Program for the

49th Annual:

Alberta Soil Science Workshop

Workshop Theme:

MONITORING IN A CHANGING ENVIRONMENT – NEEDS AND CHALLENGES

February 14 to 16, 2012

Ramada Inn

11834 Kingsway Avenue
Edmonton, AB T5G 0X5

www.soilsworkshop.ab.ca

Organizing Committee for the 2012 Alberta Soil Science Workshop

Past Chair:	Sylvia Chan-Remillard HydroQual Laboratories/Golder Associates Ltd., Calgary
Chair:	Miles Dyck Dept. Renewable Resources, Univ. of Alberta, Edmonton
Treasurer:	Newton Lupwayi Agriculture and Agri-Food Canada Research Centre, Lethbridge
Secretary:	Deo A. Heeraman and Jay Woosaree AMEC Environment and Infrastructure, Calgary, AB Alberta Innovates – Technology Futures, Vegreville, AB

Chairpersons for Technical Groups:

Soil Fertility:	Len Kryzanowski Alberta Agriculture & Rural Development, Edmonton.
Land Use:	Karen Raven and Rob Dunn Alberta Agriculture and Rural Development, Edmonton; Alberta Agriculture and Rural Development, Lethbridge;
Land Reclamation:	Deo A. Heeraman and Jay Woosaree AMEC Environment and Infrastructure, Calgary, AB Alberta Innovates – Technology Futures, Vegreville;
Forest, Riparian & Wetland Soils:	Maria Strack Dept. Geography, University of Calgary, Calgary, AB

Sponsors of the 2012 Alberta Soil Science Workshop

We are grateful to the sponsors who have contributed to the 2012 Alberta Soil Science Workshop. Please consider sponsorship of future Workshops to support professional soil science in Alberta, and to enhance the visibility of your organization. For the 2012 Workshop we acknowledge the generosity of the following sponsors:

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About the Alberta Soil Science Workshop

Background

The Alberta Soil Science Workshop is held to facilitate regional interaction among professionals in soil science. Typically 100 to 150 participants gather for a 1½ to 2 day program that comprise of 40 to 60 oral and poster presentations. These include: keynote papers focussed on the workshop theme, technical papers within four distinct fields, and volunteer papers. Currently the four technical groups are: Land Use, Soil Fertility, Land Reclamation, and Forest, Riparian and Wetland Soils.

Workshop participants include a diversity of professionals from private industry (e.g. consultants in agronomy, pedology, reclamation, remediation, and environmental services; chemists from commercial analytical laboratories), government (federal, provincial, municipal) and academia (universities and colleges). The Workshop is graduate student-friendly, providing an excellent opportunity to enhance presentation skills in a supportive setting (travel bursaries are available for out-of-town students; awards are made for the best student presentations).

Program for the 2012 Alberta Soil Science Workshop

Tuesday, February 14, 2012

7:00 – 10:00 PM Arbour Garden Lounge	Reception and Registration, Kingsway Ramada, Edmonton
Courtyard B	Technical Poster and Commercial Display Set-Up (Alberta Room)

Wednesday, February 15, 2012

7:00 AM – 5:30 PM Courtyard A	Registration
7:00 – 8:00 AM Courtyard A	Breakfast
8:00 AM – 12:00 PM Courtyard A	Plenary Session: Monitoring in a Changing Environment – Needs and Challenges Coffee and Refreshments: 9:45 – 10:10 AM
12:00 – 1:15 PM Courtyard A	Lunch
1:15 – 3:50 PM	Concurrent Sessions (Oral Presentations)
Pitcher Plant Room	Volunteer Session 1
Alberta Room	Volunteer Session 2
Courtyard B	Reclamation Technical Session 1
Courtyard A	Coffee and Refreshments: 2:40 – 3:10 PM
4:00 – 6:00 PM	
Courtyard A	Poster Session
Courtyard B	Commercial Exhibits Cash Bar Open at 5:00 PM
6:00 – 8:30 PM Courtyard A	Banquet (Cocktails 6:00 – 6:30PM)

Thursday, February 16, 2012

7:00 – 8:00 AM Courtyard A	Breakfast / Day Registration
8:00 – 9:45 AM	Technical Sessions
Courtyard B	Land Reclamation Technical Session 2
Pitcher Plant Room	Land Use Technical Session
9:45 – 10:00 AM Courtyard A	Coffee and Refreshments
10:00 – 11:45 AM	Technical Sessions
Pitcher Plant Room	Soil Fertility Technical Session
Courtyard B	Wetland and Riparian Soils Technical Session
11:45 – 1:00 PM	Lunch
Courtyard A	ASSW Business Meeting
1:00 – 4:00 PM	Professional Development Sessions
Courtyard B	Hands on Reclamation Criteria Training
Courtyard A	Professional Ethics for Professional Agrologists
Pitcher Plant Room	Biogas Production – What does this mean for Alberta?

Wednesday, February 15, 2012 – Morning Plenary Session (Courtyard A)

8:00 – 8:15 AM	Welcome and Introduction Chair: Miles Dyck, Department of Renewable Resources, University of Alberta.
8:15 – 9:00 AM	**Measuring ecosystem health at multiple scales: compatible metrics for reclaimed sites and regional assessments;** Dr. Jim Schieck, Alberta Innovates Technology Futures/Alberta Biodiversity Monitoring Institute
9:00 – 9:45 AM	TBA**;** Dr. Gregory Taylor, Dean of Faculty of Science, University of Alberta
9:45 – 10:10 AM	Coffee and refreshments
10:10 – 10:55 AM	**Strategies to Meet the Challenges of Monitoring Greenhouse Gas Emissions in Agriculture;** Dr. Alan Franzluebbers, United States Department of Agriculture, Agricultural Research Service
10:55 – 11:40 AM	**Monitoring soil water quality using trace elements: comparison of results from the Elmvale Groundwater Observatory with data from monitoring wells**; Dr. Bill Shotyk, Department of Renewable Resources, University of Alberta
11:40 – 12:00 AM	Panel discussion, All speakers

Wednesday, February 15, 2012 – Afternoon
Concurrent Sessions

*Graduate Student Presentations

PM	**Volunteer Session 1** **Room**	**Volunteer Session 2** **Room**	**Land Reclamation Session 1** **Room**
1:15 – 1:20	Introduction Chair: Newton Lupwayi Agriculture and Agri-Food Canada, Lethbridge	Introduction Chair: Miles Dyck Department of Renewable Resources, University of Alberta	Introduction Chair: Jay Woosaree Alberta Innovates – Technology Futures
1:20 – 1:40	Application of soil moisture monitoring systems in reclamation performance monitoring **Amy Heidman[1]** [1]O'Kane Consultants Inc.	A modeling study of the effects of different soil covers on the regeneration of carbon and nutrient cycling in landscapes reclaimed from oilsand mining **Emily Lloret[1], R. Grant[1], S. Quideau[1]** [1]Department of Renewable Resources, University of Alberta	*Mature fine tailings and petroleum coke as a reclamation substrate **Gabriel Luna Wolter[1], M. A. Naeth[1]** [1]Department of Renewable Resources, University of Alberta, Edmonton
1:40 – 2:00	Successes and challenges of container green roof research in Edmonton, Alberta **Lynette Esak[1], L. Nadeau[1], S. Hannem[1]** [1]Esak Consulting	An EPIC adventure: modeling element cycling and trace gas dynamics from electrons to climatic zones **Bill McGill[1], R. C. Izaurralde[2], J. R. Williams[3], R. P. Link[2], D. H. Manowitz[2], D. E. Schwab[4], X. Zhang[2]** [1]Ecosystem Science & Management, University of Northern British Columbia [2]Joint Global Change Research Institute, Pacific Northwest National Laboratory / University of Maryland [3]Texas Agri-Life Extension Service, Texas A&M University [4]Department of Economic and Social Sciences, Institute of Sustainable Economic Development, University of Natural Resources and Applied Life Sciences, Vienna	*Limiting factors for tree growth on reclaimed sites in the Athabasca oil sands region **Min Duan[1], S. X. Chang[1], J. House[1]** [1]Department of Renewable Resources, University of Alberta, Edmonton

2:00 – 2:20	Watershed evaluation of beneficial management practices (WEBs): Place-based research of BMP performance **Irene Hanuta[1], Karen Benjaminson[2], Brook Harker[3]** [1]Agriculture and Agri-Food Canada, Winnipeg [2]Agriculture and Agri-Food Canada, North Battleford [3]Agriculture and Agri-Food Canada, Regina	Comparison of fresh versus composted feedlot manure in a long-term barely silage cropping system: crop yield, soil and denitrification **Jim Miller[1], B. Beasley[1], C. Drury[2], B. Zebarth[3]** [1]Agriculture and Agri-Food Canada, Lethbridge [2]Agriculture and Agri-Food Canada, Harrow, Ontario [3]Agriculture and Agri-Food Canada, Fredericton, New Brunswick	*Spatial variability of soil biochemical properties in a 21 year old aspen (*Populous tremuloides* Michx) stand on an oil sand mine reclaimed site in northern Alberta **Sanitan Das Gupta[1], M. D. MacKenzie[1], S. A. Quideau[1]** [1]Department of Renewable Resources, University of Alberta, Edmonton
2:20 – 2:40	Soil survey and vegetation information enhanced for biophysical resource valuation **Ron McNeil[1]** [1]LandWise Inc	Nitrous oxide emission from soil amended with bio-digested materials **Xiying Hao[1], Brett Hill[1], Virginia Nelson[2] and Xiaomei Li[3]** [1]Agriculture and Agri-Food Canada, Lethbridge [2] Alberta Agriculture and Rural Development, 3000 College Dr. Lethbridge, AB. Canada. T1K 1L6. [3] XY-Green Carbon Inc. 1124 111A St. Edmonton, AB. Canada. T6J 6R9.	Dissipation of three veterinary antimicrobials in feedlot manure stockpiles **Dani Degenhardt[1], F. J. Larney[2], A. J. Cessna[3], S. Sura[3], A. F. Olson[2], T. A. McAllister[2]** [1]Alberta Innovates Technology Futures. [2]Agriculture and Agri-Food Canada, Lethbridge [3]Environment Canada, Saskatoon
2:40 – 3:10	**Coffee and Refreshments**		
3:10 – 3:30	Topography and soil development in a complex map unit **Ivan Whitson[1]** [1]Stantec	Ammonia emissions inventory for confined feeding operations in Alberta **Atta Atia[1], Ike Edeogu[1], Tanya Moskal-Hebert[1]** [1]Alberta Agriculture and Rural Development	*The influence of soil capping depth and vegetation on phosphogypsum stack reclamation in Fort Saskatchewan, Alberta **Lenore Turner[1], David Chanasyk[1], M. A. Naeth[1], Connie Nichol[2]** [1]Department of Renewable Resources, University of Alberta, Edmonton [2]Agrium Inc.
3:30 – 3:50	Building soil quality on irrigated rotations in southern Alberta **Francis Larney[1], D. C. Pearson[1], R. E. Blackshaw[1], N. Z. Lupwayi[1], P. J. Regitnig[2]** [1]Agriculture and Agri-Food Canada, Lethbridge [2]Lantic, Inc., Taber, AB	*Effects of Water Table Drawdown on Carbon dioxide dynamics and Plant Biomass of a Boreal Alberta Peatland **Tariq Munir[1], M. Perkins[1], M. Strack[1]** [1]Department of Geography, University of Calgary	
4:00 – 6:30	**Poster Session**		

Wednesday, February 15, 2012 – Afternoon Poster Session, 4:00 – 6:00 PM

*Graduate Student Posters

1	Nitrogen-use efficiency and biological nitrogen fixation of dry beans **Zafrin Akter[1], N. Z. Lupwayi[1], P. M. Balasubramanian[1]** [1]AAFC Lethbridge
2	Preceding crop, rotation length and soil management effects on bacterial endophytes **B. B. Pageni[1], N. Z. Lupwayi[1], F. J. Larney[1], L. M. Kawchuk[1], D. C. Pearson[1], R. E. Blackshaw[1], Y. T. Gan[2]** [1]Agriculture & Agri-Food Canada, Lethbridge Research Centre, Box 3000, Lethbridge, AB, T1J 4B1 [2]Agriculture & Agri-Food Canada, Semiarid Prairie Agricultural Research Centre, Swift Current
3	Long-term manure application Influences C and N distribution among soil aggregates **Yang Luo[1], X. Hao[1], B. Hill[1], P. Caffyn[1], G. Travis[1], C. Li[1], B. Ellert[1]** [1]Agriculture and Agri-Food Canada, Lethbridge
4	Desorption of arsenic in andesite overburden materials as influenced by revegetation treatments **Deo Heeraman[1], V. P. Claassen[2]** [1]AMEC Environment and Infrasctructure, Calgary, AB [2]Soils and Biogeochemistry, Dept. of LAWR, Univ. of California, Davis
5	Improving crop yield and N uptake with long-term straw retention in a Gray Luvisol **S. S. Malhi[1], M. Nyborg[2], E. D. Solberg[3], M. F. Dyck[2], D. Puurveen[2]** [1]Agriculture and Agri-Food Canada, Melfort [2]Department of Renewable Resources, University of Alberta, Edmonton [3]Alberta Agriculture, Food and Rural Development, Edmonton
6	Improving crop yield and N uptake with long-term straw retention in a Black Chernozem **S. S. Malhi[1], M. Nyborg[2], E. D. Solberg[3], M. F. Dyck[2], D. Puurveen[2]** [1]Agriculture and Agri-Food Canada, Melfort [2]Department of Renewable Resources, University of Alberta, Edmonton [3]Alberta Agriculture, Food and Rural Development, Edmonton
7	Long-term tillage, straw management and N fertilizer rate effects on crop yield, N uptake and N balance sheet in a Black Chernozem **S. S. Malhi[1], M. Nyborg[2], M. F. Dyck[2], D. Puurveen[2], D. Leach[1]** [1]Agriculture and Agri-Food Canada, Melfort [2]Department of Renewable Resources, University of Alberta, Edmonton
8	Long-term tillage, straw management and N fertilizer rate effects on crop yield, N uptake and N balance sheet in a Gray Luvisol **S. S. Malhi[1], M. Nyborg[2], M. F. Dyck[2], D. Puurveen[2], D. Leach[1]** [1]Agriculture and Agri-Food Canada, Melfort [2]Department of Renewable Resources, University of Alberta, Edmonton

9	Improving organic C and N in sulfur-deficient soils with S fertilization **S. S. Malhi[1], D. Leach[1]** [1]Agriculture and Agri-Food Canada, Melfort
10	Intercropping Barley and Pea for agronomic and economic considerations **S. S. Malhi[1], D. Leach[1]** [1]Agriculture and Agri-Food Canada, Melfort
11	Intercropping Canola and Pea for agronomic and economic considerations **S. S. Malhi[1], D. Leach[1]** [1]Agriculture and Agri-Food Canada, Melfort
12	Update on watershed evaluation of beneficial management practices (BMPs) in the Little Bow River watershed of southern Alberta **Jim Miller[1], T. Curtis[1], E. Smith[1], W. Wilms[1], S. Reedyk[1], C. Ross[1], D. S. Chanasyk[2], M. Rahbeh[2], S. Jeffrey[2], J. Unterschultz[2], D. Rogness[3], K. Schmitt[4], K. France[5]** [1]Agriculture and Agri-Food Canada, Lethbridge [2]Faculty of Agriculture, Life and Environmental Sciences, University of Alberta [3]County of Lethbridge [4]Ducks Unlimited [5]Alberta Sustainable Resource Development
13	*The efficacy of subsoil ripping to improve soil-water conditions for vegetation establishment on reclaimed mine tailings **Pamela Sabbagh[1], M. F. Dyck[1]** [1]Department of Renewable Resources, University of Alberta, Edmonton
14	*Moisture effects on microbial communities in boreal forest floors are stand-dependent **Matthew Swallow[1], S. A. Quideau[1]** [1]University of AlbertaDepartment of Renewable Resources, University of Alberta, Edmonton
15	When is reclamation success achieved - using 2010 reclamation criteria as a guide? **Jay Woosaree[1], Marshall McKenzie[1]** [1]Alberta Innovates - Technology Futures, Vegreville
16	Alberta Soils Tour – Peace Region, 2011 **John Zylstra[1], Karen Raven[1],Tom Goddard[1],Randy Perkins[1], Michelle Holden[2], Kabal Gill[3], René Labbe[4]** [1]Alberta Agriculture and Rural Development [2]Peace Agriculture Research and Demonstration Association(PARDA) [3]Smoky Applied Research and Demonstration Association (SARDA) [4] Matrix Solutions Inc.

Thursday, February 16, 2012 – Morning Technical Sessions

*Graduate Student Presentations

AM	**Land Reclamation Technical Session 2 Room**	**Land Use Technical Session Room**
8:00 – 8:05	Introduction Chair: Deo A. Heeraman AMEC Environment & Infrastructure	Introduction Chair: Karen Raven Alberta Agriculture and Rural Development, Edmonton Co-Chair: Rob Dunn Alberta Agriculture and Rural Development, Lethbridge
8:05 – 8:25	Updates to the 2010 Reclamation Criteria Assessment Tool and Record of Observation forms **Shane Patterson[1]** [1]Science and Technology Specialist, Alberta Environment and Water	Using an Ecosystem Services Approach to inform land-use decisions. **Gillian Kerr[1]** [1]Alberta Environment and Water
8:25 – 8:45	*Phytoremediation of nitrate impacted soil and groundwater at an industrial plant site **Kelly Kneteman[1], Connie Nichol[2], M. F. Dyck[1]** [1]Department of Renewable Resources, University of Alberta, Edmonton [2]Agrium Inc.	Offset policy in Alberta: Pragmatism or wishful thinking? **Marian Weber[1]** [1]Alberta Innovates - Technology Futures
8:45 – 9:05	* Development of Soil Quality Models using pH and electrical conductivity as indicators for land reclamation evaluation **Abimbola Ojekanmi[1], Scott Chang[2]** [1]Lease Development and Closure, Syncrude Canada Ltd. [2]Department of Renewable Resources, University of Alberta, Edmonton	Transfer of Development Credits- an exploration by the Beaver Hills Initiative **Brian Ilnicki[1], Kim Good[2], Brenda Wispinski[3]** [1] Land Stewardship Centre of Canada [2] Miistakis Institute 3. Beaver Hills Initiative
9:05 – 9:25	Ecological Processes from Spatial Patterns of Stand Characteristics and Soil Nutrient Availability in Reclaimed Boreal Forests **P. T. Sorenson[1], M. D. Mackenzie[2], S. M. Landhausser[2], S. A. Quideau[2]** [1]Solstice Canada [2]Department of Renewable Resources, University of Alberta, Edmonton	Agriculture environmental footprinting in Alberta **Kerrianne Koehler-Munro[1], R. Bryan[1], T. Goddard[1], L. Kryzanowski[1], J. Little[1]** [1]Environmental Stewardship Division, Alberta Agriculture and Rural Development
9:25 – 9:45		Is water the new carbon? Environmental footprinting in Alberta **Joanne Little[1], R. Bryan[1], T. Goddard[1], K. Koehler-Munro[1], L. Kryzanowski[1]** [1]Environmental Stewardship Division, Alberta Agriculture and Rural Development

9:45 – 10:00	**Coffee and Refreshments**	
	Soil Fertility Technical Session **Room**	**Forest, Riparian and Wetland Soils** **Room**
10:00 – 9:05	Introduction Chair: Len Kryzanowski Alberta Agriculture and Rural Development, Edmonton	Introduction: Chair: Maria Strack University of Calgary
10:05 – 10:25	Lessons from the Breton Plots: Is John Deere green nutrient deficient? **Dick Puurveen[1], M. F. Dyck[1]** [1]Department of Renewable Resources, University of Alberta, Edmonton	*Soil and tree ring chemistry responses of *Pinus banksiana* and *Populus tremuloides* stands in atmospheric environments in the oil sands region, Alberta, Canada **Kangho Jung[1], S. X. Chang[1], W. J. Choi[2], M. A. Arshad[1]** [1]Department of Renewable Resources, University of Alberta, Edmonton [2]Department of Rural and Biosystmes Engineering, Chonnam National University, Gwangju
10:25 – 10:45	Can urease and nitrification inhibitors help broadcast applications of urea perform well compared to side-banded urea **Tom Jensen[1]** [1]International Plant Nutrition Institute	Responses of boreal bogs to increasing nitrogen deposition: A three-year nitrogen experiment **Bin Xu[1], D. Vitt[2], K. Wieder[3]** [1]Department of Geography, University of Calgary [2]Department of Plant Biology, Southern Illinois University Carbondale [3]Associate Dean for Sciences, College of Liberal Arts and Sciences
10:45 – 11:05	Degradation of the urease inhibitor NBPT (N-(n-butyl) thiophosphoric) occurs more slowly in calcareous soils **Richard Engel[1], E. Williams[1], R. Wallander[1]** [1]Dept. of Land Resources and Environmental Sci, Montana State University, Bozeman, MT	The importance of mineral soil substrate in the re-vegetation of salinized peat fields **Marilou Montemayor[1], Jonathan Price[2], Line Rochefort[3]** [1]Watershed Science Coordinator, Athabasca Watershed Council [2]Professor, Department of Geography, University of Waterloo, ON [3]Professor, Département de Phytologie, Université Laval
11:05 – 11:25	Impact of nitrogen fertilizer management on N2O emissions. **Adil Akbar[1], Len Kryzanowski[1], Craig Sprout[1], Germar Lohstraeter[1], Leigh-Ann Powers[1], Tom Goddard[1]** [1]Alberta Agriculture and Rural Development	*Spatial variability of soil hydrophysical properties in *Sphagnum* dominated peatlands. **Jordanna Branham[1], M. Strack[1]** [1]Department of Geography, University of Calgary
11:25 – 11:45	Agronomic impact of nitrogen fertilizer management **Len Kryzanowski[1], Ross McKenzie[1], Allan Middleton[1], Adil Akbar[1]** [1]Alberta Agriculture and Rural Development, Edmonton and Lethbridge	Assessment of science for a GHG reduction protocol for boreal peatlands **Rob Janzen[1], J. Pagé[2], D. Browne[2]** [1]Climate Check Corporation, Ottawa, ON [2]Canadian Wildlife Federation, Kanata, ON

	Thursday Afternoon: Biogas Production – What Does this Mean for Alberta?
1:00 – 1:10	Welcome and Introduction: Virginia Nelson
1:10 – 1:40	Earl Jenson, AITF: Biodigester processes and feedstocks
1:50 – 2:20	Jim Jones, ARD: Cost – when is it feasible?
2:20 – 2:50	**Break**
2:50 – 3:20	Mahendran Navaratnasamy, ARD: Energy footprint considerations
3:30 – 4:00	Stefan Michalski, ECB Environmental: A biogas plant story

Plenary Session

Wednesday, February 15, 2012 – Morning

Measuring ecosystem health at multiple scales: compatible metrics for reclaimed sites and regional assessments

Dr. Jim Schieck[1]

[1]Alberta Biodiversity Monitoring Institute, Alberta Innovates – Technology Futures

Correspondence: jims@AlbertaInnovates.ca

Abstract

A key principle of resource development in Alberta is that the development must be conducted in an ecological sustainable manner. To this end, information from the Alberta Biodiversity Monitoring Institute (ABMI) can be used to assess whether developments are sustainable. At 1656 sites spaced in a grid pattern throughout Alberta, ABMI monitors hundreds of terrestrial and aquatic species plus the habitat conditions in which they live. Regional intactness – a measure of deviation from undisturbed condition – is determined for each species. Species intactness can be combined to highlight the health of biodiversity in any region. To assess ecological health at a particular site, a modified reference condition approach is used; maximum likelihood models describe the degree to which the biotic community at the target site differs from that expected in similar sites that have not been disturbed. Since information on species in both natural and human disturbed areas are required for both scales, integrated data collection increases cost efficiencies. In addition, by focusing on compatible metrics at all scales, it is possible to evaluate whether management actions at individual sites are effective at maintaining regional ecosystem health.

About Dr. Schieck:

Education

1991, Post-Doctoral Fellow, Simon Fraser University
1988, Philosophy Doctorate, University of Alberta
1984, Master of Science, University of Western Ontario
1981, Bachelor of Science, University of Western Ontario

Experience

I have been a Research Scientist at the Alberta Research Council for the past 19 years. In addition, I am an adjunct professor at the University of Alberta, and the Science Director for the Alberta Biodiversity Monitoring Institute. I have published more than 20 papers in scientific journals, helped to organize more than 10 workshops, and produced more than 100 client reports.

I have extensive experience developing, leading large ecological research projects. These projects often involve collaboration with researchers having expertise/specialties in plant ecology, wildlife ecology, statistical analyses, and conservation biology. My expertise includes avian ecology, population dynamics, community ecology, forest ecology, and conservation biology.

Title

Dr. Gregory Taylor[1]

[1]Dean, Faculty of Science, University of Alberta, Edmonton

Correspondence: gregory.taylor@ualberta.ca

Abstract

About Dr. Taylor:

Gregory Taylor was born in Montréal, Quebec. After obtaining a BSc from Queen's University, he went on to complete a Masters of Environmental Design at the University of Calgary, and a PhD, also at Queen's.

In 2003 Dr Taylor became the Dean of Science. He was formerly the Chair of Biological Sciences.

His research interests include: physiology, biochemistry and molecular biology of metal resistance in plants. His current work focuses on aluminum and cadmium. This research is interdisciplinary in nature, utilizing a wide variety of physiological, biochemical, molecular and genetic techniques on whole plant and cell culture systems.

Dr Taylor has been the recipient of several University of Alberta awards including the Killam Annual Professor (1999-2000), McCalla Research Professor (1997-98), and the Faculty of Science Research Award (1995). The Canadian Council of University Biology Chairs presented him with the Distinguished Scientist Award in recognition of excellence in science and service, in 2004. He was presented with the CD Nelson Award from the Canadian Society of Plant Physiologists in 1995 and has received an NSERC University Research Fellowship (1985-1995).

Gregory has been married for 30 years to Jane Taylor, and is the father of two children. He enjoys hiking, gardening, and soccer.

Strategies to Meet the Challenges of Monitoring Greenhouse Gas Emissions in Agriculture

Dr. Alan Franzluebbers[1]

[1]USDA-Agricultural Research Service, 1420 Experiment Station Road, Watkinsville GA 30677

Correspondence: Alan.Franzluebbers@ARS.USDA.GOV

Abstract

Quantifying and predicting soil carbon sequestration and greenhouse gas emissions from agricultural systems have been research goals for numerous institutions, especially since the turn of the millennium. Cost, time, and politics are variables that have limited the rapid development of robust quantification systems. Since 2002, USDA Agricultural Research Service has been engaged in a national project called GRACEnet (Greenhouse gas Reduction through Agricultural Carbon Enhancement network). Goals of the project are to (1) evaluate soil organic carbon status and change, (2) assess net greenhouse gas emissions (CO2, N2O, and CH4), and (3) determine ancillary environmental responses (air, water, and soil quality) within existing typical and alternative agricultural systems. Since the network's inception, a large research effort has been conducted and reported due to the interest and commitment of numerous scientists and administrators. GRACEnet and other research efforts have helped inform a new USDA process to provide technical guidelines and predict entity-level estimation of greenhouse gas emissions for U.S. agriculture. This process continues to be developed. The Global Research Alliance on Agricultural Greenhouse Gases has also been initiated to provide technical guidance and estimation procedures for monitoring greenhouse gas emissions from agriculture around the world. This presentation briefly describes each of these networks and attempts to address challenges with such greenhouse gas monitoring systems.

About Dr. Franzluebbers:

Education

Ph.D. – Soil Science, Texas A&M University, 1995
M.S. – Agronomy, University of Nebraska, 1991
B.S. – Horticulture, University of Nebraska, 1985

Research Interest

Alan Franzluebbers is an Ecologist with the USDA – Agricultural Research Service in Watkinsville GA. His research program focuses on soil organic matter management for development of sustainable agricultural systems. Conservation tillage, pasture management, and integrated crop-livestock production are topics of current interest. Biological soil quality methods and soil organic carbon sequestration are tools often used to interpret the effects of management on soil resources. He is a research member of the Greenhouse Gas Reduction through Agricultural Carbon Enhancement network (GRACEnet) and serves as co-lead of the Croplands Research Group of the Global Research Alliance on Agricultural Greenhouse Gases. He serves on editorial boards for several soil and agronomic journals.

Monitoring soil water quality using trace elements: comparison of results from the Elmvale Groundwater Observatory with data from monitoring wells

Dr. William Shotyk[1]

[1]Bocock Chair for Agriculture and the Environment, Department of Renewable Resources, University of Alberta

Correspondence: shotyk@ales.ualberta.ca

Abstract

Increasing, elevated concentrations of trace metals in the surface layers of soils may result from a diverse array of anthropogenic, atmospheric sources such as smelting and refining, fossil fuel combustion and municipal solid waste incineration, in addition to direct additions from fertilizers, sewage sludge, and composts. There is considerable, ongoing concern about the fate and transformations of potentially toxic trace elements, and their eventual release to surface waters and groundwaters. The first step in this process is their release to the soil solution, but to document this phenomenon, it is essential to obtain representative water samples for testing and analysis. The Elmvale Groundwater Observatory (Springwater Township, Ontario) consists of two dedicated groundwater sampling systems designed exclusively for the analysis of trace metals. One well was constructed entirely of surgical stainless steel, the other made using acid-washed high density polyethylene (HDPE). Both wells are artesian flow systems. Using ICP-SMS and the clean lab methods developed for polar snow and ice, it is possible to measure all of the trace metals of contemporary environmental interest. Sampling the water within a laminar flow clean air cabinet helps to eliminate variability by protecting the samples from anthropogenic aerosols in ambient air. Many trace metals such as Cr and Pb are found at concentrations (1 ng/L) significantly lower than the Arctic ice from the mid-Holocene (ca. 4 K to 8 K yr BP). Groundwater quality monitoring programs undertaken in the same region typically show "concentrations" for the same trace metals which are three orders of magnitude greater (1 µg/L) because of the introduction of colloids during sampling. The purpose of our studies is scientific, academic and analytical, whereas the monitoring studies are intended to ensure that metal concentrations in groundwaters do not exceed the relevant water quality guidelines. Illustrative results of the two approaches are presented and their implications compared, with a view to better understand the mechanisms and extent of natural filtration of water by soils and to help develop the analytical procedures to better characterize soil water quality.

About Dr. Shotyk:

William Shotyk received his B.Sc. (Agr.) in Soil Science and Chemistry from the University of Guelph in 1981 and a Ph.D. in Geology from the University of Western Ontario in 1987. Following postdoctoral research at the University of California, Riverside and UWO, he worked at the University of Berne in Switzerland where he completed a Habilitation in Geochemistry, in 1995. After 12 years at the University of Berne, he became Professor at the University of Heidelberg in Germany, and Director of the Institute of Environmental Geochemistry, in October of 2000. In 2007, with the help of family and friends, he created the Elmvale Foundation, a federally registered charity for environmental education, and the annual Elmvale Water Festival. He joined the Department of Renewable Resources at the University of Alberta on 1. October 2011, as the Bocock Chair in Agriculture and the Environment.

Volunteer Session 1

Wednesday, February 15, 2012 – Afternoon

Application of soil moisture monitoring systems in reclamation performance monitoring

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Abstract

Mine waste cover systems are designed and constructed to minimize contaminant release from mine waste as well as establish a self-sustaining vegetation community. Field performance monitoring involves measuring site climatic conditions, in situ temperature and moisture conditions, surface run-off, net percolation of infiltrating water into the underlying substrate, and oxygen ingress if required. Net percolation may be measured directly in lysimeters or estimated from changes in moisture storage at the base of the cover. Water demand over a field season is calculated by direct measurement of moisture storage in the mine cover. This presentation will focus on monitoring of soil moisture conditions on reclamation areas in the Athabasca oil sands region. Field demand, calculated as the decrease in moisture storage in a reclamation cover over the non-frozen period following draining after spring snowmelt, increases over time on sites with significant increase in vegetation cover, but is more closely related to rainfall. Moisture retention is enhanced by capillary break resulting from layering of materials with differing textures.

Successes and challenges of container green roof research in Edmonton, Alberta

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Abstract

Two studies on the use of biochar compost mixes as potential substrates for living roofs were carried out on the roofs of the Edmonton Waste Management Centre of Excellence (EWMCE) and of Esak Consulting Ltd. The EWMCE study, which started on August 25 2010, demonstrated that the 25% and 75% by volume of biochar in biochar compost mixes at 20 cm depth substantially increased plant growth and survival rates compared to field soil and the commercial living roof substrate Rooflite ™ used at 15 cm depth. These results were based on the growth of a mixture of 10 native plant species, with the grass Rocky Mountain Fescue becoming dominant. These two depths were used to reflect the different bulk densities and obtain the same weight of substrate per unit area, and they would be the ones recommended commercially.

The high cost of biochar was responsible for the second study where lower rates of biochar in biochar compost mixes were used to determine if similar effects on growth would be obtained. Biochar at rates of 5% 10% and 20% in biochar compost mixes at 15 cm depth were compared to pure compost and potting soil, also used at 15 cm depth, during the growing season 2011. Ornamental species were used instead of native species to reduce the confounding effects of plant competition with substrate. Survival rates were greater for all biochar compost mixes compared to potting soil and pure compost. Flowering however was generally greater for the potting soil treatment, often followed by the 10 or 20 % biochar treatments. Plant growth response to biochar treatment was dependent on the species, with very little difference among biochar treatments. We concluded that 5% biochar in a biochar compost mix would successfully support plant growth on a living roof.

Watershed evaluation of beneficial management practices (WEBs): Place-based research of BMP performance

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Abstract

For many years, agri-environmental programs have promoted beneficial management practices (BMPs) and often treated them as universally proven practices even though few BMPs had been assessed at watershed scales, where the combined effects of soils, topography, land cover and land use may significantly alter BMP performance. Agriculture and Agri-Food Canada's (AAFC) Watershed Evaluation of Beneficial Management Practices (WEBs) program was initiated in April 2004 to assess BMPs at a watershed scale. Currently, nine micro-watersheds (approximately 300 to 2,500 hectares each) across Canada have a variety of projects underway studying BMP economics and effects on water quality. This presentation will include an overview of the WEBs program, summary of research findings to date and WEBs priorities for the future.

Soil survey and vegetation information enhanced for biophysical resource valuation

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Abstract

The Buffalo-Atlee and Remount Community Pastures, located south of the Red Deer River in Special Areas 2, are dominantly native prairie with unique land management considerations. The main land use is livestock grazing, with secondary fossil fuel production. A team of consultants prepared a biophysical inventory of the two pastures for the Special Areas Board (SAB). The objective of the biophysical inventory is to assist the SAB to develop a land management and conservation policy for inclusion in the Red Deer River Regional Plan, part of the Land Use Framework.

The biophysical inventory was developed by enhancing existing information (soil survey and the Grassland Vegetation Inventory (GVI)), using additional field characterizations. GVI polygons were consolidated into Specific Soil Landscape Types (SSLT). Each SSLT description includes information on soils, parent material, landscape, wetlands, and conservation considerations. This inventory includes plant communities, wildlife and water resources, rare vegetation, species at risk, and cultural resources. Wetland types and habitat suitability for species at risk were also classified, correlated and mapped.

Previous information indicated Buffalo-Atlee occurs entirely in the Dry Mixedgrass Natural Subregion. Using current evidence, Buffalo-Atlee was classified into two soil climate areas: i) the Dry Mixedgrass at elevations below 793 m, and ii) a transitional climate from Dry Mixedgrass to Mixedgrass between 793 and 840 m. The Remount pasture is in the Dry Mixedgrass. A previously unrecognized paleovalley trends northeast towards the Red Deer River at Bindloss, providing a distinct separation from the surrounding plains, and strongly influences biophysical characteristics.

Topography and soil development in a complex map unit

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Abstract

Existing models of soil development on the prairies recognize the effect of topography, particularly curvature and slope position, on soil development, through moisture redistribution within the hillslope. The effects of aspect on soil development however have received less attention. Relationships between topography and soil development were investigated in a complex soil unit near Lumsden, Saskatchewan (50.7o N, 104.7o W). Landscape and profile characteristics were measured at 32 sites with slopes ranging from <1 to 33o. Site aspects were mainly southwest (grass or shrub vegetation) or northeast (forest or shrub vegetation). Sites were classified by means of equivalent latitude as: northern (>51 to 77 o), southern (29 to <49o) and control (49 to 51o). The northern treatment had darker A horizon colors than the control and southern treatments (P<0.002 and was dominated by Orthic Dark Brown and Orthic Black Chernozem profiles. The southern treatment was populated mainly by Rego and Calcareous Dark Brown and Brown Chernozems, with some Orthic Regosols. Results illustrate the interactions of aspect, potential evapotranspiration, and soil development.

Building soil quality on irrigated rotations in southern Alberta

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Abstract

An irrigated rotation study with potatoes (Solanum tuberosum L.), sugar beet (Beta vulgaris L.), dry beans (Phaseolus vulgaris L.) and soft wheat (Triticum aestivum L.) was initiated at Vauxhall, AB in 2000 and ran for 12 yr until 2011. The study examined the impact of conventional and conservation practices on crop yield/quality and soil properties. The conservation rotations were built as a package which included: (1) reduced tillage where possible; (2) fall-seeded cover crops; (3) feedlot manure compost addition; and (4) where beans occurred in the rotation, solid-seeded narrow-row (20 cm) beans vs. conventional wide-row (60 cm) beans. Rotations varied in length from 3 to 6 yr with the longest rotation containing 2 yr of timothy (Phleum pratense L.). Potatoes were the most responsive crop to soil conservation practices with increased tuber yield and reduced disease pressure (Verticilium wilt) especially in the shorter 3-yr rotation (potatoes-beans-wheat). On average, bean yields on the conservation rotations (narrow-row) were similar to conventional wide-row beans. Sugar beet also responded to conservation practices in individual later years of the study while wheat was less responsive overall. Soil parameters pointed to beneficial effects of conservation management on soil quality (e.g. increased soil organic carbon, microbial activity, and available water).

Volunteer Session 2

Wednesday, February 15, 2012 – Afternoon

A modeling study of the effects of different soil covers on the regeneration of carbon and nutrient cycling in landscapes reclaimed from oilsand mining

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Abstract

Oilsands in northern Alberta provide a valuable resource for the national and international production of gas and petroleum. However after this resource is extracted,industries must restore disturbed landscapes to a productivity equivalent to that of natural landscapes.Carbon and nitrogen cycling play important roles in the restoration of this productivity. To examine these roles, we compared modelled vs. measured effects of three different depths of mixed peat-mineral soil covers on ecosystem productivity, soil quality and salinity in a disturbed landscape at the South Hills site of the Syncrude mine in northern Alberta. We then compared the productivities of these landscapes with that of a natural landscape to determine the depth of soil cover required to restore the productivity of a reclaimed landscape to that of a natural one. These results are preliminary pending more detailed measurements of site and soil properties.

An EPIC adventure: modeling element cycling and trace gas dynamics from electrons to climatic zones

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Abstract

This paper describes the EPIC model in relation to C cycle, and trace gas emissions under land management systems ranging from arable agriculture to biofuel production and scales from lab bench to climatic zones. From its original objective of quantifying the impacts or erosion on soil productivity, the EPIC model has evolved into a comprehensive terrestrial ecosystem model for simulating numerous ecosystem processes, and comprehensive management practices (e.g. tillage, harvest, fertilization, irrigation, drainage, liming, burning, and pesticide application). The paper describes recent model developments in EPIC such as a coupled C:N model and a microbial denitrification model with feedback on C decomposition. The microbial denitrification model is resolved on an hourly time step using the concept that oxidation of carbon releases electrons, which drive a demand for electron acceptors such as O_2 and oxides of nitrogen (NO_3^-, NO_2^-, and N_2O). Diffusion of O_2 to microbial sites is described using a spherical diffusion model. A cylindrical diffusion model is used to describe O_2 transport to root surfaces. If not enough O_2 is present to accept all electrons generated, then the deficit for electron acceptors may be met by oxides of nitrogen. The movement of O_2, CO_2 and N_2O through the soil profile is modeled using the gas transport equation solved on a variable time step from < 1 minutes to an hour. Insights gained from applying EPIC to C and N cycling questions at local to regional scale will be presented.

Comparison of fresh versus composted feedlot manure in a long-term barely silage cropping system: crop yield, soil and denitrification

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Abstract

Although fresh beef cattle (Bos Taurus) manure has traditionally been applied to cropland in southern Alberta, application of composted manure has recently increased in this region. The implications of fresh manure (FM) versus composted (CM) beef cattle manure on crop yield, soil properties, solute transport and leaching, and denitrification, have not been investigated. The treatments in our study were initiated in 1998 and have been annually applied for 14 years. The treatments included fresh or composted manure containing straw or wood-chip bedding applied at three application rates of 13, 39, and 77 Mg ha^{-1}. There was also an inorganic fertilizer treatment and unamended control. Irrigated silage barley yields were generally similar for all treatments until 2010. However, in 2010 and 2011 barley dry matter yields were dramatically reduced for the highest application rate of fresh or composted manure containing wood-chips, and this was attributed to nitrogen immobilization. Surface soil denitrification was also measured for four growing seasons (2007-2010) using undisturbed soil cores, field incubation, and the acetylene inhibition method. Although daily denitrification rates were similar for fresh versus composted manure with straw at the highest application rate, cumulative rates over the growing season were significantly lower for composted compared to fresh manure for two of four years, suggesting that cumulative fluxes may be lower for composted manure in certain years.

Nitrous oxide emission from soil amended with bio-digested materials

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Abstract

Anaerobic digestion (AD) of animal manure has become an environmentally attractive technology to meet the world's increasing demand for energy. Anaerobically digested manure (ADM), often referred as digestate, is one of the final by-products of the biogas energy industry. The ADM is a nitrogen-rich material and its application increases crop yields, but could also increase soil nitrous oxide (N_2O) emissions, which is an environmental concern. The objectives of this study were to investigate the N_2O emissions from soil receiving various forms of ADM application. Two field sites were selected, one near Lethbridge, Southern Alberta, and another near St. Albert, Central Alberta. A complete randomized block design with six treatments, two application rates and four replications was used. The six treatments were: (1) control: no amendment (CK), (2) fresh manure (M), (3) ADM, (4) liquid removed from ADM to produce separated solids (SS), (5) SS processed into pellets (PE), and (6) urea-enriched SS processed into N:P balanced pellets (PEU). All amendments were applied at rates of 100 and 200 kg N ha^{-1} yr^{-1}. Barley was grown and harvested at the soft dough stage as forage for making silage feed. During the growing season, the rate of N_2O emission was collected weekly using a vented static chamber at the Lethbridge site and every two weeks at the St. Albert site. Analysis of preliminary data indicates that crop yield and N_2O emission from the ADM treatment were generally higher than from all other treatments, reflecting the higher water soluble N in the ADM and increases in soil moisture content following the amendment application. Emissions from St. Albert site were generally higher than from Lethbridge site, reflecting the higher soil organic matter, nutrient content and microbial activities associated with Black than the Dark Brown Chernozemic soil. One more year of field work is planned for much needed additional field data before meaningful conclusions can be drawn.

Ammonia emissions inventory for confined feeding operations in Alberta

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Abstract

In 2008, the Clean Air Strategic Alliance (CASA) Confined Feeding Operation (CFO) strategic plan recommended development of an air emissions inventory for the CFO industry in Alberta by 2011. To fulfil this recommendation, Alberta Agriculture and Rural Development (ARD) led development of the inventory. The inventory involves ammonia (NH_3) and particulate matter (PM) emissions because significantly more data are available for these emissions than for any of the other emissions of interest identified in the CASA CFO strategic plan (i.e., hydrogen sulphide, bioaerosols and pathogens, volatile organic compounds, and odour). Consequently, the new inventory is called the Ammonia and Particulate Matter Emissions Inventory for CFOs in Alberta (APMEICA).

APMEICA estimates emissions from CFOs with beef cattle, dairy cattle, poultry, swine and sheep, as well as various sub-categories within these five main categories. It estimates the 2006 emissions and forecasts the emissions for 2011, 2016 and 2021. The key findings of this inventory:

• CFOs in Alberta were estimated to emit 42,750 tonnes of NH_3, in 2006.

• Cattle and swine CFOs jointly accounted for 91% of the NH_3

• CFOs were estimated to be the biggest contributor of NH_3 emissions in Alberta in 2006, emitting approximately six times more NH_3 than industrial point sources.

• NH_3 emissions from CFOs were highest from May to October, due to warmer temperatures in late spring and summer and to large volumes of manure applied on land in fall

Effects of Water Table Drawdown on Carbon dioxide dynamics and Plant Biomass of a Boreal Alberta Peatland

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Abstract

The large belowground carbon stocks in northern peatland ecosystems are potentially susceptible to release because of hydrologically induced organic matter mineralization expected under a climate change scenario. However, vegetation succession in response to drought may lead to increased biomass that may counteract soil carbon losses. We studied vegetation succession and vegetation biomass along a microtopographic gradient of hummock and hollow between a natural bog and a bog that was drained ten years prior to this study in a peatland complex near the town of Wandering River, AB (55.354646,-112.518302). Carbon dioxide (CO_2) exchange including net ecosystem exchange (NEE), gross ecosystem productivity (GEP) and total respiration (Rtot) was also measured at both sites over a growing season (May-October). The ground layer biomass was determined by harvesting, overstory biomass estimated with allometric equations, belowground biomass was quantified from cores and CO_2 exchange was measured using the closed chamber technique. The coverage of Sphagnum biomass at the control site was significantly higher than at the drained site, but no significant differences were observed between microforms at either site. Drained hummocks have evolved significantly higher total biomass, due to higher density of shrubs, than drained hollows and control microforms. This resulted in significantly higher GEP at drained hummocks than drained hollows. The larger oxic zone at drained site led to significantly higher respiration than the control site. Combining these effects, there was a significant interaction between microform type and drainage for NEE in which drained hollows became much larger sources of CO_2 while hummocks were unchanged from the control site. The results support the conclusion that differences in the response of CO_2 fluxes to the predicted climate change induced deeper water table of peatland ecosystems combined with subsequent changes in vegetation biomass will differ spatially due to microtopography.

Land Reclamation Technical Session 1

Wednesday, February 15, 2012 – Afternoon

Mature fine tailings and petroleum coke as a reclamation substrate

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Abstract

Mature fine tailings and coke are waste products of the oil sands industry which can potentially be used in reclamation after oil sands mining. Mature fine tailings and coke have chemical and physical properties that make them inhospitable for plant growth and development, such as high concentrations of sodium, sulphate, chlorine and total extractable hydrocarbons. A greenhouse study was conducted to determine whether substrates of various mixtures of mature fine tailings, tailings sand, peat mineral mix and coke would support germination, emergence and growth of three grass species commonly used in land reclamation. These grass species were ticklegrass (Agrostis scabra Willd.), slender wheat grass (Agropyron trachycaulum (Link) Malte ex H.F. Lewis) and rocky mountain fescue (Festuca saximontana Rydb). Various soil and vegetation parameters were monitored for a period of 16 weeks in the greenhouse. Plant growth was inhibited in treatments with a high proportion of mature fine tailings and coke compared to the low mature fine tailings and coke rates. Agrostis scabra and Festuca saximontana were most affected by the mature fine tailings and coke, while Agropyron trachycaulum was the most tolerant species. Plant performance varied with substrate and amendment. In amended mature fine tailings plants performed better than those growing in mature fine tailings only. The amended mature fine tailings limited germination and growth. Plants can survive in coke, however, a reduction in biomass, plant density, cover and health was observed; this may be due to its coarse texture and may increase the potential for water stress in plant species

Entered in Graduate Student Competition

Limiting factors for tree growth on reclaimed sites in the Athabasca oil sands region

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Abstract

Oil sands reclaimed sites often have unfavorable conditions for tree growth due to salinity, soil compaction and low nutrient and water availabilities. The objective of this study was to identify the limiting factors for tree growth in reclaimed sites in the Athabasca oil sands region. Six lodgepole pine (Pinus contorta Dougl. ex Loud. var. latifolia Engelm.) sites on peat-mineral mix over tailings sand and 6 white spruce (Picea glauca (Moench) Voss) sites on peat-mineral mix over overburden were selected in the Suncor lease in Fort McMurray. These sites were classified into low, medium and high productivity according to visual observation of tree growth. Tree growth was measured to verify visual observation. Soil electrical conductivity (EC), pH, and soil and foliar carbon (C) and nitrogen (N) concentrations were analyzed. There was no significant difference of pH among pine or spruce sites. The EC of peat-mineral mix was higher than that of tailings sand in pine sites, but lower than that of overburden in spruce sites. The EC was higher in low than in medium and high productivity pine sites, but the trend reversed in spruce sites. The total and inorganic N concentrations in the peat-mineral mix were slightly higher in high than in low and medium productivity pine and spruce sites, consistent with the foliar N status. The results indicate a positive relationship between soil N and plant N uptake. In conclusion, salinity and nitrogen availability were potential factors affecting tree growth in the studied reclaimed sites.

Entered in Graduate Student Competition

Spatial variability of soil biochemical properties in a 21 year old aspen (Populous tremuloides Michx) stand on an oil sand mine reclaimed site in northern Alberta

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Abstract

Ecosystem processes form a complex web of interactions which can be modeled by treating space as a surrogate for unmeasured variables. Therefore, the removal of spatial residuals in environmental data can give meaningful insight about ecological processes. Understanding the spatial dependence of soil and plant properties in reclaimed forest ecosystems may also help judge reclamation success. We examined spatial patterns of some major soil biogeochemical properties in a young reclaimed aspen stand. Samples were collected using a spatially explicit sampling protocol (minimum 0.5m resolution). Field measured variables included forest floor depth, canopy cover, pH and nutrient supply rate. A lab incubation experiment was run for 8 weeks after which soils were analyzed for C and N mineralization, microbial biomass, extracellular enzyme activity, total C and N, dissolved organic C and N, and anthrone reactive C. Preliminary spatial analysis showed that soil microbial properties had more influence on nutrient supply than the other stand characteristics like canopy cover, forest floor mass, and distance to nearest tree. After removing the spatial residuals, the model parameters explained most of the variability in the dataset. Spatial dependency of microbial biomass C, dissolved organic C, basal respiration, β-glucosidase, N-acetyle-β-glucosaminidase and phosphatase activity, and resin available N all had shorter ranges of spatial dependence, similar to the canopy range. Small patch distribution of soil biogeochemical properties might indicate that soil-plant relations similar to natural aspen stands have been re-established, however, more rigorous statistical analysis and careful explanation are needed.

Entered in Graduate Student Competition

Dissipation of Three Veterinary Antimicrobials in Feedlot Manure Stockpiles

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Abstract

Livestock in confined animal feeding operations in Canada are routinely administered antimicrobials (antibiotics), therapeutically for disease treatment and prevention, as well as sub-therapeutically for growth promotion. Up to 75% or more of administered doses may be subsequently excreted in feces and urine. In beef cattle production, solid manure is removed from feedlot pens and frequently stored in stockpiles prior to land application. Although veterinary antimicrobials have been shown to dissipate during aerated windrow composting of beef cattle manure, it is unclear whether they dissipate to the same extent during stockpiling, or whether the dissipation is dependent upon the location within the stockpile. A study was conducted at Agriculture and Agri-Food Canada Research Centre, Lethbridge, AB in fall 2010 to investigate the dissipation in stockpiled manure of three antimicrobials commonly used in beef cattle production. Beef cattle (*Bos taurus*) were administered (1) 44 mg of chlortetracycline kg^{-1} feed (dry-weight), (2) 44 mg of chlortetracycline + 44 mg sulfamethazine kg^{-1} feed, (3) 11 mg of tylosin kg^{-1} feed and (4) no antimicrobials (control) in the research feedlot situated on the Research Centre. Manure was cleaned from feedlot pens and placed in stockpiles (2 replicates per treatment = 8 stockpiles). Manure samples were collected periodically from three locations (top, center and bottom) within the stockpiles over a period of 140 days and analyzed for concentrations of chloretetracycline, sulfamethazine and tylosin using LC/MS/MS analysis. The concentration data will be used to investigate the kinetics of the dissipation of the three antimicrobials during the stockpiling process.

The influence of soil capping depth and vegetation on phosphogypsum stack reclamation in Fort Saskatchewan, Alberta

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Abstract

Phosphogypsum ($CaSO_4$*H2O) is an industrial byproduct created during phosphorus fertilizer production. At Agrium's Fort Saskatchewan plant, phosphorus fertilizer production has ceased and phosphogypsum has been piled into solid stacks. Phosphogypsum stacks can pose environmental hazards including residual acidity, small quantities of radium and uranium and elevated trace elements that can become mobile in water.

This study quantifies soil, water and plant parameters and will help to develop reclamation strategies for phosphogypsum stacks.

Experimental plots with six soil cap depths and five vegetation treatments, established in 2006, are being studied.

In 50% of the 1.25 m cores, significant root mass accumulations occurred at the soil - phosphogypsum interface with 8, 15, 30 and 46 cm soil caps. Mean peak water content occurred at the interface with all cap depths in fall 2010; in spring, summer and fall 2011 different trends were noted. Maximum rooting depth increased with increasing cap depth while root biomass did not. Above ground biomass increased with increasing cap depth to a cap depth of 30 cm where it plateaued.

Substrate and vegetation tissue were analyzed for concentrations of 33 elements; some phosphogypsum contained elevated concentrations of 8 elements, some tissue of grass species 2 elements, and some tissue of a broad leafed species 3 elements when compared to controls.

Entered in Graduate Student Competition

Poster Session

Wednesday, February 15, 2012 – Afternoon

Nitrogen-use efficiency and biological nitrogen fixation of dry beans

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Abstract

Dry bean (Phaseolus vulgaris L.) genotypes with improved nitrogen-use efficiency (NUE - as dry matter yield per unit N available from soil and fertilizer) and increased N-fixing capacity are required to reduce input cost and the negative environmental impacts of N fertilizer application. Twenty-two dry bean genotypes were screened for NUE and biological N fixation potential in two greenhouse experiments. In the first experiment, at both low and high soil N levels, shoot and root dry weights, root surface area, soil plant analysis development (SPAD) index, shoot N uptake and shoot N uptake efficiency of dry bean genotypes were significantly affected by N treatments. The root surface area, root dry weight and root-shoot ratio of Othello, Topaz, PI578265, FR 266 and LEF 2RB were significantly high at low N level. Positive correlations were found among traits such as root dry weight, shoot dry weight, shoot N uptake and shoot N uptake efficiency at both N levels. The above results indicate that shoot and root dry weights, and shoot N uptake efficiency are important traits in selecting N-efficient dry bean genotypes. In the second experiment currently in-progress, plant growth, symbiotic parameters (nodule number and dry weight) and N uptake of dry bean genotypes are evaluated at four treatments: low N level, low N level with two commercial rhizobial inoculants of dry bean and high N level. Selected dry bean genotypes from both studies will be evaluated in the field in 2012 and 2013 for NUE and biological N fixation potential.

Preceding crop, rotation length and soil management effects on bacterial endophytes

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Abstract

Endophytes are microorganisms that live within a plant for part of their life without causing disease. They are believed to support the plant in aspects like growth promotion, nutrient uptake, tolerance to abiotic stresses, and inhibition of infection by pathogens. An irrigated cropping system study was initiated in 2000 at Vauxhall, Alberta, to compare the effects of 3- and 4-yr rotations under conventional or sustainable management, and 5- and 6-yr sustainable rotations on yields of dry bean, potato, sugar beet and spring wheat. Sustainable management included, where possible, reduced tillage, fall-seeded cover crops, and composted cattle manure application. In 2010, we isolated, quantified, identified and characterized endophytic bacteria from potato grown after dry bean or wheat, with the objective of comparing endophytes amongst the rotations and between management systems. Preliminary results show that endophyte populations in potato grown after dry bean in the wheat-sugar beet-bean-potato rotation were greater under sustainable management than under conventional management. Indole acetic acid (IAA) hormone activity also followed the same trend. The endophytes in the sustainable 6-yr oat(timothy)-timothy-timothy-sugar beet-bean-potato rotation were more diverse than those in the 3-yr bean-wheat-potato rotation under conventional management. Most of the endophytes were Bacillus spp, but rotations under sustainable management also contained Paenibacillus spp., Ochrobactrum spp. and Kribbia spp. Characterization of the N_2 fixation, disease control and stress tolerance potentials of the endophytes is ongoing.

Long-term manure application influences C and N distribution among soil aggregates

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Abstract

Cattle manure is nutrient-rich relative to soil, and its application to agricultural land alters soil properties and affects crop production. The purpose of this study was to evaluate the effect of long-term cattle manure application on C and N distribution among soil aggregates. Starting in 1973, manure from a beef cattle feedlot was applied at rates of 0, 30, 60, or 90 Mg ha^{-1} yr^{-1} (wet weight) in a rain-fed, continuously cropped (mainly barley) experiment on a clay loam soil at Lethbridge. Surface soil (0-15 cm) was sampled in spring 2011 after 37 annual manure applications. Each sample was air-dried and separated into five aggregates size fractions (<0.84 mm, 0.84-1 mm, 1-2 mm, 2-4.7 mm and 4.7-8 mm) using stacked sieves. Manure application decreased the proportions of soil in the two fractions larger than 2 mm, and increased that in the <0.84mm fraction. As expected with such heavy rates over several decades, soil C and N increased with manure application rate. The contribution of each aggregate fraction to whole soil C and N was largely determined by the by the aggregate size distributions. In the non-manured soil C and N concentrations were uniform among aggregate size fractions, so the contribution of each fraction to whole soil C and N was solely determined by the aggregate size distribution. In the manured soils, however, concentrations differed significantly among size fractions. Typically the greatest concentrations occurred in the 0.8 to 1.0 mm fraction, and the smallest concentrations occurred in the 4 to 8 mm fraction. Since only a small (<5%) proportion of the soil was in the 0.8 to 1.0 mm fraction, it made a corresponding small contribution to whole soil C and N, regardless of relatively large C and N concentrations within the fraction. In contrast, the declining proportion of large aggregates with increasing manure rate was reinforced by relatively low C and N contents within this fraction. Consequently, manure C and N persisting in this soil was largely confined to aggregate fractions smaller than 4 mm. Water-extractable organic C and total N accounted for less than 0.5% of soil organic C and total N, but was even more sensitive to manure rate and aggregate size. The relative contributions of the various aggregate fractions to water-extractable C and N followed similar trends observed for total organic C and total N, but accumulations in the smaller aggregate size fractions were even greater. Overall, the results indicate a non-uniform distribution of manure C and N among aggregate sizes, and this likely will influence future bioavailability.

Desorption of arsenic in andesite overburden materials as influenced by revegetation treatments

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Abstract

Sulfidic minesoils generally have low pH, low fertility and elevated metal concentrations. Amendments added to promote revegetation may alter the solution composition of these soils. In this study, the effects of lime, nitrogen (N), phosphorus (P) and organic matter (OM) on soil solution arsenic (As) concentration were examined. Soil solution was extracted after varying levels of arsenic rich-minesoils were amended, incubated and planted with a common colonizing species (Vulpia myuros L.). Three acidic minesoils containing high (S-H), medium (S-M) and low (S-L) As content were used in a randomized factorial greenhouse design. The three soils were treated with 2 lime rates (0, 2.5 mg $CaCO_3$/g soil), 2 levels of N (25, 75 kg/ha), 2 P levels (1000, 2000 kg/ha) and 2 organic matter treatments (50, 100 m^3/ha). The clay fraction of these soils contained kaolinite, goethite and gibbsite. Arsenic extracted by different methods decreased in the order as Total-As > oxalate-As > dithionite-As > mixed acid-As > water soluble-As (WS-As). Iron removed by oxalate (Feox) correlated well with As removed by oxalate. Multiple regression analyses indicated a strong positive correlation between WS-As and solution P as well as DOC. The effect of soluble P on soluble As was much greater in S-H than in S-M or S-L. In contrast, the DOC on WS-As was similar in S-H and S-M but considerably lower than S-L. Oxalate extractable Fe appears to be an important factor in the retention and mobility of As when revegetating these soils.

Improving crop yield and N uptake with long-term straw retention in a Gray Luvisol

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Abstract

A field experiment with barley monoculture (1983-1996), and wheat/barley-canola-triticale-pea rotation (1997-2009) was conducted on a Gray Luvisol [Typic Haplocryalf] loam soil at Breton, Alberta, to assess the influence of straw management (straw removed [SRem] and straw retained [SRet]), N fertilizer rate (0, 25, 50 and 75 kg N ha^{-1}) and N source (urea and polymer-coated urea [called ESN]) under conventional tillage on seed yield, straw yield, total N uptake in seed + straw and N balance sheet. On the average, SRet produced greater seed yield (by 102 kg ha^{-1}), straw yield (by 196 kg ha^{-1}) and total N uptake (by 3.7 kg N ha^{-1}) in the 1997-2009 period for both N sources. There was a considerable increase in yield and total N uptake up to 75 kg N ha^{-1} rate. The ESN was superior to urea in increasing seed yield (by 109 kg ha^{-1}), straw yield (by 80 kg ha^{-1}) and total N uptake (by 2.4 kg N ha^{-1}) in the 1983-1996 period (mainly at the 25 and 50 kg N ha^{-1} rates). The N balance sheets over the 1983-2009 study duration indicated large amounts of applied N unaccounted for, ranging from 740 to 1518 kg N ha^{-1}, suggesting a great potential for N loss from the soil-plant system through denitrification and/or nitrate leaching, and from the soil mineral N pool by N immobilization. In conclusion, the findings suggest that long-term retention of crop residue may gradually improve soil productivity.

Improving crop yield and N uptke with long-term straw retention in a Black Chernozem

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Abstract

A field experiment with barley monoculture (1983-1996), and wheat/barley-canola-triticale-pea rotation (1997-2009) was conducted on a Black Chernozem [Albic Argicryoll] silty clay loam at Ellerslie, Alberta, to assess the influence of straw management (straw removed [SRem] and straw retained [SRet]), N fertilizer rate (0, 25, 50 and 75 kg N ha^{-1}) and N source (urea and polymer-coated urea [called ESN]) under conventional tillage on seed yield, straw yield, total N uptake in seed + straw and N balance sheet. On the average, SRet produced greater seed yield (by 205-220 kg ha^{-1}), straw yield (by 154-160 kg ha^{-1}) and total N uptake (by 5.2 kg N ha^{-1}) than SRem in almost all cases in both periods for both N sources. There was a considerable increase in yield and total N uptake up to 75 kg N ha^{-1} rate. Urea produced greater straw yield (by 95 kg ha^{-1}) and total N uptake (by 3.3 kg N ha^{-1}) than ESN in the 1983-1996 period. The N balance sheets over the 1983-2009 study duration indicated large amounts of applied N unaccounted for ranging from 696 to 1334 kg N ha^{-1}, suggesting a great potential for N loss from the soil-plant system through denitrification and/or nitrate leaching, and from the soil mineral N pool by N immobilization. In conclusion, the findings suggest that long-term retention of crop residue may gradually improve soil productivity.

Long-term tillage, straw management and N fertilizer rate effects on crop yield, N uptake and N balance sheet in a Black Chernozem

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Abstract

A field experiment (established in autumn 1979, with monoculture barley [1980-1990] and barley/wheat-canola-triticale-pea rotation [1991-2008]) was conducted on a Black Chernozem [Albic Agricryoll] silty clay loam soil at Ellerslie, Alberta, to determine the influence of tillage (zero tillage [ZT] and conventional tillage [CT]), straw management (straw removed [SRem] and straw retained [SRet]) and N fertilizer rate (0, 50 and 100 kg N ha^{-1} in SRet, and only 0 kg N ha^{-1} in SRem plots) on seed yield, straw yield, total N uptake in seed + straw (1991-2008), and N balance sheet (1980-2008). The N fertilizer urea was midrow-banded under both tillage systems in the 1991-2008 period. There was a considerable increase in yield and total N uptake up to 100 kg N ha^{-1} under both tillage systems. On the average, CT produced greater seed yield (by 332 kg ha^{-1}), straw yield (by 323 kg ha^{-1}) and total N uptake (by 6.3 kg N ha^{-1}) than ZT. Compared to SRem treatment, seed yield, straw yield and total N uptake tended to be greater with SRet at the zero-N rate used in the study. The amounts of applied N unaccounted for over the 1980-2008 period ranged from 845 to 1665 kg N ha^{-1}, suggesting a great potential for N loss from the soil-plant system through denitrification, and N immobilization from the soil mineral N pool. In conclusion, crop yield and N uptake were lower under ZT than CT, and long-term retention of straw suggests some gradual improvement in soil productivity.

Long-term tillage, straw management and N fertilizer rate effects on crop yield, N uptake and N balance sheet in a Gray Luvisol

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Abstract

A field experiment with barley monoculture (1983-1996), and wheat/barley-canola-triticale-pea rotation (1997-2009) was conducted on a Gray Luvisol [Typic Haplocryalf] loam soil at Breton, Alberta, to assess the influence of straw management (straw removed [SRem] and straw retained [SRet]), N fertilizer rate (0, 25, 50 and 75 kg N ha^{-1}) and N source (urea and polymer-coated urea [called ESN]) under conventional tillage on seed yield, straw yield, total N uptake in seed + straw and N balance sheet. On the average, SRet produced greater seed yield (by 102 kg ha^{-1}), straw yield (by 196 kg ha^{-1}) and total N uptake (by 3.7 kg N ha^{-1}) in the 1997-2009 period for both N sources. There was a considerable increase in yield and total N uptake up to 75 kg N ha^{-1} rate. The ESN was superior to urea in increasing seed yield (by 109 kg ha^{-1}), straw yield (by 80 kg ha^{-1}) and total N uptake (by 2.4 kg N ha^{-1}) in the 1983-1996 period (mainly at the 25 and 50 kg N ha^{-1} rates). The N balance sheets over the 1983-2009 study duration indicated large amounts of applied N unaccounted for, ranging from 740 to 1518 kg N ha^{-1}, suggesting a great potential for N loss from the soil-plant system through denitrification and/or nitrate leaching, and from the soil mineral N pool by N immobilization. In conclusion, the findings suggest that long-term retention of crop residue may gradually improve soil productivity.

Improving organic C and N in sulfur-deficient soils with S fertilization

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Abstract

A field experiment was conducted over nine years (1999 to 2007 growing seasons) in northeastern Saskatchewan on a S-deficient Gray Luvisol (Typic Haplocryalf) soil to determine the relative effectiveness of N alone versus combined annual application of N (120 kg N ha^{-1}) and S (15 kg S ha^{-1}) fertilizers to wheat-canola rotation on storage of total organic C [TOC and N (TON), and light fraction organic C (LFOC) and N (LFON)] in soil. Compared to N alone, annual applications of S fertilizer in spring in a combination with N resulted in an increase of TOC (by 2.18 Mg C ha^{-1}), TON (by 0.138 Mg N ha^{-1}), LFOC (by 1018 kg C ha^{-1}) and LFON (by 42 kg N ha^{-1}) mass in soil. The relative increases in organic C or N due to S fertilizer application were much higher for light organic fractions (36.9% for LFOC and 27.5% for LFON) than for total organic fractions (9.2% for TOC and 7.3% for TON). The findings suggest the importance of balanced/combined application of N and S fertilizers to crops in storing more organic C and N in S-deficient soil, but further research is needed on a number of S-deficient sites.

Intercropping Barley and Pea for agronomic and economic considerations

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Abstract

Intercropping, especially a mix of non-legume and legume crops can have many benefits, such as improving crop yield and/or economic returns, and reducing inputs. A field experiment barley-pea intercrop was established in 2009 at Star City, Saskatchewan, to determine the feasibility of intercropping annual non-legume cereal (barley) and legume (pea) crops for optimizing seed yield economic returns. Barley and pea were grown as monocrops and in combinations, with application of N fertilizer at 0, 40 and 80 kg N ha^{-1} to monocrop barley and its combination with unfertilized pea. In 2009, compared to barley and pea as sole crops without applied N, seed yields and net returns improved with barley-pea intercropping, and more so when these crops were seeded in the same row. In the barley-pea intercropping combinations, application of N fertilizer increased total seed yield when the crops were seeded in alternate rows. In 2010, barley and pea in intercrop also produced higher seed yields and net returns than the sole crops. The LER values were greater than 1 for both intercropping combinations in both years, suggesting less land requirement for intercropping compared to sole crops for the same yield.

Intercropping Canola and Pea for agronomic and economic considerations

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Abstract

Intercropping, especially a mix of non-legume and legume crops can have many benefits, such as improving crop yield and/or economic returns, and reducing inputs. A field experiment with canola-pea intercrop was established in 2009 at Star City, Saskatchewan, to determine the feasibility of intercropping annual non-legume oilseed (canola) and legume (pea) crops for optimizing seed yield economic returns. Canola and pea were grown as monocrops and in combinations, with application of N fertilizer at 0, 40 and 80 kg N ha^{-1} to monocrop canola and its combination with unfertilized pea. In 2009, compared to canola and pea as sole crops without applied N, seed yields and net returns improved with canola-pea or barley-pea intercropping, and more so when these crops were seeded in the same row. In the canola-pea intercrop, application of N fertilizer decreased total seed yield in both intercropping combinations but the yield reduction was more when these crops were seeded in the same row. In 2010, canola and pea in intercrop also produced higher seed yields and net returns than the sole crops. The LER values were greater than 1 for both intercropping combinations in both years, suggesting less land requirement for intercropping compared to sole crops for the same yield.

Update on watershed evaluation of beneficial management practices (BMPs) in the Little Bow River watershed of southern Alberta

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Abstract

Five beneficial management practices (BMPs) are being evaluated within the Lower Little Bow (LLBow) River watershed of southern Alberta to determine the influence on surface water and runoff quality. The five BMPs are streambank fencing with off-stream watering, off-stream watering with no fencing, buffer strips, manure management, and conversion to forages. The major water quality variables in the river and in rainfall simulation runoff being used to evaluate these BMPs are sediment (total dissolved solids, nutrients (total N and P), and pathogens (E. coli bacteria). The findings from published studies on off-stream with and without fencing, and manure management, will be discussed. Off-stream watering with fencing prevented river pollution by cattle and improved riparian heath. The ungrazed excluded pasture associated with streambank fencing had certain vegetative and soil variables improved, runoff volume and certain nutrients in runoff were reduced, and rangeland health were improved compared to the grazed pasture. Off-stream watering without fencing prevented river pollution by cattle and slightly improved riparian health. It also improved certain vegetative and soil properties adjacent to river, but did not reduce runoff volume or improve water quality from rainfall simulations adjacent to the river. Annual or triennial P-based manure application reduced certain soluble P fractions in runoff compared to N-based application, but it did not reduce the other particulate or total P fractions. Triennial P-based application also caused greater P concentrations and loads in runoff during the first year of application compared to annual P-based application.

The efficacy of subsoil ripping to improve soil-water conditions for vegetation establishment on reclaimed mine tailings

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Abstract

Re-vegetation with perennial grasses or alfalfa is a common practice for coal mine reclamation within Alberta, however, re-vegetation with aspen is desirable in the parkland area of the province. Compaction from machinery during landscape reconstruction appears to impede Aspen root growth and development more than alfalfa and agricultural crops.

To remediate some of this compaction, a subsoil ripping treatment was applied at the Prairie Mines Genesee site. Non-ripped control plots were also established. Vegetation sub-plot treatments that will be established are: 1) no vegetation; 2) Aspen; 3) Aspen and grass mix; 4) grass mix. Subsoil ripping appears to have had a significant effect on soil bulk density down to 30 to 60 cm.

Entered in Graduate Student Competition

Moisture effects on microbial communities in boreal forest floors are stand-dependent

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Abstract

Landscape level factors such as overstory canopy composition can have a profound effect on the ecology of microbial communities in boreal forest floors. However, factors influencing community composition at the microsite scale are still poorly described and understood. Here we explored moisture effects on microbial communities in forest floor derived from undisturbed trembling aspen and white spruce stands, two of the dominant trees in the boreal forest of western Canada. Forest floor samples were incubated in a laboratory experiment for a period of one month under a moisture regime ranging from moist to dry (field capacity, 60% of field capacity and wilting point). As in previous studies we found that the origin of the forest floor material had a strong effect on the microbial community. Additionally, we found that moisture manipulation did not alter the microbial communities of the white spruce forest floor. On the other hand, the moisture had a profound effect on the aspen forest floor, and resulted in structurally and functionally distinct microbial communities. This different response to moisture could be linked to the adaptation of microbial groups to the physical environment inherent to the aspen and spruce forest floors.

Entered in Graduate Student Competition

When is reclamation success achieved - using 2010 reclamation criteria as a guide?

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Abstract

The Alberta Government's new reclamation standard (2010 Reclamation Criteria for Well sites and Associated Facilities for Grasslands) was released in June 2011. Compared to the 1995 Reclamation Criteria, more emphasis is placed on ecological health & function and land operability. The new criteria are to provide science-based information as they address ecosystem and management functions on a landscape basis. At present, the reclamation industry is left to devising their own seed mixes. How well each seed mix performed or how some revegetation practices lead to desired trajectories are not known. The findings can provide the oil and gas industry assurance of whether or not current revegetation methods can meet equivalent land capability and help them gauge a reclamation certificate in a much shorter time.

The objective of this study was to assess when and how reclamation success is achieved and to identify any efficiency to the methods to help define reclamation success.

During the summer of 2011, Alberta Innovates Technology Futures (AITF) undertook a study to determine how reclamation success is achieved, using the tools of the Record of Observation of the 2010 Reclamation Criteria. We assessed 15 sites representing different: ages after reclamation, soil types, and revegetation practices. From the findings, we correlated timelines for successful reclamation, identified successional trajectories and recommend seed mixes that have proved successful in expediting a reclamation certificate. We can show how the sites used in this study passed or failed, how best to mitigate site failures and adapting best practices to improve site certification. Results from this study will be presented.

Alberta Soils Tour – Peace Region, 2011

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Abstract

August 3-5, 2011 were excellent tour dates for 60 Soils experts, students, enthusiasts and researchers to view the soils and landscapes of the Peace Region on the 2011 Alberta Provincial Soils Tour. Including a blend of sites from agricultural soils to forest soils and peaty soils to sandy soils to heavy clays, tour participants were exposed to fertility and crop type plots, variable rate fertilizer application, forest rejuvenation, reduced industrial impact methods, dinosaur bone excavation, oilfield and pipeline land reclamations, and Peace Region landscapes. Sights were provided by farmers, AAFC-Beaverlodge, SARDA, PARDA, ARD, ENCANA, SHELL, Pipestone Creek Dinosaur Digs, Evergreen Park Center of Excellence, Whitelaw Springs, and the NAIT Boreal Research Institute at Peace River. The long days with very sunny cooperative weather, were sustained on delicious meals and great hospitality by several sponsors and municipalities, including the County of Grande Prairie and Northern Sunrise County, as well as ENCANA.

The organizing committee of Karen Raven, Tom Goddard, Randy Perkins, Michele Holden, Kabal Gill, Rene Labbe, and John Zylstra was pleased with the success of the tour and the evaluations of the tour participants. As tour coordinator, I, John Zylstra would like once again to thank the rest of the committee for their excellent work and enthusiastic involvement, without which this tour would not have happened. I also would like to thank all the participants, sponsors, and tour speakers for their enthusiasm and positive attitudes which made the tour enjoyable for everyone.

Land Reclamation Technical Session 2

Thursday, February 16, 2012 – Morning

Updates to the 2010 Reclamation Criteria Assessment Tool and Record of Observation forms

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Abstract

In June 2011 the Government of Alberta released the 2010 Reclamation Criteria for Wellsites and Associated Facilities Cultivated Lands, Native Grasslands, and Forested Lands. These criteria replaced the Reclamation Criteria for Wellsites and Associated Facilities 1995 Update and 2007 – Forested Lands in the Green Area Update. A workbook containing an Assessment Tool and Record of Observation (RoO) Datasheets for the each of the criteria was also released. Throughout the season based on comments and feedback from practitioners updates were made to the Tool and RoO to improve their usability. This presentation will highlight some of these changes that were made to each of the tools as well as address some of the frequently asked questions that were received during the course of the season.

Phytoremediation of nitrate impacted soil and groundwater at an industrial plant site

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Abstract

In-situ remediation techniques such as phytoremediation have shown promise as economical alternatives for reducing the risk of environmental contaminants at impacted sites. Research trials were initiated to determine the efficacy of phytoremediation for soil and groundwater contaminated with high levels of nitrogen fertilizer at a fertilizer plant in Alberta, Canada. Four plant types including alfalfa, willow, Okanese poplar and Saltlander grass were selected for phytoremediation experiments based on water use, rapid growth capability and tolerance to salinity. Experimental trials were conducted in environmental growth chambers, and carried out for a growing degree day period equivalent to an average growing season. Initially, plant growth trials were conducted with soils artificially contaminated with varying levels of ammonium nitrate to determine the approximate upper limit of plant nitrogen tolerance. Historically contaminated soil and groundwater containing high levels of ammonium, nitrate, phosphate and sulphate fertilizers was then investigated using electromagnetic surveying, sampling and chemical analysis. Using this data, samples were collected and growth chamber experiments designed to determine if plants could assist in the remediation of naturally occurring soils and groundwater contaminated with excess fertilizer.

Results indicate that plants can take up excess soil nitrogen caused by fertilizer contamination. Of the plant types selected, only Saltlander grass can survive in soils with up to 4000 mg/kg of ammonium nitrate. Phytoremediation is potentially effective under conditions where soils are contaminated by high concentrations of a variety of plant nutrients so long as conditions are not phytotoxic, as well as being economical, sustainable and aesthetically pleasing. The results of this research will be used to develop phytoremediation programs at many western Canadian fertilizer facilities.

Entered in Graduate Student Competition

Use of soil pH and electrical conductivity as indicators of soil quality in land reclamation

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Abstract

Soil quality evaluation and management in land reclamation operations require soil physical, chemical and biological data. Techniques are needed to effectively integrate soil quality indicators into justifiable ratings that can be calibrated against defined reclamation goals. We used predisturbance soil data to develop non–linear soil quality models based on the relationship between soil management goal parameters (SMGP) such as nutrient storage and soil fertility to pH and electrical conductivity (EC) for a-b ecosites within the oil sands region. Model validation using a different dataset from the same ecosite type was completed by comparing the effect of reclamation material types (LFH, topsoil, subsoil) on SMGP and corresponding pH and EC quality scores. Soil pH and EC were correlated with fertility, total nutrient and heavy metal concentrations. SMGP also changes ($p < 0.05$) with the type of material. Most of the soil quality models have sigmoid functions with capability to capture changes in SMGP as pH changes between 4.5 and 6.5, and EC changes between 0 and 0.4 dS/m. The effect of soil material type was similar for SMGP and model scores. To demonstrate potential practical applications of the soil quality models, analysis and integration of soil quality scores using pH and EC confirmed that soils from the same ecosite type are characterized by low nutrient or fertility status, medium capability to store essential plant nutrients and very low risk of heavy metal toxicity under the pre-disturbance condition.

Entered in Graduate Student Competition

Ecological Processes from Spatial Patterns of Stand Characteristics and Soil Nutrient Availability in Reclaimed Boreal Forests

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Abstract

Oil sands surface mining has currently disturbed roughly 650km^2 of boreal ecosystems in northern Alberta and this area is projected to increase to 1500 km^2 in the next 10-15 years. Forest reclamation after the complete removal and replacement of soil materials represents a major ongoing challenge that is partially contingent on re-establishing plant connections to soil biogeochemical cycles. Site characteristics including forest floor mass, tree location, canopy area, pH, and seasonal nutrient availability were quantified with a spatially explicit sampling protocol in three reclaimed stands (Populus tremuloides, Pinus banksiana, and Picea abies). Spatially explicit sampling allowed us to remove the effect of unmeasured variables and determine mechanistic relationships. We assessed seasonal nutrient availability using three sets of plant root simulator probes (PRS™, Western Ag Innovations) placed in August 2008, November 2008, and May 2009. Spatial patterns in soil nutrient availability were generally patchy at scales of 3 to 20 m and nutrients varied among seasons. After 25 years, fine scale patterns (~3 m) were similar to natural forest structure, but large scale patterns (~20 m) represented relics of soil placement during reclamation. In the aspen stand, canopy cover was the dominant factor leading to increased nitrogen, sulphur, and calcium, but was only related to potassium in the spruce stand. Forest floor mass, a partial indicator of soil development, was only related to phosphorus and potassium availability in the aspen stand. The spatial residuals and season were significantly related to nitrogen cycling in the conifer stand types. These results provide evidence that soil-plant relations are re-establishing differently in aspen and conifer stands, with aspens more dominated by canopy dynamics and conifers dominated by soil nutrient availability.

Land Use Technical Session

Thursday, February 16, 2012 – Morning

Using an Ecosystem Services Approach to inform land-Use decisions.

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Abstract

Ecosystem services ('ES') are the benefits that nature provides to people. Ecosystem services provide innumerable services that are underestimated in most economic development decisions; however, these services contribute to development objectives (e.g., scenic quality of the land) and to realizing quality of life goals. For example, the flood control service of wetlands can help to protect homes, infrastructure and communities during extreme weather events.

Alberta Environment and Water and other departments have proposed that adopting an ecosystem services approach will support and enable the provinces work on cumulative effects management, policy development, planning, and decision making on the landscape.

In 2010 and 2011 the Government of Alberta in collaboration with a number of expert groups, undertook an Ecosystem Services Approach Pilot on Wetlands. The ES Pilot focused on assessing the benefits that people acquire from wetlands in a qualitative, quantifiable and comparable way. While the pilot focused on wetlands, the concept of ES, supports other important work in Alberta, including the Land Use Framework and regional plans, the interim provincial wetland policy, Rocky View County, City of Calgary polices on wetlands and riparian areas, and the Institute for Agriculture, Forestry and the Environment's (IAFE) work on ES and innovation in the forestry and agriculture sectors.

This presentation will provide insights into ES as a concept and approach to support land-use decisions through an overview of the 10 year ES Roadmap and the results from the 16 month pilot project.

Offset policy in Alberta: Pragmatism or wishful thinking?

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Abstract

This talk will consider the current state of knowledge and risks around using offsets to manage landscapes in Alberta and outline an action plan for developing offset strategies that result in measurable and meaningful outcomes.

Transfer of Development Credits- an exploration by the Beaverhill Initiative

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Abstract

Rapid growth in population and increased economic activity in Alberta's Capital Region is placing unprecedented pressure on the Beaver Hills sub-watershed east of Edmonton. The Beaver Hills Initiative (BHI) started in 2002 and evolved from a need to address land use pressures which required the cooperation and coordinated efforts of a multitude of land managers from all levels of government with a goal to facilitate collaborative land management efforts between land managers and stakeholders. Transfer of Development Credit (TDC) programs have been identified by the Land Use Framework process and the subsequent Alberta Land Stewardship Act as a tool to be used by municipalities to achieve development and conservation goals. Together with zoning, TDC's encourage development to occur in desirable areas while formally protecting other areas important for agricultural or environmental conservation. This can allow owners of developed and undeveloped land to share in some of the financial benefits of selling land for development while ensuring valued lands are conserved. Landowners in areas designated for conservation sell credits to developers in areas targeted for growth. This presentation will focus on the fundamental principles of a TDC program, the partnership established to test five main steps in a TDC approach and the anticipated outcomes from the TDC pilot project.

Agriculture environmental footprinting in Alberta

Kerrianne Koehler-Munro[1], R. Bryan[1], T. Goddard[1], L. Kryzanowski[1], J. Little[1]

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Abstract

There is a growing desire in the marketplace to accurately quantify and communicate environmental sustainability of product production. Corporate sustainability programs will play a key role in the sustainability of agri-food production, as a significant portion of the environmental footprint is attributed to the farm. Alberta Agriculture and Rural Development (ARD) has undertaken an initiative to understand and quantify the environmental footprints of four agricultural commodities (canola, potatoes, chicken and egg) in Alberta. These evaluations will establish a methodology that can be transferred to other Alberta commodities in the future. The work will support Alberta's producers in remaining competitive, adaptive and responsive in the marketplace. Alberta is well-positioned on a global basis to capture opportunities in this growing and developing marketplace. This presentation will provide an overview of ARD's environmental footprinting initiative and how it could be applied to agricultural production in Alberta.

Is water the new carbon? Environmental footprinting in Alberta

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Abstract

Alberta Agriculture and Rural Development (AARD) is currently developing environmental footprints for crop (canola, potatoes) and livestock (chicken, egg) commodities in Alberta that will incorporate water footprinting. Although standard methodologies have been developed for other environmental impact categories, the most well-known being carbon, water footprinting methodologies are still in the developmental phase. However, there has been much recent attention to water footprinting and there are several initiatives underway to standardize methodologies as well as attempts to use results in labeling. In the AARD Environmental Footprinting project, we will be attempting to go beyond quantification of the amount of water used, and also consider the source of this water and the impacts of its use on the aquatic environment, thus incorporating both a spatial and a water stress component to water footprinting. This presentation will provide an overview of the current state of water footprinting and how it could be applied to agricultural production in Alberta.

Soil Fertility Technical Session 2

Thursday, February 16, 2012 – Morning

Lessons from the Breton Plots: Is John Deere green nutrient deficient?

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Abstract

The Breton Classical Rotation was initiated in 1929 near Breton, Alberta on Gray Luvisolic soil. The Classical Rotation is a five-year rotation (Wheat – Oats – Barley – Hay 1 – Hay 2) with 11 fertility treatments. As such, these Plots are an ideal setting for assessing a crops response to nutrients. One method commonly used to assess nutrient status is simply visual. Most “experienced” farmers can tell you from their truck windows if a crop appears deficient in nitrogen. Plants get their green colour from the presence and relative abundance of the pigment chlorophyll, which is responsible for photosynthesis. Chlorophyll contains nitrogen. Therefore, plants deficient in nitrogen are less green than those with adequate nitrogen. The “drive-by” visual nutrient status determination is rather subjective. A better methodology to make this comparison is to have a colour reference. The Breton Plots allow for a side-by-side comparison of a crop receiving nitrogen fertilizer to that receiving no nitrogen. In 2010, photographs were taken of the treatments with a digital SLR camera, utilizing a Colorchecker PassportTM, to determine if a colour difference could be distinguished using picture editing software. In a related study in 2011, treatments were compared by collecting data using a GreenseekerTM sensor, which measures red and NIR light reflected from the plants. These two techniques will provide insight on if colour comparison is appropriate to determine deficiencies. If colour comparison is appropriate, can we simply compare a crop to John Deere green?

Can urease and nitrification inhibitors help broadcast applications of urea perform well compared to side-banded urea

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Abstract

Side banded urea at the time of planting has become the industry standard for nitrogen application to direct seeded spring small grain and oil seed crops, in rainfed crops in western Canada. One disadvantage is that a farmer needs to handle all the fertilizer in the spring at planting. Logistically it might be useful for a farmer to take care of N applications by having urea broadcast either as a fall or early spring application, prior to planting. Compared to late fall or early spring broadcast applications, the main advantage of side-banding urea at planting is to reduce gaseous losses of N, either by ammonia (NH3) volatilization by the action of urease enzyme in soil and crop residues, or di-nitrogen (N2) or nitrous oxide (N2O) denitrification emissions by the action of soil microbes under oxygen deficit conditions at spring snowmelt. There are commercial additives available to treat urea with a urease inhibitor (NBPT, trade named Agrotain), with or without addition of a nitrification inhibitor (DCD or Nitripyrin). A study has been conducted the last two years evaluating broadcast applications of urea, with and without the inhibitors noted above, compared to side-banded at planting. The initial results show that broadcast applications may with additions of the inhibitors noted above may perform quite well compared to side-banding N at planting.

Degradation of the urease inhibitor NBPT (N-(n-butyl) thiophosphoric) occurs more slowly in calcareous soils

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Abstract

Recently completed micrometeorological NH_3 volatilization studies in Montana suggested the urease inhibitor N-(n-butyl) thiophosphoric triamide (NBPT) has prolonged activity in alkaline, calcareous soils relative to non-calcareous acidic soils. A lab incubation experiment was conducted over 28 d to determine whether NBPT degradation was affected by soil pH, and to determine the impact on urea hydrolysis. Soil material (10 g) from the surface horizon of a Telstad-Joplin loam (pH 5.5) and Brocko silt loam (pH 8.4) was placed in bottles for incubation at 0.5 and 20°C. A third soil was constructed by adding $CaCO_3$ (0.3 g) to the Telstad-Joplin loam (pH 8.2). Two treatments were applied to each soil, urea (20 mg) with and without NBPT (0.1%). HPLC-MS analysis of soil extracts revealed that NBPT degradation occurred more slowly in the alkaline, calcareous soils (Brock and Telstad-Joplin + CaCO3) compared to the acidic Telstad-Joplin soil. At 0.5 ?C, 4.7, 18.6, and 21.1 d were required for 95% of the NBPT to disappear in the Telstad-Joplin, Telstad-Joplin + CaCO3, and Brocko soils, respectively. Analogous values at 20°C were 1.4, 4.4, and 5.4 d for the three respective soils. Efficacy of NBPT inhibition of urea differed with each soil. Urea hydrolysis rates with NBPT were 44.2, 8.0 and 13.0% of the rates without NBPT for the Telstad-Joplin, Telstad-Joplin + $CaCO_3$ and Brocko soils at 0.5°C, respectively. Analogous values at 20°C were 73.2, 29.4 and 11.4%, respectively. This study confirmed observations from the field that NBPT persistence is greater in alkaline, calcareous soils. This effect will likely be of greater importance for urea applications to cold soils.

Impact of nitrogen fertilizer management on N_2O emissions.

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Abstract

The 4R ("Right Product @ Right Rate, Right Time, and Right Place™") nutrient management has not only agronomic and economic impacts, but also environmental benefits. Nitrogen fertilizer management (rate, placement, timing and source of fertilizer) is important in mitigating N_2O emissions an important GHG. Polymer-coated urea such as Environmental Smart Nitrogen (ESN) slowly releases plant available nitrogen controlled by soil moisture and temperature, the same variables that control crop growth. This has the potential to reduce nitrous oxide (N_2O) emissions. The research objective was to determine N_2O emissions reduction from timing, placement, rates and nitrogen fertilizer products (urea and ESN).

Switching from fall applied nitrogen fertilizer to spring application results in 65% to 72% N_2O emission reduction. Switching from fall applied urea to fall applied ESN results in 14% reduction while changing from spring applied urea to spring applied ESN would result in a 7% reduction.

Agronomic impact of nitrogen fertilizer management

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Abstract

Nitrogen fertilizer decisions using 4R ("Right Product @ Right Rate, Right Time, and Right Place™") nutrient management should be based on agronomic, economic and environmental benefits. Polymer-coated urea such as Environmental Smart Nitrogen (ESN) slowly releases plant available nitrogen controlled by soil moisture and temperature, which also control crop growth. This potentially can improve nitrogen use efficiency, increase productivity, reduce nitrogen application rates and allow seed-placement without risk of seedling toxicity. The research objectives are to examine agronomic performance of canola, barley and wheat for fertilizer products (urea, ESN and urea-ESN blend), along with time and placement management (fall banded, spring banded, and spring seed placed).

Nitrogen fertilizer rate greatly influences crop yield and protein level. Optimum nitrogen rate depends on soil test nitrogen levels and moisture. At sites with significant yield response, ESN yielded greater than urea. When banded, ESN is well protected with no volatilization losses and nitrogen release is slow and gradual for crop use. For spring application, the concern is whether nitrogen released from ESN is fast enough to satisfy crop demands. Urea-ESN blending could insure nitrogen supply to satisfy crop demands. Urea-ESN blend also allowed for higher nitrogen rates without seedling injury. Seed-placed urea reduced plant populations. Seed-placed ESN provided an effective means of reducing seedling injury from seed placed nitrogen and allows for even higher rates nitrogen but varies based on soil moisture and region.

Forest, Riparian and Wetland Soils Technical Session

Thursday, February 16, 2012 – Morning

Soil and tree ring chemistry responses of Pinus banksiana and Populus tremuloides stands in atmospheric environments in the oil sands region, Alberta, Canada

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Abstract

Chronic impacts of air pollution such as increasing CO_2 and acid emission on forest ecosystems in the Athabasca oil sands region in Alberta, Canada were investigated using ^{13}C, ^{15}N, and Ca/Al of soil and tree ring of Pinus banksiana (jack pine) and Populus tremuloides (trembling aspen, aspen) stands at two watersheds (NE7 and SM8) located at different distance from emission sources. Watershed NE7 was assumed to have been exposed to greater acid deposition due to its closeness to the mining area than SM8. The $\delta^{15}N$ of forest floor was lower ($p<0.05$) in NE7 (-1.42 to -0.87 ‰) than in SM8 (-0.54 to 1.43 ‰), which implies a greater recent deposition of ^{15}N-depleted N in NE7; however, other soil chemistry did not show any difference between watersheds. Gradual decrease of tree ring $\delta^{13}C$ was found over time in both tree species at both watersheds, which supported influences of ^{13}C-depleted CO_2 emission from industrial regions. However, it was not suitable to specify different magnitude of the effects of air pollution between watersheds due to counterbalancing effects of ^{13}C-depleted CO_2 (source effect on decreasing $\delta^{13}C$) and pollutant-inducing stomatal closure (C isotope discrimination effect on increasing $\delta^{13}C$) on tree $\delta^{13}C$. The N concentration and $\delta^{15}N$ of tree rings did not present any difference between watersheds and any trend with time. Interestingly, however, the difference in chemistry between watersheds calculated by subtracting values of SM8 from those of NE7 (NE7 – SM8) and expressed as Diff_X (X is a chemical variable) showed different pattern between watershed. For example, Diff_N showed a temporal increasing pattern with concomitant decreases in Diff_ δ15N, which implies further increase in ^{15}N-depleted N input in NE7 than in SM8. Such trends were clearer in aspen stands ($R2=0.64$*** for Diff_N and 0.44** for Diff_ $\delta^{15}N$ between 1964 and 2009) than in jack pine stands ($R2=0.61$** for Diff_N between 1982 and 2009). Based on our results, $\delta^{15}N$ of forest floor and Diff_N and Diff_ $\delta^{15}N$ of tree rings were suggested as useful indicators to investigate spatial variations of air pollution impacts on forest stands in the Athabasca oil sands region in Alberta.

Entered in Graduate Student Competition

Responses of boreal bogs to increasing nitrogen deposition: A three-year nitrogen experiment

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Abstract

Boreal peatlands play important roles in global carbon and nutrient cycling. A three-year N fertilization experiment with ^{15}N double-labeled $^{15}NH_4NO_3$ as a tracer was designed to study the effects of increasing N deposition on various N pools (including microbial communities, moss, roots, litter and aboveground vascular plants) and how these N pools process and retain applied nitrogen in four ombrogenous bogs in northern Alberta, Canada. Linear growth of Sphagnum mosses was highly variable. Capitula and stem bulk density as well as tissue N concentrations all increased with N deposition, resulting slight increase of annual primary production in high N treatment plots. Microbial biomass N measured by chloroform fumigation-extraction only decreased with N deposition in the first year of the experiment. Fungal biomass declined with N deposition as nutrients are readily available under high N loads, eliminating the need for help from symbiotic fungi for nutrient uptake. However, the growth of Sphagnum mosses and microbial communities are both influenced by drier and warmer growing period during 2005 to 2007. These climatic conditions could have masked the effects of nitrogen deposition on Sphagnum moss and microbial communities. ^{15}N tracer experiment revealed high retention rates of ^{15}N by moss layers as expected. However, retention efficiency of moss layers declined over time and with increasing N deposition, indicating a leakier system as N deposition exceeds the critical load of Sphagnum moss. Aboveground vascular plants overall benefited from N deposition but different species responded differently based on the root morphology, rooting depths, and the mycorrhizae associations.

The importance of mineral soil substrate in the re-vegetation of salinized peat fields

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Abstract

An actively mined coastal bog in Pokesudie Island, New Brunswick was contaminated by seawater through a storm surge and peat mining was abandoned, leaving remnant peat fields of depth 1-2 m requiring reclamation. There were three different site types identified with respect to spatial patterns in moisture and salinity: a) saline and waterlogged adjacent to former drainage ditches in-filled with eroded peat, (b) saline and relatively dry longitudinal central area of former peat fields, and (c) relatively dry areas between the lower elevation type "a" sites and the higher elevation non-saline area along the adjacent service road. Re-vegetation of type "a" sites was successfully demonstrated by an earlier study. Type "b" Sites remained to be studied. This presentation describes one of the trials to re-vegetate type "c" sites and a complementary soil trial that helped explain plant responses.

Agrostis spp. that naturally grew on sand was transplanted with its sand substrate in June 2005 in type "c" sites that sloped down 5% with increasing salinity and moisture. Plant survival and growth were recorded in August 2005 and again in October 2006. Plant survival and flowering were excellent during both years but visual checks showed no spread of roots or rhizomes into the surrounding peat and no rooting at all of any stolons. Agrostis spp. is known to have some degree of salt tolerance as well as the ability to grow in acidic mineral soil but it appeared that it was averse to very acidic peat. The plants continued to grow well probably due to the higher pH provided by its original sand substrate. This was substantiated by another experiment which showed that the pH of a transplanted volume of mineral soil into saturated areas in the peat fields was much higher than the surrounding peat. The re-vegetation of type "c" sites in the salinized peat fields could likely benefit from the addition of a sand layer on top of the peat. These results may have potential application in the reclamation of brine contaminated peatlands in northern Alberta.

Spatial variability of soil hydrophysical properties in Sphagnum dominated peatlands.

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Abstract

Peatlands are wet ecosystems where net primary productivity exceeds decomposition resulting in the accumulation of organic matter over time. In Canada, peatlands cover approximately 12% of the land surface area, and are estimated to contribute 12% of the annual global methane emissions. Hydrology is well recognised as one of the most important controls on the carbon budget of peatlands. Through ecological and hydrological feedbacks, peatlands are characterised by a micro-topography of high and low microforms in the peat surface. Microforms range from 10^0 to 10^1 m in length while peatlands range from 10^2 to 10^4 m.

Differences in the spatial distribution of hydrologic properties across a peatland may result in very different patterns of moisture and water table level, with potential feedback to whole ecosystem hydrology, ecology and biogeochemistry. Moreover, depending on the persistence of these microforms, differences may be persistent with depth, creating three dimensional patterns of hydrologic variability with implications for peatland hydrologic models. However, if the hydrologic parameters are not variable, then a simple homogeneous parameter could be appropriate and simplify modelling efforts.

This study will compare the peat hydrophysical properties of two Quebec and two Alberta peatlands with similar vegetation, but different climates. Specifically the relationship between vertical unsaturated hydraulic conductivity and the depth beneath a microform and between microform types will be investigated in the four Canadian peatlands. Preliminary results suggest that the surface of hummocks have a higher rate of flow than all other peat depths and microform types.

Entered in Graduate Student Competition

Assessment of science for a GHG reduction protocol for boreal peatlands

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Abstract

Canadian Wildlife Federation (CWF) has commissioned ClimateCHECK to assess, based on sound science, the technical feasibly of a greenhouse gas (GHG) reduction protocol for Boreal peatlands. This potential protocol fits into CWF's broader goal to bring peatland habitats into conservation decisions and land use planning and to address the factors affecting peatland conservation.

To date, substantive gaps in knowledge required for development of a rigorous and verifiable GHG reduction protocol have been identified. The regulations concerning peatland conservation and reclamation appear to be in flux. Physical inventories of peatlands are underway, but remain incomplete. Lack of clear regulations and comprehensive databases limit the assessment of the baseline condition of boreal peatlands. Carbon accounting methods for peatlands are in development. And, the practices for GHG mitigation through peatland management are not thoroughly documented. So, a challenge remains to identify practices to be prescribed in a GHG reduction quantification protocol and to attribute change in GHG dynamics to specific types of peatlands subjected to these practices.

The presentation will outline options to address the gaps in knowledge.