CONCURRENT SESSION 1: 8:30-10:00

1.1 Climate risks and resilience planning in Canadian coastal communities

The burning of fossil fuels has elevated the concentration of atmospheric greenhouse gas emissions, and resulted in an increase in global average temperatures. Climate models forecast further increases in temperature, more extreme weather events and a rise in sea-level, all of which will result in greater risk to coastal communities.

While policy mechanisms to entice a move towards a low-carbon economy, and thus mitigate climate change, have taken centre stage in international policy discussions, the importance for local-scale adaptation has become more apparent. Yet planning for climate change adaptation remains under represented in local government.

This session will explore local climate change stressors (impacts) and the decision dynamics around why and how communities incorporate (or fail to incorporate) planning for climate adaptation into policy and practice.

Keywords: urban planning; climate resilience; coastal community; climate adaptation

Climate change risks and adaptation planning in coastal communities

S. Jeff Birchall; Nicole Bonnett: Urban and Regional Planning Program, Department of Earth and Atmospheric Sciences, University of Alberta, Edmonton, AB, T6G 2E3, jeff.birchall@ualberta.ca

Climate models forecast further increases in temperature, more extreme weather events and a rise in sea-level, which will result in greater risk to coastal communities. Yet planning for climate change adaptation is under represented in local government, as is empirical (key actor) research that critically investigates the decision dynamics around why and how communities incorporate planning for climate adaptation into policy and practice.

The presentation will highlight findings from research into the motivational factors (e.g. slow v. immediate threats), extent (e.g. embedded v. appendage actions) and nature (e.g. reactionary v. anticipatory) of adaptation planning in Charlottetown, PEI, a coastal community that has demonstrated commitment to increasing it's resilience to climate variability.

By exploring the decision dynamics around community adaptation plan/ policy conception and action implementation, this research sheds light on the role planners play, and the expertise planners harness in order to help their community become resilient to climate change.

Local scale climate vulnerability in Surrey, British Columbia

Nicole Bonnett; S. Jeff Birchall: Department of Earth and Atmospheric Sciences, University of Alberta Edmonton, AB, T6G 2E3, nbonnett@ualberta.ca; jeff.birchall@ualberta.ca

Climate change is one of the most important and complex challenges facing society today. As greenhouse gas emissions continue to increase unabated, with models forecasting further increases in temperature, and

greater climate variability in general, the need for adaptation to reduce the risks of dangerous climate change is becoming more immediate.

While adaptation is particularly important at the local level, strategic planning remains limited. Likewise, scholarship that critically explores specific stressors and decision dynamics around policy and action is under-represented.

This qualitative study seeks to narrow the gap. Through interviews with a range of local government officials, this study explores governance around adaptation policy conception and development, as well as action implementation. Analysis of strategic planning documents was included in the study.

Keywords: coastal city; climate resilience; climate adaptation; community planning

A dendrohydrological analysis of the Greater Vancouver Regional District's water supply

Bryan J. Mood; Dan J Smith: University of Victoria Tree-Ring Laboratory, Department of Geography, University of Victoria, BC V8W 2Y2 E-mail: bjmood@uvic.ca

Recent water shortages for the Greater Vancouver Regional District in 2014, 2015, and 2017 have led to widespread ecological and economic impacts. The Capilano, Coquitlam, and Seymour watersheds supply the region which contains over half of British Columbia's population. They have hybrid flow regimes (snow and rain) with the lowest flow totals documented in July and August. Under climate change, July-August streamflow is expected to become even lower. The relatively short records of streamflow for the area makes it difficult to understand how frequent severe drought events have been in the past. Here, we present a 300-year reconstruction of July-August streamflow using tree-rings for the Greater Vancouver Regional District which highlights below-average totals since 1980. The results of this study are of immediate concern to water resource managers and will help inform future planning and policy which are currently under review.

Keywords: Water Resources, Vancouver, Streamflow, Tree-ring, Paleoclimate, Climate Change

Between a Rock and a Hard Place - Planning for Sea Level Rise in Bedford, Nova Scotia

Dianne Gillespie; S. Jeff Birchall, Amrita Singh: Department of Earth and Atmospheric Sciences, University of Alberta, Edmonton, AB, T6G 2E3, dianneg@ualberta.ca; jeff.birchall@ualberta.ca; amrita4@ualberta.ca

The impacts of Hurricane Juan in the Halifax region prompted the Halifax Regional Municipality to conduct several studies to assess the risks of sea level rise and storm surge in the Halifax region. The studies concluded that sea level rise and storm surge present a moderate to high risk for several municipalities within the region. However, planning policy in Bedford, Nova Scotia currently supports extensive infill of its waterfront and commercial and residential development adjacent to the waterfront.

This study used an embedded mixed methods research design to gain a comprehensive picture of the challenges and risks associated with planning for sea level rise in Bedford, Nova Scotia.

This study contributes to scholarship by exploring the challenges of planning for rising seas in Canadian coastal communities, and the impacts of sea level rise on property values in the Canadian context.

Keywords: Sea level rise; coastal cities; property values; climate adaptation planning

1.2 Panel: Field-based Teaching: Lessons Learned

This panel comprizes a group of people who, collectively, have decades of experience developing, organizing, and delivering field-based courses and other experiential learning opportunities. The panelists will share their perspectives on such programming, and will offer practical, down-to-earth advice. The panel will be of interest to students, especially those yet to take part in their first field-based learning experience, anyone who aspires to a career in teaching, and seasoned instructors.

Organizer and Chair: Tom Johnston, Department of Geography, University of Lethbridge

Panelists:
Shawn Bubel, Department of Geography, University of Lethbridge
Craig Coburn, Department of Geography, University of Lethbridge
Stacey Gaudette-Sharp, Coop Education and Applied Studies, Faculty of Arts and Science, University of Lethbridge
Dan Smith, Department of Geography, University of Victoria
Tom Waldichuk, Department of Geography, Thompson Rivers University

1.3 Geographies of Pollution

A Spatial Analysis of Air Pollution and its Relationship to Weather in the Lower Fraser Valley
Takuma Mihara: Department of Geography, University of Victoria, Victoria, BC, V8P5C2, takumamih@gmail.com

Air pollution is a concern due to its adverse effects on human health, and an understanding of their distribution over space contributes to improvements in public health. This study conducted a spatial analysis of particulate matter with a diameter of 2.5μm or less (PM2.5), within the Lower Fraser Valley in southwest British Columbia. PM2.5 concentrations at various stations were compared with synoptic weather patterns to investigate the atmospheric conditions that contribute to poor air quality events. The summer of 2017 was a catastrophic year for wildfire burns in western North America, and the resulting smoke plumes degraded the air quality in the Lower Fraser Valley. During extreme wildfire smoke events in 2017, strong spatial gradients of PM2.5 concentrations were exhibited across the valley. Continental high pressure ridges induced optimal fire weather, and directed smoke to the coast. The distribution of pollutants on a regional scale was controlled largely by topography.

Keywords: meteorology, wildfire, air quality, British Columbia, GIS

Wind dependency of ambient fine particulate matter in the Terrace-Kitimat valley of north-western British Columbia
Chibuike Onwukwe: Natural Resources and Environmental Studies Programme, University of Northern British Columbia, Prince George, BC V2N 4Z9 E-mail: onwukwe@unbc.ca

Here, surface wind dependency of ambient fine particulates in the Terrace-Kitimat Valley of northwestern BC is examined. Sector analysis of wind data (2015 -2017) from five meteorological and air quality monitoring stations in the valley revealed dominance of light northerly, and stronger southerly winds, corresponding roughly with north-south axes of its ridgelines. Calm periods were most frequent at an urban site (Terrace) while mean wind speeds were highest at a residential site in Kitimat.

Mean concentration of fine particulates is highest at a rural coastal site (Haisla village), which unlike other stations has modest, albeit consistent east-wind contribution to pollutant levels. Conditional probability of elevated concentrations in fall and in winter at this site are markedly high (~ 0.8) for north and north-east wind sectors, pointing to the potential for air pollution in the surrounding community during the cold season.

Keywords: wind sector, fine particulate matter, valley, British Columbia

Presence of Microplastics in the Fraser River, British Columbia

Madelaine Bourdages[1,2]: Department of Geography and the Environment, University of the Fraser Valley, Abbotsford, BC V2S 7M7, madelaine.bourdages@student.ufv.ca; Bernhard Peucker-Ehrenbrink[1,2]; Steven Marsh[1]; Sharon Gillies[1]; Julia K. Paine[2, 3]; Paige Bogaerts[1]; Alanna Strangway[1]; Kelly Robertson[1]; Alexandra Groeneweg[1]
[1]University of the Fraser Valley; [2]Woods Hole Oceanographic Institution; [3]University of Miami

Microplastics, defined as plastic particles smaller than 5 mm in diameter, are an emerging anthropogenic contamination in watercourses and water bodies worldwide. The extent of the environmental damage associated with microplastics, however, is not fully known. The Fraser River, a free flowing river which drains an area of over 220,000 km2 and is a major salmon bearing river system in British Columbia, is potentially threatened by microplastic pollution. Preliminary tests in the summer of 2016 on 200 liters of Fraser River water, processed through a 45 μm sieve, revealed the presence of microplastics. Following this trial, nineteen 200 liter water samples were collected between October 2016 and 2017 at the Fraser River Observatory in Fort Langley, B.C. These samples were analyzed at Woods Hole Oceanographic Institution to identifying the presence, amount, and type of microplastics being transported by the Fraser River to the coastal ocean.

Keywords: Fraser River, microplastics, anthropogenic pollution, watercourse

The Importance of Spill Response and the Canadian Coast Guard on Canada's Pacific Coast

Josh Tawse: Department of Geography, University of Victoria, Victoria, BC V8P 5C2 Email: jtawse@uvic.ca

This presentation will look at the locations of environmental response (ER) depots and personnel, including vessels and their corresponding response times. Additionally, the relationship between First Nations and the Canadian Coast Guard (CCG) will be highlighted in reference to ER.

Keywords: environmental response, Pacific Coast, British Columbia, First Nations

1.4 <u>Transport Planning; Climate Adaptation</u>

The First Mile, Last Mile Challenges for Seniors: Does Transit Go Where Seniors Want to Go?

Mindy Wing Yin Chan: Department of Earth and Atmospheric Sciences, University of Alberta, Edmonton, AB, T6G 2E3 Email: mwchan@ualberta.ca

Canada's increasing senior population is challenging planners and policymakers to expand mobility and access to public transit, with focus on enhancing seniors' ability to participate in social and leisure activities. An increasing number of Asian immigrant seniors poses the additional challenge of making transit accessible to seniors who speak only non-official languages, such as Cantonese. This study will attempt to uncover the barriers that seniors face when taking Light Rail Transit (LRT) or buses, identify whether barrier differs between LRT and bus transit and/or are cognitive, and examine the accessibility of transit.

This study will use a mixed methods research. Information gathered from seniors using a semi-structured interview and a survey will identify barriers and other areas to consider in order to increase senior usage of public transit. The study will also find ways to strengthen public transit to suit the senior population.

Keywords: Seniors, Public Transit, Light Rail Transit (LRT), Bus, Barriers

Modes of Transportation amongst Immigrants across Canada

Elena Moezzi: Department of Earth and Atmospheric Sciences, University of Alberta
Edmonton, AB T6G 2E3 E-mail : moezzi@ualberta.ca

Immigrants are increasingly the source of population growth in Canada and are in need of various services, particularly transportation. This underlines the necessity of acquiring information regarding the way immigrants move within cities. This study will attempt to investigate the modes of transportation amongst immigrants across Canada, with a focus on five different modes of transportation: private vehicle, public transit, carpooling, walking, and biking. This will be accomplished with the use of a quantitative method research through the discrete choice analysis. This study will use the existing statistics and datasets from the Canada census records between 2006 and 2016 in order to construct logit models. This study will provide insight into the transportation behavior of immigrants in Canada and will contribute to achieving the information that is integral to improving transit infrastructure in this country.

Incorporating Climate Change Adaptation into Future Planning Policy for Coastal Communities: The Case of Comox Valley Regional District, Canada

Cellina Heang: Urban and Regional Planning Program, Department of Earth and Atmospheric Sciences, University of Alberta, Edmonton, AB T6G 2E3, E-mail: heang@ualberta.ca

Climate change has social, physical, and economic implications on coastal communities. Climate change impacts, such as storm surge and sea level rise, impede on people's livelihood, envelop physical terrain, and damage coastal urban development – this creates planning challenges that coastal communities must overcome through adaptation. Using planning instruments to adapt can help build community-wide resilience to local climate change impacts. This study will determine the level of current climate change adaptation integration in planning policy and identify adaptation planning policy opportunities in Comox Valley Regional District (CVRD), Canada. The review of official planning documents will determine current adaptation integration. Five to fifteen semi-structured, key actor interviews with city council and community members, stakeholders, town planners, and other professionals will assist with coastline analysis and identification of adaptation opportunities. Among other contributions, this study offers CVRD an in-depth analysis of site-appropriate adaptation opportunities, which can be incorporated into planning policy.

Keywords: sea level rise, planning challenges, climate change adaptation, planning policy, Comox Valley Regional District

Planning for Resilient Heritage: Policy Adaptation Strategies in Charlottetown, Canada

Vada Antonakis: Department of Earth and Atmospheric Sciences, University of Alberta, Edmonton, AB T6G 2E3 E-mail: vada.antonakis@ualberta.ca

Charlottetown is characterized by extensive and distinct built heritage, which is highly valued by residents and significantly contributes to the local economy. Although policies for heritage conservation are in place, increasing climate instabilities are becoming significant threats to heritage that require attention. This study will attempt to uncover how effectively current planning policy is addressing the impacts of climate change on heritage, and then identify current challenges and potential opportunities for heritage policy improvement. The first phase of the study will involve a qualitative content review of local heritage planning documents, followed by semi-structured key actor interviews with local planning and/or heritage professionals. This study will contribute to scholarship and planning through exploring the challenges of climate change planning for heritage in Canadian coastal communities. Furthermore, this research will fill a gap in academic literature by addressing climate change impacts on heritage from a planning policy perspective.

Keywords: climate change, urban planning, cultural heritage, coastal communities, Prince Edward Island

Immediate Climate Change Vulnerabilities: A Planning Policy Evaluation in Churchill, Manitoba, Canada

Derek Macdonald: (EIT), Department of Earth and Atmospheric Sciences, University of Alberta, Edmonton, AB T6G 2E3, Email: demacdon@ualberta.ca

Immediate climate vulnerabilities are adversely affecting infrastructure in northern coastal communities and threatening their economic stability. These effects are particularly acute in the town of Churchill, Manitoba, Canada. Climate change adaptation and mitigation research in Churchill has mainly focused on its world famous and unique wildlife, but there is little academic information on how Churchill plans to adapt to or mitigate immediate climate change vulnerabilities from an infrastructure and land use planning perspective. Recent weather events have shown how exposed Churchill's logistical and economic lifelines, the Hudson Bay Railway and The Port of Churchill, currently are. This presentation highlights a qualitative research proposal that uses a preliminary literature review and criterion sampled, semi-structured snowball interviews to evaluate the effectiveness Churchill's climate change and planning policies regarding the impacts of immediate climate vulnerabilities on the Port of Churchill and the Hudson Bay Railway.

Keywords: Adaptation, Arctic gateway, climate change, northern coastal communities, vulnerability

1.5 Geographies of Health

What is lost, missing, sought, and hoped for: Exploring narratives of Canadians' Lyme disease crowdfunding campaigns

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Lyme disease remains a contested illness in Canada, thereby making the diagnostic journeys for some Canadians with suspected cases difficult. Treatment can be equally challenging as there is no standard protocol. Despite the presence of a publicly-funded health care system, many Cana-dians managing Lyme disease or pursuing a suspected diagnosis spend considerable private monetary resources on tests and treatment. This financial burden has driven some to pursue fi-nancial support through medical crowdfunding. Here we explore the narratives shared in funding campaigns. 238 campaigns were identified from three prominent crowdfunding platforms (YouCaring, FundRazar, GoFundMe). Thematic narrative analysis shows four consistent mes-sages shared in these campaigns: what is lost (e.g., bodily ability), what is missing (e.g., local care options), what is sought (e.g., funds to cover treatment), and what is hoped for (e.g., return to function). We expand on these themes here and consider their implications.

Keywords: Lyme disease, crowdfunding, health, diagnostic journey

The role of telehealth in supporting healthy aging in rural communities

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Rural communities face geographical and environmental barriers to health care resources. However, there is evidence that the aging population (e.g. 65+) in rural communities would like to age in place. Telehealth presents an innovative solution by providing virtual access to health care and decreasing the need for patients to travel outside their community. Telegeriatric telehealth services tailored to the aging population may be able to improve access to specialist care and support healthy aging in rural communities. Despite this potential, there is little evidence of how the aging population perceives telegeriatrics. My research seeks to understand the experience of older adults living in rural communities who access telegeriatric care. This presentation highlights the current research on the role of telehealth in supporting healthy aging and outlines a multi-method framework that will guide my masters research on geriatric telehealth and how this service can support healthy aging in rural British Columbia.

Keyword: telehealth, health aging, rural communities

Spatiotemporal Patterns of Babies Born Too Small in Urban Alberta

Charlene Nielsen: Department of Earth and Atmospheric Sciences & Pediatrics, University of Alberta, Edmonton, AB T6G 2E3 E-mail: ccn@ualberta.ca; Dr. Carl Amrhein, Department of Geography, Aga Khan University, Nairobi and Karachi & (emeritus) Department of Earth and Atmospheric Sciences, University of Alberta, Edmonton, AB T6G 2E3 E-mail: camrhein@ualberta.ca; Dr. Prakeshkumar Shah, Department of Pediatrics and Institute of Health Policy, Management, and Evaluation, University of Toronto, Mount Sinai Hospital, Toronto, ON M5G 1X5 E-mail: pshah@mtsinai.on.ca; Dr. Alvaro Osornio-Vargas, Department of Pediatrics, University of Alberta, Edmonton, AB T6G 1C9 E-mail: osornio@ualberta.ca

A baby born "too small" is an adverse birth outcome because it may lead to infant mortality, physical and cognitive disabilities, and chronic health problems throughout life. Alberta has higher than national averages of small for gestational age newborns. To help understand the spatiotemporal distribution, emerging hot spot analysis was applied in a geographical information system for all births, all small newborns and critically ill newborns (i.e. those admitted to the neonatal intensive care unit). The resulting categorical patterns were compared with proportions of surrounding land use and socioeconomic status, using correlation and logistic regression. Hot spot patterns of critically ill small newborns did not always occur in the same locations as all small newborns. The dominant associations with all small newborns were higher proportions of industrial land use and low socioeconomic status, providing clues as to why the patterns differed.

Keywords: GIS, adverse birth outcomes, space-time analysis, Alberta

Unconventional movements: feminist/activist use of creative spatialities to increase access to safe abortions

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Unsafe, often covertly obtained abortions endanger women's health, and result in an estimated 47,000 women's lives lost annually, at the global scale (Guttmacher Institute and WHO 2012). In this paper, we consider geographies of access to abortions and related interventions, in western Canada and other parts of the world. We examine unconventional movements employed by activists, advocates, care providers, and others, to increase access to safe abortions, and highlight the unique spatialities of this struggle. Even within states that allow abortions, access to safe abortions is highly spatialized, typically reflecting urbanormativity and spatial privilege, with poverty and certain demographic characteristics acting as persistent barriers to obtaining safe abortions. We show that new, absolute, relational, and digital spaces of resistance are created as part of efforts to overcome these barriers, resulting in creative flows of knowledge, material goods and humans, at multiple scales.

Keywords: abortion, space, spatiality, urbanormativity, activism, health

1.6 International Justice

Locating refugee deterrence around the Canada-US border

Julie E. E. Young, Assistant Professor, Department of Geography, University of Lethbridge, Lethbridge AB T1K 6T5 Email: julie.young@uleth.ca

At a time when the Canadian government has sent multiple delegations of Members of Parliament to cities across the United States urging their Salvadoran and Haitian communities not to enter Canada irregularly when their Temporary Protected Status in the US expires, it is urgent to step outside the narrative of a crisis at the border and focus on the longer histories and policy frameworks that will influence these potential migrations. Over the past decade, Canadian policies have both sought to limit migration and created the conditions under which people are now crossing the Canada-US border. This paper revisits a study of refugee

advocacy around the same border during the 1980s Central American refugee "crisis" to provide insight into the contemporary context that has seen higher-than-usual numbers of people who are undocumented in the United States seeking refuge in Canada.

Keywords: political geography, refugee deterrence, borders, Canada, US.

Drinking Water Security in Rural Ghana: Implications of Community Experiences for Sound Policy Development

Benjamin Dosu Jnr, University of Lethbridge 4401 University Drive West, Lethbridge, Alberta T1K 3M4 E-mail: dosu@uleth.ca

Water security is reliable and sufficient access to potable drinking water through community-preferred methods. Water insecurity is associated with significant health risks, even death. Although the UN recognizes the right to safe drinking water as a human right, 1.1 billion people lack water security; 84% of them living in rural areas. Rural Ghanaians are among the world's water insecure populations, despite recent policy initiatives in Ghana.

Using a case study research design, the study will draw on mixed methods to gather evidence including: document review, focus group discussions, community interviews and institutional consultation and field observation to establish how lived experiences of rural communities could contribute to shaping water policy development in Ghana. The research aims to contribute to existing stock of knowledge aimed at developing policy in Ghana and beyond.

Keywords: Water Security, Water insecurity, policy, environmental justice, water justice

Evaluating Corporate Social Responsibility Policies of Canadian Mining Companies in Chile from an Environmental Justice Framework

Lukas Bosch , College of Science and Management, University of Northern British Columbia, Prince George, BC, V2N 4Z9 Email: bosch@unbc.ca

It is increasingly evident that Canadian-owned resource extraction companies are negatively impacting peoples and places abroad. With this in mind, my research has two objectives: first to review existing Canadian law and policy in relation to Corporate Social Responsibility (CSR) as a means to regulate Canada's extractive companies operating internationally; and secondly, to review two Canadian companies operating in Chile and highlight the environmental and social injustices that have occurred as a result of their practices. The two companies are Teck Resources Ltd. headquartered in Vancouver BC, and Barrick Gold Corp. headquartered in Toronto Ontario. This research uses an environmental justice framework to evaluate the company CSR policies in question, and measures their (mis)alignment with Canadian CSR standards.

The Power of Speech Acts in Re-Imagining De-Colonial Geography

Marina Aitcheson: , Department of Geography, University of Victoria, Victoria, BC V8W 2Y2 E-mail: marina.aitcheson@gmail.com

This presentation takes an unconventional approach at discussing settler colonialism in attempts to un-settle violence associated with the geography discipline. As such, speech acts are at the heart of unsettling

comfortable geographies imagined and solidified through written forms of dispossession. Speech acts are not tools of the master's making. They are deeply intimate geographies grounded in an individual's own intersectionality. In geography, in order to decolonize our departments, we must value alternatives to the linguistic limitations and document formations of traditional written dispossession. Otherwise the violence of settler colonialism will continue to image our geographies because as Audre Lorde states "the master's tools will never dismantle the master's house."

Key words: decolonization, speech acts, intersectionality, imagined geographies

CONCURRENT SESSION 2: 10:30-12:00

2.1 The Many Facets of our Forests: Trees in Western Canada I

How will climate change effect the radial growth of four shelterbelt species across the brown, dark brown, and black soil zones of Saskatchewan?

Brooke Howat: ; and Colin P. Laroque. Mistik Askiwin Dendrochronology Lab, Department of Soil Science, 51 Campus Drive, University of Saskatchewan, Saskatoon Saskatchewan, S7N 5A8, bkh026@mail.usask.ca, Colin.Laroque@usask.ca

Climate change poses many challenges for Saskatchewan agricultural producers. Landowners will face more frequent and intense weather events, increasing pest infestations and disease, and experience warmer and drier growing seasons under future climates. In response to this issue, several studies have named shelterbelts as a valuable strategy to buffer the negative effects of climate change, by helping protect producer's crops and livestock from the elements. However, shelterbelt's ability to grow under climate change is unknown, and until it is determined, producer's will be unable to benefit from the full potential of shelterbelts. We plan to predict the growth of four shelterbelts species across the brown, dark brown, and black soil zones of Saskatchewan to determine what species will be best suited to different areas within Saskatchewan under a changing climate. With this information, producers will be able to reap the full benefits of shelterbelts, and better adapt to climate change.

Keywords: Shelterbelts, climate change, adaptation, carbon sequestration, radial-tree growth

Now you see them, now you don't. Determining shelterbelt removal by remote sensing in Saskatchewan

Colin P. Laroque, Thuan V. Ha, and Beyhan Y. Amichev. Mistik Askiwin Dendrochronology Lab, Department of Soil Science, 51 Campus Drive, University of Saskatchewan, Saskatoon Saskatchewan, S7N 5A8, Colin.Laroque@usask.ca, thuan.ha@usask.ca, bamichev@vt.edu

The Prairie Farm Rehabilitation Administration (PFRA) was established in 1935 as a division of Agriculture and Agri-Food Canada, as a mechanism to combat the climatic changes that were occurring at the time, causing lands to be degraded and farms to be abandoned. As part of these measures, the PFRA distributed hundreds of millions of shelterbelt trees across the Prairie Provinces. We inventoried these trees as they exist today and measured over 66,000 km of shelterbelts in Saskatchewan. This inventory is rapidly changing though, as the PFRA has recently been shut down, and no new trees are being given away. This has the

repercussions of decreasing the long-term storage of carbon within these agroforestry systems. We developed a method to understand how fast and where shelterbelts are being removed as part of a larger shelterbelt project, with the hopes of creating an annual removals database for Saskatchewan.

Keywords: Shelterbelts, habitat loss, carbon sequestration, repeat sampling

Predicting annual diameter changes through time by using annual increments: How many cores, is too many cores?

Rafaella Mayrinck; and Colin P. Laroque. Mistik Askiwin Dendrochronology Lab, Department of Soil Science, 51 Campus Drive, University of Saskatchewan, Saskatoon Saskatchewan, S7N 5A8, rcm786@mail.usask.ca, Colin.Laroque@usask.ca

In the Prairie provinces, shelterbelt trees have the great potential to help sequester carbon from the environment, while at the same time being a positive economic resource for landowners. To better use these agroforestry systems, it will be necessary to precisely quantify carbon sequestration, to better understand how much carbon is being locked away on an annual basis. As little information exists, using tree rings as a retrievable data set of past growing conditions at a site to estimate annual increments in the past and future, would be beneficial. The forestry model 3-PG makes such estimations, but it uses the diameter of a tree to estimate how much carbon is being sequestered above- and below-ground. The objective of my presentation is to discuss three theoretical methods of using annual-tree rings from as few cores as possible get a firm understanding of a how a tree's DBH has changed through time. (150 words)

Keywords. Shelterbelts, carbon sequestration, 3PG Model, DBH, radial-tree growth

2.2 Glaciers

The Impacts of Avalanche Activity and Snowpack Creep on Vancouver Island Marmot Habitat in a Changing Climate

Trevor Dickinson, Department of Geography, Vancouver Island University, Nanaimo, British Columbia, V9R 5S5, email: trevor.dickinson@viu.ca

Increased tree growth within the alpine meadow habitat of the endangered Vancouver Island marmot (Marmota vancouverensis) has resulted in increasingly obscured sight lines, which limit the ability of marmot colonies to detect approaching predators. Existing literature states that snowpack creep and avalanche activity play a role in suppressing tree growth in marmot habitat in the Nanaimo Lakes region of Vancouver Island. Gaining a clearer understanding of how these snow processes affect tree growth in this habitat, and the potential impacts of climate change, is of great importance to the ongoing recovery effort of the species. This study presents field-based evidence analyzing the impact of snowpack creep and avalanche activity on M. vancouverensis habitat. Preliminary results show these snow processes largely prevent tree growth within steep, smooth surfaced meadows. However, due to declining snowpack levels, trees are becoming established in rough surfaced areas, obscuring site lines for marmots.

Key words: Snow, Climate Change, Marmot, Habitat, Vancouver Island

Simulating winter glacier mass balance with a distributed snow model for alpine glaciers in the Interior Mountains, British Columbia Canada

Marzieh Mortezapour; Brian Menounos; Peter Jackson; Andre R. Erler, Natural Resources and Environmental Studies Institute, University of Northern British Columbia, Prince George, BC V2N 4Z9 E-mail: mortezapour@unbc.ca

In British Columbia most glaciers are located in rugged mountains subject to highly variable meteorological conditions. Distributed models of mass and energy are useful to simulate surface mass balance of alpine glaciers during summer, but few studies have examined whether such models can be used to simulate winter balance in regions of complex terrain. Our study uses a distributed snow model (SnowModel), forced with surface fields from the North American Land Data Assimilation System (NLDAS) and the Weather Research and Forecast (WRF) model, to simulate winter snow depth for Conrad Glacier during the winter 2014-2015. When compared to glacier-averaged snow depth measurements obtained through airborne laser altimetry SnowModel depth simulations forced by NLDAS and WRF show mean absolute errors of -49 cm and +37 cm, respectively. Mean bias decreases from 16% to 11% for simulations driven by WRF.

Keywords: Winter mass balance, Modeling, Lidar, NLDAS, WRF

Automating confluence angle calculation in dendritic systems using GIS glacier geometry

Lucas Jakober; Hester Jiskoot, Department of Geography, University of Lethbridge, Lethbridge, AB, T1K 3M4. E-mail: jakober@uleth.ca; hester.jiskoot@uleth.ca

Many glacier systems are dendritic, or tree-like, where several smaller tributaries flow into each other and ultimately channel into a main trunk glacier. We developed an automated method in which a python script for QGIS processing computes the confluence angles and locations for every tributary-trunk junction in a glacier system. Employing glacier shapefiles from the Randolph Glacier Inventory and existing glacier centrelines, we optimized our method using the Kaskawulsh Glacier, which has 252 centre flowlines and confluence angles ranging from 17°-123°. We then applied our final script, which allows for various tributary-trunk size-thresholding, to > 5000 glaciers with at least two centre flowlines in the Alaska-Yukon region. Our method will allow glaciologists to address, for the first time, existing research questions related to tributary-trunk interactions, flow instabilities, geological controls on valley geomorphology, and bedrock step development. Ultimately, the method will be applicable for computing confluence angles in any dendritic system.
Keywords: Glaciers, Geomorphology, GIS, Computer modelling, Dendritic/Arborescent systems

Optical Dating of the Postglacial Marine Regression, Savary Island, British Columbia

Travis Gingerich[1]; Olav Lian[1]; Christina Neudorf[1]; Libby Biln[2]; Jordan Bryce[3], [1]Department of Geography and the Environment, University of the Fraser Valley, Abbotsford, BC V2S 7M8; [2]Department of Earth Sciences, Simon Fraser University, Burnaby, BC V5A 1S6; [3]Department of Geography, Simon Fraser University, Burnaby, BC V5A 1S6, email: travis.gingerich@student.ufv.ca

Optical Dating of the Postglacial Marine Regression, Savary Island, British Columbia
The coastline of British Columbia has been adjusting dynamically since deglaciation. When glaciers retreated, the coastline remained isostatically depressed for several thousand years. Studies of relative sea level position have been conducted on nearby Quadra Island, but very little research regarding sea level history has been done on Savary Island. A potential contact between aeolian sand and beach sediments was found on Savary

Island in a swale between large parabolic dunes. This contact, ~7 m above present sea level, provides key insight into the timing of postglacial relative sea level regression. Due to challenges identified with optical dating of the K-feldspar fraction during recent MSc research of the area, two different optical dating techniques are utilized to provide age estimates for beach stabilization and dune initiation. Furthermore, results from applying a recently developed technique for inferring depositional environment from grain shape analysis will be reported.

Keywords: British Columbia; geochronology; Quaternary geomorphology; postglacial sea level change; optical dating

2.3 Public Participation and Activism

Wildlife stewards for the future: Attracting and nurturing the next generation of bluebird trail keepers

Glen Hvenegaard, Robyn Perkins, and Shane Hoveland, Augustana Faculty, University of Alberta, Camrose, AB T4V 2R3 E-mail: glen.hvenegaard@ualberta.ca

The conservation of many wildlife species depends on the substantial contributions of dedicated volunteer stewards, but due to ongoing turnover, there is a need to identify and support new recruits. The purpose of this study is to identify the motivations, commitment levels, constraints, and recruitment strategies for existing stewards of bluebird nest box trails. We surveyed 73 stewards at the North American Bluebird Society Conference in 2016. Bluebird stewards are much older and more rural than the general population. Stewards invest substantial amounts of time and money into their trails, and are motivated primarily to enhance conservation and to experience nature. The key reasons stewards will eventually "retire" from managing their trails related to mobility, health, and age. Respondents indicated potential recruitment strategies through nature organizations, local tours, mentoring, and family members. These results will help governments and nature organizations manage stewardship programs that promote wildlife conservation.

Keywords: wildlife stewardship, volunteer, commitment, recruitment, bluebirds

Rubber boots and climate action: Learning outcomes in nature-based citizen science programs

Mark Groulx, School of Environmental Planning, University of Northern British Columbia, Prince George, BC, V2N 4Z9 – e: mark.groulx@unbc.ca

Communities across Canada are advancing climate action, but efforts to evaluate hard (e.g., infrastructure development) and soft (e.g., educational programming) interventions are limited. This paper examines citizen science as a unique climate intervention where scientists and citizen experts collaborate in authentic research that answers scientific questions, fosters individual climate learning, and strengthens collective efforts to enact change. Using transformative learning theory, this paper systematically identifies 23 learning outcomes within the literature that has explored the interface of climate change and nature-based citizen science programming. Early results from an evaluation of the 'Climate Change at the Arctic's Edge' program in Churchill, Canada further illustrate through participant interviews how rich, placed based experiences contribute to these outcomes and to opportunities to link climate dialogues between 'home' and 'away'. Overall, findings contribute increased capacity for evaluating soft climate interventions and inform a discussion about measuring what matters in climate action.

Keywords: Citizen science, place, climate change, evaluation

Have Your Trash and Eat It Too: A Dialogue on Dumpster Diving and Waste Reclamation
Haneen Ghebari, Department of Geography and Environmental Studies, University of Victoria, Victoria, BC V8P 5C2. Email: haneenghebari@gmail.com

This presentation video explores possible intermediate steps to adopt a resilient food system that can sustain the human population, reduce our catastrophic amounts of waste, and cultivate alternative pedagogies that promote sufficiency over efficiency. The term "Dumpster Diving" refers to the salvaging of items and food placed in waste receptacles. This alternative approach to acquiring food through reclaiming waste helps contribute to the increase of reusing materials in continuous closed cycles, fosters food security to those who cannot access resources, and assists in eliminating the perception that waste should be discarded.

Keywords: Waste reclamation; food systems; dumpster diving; activism; waste geography

Beg Buttons: Public Participatory GIS and Open Data in Community Engagement
Darcy Reynard: Human Geography and Planning, Department of Earth and Atmospheric Science, University of Alberta, Edmonton, AB, T6G 2E3, reynard@ualberta.ca

Public Participatory GIS grew out of urban planning community engagement practices in the 1960s. Recently, cities have shifted to publishing Open Data, which they claim helps citizens get involved in data-driven decision-making. However, unlike PPGIS where, traditionally, cities and citizens actively work together, cities are simply publishing Open Data and then requiring citizens to be proactive in using those data to raise issues. It is also possible that cities do not publish Open Data which can be used to answer a citizen concern. This presentation reviews the history and current state of PPGIS and Open Data being used by citizens to influence urban planning. It critiques the strengths, weaknesses, and uses of PPGIS and Open Data. This presentation will conclude with an example of how concerned citizens attempted to use PPGIS and Open Data to advocate for improvements to walkability in the City of Edmonton.

Keywords: PPGIS, Open Data, Urban Planning, Citizen Science, Community Engagemen

2.4 Sense of Public Place

Drawing People to Public Space in Downtown Edmonton - A Research Proposal
Sydney Gross: , Department of Earth and Atmospheric Sciences, University of Alberta, Edmonton Alberta, T6G 2R3, E-mail: sgross1@ualberta.ca

Plazas, squares, and parks foster a sense of community, safety, and democracy. Public spaces in downtown Edmonton are largely underutilized and do not draw people in, however, these areas do have the potential to become lively, accessible, and safe for everyone.
I ask the following question: Using the guidelines laid out by Shaftoe, Crankshaw and other scholars, how do downtown Edmonton's public spaces measure up against the definition of a successful public space? What should be done within Edmonton's downtown to draw people to public spaces?

To do this, I will conduct research and field studies of public spaces in downtown Edmonton. I will also use data gathered by the Edmonton Downtown Public Places Plan's public engagement sessions to obtain information about what citizens are looking for in these spaces.
This research will help determine what draws people to public spaces and how to enhance them in the downtown core.

Keywords: Public places, downtown, draw factors, plaza, square

The Revitalization of Jasper Avenue, a Case Study of the Planning Process
Andres F. Canavera H. – Department: Earth and Atmospheric Sciences – University of Alberta – Edmonton, AB – T6G 2E3 – canavera@ualberta.ca

In 2010, the Edmonton's Capital City Downtown Plan recognized the need to revitalize Jasper Avenue, one of the most emblematic main streets in the city, by improving its streetscape design to catalyze private sector reinvestment, continued renewal, and positive change in the corridor. Due to its outstanding role in Edmonton's downtown plan and its recent updates on the final design, the revitalization of Jasper Avenue presents itself as a valuable opportunity to research the planning process behind the initiative. Using a descriptive case study as the method, this research will contribute with enough insight for urban planners that wish to apply the teachings of this revitalization experience in their practice. Ultimately, this research will provide a holistic analysis of the revitalization of Jasper Avenue by intersecting different theories on Public Engagement, Resiliency, and Evaluation Methods towards a better understanding of the complexity of the planning process.

Keywords: Urban Revitalization, Case Study, Public Engagement, Resiliency, Evaluation Methods

Enhancing walkability in multilevel cities: an Edmonton case study
Nathalia Osorio , Department of Earth and Atmospheric Sciences, University of Alberta, Edmonton, AB T6G 2E3 E-mail: osorioor@ualberta.ca

Grade-Separated Pedestrian Systems (GSPS) present some advantages for cities with extreme weather conditions, but they negatively impact users of active means of transportation, business that rely on foot traffic and public life. The City of Edmonton is exploring the possibility of prohibiting any further development of the pedway system. However, that measure does not address the problems that pedways currently create. The proposed research will explore planning principles that the City can implement to retrofit the existing pedways, improving the transition of pedestrians from underground and elevated levels to the streets. This study will use a qualitative approach; including a literature review, a morphological analysis of the pedway system, and comparative urbanism methodologies. This research responds to a practical need of the city and will fill a gap in the literature, which currently focuses on the positive and negative aspects of GSPS, but does not address strategies to retrofit them.

Key words: Grade-Separated Pedestrian Systems, pedways planning principles, qualitative approach, comparative urbanism

Small Public Urban Parks: A Systematic Review

Yashashwinee Parmar, Department of Earth and Atmospheric Sciences, University of Alberta, Edmonton, AB T6G 2E3 E-mail: yashashw@ualberta.ca

Because of the land requirements associated with large-scale parks, they are not always a viable option for providing green spaces in the city, and therefore are not equally accessible to all city residents. However, the effective planning of small-scale parks can improve the quality of life and livability of dense urban settings by improving residents' accessibility to natural areas. A comprehensive understanding of how to plan for and design successful small urban public parks that will provide these benefits is required to help urban planners better understand the potential benefits of small-scale parks and underline the related planning considerations. This proposed study will provide a systematic review of existing scholarly research on small public urban parks. Furthermore, it will highlight areas of importance for future research on small-scale parks. The review will focus on peer-reviewed articled in the global context but will be resisted to English publications.

Keywords: Green space, benefits, small urban parks, park design and planning

2.5 City and Transportation Planning

Neoliberal Transit Planning in Capital's Metropolis

Lazar Ilic, University of Ottawa, 100 Gilmour Street, Ottawa, Ontario, K2P 0N6, Email: lilic056@uottawa.ca

Transit planning has evolved over the years, and in large cities the construction of rapid transit is one of the costliest endeavors. Neoliberalism avoids extending into rapid transit in part because it is such a costly task which requires significant up-front capital investment; the private sector is not ready to commit to this. This study examines rapid transit planning in the context of Chicago and focuses on the neoliberal aspects of the process as it pertains to the city's failed 2016 Olympic bid. I argue that the planning process fails to address transit and instead focuses on promoting the accumulation of capital. In this sense, transit is a tool of gentrification rather than a means of alleviating or improving rapid transit in the city. This study, though a few years old, is timely as it is only in recent years that gentrification via transportation is increasingly being discussed.

Key Words: Transportation, Gentrification, Neoliberalism, Urban Geography, Chicago

Student Housing: Analyzing the Value of Proximity, Affordability and other Social Factors at the University of British Columbia

Rajan Sandhu, Department of Geography, University of British Columbia, Vancouver, BC V6T 1Z2 E-mail: rajansinghsandhu@gmail.com; Benjamin Felstein, Department of Geography, University of British Columbia, Vancouver, BC V6T 1Z2 E-mail: benfelstein@gmail.com; William Molloy, University of British Columbia

This paper examines where students at the University of British Columbia (UBC) are living in Vancouver, and why they live where they do. We spoke with students through focus groups, online surveys and interviews with questions relating to their current housing situation, commute times, and overall campus experience. We also asked what was missing from UBC housing. In our survey students were asked to provide their postal code, which helped us create a zone map distributing our respondents amongst a four-zoned map.

In conclusion we discovered that the majority of students did not want to live on the UBC campus and would rather commute a little further to have distance from the school itself. Although commute times were sometimes long, students still preferred a longer commute to save money and have more access to certain amenities.

Key Words: Studentification, Commuting, University, Transportation, Urban

Location Efficiency – How WHERE you live affects your energy use as much (or more) than HOW you live.

Kurt Borth – Department of Earth and Atmospheric Sciences - Human Geography and Planning – UAlberta – borth@ualberta.ca

Location efficient communities are dense and vibrant, with walkable streets, access to transit, proximity to jobs with high occurrences of retail and other services. Many North American cities have identified location efficient related mechanisms like transit oriented design (TOD), smart growth and infill development as principal components in shifting the dominant paradigm of auto oriented greenfield development. Location efficiency has been utilized in various applications in the past three decades and can help citizens to become more aware of their housing and transportation costs, GHG emissions, health impacts and happiness by choosing non location efficient homes. Location efficiency has been promoted as a means of reducing municipal infrastructure and service costs, decreasing GHG emissions, and encouraging active transportation. This presentation examines the history, evolution and current usage of location efficiency with insights from recent original research.

Keywords – Location efficiency, housing/transportation costs, housing location choice, energy efficiency

Reproduction of space: A spatial narrative of an Indian neighbourhood

Pradeep Sangapala, , Urban and Regional Planning Program, University of Alberta, Edmonton, AB T6G 2E3, Email: sangapal@ualberta.ca

Bhubaneswar, the capital of Odisha State, is one of the first planned cities in independent India. Town Planner Otto Königsberger planned the city in the early 1940s, and architect Julius Vaz designed its buildings. Since the planner was highly inspired by Clarence Perry's "neighbourhood unit" concept and the Garden city movement; he applied them as ground principles of the plan. Instead of concerning the local knowledge and culture of the place, the planning process was based on imported planning models and professionals from the West. This study focuses on one neighbourhood unit in Bhubaneswar and demonstrates how the inhabitants have 'localized' the Königsberger's plan. It argues that none of these changes degrades Königsberger's work, but they validate that Königsberger was a successful urban thinker who developed a new paradigm in planning: 'action planning,' to account for 'changes' as most necessary actions in a successful plan.

Key Words: Bhubaneswar, Otto Königsberger, Planned City, Localization, Imported Knowledge

2.6 Sustainable Land Use

Effectiveness of voluntary environmental stewardship programs in agriculture: An assessment
Christian Sprinkhuysen; Tom Johnston, Department of Geography, University of Lethbridge, Lethbridge, AB, T1K 3M4, johnston@uleth.ca

Voluntary environmental stewardship programs (VESPs) are a non-regulatory approach to induce "firms to produce environmental goods beyond legal requirements" (Prakash and Potoski, 2012, p. 123), and have become increasingly popular in North America and elsewhere since the 1990s (Morganstern and Pizer, 2008). As the popularity of VESPs has grown, so too have questions about the effectiveness of this approach. In an effort to address this matter, we conducted a review of the literature focusing on summative assessments of VESPs in the agricultural sector. Based on our findings, we have concluded that VEPS are not particularly effective relative to environmental stewardship objectives, especially in contrast with regulatory approaches and, therefore, question their widespread use. Our findings are broadly consistent with other meta-analyses of the effectiveness of VESPs in other sectors.

Food Security, Technology, and Economy: Ensuring a Sustainable Agricultural Land Reserve
Garry Fehr, Department of Geography and the Environment, University of the Fraser Valley, Abbotsford, BC V2S 7M8 Email: garry.fehr@ufv.ca

The Agricultural Land Reserve in British Columbia was established in 1973 to preserve the province's agricultural land base. However, the pressures to convert that land base into urban and industrial uses have intensified and agri-tech is transforming the role of land in producing food. This research uses a combination of GIS land utilisation surveys and a literature review to identify the diversity of pressures and opportunities that are reshaping agricultural land use. While it is true that the Agricultural Land Commission has ensured that the land base has not been eroded, the practice and diversity of agricultural activities conducted on that land have evolved significantly. The future of the reserve to remain intact for agriculture is dependent on the Commission's ability to develop innovative land use policies that enable farmers to be economically viable.
Keywords: food security, agriculture, land-use, technology, sustainability

A Land Use Change Detection Analysis of Wetlands and their Potential Connection to Groundwater Recharge: Case Studies in the Regional District of Nanaimo
Kayla Harris, Department of Geography, Vancouver Island University, Nanaimo, British Columbia 900 Fifth Street V9R 5S5 E-mail: Kayla.Harris@viu.ca

Three wetland case studies within the Regional District of Nanaimo, Vancouver Island are used to provide an understanding of a variety of historical land use changes at each site. Land use change detection of wetlands is vital to establishing groundwater conceptual models of each wetland study site to determine their potential connection to groundwater recharge. Additionally, results of this research paired with a review of federal, provincial, and municipal policy on wetlands will be used to provide recommendations for better land management and planning practices in the future on Vancouver Island, particularly those that are found to be potential sources for groundwater recharge or are deemed to be ecologically sensitive ecosystems.

Keywords: wetlands, groundwater recharge, policy, land use change detection, conservation

Deforestation and secondary growth in Costa Rica along the path of development
Kayla Stan, Arturo Sanchez-Azofeifa, University of Alberta, Department of Earth and Atmospheric Sciences, 1-26 Earth and Atmospheric Sciences, Edmonton, AB T6G 2E7

Costa Rican policy is touted as the benchmark for tropical forest conservation strategies, therefore it is important to determine if these policies have been impactful. Determining the sustainability of these forests in uncertain times is also imperative. To determine the historical deforestation trends, forest maps from 1960-2013 were used in the Dinamica Environment for Geoprocessing Objects (Dinamica EGO) to create deforestation models for Costa Rica. The historical model analyzed for changes in landscape metrics such as patch size and distance between 1960 and 2013. After validation of the model's ability to replicate patterns, a future model was created to determine the forests' future trajectory and the importance of Protected Areas. Moving forward, current forest area is sustainable even under the most extreme conditions, except in the Puntarenas province. The Protected Areas policy has little impact on the deforestation trends except in the smallest and the coastal parks.

Keywords: Land Cover Change, Environmental Modelling, Dinamica EGO, Deforestation Trends, Environmental Legislation

CONCURRENT SESSION 3: 13:00-14:30

3.1 The Many Facets of our Forests: Trees in Western Canada II

Multi-Scale Investigations of Boreal Carbon Allocation in Central Saskatchewan
Jay Maillet[1]; Alan Barr[2]; and Colin P. Laroque[3]; [1, 3] Mistik Askiwin Dendrochronology Lab
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In this talk, we will discuss active research taking place within three of the permanent Boreal Ecosystem Monitoring and Research Sites (BERMS), located in the province of Saskatchewan. These sites are representative of three distinct and representative southern boreal forest stands. The goal of the research being undertaken is to provide a comprehensive understanding of stem-level biomass and its role in forest-atmosphere carbon exchange across a diverse set of boreal ecosystems. The unique multi-scale perspective, applied here to the study of carbon allocation in the North American boreal forest for the first time, will shed light on the complex relationship between climate, tree growth, and carbon in the Canadian boreal forest. Lastly, preliminary results from a long-term study, representing the culmination of over 20 years of repeated carbon stock measurements at two of the BERMS sites (Old Aspen and Old Jack Pine), are analyzed and discussed.

Keywords: Boreal Forest; BERMS; Carbon Allocation; Climate Change; Dendrochronology

Get the lead out: Synchrotron investigations of lead in the environment of St. John's, NL
Zachary Person; Inge Verbeek, Jay Maillet, and Colin P. Laroque. Mistik Askiwin Dendrochronology Lab, Department of Soil Science, 51 Campus Drive, University of Saskatchewan, Saskatoon Saskatchewan, S7N 5A8, zwp829@mail.usask.ca, inge.verbeek@outlook.com, jam552@mail.usask.ca, Colin.Laroque@usask.ca

Previous research on soil contamination in St. John's, Newfoundland and Labrador, found lead (Pb) levels to be much higher than Environment Canada guidelines. Lead was also present in spot tests of Aesculus hippocastnum (Horse Chestnut) trees found within the long-established Government House's Garden, even though Pb is not normally incorporated into tree tissues. We used X-ray fluorescence techniques at the VESPERS beamline located at the Canadian Light Source in Saskatoon, to measure Pb counts using full-spectrum pink lasers, and correlated directly with concentrations of Pb across the core samples. Pb had congregated within the full lengths of the tree core, indicating that the annual increments can be used as a time line to better understand how the environment has changed. Pb concentrations seem to be dropping over time, indicating that the sources for the Pb have ceased, and the environment is slowly ridding itself of the toxic materials.

Keywords: X-ray fluorescence, horse chestnut, lead toxicity, synchrotron, bioavailability

Interspecific and Topographic Tree Climatic Response: a Story from Nain, Labrador

Beckett Stark; Inge Verbeek, Jay Maillet, and Colin P. Laroque. Mistik Askiwin Dendrochronology Lab, Department of Soil Science, 51 Campus Drive, University of Saskatchewan, Saskatoon Saskatchewan, S7N 5A8, beckettstark@gmail.com, inge.verbeek@outlook.com, j.maillet@usask.ca, Colin.Laroque@usask.ca

Six sets of tree cores were collected from a valley near Nain, Labrador. The sets were taken from larch (*Larix laricina)* and spruce (*Picea glauca)* at three slope aspects: north facing, south facing, and valley bottom. The annual, earlywood, and latewood growth of the trees were measured, and chronologies were compared to each other and with climate data. Larch demonstrated a stronger and more positive response to recent climatic changes, showing an increase in radial growth over the last 30 years. This increase is attributable to an increase in the annual proportion of earlywood in response to rising spring temperatures. The effect of slope aspect on radial growth followed a different trend in both species. Larch is experiencing the most dramatic increase in radial growth at the south facing site while spruce is experiencing the most dramatic increase in radial growth at the north facing site.

Keywords: eastern larch, white spruce, climate change, radial-tree growth, climatic response

3.2 Panel: Appreciating Diversity in Academia

Join us for this panel discussion, which will feature commentary from four Canadian members of academia: Margaret-Ann Armour (University of Alberta) - Professor and Associate Dean of Diversity, Faculty of Science, Michelle Driedger (University of Manitoba) - Professor and Canada Research Chair in Environment and Health Risk Communication, Sandeep Agrawal (University of Alberta) - Professor and Director of the Urban and Regional Planning Program, and Zoe Meletis (University of Northern British Columbia) - Associate Professor of Environmental Studies and Co-Founder of Inspiring Women Among Us. The discussion will focus on diversity, in general, but also valuing diversity and inclusion across and within academic institutions (which ranges from faculty to staff interactions, having or not having a terminal degree, Canadian citizen or International, youth or senior citizen, and varying religions, cultures, ethnicities, sexual preference/identities). The panel represents a diverse group of faculty from various Canadian post-secondary institutions.

Moderator: Dr. Leith Deacon - University of Alberta

Panelists:
Dr. Zoë Meletis - Associate Professor: University of Northern British Columbia
Dr. Sandeep Agrawal - Director of Urban & Regional Planning Program: University of Alberta
Dr. Margaret-Ann Armour - Associate Dean of Science, Diversity: University of Alberta
Dr. Michelle Driedger - Canada Research Chair: University of Manitoba

Keywords: diversity, inclusiveness, sensitivity, academia

3.3 Indigenous Perspectives I

Assigning Place: Inuit and Explorers in Arctic expedition narratives
Maura Hanrahan, PhD, Board of Governors Research Chair and Associate Professor, Dept. of Indigenous Studies, University of Lethbridge, Lethbridge, AB, T1K 3M4, maura.hanrahan@uleth.ca

Arctic exploration narratives from the 19th and early 20th century legitimize the appropriation of Inuit land for Western powers. These narratives ignore Inuit sovereignty and prepared the ideological ground for ongoing resource-extraction.
Inuit labour and knowledge were essential to Arctic exploration yet Inuit roles were minimized in explorers' accounts and individual Inuit were often not even named. Many explorers became famous and enjoyed great prestige; they published, lectured, endorsed products, and were given awards. Their rightful place extended to the Arctic, a site of danger, heroism, and potential wealth. Meanwhile, the rightful place of Inuit was not considered; nor was the Arctic as Inuit homeland. The Arctic narratives of Captain Bob Bartlett and Bjarne Mamen of the Canadian Arctic Expedition (1913-1918) and Edward Shackleton of the Oxford University Ellesmere Island Expedition (1934-1935) demonstrate the processes through which assigning of place occurred.

Key words: Arctic exploration; Inuit; explorers; exploration narratives; Arctic historical geography

Examining the Relationship Between Innovation-Based Employment and Well-Being in Canada's North
Jake Papineau, Dept. of Earth & Atmospheric Sciences, University of Alberta

This paper examines the relationship between innovation-based employment and objective measures of well-being in the context of Canada's North. Statistics Canada's 2011 National Household Survey data is analyzed to determine to what extent individual indicators of well-being are affected by employment in innovation-based economic sectors. Holding constant antecedent variables, a multiple linear regression analysis reveals that employment in innovation-based economic sectors is statistically correlated with higher individual incomes and slightly higher levels of housing suitability. However, it is also revealed that some individual employment sub-sectors are more strongly correlated with higher incomes than others, suggesting that significant variability exists within the innovation economy in Canada's North. Additionally, it is found that there are low levels of Aboriginal participation in the innovation economy, despite over 50% of the region's population identifying as such. Finally, it is also revealed that educational attainment is a strong predictor for employment in innovation-based economic sectors.

Indigenous Rights and Environmental Impact Assessment in Canada

Dawn Hoogeveen, Postdoctoral Fellow, IRES, University of British Columbia
Co-authors: Ginger Gibson, Firelight Group; Alistair MacDonald, Firelight Group

Environmental assessment the federal, provincial and territorial policy planning tool for deciding on industrial developments is contentious and involves conflicting jurisdictions. This paper examines EA as a process grounded in Indigenous jurisdiction, governance, and decision-making. An examination of Indigenous based EA is timely given the recent release of the federal Impact Assessment Act 2018. Through an examination of three case studies, we look to innovative approaches to project and environmental impact assessment, managed and implemented by Indigenous Governments. We do this through an explicit analysis of Indigenous controlled models of environmental and project assessment. Our goal is to discuss and strengthen understandings of novel, emerging forms of Indigenous based project assessment in Canada, in order to better define best practices in the Arctic.

Key words: Environmental Impact Assessment, jurisdiction, resource governance, Indigenous, Arctic

Nunamii'luni quvianaqtuq ("It is a happy moment to be on the land"): feelings, freedom and the spatial political ontology of well-being in Gjoa Haven and Tikiranajuq, Nunavut

Sean Robertson, Faculty of Native Studies, University of Alberta, Edmonton, AB, T6G 2H8 E-mail: sean.robertson@ualberta.ca; Gita Ljubicic, Department of Geography and Environmental Studies, Carleton University, Ottawa, ON K1S 5B6 E-mail: gitaljubicic@cunet.carleton.ca

The "therapeutic landscape" describes situated subjects composing well-being and place with (non)humans and other forces, such as emotions. As this theory lends itself to tracking relations and their effects, it was well suited to a research project with the Inuit community of Gjoa Haven, Canada on caribou and well-being. Through interviews focusing on practice, we learned that Inuit take trips to the land and enact their knowledge. In addition to physical and emotional gains, the social aspects of this environmental investment eject the individuation of the hamlet to produce a sense of unity ("freedom") with its own emotional benefit. Moreover, Inuit self-landscape transactions involve a compositional achievement of ontological difference further supportive of self-determination and emotional well-being. To better appreciate the politico-emotional content of Inuit relational ontology, we return to "freedom" as the erasure of interpersonal borders and explain happiness as the therapeutic benefit of an Inuit spatial political ontology.

Keywords: Inuit, well-being, emotion, ontology, Nunavut

3.4 Land Use Planning

Proposed zoning modifications to support mixed-use and high density development in Edmonton

Thomas Lippiatt, Department of Earth and Atmospheric Sciences, University of Alberta, Edmonton, Alberta, T6G 2E3 Email: lippiatt@ualberta.ca

This presentation describes proposed research in land use zoning for the City of Edmonton to support mixed-use and high density development. These forms of development are important for reducing urban sprawl, delivering successful Transit Oriented Development, promoting infill in mature neighbourhoods and building environmentally responsible communities. Edmonton's zoning bylaws are largely influenced by

Modernist practices and have not been updated since 2001. This presentation will discuss opportunities for improvement in Edmonton's zoning code, the public and private stakeholders that may benefit from these improvements, and a proposed coding framework to achieve these goals. The research is conducted using qualitative methods. Key actors in City Planning, City Council, the development sector, and real estate finance are interviewed to identify drivers and risks related to mixed-use and high density development. The presentation will highlight possible outcomes and conclusions from this research.
Keywords: Zoning, mixed-use, densification, development, Edmonton

The Role of Population Density in Municipal Annexation Outcomes
Kristen Knudskov, Department of Earth and Atmospheric Sciences, University of Alberta, Edmonton, AB T6G 2E3 E-mail: knudskov@ualberta.ca

Annexation has played a central role in municipal growth strategies across Alberta. Annexed areas are often distant from city cores and have historically been developed to low population density. Servicing and infrastructure are expanded to these areas, resulting in increased total public expenditure; however, the literature is not clear on how per capita expenditures are affected. This research will address the following question: how does population density in annexed areas affect a municipality's economic sustainability? Regression analysis will be employed to tease apart the fiscal impact specifically attributable to population density in annexed areas.

Keywords: annexation, population density, municipal finance, regression analysis

Infill Development in Edmonton: Measuring Perception and Attitude in Neighbourhoods That Have Experienced Infill Development
Mike Vivian, Department of Earth & Atmospheric Sciences, University of Alberta, Edmonton, AB, T6G 2E3 Email: mvivian1@ualberta.ca

Infill development is a strategy often employed by cities seeking to address negative pressures associated with growth. At the same time, there are a number of barriers to employing this strategy, with resistance from residents often being cited as the main barrier. Much of this resistance can be cited as a byproduct of perceived negative externalities of infill development, and that these negative characterizations of infill development are not born out of personal experience, but rather through preconceptions based on ambiguity. This study will attempt to determine whether or not perception or opinion of infill development in Edmonton, Alberta, positive or negative, changes once it is constructed in a neighbourhood - or, when the ambiguous becomes reality. To complete this research, a mixed-methods approach will be employed, and will consist of the following: 1) semi-structured key actor interviews, and 2) surveys to selected neighbourhoods that have experienced infill development.

Keywords: Edmonton, infill, perception, attitude

Planning for Federal Legalization of Recreational Cannabis Industries: An Analysis of Municipal Land Use/Zoning Strategies in Canada

Julie Paquette; Dr. Sandeep Agrawal, Department of Earth and Atmospheric Sciences, University of Alberta, Edmonton, AB T6G 2E3 jnpaquet@ualberta.ca; sagrawal@ualberta.ca

The Government of Canada's intention to legalize non-medicinal or recreational cannabis in the late summer of 2018 presents a challenge for Canadian municipalities concerning incorporating cannabis-related uses into their land use bylaws. This study aims to explore the land use strategies employed by Canadian municipalities to address recreational cannabis legalization. It also attempts to delineate a typology of those strategies, then provide an analysis of their benefits and drawbacks. The study will use a sample of twenty Canadian municipalities, both urban and rural, to analyze their land use bylaws and interview key informants. The findings of the study will contribute to a thin body of existing literature on legalized recreational cannabis land use strategies in Canada. Moreover, it will highlight issues in the current cannabis land use policy.

Keywords: cannabis, marijuana, land use, zoning, Canada

3.5 Travel and Learning

Religiosity to Spirituality: A Closer Look into Western Pilgrimage

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What drives pilgrims and tourists to travel thousands of miles? Pilgrimage is gaining popularity as it provides a diverse set of experiences for those who participate. The face of pilgrimage is changing as it attracts both religious and secular travelers. This presentation aims to understand and define the motivations of both pilgrim and tourist. The analysis is built on a literature review of theoretical and empirical studies, in conversation with my personal experience in walking a pilgrimage route. The literature reveals a change in motivation that can be observed in the modern, Western, pilgrim, shifting from religiosity to spirituality, and blurring the lines between pilgrims and tourists.

Keywords: Pilgrimage, tourism , spirituality

Internationalizing Canadian Geography: The Experiences of International Students in Geography at a Research University in British Columbia, Canada

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As universities move toward diversifying their campuses through the promotion of internationalization ideals, they often emphasize cross-cultural learning and social interactions between international students and their host communities. This study highlights international students' experiences while taking geography courses at a medium-size research university in British Columbia, Canada. Using a qualitative methodology, data were collected based on interviews and journal entries from international students taking geography courses in Fall 2017. The study concludes that while most international students generally had positive interactions with instructors and domestic students and favorable views of geography course content and design, there were some areas that required further improvements to assist in their academic and social experiences at the

University. This presentation will highlight some preliminary findings from an ongoing study that is based on international students' experiences within the field of geography.

Keywords: international students, diversity, cross-cultural learning, internationalization

Adventures in geography education with grandchildren and grandparents; summer camp at Vancouver Island University

Jessica Craig, Geography Department, Vancouver Island University, Nanaimo, BC, V9R 5S5, Email: Jessica.Craig@viu.ca

Each summer, Vancouver Island University hosts a summer camp for grandchildren and their grandparents. For the last two years, the Geography Department has offered a program for 25 participants consisting of grandchildren, aged 7 to 12, and their grandparents. The program aims to inspire curiosity about the world we live in and promote engagement from a geographic perspective. Active learning techniques were employed to introduce geographic topics such as map projection, using a compass, GPS, weather, rocks and minerals, and urban planning. Positive outcomes from the program included: participants learning, and having fun doing it; participants spending 'quality time' together; valuable volunteer experience for several undergraduate students; and a renewed passion for teaching for the hosting faculty.

Keywords: geography education, active learning, summer camp, grandchildren, grandparents

3.6 Political Economy

Mining the Closed Regime: Western Knowledge Production on Russia's Informal Political Economy

Nicholas Parlato, Department of Interdisciplinary Studies, UNBC, Prince George, BC V2N 4Z9 parlato@unbc.ca

The formal hierarchies and divisions of Western government structures are paralleled in Russia as a network of informal relations operating across boundaries of private-public, local-national, and legal-illegal. This network remains largely unaddressed by Western political and economic scholars, who typically critique Russian political economy from a normative democratic standpoint, classifying the entire polity within the liberal/illiberal binary, rather than understanding its multi-scaled and horizontal aspects. Considering current international tensions between the US and Russia, the language used by experts and officials in both countries must be scrutinized for its role in perpetuating marginalization and injustice. Scholars working from the institutional matrix of the Western Academy are implicated in this contentious field of politics, social justice, and knowledge-production. Challenging the usefulness of the liberal/illiberal binary to understand the ontologies and geographies of Russian federalism, this presentation approaches and interrogates the epistemological and ethical problems of Western research practices in post-Soviet spaces.

Keywords: Russia, politics, normativity, epistemology

Colombian cosmetic surgery: The performative production of neoliberal subjects
Spencer Douglas Bradbury, University of Victoria, Department of Geography, Victoria, British Columbia, V8W 2Y2, spdb93@gmail.com; sdbrad@uvic.ca

As cosmetic surgery tourism grows, an increasing number of surgeons advertise themselves in order to gain entry and maintain their positions in this lucrative enterprise. Cosmetic surgery advertising media position the recipients of cosmetic surgery as subjects who must work on themselves by investing in surgical means of self-transformation and self-refinement. The discourses of neoliberalism inform these advertising media practices, in which not only recipients of cosmetic surgery, but cosmetic surgeons come to be "entrepreneurs of themselves." This presentation introduces the research design, methodology, theory, and preliminary results from a two-month research project in Colombia, in which 21 interviews with cosmetic surgeons were conducted. Special focus will be given to a review of critical and feminist literature in order to introduce the complexity of these embodied, material-discursive, and formative practices of neoliberal subjects.

Key words: neoliberalism, subject formation, governmentality, cosmetic surgery, Colombia

An Economic Geography of the New Silk Road
Kris Carrier, Economics, Thompson Rivers University, Kamloops, BC V2C 0C8, carrierek10@mytru.ca

This course explores the current portrayal of China's new initiative in building a new Silk Road. Announced in 2013, the initiative is expected to cost close to one trillion dollars, and significantly alter the economies of multiple nations, as well as global economic patterns. In the context of such potentially dramatic change, the project has met with praise, concern, and scepticism. This presentation explores the range of views on the new silk road from an economic geography perspective, and evaluates the extent to which the new project has entered the disciplinary discourse

Keywords: economic geography, New Silk Road, globalization, academic discourse

CONCURRENT SESSION 4: 15:00-16:30

4.1 Remote Sensing

Inter-annual changes in sea ice phenology using MODIS imagery near Cambridge Bay and Kugluktuk, Nunavut, Western Canadian Arctic
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Arctic sea ice phenology, related to seasonal growth and melt, constrains community travel and hunting safety at local scales. In the western Canadian Arctic, changes in sea ice phenology due to climate are not well understood. This project quantifies changes sea ice phenological parameters detected from 2000-2017 adjacent to Cambridge Bay and Kugluktuk in the Kitikmeot region of Nunavut. The Moderate Resolution Imaging Spectroradiometer (MODIS) instrument provides a 250m daily surface reflectance product MOD09GQ in two bands, band 1 (620-670nm) and band 2 (841-876nm). Time series MODIS data were used to detect phenological parameters; freeze-up, melt onset, melt pond flooding, and break-up. Data were

spatially subset, processed to remove clouds, assessed for patterns of change, and compared to temperature data. Time series analysis of optical imagery has the potential to contribute to our understanding of Arctic sea ice phenology and inform coastal Arctic communities of changes in ice conditions.

Keywords: remote sensing, sea ice, Arctic, MODIS, time series, optical imagery, cryosphere

Vegetation productivity and phenology across the Bathurst caribou range

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Rapid change in vegetation structure, composition and growth across Arctic, subarctic and boreal terrestrial environments may play a role in the population declines of barren-ground caribou herds. We investigate impacts to the range condition of the Bathurst caribou herd over the past two decades using a combination of satellite remote sensing and ground measurements. Using NASA's MODIS sensor, we generated range maps of annual vegetation productivity. These reveal that that nearly 20% of the herd's range is experiencing significant greening trends. To link these trends with specific changes in plant growth we are using dendrochronological analysis of trees and shrubs from across the range. We will share findings from sampled plots showing the high variability of growth rates within single shrubs and also discuss our summer 2018 sampling campaign. Given that barren ground caribou are likely to respond to vegetation conditions, documentation of those changes is important for conservation efforts.
Key Words: Bathurst Herd, remote sensing, greening, dendrochronology, NWT

Stable Isotope Analysis of a Nuu-chah-nulth Wool Dog Provides Insight into Past Human Resource Use in Barkley Sound, British Columbia

Dylan Hillis, Departments of Geography and Anthropology, University of Victoria, Victoria BC, V8W 2Y2, E-mail: dylanhillis@gmail.com

Stable isotope analysis of bone collagen provides an effective means for understanding food web relationships in archaeological and ecological contexts. Domestic dog (Canis familiaris) bone collagen can be used to infer past human food web activities, as dogs were often provisioned with scraps from human meals and faeces. In this study, I use stable isotope signatures from a wide variety of taxa to interpret a Nuu-chah-nulth wool dog's diet as a way of inferring human resource use in Barkley Sound, British Columbia. Food source contributions were estimated by Bayesian stable isotope mixing models (Mix SIAR). Results suggest a diet largely composed of schooling forage fish (median, 65.2%, range, 19.1% to 85.5%). These findings contribute further insight into Tseshaht First Nation history by focusing on Indigenous marine resource use in Barkley Sound (1030-1170 AD).

Keywords: stable-isotopes, marine ecology, Canis familiaris, Nuu-chah-nulth, archaeology

Automated Detection of Yellow Flag Iris Using Learning Algorithms and UAVs

Jackson Baron, Department of Geography and Environmental Studies, Thompson Rivers University, Kamloops, V2C 0C8, Email: jacksonbaron@outlook.com

An in-depth look at combinations of image processing and supervised classification to identify the invasive plant species yellow flag iris (Iris pseudacorus) in images collected by an un-calibrated, visible-light camera attached to an unmanned aerial vehicle (UAV). Image processing techniques involving colour thresholds, template matching, and/or de-speckling were used in conjunction with a supervised random forest classifier. The effects of feature selection were also explored when refining the classifier. The importance of image processing when preparing images for classification is demonstrated, and most effective methods developed are presented from this work.

Keywords: Remote Sensing, Machine Learning, Image Processing, Invasive Plant Species, Unmanned Aerial Vehicles

4.2 Local and Regional Geographies

Regional Geography from within: Comparing a Political Memoir to Geographies of Tourist Guides and Textbooks

Kim Naqvi, Geography and Environmental Studies, Thompson Rivers University, Kamloops, BC V2C 0C8, knaqvi@tru.ca

Carmen Aguirre's political and coming of age memoir, Something Fierce: Memoirs of a Revolutionary Daughter, is used to teach a regional geography course on the Americas. Because the region's shared identity is due to its geopolitical past and present, a political memoir of a Chilean exile returning from Canada conveniently covers a lot of literal and social ground. Recounting conflicts between race and class, the Latin American left and right, and the intervention of the Global North, at the same time, it details the intimate geographies of sense of place, family relations, community dynamics, and the human scale of political conflict. This scale ranges from house by house, neighbourhood by neighbourhood, country by country, and within countries. This presentation outlines the range of geographical locations and scales Aguirre's work encompasses, and contrasts them with tourist and textbook portrayals of region and place to demonstrate its powerful pedagogical potential.

Keywords: Regional geography, pedagogy, the Americas, place

Wind Water and Harmony: Examining How Feng Shui Influence Feeling of Comfort at Thompson Rivers University

Richmond Ho Shing Yu, Department of Geography & Environmental Studies,
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Feng Shui aims to harmonize human and natural landscapes using an artistic and scientific approach. Form school Feng Shui – the artistic side of the discipline – aims to unify landscapes through the strategic placement of artifacts in space. On the other hand, the compass school – the scientific aspect of Feng Shui – evaluates "positions" with astrology and cartography. The aim of this presentation is to first, examine the existing form and compass school features of indoor locations (Arts and Education Building Room 151, and Old Main Building Computer Lab) and the outdoor Horticultural Gardens at Thompson Rivers University; and second, evaluate how good or bad Feng Shui influences the sense of comfort in these places. Through qualitative landscape observations, results suggest that Room 151 and the Horticultural Gardens contain

features that satisfy good Feng Shui. However, the Computer Lab lacks good Feng Shui structures, making it the least comfortable location on campus.

Keywords: Feng Shui; landscape architecture; Interior design; cultural perception

Gatineau Park: The failed national park near Canada's national capital

Michael Lait, Department of Geography, University of Northern British Columbia, Fort St. John, BC. V1J 0M7. Email: Michael.lait@unbc.ca

First proposed in 1913, Gatineau Park could have been the prototype in a system of near-urban national parks. Through archival research and access-to-information requests, my research examines how and why Gatineau Park failed to become a national park, and the long-term consequences of this failure as 'Gatineau Park' never obtained national park status and has been managed without legislation. I argue, first, that the main reason preventing Gatineau Park from becoming a national park is the powerful influence of private cottagers, who are concentrated in the center of the Park. Drawing from Sack's concept of territoriality, I argue, second, that the mixture of public and private ownership has not only inhibited but also undermined government control of the park territory. This argument is supported by case studies of government expropriations that prevented cottage subdivisions and hotel developments. In the conclusion I offer recommendations to remedy Gatineau Park's ongoing political situation.

Keywords: national parks, national capital, cottage country, private property, territoriality

4.3 Indigenous Perspectives II

Spring Flooding and the Case of Kashechewan First Nation in Northern Ontario, Canada

Muhammad-Arshad K. Khalafzai, Human Geography Program, University of Alberta
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Spring Flooding and the Case of Kashechewan First Nation in Northern Ontario, Canada.
This study examines the physical vulnerability of Kashechewan First Nation in Northern Ontario to spring flooding. Declaration of emergency and mandatory precautionary evacuation every spring has become a part of life for residents. The study explores the community member's observations on spring flooding and the location-specific flood risk features. This research employed a participatory case study approach. The data for the study was generated through participatory flood mapping techniques and qualitative interviews completed with residents. The research participants' local spatial knowledge helped to understand the spring flooding risk. The community's location, infrastructure, climate change, and resource development were identified by participants as the main triggers of the flooding. While warming is causing earlier spring and snowmelt, the past 50-Year Albany River discharge data indicate that there is no significant change in river flows, however, breakup ice jams and the number of jams sites has increased.

Key Words: Kashechewan First Nation, Indigenous Peoples, Canada, Participatory Flood Mapping, Climate Change

Cedar Box and the Case for Integrated Indigenous Data Management Tools

Charles Burnett, , Department of Geography, University of Victoria, Victoria, BC V8W 2Y2 E-mail: cburnett@uvic.ca; Rosie Child, Researcher & Project Manager, Kitasoo/Xai'xais Integrated Resource Authority (KXIRA), Klemtu, BC V0T 1L0 E-mail: childkr@gmail.com

Around the early 2000s, court cases clarified the Crown's Duty to Consult with First Nations on land management in BC and the need for efficient spatial data management in First Nations expanded as communication and shared file/map volumes increased significantly. A decade on, spatial data management challenges (and opportunities) within Indigenous Lands/Marine Stewardship practice has evolved even further. I present an update on the 10 year Cedar Box community-based research project, and outline the project's key research themes: data privacy, ownership, accessibility and interoperability; community-based research; and giving back to the community. I demonstrate new Heritage App functionality, with tools for (1) accessioning old interviews, reports, and maps for Indigenous Laws research, and (2) interactive multimedia Community Maps for cultural revitalization. I review use of Cedar Box in two coastal BC communities, discuss interim thoughts on research questions, and explore possible future directions for Cedar Box functionality.
Keywords: Indigenous data management, heritage planning, referrals tracking and analysis, Indigenous laws, community maps

"There's no meaningful communication when it's just on paper": Problematizing Aboriginal Consultation on Nadleh Whut'en First Nation Territory

Rebecca DeLorey, Natural Resources and Environmental Studies, University of Northern British Columbia, Prince George, BC, V2N 4Z9, delorey@unbc.ca

The overarching goal of Aboriginal consultation is to advance the process of reconciliation. However, procedural aspects continue to prioritize western planning approaches and do not advance the Interests of Nations. This study examines the use of land referrals in consultation, wherein letters and related information are sent to Nations from industry and government outlining proposed activities on their Territories. By interviewing knowledge holders from the Nadleh Whut'en First Nation (NWFN), and forestry sector stakeholders, this study explores how the referrals process limits the ability of Nations to meaningfully contribute to decision-making on their Territories. The presentation begins by problematizing Aboriginal consultation in the context of forestry operations on NWFN Territory in north-central British Columbia, and concludes with a discussion of how the NWFN is asserting their Interests through innovative water stewardship policy development. The presenter's role as the Land Referrals Coordinator with the NWFN weaves professional experience throughout the presentation.

Keywords: Aboriginal consultation, water management, social learning, British Columbia

Generative Refusal in Canada and Siberia: Considerations of Urban Indigenous Women's Experiences

Tsatia Adzich, Interdisciplinary Studies (Geography, Political Science, Gender Studies), University of Northern British Columbia (UNBC), Prince George, British Columbia, V2N 4Z9, adzich@unbc.ca

This research is concerned with the intersections of young Indigenous women's experiences of urban community building both on Coast Salish territories in Canada and in Sakha Republic (Yakutia) in the Russian Federation. As an Indigenous woman, I hold a dynamic role in academic and political considerations of urban Indigenous community networks of kinship and governance as geopolitically significant. During 2017, I collaborated with the Urban Native Youth Association in Vancouver to honour and document Indigenous women's stories in urban Coast Salish territories. In 2018, I will spend four months in the Siberian city of Yakutsk to complete thesis fieldwork and foster the creation of international networks of urban Indigenous women by similarly honouring stories. This project is guided by Indigenous methodologies that necessitate reflexive community accountabilities, and highlights my responsibility for appropriately situating the generative refusal urban Indigenous communities embody against Canadian and Russian colonial politics of recognition.

Key words: urban Indigenous women, geopolitical significance, generative refusal, Russia, kinship

4.4 Governance

The Relationship of Long-term Perspective to Strategy

Joshua Culling, University of Alberta, Edmonton, Alberta, T6G2R3, culling@ualberta.ca

In theory, a community's strategies should derive from its long-term perspective, supporting the achievement of the particular goals and desires that structure that perspective. And yet, as Evolutionary Governance Theory has outlined, communities are complex, and governance is never as straightforward and systematic as one may assume. Utilizing a mix of research methods—key actor interviews, document analysis, unstructured observation—to study an Alberta municipality, this masters research project will identify the relationship long-term perspectives have to the development strategies carried out at the community level and evaluate the consequences of this relationship. This research contributes to the broad field of governance theory and will provide important insights for planners and policy makers in regard to strategy formation and implementation.
Keywords: Governance; Evolutionary Governance Theory; Strategy; Long-term perspective

Adaptive Governance and Resilience in Complex Social Ecological Systems: A Case Study of Communities in the Canadian Rocky Mountains

Jared Candlish, Department of Earth and Atmospheric Sciences, University of Alberta, Edmonton, AB, T6G 2E3, E-mail: jcandlis@ualberta.ca

Ecosystems in the Canadian Rocky Mountain are experiencing ecological shifts due to climate change. This can impact the capacity of communities to respond to variations and vulnerabilities within social-ecological systems. This proposed research will explore adaptive governance in social-ecological systems by focussing on the social networks, narratives, and institutions that influence the ability of communities to adapt to change. This proposed research will apply the theoretical framework of evolutionary governance theory as a guide, and apply a mixed methods approach using semi structures key actor interviews, policy analysis, and path mapping.

There is significant research on resilience and adaptive capacity however, governing for resilience and the role of governance in the evolution of social-ecological systems requires further investigation. The importance of

this proposed research lies in the contribution to understanding the social complexities and governance structures created within communities, and how they interact and adapt to changing social-ecological conditions.

Keywords: resilience, adaptive capacity, Canadian Rockies, social-ecological systems, governance

An Evaluation of Integrated Community Sustainability Plans in the Regional District of East Kootenay, BC

Eden McDonald-Yale, Department of Earth and Atmospheric Sciences, University of Alberta, Edmonton, AB T6G 2E3, e-mail: eden3@ualberta.ca

As a response to climate change, many communities are implementing plans to integrate sustainability into municipal operations.
Through a series of case studies, this proposed research project will examine existing strategies to improve sustainability in six municipalities and introduce recommendations for communities to reflect a socially resilient perspective. The Integrated Community Sustainability Plans of Cranbrook, Elkford, Fernie, Invermere, Kimberley, and Sparwood will be examined. All communities are located in the Regional District of East Kootenay, British Columbia.

This analysis will involve both quantitative and qualitative methods: an initial content analysis of existing sustainability plans will highlight local examples of strengths and weaknesses from each community. Data will be tabulated into a comparative format to enable quick comparisons.
The content analysis will inform qualitative interviews with representatives from each community to corroborate initial findings and determine the extent to which various sustainability indicators and climate-related threats have been assessed and considered.

Keywords: integrated community sustainability plans, planning, sustainability, sustainable development, climate change

A cumulative effects framework for land use planning in Nunavut

Denise Baikie, Department of Earth and Atmospheric Sciences, Urban and Regional Planning Program, University of Alberta, Edmonton, AB T6G 2E3, E-mail baikie@ualberta.ca

There is ongoing conflict between promoting industrial development and protecting wildlife habitat in Nunavut. This arises from the overlap of mineral potential with important wildlife habitat such as caribou calving grounds. Stakeholders in Nunavut are working to finalize a territory-wide land use plan, and in the meantime cumulative effects are primarily being examined in the environmental assessment process. However, an effective land use planning framework through which to assess the cumulative impacts of development could help to mitigate these land use conflicts. My goal is to identify an applicable cumulative effects framework for the Nunavut planning context with a focus on mitigating effects to caribou. I will achieve this by reviewing relevant literature, conducting a gap analysis of circumpolar planning documents with a focus on Alaska and the Canadian territories, and by interviewing key actors for the Nunavut specific context.
Keywords: cumulative effects, environmental assessment, planning, caribou, Nunavut

4.5 On-Reserve Housing and Land-Use Planning: Weaving Experience with Academia to foster Equity for the Esk'etemculecw

Paneena (Sara-Lynn Harding), Department of Natural Resources & Environmental Studies, University of Northern British Columbia, Prince George, BC, V2N 4Z9; E-mail: sharding@unbc.ca

This special session explores the challenges the Esk'etemc community faces in achieving its housing goals through the experience of one Housing Committee member. As a volunteer to the Housing Committee in in her first term, the presenter planned her undergraduate coursework to support Esk'etemc On-Reserve housing development. The purpose of returning to undergraduate studies was to answer the question, "How do we plan lot sizes On-Reserve?". Now as a graduate student, research has expanded to understand the Esk'etemc governance structure and its application to modern land use planning practices. In this special session, your presenter will share experiences from the Esk'etemc Housing Committee that led to a recent opportunity to participate in a Net Zero On-Reserve Housing pilot project. Following this presentation, time will be utilized to foster meaningful dialogue between audience members to create understanding of the challenges in planning On-Reserve housing.

Keywords: Indigenous governance, environmental planning, On-Reserve housing, experiential, Esk'etemc

POSTERS

1. Street Art: Placemaking through Political and Environmental Contestation

Hayley Burns, Department of Geography, University of Victoria, Victoria, BC V8P 5C2 E-mail: handlburns@shaw.ca;
Michelle Ochsner, Department of Geography, University of Victoria, Victoria, BC V8P 5C2 Email: mochsner@telus.net

We live in a world today where issues of politics and the environment are being reflected through public places of artistic expression. Graffiti in the past has been heavily contested within the realm of traditional city design, and the appeal of street art has since shifted to become more influential in modern society. Our research explores global trends of street art, which focuses on the political aspects of graffiti such as the Berlin wall and Banksy's famous works. These broad examples provoked an interest of research on street art within our own region. After interviewing a number of people on Salt Spring Island, and analyzing graffiti in downtown Victoria, it was concluded that street art on the local level, is an outlet for self-expression, and brings people together to stand up against political, and environmental issues that communities are passionate about.

Keywords: political geography, environmental sustainability, place making, street art, community

2. Food Security, Social and Environmental Justice and Resilience in the Canadian Arctic, using Participatory Video Method

Maeva Gauthier, Department of Geography, University of Victoria, BC, V8P 5C2, E-mail: maeva@uvic.ca

Rapid environmental change in the Canadian Arctic has been affecting people by changing their environment, livelihoods, resources, as well as their cultural and biological diversity. More specifically, pollution and solid waste are very important issues affecting food security. Research has shown that Participatory Video is a powerful tool to empower youth and strengthen resilience in communities, and leads to effective communication avenues with decision-makers to advocate for change. My research will use Participatory Video to engage youth in Tuktoyaktuk, NWT, on issues related to food security. More specifically I will focus on how plastics and microplastics in their environment might affect their livelihoods.

Key words: participatory video, microplastics, resilience, subsistence food, Arctic

3. DIY Urbanism: Influences & Impacts on Community Planning

Steven Shuttle University of Alberta, Edmonton, Email: shuttle@ualberta.ca

'Do It Yourself' (DIY) urbanism is usually initiated by community members using a grassroots approach to change urban areas. Community planning involves making decisions about urban areas. This paper examines topics regarding DIY urbanism and community planning. Community engagement, neoliberalism and municipal support are key influences of DIY urbanism related to planning. DIY urbanism impacts the planner's role as well as the relationships between planners, communities and municipalities. Three Canadian examples of DIY urbanism are introduced, including the Urban Repair Squad, PARK(ing) Day, and CITYlab. Discussion focuses on the opportunities and potential challenges of DIY urbanism for planners to consider. Potential challenges include public safety and municipal liability. Recommendations for planners regarding DIY urbanism are provided. DIY urbanism can be beneficial if planners work collaboratively and focus on small scale, low cost improvements.

Keywords: DIY Urbanism, Community Engagement, Grassroots Approaches, Neoliberalism, PARK(ing) Day

4. Water Quality Data to Support Cumulative Effects Decision-Making in the Mackenzie Valley, Northwest Territories

Lindsay Wong, Department of Geography and Planning, University of Saskatchewan, Saskatchewan, SK S7N 5C8 E-mail: Lindsay.Wong@usask.ca; Bram Noble, Department of Geography and Planning, University of Saskatchewan, Saskatchewan, SK S7N 5C8 E-mail: B.Noble@usask.ca; Kevin Hanna, Centre for Environmental Assessment Research, The University of British Columbia, Fipke Centre for Innovative 3427 University Way, Kelowna, British Columbia V1V 1V7 E-mail: Kevin.Hanna@ubc.ca

This research examines how environmental monitoring programs in the Mackenzie Valley, Northwest Territories, contribute to the identification, understanding and management of cumulative effects to freshwater systems. This involved a review of databases to assess the nature of water quality monitoring conducted by government agencies and project proponents. Semi-structured interviews complemented the review to determine the utility of existing data to develop environmental baselines and to predict cumulative effects.

Findings suggest that there are several challenges, including the lack of common understanding of cumulative effects, uncertainty over responsibility for them, unclear stakeholder roles and inaccessibility of government and proponent-based data. Ultimately, this may be preventing cumulative effects from being assessed and

managed in a comprehensive and systematic manner. These results will aid in advancing the integration of government- and proponent-based environmental monitoring and be of direct value for regulatory decision-making by land and water boards in the North.

Key words: cumulative effects, water quality, environmental monitoring programs, regulatory decision-making, Northwest Territories

5. Minimizing harmful effects of fences on wildlife: A case study on the reintroduction of Bison into Banff National Park

Daniel Ripmeester; Joshua Kirylchuk, Department of Environmental Studies, The King's University, Edmonton, AB,T6B 2H3. Emails: danielripmeester@gmail.com, josh.kirylchuk@gmail.com

Fences are necessary to contain the Bison that are being reintroduced to Banff National Park. This study analyzed how introducing fences into natural areas can impact wildlife. We examined short term disturbances involved with construction as well as long term impacts on wildlife movement and migration. This case study is based on the Detailed Environmental Impact Analysis along with several academic articles. We found that there are several mitigation measures in place to minimize the fences' effects on wildlife. In order to reduce noise, changes to the landscape, and human presence in the area, fence construction was done by hand instead of using machinery. Fences were only constructed in select locations, where natural landscape features would not sufficiently contain the bison. They were constructed to be wildlife permeable 95 percent of the time. We concluded that the chosen mitigation techniques will successfully minimize the impacts of fences on wildlife.

Keywords: Wildlife, impacts, fences, permeability, construction

6. Increased shipping in Canadian Arctic waters: Is Canada ready?

Nicole Peletz-Bohbot, Department of Community, Culture, and Global Studies, Centre for Environmental Assessment Research, University of British Columbia – Okanagan, Kelowna, BC, V1V 1V7, nicole.peletz@ubc.ca

The Canadian Arctic is experiencing an unprecedented amount of change. From temperature increase to sea-ice decline, Arctic waters are becoming more navigable leading to an increase in resource development and posing pressure on marine environments, notably in Nunavut. As the first Arctic development to propose year-round shipping, the Mary River iron ore mine in Baffin Island, NU, presents an interesting case study surrounding the feasibility of an extended Arctic shipping season, and the future of shipping in the Canadian Arctic. Through an overview of the Mary River environmental assessment review as well as the broad Arctic shipping context, this poster highlights the challenges regarding increased Arctic shipping in Canada, and offers recommendations moving forward.

Keywords: Arctic, shipping, resource-development, marine environments, Canada

7. Bill C-69: An improvement in public participation for Indigenous peoples and the Canadian public?

Claire Brandenbarg and Erin Postma, Department of Environmental Studies, The King's University, Edmonton, 9125 50 St NW, Edmonton, AB T6B 2H3 Email: claire.brandenbarg@lab.kingsu.ca, erin.postma@lab.kingsu.ca

Participation is a particularly contentious element of environmental impact assessment reform in Canada; it requires a fair and balanced inclusion of the knowledge and perspectives held by both Indigenous peoples and the general Canadian public. Effective and equitable opportunities for the inclusion of Indigenous peoples is of recurring mention in Bill C-69, the most recent document regarding Canadian EIA legislation. Suggestions for proper participatory measures are made in the Clogg et al., paper "Making the Grade: A Report Card on Canada's Proposal for Strengthening Environmental Laws and Processes". Using their proposed pillars as guiding standards, our poster will examine the suggested changes to Indigenous and public participation made in Bill C-69. Developments such enhanced accessibility for the Canadian public, more comprehensive Indigenous consent, and dynamic gender-based approaches indicate that Bill C-69 has ample potential to meet informed and improved participation standards.

Keywords: EIA reform, public participation, Indigenous peoples, gender, Canada

8. Costs of North American Big Game: testing effects of species rarity and costly signalling qualities

Ilona Mihalik, Department of Geography, University of Victoria, Victoria, BC V8W 2Y2 E-mail: ilonammillie@gmail.com

The anthropogenic Allee effect model (Courchamp et al. 2006) predicts the high monetary cost associated with killing rare species increases their demand, potentially leading to declines and extinction. Motivation for killing rare and/or "dangerous" species could be for showing-off, following Costly Signalling Theory (Darimont et al. 2017).

This project looks at variation in hunting guide outfitter prices for 16 big game species in North America. Rarity is measured by focusing on localized conservation status assignments at the provincial/state-level. Safari Club International hunt descriptions are analyzed for inclusion of "dangerous", "difficult" remarks. I also account for how body mass and other potential influences (such as herbivore vs carnivore) affect prices. The findings of this research unite these two bodies of work, and may encourage further discussion on endangered species and valuing rarity to identify different routes in conservation.

Keywords: trophy hunting, anthropogenic Allee effect, rarity, big game, North America

9. Rethinking Zoning: An Alternative to Rigid and Complex Land Use Bylaws

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Zoning is one of the most fundamental and widespread tools available to urban planners. In recent decades, planners have sought to promote a greater mix of land uses in order to create more livable and sustainable communities. In this study, I investigate key principles underlying both traditional and contemporary zoning bylaws, explore alternative approaches to zoning across Canada (particularly in Ontario), and suggest an updated approach that increases public accessibility and more closely aligns with contemporary planning objectives. This model bylaw is intended to influence Edmonton's Zoning Bylaw Renewal project taking

place over the next three years, and seeks to address several shortcomings of traditional zoning. These include overly complex regulations, limited flexibility, and a lack of design-based elements. Ultimately, my research aims to improve the practical outcomes of zoning, and enable clear two-way communication between planners and citizens regarding the future form and design of Edmonton's communities.

Keywords: zoning bylaws, land use, planning, sustainability, Edmonton

10. How do you view the grizzly hunt? Investigating Social Climate, Science and Other Influences on the 2017 BC Grizzly Bear Hunt Ban

Bridget Kinsley; Dr. Zoë Meletis, University of Northern British Columbia

British Columbia has recently banned the grizzly hunt (2017). Government-cited science suggests the hunt was not adversely impacting population numbers. Recent Government announcements suggest a greater prioritization of social values, citing waning societal support for the hunt as reason for the bans. I will investigate this by: 1) examining key documents preceding the 2017 bans, focusing on key claims; 2) surveying media coverage of the grizzly hunt bans and public perceptions; and 3) interviewing experts about grizzly policy formulation. I will use resulting analyses to address claims that a) BC resident perceptions of grizzlies and the hunt have changed, and 2) management is responding to this. My dual goals are 1) to consolidate information about BC's grizzly hunt and perceptions of it, and 2) to determine if a shift in management culture is occurring. If shifts are occurring, what do they mean for current and future wildlife management in BC?

Key words: grizzly bear, natural resource management, wildlife perceptions, hunting, charismatic megafauna

11. Space, Power, and Street Performers: The Effects of Regulation and Exclusionary Space in Victoria, B.C.

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The formal and informal regulation of street performers in Victoria, British Columbia, has spatial effects on the human and non-human landscapes of the city. The exclusionary space of the Lower Causeway, a predominant tourist location, is compared with the public streets of the city. The power of street performers and the profuse ways they negotiate barriers and regulations is evaluated using performativity theory. Data were collected through participant observation, semi-structured interviews, and the textual analysis of public online videos. The formal regulation of the Lower Causeway was found to be simultaneously exclusionary and inclusionary: certain street performers are alienated from the space while others benefit and depend on it for their living. A more dynamic approach to regulate the space may allow it to be more inclusive while not jeopardizing those whom depend on the space. However, formal regulation is inherently rigid and may be difficult to optimally modify.

Keywords: street performers; performativity; regulation; exclusionary spaces; Victoria

12. Land use change impacts on the flow regime in Redfish Creek watershed

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Forest harvesting in British Columbia Mountains have the ability to change the flow regime and water balance in watersheds. Therefore, any changes in forest vegetation can influence the hydrological cycle. Availability of forest cut blocks data, and the long-term hydrological and climatological data in the Redfish Creek situated in southern of British Colombia, provide an opportunity to investigate land use change impacts on the flow regime in a small watershed. In this research, statistical analysis was used to evaluate the effects of land use change on the flow regime for 1995-2011, with a series of harvesting events which constitute 14% of the watershed during these years. Data was analyzed before and after harvesting events for two different time periods. The preliminary analysis demonstrate that annual flow volume increased following both harvesting events despite a reduction in annual precipitation. Impacts of logging on extreme flow events is planned to be investigated.

Key words: Land use change, Watershed, Redfish Creek, Flow regime, British Columbia

13. Mapping Waste Governance in Two Canadian Cities in Relation to the Informal Recycling Sector

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As waste generation continues to increase globally, its management has become problematic. Through waste recovery, the informal recycling sector has contributed significantly to reducing landfill jam and carbon footprints. However, these individuals are generally marginalized, impoverished, and are mostly excluded from the formal waste management system; and Canada is not an exception. Using a comparative case study approach and mixed method, this study examines waste governance in two Canadian cities with the aim of identifying how through policy making, political actors affect waste recovery and the level of inclusiveness in the waste management system. The study will investigate the role of grassroots social innovations in improving the livelihoods of these individuals. Results from this research will help inform authorities, policy makers and practitioners on the need for an inclusive waste management system and will provide strategies for improving the livelihoods of this sector while promoting sustainability in the city.

Keywords: informal waste recycling, waste governance, grassroots social innovations, livelihoods, waste management.

14. Clean drinking water in Indigenous communities across Canada – a sustainable solution for a wicked problem

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This poster examines the inaccessibility to clean water in Indigenous communities across Canada, offering both short- and long-term suggestions for sustainable solutions.

Keywords: Water rights, Indigenous communities, sustainability, Canada

15. Saving the Swamp? An Evaluation of the Alberta Wetland Policy

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Reclamation of wetlands is a controversial subject that poses questions of ecological integrity and human ability to return natural areas to their pre-disturbed functionality. Wetlands play a crucial role in carbon sequestration and provide countless ecosystem services. These values highlight the importance of strong and effective policy for wetland conservation and management. Alberta has lost 64% of its natural wetlands, and continues to lose 0.3-0.5% annually. The Alberta Wetland Policy includes a no net loss component, meaning that any wetlands lost or degraded due to oil and gas activity must be restored or replaced. A case study of the Syncrude Sandhill Fen along with literature review was used to analyse the effectiveness of this policy. The results show that to date, there is uncertainty surrounding our ability to fully restore wetlands within a reasonable timeframe, indicating that the Alberta Wetland Policy may fail to preserve the ecological integrity of these systems.

Keywords: wetlands, policy, reclamation, oil and gas

16. A Creative Cities Analysis of Artists in Vancouver

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Post-industrial Vancouver has experienced large-scale expansive economic development. This process of expansion reflects many of Richard Florida's "Creative City Initiative" economic development strategies. One of Florida's principal strategies is to provide an open and accessible city that caters to the creative class. A proto-typical creative city would be one with a thriving arts and culture scene. Through their municipal policy initiatives, funding, and goals, Vancouver has strategically taken this approach. I argue that this approach has benefited the city economically as a whole but has predominantly disadvantaged artists themselves who are integral in the development of arts and culture in any given city.

Keywords: creative class, development, artists, arts, culture

17. Barriers and Benefits to Bio-diesel use in Commercial and Industrial Vehicle Fleets in the Regional District of Nanaimo

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The production and consumption of fuel for transportation is a critical factor affecting local and global sustainability. Renewable contributions including bio-diesel produced from waste cooking oils is biodegradable, non-toxic, renewable, carbon neutral, clean burning, and can be used in diesel engines to reduce reliance on fossil fuels. It can also be locally produced and distributed by community-based organizations like the Cowichan Bio-Diesel Coop in Duncan on Vancouver Island, BC. Commercial and industrial vehicle fleet diesel use represents a concentrated 'low-hanging fruit' for targeting greenhouse gas emissions, however barriers to bio-diesel adoption persist. A political ecology framework is used to explore the technological, economic, political, cultural and social enablers and constraints to bio-diesel adoption in

commercial and industrial vehicle fleets in the Regional District of Nanaimo by asking fleet managers about the barriers and benefits to bio-diesel use.
Keywords: bio-diesel, energy alternatives, transportation, renewable, sustainability

18. Changes in pH of the Surface and Subsurface Waters in Blaauw Eco Forest
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A swamp consists of land which is permanently saturated with water, making the water quality of the swamp very important to its environmental contributions. In this study, the pH of subsurface and surface waters was taken to build upon the profile of the swamp-forest and observe trends in the pH changes within two levels of water. This was done by using a meter to measure surface and subsurface water pH. The two water sources were compared to one another to determine the difference in pH between the depths and locations. The data was used to create interpolated maps using GIS. The surface water showed a higher pH than the subsurface water with the pH decreasing over the study period. The subsurface waters had a lower pH with a trend of increasing pH over the study period. Further studies need to be completed to determine the influence of the pH trends.

Keywords: pH, Wetland, Swamp-forest, Monitoring wells, Water Quality

19. Mitigation of Bird and Bat Fatalities Due to Onshore Wind Turbines
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In the case of wind energy, one potential risk was the increasing potential for bird and bat fatality as the number of wind turbines increases. The objective of this project was to outline the current problems that connect birds, bats, and wind power. It was also to explore current and potential mitigation efforts that were being used to prevent bird and bat deaths due to turbines. Content analysis and literary reviews were used to find current mitigation efforts and the impact wind farms are having on birds and bats. The results include multiple mitigation efforts such as tubular wind towers, bird and bat migration studies, and scare tape. The conclusion found was that there needed to be more studies of the area pre-construction and the employment of multiple mitigation techniques together.

Keywords: Birds, Bats, Wind Turbines, Mitigation.

20. Synergy between Oyster Reefs and Sea Level Rise in the Mississippi River Delta (MRD)
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Due to the rise in average global temperatures, sea levels have begun to encroach inland, leading to coastal erosion and habitat loss. One coastline that will be impacted by changing sea levels is the Mississippi River Delta in Louisiana, United States. The delta is home to the Eastern Oyster (Crassostrea virginica) whose reefs create structural systems that help prevent sediment erosion, thus reducing the impact of sea level rise on coastal environments. However, sea level rise can also negatively affect oyster reefs by obstructing healthy

oyster reproduction. The objective of my research is to identify geographical areas in the Mississippi River Delta where artificial oyster reef development will likely persist despite sea level rise. Using Geographic Information Systems, I will integrate digital elevation files and oyster reef line data to determine which artificial oyster reefs in the Mississippi River Delta are at risk due to increased sea level.

Keywords: Coastal environments, Geographic Information System (GIS), Mississippi River Delta (MRD), artificial oyster reefs, sea level rise

21. Water Geochemistry and Bacteria Analysis of the Willband Watershed, Abbotsford, British Columbia

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1 University of the Fraser Valley
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The Willband watershed, which drains into the Fraser River in Abbotsford, BC, is an example of a system being impacted by increasing urban and agricultural land use. The creeks within this watershed flow through urban, industrial, forested, and agricultural lands. Water geochemistry data has been collected from this watershed since 2012 at sites on Stoney, Clayburn, and Willband creeks. Sampling for bacteria concentrations at these sites began in November 2016, which combined with the long-term geochemistry data provides insight into the current state of the creeks as well as seasonal trends in water geochemistry.

Key words: Water Geochemistry, Bacteria

22. Killing to Save?

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Since the Northern Diseased Bison Environmental Assessment in 1990, the approach to dealing with diseased wood bison has developed, while the threat has still persisted. By completing a case study including the original Northern Diseased Bison Environmental Assessment, the 2001 National Recovery Plan for Wood Bison, and the proposed 2016 Recovery Strategy for the Wood Bison, this poster looks at the changes in recommendations and what the future for diseased wood bison looks like. Overall, the original environmental assessment and the 2016 recovery strategy both suggested an elimination of the wood bison herd was necessary, and while the 2001 recovery plan also said that the elimination would be necessary, they also suggested more research into alternatives.

Keywords: Wood Bison, recovery, management, threatened

23. Bridging the Gap

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The Edmonton Metropolitan Region Board's proposed plan for a Northeast River Crossing over the North Saskatchewan River exemplifies challenges of building urban transportation infrastructure and conserving ecological and heritage resources in the largest urban river valley in North America. The purpose of our research is to examine the effects of alternative crossing routes and how these reflect uncertainty and various value judgements in planning and development processes. After reviewing regional and local development plans, we used a comparative analogy using an environmental impact assessment for a now completed Northeast Anthony Henday river crossing. Using these sources, we expect our findings to recommend a preferred route for the proposed crossing that will meet urban transportation needs, conserve ecological integrity, and heritage resource in this unique valley.

Keywords: North East River Crossing, Development, Environmental Impact Assessment

24. Mapping Below Sea Level Bedrock Topography of Taku Glacier and Tributaries on the Juneau Icefield, Alaska with Low-Frequency Ground Penetrating RADAR

Theresa Westhaver, University of Northern British Columbia, Prince George, BC Canada V2N 4Z9, Email: westhav@unbc.ca

Mapping Below Sea Level Bedrock Topography of Taku Glacier and Tributaries on the Juneau Icefield, Alaska with Low-Frequency Ground Penetrating RADAR: Taku Glacier is the thickest temperate glacier ever measured worldwide. The bed of this tidewater glacier is estimated to be up to 600 meters below sea level at its thickest point; however, the full spatial below-sea level extent of the Taku and its tributaries is not well documented. A combination of low-frequency ground penetrating radar data and unpublished seismic profiles of Taku Glacier and tributary glaciers, including Demorest Glacier, Matthes Glacier, and the Northwest Branch of Taku Glacier were used to map the spatial extent below sea level and compared with modelled points to verify a global-scale ice thickness model. Understanding the spatial extent of the bed topography below sea level is essential for predicting how the future shoreline of Southeast Alaska will be affected by climate change when the Juneau Icefield melts in its entirety, as projected, by ~2200 CE.

Keywords: glaciology, climate change, ice thickness, radar

25. The Landscape Identity of the North Okanagan: Using Physical Geography, Climate, and History to Create a Distinctive Wine Region

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As the British Columbia wine industry continues to expand, there is an opportunity to differentiate official sub-regions, known as sub-geographical indications (sub-GI), through the unique physical geography and climate characteristics that may result in distinctive wine styles. Currently, the Golden Mile Bench south of Oliver is the only official sub-GI in the Okanagan. The North Okanagan is a uniquely situated location that has the ability to establish a landscape identity and expression of terroir. This region extends from the

southern tip of Kalamalka Lake, north to Armstrong, and east to Lumby. While there are currently small vineyards, there are no existing farm-gate wineries, which offers the rare opportunity to preemptively establish a wine identity. By examining the historical sense of place, grape growing potential, physical geography, and changing climate of this region, this poster highlights and makes recommendations on how a unique landscape identity could be created for producing wine.

Keywords: Landscape Identity, Wine, Climate Change, Physical Geography, History

26. Understanding Arctic marine impacts and mitigation: Environmental assessment as a tool for knowledge brokerage

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Social learning and the co-production of knowledge are increasingly seen alongside traditional environmental assessment effectiveness criteria. However, environmental assessment in the Canadian Arctic is addressing more fundamental concerns, such as building institutional capacity and baseline knowledge gaps. Environmental assessment in Nunavut is an example, where marine environments are experiencing increased pressure from resource development and climate change, and marine-related issues can dominate stakeholder concerns about a range of land-based developments. This research proposal aims to understand how knowledge about marine impacts and mitigation is brokered in the assessment process. Through a review of environmental assessment documents and focus groups conducted in Nunavut with stakeholders, the following objectives will be met: i) identify the routine information needs of stakeholders about impacts and mitigation; ii) assess if current practices are meeting those needs; and iii) identify opportunities for enhanced knowledge exchange in order to better meet stakeholder information needs.

Keywords: environmental impact assessment; arctic; marine; knowledge brokerage

27. Reflecting on protein: 2017 Field Season

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The normalized difference vegetation index (NDVI) is the most commonly used remote sensing index to monitor crop quality. This index reveals stress in plants and can help a farmer apply irrigation and/or fertilizer; however, it does not reveal the nutritional content of a crop. In the case of forage crops, crude protein is a key indicator of crop quality. This project seeks to develop a statistical model that relates crude protein to the temporal pattern of spectral reflectance signature of alfalfa (Medicago Sativa L.) as measured by a broad band radiometer. The prospective models can be used for optimizing yield and assessing forage nutrition. This will support farmers in harvesting and marketing their feed crops. This modelling study considers the reflectance signature of alfalfa generated during two harvest periods during the summer of

2017, and explores linear statistics-based models to predict the protein content (%) of the crop at each measurement time during the growing period.

Keywords: precision farming, proximal sensing, temporal patterns, optimal harvest

28. Creating Valleys; Wildlife Impacts of the Valley LRT

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The City of Edmonton has approved the construction of the Valley Line Light-Rail Transit and has begun construction on the southeast section, which runs from Downtown Edmonton to Millwoods. The proposed route creates barriers to wildlife movement in four main areas: at the North Saskatchewan River Bridge, at the north and south ends; at the bridge over 98th Avenue, at the Muttart stop and traction power sub-station; and beside the LRT track along the pre-existing Connors Road. We will be conducting an analysis of the Environmental Impact Assessment (EIA), focusing on the impacts and proposed mitigation strategies surrounding disruptions to wildlife corridors. The impacts of this line are predicted to be negligible at three out of four of the areas; the exception being the North Saskatchewan River Bridge, where impacts are predicted as permanent but minimal. An assessment of the proposed mitigation strategies for possible shortcomings will be conducted.

Key words: environmental impact assessment (EIA), light-rail transit (LRT), Edmonton, wildlife, mitigation strategies

29. Internet of Trees: Secure and Affordable Internet of Things for Environmental Monitoring

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The internet of things (IoT) promises macro-scale sensing thanks to the ubiquity of Internet connected devices. Environmental research has been slow to leverage the potential of IoT with barriers to its utilization being cost, reliability and security. To address these issues, we propose a framework for IoT based environmental sensing that employs low-cost, low-power radios to provide inexpensive, reliable data backhaul and security. This framework is being tested using a case study based on tree-canopy hydrology. An array of hobbyist grade electronics were used to create sensor nodes capable of monitoring near real-time production of stemflow. These nodes are wirelessly connected to a gateway which publishes data to a central server capable of distributing it to waiting applications including a web portal and database. All transmitted data is secured by encryption reducing the risk of external disruption.

Keywords: hydrology, wireless sensor networks, XBee, Arduino, environmental research

30. Analyzing the Three Pillars of Sustainable Development in the Rural-Urban Fringe in Canada
Brie Dinsdale, Narain Spolia, Dept. of Geography and Environmental Studies, Thompson Rivers University, Kamloops, BC, V2C 6N6

The rural-urban fringe (RUF) can be described as the transition zone between urban areas, and those devoted to agricultural purposes. Recently, however, the exact boundaries of the rural-urban fringe have become blurred and more difficult to define. Increased urbanization and sprawl has often resulted in the development of the rural-urban fringe to support industry that either does not fit within the urban city-limits, or to expand those limits. This leads to the main focus of our poster as to whether or not development of the rural-urban fringe can be classified as sustainable. With regard to sustainable development, the United Nations states that there needs to be a balance between the three pillars of sustainability: the social, environmental, and economic sectors. After extensive literature review, land policy, and sustainable development framework analysis, we can tentatively conclude that with the correct political infrastructures implemented, sustainable development in the rural-urban fringe is possible.

Keywords: Sustainable Development, Rural-Urban Fringe, Sprawl, Urbanization, Development

31. Economics of Geoengineering
Brandon Christy, TRU, Kamloops, B.C, V1S OB6; Madison McGregor, Kamloops, TRU, B.C

Climate Change is accelerating at an alarming rate. With no definitive action in place, geoengineering is one such option that should be at minimum considered for use. Specifically, Solar Radiation Management (SRM) sulfate aerosol injections (the most cost effective method) can be used as a temporary respite to allow time for C02 reduction methods. If used continuously, injections can lower costs from BAU of 3% Gross World Product (GWP) to <1% GWP, and temperatures could decrease to below preindustrial levels in a few decades. There is uncertainty with continuous injections and negative environmental impacts, but the benefits of such methods if applied correctly could drastically outweigh the costs if C02 reduction cannot or will not be applied effectively.

Keywords: Geoengineering; Solar Radiation Management; Sulfate Injections

32. Libby Dam and it's Effects on the Kootenay Region
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The Libby Dam Project is an achievement of technology and international cooperation between the United States and Canada, while maintaining the natural environment of the Kootenay Region. As environmental awareness grew, the dam's plans began to change, merging with the environment, forming a relationship between the Libby Dam and the Kootenays. The purpose of this poster is to consider the effects that the Libby Dam has had on the atmosphere, biosphere, hydrosphere and lithosphere in the Kootenay Region. The Libby Dam was built to help control the flow of the Columbia River Basin in the United States and Canada. The fully operational dam created the Koocanusa Reservoir on Kootenay River. Now that the effects of the dam have taken place it will be almost impossible for the Kootenays to go back to the way they were. This dam has successfully helped control the Columbia Basin watershed, but over time has changed the Kootenay Region.

Key words: Kootenays, Libby Dam, Columbia River Basin, Kootenay River

33. The Tourism Walking Routes of Bunkyo Ward, Tokyo: Foreign perceptions of walkability

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The Tourist Walking Routes of Bunkyo Ward, Tokyo: Foreign perceptions of walkability
Many cities have developed walking networks that are geared for international and domestic tourists. We explored four tourist walking routes of Bunkyo Ward, Tokyo, depicted on a tourist map in May 2017, as part of a third year geography field course. The main objective was to evaluate the walking routes in terms of safety and enjoyment. Our methods included evaluating the walkability of each route using criteria from ican.walk.ca. Overall results were that each route highlighted gardens, museums, temples, and shrines according to themes about local literary culture. Also, the routes took longer to walk than what was suggested on the map. Our principal conclusions were that the routes were generally safe to walk, but some of us were disengaged due to our lack of knowledge of Japanese literary culture and language. In addition, wayfinding was difficult because there were no route markers.

Key words: Bunkyo Ward, Tokyo; tourist walking routes; walkability; cultural perception; international urban tourism

34. The Q'eqchi' Resistance: The Impact of Indigenous Women in Land Defense Against the Violence of Canadian Mining

Rebecca Ferris, MA Candidate Natural Resources and Environmental Studies, University of Northern British Columbia, BC. E-mail: rferris@unbc.ca

In 2013, Mayan Indigenous land defenders made history in a precedent-setting case when Ontario Supreme Court Justice Carole Brown ruled in favour of allowing three lawsuits against Ontario-based mining company HudBay Minerals for alleged human rights violations committed in Guatemala to stand in Canadian court. Canadian exploitation of Guatemalan land, as well as the infringement of indigenous rights in areas of resource extraction, has been ongoing since the 1960s, but this is the first case in which a Canadian company has been pursued in domestic court for human rights violations committed abroad. This presentation depicts the preliminary stage of thesis proposal research and seeks to explore the role of Q'eqchi' women involved in these cases against HudBay Minerals as activists and members of their community.

Keywords: Guatemala, Canada, resource extraction, Social Justice, Resistance

35. The Helping Behaviours of Individuals in Response to Natural Disasters With a Focus on Student Populations

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This poster provides a comprehensive discussion of the existing literature surrounding the helping behaviours of individuals in response to natural disasters, with a focus on student volunteer participation during wildfires. The poster discusses the traits highlighted as a pre-cursor of being a volunteer, as well as the lasting impact participating in relief aid has on the volunteer(s). The lack of specific research on student volunteer participation during wildfires highlights the need for more research within this area as the existing research shows that the student demographics are overwhelmingly willing to provide aid, especially if it aligns with their study of interest. This provides a great opportunity to introduce students to relief aid organizations that can form a continuous relationship of aid.

Keywords: helping behaviours, volunteering, natural disasters, student participation, relief aid

36. Public Perception of Proposed Adaptation Strategies for Sea-level Rise in Crescent Beach, BC

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Students from the University of the Fraser Valley collaborated with the City of Surrey's Coastal Flooding Adaptation Strategy project to survey the public in Crescent Beach about the proposed adaptations to one metre of projected sea level rise by 2100. Eighty-five questionnaire surveys were collected in a pop-up event at Crescent Beach. Forty-four percent of respondents chose the expanded ocean edge strategy as their preferred option followed by managed retreat (23%), barrier island (14%), and fixed ocean dam (7%); twelve percent indicated no preference. Ninety-four percent believe that a major coastal flood will likely occur in the area in the next 10 years and 77% further indicated that a major flood would be moderately to completely disruptive to themselves if it occurred tomorrow. Survey results will be used to inform the subsequent stages of the project and will be considered in the City of Surrey's decision-making process.

Keywords: sea level rise, climate change, adaptation, British Columbia-Surrey, expanded ocean edge

37. Optimizing the Placement of Indoor Waste Stations using GIS Techniques

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Managers and operators of large multi-use public buildings have a sizeable responsibility to ensure that sustainable solid waste disposal is being encouraged and facilitated on their premises. Many universities have adopted a multi-bin waste station strategy that enables users to sort their waste into sustainable waste streams such as composting and recycling. The placement of these waste stations, however, is often overlooked, and because of this, many buildings are either inadequately or inefficiently covered for waste disposal. GIS technology, predominantly used at the municipal level or local scale to coordinate waste disposal and collection, can also enable optimization of waste station placement within buildings. A new technique is proposed to first analyze areas of highest waste production potential, then place stations accordingly, and

finally test those station placements to fine-tune waste station locations, ensuring high operational efficiency and cost effectiveness along with user satisfaction.

Keywords: GIS; sustainability; waste management; planning

38. Seasonal variation in water chemistry in the Clayburn – Willband watershed, Abbotsford, British Columbia

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Faculty and students from the University of the Fraser Valley (UFV) have conducted times series sampling of the Fraser River at Fort Langley and six Fraser Valley tributaries as a member of the Global Rivers Observatory (GRO, www.globalrivers.org) coordinated by Woods Hole Oceanographic Institution and Woods Hole Research Center. The Clayburn – Willband – Stoney watershed has become a focus of the sampling being conducted by faculty and students from the Geography and Biology Departments at UFV. Water chemistry data and samples have been collected weekly from sites on these three creeks. These watersheds are threatened by increasing urban development, industrial activity and agricultural landuse within these watersheds. Documenting the seasonal changes in the water chemistry as measured during the onset of the heavy fall and winter rains, the wet and cool winters and springs, and the increasingly hot and dry summers will assist in attempts to protect these important salmon spawning streams.

Keywords: water chemistry, seasonal changes, Fraser Valley tributaries, Abbotsford

39. The Effects and Solutions of Toxins in the Columbia River Gorge

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The Columbia River Gorge is a region along the Columbia River in the United States that represents the border between Washington and Oregon States. This section of the major river between Troutdale and The Dalles, Oregon hosts a variety of pollution due to water quality issues. Main contamination methods include contamination from decommissioned nuclear sites – in particular the Hanford Nuclear Site in Washington, hydroelectric dams, railway lines transporting coal, and runoff from farms. This project highlights key sources of pollution and the negative effects they have on marine wildlife, tourism, and ecosystems located downstream. Additionally, the paper discusses current cleanup initiatives, as well as future concerns and how to address them.

Keywords: Contamination; Water quality; Nuclear power plant

40. **Death by Disease in The City of Chicago**

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This project analyzes how death by disease (cancer and coronary heart disease) in the city of Chicago is spatially correlated to aspects of income, race and the placement of hospitals. We conducted our analysis

using ArcGIS to perform joins, a "near analysis", a hot spot analysis to explore the distribution of diseases, and an exploratory regression analysis to determine which factor or combination of factors (income, race, distance to hospital) best correlates to death by disease. Our final maps and analysis show that majority African American and low-income neighbourhoods in Chicago have higher number of deaths by disease and longer distances to hospitals, while majority Caucasian populations that are above the median income, have lower numbers of death by disease and shorter distances to hospitals. Our results indicate that areas with high numbers of death by disease are spatially correlated to aspects of income, race and distance to hospital.

Keywords: GIS, health, socioeconomics, structural inequality, spatial correlation