. pp. 180-193.

Jeglum, J.K. 1984. Strip cutting in shallow-soil upland black spruce near Nipigon, Ontario. IV. Seedling-seedbed relationships. GLFRC, Can. For. Ser., Dep. Of Env., Information report OX-359.

Nicolson, J.A. 1988. Alternate strip clearcutting in upland black spruce The Nipigon Workshop, June 24 and 25, 1986. The Forestry Chronicle, 1988;64:52.

Wood, J.E., and J.K. Jeglum. 1984. Black spruce regeneration trials near Nipigon, Ontario: planting versus seeding, lowlands versus uplands, clearcut versus strip cut. Information report OX (1984).

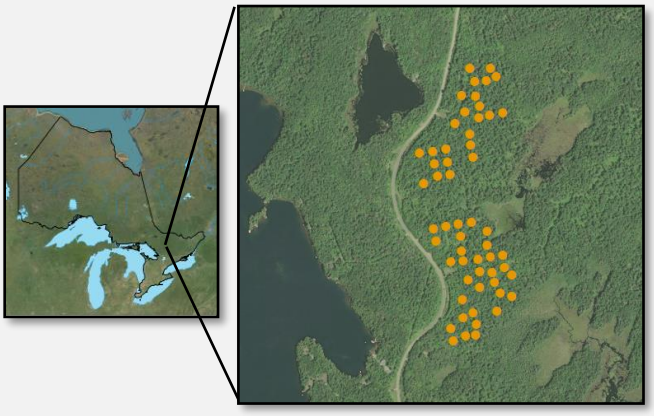
Forest Soil Datasets in Ontario

Porridge Lake Wood Ash Trial

Project Details

This project is a component within the larger Natural Resources Canada-Canadian Forest Service led AshNet project, a network of scientists, foresters, industry and government (federal and provincial) representatives who are actively investigating the potential for moving forward Canada's bioeconomy objectives, reducing waste and improving forest health by applying wood ash from bioenergy production to forest soils. The Porridge Lake Trial is pilot project with long-term monitoring of the ecological effects of a one-time wood ash application to the soil at a hardwood forest site. Sampling planned for 5, 10, 15 and 20 years after application. Pre-ash application sampling completed in 2018.

Plot Map



Dataset Information

Project Year(s): 2017-ongoing

 # Plots: 56

Data Format: Excel spreadsheet

Data Steward: Rob Fleming, NRCan (GLFC)
email: rob.fleming@nrcan-rncan.gc.ca

Partners: NRCan (GLFC), MNRF, Laurentian U., Trent U., Westwind Forest Stewardship Inc., Murray Brothers Lumber Company, Brinkman Reforestation Ltd., OMECP

Soil Data Attributes

✓ - Site specific details
✓* - Plot specific details

SITE INFORMATION	
Location (coordinates, ecodistrict, township, etc.)	✓*
Plot or Polygon ID	✓*
Year	✓*
Elevation	
Site Treatment / Disturbance	✓*

SOIL SAMPLING	
Soil Sampling Method	✓
Sampled by Horizon	✓*
Sampled by Depth or Layer	✓*
Archived Samples	✓*

SOIL PHYSICAL FIELD CHARACTERISTICS			
Mode of Deposition		Drainage Class	✓*
Topographic details		Pore pattern	
Landform		Humus form	
Stone/Rock outcrop		Structure	
Ecosite		Boundary	
Texture	✓*	Roots	
Soil Profile Depth details (depth to bedrock, water table, mottles, etc.)	✓*	Coarse Fragment Content	✓*
Moisture Regime		Colour	
Seepage		Presence of carbonates	

SOIL PROPERTIES	
Bulk Density	✓*
Sand Silt Clay	✓*
pH	✓*
C, organic C	✓*
Total N	✓*
C/N ratio	✓*
CEC	✓*
Exchangeable cations	✓*
SO4	
Phosphorus	✓*
Other elements	✓*
Soil Biology	

Publications

Porridge Lake Wood Ash Experiment

Publications

Smith, E.P., 2023. Short-Term Biogeochemical Response of Hardwood Forest Soils to Wood Ash Additions in Central Ontario (Doctoral dissertation, Trent University (Canada).

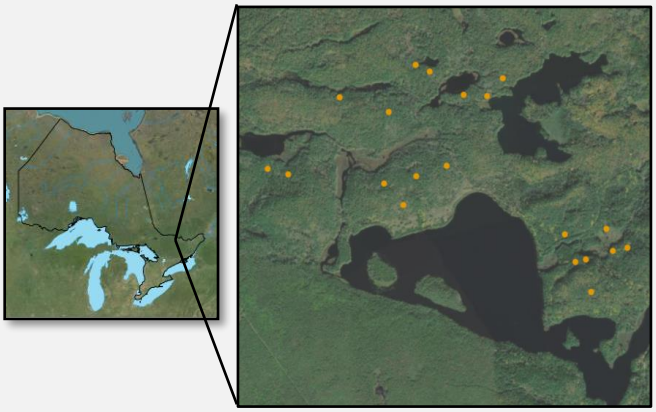
Forest Soil Datasets in Ontario

Petawawa Research Forest (PRF)
Cartier Lake Silvicultural Area (CLSA)

Project Details

The Cartier Lake White Pine Improvement Harvest study was initiated in 1971 primarily to explore the potential of accelerating merchantable white pine volume production through that harvest of mature tolerant hardwoods overtopping mid-rotation white pine. The study included harvest and no-harvest treatments across several stands with three levels of residual pine basal area. Soil pits were established adjacent to a subset of plots in 2001 to quantify effects on soil carbon and nutrients.

Plot Map



Dataset Information

Project Year(s): 1971-2001, ongoing

 # Plots: 20

Data Format: ArcMap shapefile, Excel spreadsheet

Data Steward: Michael Hoepting, Silviculture Research Forester, NRCan (CWFC) email: michael.hoepting@NRCan-RNCan.gc.ca

Partners: NRCan (CWFC), MNRF, Forest Research Partnership (FRP), Univ. of Toronto

Soil Data Attributes

✓ - Site specific details
✓* - Plot specific details

SITE INFORMATION	
Location (coordinates, ecodistrict, township, etc.)	✓*
Plot or Polygon ID	✓*
Year	✓*
Elevation	
Site Treatment / Disturbance	✓

SOIL SAMPLING	
Soil Sampling Method	
Sampled by Horizon	✓*
Sampled by Depth or Layer	✓*
Archived Samples	

SOIL PHYSICAL FIELD CHARACTERISTICS			
Mode of Deposition		Drainage Class	
Topographic details		Pore pattern	
Landform		Humus form	
Stone/Rock outcrop		Structure	
Ecosite		Boundary	
Texture	✓*	Roots	
Soil Profile Depth details (depth to bedrock, water table, mottles, etc.)	✓*	Coarse Fragment Content	
Moisture Regime		Colour	✓*
Seepage		Presence of carbonates	

SOIL PROPERTIES	
Bulk Density	✓*
Sand Silt Clay	✓*
pH	✓*
C, organic C	✓*
Total N	✓*
C/N ratio	✓*
CEC	✓*
Exchangeable cations	✓*
SO4	
Phosphorus	✓*
Other elements	✓*
Soil Biology	

Publications

Forest Soil Datasets in Ontario

Petawawa Research Forest (PRF)
Cartier Lake Silvicultural Area (CLSA)

Publications

Bevilacqua, E., D. Puttock, T.J. Blake, and D. Burgess. 2005. Long-term differential stem growth responses in mature eastern white pine following release from competition. Can. J. For. Res. 35: 511-520.

Brace, L.G. 1978. An intermediate cutting in pine mixedwoods. Pages 131–138 in D.A. Cameron, comp. White and red pine symposium, Chalk River, ON, 20–22 September 1977. Symposiun Proceedings O-P-6. Department of the Environment, Canadian Forestry Service, Great Lakes Forest Research Centre, Sault Ste. Marie, ON. 178 p.

Brace, L.G.; Stewart, D.J. 1974. Careful thinning can preserve amenities and increase yield. Pulp and Paper Mag. Can. 75:36–42.

Burgess, D.; Robinson, C.; Wetzel, S. 2005. Eastern white pine response to release 30 years after partial harvesting in pine mixedwood forests. For. Ecol. Manag. 209:117–129.

Burgess, D., Wetzel, S. and Pinto, F., 1999. Regenerating eastern white pine: a cooperative research approach. The Forestry Chronicle, 75(3), pp.423-425. Murray, W.G. 1977. A winter pruning operation in white and red pine. For. Chron. 53:164–165.

Rollins, K.; Forsyth, M.; Bonti-Ankomah, S.; Amoah, B. 1994. Economic analysis of forestry management practices with an application to a white pine improvement cut in Ontario. Natural Resources Canada, Canadian Forest Service, Great Lakes Forestry Centre, Sault Ste. Marie, ON, and OMNR, NODA Note No. 3. 5 p.

Rollins, K.; Forsyth, M.; Bonti-Ankomah, S.; Amoah, B. 1995. A financial analysis of a white pine improvement cut in Ontario. For. Chron. 71:466–472.

Stiell, W.M. 1984. Improvement cut accelerates white pine sawlog growth. For. Chron. 60:3–9.

Stiell, W.M.; Robinson, C.F.; Burgess, D. 1994. 20-year growth of white pine following commercial improvement cut in pine mixedwoods. For. Chron. 70:385–394.

Whitney, R.D. 1991. Quality of eastern white pine 10 years after damage by logging. For. Chron. 67:23–26.

Whitney, R.D.; Brace, L.G. 1979. Internal defect resulting from logging wounds in residual white pine trees. For. Chron. 55:8–12.

Williams, J. 1994. Planning and executing a commercial stand improvement experiment in pine mixedwoods. For. Chron. 70:382–384.

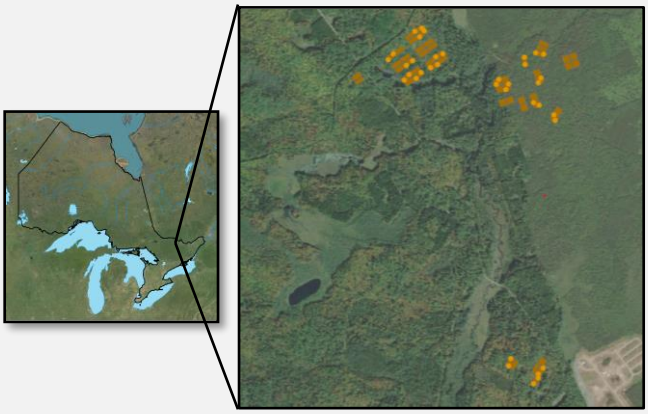
Forest Soil Datasets in Ontario

Petawawa Research Forest (PRF)
Meridian Road Silvicultural Area (MRSA)

Project Details

Studies in the Meridian Road Silviculture Area (27ha) in the PRF focused on a white pine shelterwood study. A soil survey was completed in 1993, but coordinates were not recorded for location of plots. 1999 sampling was done and the general plots locations are only available in a pdf file. Polygons for the general study area plots are mapped.

Plot Map



Dataset Information

Project Year(s): 1993, 1999, ongoing

 # Plots: 36

Data Format: ArcMap shapefile, Excel spreadsheet

Data Steward: Michael Hoepting, Silviculture Research Forester, NRCan (CWFC) email: michael.hoepting@NRCan-RNCan.gc.ca

Partners: NRCan (CWFC), MNRF, Universities

Soil Data Attributes

✓ - Site specific details
✓* - Plot specific details

SITE INFORMATION	
Location (coordinates, ecodistrict, township, etc.)	✓*
Plot or Polygon ID	✓*
Year	✓*
Elevation	
Site Treatment / Disturbance	✓

SOIL SAMPLING	
Soil Sampling Method	✓*
Sampled by Horizon	✓*
Sampled by Depth or Layer	
Archived Samples	

SOIL PHYSICAL FIELD CHARACTERISTICS			
Mode of Deposition		Drainage Class	✓*
Topographic details	✓*	Pore pattern	
Landform		Humus form	✓*
Stone/Rock outcrop		Structure	
Ecosite		Boundary	
Texture	✓*	Roots	
Soil Profile Depth details (depth to bedrock, water table, mottles, etc.)	✓*	Coarse Fragment Content	
Moisture Regime		Colour	
Seepage		Presence of carbonates	

SOIL PROPERTIES	
Bulk Density	✓*
Sand Silt Clay	✓*
pH	✓*
C, organic C	✓*
Total N	✓*
C/N ratio	✓*
CEC	✓*
Exchangeable cations	✓*
SO4	✓*
Phosphorus	✓*
Other elements	✓*
Soil Biology	

Publications

Petawawa Research Forest (PRF)
Meridian Road Silvicultural Area (MRSA)

Publications

Burgess, D.; Wetzel, S.; Pinto, F. 1999. Regenerating eastern white pine: A cooperative research approach. For. Chron. 75:423–425.

Burgess, D.; Wetzel, S. 2000. Nutrient availability and regeneration response after partial cutting and site preparation in eastern white pine. For. Ecol. Manag. 138:249–261.

Burgess, D.; Wetzel, S.; Baldock, J. 2000. White/red pine stand response to partial cutting and site preparation. J. Sustain. For. 10:221–227.

Burgess, D. and S. Wetzel. 2001. Nutrient availability and regeneration response after partial cutting and site preparation in eastern white pine. In Forest Soils and Ecosystem Sustainability. Edited by J.R. Boyle and R.F. Powers. Elsevier Science, Amsterdam, the Netherlands pp.249-261.

Wetzel, S.; Burgess, D. 2001. Understorey environment and vegetation response after partial cutting and site preparation in *Pinus strobus* L. stands. For. Ecol. Manag. 151:43–59.

Burgess, D.; Wetzel, S. 2002. Recruitment and early growth of eastern white pine (Pinus strobus) regeneration after partial cutting and site preparation. Forestry 75:419–423.

Boucher, J-F.; Bernier, P.Y.; Margolis, H.A.; and Munson, A.D. 2007. Growth and physiological response of eastern white pine seedlings to partial cutting and site preparation. Forest Ecology and Management 240: 151-164.

Burgess, D.; Pinto, F.; Wetzel, S. 2002. Some management implications from an eastern white pine regeneration experiment. Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre, Victoria, BC. Technology Transfer Note No. 28. 6 p.

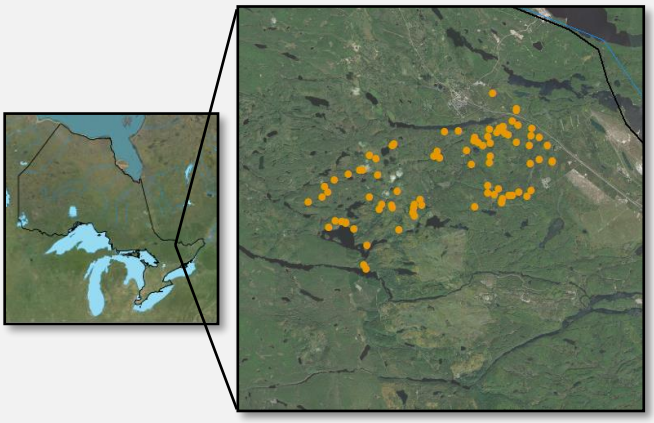
Forest Soil Datasets in Ontario

Petawawa Research Forest (PRF)
Soil Sampling for Digital Soil Mapping Project

Project Details

To support the Digital Soil Mapping (DSM) project, soil sampling on 82 sites representing a variety of ecosites was done in the PRF. Locations were already established through the Advanced Forest Resource Inventory Technologies (AFRIT) project lead by Murray Woods, MNRF. In 2018, PVC tube cores were pounded to a depth of 30cm at 246 subplots and brought back to the lab. C horizon samples were also taken, if possible, at the 30-45cm depth. In 2019, 6 full soil pits were dug, representing the most common ecosite types. Full descriptions were recorded, and organic and mineral samples were brought back to the lab for analysis.

Plot Map



Dataset Information

Project Year(s): 2018-2019

 # Plots: 88 (246 subplots)

Data Format: Excel spreadsheet

Data Steward: Stephanie Nelson, NRCan (GLFC) email: stephanie.nelson@nrcan-rncan.gc.ca

Partners: NRCan, MNRF

Soil Data Attributes

✓ - Site specific details
✓* - Plot specific details

SITE INFORMATION	
Location (coordinates, ecodistrict, township, etc.)	✓*
Plot or Polygon ID	✓*
Year	✓*
Elevation	
Site Treatment / Disturbance	

SOIL SAMPLING	
Soil Sampling Method	✓*
Sampled by Horizon	✓*
Sampled by Depth or Layer	✓*
Archived Samples	✓*

SOIL PHYSICAL FIELD CHARACTERISTICS			
Mode of Deposition		Drainage Class	
Topographic details		Pore pattern	
Landform		Humus form	
Stone/Rock outcrop		Structure	✓*
Ecosite	✓*	Boundary	
Texture	✓*	Roots	✓*
Soil Profile Depth details (depth to bedrock, water table, mottles, etc.)	✓*	Coarse Fragment Content	✓*
Moisture Regime	✓*	Colour	✓*
Seepage	✓*	Presence of carbonates	

SOIL PROPERTIES	
Bulk Density	✓*
Sand Silt Clay	✓*
pH	✓*
C, organic C	✓*
Total N	✓*
C/N ratio	✓*
CEC	✓*
Exchangeable cations	✓*
SO4	✓*
Phosphorus	✓*
Other elements	✓*
Soil Biology	

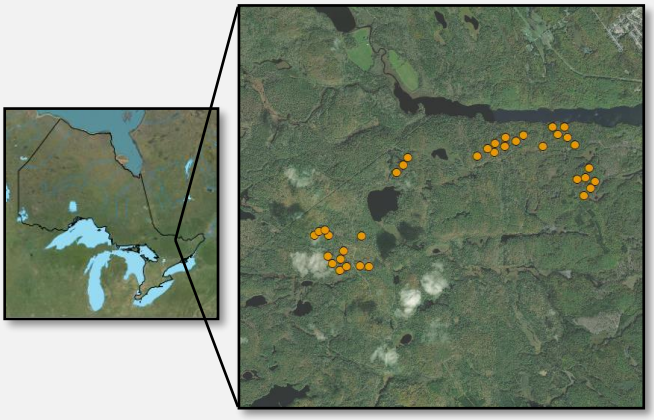
Forest Soil Datasets in Ontario

Petawawa Research Forest (PRF) Biomass Study

Project Details

Project concentrating on effects of varying stand removal strategies on forest soil chemistry. Soil samples were taken by depth – rooting layers, and deep soils. Organic layer was also sampled. Original samples were collected in 2012 and 2013. Other, more recent samples still in lab for analysis.

Plot Map



Dataset Information

Project Year(s): 2012-ongoing

 # Plots: 36

Data Format: Excel spreadsheet

Data Steward: Trevor Jones, Research Scientist, NRCan (GLFC) email: trevor.jones@nrcan-rncan.gc.ca

Partners: NRCan (GLFC), MNRF

Soil Data Attributes

✓ - Site specific details
✓* - Plot specific details

SITE INFORMATION	
Location (coordinates, ecodistrict, township, etc.)	✓*
Plot or Polygon ID	✓*
Year	✓*
Elevation	
Site Treatment / Disturbance	✓*

SOIL SAMPLING	
Soil Sampling Method	
Sampled by Horizon	✓*
Sampled by Depth or Layer	
Archived Samples	✓*

SOIL PHYSICAL FIELD CHARACTERISTICS			
Mode of Deposition		Drainage Class	
Topographic details		Pore pattern	
Landform		Humus form	
Stone/Rock outcrop		Structure	
Ecosite	✓*	Boundary	
Texture	✓*	Roots	
Soil Profile Depth details (depth to bedrock, water table, mottles, etc.)	✓*	Coarse Fragment Content	
Moisture Regime	✓*	Colour	
Seepage	✓*	Presence of carbonates	

SOIL PROPERTIES	
Bulk Density	
Sand Silt Clay	✓*
pH	✓*
C, organic C	✓*
Total N	✓*
C/N ratio	✓*
CEC	✓*
Exchangeable cations	✓*
SO4	✓*
Phosphorus	✓*
Other elements	✓*
Soil Biology	

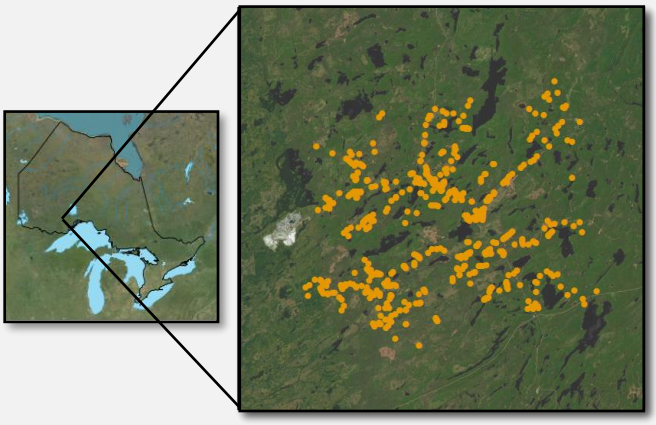
Forest Soil Datasets in Ontario

Rinker Lake Boreal Mixedwood Mapping Pilot Project

Project Details

This dataset contains a summary of information collected from the North Central Forest Ecosystem Classification (NCFEC, merged with Northwestern FEC, NWFEC) plots installed in 1983. In early 1990's, GLFC researchers used those 1983 plots, and added more in 1993 for use as a test case for developing spatial analysis tools and approaches. Canadian Wildlife Society (CWS) added plots in 1992, University of Waterloo added plots in 1993, Ontario Geological Society (OGS) added a large number of geomorphology/bedrock geology plots in 1993; GLFC added plots in 1994 and 1995 to study forest succession on areas that were harvested previously, a few that were from the NCFEC plots from 1983.

Plot Map



Dataset Information

Project Year(s): 1983, 1992-95

 # Plots: 655

Data Format: Excel spreadsheet

Data Steward: Rob Fleming, Research Scientist, Biophysical Processes, NRCan (GLFC) email: rob.fleming@nrcan-rncan.gc.ca

Partners: NRCan (GLFC), MNRF, CWS, UWaterloo, OGS

Soil Data Attributes

✓ - Site specific details
✓* - Plot specific details

SITE INFORMATION	
Location (coordinates, ecodistrict, township, etc.)	✓*
Plot or Polygon ID	✓*
Year	✓*
Elevation	✓
Site Treatment / Disturbance	✓

SOIL SAMPLING	
Soil Sampling Method	
Sampled by Horizon	✓*
Sampled by Depth or Layer	✓*
Archived Samples	✓*

SOIL PHYSICAL FIELD CHARACTERISTICS			
Mode of Deposition	✓*	Drainage Class	
Topographic details	✓*	Pore pattern	
Landform	✓*	Humus form	✓*
Stone/Rock outcrop		Structure	
Ecosite		Boundary	
Texture	✓*	Roots	
Soil Profile Depth details (depth to bedrock, water table, mottles, etc.)	✓*	Coarse Fragment Content	
Moisture Regime	✓*	Colour	
Seepage	✓*	Presence of carbonates	

SOIL PROPERTIES	
Bulk Density	
Sand Silt Clay	✓*
pH	✓*
C, organic C	✓*
Total N	✓*
C/N ratio	✓*
CEC	✓*
Exchangeable cations	✓*
SO4	✓*
Phosphorus	✓*
Other elements	✓*
Soil Biology	

Publications

Forest Soil Datasets in Ontario

Rinker Lake Boreal Mixedwood Mapping Pilot Project

Publications

Akumu, C.E., Baldwin, K. and Dennis, S., 2019. GIS-based modeling of forest soil moisture regime classes: Using Rinker Lake in northwestern Ontario, Canada as a case study. Geoderma, 351, pp.25-35.

Baldwin, K.A., Sims, R.A., and Lawrence, K.M. 1996. Integrated ecosystem studies in the Rinker Lake Research Area, northwestern Ontario. in Smith, C.R. and Crook, G.W., compilers. Advancing boreal mixed wood management in Ontario: proceedings of a workshop, October 17-19, 1995, Sault Ste. Marie, Ontario. NRCan, CFS, GLFC.

Mackey, B.G., Sims, R.A., Baldwin, K.A. and Moore, I.D., 1996. Spatial analysis of boreal forest ecosystems—Results from the Rinker Lake case study. GIS and environmental modeling: progress and research issues, pp.187-190.

McKenney, D.W., 1999. Calibration and sensitivity analysis of a spatially-distributed solar radiation model. International Journal of Geographical Information Science, 13(1), pp.49-65.

McKenney, D.W., Mackey, B.G. and Sims, R.A., 1996. Primary databases for forest ecosystem management-examples from Ontario and possibilities for Canada: NatGRID. Global to Local: Ecological Land Classification: Thunderbay, Ontario, Canada, August 14–17, 1994, pp.399-415.

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Pearce, J.L., Venier, L.A., Eccles, G., Pedlar, J. and McKenney, D., 2005. Habitat islands, forest edge and spring-active invertebrate assemblages. Biodiversity & Conservation, 14, pp.2949-2969.

Pearce, J.L., Venier, L.A., McKee, J., Pedlar, J. and McKenney, D., 2003. Influence of habitat and microhabitat on carabid (Coleoptera: Carabidae) assemblages in four stand types. The Canadian Entomologist, 135(3), pp.337-357.

Pedlar, J.H, Pearce, J.L., Venier, L.A., and McKenney, D.W. 2002. Coarse woody debris in relations to disturbance and forest type in boreal Canada. Forest Ecology and Management Vo.158, Issues 1-3, 15 March 2002, Pages 189-194.

Sims, R.A. and Mackey, B.G., 1994. Development of spatially-based ecosystem models for the Rinker Lake Research Area in northwestern Ontario's boreal forest. Proceedings, GIS, 94, pp.21-24.

Forest Soil Datasets in Ontario

Rinker Lake Boreal Mixedwood Mapping Pilot Project

Publications

Sims, R.A., Mackey, B.G. and Baldwin, K.A., 1995. Stand and landscape level applications of a forest ecosystem classification for northwestern Ontario, Canada. In Annales des sciences forestières (Vol. 52, No. 6, pp. 573-588). EDP Sciences.

Sims, R.A., Baldwin, K.A., Walsh, S.A., Lawrence, K.M., McKenney, D.W., Ford, M.J., and Mackey, B.G. 2002. The derivations of spatially referenced ecological databases for ecosystem mapping and modeling in the Rinker Lake Research Area, Northwestern Ontario. GLFC File Report 32428.

Thompson, I.D., 2000. Forest vegetation of Ontario: factors influencing landscape change. Ecology of a managed terrestrial landscape: patterns and processes of forest landscapes in Ontario, pp.30-53.

Treitz, P.M., 1997. Boreal forest ecosystem characterization at site and landscape scales using multispatial resolution remote sensing data. PhD Thesis, University of Waterloo.

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Venier, L.A. and Mackey, B.G., 1996. A method for rapid, spatially explicit habitat assessment for forest songbirds. Journal of Sustainable Forestry, 4(1-2), pp.99-118.

Walsh, S.A., Baldwin, K.A. and Sims, R.A., 1996. Early succession in boreal mixedwoods in the Rinker Lake Research Area, northwestern Ontario.

Welsh, D.A. and Venier, L.A., 1996. Binoculars and satellites: developing a conservation framework for boreal forest wildlife at varying scales. Forest Ecology and Management, 85(1-3), pp.53-65.

Wilson, J.P. and Gallant, J.C. eds., 2000. Terrain analysis: principles and applications. John Wiley & Sons.

Wilson, H.G. and Howarth, P.J., 2002, June. Use of remote sensing data to examine spatial pattern measurement for improved forest management practices. In IEEE International Geoscience and Remote Sensing Symposium (Vol. 2, pp. 1082-1084). IEEE.

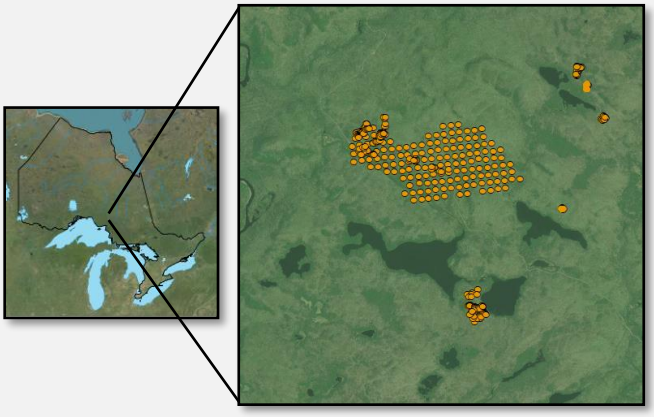
Forest Soil Datasets in Ontario

Turkey Lakes Watershed Study (TLW)

Project Details

Soils data was collected as part of the Turkey Lakes Watershed Study. The TLW is located in the Eastern Temperate Mixed Forest on the Canadian Shield, approximately 60 km north of Sault Ste. Marie, Ontario. This 10.5 km^2 watershed has been the site of one of the longest running ecosystem studies in Canada. A whole-ecosystem investigative approach was adopted from the outset by federal scientists and has allowed research to evolve from its original (and continuing) acidification focus to include investigations on the effects of climate change, forest harvesting and other forest ecosystem perturbations. Soil data collected includes soil surveys, soil water, and detailed soil pit excavations for a variety of studies throughout the TLW.

Plot Map



Dataset Information

Project Year(s): 1980-2016, ongoing

 # Plots: 457

Data Format: Excel spreadsheet

Data Steward: Stephanie Nelson, NRCan (GLFC) email: stephanie.nelson@nrcan-rncan.gc.ca

Partners: NRCan (GLFC), MNRF, Universities

Soil Data Attributes

✓ - Site specific details
✓* - Plot specific details

SITE INFORMATION	
Location (coordinates, ecodistrict, township, etc.)	✓*
Plot or Polygon ID	✓*
Year	✓*
Elevation	
Site Treatment / Disturbance	✓*

SOIL SAMPLING	
Soil Sampling Method	
Sampled by Horizon	✓*
Sampled by Depth or Layer	
Archived Samples	✓*

SOIL PHYSICAL FIELD CHARACTERISTICS			
Mode of Deposition	✓*	Drainage Class	✓*
Topographic details	✓	Pore pattern	
Landform		Humus form	
Stone/Rock outcrop		Structure	
Ecosite		Boundary	
Texture	✓*	Roots	
Soil Profile Depth details (depth to bedrock, water table, mottles, etc.)	✓*	Coarse Fragment Content	✓*
Moisture Regime	✓*	Colour	
Seepage		Presence of carbonates	✓*

SOIL PROPERTIES	
Bulk Density	✓*
Sand Silt Clay	✓*
pH	✓*
C, organic C	✓*
Total N	✓*
C/N ratio	✓*
CEC	✓*
Exchangeable cations	✓*
SO4	✓*
Phosphorus	✓*
Other elements	✓*
Soil Biology	

Publications

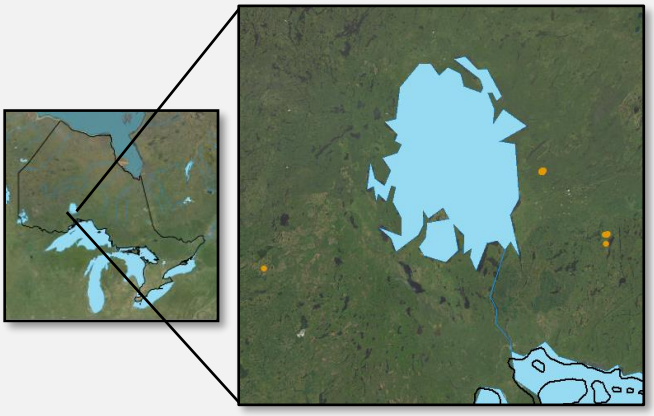
Forest Soil Datasets in Ontario

Tyrol Lake
Black Spruce Pre-Commercial Thinning Project

Project Details

As part of a project near Beardmore, Ontario, soil descriptions and chemistry were done in 1994. The plots were part of a project studying the effects of cleaning (hardwood removal) and different levels of precommercial thinning on stand development in a dense upland black spruce plantation.

Plot Map



Dataset Information

Project Year(s): 1994, 2007

 # Plots: 62

Data Format: Excel spreadsheet

Data Steward: Rob Fleming, Research Scientist, Biophysical Processes, NRCan (GLFC) email: rob.fleming@nrcan-rncan.gc.ca

Partners: NRCan (GLFC)

Soil Data Attributes

✓ - Site specific details
✓* - Plot specific details

SITE INFORMATION	
Location (coordinates, ecodistrict, township, etc.)	✓*
Plot or Polygon ID	✓*
Year	✓*
Elevation	
Site Treatment / Disturbance	✓*

SOIL SAMPLING	
Soil Sampling Method	
Sampled by Horizon	✓*
Sampled by Depth or Layer	
Archived Samples	

SOIL PHYSICAL FIELD CHARACTERISTICS			
Mode of Deposition		Drainage Class	
Topographic details	✓*	Pore pattern	
Landform		Humus form	
Stone/Rock outcrop		Structure	
Ecosite	✓*	Boundary	
Texture	✓*	Roots	✓*
Soil Profile Depth details (depth to bedrock, water table, mottles, etc.)	✓*	Coarse Fragment Content	✓*
Moisture Regime		Colour	
Seepage		Presence of carbonates	

SOIL PROPERTIES	
Bulk Density	
Sand Silt Clay	
pH	✓*
C, organic C	✓*
Total N	✓*
C/N ratio	✓*
CEC	✓*
Exchangeable cations	✓*
SO4	✓*
Phosphorus	✓*
Other elements	✓*
Soil Biology	

Publications

Tyrol Lake
Black Spruce Pre-Commercial Thinning Project

Publications

Fleming, R.L, Mossa, D.S., and Marek, G.T. 2005. Upland black spruce stand development 17 years after cleaning and precommercial thinning. The Forestry Chronicle, Jan/Feb 2004, Vol.81, No.1.

Groot, A. and Saucier, J.P., 2008. Volume increment efficiency of *Picea mariana* in northern Ontario, Canada. Forest Ecology and Management, 255(5-6), pp.1647-1653.

Kwiaton, M.M., 2008. Comparison of growth intercept and site index models of black spruce plantations and natural stands in Northern Ontario (Doctoral dissertation).

Kwiaton, M.M., Wang, J.R. and Reid, D.E., 2011. A height growth model and associated growth intercept models for estimating site index in black spruce (*Picea mariana* Mill. BSP) plantations in Northern Ontario, Canada. Northern Journal of Applied Forestry, 28(3), pp.129-137.

Maxfield, D., 2023. The effects different commercial thinning treatments have on black spruce diameter, height, basal area and volume (Doctoral dissertation).

Reid, D.E., Young, S., Tong, Q., Zhang, S.Y. and Morris, D.M., 2009. Lumber grade yield, and value of plantation-grown black spruce from 3 stands in northwestern Ontario. The Forestry Chronicle, 85(4), pp.609-617.

Young, S.M., 2008. Lumber recovery, a leaf area model, and water use in response to commercial thinning, for plantation grown black spruce (*Picea mariana* [Mills] BSP) (Doctoral dissertation).

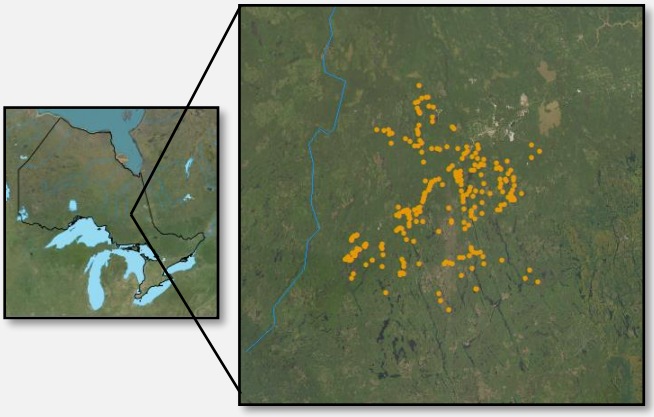
Forest Soil Datasets in Ontario

Vegetation Sampling Network (VSN)

Project Details

This dataset is a summary of information collected in the Romeo Mallette Forest Management Unit (FMU) for the long-term, repeat measurement of ecological monitoring plots formerly called the Integrated Monitoring Framework, or IMF vegetation/habitat plot network. VSN plots are a subset of the full set of LiDAR calibration plots (some are just one time sampling), but all get full soil pit descriptions. The VSN will include 200-250 plots per FMU with georeferenced soil pit descriptions, with approximately 60 of those plots to include horizon samples sent for chemical analysis. A subset of those plots will be selected for longer-term vegetation sampling and measurements with no plan for soil resampling.

Plot Map



Dataset Information

Project Year(s): 2020, ongoing

 # Plots: 258

Data Format: Excel spreadsheets

Data Steward: Dr. Dave Morris, Research Scientist, Forest Stand Ecology, Centre for Northern Forest Ecosystem Research, MNRF
email: dave.m.morris@ontario.ca

Partners: MNRF

Soil Data Attributes

✓ - Site specific details
✓* - Plot specific details

SITE INFORMATION	
Location (coordinates, ecodistrict, township, etc.)	✓*
Plot or Polygon ID	✓*
Year	✓*
Elevation	
Site Treatment / Disturbance	

SOIL SAMPLING	
Soil Sampling Method	✓*
Sampled by Horizon	✓*
Sampled by Depth or Layer	
Archived Samples	

SOIL PHYSICAL FIELD CHARACTERISTICS			
Mode of Deposition	✓*	Drainage Class	✓*
Topographic details	✓*	Pore pattern	✓*
Landform		Humus form	✓*
Stone/Rock outcrop		Structure	✓*
Ecosite	✓*	Boundary	✓*
Texture	✓*	Roots	✓*
Soil Profile Depth details (depth to bedrock, water table, mottles, etc.)	✓*	Coarse Fragment Content	✓*
Moisture Regime	✓*	Colour	✓*
Seepage	✓*	Presence of carbonates	✓*

SOIL PROPERTIES	
Bulk Density	✓*
Sand Silt Clay	✓*
pH	✓*
C, organic C	✓*
Total N	✓*
C/N ratio	✓*
CEC	✓*
Exchangeable cations	✓*
SO4	✓*
Phosphorus	✓*
Other elements	✓*
Soil Biology	

Publications

Forest Soil Datasets in Ontario

Vegetation Sampling Network (VSN)

Publications

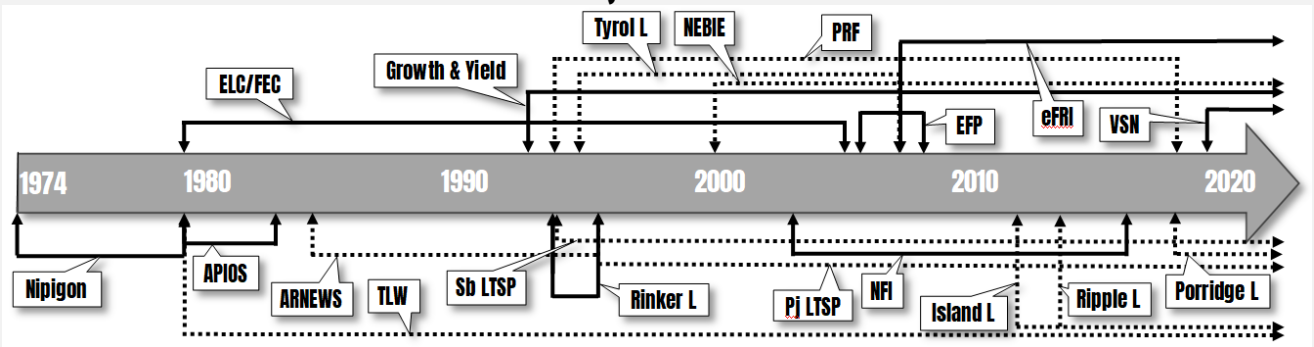
Blackford, C., Heung, B., Baldwin, K., Fleming, R.L., Hazlett, P.W., Morris, D.M., Uhlig, P.W. and Webster, K.L., 2021. Digital soil mapping workflow for forest resource applications: a case study in the Hearst Forest, Ontario. Canadian Journal of Forest Research, 51(1), pp.59-77.

Guenther, M., Heenkenda, M.K., Morris, D. and Leblon, B., 2023. Tree Diameter at Breast Height (DBH) Estimation Using an iPad Pro LiDAR Scanner: A Case Study in Boreal Forests, Ontario, Canada.

Forest Soil Datasets in Ontario

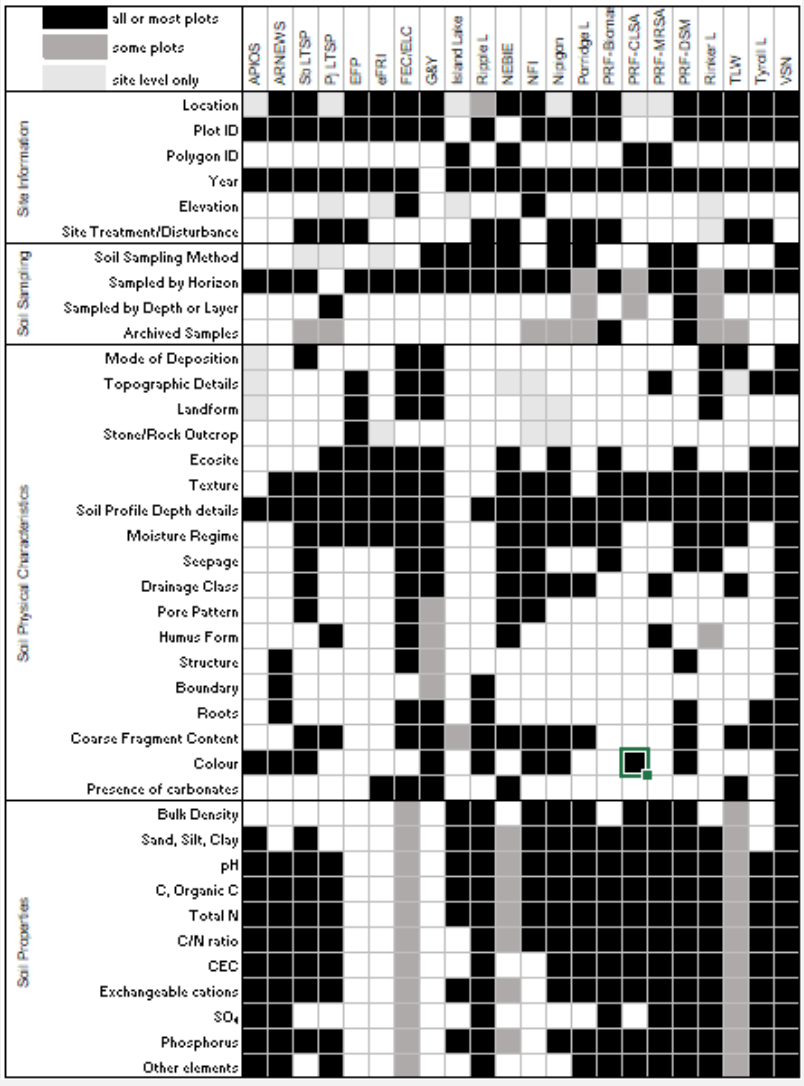
Dataset Summary

Project Timelines



Datasets Plot Map

Soil Data Attributes



Summary

This report summarizes forest soil databases from 22 different studies totaling 94 650 soil data points over 50 years. The majority of these data points (88%) are from the eFRI inventory that while extensive, contain only field-assessed values. For some of these studies, forest soil collection and data may not have been the primary focus, and therefore the data may have some limitations for its use. Methods and protocols for forest soil field description and sampling techniques varied and may not be comparable or compatible.

In terms of site information, location accuracy is highlighted as a key limitation to the use of the data for applications, such as DSM, which require precision. Particularly for older studies, there is uncertainty around location information. Some data sets have inaccurate, general, or missing plot location coordinates. Even with more recent studies, the GPS points may record the plot or site location, but not the soil sampling location (e.g., Growth and Yield).

In terms of the soil sampling approach, there were different methods for sampling (by horizon or depth), and sometimes single samples were taken, other times multiple samples were collected and either analyzed individually or bulked together. There were some instances in which the unit of measurement was not recorded. Archived soil samples have been noted for nine of the studies, thus there is an opportunity for additional analyses on these dried samples or comparison with remeasured soils to be done.

In terms of soil physical characteristics, 21/22 of the studies had soil depth profile details, 18/22 studies had texture (16/22 have lab estimates of % sand, silt, clay), 15/22 had field-assessed moisture regime, 14/22 had coarse fragment content. In terms of lab-assessed soil chemical properties, 19/22 studies have both organic C and total N, 18/22 have exchangeable cations and phosphorus, and only 11/22 have bulk density. Having horizon and depth information allows for greater flexibility in the use of data for other applications. However, the lack of bulk density and coarse fragment information provides challenges for converting chemical concentrations to nutrient pools.

Recommendations

This collection of forest soil datasets is a valuable asset to those requiring information on soils for research, operations, planning and policy development. Using and combining datasets will require careful consideration of the limitations of each dataset and the purpose for which the data will be used. Work on data quality assurance and clarification continues, including contacting project researchers where possible. Many efforts are being made to create centralized databases to house both legacy and ongoing soil research data at the Provincial and National levels. This Ontario forest soil dataset collection will be a valuable contribution to these efforts.

New avenues of research are helping to expand the usefulness of these soil datasets. For example, effective texture and moisture regimes are being derived using the horizon information in the Growth & Yield data. Other approaches, such as the creation of functions that use more commonly measured soil properties to predict less commonly measured soil properties (e.g., soil chemistry), will extend the applications of these datasets. Furthermore, new technologies, such as spectroscopic characteristics are emerging in soil science and can take advantage of the archived soil samples and associated data.

Many of the limitations of the soil datasets are related to lack of standardization in protocols. Efforts are being made to develop soil and forest soil sampling protocols that provide best practices and recommendations for new soil data collections. This includes guidance on key soil properties that should be collected that are useful for many different applications and the best approaches to collect those properties.