9th Annual Earth Day Colloquium

Book of Abstracts

Thursday, April 12 & Friday, April 13, 2012

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Keynote Speakers

The History of Now: Decoding Environmental Sustainability

Dr. Michael Egan

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Michael Egan is an Associate Professor of History at McMaster University. His research and teaching concentrate on the histories of science, technology, environment, and the future. He is the author of Barry Commoner and the Science of Survival: The Remaking of American Environmentalism (MIT Press, 2007), and co-editor of Natural Protest: Essays on the History of American Environmentalism (Routledge, 2008). He is currently at work on two projects. The first explores the history of environmental sustainability; the second treats the global history of knowing and regulating mercury pollution since World War II. Michael Egan is also the editor of a new MIT Press books series titled History for a Sustainable Future, dedicated to publishing short, scholarly books on the histories of contemporary environmental issues.

The Tipping Point: The Emerging Global Sustainability Measurement System and What It Means

David Smith

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Founded over 100 years ago, Sobeys Inc. is a Canadian supermarket company with about 1400 stores across the country and $16 billion in annual revenue. David leads Sobeys sustainability direction, covering direct operations (retails stores, fleets, warehouses) and product sourcing (including sustainable seafood, agriculture, packaging, social compliance, animal welfare). He also participates in numerous Canadian, North American, and global sustainability committees, including with The Consumer Goods Forum and the Global Social Compliance Program.
In his previous position with Sobeys, David was General Manager of its new small urban store concept. Prior to Sobeys, David was National VP of Marketing for Whole Foods Market, Austin, Texas, during which time he was on the Organic Trade Association marketing committee, was on the inaugural Wi-Fi industry marketing committee while with a California-based wireless networking start-up, was with McDonald's Restaurants of Canada, and was with a developing country master franchisee for Pizza Hut and KFC. David has an undergraduate degree in environmental science and a MBA.

Invited Speakers

Research and Science Policy: Experiences Gained from Canada's Ecosystem and Issue Initiatives

Dr. Patricia Chambers

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Canada's Environment Department conducts ecosystem and issue-driven initiatives to advance science-based policy to ensure environmental sustainability. Here I discuss science results from two initiatives and how conclusions informed policy decisions. The Northern River Basins Study was an ecosystem initiative focused on effects of pulp mill expansion. Findings on: (a) dissolved oxygen depletions under ice and sensitivities of vulnerable life stages of fish resulted in new objectives for oxygen; (b) nutrient enrichment led to a cap on wastewater discharge; (c) drying-out of a riverine delta led to changes in hydroelectric dam regulation. The National Agri-Environmental Standards Initiative was an issue-driven initiative to identify ecosystem thresholds protective of aquatic life in agriculturally-dominated watersheds. Thresholds identified for nitrogen, phosphorus and suspended sediments served to define environmental outcomes for watershed management programs, prioritize options for beneficial management practices, and set risk levels for a national report card. Our experience has shown that delivering science to policy makers demands science programs be designed at the onset to address policy questions and requires a personal commitment to give fearless science advice in the face of opposition.

Growing Sustainable Students

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Acting Today, Shaping Tomorrow: A Policy Framework for Environmental Education in Ontario Schools (2009) requires us to be including environmental education in all grades, all subjects and all strands - but is this being done? There has been amazing growth in participation in the Ontario ecoSchools program indicating many schools are going green…but how many teachers and how many of the school population are involved in the process? Part of my job is to promote environmental education and in doing so I try to address waste minimization. To date we have over 90 schools participating in the ecoSchools program and even more that 'going green' but are not under the ecoSchools umbrella. In terms of waste minimization, I can say that schools are doing a fantastic job when it comes to recycling and reducing the amount of garbage waste, but we still have a long way to go in terms of waste minimization – more specifically waste reduction.

My talk will address the many Thames Valley District School Board staff moving in the right direction and looking at ways to address waste minimization beyond reusing and recycling. From paperless week to taking students outside to learn, students learn in, about and for the environment in ways that can serve only to help them better understand and protect our environment. Sustainability appears to be a common thread that is woven throughout TVDSB's environmental initiatives both at the school and system level.

Presentations

Analysis of Energy Contents and Carbon Contents of Soybean Stover Biomass Samples of Different Locations of Ontario

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Canada is committed to tackling climate change through sustained action to build a low-carbon economy that includes reaching a global agreement, working with international partners and taking action domestically. Recently, Ontario government had decided to close all the coal operated energy generators by 2014. Biomass Energy is an organic material that can be burned and used as a source of fuel. This is the right time to think on the replacement of coal based industry by the carbon neutral bio-energy. Agricultural residue is being the main source of biomass. Crops or any type of waste from wood is processed to make wood-pellets and used as fuel for wood pellet boilers and stoves. Crops such as switch-grass, wheat straw, corn and sugarcane are produced to form ethanol which can be used as fuel for vehicles leading towards a great success. Waste heat harnessed by waste-to-energy plants can generate electricity for heating buildings. There are number of research on the torrefaction and energy produced by the biomass but limited papers have addressed on energy consumption during the torrefaction and pelletization for the particular agricultural residues and the reactor at specified temperature and time duration. The purpose of this study is to investigate the energy, Carbon, Moisture and Ash contents of soybean Stover of different locations of Ontario. Samples of Soybean Stover were collected from Essex (ES), Huron (HU), Elgin (EL), Peterboro (PO), Grey/Bruce (BC) and Norforlk (NF) counties of Ontario. The energy content of collected biomass is found from 11MJ/Kg to 18MJ/Kg using bomb calorimeter. The carbon, moisture and ash content of same biomass are found different for different locations. The carbon content varies from 6% to 12% depending upon the locations. It is observed that location and farming environment has impact on the energy and carbon contents of the agricultural residue. For the protection of greenhouse gas emission, production of the agricultural biomass with high energy contents and less carbon contents shall be given high priority in the application bio-fuel.

Keywords: Biomass, Energy contents, Carbon neutral

Optimized synthesis of ceria supported silver nanocatalyst by means of gel casting technique using central composite experimental design

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Ceria supported silver nano catalyst was synthesized using a simple, fast and cost-effective gel casting technique. The gel was made of acryl amide monomer (AM) to disperse, stabilize and control the size of metal nanoparticles. The obtained results were revealed that nano particles can easily confine into three dimensional network of the polymeric gel. Polymer matrix was then removed by calcination under controlled atmosphere and temperature. A central composite experimental design, which is one of the most popular designs of response surface methodology, was used to optimize the production parameters influencing the surface area and particle size. The studied parameters were the amount of cross-linker (N,N'-Methylenebisacrylamide (MBAM)), monomer (AM) to cross linker ratio and monomer to salt (silver nitrate) ratio. Two quadratic mathematical model equations were derived for surface area and particle size. Analysis of variance showed that AM/salt ratio was the most significant factor affecting surface area of nanoparticles. Maximum and minimum values of surface area and particle size were achieved as 5.38 m2/g and 190 nm, respectively. The optimal ranges of AM/salt ratio and amount of MBAM to achieve minimum particle size were 46.97-49.43 and 0.38 – 0.51, respectively. The optimal values of the MBAM, AM/MBAM and AM/salt ratio for the maximum surface area of 6.09 m2/g were found to be 0.54 g, 33.92 and 51.89, respectively.

Keywords: Gel-casting, Ag/CeO2, Nano catalyst, Optimization, Modelling

Light and Heat Selective Nano-films for Sustainable Greenhouses

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North American consumers demand fresh, safe produce year round. The ability to meet this demand is made possible through the use of large-scale commercial greenhouses. In an effort to reduce cost and environmental impact Ontario greenhouse operators use sustainable growing practices. This allows them to produce 30 times more per acre then conventionally grown field commodities while limiting soil fertility destruction and soil loss, exposure to diseases, pesticides and drought. Despite these benefits, high energy consumption and water usage remain a cause for environmental concern.

This work focuses on developing experimental plastic greenhouse covers that improve biomass production and decrease energy consumption in greenhouses. Quantum dot nano particles are used to manipulate and control light transmission, influencing a plants growth and development. Silica aerogels are used to optimize the thermal properties of the experimental films, blocking heat transfer in the form of long-wave infrared radiation.

The experimental films were characterized in terms of their optical and thermal properties. The QDs and silica aerogels incorporated into the films were found to provide simultaneous UV protection, infrared retention, and light selectivity for controlling plant growth, ultimately working to improve biomass production and reduce energy consumption in Ontario greenhouses, lessening their environmental impact.

Keywords: Agricultural Films, Nano-particles, Quantum Dots, Silica Aerogels

Are Invasive Alien Species Pollutants?

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Invasive alien species (IAS) drastically impact the biotic makeup of an ecosystem and can harm its function. IAS have been considered by scientists and media as "biological pollution", meaning that they irreversibly impact an ecosystem by dominating an ecological niche. The question that emerges is whether IAS have the legal properties to qualify as pollution under Canadian legislation. A pollutant creates an abnormal or atypical impact on the environment. Bioinvasions also have extensive impacts to ecosystems. IAS can alter fire regimes, inhibit nutrient cycling, change hydrology, alter chemical composition, and completely alter the appearance and make up of an ecosystem. In addition, IAS can lead to the homogenization of an ecosystem. Local genotypes can hybridize with IAS, or can out-compete local species resulting in native species decline. Therefore, I argue that the impacts of IAS are significant enough to fulfill the definition of pollution. If IAS are legally considered a pollutant, more environmental regulations can be applied to their management. In addition, a wider base of analogous case law about pollution can be considered. Based on the recent dispute concerning the discharge of excess water between the United States and Canada related to the Devil's Lake outlet near the North Dakota/ Manitoba border, the potential for IAS to be considered a pollutant is timely. Defining IAS as pollutants looks to scientific considerations, as well as societal, ethical and legal considerations of what is understood as "pollution" and the "natural environment."

Keywords: invasive species, pollution, environmental law, biodiversity

Devils Lake: Flooded American Homes vs. Canadian Environmental Risk?

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The desire of the North Dakotan State Government to use an artificial outlet to reduce harmful flooding in the closed-loop Devils Lake basin has created controversy due to its potential to spread harmful water quality and invasive species into otherwise unconnected water bodies such as the Sheyenne River, the Red River and the wider Hudson Bay watershed which includes Lake Winnipeg; the World's tenth largest freshwater lake. The province of Manitoba, the State of Minnesota, the Canadian Federal Government as well as various citizen and environmental organizations have, over the years, contested the use of the outlet on grounds of environmental risk. My study will attempt to understand the public discourses which surround this dispute through analysis of policy and printed news media relevant to the situation. It is hypothesized that several inherently geographical discourses have factored into the creation of this dispute including the relationship between freshwater and Canadian national identity, the desire for American interests to avoid foreign interference in domestic politics, the presentation of the topic by the media, and the rhetorical devices used by citizens, government officials and practitioners on both sides. From this discourse analysis of various sources it is hoped that insight will be gained towards how transboundary water disputes can be avoided between the two countries, how water management policy and public discourse interact, and how local media creates or affects public discourses specific to the dispute. In the end, the project will aim to help answer why transboundary environmental disputes exist.

Keywords: Canada-United States, Transboundary Water, Environmental Discourse, Policy, Water Management

The Nahal Oz Reservoir dam-break flood: geomorphic impact on a small ephemeral loess-channel, Negev Desert, Israel

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On March 2001, part of the western dike of the Nahal Oz Reservoir breached and generated a flow release of 3.5*106 m3 of secondary irrigation water. The consequent 12-hour flood surge with an estimated peak discharge of 1000 m3s-1 inflicted severe loess erosion, agricultural, property and infrastructural damage downstream ($6 million) in both SW Israel and the nearby Gaza Strip. The majority of the flood flow was channeled down the 1st order ephemeral Nahal Yare'akh stream.

Post-flood mapping documented the geomorphic response of the channel to the flood. The major geomorphic impact was scour and channel widening along the initial 2 km downstream of the Reservoir. The increase in cross-sectional area was about 60% and had an estimated 170,000 m3 of sediment bank, floodplain and channel erosion. Downstream, a wide braided reach indicates deposition of the eroded sediments, whereas at the end of the channel the floodwater diverged into several watercourses and dispersed over tilled agricultural fields and neighborhoods. The peak discharge attenuated rapidly until the flow diminished 30 km downstream from the reservoir. This reduction is attributed to the anthropogenic infrastructure and transmission losses typical of sandy ephemeral streams.

The study shows that channels within erodible materials respond to high peak discharges and dissipate energy by substantial sediment erosion from the channel bed, banks and floodplain. The spatial extent of downstream sediment deposition varies. The natural flow regime has only minor impact on the newly formed channel geometry, which may preserve for a relatively long time.

Keywords: dam-break, catastrophic flooding, loess channel erosion, geomorphic impact

Saving the Water: A Global Issue with a Community Perspective

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The Western University course, 'Growing Sustainable Indigenous Communities' is focused on developing and instigating sustainable initiatives on the Indigenous community of Walpole Island. Water is an absolutely crucial aspect for sustainability within any community, and our analysis of the issues in Indigenous communities, such as Walpole Island, has led to the construction of a project that analyzes the traditional Indigenous roles that require healthy water. Within traditional and contemporary Anishnaabe culture, practices such as hunting, fishing, and trapping are all crucial components of self-sustainability. All of these elements are also directly connected to healthy water. Other community issues that occur due to poor water quality can be demonstrated by Tyendinaga Mohawk Community in Ontario, whereas a local dump expansion has resulted in community-wide boil water advisory. A much more severe instance of poor water quality on Indigenous communities can be found on Grassy Narrows Reserve, where mercury contamination has had horrific repercussions, such as birth defects and even death. Poor water health is therefore an incredibly detrimental factor to Indigenous cultural elements, Indigenous self-sustainability, and Indigenous lives. Water purification technology, facilities, awareness, and projects are paramount to life as an Indigenous person; therefore the design and implementation of this project is of utmost importance. Many communities, Indigenous and others, across North America are currently deprived of the basic human right to clean drinking water, and therefore self-sustainability is unfeasible until methods of water purification are implemented.

Keywords: water purification, ecosystem health

Fast food or fine dining: what's for dinner in our acidic ocean?

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Ocean acidification, the result of decreasing ocean pH due to the solubilization of atmospheric carbon dioxide, is an effect of global climate change that has substantial implications for the marine food web. Notably, the ocean's primary producers- the phytoplankton community- may be physiologically impacted by acidification in a way that can affect the health of all levels in our marine food web. Most studies on phytoplankton in acidified waters have examined changes in biomass and community structure. Unresolved, is whether the quality of phytoplankton as a primary food source to fish and higher trophic levels will remain unaltered. There is a need to assess whether there is a link between the nutritional value of phytoplankton as suitable prey to support highly productive food webs and the chemistry of an acidifying ocean. Of particular ecological importance are the consequences resulting from the dietary link of phytoplankton to the reproductive and developmental potential of fish and higher trophic levels. Essential fatty acid (EFA) production in phytoplankton has the unique potential to exert bottom-up control on animal populations in aquatic systems. Quantifying the link between phytoplankton EFA production and nutrient availability from ocean acidification is crucial because EFAs are the only lipid constituents that cannot be synthesized by animals and must be obtained through diet. Understanding the link between nutrient availability and phytoplankton in acidified oceans will allow for improvements in the quality and management of marine fisheries, economies, and the health of communities around the globe that rely on fish for consumption.

Keywords: ocean acidification, fatty acid, phytoplankton, upwelling, carbon dioxide

An examination of policy implementation for the 2008 Koi Herpesvirus outbreak in Lake Simcoe, Ontario and disposal of Cyprinus carpio carpio L. contaminated with Polychlorinated Biphenyls (PCBs) on Snake Island, land of the Chippewas of Georgina Island

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Fish epizootics are rapidly causing international concern regarding the sustainability of numerous aquatic industries and their associated communities. In Canada, these issues are compounded as some of the diseased fish are known to bioconcentrate elevated levels of persistent organic pollutants which have been associated with adverse effects on exposed biota. During the summer of 2008, a mass die-off of Cyprinus carpio carpio occurred in Lake Simcoe as a result of an outbreak of Koi Herpesvirus. Following the mass mortality of C.carpio, by recommendation of the Ontario Ministry of Natural Resources, residents were instructed to bury the carcasses or place the bodies out for roadside pickup. Considering the history of unsustainable development in the Lake Simcoe watershed and extensive literature documenting the trophic amplification of persistent organic pollutants in carp, concern has been raised regarding the movement of hazardous substances through the ecosystem via improperly disposed biota. Disposal policies at both the provincial and federal level omit handling practices for fish, which in many cases are known to be significant sources of environmental contaminants. There is reasonable concern that current disposal guidelines for fish epizootics are not sustainable, as they do not sufficiently consider the socio-ecological health of private landowners and local residents and fail to consider the bioconcentration of inorganic contaminants. As the movement of aquatic species continues to grow at an accelerated rate throughout the world, comprehensive biota disposal practices need to be implemented at a local, provincial and national level in order to protect Canada's valuable aquatic resources.

Keywords: Epizootics, Disposal, Sustainability, Toxicology

Current Status and Challenges of Membranes for Microbial Fuel Cell Application

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Microbial fuel cell (MFC) is a promising technology that can simultaneously treat waste and wastewater, and produce renewable energy. Membrane is a vital component in traditional MFC designs. Cost and performance of membranes is considered as one of the major barriers for the practical implementation of MFC. Cost of membrane is almost 38% of the total capital cost of MFC. Therefore, a focus on the development of membranes is very indispensable to make the MFC technology commercially competitive. Although various types of membrane including proton exchange membrane, anion exchange membrane, bipolar membrane, ultrafiltration membrane, microfiltration membrane, forward osmosis membrane, and nanocomposite membrane etc. have been explored for MFC application, researchers are still facing a number of challenges associated with membrane application for MFC such as internal resistance, price, oxygen leakage, proton transfer efficiency, substrate loss, pH gradient, membrane polarization, scale up, biofouling etc. This presentation focuses on the current status of membranes for MFC, recent advances, and the need of further research and development of membranes for MFC application. Based on the literature survey, it was found that low-cost anion exchange membrane would be a good choice for MFC application from techno-economic perspective.

Keywords: Microbial Fuel Cell, Membrane, Renewable Energy, Water and Wastewater Treatment

Bacteriological Analysis of Faecal Pollution and Solar Radiation Disinfection of Domestic Water Sources within Lake Naivasha Basin, Kenya

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There is rise in exposure of water sources to faecal contamination as a result of expanding anthropogenic activities within Lake Naivasha Basin in Kenya. This contamination exposes water users in the region to a variety of health risks. This study investigated faecal pollution of community water sources (Lake, Rivers and boreholes) within Lake Naivasha basin through determination of the concentrations of total coliforms, Escherichia coli, intestinal enterococci, Clostridia perfringens and heterotophic bacteria in various water sources using Membrane Filtration Technique (MFT) and Heterotrophic Plate Count (HPC) procedures. The potential of solar pasteurization in disinfecting domestic water was also explored by heating known volumes of water samples in a black solar box cooker at given time intervals. In addition, determination of E. coli to intestinal enterococci ratio was used in faecal pollution source tracking. Physico-chemical parameters were measured in situ for all water sources. Data was analysed for mean variation using Statistical Package for Social Sciences (SPSS) version 17 software. Surfaces sources gave higher values for all microbial parameters than borehole sources. Borehole direct sources showed no significant variation with respect to site for microbial parameters (E. coli, total coliform, intestinal enterococci, C. perfringens and HPC), the same was also observed in borehole points of use sources, ($P>0.05$). Surface sources showed significant spatial variation for microbial parameters, ($P<0.05$). Samples from households in Karagita, Mirera and Kamere villages and vendors also showed no significant variation for all the microbial parameters, ($P> 0.05$). The use of solar radiation in water disinfection showed that 75 0C attained after 30 minutes from pasteurization point, E. coli and total coliforms were completely eradicated from all the water sources. E. coli to intestinal enterococci density ratios from all the water sources were closer to 0.7; this showed that non human warm blooded animals were the most possible source of faecal pollution into these water sources. In conclusion, there was pollution of the water available for domestic use in L. Naivasha basin and poor handling further deteriorates this quality. The use of solar radiation can be recommended as a cost-effective method of disinfecting water for domestic consumption to reduce likely incidences of waterborne diseases. Use of other methods like ribotyping is also recommended in tracking the possible sources of faecal pollution into water sources within Naivasha lake Basin.

Keywords: Faecal, Indicators, Naivasha, Pasteurization, pollution, waterborne diseases

Unlocking the door to cyanobacterial blooms: siderophores are the keys

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Freshwater lakes provide a number of significant ecological services including clean drinking water, habitat for aquatic biota, and economic benefits. The provision of these ecological services, as well as the health of these aquatic systems, is threatened by the excessive growth of algae. Cyanobacteria are creating suffocating blooms that cause negative effects, which impact the quality of aquatic environmental health. Historically, blooms have been linked to eutrophication but recent occurrences indicate that there are less dramatic changes that induce these blooms. One putative regulator is iron availability. Iron is an essential micronutrient required for specific essential metabolic pathways (i.e., nitrogen metabolism, chlorophyll synthesis, photosynthesis). In naturally occurring lakes, the amount of biologically available iron, ferric (Fe III) iron, ranges from saturation to much lower than cell transport affinities. To assist in the modulation of iron availabilities cyanobacteria in culture produce low molecular weight iron chelators called siderophores that function in an iron binding and acquisition system. It is hypothesized that cyanobacteria produce and utilize siderophores in low Fe and nitrogen (N) conditions, creating a competitive advantage over other algae in freshwater lakes. Previous studies have been conducted both in laboratory experiments and marine systems, however, studies in freshwater lakes are generally lacking. This study aims to provide insight on the potential for natural blooms of cyanobacteria to produce and advantageously utilize siderophores in the freshwater lakes of Alberta.

Keywords: Cyanobacteria, iron, siderophores, freshwater

Integrated Renewable Bioenergy System “THE fuel of the future”: A Fuel With ‘no’ carbon emissions”

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In times of shrinking fossil energy resources, renewable bioenergy is a visible alternative for satisfying today’s energy needs. Among many alternatives, integrate biohydrogen and microalgae biofuels processes have a potential to reduce greenhouse gases (GHGs) and contribute to secure energy supply. Integration of such a renewable processes not only reduce the carbon emission, but also reduce the foot print renewable bioenergy systems and enhance the efficiency of the microalgae process with a continues feed of CO2.
Coupling microalgae culture and anaerobic digestion to process a waste materials into hydrogen and methane and use the solar energy and microalgae to produce bio-oil and sequestrate the CO2 produce in the first system. A novel integrated waste-to-energy system for biohydrogen, bio-oil, and fertilizer production used for treatment different types of organic wastes and called: Integrated Bioenergy Reactors System (IBRS).

Keywords: Microalgae, Bioenergy, renewable, greenhouse gases, biohydrogen

Near surface water storage dynamics in a Mexican tropical Dry forest: Over, under or through?

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Infiltration and percolation exert strong controls on near-surface soil water storage dynamics. A key initial step in understanding runoff is to characterize these processes which govern the entry of water through the soil surface and can contribute to surface runoff generation. In tropical dry forests, the prolonged dry season may affect infiltration due to the development of soil water repellency (SWR), and the short duration rainy season may limit periods of percolation and soil water recharge. As the soil water balance governs ecosystem processes and the translation of surplus water downslope as event runoff, an understanding of soil water dynamics is essential to predicting both current and future water availability in these already water-limited catchments.

Investigations were carried out at a small dry forest catchment in central Jalisco State, Mexico. Rainfall and soil water content were continuously monitored, while soil surface infiltration and water repellency were measured during the wet and early dry seasons. During the early dry period, the average cumulative infiltration rate was 9 mm/h and soils were strongly hydrophobic. Unlike the dry period, the wet season characterized by higher infiltration rates (200 mm/h) resulting in rapid increases in soil moisture to small rainfall inputs.

Keywords: Infiltration, soil water repellency, runoff, tropical dry forest

Urban Vacancies Revisited: Strategic re-integration of vacant lands into more sustainable land patterns

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Eighty percent of the Canadian population lives in urban centres, where typical land use patterns negatively impact urban ecosystems and decrease quality of life. Current municipal Community Improvement Plans target urban vacancies for intensification efforts and provide incentives for redevelopment. Efforts to manage growth by intensification can result in a more compact city but can increase fragmentation and degradation of the urban ecosystem. This project examines the urban environment: its vacancies, ecological patterns and human impacts. A strategy derived from ecological principles of re-establishing connectivity, creating large patches of nature as well as small heterogeneous patches, will be applied to select neighbourhoods within Guelph's Community Improvement Project Area. The resulting land transformation will be evaluated using landscape metrics, i.e., patch size, number, shape, density, and orientation. A neighbourhood ecological planning approach to vacancies may provide previously unconsidered opportunities to decrease fragmentation and create a more resilient, sustainable urban environment.

Keywords: Landscape ecology planning, ecological patterns, neighbourhood revitalization, urban ecosystems

Do developing countries face a higher cost of reducing carbon emissions?

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The rapid growth of developing countries requires increasing energy consumption, and the cheapest energy sources usually require burning fossil fuels. As developing countries continue to grow rapidly, greenhouse gas (GHG) emissions from these countries are thus expected to grow very quickly as well. For example, between 2000 and 2050, China's emissions are expected to increase by 180% while the U.S.'s emissions increase by 56% and the EU's emissions increase by 30% (Weyant et al. 2006). This implies that developing countries must significantly reduce emissions compared to a business-as-usual scenario to stabilize global emissions. However, it has been argued that developing countries cannot significantly reduce emissions growth without hampering economic development because their energy mix is very carbon-intensive. This is compounded by the fact that energy intensity (energy consumption per unit of GDP) is also higher in developing countries.

Although the role of developing countries has been at the heart of international climate negotiations, there has been little work comparing the costs of reducing emissions across countries. I use an energy-economy model to study how GDP is affected by lowering emissions via a carbon tax. I compare losses across countries to see if developing countries face much steeper losses than developed countries. I find that developing countries face a larger decline in GDP from a carbon tax for an equivalent reduction in emissions, especially countries with a high dependence on coal. This implies that transfers to developing countries will be required to secure a global climate treaty.

Keywords: Climate Change, Carbon Tax, Economic Development, Macroeconomics

Reconstructing Fire Severity from the Oxygen-Isotope Compositions of Plant Char

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Char formed from biomass burning is resistant to decay and so the presence of char in soils can be used as an indicator of the occurrence and frequency of past natural fires (forest or grassland) or anthropogenic burning (milpa agriculture or hearths). However, little is known about the temperature and duration of paleo-fires, which in modern systems are known to vary with fuel source and aridity. This study assessed whether variations in the δ18O values of char could be related to burning severity. Ground samples of oak, pine, and grass plant species were charred for varying durations (5 and 30 minutes) at constant temperatures between 200 and 900°C, and under oxygenated versus anaerobic conditions. Char δ18O values became progressively depleted of 18O by up to 25.8‰ for wood and 16.5‰ for grass as temperature, duration of burning, and amount of oxygen increased. The primary reason for the decrease in δ18O values as charring progresses is the loss of 18O-enriched compounds such as cellulose at lower temperatures (300-600°C). However, the decrease in δ18O values of the remaining lignin or whole wood residues at higher temperatures suggests there is also exchange occurring with 18O-depleted water vapour or loss of 18O-enriched volatiles. The large shifts in δ18O values observed in this study for charred wood and grass species suggest there is potential to use the δ18O values of char to estimate fire severity and reconstruct paleo-fire dynamics (e.g., rate of spread, fuel type, extent of burning, etc.) from char preserved in soils.

Keywords: Char, experimental burning, fire severity, oxygen isotopes, paleo-fires

Promoting Sustainability: How Consumers Respond to Sustainable Message?

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Promoting sustainability is a major global challenge facing governments, non-government organizations as well as businesses. A fundamental criterion for evaluating the effectiveness of any sustainable policy or sustainable practice is whether the public (or mainstream consumers) take sustainable actions in day to day life. In order to promote sustainability to the public, governments and organizations spend a huge amount of budget launching various public campaigns to promote sustainable behaviour. However, based on sustainable literature, the majority of these campaigns did not achieve their marketing goals, leaving no or little impacts on consumers' day to day behaviour. This study will investigate how the public (or mainstream consumers) respond sustainable message claimed in sustainable campaigns. Through reviewing current sustainable marketing and sustainability literature, the author suggests that consumers' responses to sustainable message include several stages of cognitive, emotional and behavioural reactions to the claimed message. The responding process is also affected by three factors, including consumers' individual characteristics, message characteristics and communication situations. According to the above propositions, the author will be developing a comprehensive model that illustrates consumers' responding process to suitability message. This model contributes to sustainability literature by providing a theoretical and managerial guideline for sustainability researchers and practitioners.

Keywords: sustainable communication, consumers, marketing

Community-based Ecosystem Health at Walpole Island First Nation: An enhanced risk for incidence of type 2 diabetes and neurodevelopmental deficiencies from exposure to environmental contaminants

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Many members from Walpole Island First Nation (WIFN) community believe their health is negatively impacted by exposures to environmental contaminants, including toxic metals such as mercury and persistent organic pollutants (POPs) in their traditional food and water supplies. In a multi-disciplinary, participatory, community-based, collaborative investigation, this study began the process of delineating the current exposures and body burdens of some common pollutants (mercury; other toxic metals; organochlorine (OC) pesticides and PCB congeners) in community members at WIFN and in ten species of traditional, local fish and game. Particular attention is given to two pathologies that have been associated with environmental exposures, and that could be adversely affecting First Nations communities: type 2 diabetes (arsenic and POPs) and neurodevelopmental deficiencies (mercury). It is hoped increased understanding of the real, current links between diet and exposures to contaminants, and the associations between these exposures with the disease burden in First Nations will empower people to make changes that will benefit their health as well as reduce stress caused by fear of exposure to environmental contaminants.

Keywords: ecosystem health, type 2 diabetes, First Nations, POPs, toxic metals

John Muir's wilderness: The significance of place attachment

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John Muir was a Scottish-born American naturalist, author and a prominent figure in the conservation movement. Muir's writings depicted his wealth of experience in some of North America's most wild places, illustrating an in-depth understanding of places and their inherent values.
The concept of place attachment is used to investigate the relationship between Muir and his environment. Briefly, place attachment is the bonding between individuals and their chosen places of importance. This study responds to the following research questions: (1) What are the connections and disconnections between Muir's writings on wilderness and contemporary place attachment literature? (2) How might contemporary place attachment literature benefit from Muir's writings?
Included in the analysis are the following texts: My First Summer in the Sierra, Stickeen, and Travels in Alaska. Coding will be guided by Scannell & Gifford's (2010) place attachment framework (person, place, and process). The constant comparative method of data interpretation was used to refine and merge basic codes into more comprehensive themes.
Furthering the understanding of the influence that wilderness had on Muir's life rekindles the debate as to whether or not wilderness experiences and the subsequent attachment ascribed to those places leads individuals towards preservationist values. The analysis of Muir's written works offers a unique view of an untouched North American wilderness and the values associated with those places.

Keywords: Place Attachment, John Muir, Wilderness, Preservation

Sweetgrass Teachings and Environmental Sustainability

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First Nations Peoples have always used traditional medicines as a means of sustaining their way of life. These teachings are passed down from generations as lessons for preserving the natural elements of the earth for the future. In recent years the people of Walpole Island have become disconnected to both the teachings of medicines and the land, which has resulted in an overall apathy at the community level. Therefore, it has become important for our communities to relearn the significance of traditional teachings. Amongst First Nations there is a teaching behind the sweetgrass braid in which it represents the interconnected importance of the land, water and air. As the teaching goes "We cannot live without one [of the elements]"; if one element becomes unhealthy, all three are affected. As a result our communities risk becoming unhealthy as well. Walpole Island First Nation has an incredibly rich and fertile history of growing, maintaining, and protecting the cultural significance of sweetgrass. Our goal for this project is to raise awareness within the community by presenting ways in which the individual can reconnect to the environment by relearning the teachings associated to natural medicines such as sweetgrass.

Keywords: Walpole-Island, First-Nations, Sweetgrass, Community, Teachings

Stories of Activism: A Narrative Approach to the German Anti-Nuclear Movement

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The environmental movement would be impossible without the work activists and yet, in the field of environmental studies, few interviews with activists have been conducted. With the burgeoning of social movements around the world, it is important to ask how and why activism occurs. This study of German anti-nuclear activists is a start. I interviewed 11 Greenpeace Germany volunteers and 1 staff member over a 3 month period in Freiburg, Frankfurt, Berlin and Hamburg, Germany in the summer of 2011. The interviews were conducted using a narrative framework and the resultant data analyzed using thematic analysis. Narrative studies begin with one main question and proceed with follow up questions depending on the answers given. Thus, I asked the activists to tell me a story about their life, how they first became interested in their environment, and how they later joined Greenpeace. Several themes including family background, the effect of the Chernobyl nuclear plant meltdown, and experience abroad were identified as reasons for becoming active. Despite social movements becoming increasingly global, very few studies look at the effects of travelling and living abroad on activists. Over half of the anti-nuclear activists in this study spent extensive time abroad. Many found their self-confidence increased while others returned home with a renewed appreciation for Germany, its high environmental standards, and vibrant anti-nuclear movement. In the age of the Arab Spring and Occupy, this study makes an important contribution to the literature and points to new avenues in environmental research.

Keywords: activism, Germany, nuclear, narrative

Urban Dweller Sadly Seeks Stellar Access

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In a world of cities, where can people learn about the world they are supposed to protect? In many jurisdictions the responsibility for ecological awareness is transferred to schools. Outdoor Education Centres attempt to evoke a sense of ecological literacy, but how well do they achieve their goals. In the proposed presentation of my research project, I will begin with some background detailing the manner in which many urban children are educated about the environment. I will then ask the audience the hard questions concerning their perception of what is the best manner to evoke environmental protection in people. What conclusion will we reach? It aims to be an interactive talk about being in the multi-media world, the endeavour of environmental consciousness education, and an examination of what we need to do if we want people to care about the environment that surrounds them.

Keywords: pedagogy, consciousness, education, biophilia, evaluation

Learning About European Union's Geographical Indications Programs from the Expert/Local Knowledge Debate

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The relationship between expert and local knowledge has been debated significantly in the field of science studies and particularly during the Science Wars of the 1990s. While some assign superiority to one or the other forms of knowledge, others claim that such a dichotomy no longer exists or is no longer relevant. Some scholars have began to examine how expert and local knowledge can be integrated and how they can work together to resolve real problems on ground. This article will apply Geographic Indications (GI), specifically the Protected Designations of Origins (PDO), Protected Geographical Indications (PGI) and Traditional Specialities Guaranteed (TSG) programs in the European Union (EU) to demonstrate the integration of expert and local knowledge for policy purposes. GI programs in the EU are often commended for protecting local knowledge as well as for being very inclusive of local stakeholders in the application of programs. The discussion begins with an overview of the various debates that have taken place around expert and local knowledge. The paper will then introduce the GI programs in the EU. The article will then argue that 1. the boundary between expert and local knowledge still exists in this context, 2. the two forms of knowledge do work together, and 3. they can be successful in creating policies and programs having positive practical effects for specific local stakeholders.

Keywords: Geographical indications, Rural Development, Local knowledge, Expert knowledge, Europe

Reactive Transport of Heavy Metals in a Freshwater Beach, Great Lakes, Canada

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Groundwater may provide an important pathway for pollutants to enter the near shore water of the Great Lakes. Complex physical flow and chemical processes occurring close to the groundwater-lake interface strongly control the transport and fate of groundwater-derived contaminants discharging to the lake. Groundwater quality measurements collected at a freshwater beach during August 2011 revealed significantly elevated concentrations heavy metals including arsenic and iron in the groundwater beneath the shoreline. The arsenic groundwater concentrations below the shoreline were significantly higher than those measured in the groundwater at a nearby industrial brownfield site. The subsurface distribution of the heavy metals indicates that the elevated concentrations below the shoreline maybe due to with the accumulation of heavy metals at this location due to dynamic groundwater-lake interactions or alternatively maybe due to naturally occurring processes in sandy sediment. If the heavy metals in the groundwater are naturally-occurring they may also be elevated at other sandy shoreline all along the Great Lakes and this may have major implications for the chemical budgets for the near shore waters.

Keywords: metal transport, freshwater beach

Nanostructure-initiator mass spectrometry for analysis of peptides

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Nanostructure-initiator mass spectrometry (NIMS) is a new low background and high sensitivity mass analysis technique based on a nanostructured surface, which has an ability to trap initiators such as perfluorinated siloxanes. Initiators trapped within the nanostructured material are readily transported into the gas phase by laser-induced heating, and help release and ionize intact molecules absorbed on the surface. Nanostructured silicon surface composed of 10-20 nm pores were prepared by electrochemically etching of crystalline silicon in hydrofluoric acid/ethanol solutions. Peptides such as Dalargin and Bradkyinin were detected using bis(heptadecafluoro-1,1,2,2-tetrahydrodecyl) tetramethyldisiloxane as the initiator. A detection limit on the order of femtomoles was achieved. Compared with MALDI, NIMS analytes exhibit minimal fragmentation and the resultant mass spectra have a low background noise. Our results demonstrate that NIMS has the potential to be very useful in the analysis of small molecular weight compounds.

Keywords: Nanostructure-initiator mass spectrometry peptides analysis

Naturally-speaking: Educational connections of language and land

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The indigenous and tribal communities in Canada and India are strongly connected to nature. Nature is a way of life for these communities but unfortunately, when indigenous/tribal children enter schools they face a strong disconnect. The route employed by schools for teaching indigenous minorities takes children away from their roots and thus children from indigenous/tribal communities fail to grow academically. Thus, there is a strong need to include indigenous/tribal children's language and cultural resources in pedagogic processes to ensure that children can participate in teaching-learning processes and learn.

With the help of few activities employed in educational projects in India, we will demonstrate how nature can be utilized to teach indigenous/tribal children not only about environmental issues but also mathematics and language. In Canada, language reclamation activities of Walpole Island First Nation will be shared and discussed as a means to establish, maintain, and strengthen the relationship between self and the natural world. Although definitions of sustainability may be different for different peoples, the authors believe that natural and cultural resources within education are key components to building sustainable communities.

Keywords: Indigenous/tribal communities, language reclamation, cultural resources in education

When Sea Dry We Go by Land: Livelihood Swap due to Climate Change

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A key component of climate change adaptation is the ability of actors and institutions to moderate climate change related constraints and to take advantage of opportunities. In many circumstances, this involves entire communities swapping their traditional livelihoods impacted by climate change to new and untested forms of livelihood practices. But the inherent socio-ecological costs of climate change-induced livelihood switch have not been satisfactorily explored in community based adaptation strategies. In this paper, I present initial assessment of the social and environmental costs of artisanal fishermen swapping marine fishing for farming as a result of the impacts of climate change. The paper is based on a qualitative study of a selected number of fishing communities in the Dangme East District of Ghana. Initial findings suggest that the major environmental costs associated with climate change-induced livelihood (and occupational) swap from artisanal fishing to farming include intense exploitation of and associated damage to ecological resources/services due to prolonged poverty conditions; deforestation and its implications for carbon sequestration and; salinization of water resources. Also, prevailing environmental challenges manifest in frequent conflicts among stakeholders and supporting institutions which tend to undermine sustainable environmental management in the district.

Keywords: climate change, livelihoods swap, salinization, artisanal fishing, farming

The influence of landscape composition and configuration on patterns of genetic structure in the pitcher plant midge, *Metriocnemus knabi* (Diptera, Chironomidae)

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In many natural landscapes suitable habitat for species occurs in small spatially distinct patches. Often the population genetic structure of a species is associated with the distribution of its habitat, however it remains unclear how the composition and configuration of habitat patches influence gene flow among populations. Here we investigate the relative contribution of landscape composition and configuration to patterns of genetic structure in the pitcher plant midge, *Metriocnemus knabi*, across spatial scales. As an obligate larval inhabitant of the leaves of the purple pitcher plant (*Sarracenia purpurea*), the habitat for *M. knabi* is defined and organized among pitcher leaves, plants, clusters of plants, and bogs. We use the amount of habitat, the size of habitat patches, and the degree of isolation among habitat patches from the fine leaf scale to broadest bog scale as metrics of landscape composition and configuration, and hierarchical F-statistics as metrics of genetic structure. With a statistical modelling approach, we predict that the spatial configuration of habitat has a stronger effect on patterns of genetic divergence than the amount of habitat. Our results will provide critical insight into the underlying processes affecting the spatial organization of genetic variation in nature.

Keywords: Landscape genetics; population genetics; dispersal; gene flow; hierarchical F-statistics

Developments in Gamma Regression

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Analyzing left-censored gamma data has significant application to environmental sciences and relevant industries where data from research may be incomplete. Left-censored data are similar to survival data in that data are not known beyond a certain limit. In general, censoring occurs when the value of observation is only partially known. There are different types of censoring, we concern about the left-censored data where a data point is below a certain value but it is unknown by how much. In our study, we intend to find a method recommendation for analyzing left-censored data using simulation. We simulate left-censored data under the assumption that the underlying distribution is gamma. We implemented a new exact MLE that includes censoring with gamma regression. We use our proposed model with the forest fires data from the Montesinho Natural Park from January 2000 to December 2003. We compare estimates of the left-censored gamma for the forest fire data with glm and OLS estimates

Keywords: OLS estimates, left-censored gamma

Surface water and groundwater contributions to streamflow in the Hudson Bay Lowlands

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Extensive peatlands of the Hudson Bay Lowlands (HBL) in Canada's North have remained relatively unexplored, particularly with respect to hydrology of the region. The importance of understanding hydrological processes of the 2nd largest peatland is related to the projections of climate warming and mining activities, which will inevitably affect water and biogeochemical cycles of the peatland.

The study site is located in the vicinity of the De Beers Victor Mine in the Attawapiskat River basin, and is characterized by a continuous peatland underlain by low-conductivity marine sediments and Silurian limestones. The complex regional geology controls the relationship between the groundwater and surface water systems.

The objective of this research was to determine the sources of water and to quantify their contribution to the streams of different orders in the HBL using a chemical mixing model approach. Naturally occurring tracers (major ions, DOC, isotopes of water) have been applied to define the end-members, or chemical signatures of contributing water sources, and explain the differences in water composition in the small creeks draining the muskeg, and the large rivers incised into bedrock. The results revealed considerable variability in the end-member and stream water chemistry. The estimated proportions of surface water and groundwater in streamflow varied over time and scale, with larger rivers showing a downstream increase of groundwater contribution. Assessing the variability in stream water chemistry and water sources provides an insight into the sensitivity of these catchments to the current and projected changes in climate and land-use.

Keywords: streamflow, peatland, groundwater, water quality

Aggregate site rehabilitation in the Region of Waterloo, Ontario: Challenges and Opportunities

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On average, less than 50 per cent of land disturbed by aggregate operations (i.e. sand and gravel pits) in Ontario is rehabilitated annually. This low rate of rehabilitation is increasing the contentious nature of proposed projects and intensifying the social and environmental impacts of aggregate extraction on the landscape. Using the Region of Waterloo as a case-study, the purpose of my research will be to: determine the rate of aggregate site rehabilitation occurring within this municipality, assess the quality of completed rehabilitation, and explore stakeholder views regarding the rehabilitation process. This research will seek to identify gaps and deficiencies in the existing regulatory framework. Data analysis using MNR records will determine the rehabilitation rate of expired sites within the Waterloo Region and site-visits will be used to assess the quality of the completed rehabilitation. In addition, semi-structured interviews will be conducted with stakeholders in order to identify the challenges and opportunities regarding the aggregate site rehabilitation process. The results of my study can be used to inform aggregate policy review processes and lead to the adoption of new regulatory measures. An increased rehabilitation rate for worked-out sites will lessen the social and environmental costs of aggregate extraction on the landscape, resulting in a more sustainable industry and fewer land-use conflicts. This is an ongoing Master's thesis project; the research proposal and any preliminary findings will be presented.

Keywords: rehabilitation, aggregate industry, policy

Indigenous peoples and their traditional knowledge: a resource for community-based sustainable development

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Indigenous peoples' traditional knowledge is an undervalued resource that is often ignored in the development process and sustainable use of natural capital. In terms of generating sustainability in Indigenous communities, we look to the world peoples and past practices in an attempt to foster community based approaches to sustainable development and to increase education and knowledge of past cultural practices. Through research of world response to the extinction of Indigenous people, researchers have developed a protocol that revitalizes community resources and knowledge to sustain future development and protection of a body of knowledge specific to a particular ecosystem. Specifically, this proposal focuses on the Indigenous community of Walpole Island – a small community outside of London. Using the Sustainable Development Platform Method, first proposed by Matthew Campbell-Ellis, the methodology focuses on potential environmental and socio-cultural benefits for the community. Community input is emphasized as the most important factor in determining which sustainability approach to use. So in using a focus group methodology to assess the needs of the community, two small-scale projects were identified. "Living Books" capitalizes on a pre-existing community resource, essentially facilitating an exchange of historical information from elder to community member. "Treaty Walking" allows the dissemination of knowledge about important historical events and environmentally significant locations. Harnessing community knowledge through preservation of past practices sustains development and re-institutes praxis. It is our belief that practices from the past can be used to propel the Indigenous community on Walpole Island into the future.

Keywords: Walpole, Community-based, "Indigenous Peoples", "Traditional Knowledge," "Sustainable Development"

Harmful cyanobacterial blooms in Lake Naivasha, Kenya: Causes, health risks and the way forward

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With our global population rising and the demand for freshwater increasing, cyanobacteria harmful algal blooms (cHABs) pose a threat to water resources. Cyanobacteria can produce harmful cyanotoxins that lead to illness or death if ingested. Lake Naivasha, Kenya, a eutrophic, human-influenced lake, provides valuable ecological services for the community—directly influencing the health of its human population. cHABs were first observed about six years ago, but the ecosystem health implications of these blooms have not yet been examined. Physical, chemical and biological parameters were measured in Lake Naivasha from September 2010 to August 2011. During this time there were periods of high and low cHAB dominance, as well as no bloom at all. While the overall eutrophication of Lake Naivasha can be contributed to years of land use changes, improper sewage treatment and increased nutrient loading from agricultural activities, results indicate that this particular cHAB was controlled by lake level and rainfall changes. The concentration of microcystin, a harmful liver toxin, peaked when bloom biomass was highest, but concentrations were below 1µg/L—the maximum concentration guideline of microcystin in drinking water set by World Health Organization. Future cHAB occurrences should be monitored to ensure that microcystin levels do not increase. Key points of intervention will be presented as potential solutions to control future cHAB events in Lake Naivasha. Furthermore, ideas to foster empowerment in Naivasha will be discussed, so that the community can understand these environmental issues and take action when their ecosystem is presenting a risk to their health.

Keywords: cyanobacteria, harmful algal bloom, microcystin, Lake Naivasha, Ecosystem Health

Towards Sustainism: A call for new aesthetics in theatre, live art and performance

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Recently there has been a 'performative turn' in the study of environment and society. Nature and nature-human relations are no longer viewed as static structures and rules but as a dynamic symbiosis, "an adaptation and mutual change in relation with the natural world, and openness to the emotive, sensual, and perceptual dimensions of nature-social 'relations'". When we, as artists, create theatre, live art, and performance, we too are performing nature. These performances leave remains, traces on our environment, some of which are direct and immediate, most of which are indirect and long lasting.

This talk explores the relationship between environmental ethics and aesthetics in performance calling for a new aesthetics. I posit: Do ethics have a role in aesthetics? How do environmental ethics influence aesthetics in performance? Does theatre, live art and performance have a responsibility to the environment? Critical theory is gently woven into this exploration of a new aesthetic system that examines a work's ecological impact and artistic footprint. Gododdin was a large-scale, site-specific work presented in an abandoned car factory by Welsh Performance group Brith Gof. Mike Pearson describes the show as "a scenography which 'brought the outside inside,' an arrangement of hundreds of tons of sand, dozens of trees and wrecked cars, and thousands of gallons of water, the latter of which gradually flooded the performing area during the performance."

In 2009, I created a radical re-performance of the (in)famous site-specific performance Gododdin. Performed in a natural grove on Penglais Hill in Aberystwyth Wales, my performance brought the manmade elements of the car factory–car tires and hoods–into a natural space with its own naturally occurring trees and dirt, working with nature instead of against it. Learnings from this experience will be shared with the symposium to help elucidate my call towards a new aesthetics, towards Sustainism.

Green and Bare Roof Module Energy Balance Assessment

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"Green roofs" are a modification to the built environment that replace traditional building roof materials with a vegetated cover. Through alterations of the surface energy and water balance, green roofs modify the microclimate and hydrology of roof surfaces which can lead to improved environmental conditions at both the building and urban scale. Here we analyze the surface energy balance of vegetated and bare (only growing medium) roof modules for a 10 day period in early October 2011 on the roof of the Claudette-MacKay Lassonde Pavilion at the University of Western Ontario. Two test arrays were constructed, one using vegetated modules and the other with bare (growing medium-only) modules. Direct measurements of the net radiation, latent heat flux and ground heat flux were made for both test arrays. The net radiation for the bare module was greater than that of the vegetated. After a rainfall event the maximum latent heat flux for the vegetated modules was 33% of the net radiation while for the bare module was 56%. After several days of evaporation the maximum latent heat flux dropped to approximately 13% and 22% for the vegetated and bare modules respectively. The soil heat flux fraction was substantially reduced under the vegetated array. The results from our arrays are constrained by extensive shadow patterns from the roof structure on the building that occurred at this time of the year.

Keywords: Green roof, energy balance, urban climate

Peasant Women Preserving Native Potatoes in the Andes of Peru

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The feminist study analyzed the participation of peasant producers in the production of native potatoes in the Central Andes of Peru. 220 female and male producers from two groups were included; the case study and a control group. A sequential three-phase strategy (QUAL - QUAL – QUAN) assisted on the understanding of the processes. The study recognized diversity not only on men and women's lives, the context where they live and perform, their Andean Cosmo vision and worldviews that guide their lives ("buen vivir", reciprocity, collectivity, complementarily and duality). Agricultural policies, governments and institutions have considered the context as homogeneous without protecting women and men's traditional knowledge, forms of community organization and the validity of customary law as a standard regulating the coexistence of indigenous peoples and their interrelated cultures. Women and men bring their knowledge and Andean ways of innovation, their innate capacities and biodiversity of native potatoes. They have preserved the potatoes genetic biodiversity and coped with adversities like climate change, globalization and food scarcity in the course of adaptation and resilience through common and reciprocal forces that are the foundation of peasant communities in the Andes. Gaps still exist between the political and the social dimensions in relation to the dynamics that maintain poverty and inequality and also in relation to the institutions and governability that can create strategies to empower women and men in the highlands. Presence of peasant women at macro level of agriculture is still very weak. Peasant women suffered double discrimination because of just being women and female peasant. The non-institutionalization of gender in agricultural development and the absence of public policies to this respect do not support the achievement of social equality and inclusion. Limited resources are available for peasant women. Structuring of institutions and policies need to be congruent, selective, integral, sufficient, opportune and urgent. In the agricultural and rural context of the Peruvian Andes these are crucial and determinant to achieve the integration of peasant or indigenous communities.

Keywords: Native potatoes, food security, feminism, gender, peasant communities, peasant women

Treatment of Vegetable greenhouse effluent by Microalgae: A new economical approach

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Hydroponic greenhouse effluent has high concentration of total phosphorus (30–100 mg PO4-P L-1) and nitrate (200–300 mg NO3-N L-1). Current technologies (e.g. wetland systems, ultra-filtration) and bioremediation (heterotrophic bacteria and macrophytes) have limitations of performance and high maintenance cost. A study is designed in two steps for nutrient removal (i) strong alkali treatment of effluent (ii) cultivation of microalgae on treated hydroponic effluent. Treatment with strong alkali resulted in 90% removal of phosphorous especially in the form of phosphate, irrespective of change in nitrate concentration. Marine algae Dunaliella salina UTEX (1644) was cultivated on treated hydroponic effluent at pH 7.5, showed >80% nitrate removal capacity within 4 days of cultivation. Biomass production potential and carotene content of this system was in range of 2.5±0.2 g/L and 0.7±±0.02 µg/mg (of dry cell weight) respectively. Combining conventional alkali precipitation method with microalgae treatment system represents a suitable approach for the removal of excess nutrient from hydroponic effluent and potentially viable for the production of biodiesel and carotene.

Keywords: Bioremediation, Greenhouse, Hydroponic effluent, phosphate, nitrate

Community Responses to Wind Energy Development in Ontario

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The Province of Ontario has one of the most radical jurisdictions in the developed world for supporting and promoting renewable energy development. Legislatively, the Green Energy and Green Economy Act, 2009 is aimed at making Ontario a global leader in renewable energy development. Wind energy in particular represents one of the integral and controversial parts of these commitments. Several new installations have been built or announced and yet community opposition grows. Through a media content analysis of national, regional and local newspapers circulated within the province of Ontario, this study documents and analyzes issues motivating community resistance against and/or support for wind energy development in Ontario.

Keywords: Ontario, Wind Energy, Newspaper, Green Energy Act, Content Analysis

Examining the decline of Atlantic cod stocks and management practices for stock recovery

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Atlantic cod, *Gadus morhua*, is a species of groundfish found throughout the Atlantic Ocean. It is best known for its popularity as a commercial species in Atlantic Canada, until a collapse in stock numbers in the 1980s caused the closure of the cod fisheries in the early 1990s. The stocks have not yet recovered, and Atlantic cod is currently listed as a protected species. Through combined journal and government website research, we have collected data to quantify the decline of Atlantic cod, to determine the factors causing the decline and non-recovery of the stocks, and to examine and evaluate management practices for the recovery of the species. Results indicate that intensive fishing and seal predation led to the severe decline in cod abundance in the 1980s, while decreasing food sources and poor nutrition have prevented their recovery. Policies to regulate fishing of both cod and its food sources and to reduce seal predation have been implemented with limited success, and other policies have been proposed. We believe that the future recovery of Atlantic cod stocks will have better success if proposed action plans, such as modification of the fisheries management framework and more effective management of fishing mortality, are implemented and greater consideration is given to the protection of cod food sources.

Keywords: Atlantic cod, fisheries, management, recovery

Growing Sustainable Indigenous Communities - Enriching a Community Garden

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Indigenous communities struggle with issues of development while maintaining environmental integrity of their lands. We are collaborating with the Walpole Island First Nation community garden initiative to promote sustainable practices throughout their community garden to nurture a healing process for the land and the people by creating a sustainable food source using traditional gardening practices within their community garden.

To assist in this endeavor, our research focuses on practical projects that can be realistically implemented at a community level with goals of sustainable development, environmental responsibility, and community health. We are researching traditional companion planting, seed sovereignty, drip irrigation systems, and health benefits of community gardens.

Traditional companion planting will increase the sustainability of the community garden by increasing food yield while decreasing the need for fertilizer and pesticide use. Through awareness of where seeds come from and how to save seeds the sustainability and health of the garden can be maintained, while also working towards food sovereignty within the community. Water consumption will be reduced through the implementation of the drip irrigation system, as such systems are proven to use less water than conventional watering methods. Community gardens provide access to a variety fresh produce which supports nutritional health and decreases susceptibility to illnesses, thus reducing the overall burden on the health care system.

By focusing on praxis rather than solely on theory, the implementation of this research will produce real benefits to the Walpole Island First Nation community garden initiative.

Keywords: Walpole Island First Nation, community garden, sustainable development

Are Edge Effects in Urban Woodlands Related to Adjacent Human Land Use Type?

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Although the impacts of urbanization on biodiversity in woodland habitat fragments are well understood, most research has fallen short of considering the highly heterogeneous nature of the urban landscape. Contemporary research has demonstrated that the effects of urban land use on biodiversity in woodlands are much more complex than previously believed. The difference in environmental impacts between different urban land use types (residential, industrial, commercial, etc.) may be just as important as the differences between urban and rural landscapes. Using plant community composition at the edges or urban woodlands as an indicator of the impacts of adjacent land use, I will explore whether certain urban land use types impact biodiversity in habitat fragments more than others. This could be highly informative for municipal and provincial land use planning policy by indicating how land uses around habitat fragments should be arranged in order to minimize impacts on biodiversity and ecosystem health.

Keywords: urban ecosystems, biodiversity, land use planning, edge effects, conservation

Sport Fishing Regulation Guidelines Violators and Ethnicity: Is there a Correlation?

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Fishing remains a popular recreational pastime and tourism activity of many Canadians. However, as the population continues to grow, both from natural growth and immigration, it places added pressure on natural recourses; including fish. To ensure long term sustainability of fish stocks, provincial governments have implemented various fishing regulations that are to be followed. However, not all anglers follow fishing regulations equally. Some individuals might purposefully commit fishing regulation violations; meanwhile others might break fishing regulations unknowingly. The methodology has two separate steps. Step one involves participant observations of anglers in 6 different locations throughout Southern Ontario. Such observation was done over a four year period, whereby the researcher immersed himself amongst other anglers to observe and record their behaviour. The second step involved 120 semi structured interviews of anglers within 6 selected locations. Interviewees were asked pre-determined questions, which could lead into open dialogue. The interviewees remained anonymous to gain trust and to protect their identities. Interviews with non-English speakers were conducted in numerous languages through the use of translators. This research touched upon the concept of natural resources management and provides practical solutions for government policy makers. The results indicate that there is a significant amount of people who break fishing regulations. There is also a strong correlation between ethnicity/nationality and fishing regulation violations. Lack of English comprehension is a leading cause for many immigrants breaking fishing regulations, followed by a lack of government action related to conservation education. The government should publish fishing regulations in various languages.

Keywords: sport fishing, fishing regulations, immigrants, natural resources management, fishing regulations

Winds of Change: The role of social and political forces in Ontario

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Wind turbine development has expanded around the world in the past decade and Ontario is no different. However, unlike many other parts of the world the rapid growth in wind energy development has caused some controversy across the province. Concerns are numerous and range from human health problems and wildlife concerns to the increases in taxes required to fund these projects. In some areas, there have been suggestions that the conflict has gone so far as to disrupt otherwise peaceful communities- pitting neighbour against neighbour. Despite the apparent conflict, the benefits of renewable energy projects continue to be touted by the Ontario Liberals- a government that continues to reject many of the supposed problems that are brought forth to them. Our research has discovered a case which is not commonly seen in the literature and is virtually non-existent in the popular media. The "success story" we found in the Port Burwell, Ontario area (Erie Shores Wind Farm) is one we feel is very important to be told. Among other things it is clear that many socio-political forces may be playing an important role in the acceptance (or lack-thereof) of wind turbines. Implications of the research, including the future of effective policy and planning practices will be discussed.

Keywords: Sustainability, energy policy, green energy, wind turbines

Purple Crow LIDAR

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The University of Western Ontario's Purple Crow Lidar (PCL) has been in near continuous operation since 1993 and routinely measures temperature from 10 km to above 100 km, water vapor mixing ratio in the troposphere and stratosphere, as well as aerosol products. The PCL was recently relocated to a new custom-built, environmentally friendly facility at Western's Environmental Research Station located 9 km north of the campus. The PCL move allowed the opportunity for many new and exciting instrumentation upgrades and improvements. Our new transmitter, a Litron Nd:YAG laser, produces 1000 mJ/pulse at 532 nm with a 30 Hz repetition rate (i.e. 30 W). This new laser increases our transmitter power by 2.5 times compared to our previous laser and boosts the PCL's power-aperture product to 160 W/m^2. We have also upgraded the counting electronics to improve the vertical height resolution of our Rayleigh temperature from 24 m to 7.5 m and our water vapour, vibrational Raman temperature, and aerosol measurements from 250 m to 24 m. As well, the system is now capable of automatic alignment during operations. The water vapor measurements have been further improved by the addition of a white light calibration source. We are in the process of upgrading the system for more direct aerosol measurements by including a low altitude aerosol channel using a small co-aligned telescope.

The enhanced system will have two major impacts on upper mesosphere/lower thermosphere science. First, our new laser will allow our temperature measurements to gain another 10 km in altitude, pushing them at times above 110 km. Second, due to the new inversion method developed by, an assumption of a seed pressure at the top of the atmosphere will no longer be required, so any systematic retrieval uncertainties will be less than the measurement statistical uncertainty in the lower thermosphere. With the seeding of the temperature profiles now done at the lowest heights (i.e. stratosphere), the measurements may now allow the retrieval of molecular oxygen and nitrogen profiles in the mesosphere and lower thermosphere. We will present initial results from our enhanced system, highlighting the improvement of our measurements in the mesosphere and lower thermosphere.

Keywords: Atmospheric temperature, structure, measurement