It Starts with the Soil…

Ontario Society for Ecological Restoration - Symposium 2014

March 1, 2014

University of Guelph Arboretum
www.uoguelph.ca/arboretum/
The GPS Co-ordinates:
43°32'39.06"N 80°12'57.78"W
Directions Attached

AGENDA

8:30 Registration and Coffee

9:00 Welcome and Introduction – Richard Heck (University of Guelph)

9:30 Dave Kroetsch (Agriculture and Agri-Food Canada) - SOIL FUNDAMENTALS

10:15 Richard Heck – SOIL STRUCTURE – IT DEPENDS ON YOUR POINT OF VIEW

11:00 Break

11:15 Mike McTavish (University of Waterloo) - ARCHITECTS OF THE SOIL: INFLUENCES OF EXOTIC EARTHWORMS ON ECOSYSTEM STRUCTURE AND FUNCTION WITH IMPLICATIONS FOR RESTORATION IN INVADED ECOSYSTEMS

12:00 Autumn Watkinson (Laurentian University) - PLANNING FOR ECOSYSTEM REHABILITATION ON MINE CLOSURE IN NORTHERN ONTARIO: MANUFACTURED SOIL USE FOR NATIVE VEGETATION

12:45 Lunch and Networking

1:30 Chris Morrison (StormWaterForestry) - GARDENING WITH A DOZER: RE-INVENTING DEVELOPMENT

2:15 Maren Oelbermann (University of Waterloo) – USING COMPLEX AGROECOSYSTEMS TO RESTORE DEGRADED SOIL AND SEQUESTER CARBON

3:00 Sean Rapai (University of Guelph) - THE ROLE OF BIOTIC AND ORGANIC SOIL AMENDMENTS IN NATIVE PLANT RESTORATION ON POST MINE SUBSTRATES IN ONTARIO'S BOREAL ECOSYSTEM

Figure 1: Agroecosystems

3:45 Break

4:00 Adrienne Mason (University of Waterloo) – INNOVATIVE WATER AND SEDIMENT CONTROL BERM TO IMPROVE WATER QUALITY IN THE PINE RIVER WATERSHED

4:45 Discussion, Wrap up and Evaluation

5:30 Meet us at the Baker's Street Station Pub!
PUB NIGHT: HOW TO GET A JOB IN SOIL SCIENCE OR ECOLOGICAL RESTORATION?
76 BAKER STREET, MAIN FLOOR BACK ROOM

Ontario Society for Ecological Restoration

http://chapter.ser.org/ontario/

Speaker and Talk Summaries

Richard J Heck

A Closer Look at Soil Structure

Presentation summary

The popular view of soil is typically restricted to texture, reflecting the size of mineral grains, as well as organic matter (humus) content. Certainly, these components contribute to the behavior of soil, participating in a myriad of biogeochemical reactions. Less recognized or fully appreciated, however, is the nature of the aggregation of these materials and associated voids, commonly referred as soil structure and porosity. At the most basic level, soil structure comprises the packing of individual mineral grains and organic fragments, with their interstices – this is considered to be the primary aggregation of the soil. Primary aggregates may, intern, be coalesced into secondary aggregates; indeed, it is not unusual for several levels of aggregation to occur in soils, reflecting specific natural or artificial processes. For each level of organization, one may recognize intra-aggregate and inter-aggregate voids – the nature of these voids ultimately influences the infiltration/retention of water and aeration. Consequently, in the field, attention is often given to characterizing the type, size and grade of aggregates, as well as the pores. Equally important is the need to consider structural stability – the breakdown of aggregates is often recognized by the presence of surface crusts or compacted subsurface layers (pans).

Biography

Dr. Richard Heck an Associate Professor (Soils and Landscape Processes) in the School of Environmental Sciences at the University of Guelph. Originally from Saskatchewan, he obtained his undergraduate (B.S.A., Agronomy) and graduate (M.Sc. and Ph.D. in Soil Science) degrees at the University of Saskatchewan. Subsequently, he was a Visiting Professor of Soil Chemistry, at the Universidade Federal Rural de Pernambuco in Brazil; in 2000, he assumed his position at the University of Guelph. Richard has taught various courses, at the Diploma to Post-graduate levels, including Land Evaluation/Utilization, Soil Chemistry and Soil Physical Chemistry, Introductory Soils, Soils Processes in the Landscape, and a field excursion in Tropical Soils. Currently, Richard`s research focuses on the application of high-resolution X-ray computed tomography to the quantification of soil morphology; this involves collaborators from Canada, the US, Europe and South America.

David J Kroetsch

Soil FUNdamentals

Presentation summary

Soil FUNdamentals is an introductory 'down to earth' presentation that defines what a soil is and the factors that control soil formation. Soil horizonation, a fundamental characteristic of every soil will be discussed as a way to understand and characterize the soil and soil properties important for soil forming factors, soil health and functions of the soil. Soil structure and texture (field methods to determine soil texture classes) are critical properties that affect soil function and will be examined. General concepts of soil classification will be presented with respect to landscape and drainage conditions. Examples of site information and field data collection will be presented, as will be examples of new technologies that are being used to model and characterize soils in the landscape.

Biography

David is a Senior Soil Resource Specialist with Agriculture and Agri-Food Canada. He specializes in soil survey upgrades and research on soil re-survey, and the spatial and temporal change in soil and landscape attribute information using geospatial digital information and modeling. Other areas of specialization include the interpretation of regional and national soil data for soil applications from national Soil Landscape mapping, to North

America – European (OECD) Pesticide dissipation studies and Climate Change projects. As an adjunct Professor in the School of Environmental Sciences, University of Guelph, he is involved with the development and instruction of a Graduate Diploma course in Field Soil and Landscape Inventory. David has also been involved in developing the content and teaching the soils portion of the southern Ontario Ecological Land Classification course for the Ministry of Natural Resources. David also works with the High School Envirothon program.

David is a home brewer and winemaker and is a certified Wine Judge of Canada. David sings 2nd bass with the Nepean Choir and is a kayak and canoe tripper on the rivers and lakes of near-north Ontario.

Michael J. McTavish, B.Sc. (Hons.), PhD Student

Architects of the soil: influences of exotic earthworms on ecosystem structure and function with implications for restoration in invaded ecosystems

Presentation summary

Exotic earthworms have invaded much of eastern North America and can have dramatic impacts on ecosystem structure and function. Earthworms influence plant communities indirectly by changing the structure and hydrology of the soil, the cycling and availability of nutrients, and the abundance, activity, and diversity of microbes. Additional impacts of earthworms include direct effects on granivory and seed germination, vertical seed re-distribution, and herbivory. These earthworm-soil-plant interactions are complex and may have mixed positive and negative impacts on different plants – including vulnerable at-risk species and aggressive invasive species – potentially resulting in large-scale community-level change in invaded ecosystems. Management options against exotic earthworms are limited; it is important to recognize earthworms as novel ecosystem components that are here to stay. Ecologists are beginning to recognize the potential use of earthworm inoculation in remediation and reclamation projects, but have yet to address the problem of reconciling restoration objectives to earthworm invasion and naturalization. By working with – rather than against – the continuing spread of earthworms throughout North America it may be possible to generate new, effective restoration options for invaded landscapes and to encourage a more progressive ecological ethic of embracing complexity and novelty in ecosystems.

Biography

Michael is a PhD student at the University of Waterloo working in the Department of Environment & Resource Studies with Dr. Stephen Murphy. He completed his B.Sc. (Hons.) in biology at the University of Toronto Mississauga, completing an honours thesis examining the impacts of environmental factors on the dispersal behaviour of invasive earthworms. Michael's current research interests include the interactions of earthworms with invasive plant species and the potential role of exotic earthworms in ecosystem restoration. Overall, he hopes to advance our understanding of how we think about exotic species in the context of ecosystem novelty.

Autumn Watkinson, B.Sc., M.Sc. student

Planning for Ecosystem Rehabilitation on Mine Closure in Northern Ontario: Manufactured Soil Use for Native Vegetation

Presentation summary

With ongoing development of Northern Ontario, emphasis is being placed on minimizing the industrial footprint while implementing closure plans in the mining industry. Barrick Gold Corporation (Hemlo, ON) is supporting research examining the suitability of soils manufactured from locally sourced, industry by-

products, as a growth medium for boreal vegetation to incorporate as 'cover islands' for large piles of mine rock generated through open-pit mining activities. Potential materials were combined in several ratios to produce multiple Technosols that were tested in a series of growth room studies.

Figure 2: Backhoe mixing finely crushed mine rock and woody residuals on site at Barrick (Hemlo, ON).

Results demonstrated that blends of finely crushed mine rock produced from open-pit mining activities at Barrick (Hemlo, ON) and woody residuals generated from mill operations (White River, ON) are viable materials for manufacturing a growth medium. On the industrial brownfields, the two materials were screened and mixed to produce two Technosols comprised of 40% and 80% organics, which were used in the construction of field lysimeters, for the long term monitoring of soil microclimate, biogeochemical weathering of mine rock, and plant productivity. As studies continue, the relationship between climate, soil hydrology and hydrochemistry will be evaluated for performance assessment of the manufactured soil covers as a medium for the establishment of successional boreal species.

Figure 3: Field Lysimeters established at Barrick (Hemlo, ON) for long term monitoring of soil development.

Biography

Autumn is currently pursuing her M.Sc. in Biology at Laurentian University under the supervision of Dr. G. Spiers and Dr. P. Beckett. Autumn received an Honours B.Sc. with specialization in Biology from the University of Ottawa in 2012. Her interest in land reclamation started when she attended a field course based out of Laurentian University, during which she helped plan and execute a study that assessed the longevity and effectiveness of the City of Greater Sudbury Land Reclamation Program. Autumn plans to defend her M.Sc. in August 2014 and continue studies at Laurentian in the Ph.D. Boreal Ecology program.

Chris Morrison

Gardening with a Dozer: Re-Inventing Development

Presentation summary

Urbanization and specifically suburbanization has created a legacy of chronic environmental conditions which may never be fully corrected. Great effort and expense has been directed to resolving these conditions, though mostly with marginal success. The lesson here may be that since it is so challenging to fix the past, maybe our focus should be on not messing up the future. This presentation focuses on some common sense best management practices which are available to protect and improve the functionality of existing green infrastructure during construction, and to ensure future development benefits from the ecological services which green infrastructure provides.

Biography

Chris provides urban forest and soil management consulting and workshops focused on best management practices for sustainable

land development. He is an ISA Certified Arborist and a SOUL Certified Organic Land Care Professional with three decades of experience in arboriculture and urban forestry, erosion and sediment control and site remediation.

Maren Oelbermann, Ph.D.

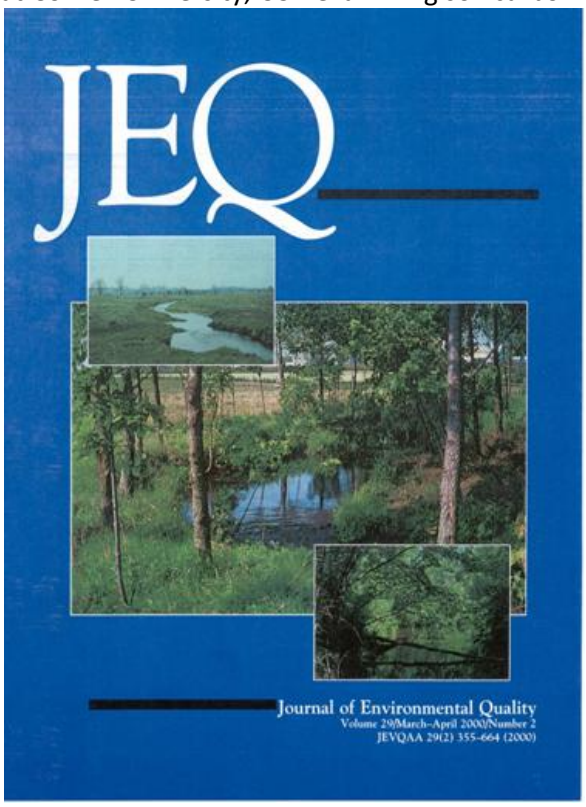
Using Complex Agroecosystems to Restore Degraded Soil and Sequester Carbon

Presentation summary

Complex agroecosystems, such as cereal-legume intercrops or agroforestry systems can decrease soil degradation and maintain soil fertility as a result of interactions between the various components within the agroecosystem. Central to the development of sustainable agroecosystem management practices is the recycling of organic resources including crop residues, animal manures or green manures. Mixing low and high quality residues or combining the application of low quality organic matter with mineral fertilizers may help to improve the synchrony between nutrient supply and crop demand. This leads to a different quantity and quality of residues within complex agroecosystems which may also increase crop yield, and reduce nitrogen losses from the soil-plant system. Because of the complementary use of resources through microbial activity and tight nutrient cycling, complex agroecosystems are more sustainable compared to single species crops (sole crops or monocrops) and provide an opportunity for the sequestration of carbon and the mitigation of greenhouse gases such as carbon dioxide and nitrous oxide. Central to the concept of complementary resource use in complex agroecosystems is their ability to enhance levels of soil organic matter. Soil organic matter is the 'glue of the soil' and thus it plays an important role in minimizing soil erosion, maintaining aggregate stability and soil nutrient levels. As such, complex agroecosystems serve a dual purpose by maintaining or enhancing soil quality to ensure a sustainable source of food for a growing population, and by mitigating global warming through carbon sequestration and greenhouse gas mitigation.

Biography

Dr. Oelbermann is an Associate Professor in the Department of Environment and Resource Studies, University of Waterloo, Canada specializing in soil ecosystem dynamics. She received her Ph.D. from the University of Guelph, Canada quantifying the potential of temperate and tropical agroforestry systems to sequester carbon. During this time, she was also recognized as a visiting scientist at the Centro Agronómico Tropical de Investigación y Enseñanza (CATIE) in Costa Rica. Following her dissertation, she became a post-doctoral fellow at Cornell University, USA examining soil carbon



dynamics under reduced impact logging in the Brazilian Amazon, and subsequently worked as a post-doctoral researcher at the University of Waterloo where she continued her in-depth studies on stable isotopes in soil research. With investigative experience in arctic, temperate and tropical environments, Dr. Oelbermann's work centres on fundamental and applied

research into the functions and processes regulating carbon and nitrogen in undisturbed and managed landscapes, with an emphasis on complex agroecosystems and agroforestry systems. Her most current research has focused on the investigation of soil carbon dynamics and nitrogen transformations, and greenhouse gas emissions, using stable isotopes as an investigative tool, in cereal-legume intercrops. She has also conducted work on the use of biochar as a soil amendment; the removal of crop residues on soil microbial biomass; using *Tithonia diversifolia* to investigate plant and soil phosphorus dynamics; using agroforestry in climate change adaptation; and the effect of climate change agroforestry tree seedlings and on soil processes. Dr. Oelbermann manages an active research laboratory with a group of graduate students at the master's and PhD level, and regularly hosts international research scientists to conduct research in her laboratory. Her work appears in high impact factor peer-reviewed journals. She has recently edited a special edition of the *Agricultural Journal* (Vol. 4, 2010); is an associate editor for the *Journal of Environmental Management* (Springer), and is awaiting the publication of her forthcoming book "*Sustainable Agroecosystems in Climate Change Mitigation*" (Wageningen Academic Publishers, March 3r, 2014. Further information and a complete publication list can be found at: www.moelbermann.com

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Sean Rapai, MSc. Candidate

The role of biotic and organic soil amendments in native plant restoration on post mine substrates in Ontario's boreal ecosystem

Presentation summary

The Detour Lake gold mine is located 185km northeast of Cochrane, Ontario. The mine overburden contains low levels of available nutrients, organic matter and plant propagules. The overburden also lacks arbuscular mycorrhizal fungi (AMF), a key symbiotic organism that promotes plant survival and forms a relationship with 70-80% of terrestrial plants. Salvageable peat and upland topsoil are available on the mine site, and represent valuable materials for restoration. These materials contain organic matter, nutrients, a local seed bank, and AMF propagules. AMF have been widely cited for there benefits to plant restoration. However, commercial AMF strains are selected for their ability to colonize the roots of a wide variety of species, and not for their tolerance of post mine soil conditions. This raises uncertainty regarding the use of commercial mycorrhizae in mine restoration. Greenhouse trials have been established to test practical soil amendment techniques in the restoration of native boreal plant communities. This study uses greenhouse microcosms to examine the impact of peat, topsoil and varying AMF amendments on native plant production in post mine substrates from the Detour Lake mine site.

Biography

Sean Rapai is an MSc. candidate at the University of Guelph. He was rescued from the world of data loggers and dust emissions by the Biodiversity Institute of Ontario (BIO) Herbarium. Sean made is academic got his start at the BIO herbarium during his undergraduate career, exploring lichen communities along high elevation gradients in western Canada. Sean is now eager to apply his skills and botanical knowledge to aid in restoring native vascular plant communities on degraded landscapes in Ontario's boreal ecosystem.

Adrienne Mason

Innovative Water and Sediment Control Berm to Improve Water Quality in the Pine River Watershed

Presentation summary

One of the innovative projects that the Pine River Watershed Initiative Network has implemented in 2013, is the Water and Sediment Control berm project on the Eadie farm located in Huron-Kinloss township. This project addresses one of the targets outlined in the 2012 Integrated Watershed Management

Plan that will lead to improved water quality in the Pine River Watershed. Three Water and sediment control berms were constructed during the fall of 2013 and a fourth is scheduled for construction during the spring of 2014. Each berm corresponds to a specific section of the field that sheds water into a central gully. The berms act in sequence to store water and sediment in shallow pools, behind the berms, for a period of up to 24hrs following a storm event. This allows the topsoil to stay on the farm fields, where it will continue to support agriculture and will also slow down the flow of water off the fields and into the nearby ditches. Prior to the construction of these berms it was estimated that, on average, 71.2 tonnes of topsoil were lost from this section of the Eadie farm annually.

Biography

Adrienne Mason has worked for the Pine River Watershed Initiative Network, a charitable organization, for 5 years in her role as Projects Coordinator, towards the mandate of restoring "Clean water and a healthy ecosystem to the Pine River Watershed". She is also studying her Masters of Environmental Resource Studies at the University of Waterloo where she is looking into the subject of watershed health and community well-being, under the supervision of Dr. Stephen Murphy. Adrienne completed her undergraduate degree at Trent University in Environmental Science and worked for 7 seasons as a Natural Heritage Education Leader at both Inverhuron and Mac Gregor Point Provincial Parks.

Figure 4: Construction of Berm 2 on the Eadie Farm

Special Thanks to our Sponsors

Thank you to the following sponsors who have helped support SERO and have ensured we will be able to continue our scholarship program into 2015.

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Thanks so much for coming!

(please fill in the evaluation that follows and we'll thank you AGAIN!)

It Starts with the Soils…

GIVE US SOME FEEDBACK, PLEASE!

Why did you come to the AGM?

What is your profession? Do you use restoration ecology?

What did you like most about this meeting?

What did you like least about it?

Was the registration process satisfactory?

Were the location and facilities satisfactory?

Was there enough time for discussion and networking?

Did the agenda fulfill your expectations?

What topics would you suggest for future SERO conferences and where?

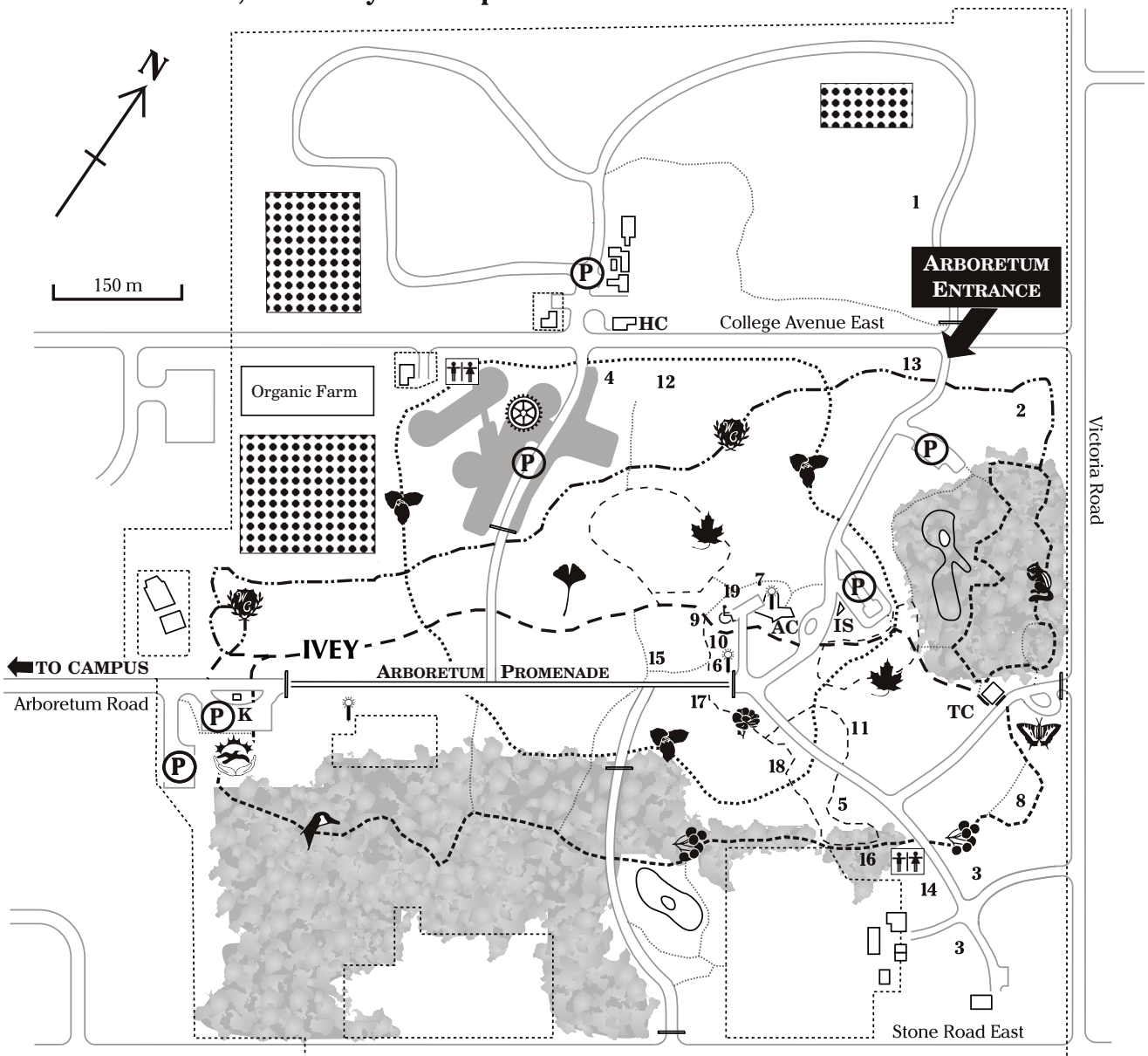
Do you have ideas for field trips? What are your **hot topics** and **burning need to know** ? And where?

In the last six months have you visited the SER International website? The Ontario Chapter page? Do you plan to? http://chapter.ser.org/ontario/

Other comments or suggestions? How can we improve?

Thanks for your comments! Please leave in the box as you leave or email dleadbeater@slrconsulting.com.

The Arboretum, University of Guelph



1 Beeches and Oaks
2 Century Pines
3 Conifers
4 Disc Golf
5 Dwarf Conifers
6 English Garden
7 Gazebo
8 Gravel Pit Rehabilitation
9 Italian Garden
10 Japanese Garden
11 Lilacs
12 Maples
13 Oak Grove
14 Outdoor Ceremony Site
15 The Park in The Garden
16 Rhododendrons
17 Roses
18 Serviceberries
19 West Lawn

Gosling Wildlife Garden
Hammond Rotary Tree Grove
Hospice Lilac Garden
Gene Bank
Wooded Area
Physically Challenged Parking
Emergency Phone
Parking
Toilet
Pond
Closed Gate

Col. John McCrae Trail
East Walk
IVEY Ivey Trail
Native Trees of Ontario Trail
Trillium Trail
Victoria Woods Trail
Wall-Custance Memorial Forest Trail
Wild Goose Woods Trail
World of Trees
connector trail
Arboretum boundary

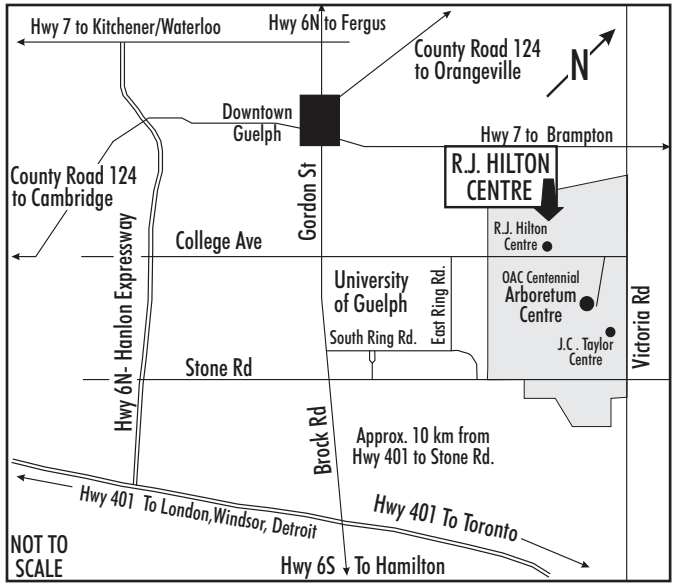
Arboretum Nature Reserve
For teaching and research purposes only.
No Public Access

Buildings

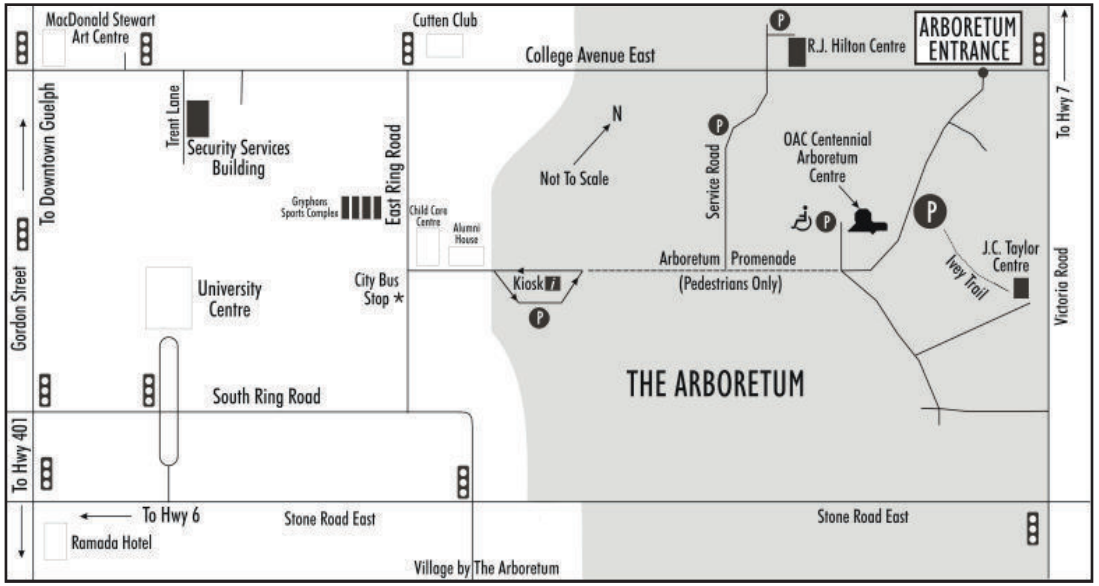
AC Arboretum Centre
HC Hilton Centre
IS Information Shelter
K Kiosk
TC Taylor Centre

HOW TO GET TO THE ARBORETUM, UNIVERSITY OF GUELPH

From outside Guelph



From within Guelph



THE ARBORETUM

If travelling from out of town, use the map on the left. From within Guelph use the map on the right. Follow College Avenue to The Arboretum Entrance. The co-ordinates to the entrance are: 43°32'39.06"N 80°12'57.78"W

THE OAC CENTENNIAL ARBORETUM CENTRE

From the Entrance off College Avenue, continue south about 0.3 km to the parking lot on the left. The Arboretum Centre is on the right.

If walking from Campus, take Arboretum Road off East Ring Road to the Kiosk and follow the Ivey Trail or Arboretum Promenade to The Arboretum Centre

THE J.C. TAYLOR CENTRE

At the far (east) end of the large parking lot across from The Arboretum Centre, you can access the Ivey Trail (look for the split-rail fence) which leads to the south corner of Victoria Woods and to the J.C. Taylor Centre.

BY BUS

Take Guelph city bus route 1a or 1b to the Arboretum Road bus stop on East Ring Road. Follow Arboretum Road to the Information Kiosk and from there walk along the Ivey Trail or Arboretum Promenade.

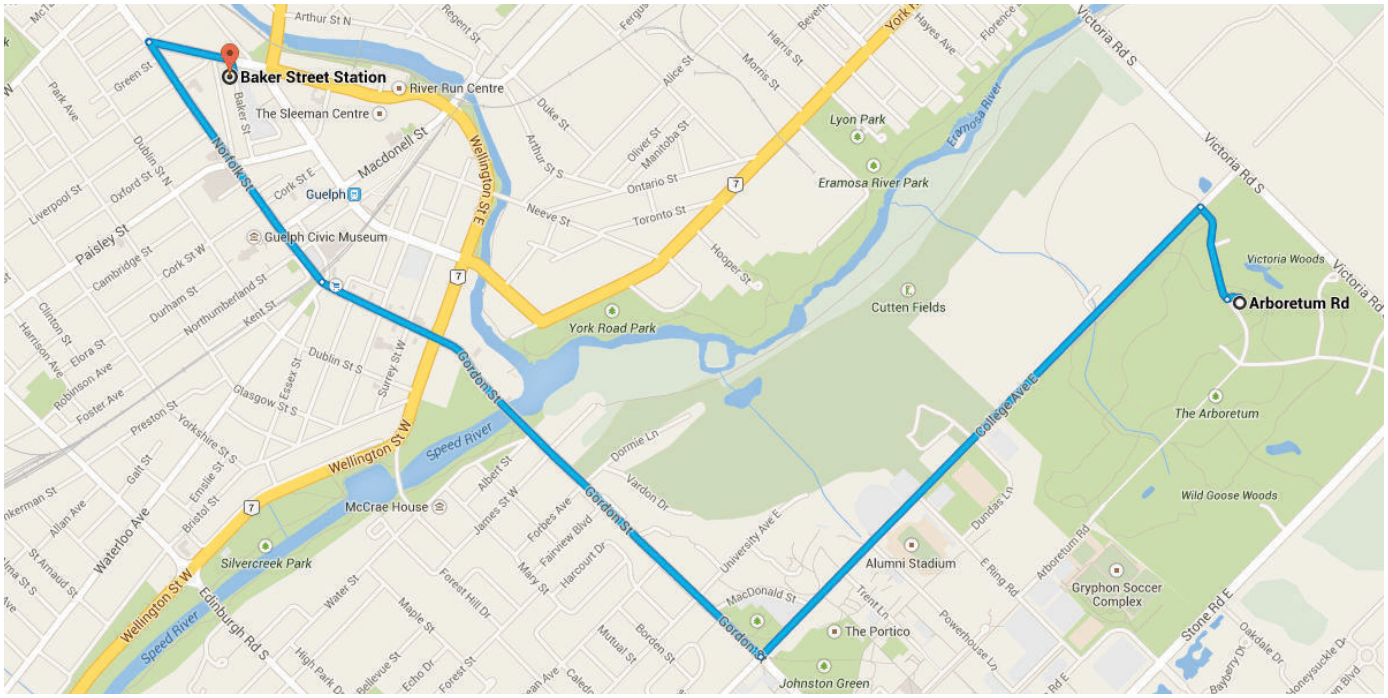
ARBORETUM HOURS

Grounds: Dawn to dusk, every day, year round
OAC Centennial Arboretum Centre
Monday-Friday, 8:30 a.m. - 4:30 p.m.
For information call 519-824-4120, extension 52113

Google

Drive 5.2 km, 9 min

Directions from **Arboretum Rd** to **Baker Street Station**



Arboretum Rd

Guelph, ON N0B

1. Head **west** toward **Arboretum Rd**

40 m

2. Turn **right** onto **Arboretum Rd**

300 m

3. Turn **left** onto **College Ave E**

1.9 km

4. Turn **right** onto **Gordon St**

1.8 km

5. Continue onto **Norfolk St**

900 m

6. Sharp **right** onto **Woolwich St**

250 m

7. Turn **right** onto **Baker St**

Destination will be on the right

44 m