

RELEVANCE

65th Annual meeting of the Western
Division of the Canadian Association of
Geographers

Okanagan College
Kelowna BC



1000 K.L.O. Road
Kelowna, BC

March 15-16, 2024
<http://www.geog.uvic.ca/wcag/>

RELEVANCE

Relevance is what makes geography powerful. Geographers are in important positions in government, business, and the community. We have insights that recognize challenges others don't, and we provide solutions. We understand why solutions that work in one place won't work in another. We make connections and see the big picture.

The theme of the 2024 WDCAG conference is relevance. We invite participants to reflect on how your work is relevant, whether to society, a community, a government department, an employer, or to your own development.



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Land Acknowledgements

Okanagan College respectfully acknowledges that our Penticton, Kelowna and Vernon campuses are located on the traditional and unceded territory of the Syilx Okanagan people, our Salmon Arm campus is located on the traditional and unceded territory of the Secwepemc, and our Revelstoke centre is located on the traditional and unceded territories of the Ktunaxa, Secwepemc, Sinixt and Syilx Okanagan peoples.



President's Welcome



February, 2024



Welcome, Way', Weytkp,

It is my pleasure to welcome you to the 65th Annual meeting of the Western Division of the Canadian Association of Geographers, to this beautiful region, and to Okanagan College.

At OC, our campuses are situated on the unceded territories of the Syilx Okanagan, Secwepemc, Ktunaxa, and Sinixt, and we are committed to learning from, listening to and working with Indigenous communities. Over the course of your stay, I encourage you to be open to local Indigenous stories and ways of knowing and being in this region.

In a rapidly changing world, the role of geographers has never been more crucial. Globally and here at home, we are confronted by a myriad of intersecting, complex challenges. These include climate change, the ongoing impacts of COVID-19, conflicts and war, and socio-economic disparities – to name just a few. Geographers stand at the forefront of understanding, analyzing, and proposing ways to move forward in the face of these multifaceted issues and concerns.

The theme of this year's conference, **Relevance**, echoes our role and the way geography and geographers are responding to and shaping our world. Whether you are a seasoned expert or a newcomer to the field, we hope you will actively participate in the sessions, engage in discussions, and take full advantage of the opportunities over the next few days to connect with fellow attendees.

Our mission at Okanagan College is to *Transform Lives and Communities*. While you are here with us on campus, be inspired by this call to action and hope. Through this conference and ongoing collaboration, transformational change and solutions are possible.

On behalf of OC, thank you for choosing to be here and may the next few days be filled with insightful discussions, new friendships, and a renewed sense of purpose.

Limləmt, Kukstemc, Thank you,

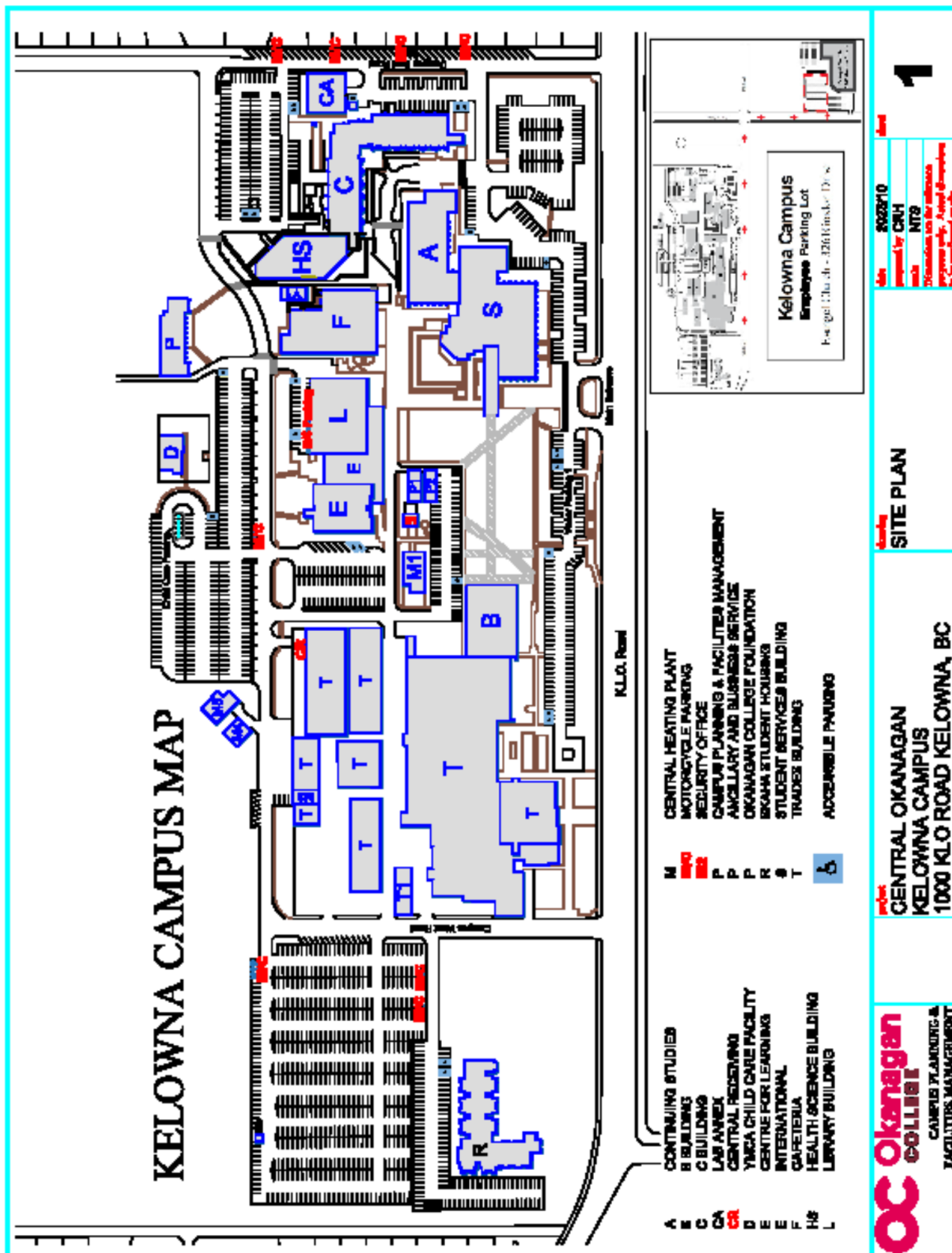
A handwritten signature in black ink, appearing to read 'Neil Fassina'.

Neil Fassina
President, Okanagan College

Sponsors

We would not be able to host an event like this without the support of a variety of individuals and organisations. We would gratefully acknowledge the following:





Schedule of Events: Friday

		room
11:00	Registration desk opens	Atrium E bldg
13:00	Field trips departures	KLO bus loop
17:00	Welcome social/dinner	Cafeteria, F bldg
18:15	Keynote address: Ryan Smith, City of Kelowna	Cafeteria, F Bldg



Schedule of Events: Saturday

begins:	ends:				
8:00		Registration desk opens			
8:30	9:00	Morning Keynote: Brendan Pauls, Urban Systems			Cafeteria
9:15	10:45	Concurrent session A			
		Physical environmental processes			E207
		Housing in a mid-sized city: Groups at Risk I			E208
		Migrations			E213
		Empowerment and education			E212
		Experience Builder workshop: Kendra Munn, ESRI			C278
10:45	11:15	Coffee and poster session I			E Building atrium
		2024 WDCAG Map exhibit			library
11:15	12:45	Concurrent session B			
		Floods, responses, and built environments			E207
		Housing in a mid-sized city: Groups at Risk II			E208
		Careers in Geography			E212
		Place and regions			E213
		Workshop on iPhone/iPad lidar: Dr. Todd Redding, OC			HS101
12:45	14:00	Lunch			Cafeteria
		Executive Meeting			HS102
14:00	15:30	Concurrent session C			
		Mapping and imagery			E207
		Social Justice and urban issues			E213
		Opportunities and limitations of field schools as decolonial practice			E208
		Technological advances and methodologies in Geography			E212
		Workshop on Field Maps: Kendra Munn, ESRI			C278
15:30	16:00	Coffee and poster session II			E building atrium
		2024 WDCAG Map exhibit			library
16:15	17:30	WDCAG AGM			HS101
17:45		Banquet and closing address			Cafeteria

Friday, March 15 Field Trips

Starting at 13:00, departing from the Atrium of the E building, see campus map for location.

1. Exploring the Impact of the 2023 Wildfires

Host: Dr. Terrence Day, Okanagan College (tday@okanagan.bc.ca); cost tba

For many British Columbians, make that Canadians, or should we say citizens of planet Earth, 2023 was the year of conflagration, as the entire world seemed to erupt in flames. During the average wildfire season, 24,600 km² of land burns across Canada. In 2023, the B.C. Wildfire Service states that, in B.C. alone, almost 25,000 km² of terrain were burned, doubling the previous provincial record from 2018. British Columbia was certainly an attention-grabbing one to out-of-control wildfires. Worryingly, the trend seems to be continuing. Okanagan took a direct hit from the fast-moving and destructive winds generated by the fire, the blaze jumped the lake from West Kelowna (the west side of the lake), a distance of two kilometres or more. Much of the damage occurred in interface zones where structures and other elements of the built environment meet the wildlands. We will tour Kelowna, B.C., looking at fire hazards within the physical environment. The trip will focus on the 2023 fires, examining the mapping of wildfires, the challenges of FireSmart™ approaches, and evacuation issues. We will get a firsthand look at the Central Okanagan Emergency Operations Centre and meet with one of the fire chiefs who actively participated in the 2023 fires. There may be a cost associated with this field trip, please contact Terry Day (tday@okanagan.bc.ca) for particulars.

Cancelled due to unforeseen circumstances

2. South Fascieux Creek

Host: Barbara Ramovs, Okanagan College; (bramovs@okanagan.bc.ca) cost free, participant cap = 20

South Fascieux Creek, a waterway within a short walking distance from Okanagan College, has long been a vital spawning habitat for Kokanee salmon, a keystone species in the local ecosystem and a cultural and spiritual touchstone for the local Sylix peoples. Kokanee salmon play an important role in Sylix stories, teachings, and intergenerational, ecological knowledge transfer. Over many decades, Kelowna's natural floodplain and many of its stream channels have been transformed due to urban development: buried or redirected using concrete pipes. This has negatively impacted the spawning capacity of the salmon. Additionally, human-caused climate change, with its accompanying extreme weather events and flooding, is damaging this built infrastructure. The City of Kelowna, in partnership with many community stakeholders, is currently in the process of resurrecting parts of this important waterway, 'daylighting' and restoring natural stream flows, removing invasive species, and planting native ones, improving long-term stability and sustainability to these environments, including the remediation of salmon-spawning habitat so central to the Sylix culture. This informative excursion will provide participants with an insightful, real-world demonstration of physical and human geography in action. Revealing how our community is addressing this challenge may prompt others to consider ways in which Kelowna's efforts might be adapted to fit the needs of their communities. Please contact Barb (bramovs@okanagan.bc.ca) for further information. Spots are available on a first come basis.

4 Downtown Beer District

Host: Dr. Markus Heinrichs, Okanagan College; (mheinrichs@okanagan.bc.ca) cost \$5, participant cap = 20

Though we mourn the loss of Tree Brewing in Kelowna, the void left behind has nearly been filled with a number of exciting and inviting brew pubs, concentrated in the northern end of the city near the cultural district. We will take the #1 bus (\$2.50) from OC to the Queensway loop and walk along Ellis St. past the Laurel Packinghouse, where you can see an exhibit featuring early orcharding in the area. The first pub we pass by is BNA Brewing, featuring its own bowling lanes. We'll turn east along the north side of Clement Ave, and see the locations of Unleashed Brewing, Welton Arms, and The Office. From there we turn north on Ethel to Vaughn Ave, where returning west, we pass the Rustic Reel. Carrying on west, we reach Richter Ave, where we pass Sandhill wines and Vice & Virtue, perhaps turning right on Baillie Ave to see Jackknife and Kettle River. We will return downtown along Richter, perhaps pausing to have a refreshment break at Red Bird. The #1 bus from Queensway runs every 15 minutes and will take us back to campus, where we will meet with the other field trip participants. This trip involves approximately 5km of walking, so participants should be prepared for urban walking and be dressed accordingly. Please contact Markus (mheinrichs@okanagan.bc.ca) for further information. Spots are available on a first come basis.

Friday, March 15

Keynote Speaker: Ryan Smith



Ryan Smith
Divisional Director
Planning, Climate Action &
Development Services

Ryan has worked with the City of Kelowna for 19 years, first as a development planner, then Subdivision Approving Officer, Urban Planning Manager, Department Manager of Community Planning and now Divisional Director of Planning and Development Services. Ryan has also spent time working for a private real estate development company where he collaborated on the development of townhouse and resort projects.

Ryan has a bachelor's degree in Geography and Certificates in Urban Design and Community Economic Development from Simon Fraser University and is a member of the Canadian Institute of Planners.

Ryan has been a member of the provincial Subdivision Approving Officer's Committee since 2010 and Co-Chair of this committee since 2016. He was instrumental in the development of the School for Subdivision Approving Officers and has been helping teach Subdivision since 2010. Ryan also helps teach modules as part of the MATI Community Planning Course and Capilano University Courses.

Ryan is an avid cyclist, trail runner and skier.



Saturday, March 16

Keynote Speaker: Brendan Pauls

Bio: Brendan learned to appreciate Geography while Majoring in Geography at Thompson Rivers University in Kamloops, BC. Further studies in Geomatics, GIS, and Hydrology at the University of Gävle, Sweden, cemented his love for the spatial science. He has been working at Urban Systems, in the field of GIS, for the last 15 years. Throughout those years, his work has focused on hydrology, stormwater analysis, asset management, and urban planning. He is a partner with Urban Systems and currently splits his time between the GIS Practice and Branch Management here in Kelowna. In his spare time at work, he enjoys working with drones, 360-degree imagery capture, and other fun tech!



Abstract: Each year it feels like our world gets a little smaller. We add more people. We expand our infrastructure. Nature keeps warning us that it needs more room to stretch than we initially thought. Accordingly, our society is thinking more spatially than ever – space is precious! As a geospatial consultant at Urban Systems, Brendan has had a 15-year front row seat to this cultural mindset shift. Communities are prioritizing hiring of geospatial experts. Spatial analysis and visualization have become table stakes for most projects, aided by advancements in technology. People understand that to holistically solve many of the problems we face today, we need to answer the question of “where?”. And Geography equips us to do just that (with Google Maps helping a little on the side).

This presentation will take us on a journey, following the paths of several professionals who built their foundation in Geography and are now applying their learning and skills across a wide range of disciplines. Each person is helping to build vibrant communities across Canada. Examples of the relevance of Geography in action will be shared, ranging from planning and designing neighbourhoods to successfully running businesses. We will learn how Geography helps when tackling social issues such as housing, access to food, and supporting vulnerable populations. We will dive into how a Geographer can help municipalities provide sustainable service delivery to residents or use complex data and tools to keep people and property safe from natural disasters.

The solutions to these complicated problems often bear the fingerprints of a thoughtful geographic mind. It’s an exciting time to be spatial!

ESRI Workshops hosted by Kendra Munn



Kendra Munn is an Urban Solutions Specialist in the Education and Research group at Esri Canada. She contributes to academic research projects in collaboration with universities and creates educational resources and workshops on ArcGIS software. Working with the Professional Services Urban team, she assists municipal organizations in developing Urban models and data preparation workflows through the deployment of packaged services. Kendra holds a bachelor's degree in environmental science, applied biology and a master's degree in geography, geographic information systems from Simon Fraser University. Kendra Munn was awarded the 2021 National Young Scholars Award in GIS, a national award competition managed by Esri Canada and launched in 2012 to recognize the exemplary work of undergraduate and graduate students in the geospatial sciences. Kendra is affiliated with the Spatial Analysis and Modeling (SAM) Research Lab in the Department of Geography, SFU, and her research explores novel approaches for 3D spatial analysis methods, particularly multicriteria decision methods for suitability analysis of 3D urban environments. She is the holder of an NSERC CGS-M scholarship and an active student member of the SFU ECCE in GIS.

Concurrent Session A 9:15am, C278

focusing on data visualization and sharing: using Dashboards, Instant Apps, and Experience Builder

Concurrent Session C 14:00, C278

focusing on data collection apps, introduction to each of the Survey123, Field Maps, and QuickCapture apps

Workshop:

LiDAR in Your Pocket



Hosted by Dr. Todd Redding, Okanagan College

This short workshop will introduce you to some of the uses of the LiDAR sensor built into new version (Gen 12 and newer) iPhones and iPads. A few research and teaching applications will be covered, and some hand-on measurements will be made. If you have one of these devices, please bring it along.

2024 WDCAG Map Exhibit

Library, Okanagan College, KLO campus Kelowna

Maps are more than a tool for navigating to a place. They also are tools for education, planning and decision-making. They provide a record of the way that places change over time, and how changing technologies influence the way that we see places. Cartographers are the people who make maps. The maps shown here were produced by cartographers between the sixteenth and twentieth centuries and were selected to show a range of different themes:

- Cartographic conventions (Ireland on Top)
- Earth is not a perfect sphere and that makes mapping complicated (Measuring the Earth)
- Maps suggest opportunities and provide inspiration (Indigenous peoples of Canada)
- Maps record places and time (A unique historical record)
- Places are different (Understanding the world)
- People are different (Mapping people)
- Maps and power (Secret Information)
- Most geographers do not have beards (Women and geography)
- The importance of geocoded information (The origin of postal codes)

If you'd like to see some twenty first century maps we suggest you check your phone. Search for terms like "Geographic Information Systems", or "GIS".

IRELAND ON TOP: *"Insularum Britannicarum Acurata Delineatio ex Geographicis Conatibus Abraham Ortelii"* (Amsterdam: Jan Jansson, 1646)

This map of Roman and Ancient Britain was published in Jan Jansson's "Atlas Major". It is based on a similar map produced by Ortelius who produced the world's first atlas in 1575. What is striking is that north is to the right, and west is "up". This makes Ireland appear on top of the map, in contrast to the more familiar representation of Ireland to the left of Britain, with Scotland to the top of the map.

The representation of north to the top in maps is common, but there is no scientific justification for it. Earth is a planet in space, and there is no "up" nor "down". Different civilizations at different times in history have north, south, east, or west to the top. For example, many mediaeval European maps had east to the top, emphasizing the importance of Jerusalem in Christianity. North-on-top maps became popularized as sailors used magnetic compasses and used Polaris (the North star) for navigation. They also reflect northern hemisphere domination and colonization of the global south.

Today, the idea of North-on-top is dominant but is not exclusively applied. With Ireland on top in this map all we can say is a happy St Patrick's Day.

MEASURING THE EARTH: *"Carte de la Province de Quito au Perou"* (Paris: Jean-Baptiste Bourguignon d'Anville, 1751) and *"A map of the country where the Arc of the Meridian was measured"* (London: John Bonnycastle, 1803)

The fact that Earth was round was well known to geographers more than 2,500 years ago. However, not perfectly spherical. Isaac Newton suggested centrifugal force from Earth's rotation would produce an equatorial bulge, so that Earth was an oblate spheroid, i.e. a sphere that is slightly flattened at the poles. If the

Earth is an oblate spheroid then the distance along a meridian, *i.e.* between lines of latitude should be longer at higher latitudes, than at lower latitudes. This is because the circle associated with Earth's curvature gets larger closer to the poles.

Newton's hypothesis was tested in an experiment undertaken in 1735 by the French Academy of Sciences which sent an expedition to Lapland to check the distance of one degree of latitude at high latitudes, and another expedition to Quito near the Equator. The experiment showed one degree in Lapland was 111.09 km, and one degree near the Equator measured as 109.92 km. This confirmed Newton's oblate spheroid hypothesis, an idea that is generally accepted today. Modern measurements show the diameter at the Equator as 12,756 km, but 12,714 km through the poles.

The larger map shows the measurements near the Equator, and the smaller map shows the measurements in Lapland. The distance over more than 100 km was accurately measured by triangulation from a measured shorter line. The surveyed triangles are shown on both maps.

Map making is both an art and a science. Aesthetic layout of map elements, appropriate colouring, and symbolization are all important, but there is also a need for scientific accuracy. Knowing the exact shape of the Earth allows us to accurately state the geographic coordinates of places. That information is fundamental to all Location-Based Services on smartphones.

INDIGENOUS PEOPLES OF CANADA “*Carte Du Canada ou de la Nouvelle France et des Decouvertes qui y ont ete faites ...*” (Paris: Guillaume De L'Isle, 1703).

At the time this map was produced, Canada was still being fought over by France and Britain. Cities such as Toronto, were only beginning to be settled, and many other major cities, such as Halifax hadn't been settled at all. Some places that are small now, such as Annapolis Royal (named on the map as Port Royal) in Nova Scotia were depicted as major centres. However, it is Indigenous names that are most prominent on the map. The word “Iroquois” is especially prominent, but everywhere there are references to Indigenous people, such as, “Abnakis”, “Etechemins”, “Attikamegrues”, “Mikmaques”, and “Assenipolis”. Lake Michigan is called “Lake Illinois”. Indigenous peoples were acknowledged, and the map recalls a time when Europeans were clearly settlers in a foreign land.

The map shows a snapshot in time and offers a chance to reflect. What has changed since 1703? What will the future look like for Indigenous people in Canada? What will it be like for the descendants of settlers, and for immigrants? How can we acknowledge the past, respect the environment, and work towards a better tomorrow?

Okanagan College respectfully acknowledges that our Penticton, Kelowna and Vernon campuses are located on the traditional and unceded territory of the Syilx Okanagan People, our Salmon Arm campus is located on the traditional and unceded territory of the Secwépemc, and our Revelstoke centre is located on the traditional and unceded territories of the Ktunaxa, Secwépemc, Sinixt and Syilx Okanagan Peoples.

A UNIQUE HISTORICAL RECORD: “*Il Cuscho Citta Principale Della Provincia Del Peru*” (Venice: J.G. Ramusio, 1558)

Cusco was the main Inca city in Peru in the sixteenth century. The buildings were of stone, and there was gold everywhere, used to decorate the buildings. And then in 1533 the Spanish conquistador Francisco Pizarro

came. Cusco was captured and the gold was taken. But in 1536 Inca warriors laid siege to the city for 10 months. The Inca forces were unsuccessful and withdrew.

After the siege the Spanish built over Inca palaces and temples, and a central plaza (Plaza de Armas) was constructed. There was forced cultural assimilation, but a lot of indigenous culture was preserved. The city still has a blend of Inca and Spanish colonial architecture, the so-called “mestizo” or mixed style. Today, Cusco is a major tourist attraction and a UNESCO World Heritage Site, standing as a monument to indigenous resilience and colonial greed.

This aerial view of Cusco in Peru was created a long time before aircraft, or even hot-air balloons. The creator used principles of perspective, along with a map to create this wonderful image of a city in transition. The old Inca palace and temple can be seen on the left. It is one of the oldest views of a city in the “New World”.

UNDERSTANDING THE WORLD: “Physical Geography. Humboldt’s distribution of plants in Equinoctial America according to elevation above the level of the sea”. (Edinburgh: A & C Black, c. 1840) and “Isothermal chart, or view of climates & productions; drawn from the accounts of Humboldt & others”. Connecticut: W.C. Woodbridge, 1823.

In 1802 the German naturalist Alexander von Humboldt ascended Chimborazo in Ecuador, believed at the time to be the world’s highest mountain. He didn’t quite make it to the top, but the resulting work laid the basis for the development of physical geography. Humboldt recognized the decreasing temperature with altitude, and the association of climate with vegetation zones. He then made a leap from understanding the impacts of altitude on vegetation and transformed those altitudinal changes into changes with latitude. He had uncovered a way to understand global climate and biogeography.

The 1823 map of Earth’s temperature was the first map to show Earth’s temperature and is based on Humboldt’s approach. The dotted lines are isotherms that join up places of equal temperature, and the areas between the isotherms are coloured to show temperature zones. These are then related to vegetation. It’s creator, William Woodbridge, was an American schoolteacher who met Humboldt on a visit to Paris. Humboldt himself hadn’t published his own world map yet because he was still acquiring data. Woodbridge as a schoolteacher didn’t perhaps feel quite as constrained as the distinguished Humboldt and “scooped” him. Woodbridge’s work as a mapmaker may be underestimated. He worked closely with students who were deaf and saw maps as an excellent form of visual communication.

MAPPING PEOPLE: “Maps Descriptive of London Poverty” (London: Chares Booth, 1898-99) and Japanese in São Paulo State Brazil ([n.p.] Office of Strategic Services, 1943)

The small map is one of twelve map sheets of poverty in London. First produced ten years earlier, the maps in this edition were produced by having researchers accompany police officers on their beats around London. The police officers made their own comments on each neighbourhood, and the researchers also provided their own interpretations. The maps are coloured according to social class and income of residents.

The map of the Japanese population of Sao Paulo was produced in 1943 by OSS (predecessor of the CIA), two years after the Japanese attack on Pearl Harbour. Brazil had aligned itself with the US and allies (including Canada) in 1942, and therefore the OSS was concerned about potential enemy activity or insurgency in Brazil. The map is a dot map where one small dot represents 10 Japanese families, and a large dot represents 3,000 Japanese families.

Thematic maps of this type are still widely used in geography. Thematic maps use symbolization, colour, density, and size to represent the complex mosaic of human life on earth. They provide information that is useful for planning, location of facilities, monitoring of social conditions, as well as marketing and other commercial and social applications.

SECRET INFORMATION: [German trench map of Vimy, April 7, 1917]

The Battle of Vimy Ridge was fought in 1917 between Canadian and German troops during the First World War (1914-1918). The Canadians won. Much of the war was dominated by trench warfare, where each entrenched army held ground, separated by a hundred meters or so of “no-mans-land”. For warfare of this type, it was important that the armies, know the exact location of enemy trenches. That was the origin of “trench maps”.

This map was produced by the German army immediately prior to the Battle of Vimy Ridge. The map shows the vast amount of intelligence available to the Germans prior to the battle. They were well aware of the Canadian trench layout, barracks, and artillery positions. However, they were apparently not aware of the tunnels that were dug to bring the troops forward, quietly and secretly.

This map is not one of the regular ones issued to officers at the front. The regular trench maps contained information on enemy positions but did not contain information on their own positions. If such a map was captured, then it could compromise defences. This map has both allied trenches (red) and German trenches (blue). It would have been used by staff officers for planning, and we know that because there is a note in the bottom margin stating that the map should not be brought into the front lines. If this map would have been captured in the front lines then the enemy would know everything about German positions, and also know what the Germans knew about Canadian positions.

According to Howard Hisdal of the History Department at Okanagan College, the area of Vimy Ridge just opposite the town of Vimy called “La Folie Farm” was captured by the 2nd Canadian Mounted Rifles from the Okanagan Valley. They are now the British Columbia Dragoons.

WOMEN AND GEOGRAPHY: *Ducatus Mediolanensis, Finitimarumq Regionu Descriptio Auctore Ioanne Georgio Septala Mediolanense (Antwerp: Abraham Ortelius, 1570)*

In 1570 Abraham Ortelius produced the first modern-style atlas, the *Theatrum Orbis Terrarum* (Theatre of the World). Over the next 30 years or so the atlas was issued in Latin, Italian, German, French, Dutch, Spanish and English editions. The atlas could be purchased with the maps uncoloured, or they could be bought coloured by hand. The colour versions have always been more sought after by map collectors, so many of the uncoloured maps were later coloured throughout the centuries by dealers and collectors. However, the maps with original colour have always been more prized.

This is an example of an Ortelius map with original colouring. Most maps at the time were hand coloured by anonymous artists. However, this map of the area around Milan in northern Italy was almost certainly coloured by a named artist, Anna Ortel, the sister of Abraham Ortelius. It was coloured by hand using red, blue, yellow and green. This is in accordance with the four-colour theorem that says no more than four colours are required to colour a map to avoid having adjacent regions in the same colour. The mathematical proof for this didn't come until 1976, but Anna Ortel was apparently aware of the four-colour theorem more than 400 years ago

Like many accomplished women in history, Anna's life is not well known. However, her role in colouring the Ortelius *Theatrum* is well known and acknowledged. March 8, 2024 is International Women's Day. Let's celebrate Anna and all women map makers.

THE ORIGIN OF POSTAL CODES: “Map of the Environs of London Reduced from the Ordnance Survey” (London: Edward Stanford, c.1865)

This c. 1865 map of London shows the original ten postal districts of that city, e.g. East, Southwest etc., all listed at the bottom of the map. These were used to help sort the large volumes of mail that was coming into London. The large volumes were the result of the 1840 introduction of inexpensive prepaid mail at a uniform cost, regardless of distance carried. The original postal districts were subdivided in 1917, e.g. Plaistow in east London became E13. These were then changed to 6- character postal codes (or post codes) for most of the UK since 1965. The postal code for one side of a small street might then be E13 9BL.

Postal codes were introduced into Canada in 1971. The Postal code for 1000 KLO Road (Okanagan College Kelowna campus) is V1Y 4X8. The first part is the Forward Sortation Area (V is used for all of BC), and the second part is the Local Delivery Unit. Similar types of system exist elsewhere in the world. One of the earliest was in Paris that had a system of 12 numbered *arrondissements* as early as 1795. The US equivalent is the zip code, which uses only numbers.

Originally used just to sort mail, postal codes are now also used to report statistical information about health, poverty, income, education and other geodemographic data. Information reported in this way can be mapped and is now widely used in geomarketing.

Concurrent Session A:

Physical environmental processes

E207

Crystal Kersey, Seasonal and Spatial Variability of Methane and Carbon Dioxide Concentrations in Glacial Meltwater of the Canadian Rockies

Natalie Krizan, Treefall Following Wildfire: Implications for long-term carbon balance in post-fire mountain landscapes

Alyssa Kynoch, Emma Marnik, Benthic Invertebrate Community Structure; Indications of Peculiar Phenomena in Cypress Hills, Alberta

Sarah Rebitt, Assessing relationships between soil properties and crop productivity: A case study of Criollo cacao agroforestry systems in Belize

Housing in a mid-sized city: Groups at Risk I

E208

Heather Brown, Aging Gracefully: A Case Study of Senior Renters in Kelowna's Housing Market

Murray Derksen, Refugees and Religious Institutions in a Mid-Size Canadian City

Fernanda Novoa, Mexican migrant agricultural workers' experiences of the public health measures during the COVID-19 pandemic in the Okanagan: Insights into housing inequities

Kaylah Vrabic, Gender and Pathways to Housing

Empowerment and education

E212

Richard Darko, Advancing New Regional Industrial Development Pathways: Exploring the Dynamics of Power, Legitimacy, and Institutionalization

Shelbea Julseth-White, Relevance of Vertical Agriculture Education

Kayla Wiens, The lemmings dilemma: An examination of environmental justice, volunteerism, and the pursuit of empowerment in biodiversity conservation organizations in Canada

Robin Westland, Critical Academic Friendship

Migrations

E213

Lawrenz Decano, Urban Stories of Migrant Families, Households, and App-Based Delivery Couriers Negotiating Precarity in Lethbridge, Alberta

Anne-Cécile Delaisse, Examining Mexican and Vietnamese Students' Temporalities and Navigation of Canada's "Edugration" System

Jemima Duru, Gendered experiences of climate change-induced displacement: Exploring inequality, agency and resilience among displaced women

Jessica Froese, Exploring the Migration Decisions of Rural Youth: A Case Study of Tumbler Ridge, BC

Experience Builder workshop: Kendra Munn, ESRI

C278

Title: Seasonal and Spatial Variability of Methane and Carbon Dioxide Concentrations in Glacial Meltwater of the Canadian Rockies

Presenter/Researcher: Crystal Kersey, work supervised by Dr. Brian Moorman

Affiliation: University of Calgary (currently a second year MSc student in Physical Geography)

Keywords: glaciers, climate change, geochemistry, greenhouse gases

Abstract:

This presentation will explore the dynamics of dissolved methane (CH₄) and carbon dioxide (CO₂) concentrations in glacial meltwater across three glaciers in the Canadian Rockies: Robertson Glacier, Athabasca Glacier, and Dome Glacier. Over the summer of 2023, I conducted comprehensive field investigations with three visits to each glacier, sampling four distinct sites during each visit. The primary aim of this study was to elucidate the seasonal and spatial variations in greenhouse gas concentrations within the rapidly changing glacial environments.

In addition to CH₄ and CO₂, I collected data on dissolved organic carbon, dissolved inorganic carbon, major ions, pH, water temperature, dissolved oxygen, and suspended sediment at each sampling site. This holistic approach allowed for a nuanced understanding of the factors influencing greenhouse gas concentrations in glacial meltwater.

Preliminary findings reveal notable temporal fluctuations in CH₄ and CO₂ concentrations, suggesting a seasonally dependent influence on glacial meltwater. Furthermore, the spatial variability across the three glaciers provides insights into the unique hydrological and geochemical characteristics of each glacier. Athabasca Glacier showed the highest average CO₂ concentrations while Dome Glacier showed the lowest average.

This research not only contributes to our understanding of greenhouse gas variability in glacial meltwater but also sheds light on the broader implications for downstream ecosystems. As glacial environments continue to respond to climate change, these insights are crucial for predicting the impact on global carbon budgets and refining climate change models. The presentation underscores the importance of considering both seasonal and spatial dimensions in studying greenhouse gas concentrations in glacial meltwater.

Treefall Following Wildfire

Implications for long-term carbon balance in post-fire mountain landscapes

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Keywords: allometry, remote sensing, change detection, carbon pools

About 50% of the pre-fire carbon remains stored in trees following high-intensity wildfires. Standing dead trees remain as carbon pools until they fall and decompose, which can take decades. Remote sensing technologies combined with validating field data collection can be used to address the gap in literature that exists for relating treefall to long-term carbon balance following wildfires.

Objectives of this study are: 1) determine status of trees as ‘standing’, ‘fallen since fire’, or ‘fallen since 2019/2020’ and take measurements to determine the carbon stored in trees, and 2) use Remotely Piloted Aircraft System (RPAS) structure-from-motion (Sfm) data to detect those fallen trees. Following the 2017 Kenow Wildfire in Waterton Lakes National Park, Alberta, Canada, tree plots were established in dry upland and moist lowland sites. In 2019/2020 and 2023, diameter at breast height (DBH) and tree height were measured and used in allometric equations to calculate biomass and carbon of trees. Ground layer analysis of RPAS Sfm point-clouds for 2019 and 2023 enabled detection of treefall.

Despite fewer trees in the lowland (136) versus the upland site (206), larger trees (lowland site average DBH 22.17 cm, upland site 16.27 cm) and a higher percentage of fallen trees (lowland site 33%, upland site 23%) likely results in earlier post-fire peak carbon emissions in lowland site (13.42 kg carbon/m² in fallen lowland site trees versus 4.54 kg carbon/m² in fallen upland site trees). Despite issues with differences in data quality for the two years, RPAS change detection proved useful for identifying the location of two known fallen trees.

Benthic Invertebrate Community Structure; Indications of Peculiar Phenomena in Cypress Hills, Alberta

Alyssa Kynoch and Emma Marnik

University of Lethbridge

Department of Geography and Environmental Science

Key Words: Benthic Invertebrates, Community Structure, Bioindicators, Sky Island, Endemic Species, Cypress Hills Interprovincial Park.

Cypress Hills Interprovincial Park in south-eastern Alberta contains numerous endemic species and has an unusual history. Specific environmental features of the Cypress Hills include its higher elevation, a wetter, cooler climate, and unglaciated history. Consequently, the elevated and forested Cypress Hills have been proposed to be a “sky island” habitat surrounded by lower-elevation grasslands. Coinciding with this region is a number of isolated populations, forming a number of identified endemic and endangered species.

We identified a gap in the knowledge of benthic invertebrate communities in Cypress Hills. Using standardized kick-net sampling, we assessed the benthic invertebrate taxonomy at four sites. We found statistically significant differences in the community structures and taxonomic richness of benthic invertebrates. We identified 16 taxa across the four sites. The study of benthic invertebrates is important in regard to their use as bioindicators for assessing water quality.

This unique environment has not prompted extensive study. Our evaluation of an understudied area allowed us to identify the potential expansion of an endemic species and explore a new aspect of this unusual region.

Relevance:

The study of invertebrates does not often make headlines. This is increasingly important as the use of benthic invertebrates as bioindicators gains popularity. In our research, we identified an expansion in the range of the endemic Autumn-mottled Caddisfly into Cypress Hills. This species has now been identified in the park, and the vicinity of Kelowna. This accompanies the endemic shieldback katydid, known to be found in both the vicinity of Cypress Hills Park and Kelowna.

Assessing relationships between soil properties and crop productivity: A case study of Criollo cacao agroforestry systems in Belize

Sarah Rebitt

BSc Geography Honours student

University of Victoria

Keywords: *cacao, agroforestry, soil health, crop productivity, tropical agriculture*

Soil health is essential to life on Earth, however there is a major knowledge gap surrounding soil, particularly in the context of agroecology. This study uses soil health as a vehicle to investigate crop productivity through a case study of Criollo cacao agroforestry systems in Belize. Criollo cacao (*Theobroma cacao L.*) is a subspecies of cacao that is recognized for its high quality and affinity to shade conditions. The objectives of this research were to (i) provide insight into the overall soil health of existing Criollo cacao systems; (ii) assess relationships between soil properties and crop productivity; and to (iii) better understand how to maximize productivity of Criollo cacao within agroforestry systems. To achieve these objectives, soil samples were collected from three plots of varying crop productivity, during field work at the Belize Foundation for Research and Environmental Education (BFREE). A series of soil properties were analyzed, including bulk density, pH, moisture concentration, aggregate stability, texture and colour. T-tests and ANOVA testing were used to discern relationships between soil properties and crop productivity metrics. Preliminary results reveal exciting trends among soil properties and provide insight into future research directions. Findings from this study will help inform future management of Criollo cacao to optimize production and contribute to preservation of the rare subspecies in Belize.

Aging Gracefully: A Case Study of Senior Renters in Kelowna's Housing Market

Heather Brown, UBC Okanagan

Abstract

This paper explores the most salient housing issues experienced by seniors as renters living in the city of Kelowna, British Columbia. Kelowna is known as one of the most expensive housing markets in Canada. Barriers and challenges in obtaining and maintaining their housing, housing affordability, and aging-in-place are the primary issues discussed. Avenues for further research are also addressed.

Data for this study were collected between June and October 2011, based on a survey of 34 senior renters as well as semi-structured interviews conducted with 12 key informants. The sample was drawn from the population of seniors (aged 65 or older) who have a primary residence in the city of Kelowna. All participants were required to be Canadian citizens and living independently at the time the research was conducted. Results from the case study point out those seniors in Kelowna's rental housing market, face challenges and barriers with affordability, accessibility, adaptability and aging-in-place. Empirical data indicate that senior renters in Kelowna have major concerns in their search for adequate, accessible and affordable housing.

This exploratory case study adds to the existing literature by highlighting the importance of understanding seniors' housing experiences in the city of Kelowna. Significant issues such as accessibility, adaptability and aging-in-place are thoroughly discussed in this study. Recommendations from this study include a need for more government support in the form of affordable housing, as well as possible policy initiatives addressing future housing construction in the city of Kelowna.

Keywords: seniors, renters, accessibility, affordability, aging-in-place

Refugees and Religious Institutions in a Mid-Size Canadian City

Murray Derksen, PhD Candidate, Interdisciplinary Graduate Studies, UBC Okanagan

Abstract

Canada is a leading refugee settlement nation with a highly developed private refugee sponsorship program involving many community and religious institutions. This study explored how religious institutions affect refugee settlement in Kelowna, a mid-size city in British Columbia. Kelowna has had a significant increase in refugee sponsorship since the 2015 Syrian crisis, and most private sponsorship has involved churches and the local mosque, in collaboration with government funded settlement services and community partners. We collected data through a questionnaire distributed among former refugees and semi-structured interviews with key informants including clergy, refugee sponsorship groups, and service providers. The results reveal that religious institutions help refugees cope with barriers and challenges in Kelowna in three main ways: bridging language barriers between newcomers, service providers, and sponsorship providers; helping newcomers establish new lives in Kelowna and move toward integration; and helping newcomers move away from precarity toward prosperity as they re-establish themselves and their families. Of particular note in this case study was the precarity experienced in housing by newcomer refugees, with a majority (76%) of the refugee families in the study reporting core housing need. While this was mitigated in the first year by government assisted and private sponsors, it has created an environment of precarity for former refugees as they try to attain housing that is both adequate and affordable.

Keywords: Refugees, Resettlement, Housing, Mid-size city, Private/Government Sponsorship

Title: MEXICAN MIGRANT AGRICULTURAL WORKERS' EXPERIENCES OF THE PUBLIC HEALTH MEASURES DURING THE COVID-19 PANDEMIC IN THE OKANAGAN: INSIGHTS INTO HOUSING INEQUITIES

Author: Fernanda Novoa, MD, MA

Affiliation: University of British Columbia Okanagan

ABSTRACT

Migrant agricultural workers (MAWs) play a key role in ensuring Canadian food security, with nearly half of these workers coming from Mexico. Extensive research reveals that MAWs in Canada face a high risk of health inequities, among which inadequate housing stands out as a significant determinant of health. COVID-19 shed light on the far-reaching consequences of inadequate housing on the well-being of MAWs. To date, limited research has focused on the housing experiences of MAWs during the pandemic.

This study explores Mexican MAWs' barriers, facilitators and adverse effects associated with the pandemic response and its public health measures (PHM), with a focus on their rental housing experiences in the Okanagan. The study employs community-based research using an interpretive description methodology. Data were collected through field notes taken during volunteer work and semi-structured interviews with 14 Mexican MAWs, two healthcare professionals, and three support individuals. Interview transcripts and field notes were coded and subjected to thematic analysis using the NVivo software.

Results revealed a range of housing-related health inequities, including the impact of employer surveillance, restricted mobility, transportation barriers, and limited access to essential services during the pandemic. The inadequacy of housing conditions, often unsanitary and overcrowded, presented formidable challenges for MAWs in adhering to PHM, exacerbating their vulnerability to COVID-19.

This research contributes nuanced perspectives on the intersection of housing, health, and systemic challenges faced by Mexican MAWs, especially in pandemic contexts. The findings emphasize the urgent need for improved housing standards and comprehensive policy reforms to address health inequities experienced by this population.

Key words: Migrant agricultural workers; health inequities; housing; Okanagan region

Gender and Pathways to Housing

Authors: Kaylah Vrabic, Ph.D. Candidate, Faculty of Earth, Environment and Society at McMaster University

Abstract

Housing is a fundamental human right and an indicator of quality of life. This article explores how women experience barriers to locating affordable rental housing in Kelowna, a mid-sized city with one of the most expensive housing markets in Canada. It explores the type of rental housing units women prefer, what concerns inform their housing search, and the coping strategies they use to overcome barriers in the rental housing market. These findings were derived from a study of 25 women living in rental housing in Kelowna. The primary means of obtaining data was a self-administered questionnaire survey that investigated topics including housing availability and barriers encountered in the housing market including income level, gender identity, and safety. Additional information was collected through semi-structured interviews with 10 key informants to elaborate on the numerous barriers and challenges women face in the rental housing market and to find possible solutions/recommendations for improving the local housing market and the experiences of women renting in Kelowna. The evidence indicates that women living in rental housing in Kelowna experienced several barriers locating housing that meets their needs. Participants indicated that the cost of housing, lack of affordable housing units in areas deemed safe and desirable, a lack of safety features in rental units, and discrimination based on level or source of income as primary barriers. Participants also indicated that they preferred to live with a roommate(s) who also identify as female. These findings add to the existing literature about women's housing experiences by clarifying the barriers women encounter in the rental housing market in a midsized Canadian city. Additionally, based on the results, policy recommendations were developed to improve the rental housing experiences of women living in small and mid-sized cities in Canada.

Keywords: Gender, Housing, Affordability, Canada

Advancing New Regional Industrial Development Pathways: Exploring the Dynamics of Power, Legitimacy, and Institutionalization

Richard Darko

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Abstract

Since the 1980s, rural regions, particularly those reliant on resource commodities have experienced significant changes. Such changes significantly affect the prospects of these regions and their economies. Recent studies have explored how these regions create, or transition to, new economic paths. However, little is known about how new industries or economic development pathways become institutionally 'embedded' in regions and how the associated processes of institutionalization and legitimation are shaped by power dynamics. Utilizing a comparative case study approach, this study focuses on wind energy development in Ontario, Canada, and Victoria, Australia. These cases share similar colonial, governance, legal, and historical frameworks, providing a robust basis for comparative analysis. In this presentation, I will outline and review my research aims and plans for this project. The aim is to create a framework to elucidate the process by which a new industrial development path gains institutional thickness. This will include providing a detailed analysis of factors contributing to institutionalization such as regulatory, economic, technological, and societal dimensions etc. The study will also emphasize barriers hindering institutionalization, such as resistance from incumbent industries, political conflicts, or environmental constraints etc. Additionally, it intends to examine how core-peripheral power structure influences industrial legitimacy and institutionalization. Thus, this study seeks to shed *light on 'deep-rooted' societal issues shaping economic development, sustainability, and energy transition in order to inform policy decisions regarding new industrial developments in rural regions.*

Keywords: new industries, industrial legitimacy, institutionalization, power dynamics, rural regions.

Relevance of Vertical Agriculture Education

Shelbea Julseth-White

University of the Fraser Valley

Keywords: Vertical Agriculture, Planning, Efficiency, Sustainability, Education.

Vertical agriculture is a concept gaining relevance due to population growth, food scarcity, and environmental degradation. This innovative approach grows crops in vertically stacked layers in controlled environments, reducing the need for land, water, and pesticides. Mitigating these adverse effects is particularly significant in urban areas where land availability is limited, and the demand for fresh, locally sourced produce is growing.

Research shows that current education and training in vertical agriculture focus heavily on technical aspects of vertical growth, such as engineering and horticulture, neglecting areas like business management, community planning, and pre-or post-production processes. The lack of open data and standardized practices makes establishing baselines for comparison and implementing consistent approaches challenging.

To expand beyond supplementing existing supply chains, exploring economic models like circular economy approaches can offer new insights and opportunities. Sustainable practices, collaboration, and community integration can enhance food security by providing a consistent, nutritious food source year-round, fostering self-reliance and resilience to supply chain disruptions.

Governments can incentivize vertical farming adoption through policies and financial support, stimulating economic growth, creating jobs, and reducing the agriculture sector's carbon footprint. Employers benefit from increased innovation opportunities, market demand for sustainable products, and a skilled workforce. Individuals engaging with vertical farming practices can better understand the food production process and cultivate a sense of environmental responsibility. Ultimately, this will contribute to building a more resilient and inclusive food system.

The relevance of vertical agriculture in geography transcends mere technical innovation; it touches upon fundamental aspects of society, economy, and individual well-being. By addressing these strengths and gaps, future educational materials can better equip individuals involved in vertical agriculture and contribute to the industry's overall success.

The lemmings dilemma:

An examination of environmental justice, volunteerism, and the pursuit of empowerment in biodiversity conservation organizations in Canada

Kayla Wiens*^a, Mark Groulx^b, Annie Booth^c, Chris J. Lemieux^d

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Keywords: Citizen and community science; partnership; biodiversity conservation; volunteer

In the face of ongoing biodiversity decline, examining factors that contribute to the success and failure of biodiversity conservation initiatives is crucial. This study explores lessons from community engagement and engagement design within citizen and community science projects and programs. The goal is to learn from these contexts to better understand where and how ineffective engagement in conservation science and practice contributes to conservation failure. Findings stem from semi structured interviews with seventeen project and program staff and coordinators representing eleven citizen and community science programs across Canada. Staff and coordinators were recruited for their direct experience working with volunteers and interviews were thematically analyzed following by Charmaz's grounded theory approach.

Analysis involved the construction of two related themes. The first theme explores staff and coordinators' intentions and strategies to promote co-design and co-production with the community. These efforts address a goal to ensure volunteers have a meaningful experience beyond tasks specific to data collection. The second theme explores how the creation of meaningful experiences has evolved as a response to structural, particularly demographic challenges related to volunteer recruitment and retention. Staff and coordinators report partnerships with post-secondary institutions as one desired strategy to overcome recruitment and retention issues. Findings examine the implications of establishing university-community partnerships as an approach to ensure effective engagement, and the need to consider partnerships on a case-by-case basis.

Authors:

Dr. Robin Westland, Thompson Rivers University

Heidi Wismath, Thompson Rivers University

Key Words:

Feminist geography; critical academic friendship; empowerment; affectual/emotional geography; gift economy

Abstract:

Critical Academic Friendship (CAF) has garnered attention in the field of geography since the early 1990s. As a transformative relational framework, CAF serves as a form of resistance against the hierarchal and competitive structures within the modern neoliberal university by instead promoting reciprocal relationships, supportive dialogue, and ethical care. Existing literature on CAF focuses on peer-to-peer relationships; what happens when there are power-differentials involved? Power-differentials such as those between a professor and an undergraduate student? Can a CAF develop under such a hierarchal structure? More than that, should it, given the necessary ethical considerations? Furthermore, if such a relationship is fostered, how does it differ from mentorship and what is its value? We explore these questions and present our own experience as an undergraduate student and a junior professor who have navigated these tricky waters through open and careful dialogue. We propose that rather than a CAF our experience is more akin to a Critical Academic Gift. We choose the term gift to counteract the growing framing of the professor-student dynamic being one of financial exchange between a paying student and a paid professor. In contrast, our gift is built on reciprocity, mutual respect, and co-learning. Our CAG has served as a powerful tool of schismogenesis, a catalyst for us each to unearth new aspects of ourselves and to reinforce our individual and collaborative commitment to facilitating social change. Situated in feminist and affectual/emotional geographies, we recount the forming of our connection and the ongoing relevance beyond ourselves, the 'ripple effect' resulting from reciprocal empowerment. We conclude that there *is* value to both the student and the professor in allowing CAGs to develop, and we propose that highlighting this reality is a powerful tool of challenging the hierarchal structures of the modern neoliberal university.

Relevance Statement:

We demonstrate here that feminist methodologies, pedagogies, and non-hierarchical approaches are deeply relevant in the learning environment, despite remaining marginalized within geography as a whole. As counter-cultural and political approaches, feminist geographies support personal development, foster empowerment, and have wide-ranging impacts within the academy and beyond.

**Urban Stories of Migrant Families, Households, and App-Based Delivery Couriers Negotiating
Precarity in Lethbridge, Alberta**

Lawrenz Decano

Department of Geography and Environment

University of Lethbridge

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Oral presentation

Abstract

The COVID-19 pandemic and lockdown measures saw a surge of individuals working for app-based delivery systems. With the lack of labour security and protection, it is curious how app-based delivery couriers continue to be a desirable option for most migrants in the city of Lethbridge. Precarity is often discussed in geography to describe an individual's less-than-legal status while residing in Canada or labour experiences that are insecure and unstable. Using the methods of grounded theory, I conducted interviews and timelining activities with migrants who are currently working or have worked for app-based delivery systems offered in Lethbridge. Throughout six weeks of ethnographic fieldwork, I looked at the family and household to understand how migration and app-based work are used as tactics. Multi-status families and households make evident that migration is a kin-based strategy, redefining "kin" to include attachments and relationships created beyond nuclear family members and blood relations. This strategy is used by migrants to negotiate with their everyday realities, such as domestic labour and childcare, while they work. Even if their status is non-precarious, migrants still choose to go in and out of precarious labour as app-based delivery couriers to earn money. These urban stories unfold to describe practices of migrant agency and resilience.

Understanding stories is important to explore the impacts of global and systemic phenomena on people's lives as they placemake and dwell. My work aims to make this process relevant. These nuanced stories of precarity are significant because they complicate our understandings of migrant labour and provide insight to migrant experiences in small cities.

Keywords: precarity, app-based delivery, migrant tactics, multi-status families and households, grounded theory, timelining

Examining Mexican and Vietnamese Students' Temporalities and Navigation of Canada's "Edugration" System

Anne-Cécile Delaisse and Maria Cervantes - The University of British Columbia

This paper compares Mexican and Vietnamese international students' and graduates' migration decision-making while navigating Canadian policies merging international higher education and migration. While this "edugration" system offers a linear succession of time-bound migration categories leading to permanent residency; we argue that it does not align with the temporalities of students' aspirations.

We draw from 45 interviews conducted with Mexican or Vietnamese students and graduates. We move beyond traditional focuses on "migrant's productive mid-life" as well as the assumption of a linear temporal pathway of migration informing policy-making and research. Our findings highlight how students' education aspirations extend beyond their 'temporary' experience in the "edugration" system, encompassing early-life choices made by families and evolving long-term plans of individuals. We also underscore how participants' migration journeys deviate from the linear "edugration" path, as they navigate changing migration status and can engage in circular and return migration. Concurrently, we demonstrate how participants' migration strategies for transnational social mobility are created over time and vary depending on the region of origin.

This paper is relevant to various stakeholders working with international students, including educational institutions, policy makers and scholars. Indeed, we showcase the misalignment between the homogenizing edugration system and students' temporalities, emphasizing the importance for stakeholders to prioritize the latter and remain critical of the current policy framework. Finally, comparing Mexican and Vietnamese students' and graduates' experiences highlights the different geographies of international students mobilities in Canada. This paper reveals how national and local bordering practices stem from the power dynamics inherent and specific to the unequal relationship between different sending and receiving countries in the context of international education.

Key words: International higher education, International students, Temporality, Migration policies

GENDERED EXPERIENCES OF CLIMATE CHANGE-INDUCED DISPLACEMENT: EXPLORING INEQUALITY, AGENCY AND RESILIENCE AMONG DISPLACED WOMEN

Jemima Duru, University of Northern British Columbia

As climate change intensifies, displacements continue worldwide. **Policies and programs to support people living with climate change must reflect local lives, livelihoods, constraints, and opportunities to be relevant and context-appropriate.** This paper introduces proposed PhD research about how women in an Internally Displaced Camp (Lagos, Nigeria) experience climate change-induced displacement. Women are often seen as among those most impacted by climate change and related displacement (UNHCR 2022, IOM 2024). My research will consider micro-scale experiences within greater contexts and will investigate the interplay between climate change-induced displacement and gender inequality. I plan to record, analyse, and amplify women's everyday experiences, observations, and adaptations. As an insider/outsider researcher drawing upon feminist scholarship, I will use ethnographically informed semi-structured interviews, focus groups, and observation. I will integrate frameworks, theories, and concepts from critical development studies, anthropology of the everyday, post-colonial studies, and feminist geography. I will analyse the resulting data using adapted grounded theory and thematic analysis to understand interactions between climate change, displacement, gender, and gender relations. I hope this work will offer new portrayals of climate change impacts and responses to them, and contribute to growing scholarship on "gender and climate change" in the Global Majority (Baada and Najjar 2020, Nakate 2022). I will look for progress/lack of progress regarding equity, and highlight agency and resilience, heeding calls to move beyond portrayals of women as (only) vulnerable and impacted (e.g. Arora-Johnson 2011). I hope my study will inform more inclusive, equitable, and gender-sensitive policies. This is an abridged version of my PhD proposal, and it includes case studies from other scholars. I welcome feedback on theoretical elements and research design.

Keywords: climate change; gender; inequality; displacement; feminist; Nigeria

Abstract submission - paper presentation

Title:

Exploring the Migration Decisions of Rural Youth: A Case Study of Tumbler Ridge, BC

Author:

Jessica Froese, University of Northern BC

Abstract:

Rural and small-town places across Canada have been undergoing rapid sociodemographic and economic changes since the early 1980s. These changes are the product of the 1980s recession which fostered neoliberal public policies that reduced the role of the state and their public sector involvement, offloaded government assets, contracted out services, and effectively shifted government initiatives away from community-building. Many communities in northern BC were originally developed to house the working families of the post-war natural resource economy. Since then, service infrastructure has aged, the original workforce is retiring, and many youth and young families have migrated out of these communities. At the same time, significant economic transition is occurring as the natural resource economy becomes increasingly automated, reducing the number of required rural and small-town workers. Therefore, the changing resource economy combined with an unsuitable service infrastructure has changed the nature of work in rural and small-town places and for the young people seeking employment and quality of life within them.

My master's research will explore the issue of rural youth migration through a mixed-methods case study of Tumbler Ridge, BC. The focus of this research is exploring senior high school students' feelings about staying, leaving, or returning to their community. Grounded in community-based research methodology, this research will tell the story of those about to make this critical decision. This research is relevant to Tumbler Ridge to improve their understanding of local youth migration, relevant to other rural and small-town places across BC, and relevant to the academic literature as an important part of the rural story.

Key words:

Northern BC, rural, community change, youth, migration

Concurrent Session B:

Floods, responses, and built environments

E207

Don Alexander, Nature-Based Solutions to Climate Change

Leif Burge, Naturalization of Vernon Creek in Polson Park: A Case Study of Flood Mitigation and Fish Habitat Enhancement in an Urban Park

Emi Kingan, A Historical Look at Flood Risk and Managed Retreat in Squamish, British Columbia

Neil Nunn, State failure, or formation? Regulating mass destruction in BC, from the 1858 Gold Rush to the 2014 Mount Polley Mine Disaster (and beyond)

Housing in a mid-sized city: Groups at Risk II

E208

Taylor Manns, Disrupting the Settler City: Engaging with Indigenous Imaginaries toward Anti-colonial Urban Design

Afia Zubair Raja, Housing Crisis in Lower mainland BC- the real stress test

Pablo Wikander, Collaborative Housing Solutions for Low-Income Recent Immigrants Through Research-Driven Design

Carlos Teixeira, Housing Groups at Risk in Mid-size Cities: A Case Study of Recent Immigrants in the Rental Housing Market in Kelowna – An Overview

Careers in Geography

E212

Place and regions

E213

Patrick Buckley, New new regions, globalization, and NE Asia: a failed exercise?

Danielle Gallina, Constructing Place and Time in the Okanagan Valley Wine Region: A Visual Analysis of Local Winery Imagery

Laura Greene, Filmmaking as Placemaking

Tom Waldichuk, Translating landscapes of Japan in the early 1950s from the perspective of an American Geographer living temporarily in Tokyo

Workshop on iPhone/iPad LiDAR: Dr. Todd Redding, OC

HS101

Nature-Based Solutions to Climate Change

Author: Dr. Don Alexander

Institution: Department of Geography, Vancouver Island University

Abstract: In recent years, municipalities have become increasingly aware of the threat posed by climate change and have begun to take appropriate action. Initially, this action was mainly focused on *mitigation* – reducing greenhouse gas (GHG) emissions from their own operations and from their residents through encouraging behaviour change. However, it has become increasingly apparent that even if society achieves significant reductions in GHGs, there are enough CO₂ and other GHGs ‘in the pipeline’ that climate change impacts will be severe. As a result, attention has begun to shift to *adaptation* measures.

Fortunately, municipalities do not have to choose between mitigation and adaptation. Recently, a whole policy and practice has emerged around what are called ‘*nature-based climate solutions*.’ These are measures that either use nature directly through the retention of natural capital – as with natural asset management – or that emulate nature through human-constructed ‘green infrastructure.’

The strength of nature-based climate solutions is that they can achieve, in many cases, mitigation and adaptation objectives simultaneously. To demonstrate this, I will look at six categories: maintaining and enhancing abundant urban tree canopies; avoiding development in floodplains and establishing more ephemeral land uses; retention and expansion of wetlands; maintenance and enhancement of riparian zones and estuaries; ‘Green Shore’ initiatives, and encouraging urban agriculture. If time permits, I will provide a brief example of each of these.

This presentation topic is pertinent to the theme of “Relevance” because climate change is the greatest threat facing humanity and the living world at the present time. It is relevant to Geography because geographers can explore nature-based solutions to climate challenges based on the specificity of their respective locales which they are uniquely equipped to gauge.

Keywords: municipal climate action, mitigation, adaptation, nature-based climate solutions

Primary Presenter	Leif Burge, Ph.D., P.Ag., Fluvial Geomorphologist
Organization	Ecofish Research
Key words:	Stream Restoration, Fluvial Geomorphology, Natural Channel Design, Polson Park, Flood Mitigation
Title:	Naturalization of Vernon Creek in Polson Park: A Case Study of Flood Mitigation and Fish Habitat Enhancement in an Urban Park
Authors:	Leif Burge, Ecofish Research, Mathew Keast, City of Vernon, Ivano Biagioni, Stantec Consulting Inc.

Abstract

Polson Park is a popular urban park in Vernon, British Columbia, that has experienced chronic flooding and groundwater issues due to the presence of the concrete-lined Vernon Creek channel. The creek was modified sometime before the early 20th century and now flows through a degraded downstream section with concrete banks, lawns and concrete duck ponds on what was the floodplain and a semi-natural upstream section with beaver dams, floodplain connection and riparian vegetation. The downstream section provides poor fish and riparian habitat and was identified as a good site for naturalization. The existing fish and benthic invertebrate communities, fish habitat, hydraulic, geomorphic, groundwater, hydrology, water quality, sediment quality conditions were documented to inform the design. The fish population is limited by the lack of pool habitat, riparian cover, hydraulic conditions, and lack of spawning material. The City of Vernon initiated a project to naturalize the creek through the park over two phases, starting from Highway 97 and ending at a maintenance bridge crossing approximately 550 m upstream. The project aims to create a naturalized floodplain with meandering channels, riffle pools, root wads, boulders, and riparian vegetation to accommodate seasonal flows and flooding events, improve water quality and fish habitat, and reduce maintenance costs. The target species for the design were rainbow trout (*Oncorhynchus mykiss*) and kokanee and sockeye salmon (*Oncorhynchus nerka*). The project supports efforts to reintroduce sockeye salmon to the region. Specifically, the design includes the removal of the duck ponds, removal of seven bridges, the reconstruction of three more robust bridges, floodplains on one or both sides of the channel, addition of spawning gravel and planting of riparian vegetation. The project is expected to start construction in the summer of 2024 and be completed in 2025. This presentation will provide an overview of the project design, implementation, challenges, and expected outcomes.

A Historical Look at Flood Risk and Managed Retreat in Squamish, British Columbia

Emi Kingan, Master of Arts Student in Geography,
University of British Columbia Vancouver

Abstract:

Following the atmospheric river and flood events throughout British Columbia in late 2021, many communities across the province have been forced to face their ingrained flood risk. For some of these communities, this has involved considering the flood mitigation strategy known as managed retreat or community-led relocation in which vulnerable people, infrastructure, and services are moved away from flood risk areas. Despite the potential of this tool to reduce flood risk, as well as loss and death during flood events, there is still much understandable resistance towards the strategy due to the social and economic disruption it could cause. For my MA thesis research, I am investigating how managed retreat is being considered and implemented in Squamish, British Columbia—a community that experiences riverine and coastal flooding. Managed retreat has been a part of the community's flood management strategy since 2017 along with other tools from the protect-accommodate-retreat-avoid toolkit. Yet, interviews and archival research into Squamish's history reveals that managed retreat is not a new idea: relocation programs have indeed been proposed in the community long ago. This presentation examines these flood-induced relocation programs that were proposed for Squamish decades ago in relation to today's heightened interest in—and hesitancy towards—managed retreat. In doing so, I hope to impress the importance of conducting thorough historical and locally situated analyses to understand why communities in the province today experience high levels of flood risk. Ultimately, the presentation argues that an informed understanding of historical debates around flood management can help motivate current leaders to reassess the province's long-standing reliance on flood control infrastructures and thus avoid replicating past mistakes and business-as-usual conditions.

Keywords: managed retreat, flood risk, climate change adaptation, historical research

Paper Title: State failure, or formation? Regulating mass destruction in BC, from the 1858 Gold Rush to the 2014 Mount Polley Mine Disaster (and beyond)

Neil Nunn, Postdoctoral Fellow

Allard School of Law, University of British Columbia

Keywords: Environment injustice, social and ecological devastation, settler colonialism, British Columbia, mining, extraction, the 2014 Mount Polley Mine disaster

ABSTRACT: Amidst a growing awareness of existential ecological threats and histories of genocide, why has the colonial state of British Columbia (BC) proven incapable of averting further large-scale and widespread social and ecological death? This paper seeks insight into this question by placing the 2014 Mount Polley Mine disaster—the largest mine-waste disaster in Canadian history—within a broader settler-colonial context in BC. I argue that turning to BC’s settler-colonial history offers valuable clues into an inability of colonial modern governance to respond to ecocide and mass racialized death and disruption. BC’s history reveals a delicate dance of colonial governance whereby, on the one hand, the colonial government offers primacy to violent forms of extractivism, while on the other, its sovereign power relies on maintaining beliefs from the body politic of safety and stability. I exemplify this tension between industrial primacy, and an appearance of responsible governance (amidst increasingly unignorable manifestations of ecological disruption) by examining the implementation of environmental laws leading to and following the disaster. This paper concludes with concrete suggestions about moving beyond this enduring and deadly settler-colonial politics of devastating.

This paper provides a relevant frame of reference to address some of the world’s most pressing challenges

Disrupting the Settler City:**Engaging with Indigenous Imaginaries toward Anti-colonial Urban Design**

Taylor Manns

Department of Geography & Environment

University of Lethbridge

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Oral Presentation

Abstract

The project contributes to ongoing discussions surrounding decolonizing urban design and planning practices within Treaty 7, particularly in Sik ooh kotoki (Lethbridge, AB). It aims to understand Blackfoot and Indigenous approaches to urban design, and spatial resistance to settler colonial structures that seek to erase and oppress Indigenous community members. The project challenges the notion of urbanism and Indigeneity as opposing forces and seeks to understand futurities of urban Indigenous sovereignty and self-determination, Land Back, and reconciliation within the city. Analyzing policies and practices at the municipal level, the project investigates how current practices urban planning and design legitimize settler colonialism and manifest Indigenous erasure in Lethbridge. The research aims to empower participants to depict and create spaces that reflect their narratives, stories, and experiences by utilizing qualitative and community-engaged methods, such as photovoice and artist-led engagement. In addition, the project will co-create pathways for social advocacy and change with the Sik Ooh Kotoki Friendship Society, contributing to greater reflection on and engagement with Indigenous urban spaces and settler urban design practices in Lethbridge and Southern Alberta.

This work is relevant as it acknowledges ongoing settler colonialism and seeks to understand the points of leverage through which to disrupt settler governmentality and empower Indigenous people within cities. It is important to interrogate planning and decision making practices that perpetuate spatial violence experienced by Indigenous community members in cities as they relate to practices of anticolonial resistance.

Key Words: self-determination; spatial justice; settler colonialism; urban planning and design

“Housing Crisis in Lower mainland BC- the real stress test”

Presenters:

Dr. Afia Zubair Raja, Department Head Planning, Geography and Environmental Sciences, University of the Fraser Valley, Abbotsford, BC

Dr. Zubair Ali Raja, Assistant Professor, Finance, Thompson Rivers University, BC

Keywords: Housing Affordability, housing crisis, advanced statistical analysis.

Multiple sources have identified “Housing Affordability” as the most critical issue in Lower Mainland BC. Abbotsford Community Foundation (ACF) has released the 2022 Vital Signs report. The report uses community knowledge to quantify the importance of the indicators on the themes of community belonging, health and wellness, housing, safety, work and economy. In this manuscript the researchers use multiple advance statistical tests like correlation tests, Analysis of Variance, Regression, Chi-square etc. to generate relationships between the themes associated with housing affordability. The results show the connection of integral social and economic trends to the “Quality of life” of the Abbotsford community as a case study. This output will help local governments, community organizations, policy makers, housing analysts, financial mangers, and citizens to better understand the dynamics of housing market in the Lower Mainland so that rational solutions can be suggested, which will help make informed decisions.

Statement of why this work is relevant:

Housing affordability is well aligned with the theme of the conference.

Collaborative Housing Solutions for Low-Income Recent Immigrants Through Research-Driven Design

Authors:

PhD candidate. Pablo Wikander (first author), University of Alberta - Earth & Atmospheric Sciences
Dr. Damian Collins, University of Alberta - Earth & Atmospheric Sciences

Abstract

The housing crisis in Canada has profound implications for low-income immigrants in their quest for affordable housing. Addressing this issue is essential for the well-being of individuals and holds significant relevance to society, particularly in fostering inclusive communities and upholding the human right to housing. Recognizing the challenges housing provider organizations face, some of which are actively working towards constructing housing solutions for this vulnerable population, it becomes evident that the successful translation of housing research into practical designs is paramount.

We aim to underscore the societal and community relevance of bridging the existing knowledge gap in collaborative housing. By employing the 'research through design approach,' this study engaged in workshops with recent low-income immigrants, resulting in 45 unique housing designs or artifacts. The subsequent digital translation and categorization of these artifacts revealed five core collaborative housing models tailored to meet the specific needs of such a population.

Relevance

In the broader context, the outcomes of this research demonstrate the immediate relevance of 'research through design' in co-creating housing solutions for low-income recent immigrants. By successfully closing the knowledge gap between housing research and design implementation, this work contributes to improving the living conditions of a specific demographic and aligns with the broader societal goals of fostering inclusive communities and ensuring access to housing as a human right. This paper's findings can potentially inform and guide governmental departments, housing organizations, and community development initiatives in their efforts to address the housing crisis and promote equitable housing opportunities for vulnerable populations.

Keywords: collaborative housing, housing models, immigrants, design methodology, community participation.

Housing Groups at Risk in Mid-size Cities: A Case Study of Recent Immigrants in the Rental Housing Market in Kelowna – An Overview

Carlos Teixeira, University of British Columbia Okanagan and Morgan Game, Undergraduate student/Geography, University of British Columbia Okanagan

Abstract

In Canada, we know relatively little about immigrants' settlement experiences, including their level of access to local services and their housing experiences/outcomes – both key factors with regard to their successful integration in small- and mid-size cities or in rural regions. This paper explores the settlement and housing experiences of recent immigrants in the city of Kelowna, a mid-size city in the interior of British Columbia with a focus on the rental housing market. The study draws on primary data from questionnaire surveys. Additional information was collected through focus groups and semi-structured interviews with key informants who were experts on housing or community services and thus could elaborate on the numerous barriers encountered by recent immigrants and also make recommendations for improving Kelowna's rental housing situation. Data were collected in three stages: (a) in summer 2008 from five focus groups with recent immigrants (34) and interviews with 20 key informants, and (b) from questionnaire surveys administered in 2015 and 2018 with a total of 67 recent immigrant respondents. The findings revealed that, for immigrants, transitioning from their homeland was a stressful and costly experience. Affordability (“high rents”) is a major issue for recent immigrants and many will not be able to move out of their present place soon in order to improve their housing conditions. Given escalating housing costs and low vacancy rates in the rental housing market over the last decade, most participants had difficulties finding affordable, adequate, and suitable housing in Kelowna. Few relied on local community organizations (NGOs) or government-sponsored ones to find a place to live upon arrival in Kelowna, but those who did found them very helpful. Immigrants and key informants strongly recommended that more information sources for settlement and housing services be available before, or just after immigrants' arrival in Canada, that are appropriate to their housing needs and preferences. It is evident that Kelowna can benefit from immigration. However, attracting and retaining immigrants to this city will depend on the presence of (a) more subsidized/affordable housing; (b) job opportunities that match immigrants' qualifications and offer an adequate income, and (c) quality services and programs to integrate new immigrants into the community.

Keywords: Immigrants; rental housing; affordable housing; City of Kelowna; British Columbia.

New new regions, globalization, and NE Asia: a failed exercise?

Dr. Patrick Buckley, 513 High Street, Western Washington University,
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Northeast Asia is a space made up of five states yet to become a regional place: keenly bereft of regional institutions. Although it is potentially economically, militarily, and demographically (even while faced with declining numbers), larger and more powerful than the European Union. The independent parts retain and maintain core characteristics that separate them even as they have recently flexibly melded together at various scales and combinations in a variety of contexts over the post-Cold War era. However, what now stands out most is not the whole but the negotiation of the parts, at the various scales, and over a variety of distinct sometimes bilateral issues. There is a distinct lack of community building institutions. Bilateral sovereignty and security issues continue to dominate the discussion. What at one time seemed like a candidate of Jones's plasticity and a "new new region" now seems headed for a possible new Cold War. This seems especially true given China's more aggressive posturing towards Taiwan and Japan as well as its post-Covid slow down. Add to this Russia's Ukraine invasion and closer embrace of China and North Korea. Finally, with North Korea's resurgent leverage of aggressively playing off her neighbors once again as she amasses nuclear capabilities, the plasticity of a new new region seems to have failed.

Key Words: Northeast Asia; Globalization; Regionalization

Relevance: Has recent globalization joined the failure of earlier efforts.

Constructing Place and Time in the Okanagan Valley Wine Region: A Visual Analysis of Local Winery Imagery

Authors: Danielle Gallina and Jonathan Cinnamon

Institution: The University of British Columbia Okanagan

Abstract:

Over the past few decades there has been major growth and transformation in the global wine industry, which has resulted in increased competition between wineries and wine regions. In this context, many wineries often seek to construct brand identities connected to their region's terroir, tradition, culture, and heritage to distinguish themselves. Over the past 30 years, the Okanagan Valley region of British Columbia has made a name for itself as a New World wine region through its production of high-quality wine and its unique terroir. While there has been some research on wine identity in the Okanagan Valley, little is known about winery branding strategies in the region. The aim of this study is to examine the construction of the Okanagan Valley wine region and winery brand identity through a visual content and semiotic analysis of photographic images found on local winery websites. This study exemplifies how visual representations of place and temporality provide a recurring motif across a range of wineries. More specifically, this study suggests that Okanagan wineries rely on wider region-specific imaginaries of place to construct their identity, and attempt to evoke longer-term temporalities through imagery suggestive of both historical and intergenerational connection to the land. In a saturated region that is still experiencing growth, such practices are used strategically by wineries to create authenticity which appeals to consumers and attracts them to their specific locations. Overall, these findings add to the literature on wine brand identity and have relevance for industry and regional development stakeholders interested in place- and time-based branding strategies.

Key Words: Okanagan Valley wine region, corporate heritage, brand identity, temporality, visual analysis.

Filmmaking as Placemaking

Laura Greene (University of Victoria)

Films aim to create places that appeal to audiences. In many ways, these filmic places are socially constructed by both the filmmaker and the audience and their appeal depends on their authenticity to the audience. Whilst previous geographies of film have focused on the accurate portrayal of locations, this paper suggests that the gender of the filmmaker(s) in relation to the gender of the intended audience impacts the authenticity of the place that is created in a film. The use of the Author-Text-Reader approach in film geography supports the idea that the filmmaker has power over the production of meaning and I contend this includes the production of place meaning (Sharp & Lukinbeal, 2015). By applying concepts from urban tourism planning in new ways, specifically the importance of participatory planning, I suggest that the producers of place in film (writer, director, etc.) can be viewed as representatives of the ‘community’, in this case the target audience. I argue that to produce an authentic place in a film the key contributors must be representative of the intended audience. My analysis is focused on modern “woman’s films” because they are intended for a female audience. In theory, these films should create places that their intended audience find authentic to their everyday experiences. It is hypothesized that “woman’s films”, written and directed by women as a result of their lived experiences, should create more authentic places for women than those written and directed by men.

This is relevant because authentic representation is key to fostering a positive sense of place. I view the lack of representation in the film industry as a social justice issue. It causes alienation and reinforces ideologies that exclude minorities from the mainstream public narrative.

Key words: Placemaking, Gender, Film.

Translating landscapes of Japan in the early 1950s from the perspective of an American Geographer living temporarily in Tokyo

Tom Waldichuk, Department of Environment, Culture, & Society, Thompson Rivers University, 805 TRU Way, Kamloops, BC V2C 0C8 twaldichuk@tru.ca

The early 1950s in Japan was a period of peace and stability. R.A. Davidson (2021) calls this period "...a lull between the two Showa-era upheavals of war(,) and rapid development and urbanization..." For recently arrived foreigners, such as a young American serviceman and geographer, Japan was an interesting place to explore. How did these people translate the landscapes around them? What stood out? Geographers have noted that most people have a challenging time reading the landscape. Related to this, geographer Yi Fu Tuan talked about how landscape interpretations of the local resident are different from those of the wealthy visitor. One can relate these landscape perception differences to sense of place. For example, in the early 1950s, the coastal community of Atami was commonly known as "the Riviera of Japan"-- an image which obviously lured some tourists. Seventy years later, has this sense of place changed? The objective of this presentation is to discuss how past visitors to Japan translated or interpreted what they saw in the landscape. How did they describe what they saw? How does this translate into Japanese? I discuss these perceptions and interpretations using examples from Japan in the early 1950s through the photographs of a young American geographer. This discussion is relevant because this geographer eventually became my masters supervisor and life-long friend. The preliminary findings are that the peacefulness that Davidson (2021) writes about can be seen through the photographs of this newly arrived geographer. The principal conclusion is that, whereas learning to read the landscape is difficult, communicating landscape perceptions of someone no longer with us is also a challenge.

Keywords: 1950s Japan; landscape change; perception; philology

Concurrent Session C:

Mapping and imagery

E207

Mariah Kashmark, A Comparative Analysis of Image Classification Techniques: Using ArcGIS to

Develop Deep Learning Models for use with Imagery Collected with RPAS Systems

Tammi Mills, Aerial Thermography and Photogrammetry for the Detection of Archaeological Sites

Daniel Brendle-Moczuk, To know a place we must know the past: UVic Libraries Vault historical maps and some of their uses

S.M. Talha Qadri, Understanding the Current and Future Projections of Climate Change using SSP

Scenarios and Spatial Distribution Maps in the Fraser Valley Regional District, British Columbia, Canada

Social Justice and urban issues

E213

Gabrielle Heschuk, Regenerative Tourism Strategies within Kelowna BC to Promote Destination

Development and Environmental Sustainability

Ali Jetha, Age Friendly Design in Northern British Columbia

Michaela Meil, Keeping up with the sustainability leaders: Corporate social responsibility commitments for coffee imports into Canada

Ivan Townshend, An Urban Geography of COVID Funding Uptake and Neighbourhood Dependence: Some Preliminary Observations

Bryanne Wandler, Understanding Student Food Insecurity at the University of Lethbridge: Challenges with Accessing, Affordable Nutritious Food

Opportunities and limitations of field schools as decolonial praxis and curriculum

E208

Catharine Hume, Field Schools

Kalea Richardson, Opportunities & Limitations of Field Schools as Decolonial Praxis & Curriculum Panel Discussion

Laura Greene, Opportunities and Limitations of Field Schools as Decolonial Praxis and Curriculum: Combatting Extractive Research Practices

Riley Watts, Community Relevance and Pollution Monitoring as Sovereignty

Technological advances and methodologies in Geography

E212

Jingya Dai, Of assemblage and agency: Understanding digital sustainability transition in China through sociospatialities

Parthi Krishnan, Depicting earthquake data using standard deviation ellipses in a Geographic Information System (GIS)

Rachel Pagdin, Low-Cost Remote Data Loggers with Arduino

Behnoosh Roknaldini, Investigating the use of statistical and hybrid models to simulate freshwater temperatures in northern British Columbia, Canada

Ryan Walsh, Reasoning Spatial Reasoning: The Role of Mathematics in Advancing Remote Sensing Methods

Workshop on Field Maps: Kendra Munn, ESRI

C278

A Comparative Analysis of Image Classification Techniques: Using ArcGIS to Develop Deep Learning Models for use with Imagery Collected with RPAS Systems:

WDCAG 2024 Abstract Author: Mariah Kashmark

This independent study seeks to identify the best performing classifier for the delineation of sandbars, water, and vegetation using imagery collected with remotely piloted aircraft systems. Knowing the optimal classifier within the context of this environment will be valuable for an ongoing research project focused on monitoring changes in riparian ecosystems. This project uses the image analyst and deep learning (DL) tools embedded in Esri ArcGIS Pro 3.2.0.

River sandbars are dynamic features that undergo alterations due to factors such as water flow, sediment deposition, and erosion. By precisely identifying and tracking these changes, a DL model could provide valuable information about the evolving landscape. Image classification involves assigning pixels or objects to specific categories using a training dataset. In ArcGIS, various classification methods are available for analyzing remotely sensed data. These tools utilize pixel values and configurations to address challenges such as delineating land types or identifying areas experiencing change. In the first part of this project, the ArcGIS classification wizard was used to create pixel based and object based image classifications. A DL model was then developed and used to generate similar classifications using new imagery.

In geography, deep learning technology can be applied to various tasks such as change detection, feature extraction, spatial forecasting, and disaster response planning.

ArcGIS's deep learning capabilities are user-friendly and straightforward. It is important for geographers of all levels to learn and utilize them effectively. This presentation will introduce students to the deep learning tools we have access to in ArcGIS.

Key words: GIS, Image Classification, Deep Learning, ArcGIS, Remote Sensing

Relevance: The DL model created is pertinent to a larger study which examines changes in riparian ecosystems.

Aerial Thermography and Photogrammetry for the Detection of Archaeological Sites

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ABSTRACT

Aerial thermography and photogrammetry are techniques that can be used to reveal archaeological features in the landscape. Advancements in remote sensing technology have enabled the collection of RGB and thermal images to be used in analysis producing high-quality results at lower costs than could be achieved using traditional methods. Utilizing an archaeological site in Southern Alberta as a study area, a remotely piloted aircraft system (RPAS) was used to determine optimal flying heights and the ideal time-of-day thermal data collection. The results from RGB and thermal orthomosaics show that careful consideration should be given to the acquisition parameters as optimal time-of-day and spatial resolution (flying height) resulted in improvements in the detection of surface and sub-surface stone features over the study area. Understanding these critical imaging parameters enhances methods available for archaeologists to use while targeting smaller areas for more intensive pedestrian surveys. Additionally, remote sensing in archaeology uses non-invasive methods for the delineation and analysis of subsurface archaeological and cultural features. With the increased popularity and lower costs of the technology, the use of remote sensing in archaeology will make the overall project more robust in coverage and data collection and offer a way to cover large areas over short periods with smaller field crews.

Title: To know a place we must know the past: UVic Libraries *Vault* historical maps and some of their uses

Abstract:

Vault is UVic Libraries digital assets management system that stores and provides access to digitized materials from rare and unique holdings in UVic Archives, Special Collections and most important UVic Libraries' project partners across BC.

The historical maps range from c.1800 to c.1920 and were created by BC Land Title Survey Authority, Insurance surveyors, Royal Engineers, Hudson's Bay surveyors such as Joseph Pemberton and even Spanish navigators and the UK Admiralty.

Historical maps are relevant because they enable biologists, ecologists, geographers, historians, planners, politicians, etc, to, in the words of Yi-Fu Tuan, know the land and place.

The maps are utilised in a number of projects detailing historical coast lines, creeks, vegetation and even the locations of historical First Nations building and structures.

This session will also focus on historical maps and projects from the Okanagan.

Keywords: historical maps, landscape, surveyors, BC Land Title Survey Authority, Hudson's Bay Company

daniel Brendle-Moczuk, MLIS, Geospatial Librarian; Editor, *Western Geography*
University of Victoria, (Canada)

Understanding the Current and Future Projections of Climate Change using SSP Scenarios and Spatial Distribution Maps in the Fraser Valley Regional District, British Columbia, Canada.

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Current and future climate changes are influenced primarily by human emissions of greenhouse gases (GHGs). The present study focuses on the Fraser Valley Regional District (FVRD) in Southwestern British Columbia. It contributes towards understanding the current and future climatic projections using GIS-designed spatial distribution maps and Shared Socio-Economic Pathways (SSP). The study presents NDVI, NBI and LST maps to represent changes in built area and temperature in the study area during 2003 and 2023. The study also focuses on variables like the hottest and coolest days, mean and maximum temperatures, and days with humidex above 40 to better understand the future implications of climate change through the SSP scenarios. The study's outcome reveals that the hottest day temperature (during summer), recorded as 34.8°C for 2023, will spike to 39.5°C, whereas the coolest day temperature is expected to change from -8.7°C recorded in 2023 to 0.5°C by 2100 following the SSP 8.5 scenario. The results also indicated that the mean temperature recorded as 11.5°C in 2023 is expected to increase to 15°C by 2100. In contrast, the maximum temperature (warmest temperature of the 24-hour day) recorded as 16.5°C in 2023 is projected to be 20.5°C by the year 2100 following the SSP 8.5 scenario. The study also finds that the number of days with humidex greater than 40 will grow from 1 to 22 days in the next 75 years. Total precipitation increased from 1756 mm to 1870 mm between 2023 and 2100 following the SSP 8.5 scenario, whereas the maximum number of consecutive dry days is projected to spike from 20 days in 2023 to 27 days in 2100. These findings indicate the areas undergoing urban sprawl and increased temperatures, along with the rise in severity of heat waves, dry spells, wildfires, and flash floods, in the future. The results will be a proactive measure for devising adaptation and mitigation schemes to counter climate change severities in the study area.

Keywords: Climate Change; Fraser Valley Regional District, British Columbia; Shared Socio-Economic Pathway

Author: Gabrielle Heschuk

Institution: University of British Columbia

Keywords: Regeneration, Sustainability, Recovery, Resiliency, Tourism

Title: Regenerative Tourism Strategies within Kelowna BC to Promote Destination Development and Environmental Sustainability

Abstract

The objective of this research is to consider the relationship between continued tourism growth and the environment in order to uncover the limitations and potentials of destination development within an environmentally sustainable context. The approach considers regenerative tourism models as a basis for sustainable community development and a framework for the co-existence of environmental sustainability and destination development. Tourism Kelowna is a not-for-profit tourism organization based in Kelowna, BC. Recently the organization has proposed a destination development that has four main strategic goals: seasonality, destination management, internal excellence, and external engagement. Under the second goal of destination management, the purpose is to “foster the sustainable growth of the destination”. (Tourism Kelowna, 2022) This goal will serve as the focus of this research on the limitations and potential of destination development and environmental sustainability. This research uses a qualitative, multi-method case study approach of Kelowna, BC using semi-structured interviews. The project aims to create deliverable strategies to implement goal number two, *fostering the sustainable growth of the destination*. The original timeline for the project encountered unforeseen delays and challenges due to the 2023 McDougall Creek forest fire that occurred in Kelowna, BC from August 15th to September 21st. For this project that aims to research regenerative tourism strategies in Kelowna, BC, it would be irresponsible to ignore the importance of incorporating recovery and resilience strategies into the project. The projects scope now also incorporates how recovery and resiliency are essential pathways to a regenerative tourism industry.

Statement of Relevance

As climate disasters continue to become more severe it is important to consider recovery strategies within the local community that will promote resiliency.

Authors: Ali Jetha, Anastasia Zehetmeier, Christopher Fequet, Connor Lewis, Jennifer Poole, Mazira Faubert

Supervisor: Dr. Mark Groux

Institution: University of Northern British Columbia (UNBC)

Keywords: Age friendly design, Built environment, Older Adults.

Age Friendly Design in Northern British Columbia

Abstract:

British Columbia is aging. As of 2021, 20% of the population was over the age of 65, and by 2043 older adults will make up 25% of the total population. This demographic change has increased demand for age-friendly design in our built environment. Dominant design principles do little to consider the mobility or cognitive changes that can come with aging. As such, much of the built environment across BC excludes older adults from meaningfully participating in basic aspects of society. In 2023 the Center for Technology Adoption for Aging in the North (CTAAN) partnered with the UNBC's Ecological Design Studio to create a student led design vision for a new research and outreach site in Prince George. As a response to legacies of exclusionary design, CTAAN and UNBC students advanced a vision with strong elements of age friendly design.

To understand the needs of CTAAN and its intended users, students held community engagement sessions, conducted socio-demographic research, identified age friendly design precedents, and completed a site analysis. Community engagements mapped the needs of current and older adults, while site analyses examined geotechnical and other constraints and opportunities of the site. Based on these analyses, students prepared a site design that capitalized on a central downtown location, connection to transit, and proximity to an urban older adult population. This presentation shares how the site design process and final design captured a sense of connection to the surrounding neighborhood for all potential users.

By centering the needs of older adults, site design processes can better promote inclusivity and connection. There is pressing demand to move away from designs that assume the needs of a "normal" or "abled bodied" individual. Age friendly design can be a location for new partnerships and a path to promoting quality of life and inclusion for people of all ages.

Title: Keeping up with the sustainability leaders: Corporate social responsibility commitments for coffee imports into Canada.

Authors: Michaela Meil (BSc Student) and Emma Bowick (MA Student)

University of Victoria, Department of Geography

Abstract:

Canada has historically relied on voluntary due-diligence commitments, often in the form of corporate social responsibility (CSR) reports and company specific policies for business conduct at home and abroad. In this research project we observe 22 companies, which make up the top 80% of coffee importers into Canada. Using their public facing CSR reports we document the specific commitments made by these companies and their overall strength, ranking companies by report availability, established standards or company policies, and external auditing or third-party verification mechanisms. Our comprehensive analysis provides insight into the wide range of commitments being made by companies. From there, we assess the demonstrated capacity of the Canadian coffee industry to meet potential forthcoming due diligence legislation such as Bill C-262, *An Act respecting the corporate responsibility to prevent, address and remedy adverse impacts on human rights occurring in relation to business activities conducted abroad*.

Worldwide, there is growing awareness of the human, social and environmental harms occurring in global food systems. While Canada remains a net exporter of food, many products cannot be grown within Canadian borders and must be imported. Coffee is a prime example of this, due to its unique climatic growing conditions. With a focus on coffee importing companies and their established CSR mechanisms, we point to the limitations of relying on voluntary due-diligence, and advocate for the adoption of comprehensive policy options like Bill C-262 to address human, social and environmental harms of global food systems.

Keywords: coffee, corporate social responsibility, due-diligence, food systems, public policy.

An Urban Geography of COVID Funding Uptake and
Neighbourhood Dependence: Some Preliminary Observations.

Presentation Abstract :

The COVID-19 Pandemic had significant employment and financial impacts. Governments rolled out funding packages for both individuals and businesses to alleviate some of these impacts. The federal CERB (Canada Emergency Response Benefit) program was one example. Qualifying conditions for CERB were in place. Individuals could apply for CERB support, ranging from \$2000 to \$14000, between March and September 2020. Analyses by Statistics Canada of CERB recipients point to key traits, including workers in the Service sector, low wage /income workers, younger people aged 15-34 (including students), visible minorities, refugees, etc. Statistics Canada also noted provincial variations in CERB relief. However, little attention has been given to the Urban Geography of COVID relief. This paper examines the spatial patterns or ecology of COVID financial relief across the neighbourhoods of Calgary, Alberta. It explores two measures: a) the level of “uptake” of CERB, and b) the level of aggregate “neighbourhood dependence” on COVID funding programs. Patterns reveal a differentiated geography of uptake and dependence. Calgary is one of Canada’s most “unequal” CMAs with well-known kinds of social differentiation such as socioeconomic status, poverty, segregation of ethnic and visible groups, and increasing income inequality and polarization that are generating increasing inequalities and marginalization. The social ecology of the city will likely underly much of the observed patterns, and is relevant to the spatial manifestation of COVID relief. The paper explores the association between COVID relief patterns and a number of neighbourhood social indicators, and explores the idea that the observed co-linearity represents the underlying intersectionality of marginalizing forces in the city.

Type of Contribution: Paper presentation

Key Words: COVID-19; Urban Ecology, Social Inequalities, Segregation; Vulnerable Population, Intersectional segregation.

Name of Presenter: Townshend, Ivan

Affiliation of Presenter 1: University of Lethbridge.

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Understanding Student Food Insecurity at the University of Lethbridge: Challenges with Accessing, Affordable Nutritious Food

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Oral Presentation

Abstract: Food banks have existed since the 1980s, yet their demand has increased exponentially; in March 2023, there were nearly 2 million visits to food banks across Canada (Agriculture and Agri-Food Canada, 1998; Food Banks Canada, 2023). Food insecurity has often been studied through one field, but I have found that a multidisciplinary approach may broaden our understanding of how interconnected food insecurity is. This thesis will look at food insecurity amongst undergraduate students at the University of Lethbridge through three key lenses: access, affordability, and stigma. Data was collected qualitatively through six semi-structured interviews with second-year domestic undergraduate students to hear firsthand about their experiences as students navigating a geographically constrained campus amidst an affordability crisis. In order to visually capture the food desertification in the city of Lethbridge, a service area map between the street network and grocery store locations with a 1-3 kilometer walking distance was created using ArcGIS software. A few recurring themes from the interviews included that students may not perceive themselves as food insecure since they find their financial status stable despite frequently skipping meals. In addition, food secure and insecure students were very likely to push off eating while on campus if they did not pack anything despite their hunger due to the cost of food from on-campus vendors. Thus, the perception of food insecurity may appear distorted based on the normality of the increased cost of living. My research aims to add to the growing conversation surrounding student food insecurity and support institutions looking to create food secure campuses.

Key Words: food insecurity, stigma, food deserts, affordability, food banks

Relevance: Student food insecurity within the city of Lethbridge has numerous factors that contribute to the precarity all students face on a daily basis. For example, the city is divided by a coulee, which creates another barrier for many students to overcome in order to get to and from campus, as well as other services such as grocery stores and food banks. These barriers have not been studied in conjunction with food insecurity within Lethbridge recently, so this study aims to inform the public about the unforeseen impacts geographical barriers and the affordability crisis have created for students.

Opportunities and limitations of field schools as decolonial praxis and curriculum

The discipline of geography, with its intricate ties to colonial histories, finds itself at a critical juncture, necessitating a profound transformation in its methodologies, pedagogies, and curricula. Our session, based on the experiences of the 2023 Onyota'a:ká field school aims to explore the relevance and potential of field schools with Indigenous nations as a form of decolonial praxis, offering a pathway to reconceptualize geographic education and research through the lens of decolonization. Geography's complicity in colonialism has underscored the urgent need for geographers to radically alter our academic and practical approaches. By engaging directly, and in the field with Indigenous nations, field schools present an opportunity to move beyond traditional Eurocentric frameworks, fostering an environment of mutual learning, respect, and collaboration.

Our session will delve into how these immersive experiences challenge and reshape our understanding of place, space, and environment, highlighting the significance of Indigenous knowledges and methodologies in constructing a more equitable and inclusive geography. Presentations will cover a range of topics, including the practicalities of establishing field schools, the ethics of engagement and reciprocity, and the transformational impacts on students, faculty, and Indigenous communities alike. By examining these collaborative endeavors, we aim to demonstrate how geography, through its unique insights into place-based challenges and solutions, can contribute to the broader decolonization movement.

In doing so, we argue that the relevance of geography today lies in its ability to critically address its colonial legacy and to forge new pathways of understanding and action that respect the sovereignty, knowledge, and rights of Indigenous peoples. Through this session, we invite participants to consider how geography can be reimagined as a powerful tool for decolonization, capable of recognizing and addressing challenges unseen by others, and providing solutions that are mindful of the diversity and specificity of places. Join us in exploring how the decolonial potential of field schools with Indigenous Nations can redefine the relevance of geography and empower us to create a more just and sustainable world.

Author: Catharine Hume

Keywords: Field Schools, Praxis, Decolonization, Community Engagement, Food Forests

Institution: University of Victoria

In July 2023, I attended the Onyota'a:ká Field School in Southern Ontario, offered through the Department of Geography at the University of Victoria in collaboration with the Oneida Nation of the Thames. My written deliverable was a collaborative food forest plan established within a two-eyed seeing framework incorporating Haudenosaunee worldviews and Western methods as one strategy to support Indigenous food sovereignty. The plan was informed and inspired by the various perspectives, insights, and goals of Onyota'a:ká community members. Geography, inherently involved in the interconnectedness of place, people and the environment, is well-positioned to support place-based food sovereignty initiatives. However, the discipline is also complicit in the dispossession of land from Indigenous peoples as well as colonial structures more broadly. Founded on my personal experiences and reflections of creating the food forest plan and participating in the field school, I explore the limitations and opportunities of geographically grounded field schools with Indigenous nations as decolonial praxis. Regardless of meaningful collaboration and engagement to prepare and carry out field schools, they remain situated within a limited Eurocentric and institutional framework that prioritizes deliverables that can be easily assessed and submitted in a short time frame. Other considerations include the responsibilities and accountability of students when participating in field schools, reciprocity and continued relationships with nations, acceptable timelines, and distance—both geographically and socially. All geographers must continuously analyze the methodologies and pedagogies they use to engage with society to stay relevant. As academics affiliated with geography and colonial institutions, it is crucial to critique current forms of community engagement with Indigenous nations to explore the potential and suitability of these opportunities in decolonizing the discipline and academia overall.

Opportunities & Limitations of Field Schools as Decolonial Praxis & Curriculum Panel

Discussion

Kalea Richardson

University of Victoria

Abstract

Geography as a discipline is currently experiencing a metamorphosis; trying to reconcile its colonial past and work towards a decolonized curricula. The discipline's main site of reconciliation must be with Indigenous peoples. Colonial geographic narratives of *terra nullius* are responsible for the historic and continued displacement, colonization and violence perpetrated against Indigenous communities. Through these narratives, historically extractive research and other colonial endeavors, geography has entrenched its ties to colonial systems. Today the discipline seeks new avenues to build and repair these relationships through the decolonization however, this concept holds different meanings and responsibilities to different stakeholders. A challenge here becomes apparent in implementation as questions arise of how an institution built on colonial practices can effectively employ and maintain true decolonial frameworks. Our session will discuss the opportunities and limitations of field schools with Indigenous nations as a means of decolonizing geography.

Based on our work within the 2023 Onyote'a:ka Indigenous Conservation and Stewardship field school we seek to explore our experiences working in community and within a Two-Eyed Seeing (TES) approach, coming from a colonial educational institution. While there is immense potential in these types of field schools, questions of how to effectively employ a TES framework, reciprocity with the nation and maintain a continuing relationship with the community arise. These are considered some of the tenets of decolonization thus their fulfillment is essential to claim these field schools as decolonial praxis and curriculum. Failure to meet these results in a more extractive approach characteristic of the last centuries of engagement with Indigenous peoples. Our panel will reflect on our experience with these concepts working with the Oneida Nation of the Thames and how our experiences can help shape the future of geography.

Keywords: Decolonization, Field Schools, Two-Eyed Seeing

Opportunities and Limitations of Field Schools as Decolonial Praxis and Curriculum: Combatting Extractive Research Practices

Laura Greene (University of Victoria)

Engaging in field schools with Indigenous nations creates opportunities for learning that extend beyond a colonial, Eurocentric pedagogy. However, a limitation of the typical field school model is the duration of engagement. It can feel extractive to engage with an Indigenous nation for a short field school if there is no follow up or continued collaboration. The lack of follow up is reminiscent of Geography's colonial history wherein research practices only benefitted the Geographer. I am interested in exploring ways to ensure field schools are beneficial to all parties. Primarily focusing on continued engagement beyond the duration of the field school to make them less extractive. For example, we created management plans in collaboration with the Oneida Nation of the Thames (Onyota'á:ka). How can we continue this work while combating traditional colonial practices that prioritize academic institutions and instead focus on a more reciprocal framework that supports decolonization? This is relevant to the growth of Geography as we strive to move away from colonial practices.

Key Words: Field Schools, Decolonization.

Session: *Opportunities and limitations of field schools as decolonial praxis and curriculum***Key-words:** Education, Decolonization, Community-Based Monitoring, Environmental Risk**Community Relevance and Pollution Monitoring as Sovereignty**

Riley Watts

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Students often describe community-engaged field schools as transformative experiences. They are relevant not only to the rest of our education but also to our future careers and lifepaths. As participants in a field school focused on working in reciprocity and contributing to Onyota'a:ká sovereignty, a key question is how we can remain as relevant to the community as they are to us. My approach to this question starts with my project on community-based monitoring as an act of rematriation and an expression of sovereignty in response to the colonial violence of pollution and the impact of unknown risks on well-being. As a project that evolved from a pivot in focus due to environmental conditions and direction from community members, this experience serves as a query into the limitations of traditional field school structures on transformative and decolonial processes. Its research provokes questions about the relevance of geography in the context of spatial knowledge, measurement, and action as (de)colonial politics. It is also worth noting that pathways for community-based monitoring and risk management are relevant not only to Indigenous nations. They are part of the global challenges of misinformation and changing environments.

**Of assemblage and agency:
Understanding digital sustainability transition in China through sociospatialities**

Jingya Dai

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Abstract In conjunction with “ecological civilization” endeavors afoot, a digital sustainability system is emerging in China to contribute to state environmental regulation. Despite the augmenting importance of digital sustainability in the context of China and the growing attention to environmentally focused digital geographies research in recent years, digital geographical studies has yet to adequately theorize the spatialities of digital sustainability and how state actors mobilize sociospatial relations to facilitate digital sustainability transition. To address this gap, this paper stages a conversation between assemblage thinking and territory-place-scale-network (TPSN) framework and argues for conceptualizing China’s smart environmental governance as a power-laden process of sociospatial organization. It reveals how “big data” is mobilized as a malleable and seductive agent enabling state actors to frame economy and environment as mutually beneficial. In doing so, this paper illustrates the multidimensional and relational spatialities of China’s smart-sustainability trajectory on the one hand, and contributes to discussions on (environmental) subjectivities and agencies that the TPSN framework has underemphasized, on the other.

Keywords digital sustainability, assemblage, state rescaling, China, TPSN approach

Statement of why this work is relevant This work is relevant in its combination of assemblage thinking and TPSN framework to understand the relational constitution of sociospatial categories. In doing so, this paper hopefully illustrates how the interventionist role of the state inflects the digital sustainability assemblage through reorganizing four dimensions of sociospatial relations – territory, place, scale, and networks.

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Title: Depicting earthquake data using standard deviation ellipses in a Geographic Information System (GIS)

Abstract:

As a seismically active zone in the "Pacific Ring of Fire", British Columbia (BC) experiences earthquakes daily, both felt and recorded. On average, about 3,000 earthquakes are reported yearly in BC with structurally damaging ones occurring once a decade. The west coast, and particularly Southwestern BC, is susceptible to earthquakes with the added danger of tsunamis triggered by them. Hence, it is vital that residents of BC understand and prepare for the potential devastation they pose.

Current methods of depicting earthquake data focus on their point location, time, strength and duration to produce chronological tables of records. Using them, visualizations and animations to show the sequential earthquake events have become the standard way to present such data. While they depict where and when earthquakes occurred, data users are limited statistically to zero dimension (points) when analyzing the data to understand the spread and variability of such events.

The standard deviational ellipse of point datasets depicts the "center, distribution and orientation of a set of features". It depicts the trends of points in space and, in this research, the spread of the individual earthquakes is defined by the axes of an ellipse both in the x- and y-directions, and aligned to the orientation of the events. Using time series of these standard deviational ellipses, this research aims to extend the visualization of earthquake data into two dimensions to provide insights into their distribution for better monitoring, analysis and information dissemination.

Keywords: Earthquakes, Standard Deviational Ellipse, Geographic Information Systems (GIS)

Low-Cost Remote Data Loggers with Arduino

Abstract

Various environmental data are often collected in remote locations, particularly across British Columbia with its wealth of geographic phenomena. However, a considerable proportion of these locations are difficult and costly to access, limiting real-time data production across the province. Commercial units are available to transmit real-time data, but they are expensive and difficult to customize. In a fast-paced world with heavy reliability on immense amounts of data to develop models, make decisions, and support artificial intelligence, cheap access to real-time data is becoming ever more important. I will present a do-it-yourself data logger developed for the Ministry of Forests through partnerships with UNBC, several First Nations groups, companies, and other branches of BC government. The loggers are built with an Arduino, a low-cost open-source microcontroller, at the centre. Currently, they support a variety of sensors for hydrometric monitoring, regularly sampling and transmitting measurements to a web-based database through a satellite network. The Arduino units can be custom-built at a fraction of the cost of comparable commercially available devices and provide near-real-time data from remote locations. The approach is not sensor-specific; it can be modified to support a wide variety of sensors and applications. Twelve stations are deployed and actively transmitting data. Ongoing work on the loggers aims to decrease power consumption and document the system with the goal of allowing other researchers to build their own DIY remote loggers. Increasing accessibility of remote data will have applications across academia, government, and industry to improve our understanding of our diverse landscape and changing climate. I will provide a compelling argument for accessible custom remote loggers to reliably acquire data for your research or business.

Author: Rachel Pagdin

Institution: University of Northern British Columbia, BC Ministry of Forests

Keywords: real-time data, remote data, Arduino, do-it-yourself, sensors, data accessibility, data acquisition

Investigating the use of statistical and hybrid models to simulate freshwater temperatures in northern British Columbia, Canada

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Abstract

This study investigates the applications of statistical and hybrid models to simulate changes in water temperatures. We developed Artificial Neural Network (ANN) and Multiple Linear Regression (MLR) statistical models for the two freshwater systems, the Atlin Lake and Parsnip River, in northern British Columbia. In addition, we also implemented Air2Water and Air2Stream water temperature models on Atlin Lake and Parsnip River, respectively, to compare the simulations and quantify changes in water temperature temporal variability. Our modeling framework utilized several hydrometeorological variables such as air and water temperature, precipitation, streamflow, wind speed, and relative humidity on daily time scales from 2000 to 2022 time period.

The results show that the ANN model outperformed the MLR model during the warm season (May to September), with R^2 values of 91% for the Parsnip River and 70% for the Atlin Lake. While comparing these models with hybrid models, the Air2Stream and Air2Water produced more realistic outcomes, showing an R^2 value of 97% for the Parsnip River and 91% for the Atlin Lake. Such comparisons highlighted the efficiency of hybrid models, slightly surpassing traditional statistical models while requiring fewer inputs, confirming them as efficient tools for enhanced environmental modeling.

Key words: Freshwater, statistical models, hybrid models, water temperature, lake and river.

REASONING SPATIAL REASONING

The Role of Mathematics in
Advancing Methods in Remote Sensing

Ryan Walsh
University of Lethbridge

Abstract

Mathematics is the Rosetta Stone of spatial reasoning and, as such, serves as an instrumental tool to unravel complex aspects of the Earth and our perception of it. In this paper, we explore the pivotal role that mathematical reasoning plays in solving remote sensing (RS) problems. Advancements in RS can be attributed to fundamental techniques in linear algebra, calculus, statistics, et cetera; their applications to solving problems in image processing and interpretation. Linear algebra, for instance, is used to manipulate imagery through rotations, scaling, and transformation. Calculus shows up in the theory behind energy interactions and signal processing. Additionally, probability and statistics are used in image classification and segmentation, as well as land use and land cover applications such as geostatistics and change detection. Likewise, these areas lay crucial theoretical foundations in the ways we approach data, and a well-informed understanding of these mathematical frameworks enables methodological analysis of RS data, making complex problems surmountable. Through the examination of current methods in image processing, spatiotemporal analysis, energy interactions & signal processing, spatial interpolation, and quantifying physical phenomena, we find that mathematical interpretations constitute significant underpinnings in the research and applications of RS. Moreover, we can see how applying mathematical strategies supports the evolution of RS, and surmise that progression in one coincides with the other.

Posters Sessions I and II

(listed in alphabetical order by first author)

Atrium E building



Recent Retreat of the Samuel Glacier, Tatshenshini-Alsek Provincial Park, British Columbia

Cambria Alford & Crystal Huscroft

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Many studies document the rapid recession of glaciers around the world due to climate change. The Samuel Glacier located in Tatshenshini-Alsek Provincial Park, northwestern British Columbia. Despite being well visited by hikers, this glacier remains unstudied. Using Sentinel-2 multispectral imagery as well as Google Earth and Earth Engine timelapse imagery, changes in the accumulation zone as well as the length of the toe of the Samuel Glacier were analyzed. The position of Little Ice Age (LIA) moraines indicate that the glacier has receded a minimum of 2060 m since the maximum of the LIA which remains undated in this part of the Canadian Cordillera. Comparison of Google Earth Engine Timelapse imagery demonstrated that between 2003 and 2019 the glacier had receded on average 46 m/yr (3.3% annually). Comparison of Sentinel-2 images indicate that the glacier lost about 20% of its area between 2017 and 2023. Inspection of multispectral imagery at the end of the mass balance year indicates that the retreat of the Samuel Glacier is and expected to continue.

Title: Satellite-based estimates of boreal forest carbon flux changes

Authors: Saba Asadolah and Peter L. Jackson

University of Northern British Columbia Faculty of Environment, Natural Resources and Environmental Studies

Abstract: This research seeks a better understanding of carbon fluxes in the Canadian boreal forest in recent years, notably influenced by the significant impacts of climate change and the recent wildfire occurrences. These forests are crucial in the global carbon cycle, serving as major carbon sinks through the absorption of carbon dioxide from the atmosphere. However, this balance between carbon absorption and release is delicate, susceptible to disruption by climate change phenomena, leading to increased temperatures, altered precipitation patterns, and the rise in frequency and severity of wildfires. Such environmental shifts directly affect the carbon balance of boreal forests, with wildfires releasing vast amounts of stored carbon back into the atmosphere and modifying the landscape, thus impacting its future carbon storage capabilities.

Integrating top-down satellite observations with bottom-up field measurements, this research aims to provide an extensive quantification and modeling of CO₂ fluxes, thereby enhancing our understanding of the mechanisms behind carbon sequestration. The primary objectives are to identify the leading drivers behind the variability of CO₂ exchange, to assess the impact of wildfires on the forest's carbon balances, and to evaluate the implications of post-fire forest recovery on carbon sequestration abilities. Methodologically, the study employs a comprehensive array of satellite data combined with in-situ measurements of FluxNet to ensure accurate validation.

An inverse modeling approach using the Global Earth-system Monitoring model (GEOS-Chem) supports the interpretation of collected data, facilitating the identification of CO₂ flux patterns in conjunction with vegetation dynamics and prevailing climate conditions.

Furthermore, this study leverages satellite imagery to meticulously analyze changes in land cover, disturbances from fires, and the regeneration processes following fires. The integrated approach of combining top-down and bottom-up methodologies aims to address the extent, frequency, and intensity of wildfires and their subsequent effects on the forest's carbon balance, with a particular focus on post-fire scenarios and the recovery period, which are critical for understanding future carbon sequestration potential. Through this comprehensive analysis, the research intends to offer new insights into the adaptive strategies required for managing boreal forests under the evolving climate paradigm, contributing significantly to the broader field of carbon cycle science and environmental management.

Keywords: Canadian boreal forest, carbon fluxes, climate change, wildfires, CO₂ sequestration.

Title: Partnership protecting the Salish Sea

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Body: The research paper/poster analyzes the literature published by academic sources regarding the legislation and measures taken by BC and Washington State. Besides legal legislative bodies, efforts made by environmental activists and the indigenous populations protecting the Salish Sea that have a long-established stake in the Georgia Strait and the Salish Sea that continues south are also looked into. The protection will be of the salmon, orcas and sealife that can be found across the 49th parallel. There's a history of treaties written between the state and the province involved, along with agreements reached between the federal governments involved along the Salish Sea. BC has been actively negating indigenous Salish Sea stakeholders' actions taken to be involved protecting their traditional area. The paper touches on if Washington State or federal American government has allowed native tribe involvement in Salish Sea protection. The focus is the research isn't to decry provincial or state governments failing to give the eponymous natives the means with which to keep the Salish Sea healthy. The project looks beyond legislation written to achieve these ends. The paper includes clean-up efforts made by all parties involved. Historical precedents established are in the analysis so the readers/viewers can see laws followed. There will be comparison to alike instances of cross-border mutual agreements such as the Great Lakes so readers will have protection efforts to compare to how effectively the Salish Sea is protected. Mutual protection agreements across the 49th have worked. This study illustrates how including the indigenous in planning cooperatively to protect the Salish sea is beneficial and should be cross-border.

Keywords: Salish sea, BC, Washington, salmon, pollution, fishing, treaty, mutual agreements, cooperation beyond the 49th parallel.

Skye Bandura Griffore, supervised by Crystal Huscroft

Thompson Rivers University

Key Words: Indigenous fire management, British Columbia, hydrosphere, biosphere, lithosphere, atmosphere

Abstract

Wildfires have become increasingly hazardous over the past few years across British Columbia. However, evidence exists that there are Indigenous fire management practices that can assist in various ways of managing fire on the landscape. Here I address how these practices impact the 4 spheres of Earth's system: biosphere, hydrosphere, lithosphere/geosphere, and atmosphere, the systems that supply us the food we eat, water we drink, land we occupy, and air we breathe. The results demonstrate that Indigenous fire management practices have impacts that reverberate throughout all spheres of Earth's system, resulting in the relative reduction of carbon emissions. I hope these findings will lead to more involvement of Indigenous stewardship within land and fire management, progressing British Columbia towards a more sustainable and reconciled future.

Relevance Statement

British Columbia has suffered greatly in recent years, with harmful air quality, loss of entire towns, burning of our forests, and much more due to the increasingly severe fire seasons. Finding ways to manage these kinds of natural hazards to protect our unique built and natural environment is of the utmost relevance, and there are local Indigenous fire management practices that can reduce fire severity. This research highlights the impacts that incorporating Indigenous management practices could have on each sphere of the earth's system.

Interpreting Turbidity Variations: Concentrations and Impacts of Suspended Particulates in the Lower Fraser River

Matthew Bergen, University of the Fraser Valley

Abstract:

The nearly 1400-kilometre-long Fraser River is perhaps the most important hydrological fluvial system in British Columbia. It is a major influencer of both human and natural environments in proximal regions. The high competency of the water allows the system to transport 17×10^6 tons of sedimentary material into the Strait of Georgia annually. The amalgamation of a suspended sedimentary load's components (silts, clays, organic material, anthropogenic particulates, etc.) subsidizes the Lower Fraser River's turbidity, an optical and primary property in active fluvial systems. Turbidity acts to not only impact visible water clarity in a system; it also carries potential to influence a river's overall geochemistry, geomorphological potential, biohealth, and general relevancy to local populations in either a positive or negative measure. Through consistent and set-frequency monitoring of the Lower Fraser River's turbidity over a semi-long temporal span at a centrally located site relative to the Fraser Lowland, contrasting variations in turbidity are observed to be widely distributed. This variation subsequently alters the potential for turbidity to impact the physical, biological, and human environment nearest to the system.

Analysis of Stoney Creek, Abbotsford, British Columbia: Seasonal Changes in Water Quality Throughout 2015-2023

Tristan Burtnick¹; Steven Marsh¹; Mariano Mapili¹; Bernhard Peucker-Ehrenbrink²; Sharon Gillies¹; Matthew Bergen¹; Robert Trustham¹, Clay Falk¹; Raphael Medina¹

¹University of the Fraser Valley; ²Woods Hole Oceanographic Institution

Abstract:

Stoney Creek is a tributary of the Fraser River. Stoney Creek runs from its origin point at Sumas Mountain, through residential Abbotsford, and the Matsqui Prairie, ending at the Fraser River. The total flow of Stoney Creek is 6.5 km. Stoney Creek is an important creek to the community and the local ecosystem. The creek is a common walking trail for residents and is a vital salmon spawning ground. Therefore, it is important to study the water chemistry and the seasonal variability of the creek to ensure the safety of residents and to make sure that the local ecosystem is healthy. Water quality data has been collected and studied for over 9 years. The data was collected with a YSI Pro Plus Multiparameter probe, a YSI Pro ODO probe, and a Lamotte 2020we Turbidimeter by different teams of students and volunteers over the 9-year period. The creek should continue to be monitored to aid in keeping the ecosystem safe and the creek clean.

Keywords: Stoney Creek, Seasonal Variability, Water Quality

Re-envisioning Fishtrap Creek Park with a focus on accessible tourism

Amy Campbell, Katrina Simon, Grace McDonald, Jessica Sparkes and Janie Zhang
University of the Fraser Valley

Fishtrap Creek Park is a beautiful park that has much potential as a tourism destination for those visiting Abbotsford, BC. However some of this potential remains untapped due to accessibility challenges. Our poster illuminates how Fishtrap Creek Park can be reimagined with a focal point on accessible tourism.

In tourism accessibility isn't just about physical accommodations, it is about fostering an environment where everyone can engage with and enjoy all that the park has to offer. When re-envisioning this park we also thought it was important to speak on inclusivity because a park can not be truly accessible to everyone without taking into account inclusivity. One of the key features we wanted to showcase was the Indigenous land that this park is located on. By prioritizing accessibility and inclusivity we unlock endless possibilities for opportunities for individuals with disabilities, seniors, families with children and other demographics to enjoy this space.

The relevance of this re-envisioning aligns with global efforts towards accessible, sustainable tourism, ensuring that the benefits from tourism are distributed equitably amount the community and minimizing any negative environmental impacts.

In conclusion,

Re-envisioning Fishtrap Creek Park through an accessible tourism lens is a fundamental step towards creating a more inclusive and sustainable society, our poster advocates for this vision.

Keywords: Accessible Tourism, inclusivity, sustainability, Indigenous acknowledgement, diversity

Environmental governance of Uranium Mining in the Athabasca Basin of Northern Saskatchewan

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Canada is the world's second largest producer of Uranium, responsible for about 20% of the production worldwide. Most of this Uranium mining takes place in the Athabasca Basin and surrounding areas in Northern Saskatchewan. With such large scale production of Uranium comes issues surrounding both environmental damage, and governance strategies for managing this vital resource. Through literature search, this study will assess the relationships between the public and private sectors as they relate to Uranium mining in North Saskatchewan, and the role Traditional Knowledge has played in the governance of these mines by First Nations. This study will assess how each governance strategy has affected the ecological impact of these mines throughout the 20th and 21st centuries, and how the principles of Traditional Knowledge can be applied to future mining operations.

Keywords: Uranium mining, Tradition Knowledge, Athabasca Basin

The Race Against Climate Change and the Billy Whiskers Glacier, Columbia Mountains, British Columbia

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With increasing temperatures, the probability of survival of glaciers in the British Columbia interior is questionable. This study examines past retreat of Billy Whiskers Glacier, located in the Selkirk Mountains of British Columbia, and assesses the likelihood of its survival in current climate conditions based on analysis of satellite imagery. An examination of moraines from the Little Ice Age in high-resolution satellite imagery shows evidence of 2960 m of retreat. A comparison of Google Earth Timelapse images of the glacial toe in 1984 and 2022, reveals the glacier to be retreating at the average rate of roughly 13 meters a year. Multispectral Sentinel-2 satellite imaging, indicates an accumulation area ratio during the 2022-23 mass balance year above 0.30, yet also shows accumulation area thinning and large amounts of newly exposed rock surfacing within the accumulation zone, and a moderate to low likelihood of survival of the glacier. The mixed results of this analysis make the future of this glacier uncertain.

Keywords: Glacier, recession, mass balance, remote sensing

The Retreat of Bugaboo Glacier, British Columbia, Canada
Amber Delage & Crystal Huscroft
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Bugaboo Glacier in southeastern British Columbia is analyzed to assess its retreat rate and likelihood of survival in the current climate. The magnitude of retreat since the Little Ice Age (approximately 1850) and changes from 1985 to 2022 were identified using satellite imagery available on Google Earth and Google Earth Engine respectively. The accumulation area ratio (AAR) for the 2022-2023 mass balance year was assessed using Sentinel-2 multispectral imagery. Results of our analyses include an estimated 10 m/yr retreat rate since the maximum of the Little Ice Age, an accelerated 31 m/yr recession rate from 1985-2022, and an AAR of 0.45. We assess a low likelihood of survival of this glacier due to its AAR below 0.5 and the discontinuous nature of the accumulation zone in recent Sentinel-2 multispectral satellite images. Considering these results, Bugaboo Glacier faces a high likelihood of frequent negative annual mass balance values. Extrapolation of its current retreat rate indicates the high potential to completely vanish within the next century. Continued global warming may accelerate this process, posing a significant threat to the glacier's survival.

Keywords: glacier, global warming, recession, remote-sensing

Kalum V. Delaney

University of Victoria, Department of Geography

Sea Ice
Climate Change
Canadian Arctic Archipelago
Surface reflectance
Microwave Remote Sensing
Climate Modelling

The decline in Arctic sea ice extent, age, and thickness over the past four decades, as seen in the satellite records, has been attributed to prolonged melt seasons and a shift towards a predominantly first-year (FY) sea ice coverage. FY ice, being smoother than multi-year (MY) ice, facilitates extensive surface meltwater coverage during the melt season, reducing surface reflectance due to the lower albedo of water compared to ice. These changes to the surface reflectance alter the surface energy budget, ocean-atmosphere heat exchange, and contribute to the ice loss observed over the Arctic. With climate forcing altering the timing and intensity of melt related processes, the importance of accurate parameter retrieval for the prediction of ocean, ice and atmospheric processes is becoming increasingly important for operational shipping, climate change modelling and policy implementation over the Arctic. This includes the need to map the spatio-temporal variations in melt water coverage (termed melt pond fraction), by estimating the melt pond fractional coverage relative to the bare sea ice surface.

This project is aimed at developing a methodology to use high resolution synthetic aperture radar (SAR) satellite imagery to quantify sea ice melt pond fraction during the summer melt season. SAR, which operates in the microwave frequency, provides a significant advantage over satellite optical data since cloud cover is transparent in the microwave region of the electromagnetic spectrum. Routine SAR-based mapping of melt pond fraction will benefit the climate modelling and sea ice forecasting communities, the latter who are responsible for providing routine regional ice property and weather forecast information in support of operational activities in the north.

The Rapid Retreat of the Braithwaite Glacier, Columbia Mountains, British Columbia

Kierstin Earle & Crystal Huscroft

Thompson Rivers University

Keywords: Glacier, Global Warming, Recession, Remote Sensing.

Statement of Relevance: This work focuses on a glacial ecosystem that is in danger. Furthermore, the Braithwaite Glacier is one located within British Columbia, and directly impacts people all over the province such as it feeds into multiple different major river systems. With this glacier retreating as rapidly as it is, it puts the future climate of British Columbia in crisis.

Abstract: The Braithwaite Glacier, located within the Columbia Mountains, is one of many glaciers in Western Canada that has been negatively affected by climate change. This mountainous glacier is located within Wells Gray Provincial Park and is a vital source of water for Hobson Lake and the Clearwater River, which drains into the North Thompson River, Thompson River, and Fraser River. However, the retreat of the Braithwaite Glacier has been undocumented. Analysis of recent multi-spectral imaging reveals that the Braithwaite Glacier is receding at about 17 m/yr. between 1984 and 2022. Furthermore, this glacier's accumulation area ratio (AAR) during the 2022-2023 mass balance year was 0.1, well below the reported ratio of 0.3 necessary for stabilisation. Therefore, this glacier's likelihood of survival is low. With this research, along with recent evidence that temperatures in British Columbia are rising, it is necessary to take action to help preserve glaciers, such as the Braithwaite Glacier.

Title: Using Electrical Conductivity, Water Level and Meteorological Data to study Commercial Logging Impacts on Karst Water Quality in the Wolf Creek Catchment, Southern Vancouver Island

Author & Institution: Jaymie Carol Fletcher, University of Victoria

Abstract: Interdisciplinary water quality monitoring approaches offer a desirable framework to study the complex three-dimensional properties of coastal karst. Degradation of karst landscapes is predominantly driven by commercial logging in Western Canada, where the removal of forest canopy and other human-led disturbances to forest ecosystems are linked to impacts on hydrologic processes such as evapotranspiration and groundwater recharge. Slow-showing in nature and often-cumulative, commercial logging impacts continue to threaten significant karst features on Southern Vancouver Island. Largely understudied and minimally legislated are water quality impacts and subterranean connectivity of autogenic (karst) and allogenic (non-karst) topographies. In this research, preliminary studies on karst water quality impacts in the Wolf Creek catchment, located within the Gordon River watershed on the unceded territories of the Pacheedaht and Ditidaht First Nations, aim to inform future revisions to the Karst Management Handbook policies surrounding the practice of logging on and adjacent-to Vancouver Island karst landscapes. This eight month study examines the hydrological response of physiochemical parameters, such as water temperature ($^{\circ}\text{C}$), and electrical conductivity ($\mu\text{s}/\text{cm}$) in relation to precipitation (inputs) and water level (outputs). Hourly measurements from OnSet HOB0 U20L Water Level and U24 Electrical Conductivity data loggers at two key locations within the karst unit were processed using Pandas and Matplotlib in Python programming language. Through case studies of conductivity fluxes in relation to local meteorological data, this study aims to characterize the karst aquifer's response to varying hydrological and atmospheric conditions and will provide baseline information for a five-year UVic Geography water quality monitoring program.

Keywords: karst, forest management, Vancouver Island, hydrology, logging impacts

Relevance Statement: In wake of the many simultaneous challenges facing forest ecosystems due to climate change and resource extraction, sustainable karst management requires strict best-practice management schemes to ensure water quality and quantity. Largely understudied in Western Canada, karst deterioration is predominantly a result of commercial logging impacts which have frightening implications for soil degradation, increased wildfire risk and the hindering of cultural, recreational, and educational values.

Presentation type: poster

Lead author is an undergraduate student for which, please consider for a student award.

The Correlation Between Resource Extraction and Endangered Species in BC.

Mackenzie Frater, Okanagan College, Kelowna, BC

In British Columbia, numerous mines contribute to waterway contamination, releasing heavy metals and toxic wastes, posing a significant environmental threat to local ecology. This study investigates the impact of such pollution by mapping mine locations, tracing downstream pathways, and overlaying them with documented sites of Red-Listed endangered species, denoting those at high risk of extinction. The research aims to visually convey the potential and ongoing consequences of mining activities on the surrounding ecology. Additionally, by acknowledging logging as a primary contributor to species endangerment through habitat loss, a parallel approach is employed. Recent and future cut-blocks are mapped alongside known Red-Listed species locations to uncover potential correlations, enhancing our understanding of the intricate relationship between logging activities and the well-being of endangered species.

ArcGIS Online was employed to perform the necessary analysis and produce the desired output. The public data sourced from the Conservation Data Center of British Columbia website, outlining red-listed species, lacked the essential spatial coordinates associated with their locations. To address this gap, Google Earth was employed to mark the precise geographical coordinates of various species, subsequently transferring the points into a CSV file created using Microsoft Excel. It was then uploaded into ArcGIS Online, where the locational data was integrated and visually presented for comprehensive analysis.

The findings revealed clustering of red-listed endangered species around mines in British Columbia. This observation prompts a call for deeper investigation into discerning causation versus correlation, urging a more comprehensive understanding of the intricate relationships between mining activities and endangered species habitats. The outcomes also reveal the disconcerting overlap between endangered species habitats and regions subjected to timber harvesting, both historically and in projected future activities. This alarming intersection poses an increased threat to species already in critical jeopardy, emphasizing the urgent need for conservation efforts and thoughtful management strategies to safeguard these vulnerable ecosystems and their inhabitants.

An Exploration and Analysis of Survival for Crowfoot Glacier

Kirsten Fryklind & Crystal Huscroft

Thompson Rivers University

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Abstract

Amidst global climate change, worldwide glacier loss is a prominent concern. This study focuses on the annual rate of retreat of Crowfoot Glacier, and ultimately, its likelihood of survival over the decades to come. Crowfoot Glacier is a member of the constellation of alpine glaciers that feed the Bow River; a river system which supplies water to millions of Canadians between the Rocky Mountains and Hudson's Bay. Observation of terminal moraine position identified in high resolution satellite imagery assisted in determining net glacial retreat since the Little Ice Age. Comparison of satellite imagery from a 36 year timespan facilitated the calculation of average glacier toe retreat over a more recent time interval. To determine if the past pattern of retreat will threaten the survival of Crowfoot Glacier, Sentinel II multi-spectral imagery satellite was used to estimate an accumulation area ratio of approximately 0.23 for the summer of 2023. This is well below the established minimum annual accumulation area ratio of at least 0.3 required for survival of the ice mass. Accumulation zone depletion is further evident through comparing satellite imagery of the glacier in 1986 and 2022; the latter year showing increased exposure of rock outcrops at the toe, along the accumulation zone ridgeline, and the noticeable retreat of side margins. Average annual retreat since the maximum of the Little Ice Age was measured at approximately 7m/year, whereas the average rate of retreat between 1986 & 2022 was 13m/year. At this most recent accelerated rate, the glacier will disappear in approximately 130 years. These results suggest that Crowfoot Glacier is not maintaining a positive mass balance, and will dissipate completely if the current climate remains the same, or continues to warm as forecasted. Its projected disappearance illustrates a distressing impact of the climate crisis, and sheds light on what is probable for other glaciers in the same area, and beyond.

The Survival of Rumbling Glacier, an Alpine Glacier in the Southern Coastal Mountains

Emerson Goodall and Crystal Huscroft
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It is well established that in our world's warming climate a vast number of glaciers are retreating and disappearing. We determined the change in length and assessed the likelihood for the survival of Rumbling Glacier using satellite imagery between 1984 and 2023. Google Earth timelapse indicates that the glacier has retreated 469 m over a period of 38 years. In comparison, since the maximum of the Little Ice Age (approximately 1850 AD), the glacier has retreated 1.8 km. This glacier's likelihood of survival was assessed by estimating the Rumbling Glaciers accumulation area ratio (AAR) for the 2022-2023 mass balance year. Smaller glaciers, like the Rumbling Glacier (less than 4km²), must have an AAR >0.50. Surprisingly, analysis of Sentinel-2 multispectral images indicates a minimum AAR of 0.90 in 2023, indicating Rumbling Glacier's pattern of retreat would reverse and the glacier would grow if climate would stabilize, and meteorological conditions of the 2022-2023 mass balance were the norm. However, projections do not predict a stable climate in the near future. Therefore, to support coastal glacier survival in southern British Columbia, we need to reach net zero CO₂ emissions. Rumbling Glacier's 2022-23 pattern of accumulation provides a powerful example of what is at stake if global temperatures exceed 1.5° C above pre-industrial temperatures.

Statement of Relevance:

In order to help people understand why reducing CO₂ emissions is so important, it is essential to provide easy to understand, real world examples of the detrimental effects of that climate change has.

Keywords: Alpine Glacier, Climate Change, Remote Sensing, Stabilization

Title: **Transboundary Collaborations in Pacific Salmon Conservation**

Presenters: Kristi Hartt, Gintare Paskocimaite, Western Washington University

This research is an attempt to investigate the cooperative efforts between the United States and Canada in the conservation and management of Pacific salmon. The objective is to analyze the effectiveness of transboundary collaborations, legal frameworks, and management strategies in preserving salmon populations. Our study will focus on the geographic region encompassing the Pacific Northwest, particularly the transboundary locations of the Fraser and Yukon rivers of the United States and Canada where these international efforts are most concentrated. Methodologically, the project employs a comprehensive literature review, including policy analysis and evaluation of treaties such as the Pacific Salmon Treaty, as well as an examination of the roles of various organizations like the Pacific Salmon Commission and the North Pacific Anadromous Fish Commission. Additionally, the study will consider the impacts of initiatives like the Salish Sea Marine Survival Project and the contributions of non-profit organizations such as Long Live the Kings and the Pacific Salmon Foundation. Preliminary findings suggest that these collaborative efforts may have contributed to significant advancements in legal and regulatory measures, monitoring programs, and reporting protocols that are critical to salmon conservation. Our research anticipates demonstrating the importance of continued binational cooperation and the involvement of diverse stakeholders in ensuring the sustainability of salmon populations; this project aims to highlight the successes and challenges of transboundary collaborations in salmon conservation and to underscore the necessity of ongoing commitment to these efforts for the future health of Pacific salmon stocks.

Keywords: Pacific salmon, transboundary collaboration, conservation, management strategies, United States, Canada

Challenges of Cross-Border Cooperation: Mitigating Flooding of the Nooksack River

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Recorded major flooding events in the Nooksack River date back to the 19th century, and such events have been historically known to cause damage to towns in both the United States and Canada. Flooding of the river has happened repeatedly since then, and there has been little done by neither the American nor Canadian governments to address this issue. Currently, the Nooksack River is located entirely within Washington State in the Fraser Lowlands, but the most recent flood in 2021 threatened to change the flow of the river and drain into the Sumas River. This further reinforced the need to address the recurring floods. Because of the climate crisis, rivers such as the cross-border Sumas may be prone to flooding episodes at a greater frequency and intensity, and lead to a permanent change in the course of the Nooksack River. An overwhelming flood could cause the Nooksack to break its banks and flood into the Sumas River. If this happens, the pumps currently keeping Lake Sumas dry will fail, causing the flooding of the lake. This is a dire threat to surrounding agricultural land and infrastructure, such as the flooding of the Trans-Canadian Highway in 2021. Though a cross-border task force dedicated specifically to understanding the flooding of the Nooksack River watershed was formed over three decades ago, its activity has been inconsistent and ineffective. This issue requires greater cross-border co-operation between local, state/provincial, federal, and tribal governments to mitigate flooding in the Nooksack floodplain.

Keywords: Cross-Border, Climate Crisis, Watershed, Floodplain

Working Towards Improved Protection of Cave and Karst Environments, in British Columbia

Authors:

Sarah Jensen, Gillian Krezoski, Shannon Fargey

Abstract:

British Columbia contains thousands of known caves, with new discoveries each year. These subterranean environments hold unique archeological, biological, cultural, geological, hydrological, paleontological, and recreational value. Due to their delicate nature, locational data is often hidden in hopes of protecting these unique environments. Currently, much of the provincial knowledge is held by a few select community members, with no long-term database strategy. A new community-maintained database may prove beneficial, limiting potential loss of information and more importantly, help support provincial conservation efforts. Working with the British Columbia Speleological Federation, based on needs expressed by the members of the community, this project entails the creation of a new cave and karst database. Methods include anonymous surveys of cavers with various experience levels, observations, and review of existing database structures. Results show members of the caving community strongly desire certain aspects of information to be included over others: 88% of respondents indicated desire for the cave survey to be locationally linked, 83% indicated desire for a linked entrance picture, and 80% indicated desire for included information on the cave length and depth. The possible inclusion of other information within the database was desired by members of the caving community, but at much lower percentages. Results also revealed complexities found within the caving community regarding staggeringly different opinions on who should be able to access and update the database. Upon completion of the database, it will be gifted to the British Columbia Speleological Federation to utilize as a community maintained living database. Improved utility should encourage frequent information updates and therefore further karst related conservation efforts in terms of protecting caves and karst from industry operations.

Relevance Statement:

This work is relevant within the caving community in British Columbia and Canada as the first work of its kind. This investigation into what desires the caving community has for data will work to serve their best interests in the outcome of this project and to guide future considerations into the views the community has on data accessibility and uses.

Keywords:

Caves, Karst, Database, Conservation, Community-engaged Research

Dynamic land use modeling to simulate the hydrological response of forest cover changes in the upper McLeod River Basin, Alberta, Canada

Krishna Kafle, Siraj ul Islam, and Stephen Déry

Department of Geography, Earth and Environmental Sciences, Faculty of Environment, University of Northern British Columbia, Prince George, BC, Canada

Abstract

This study focuses on implementing the Variable Infiltration Capacity (VIC) hydrological model over the upper McLeod River Basin (MRB), Alberta, to simulate hydrological changes under variable forest cover. The primary goal is to model the varying intensity of the Mountain Pine Beetle (MPB) incursion on forest cover and estimate the corresponding change in the simulated snow depth, runoff, and streamflow. The modeling framework incorporates a dynamic land use approach by varying the MRB's forest cover in the model setup every five years during the 2000 to 2019 time period. This is achieved by generating multiple land use input files for the model simulation using spatial maps of aerial surveys conducted by the Alberta government over western Alberta.

Results show an increase in the MRB's streamflow when 90% forest loss is fed into the model simulations compared to the baseline simulation with 0% Forest loss. The streamflow increased mainly due to reduced precipitation interception, infiltration, and evapotranspiration. Furthermore, the MPB-induced hydrological changes show significant variations in the magnitude and timing due to year-to-year climate variability. Overall, this study provides new knowledge and understanding of MPB impacts on hydrology that can support operational decisions in water management under the continued expansion of MPB.

Vegetative Requirements for Great Basin Spadefoot (*Spea intermontana*) Tadpole Habitat: Insights for Ephemeral Pond Vegetation Management

2023 UREAP Research Abstract

Danielle Lafleur, T00668045

Supervised by Dr. Lyn Baldwin, Faculty of Biological Sciences

Image 1, Photo of one of the, approximately ten, *Spea intermontana* tadpoles located in the Lac du Bois ORV region in Kamloops BC, May 2023.



ABSTRACT

My research characterized the groundwater hydrology and vegetation composition surrounding an ephemeral pond inhabited by a small population of Great Basin spadefoot tadpoles (*Spea intermontana*) in May 2023, located within the Off-Road Vehicle (ORV) area located on the Lac du Bois Grasslands, north of Kamloops BC. In addition, I also examined the plant community in two nearby ponds to better understand the relationship between vegetation composition, water availability, and level of disturbance. The findings showed that the spadefoot pond had the highest species richness and the fewest number of introduced species compared to the other sites. The presence of keystone wetland species such as *Sporobolus hookerianus*, *Distichlis spicata*, and hydrophytes, such as *Schoenoplectus acutus* and *Eleocharis palustris*, may have contributed to the success of the spadefoot pond as well as the geographical protection of the pond that the drainage basin provides. This study also highlighted the importance of alkalinity in influencing plant species composition in wetlands. The findings of this study will contribute to the restoration of disturbed wetlands and provide insights for future habitat restoration efforts involving greenhouse-grown native species that were collected from these sites in fall of 2022. The results will assist in the ongoing restoration of disturbed wetlands and provide insights for future habitat restoration efforts involving native species.

SIGNIFICANCE

My research on the Great Basin Spadefoot (*Spea intermontana*) habitat in the Lac du Bois Grasslands represented an interdisciplinary approach to conservation biology and wetland ecology. It highlighted the complexity in studying grassland dynamics, vegetation, hydrology and amphibians for the purpose of restoring a decimated, historical Off Road Vehicle Site (ORV). My research is not limited to contributing to the preservation of a threatened species but demonstrated the potential to mitigate ecological damage through informed, active, and interdisciplinary conservation strategies. The study aimed to achieve an outline for constructing and replanting the specific requirements for an ephemeral pond with collected, greenhouse-grown native species, showcasing a proactive approach to reversing habitat degradation. Such research is vital in guiding the future role of scientific and cultural understanding in ecosystem restoration projects.

One-dimensional step-backwater modelling of the Late-Glacial, Lake Fraser outburst flood in British Columbia, Canada

Loeffler, Sean M. & Norris, Sophie L.

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Keywords: Fraser Valley, Glacial Lake Fraser, Cordilleran Ice Sheet, glacial lake outburst flood, paleohydrology

Glacial Lake Fraser was the largest of the meltwater lakes which formed in the imprint of the last Cordilleran Ice Sheet in what is now central British Columbia. The lake's catastrophic drainage released hundreds of km³ of freshwater into the Salish Sea, but little is known of this event. Here, the outburst flood's peak discharge in two reaches of the spillway is modelled using a one-dimensional step-backwater technique within HEC-GeoRAS and HEC-RAS. To account for Holocene-era channel incision, a paleochannel surface is linearly interpolated / extrapolated for two reaches using previously published estimations at several points within each reach. Flood-deposited gravel bars identify minimum water surface elevation during the flood. Peak discharge is constrained to an order of magnitude, providing a baseline for future independent modelling techniques that will further constrain characteristics of the Glacial Lake Fraser outburst flood.

An Economic Investigation in Cross Border Consumer Goods

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The Washington-British Columbia regions have connected economies and many similar goods sold on both sides of the Canada-U.S. border. Citizens rely on cross-border travel to participate in the purchasing of consumer goods at cheaper prices in the other country. This study demonstrates an understanding by consumers of the price differential of goods and services sold in both Canada and the U.S. and reveals how the money saved on goods offsets the cost of travel. Travel costs were calculated based on estimates of miles driven to access these different consumer products and the cost of driving, meaning they are specific to the study's region. This project reviews literature that discusses the existing cross-border trade relationship between Canada and the U.S.. Additionally, this project utilizes data collected from consumer reports, online pricing resources, and government databases. The goods and services selected for analysis were the cost of gasoline, dairy products, restaurants at different price ranges, and air travel. Certain goods and services have significant enough price differences to make cross-border travel price efficient and worth the travel costs. Comparatively, other goods and services investigated don't have this same price differential to make travel worth it. Overall, the findings from this study, based on literature and data analysis, suggest that cross-border commerce can benefit consumers on both sides of the border. However, consumers should be aware that some items are not discounted enough to make cross-border travel worthwhile.

Keywords: Cross-border Travel, Consumer Goods, Washington, British Columbia.

Title: BRINGING THE OUTSIDE IN- Designing relevant geography curriculum for engaged students

Author: Dr. Mariano Mapili

Institution: University of the Fraser Valley

Abstract:

The rapidly changing environmental, economic, social, and political realities outside the academe impose changes on the structure of the geography curriculum, how we teach geography, and how we engage our students. We know that these changes demand geography departments to evolve ever so rapidly to be relevant if it wants to ensure its survival in a university where competition of limited resources resemble that of a cutthroat industry. We report how the new Department of Planning, Geography, and Environmental Studies (PGES) at the University of the Fraser Valley (UFV) has embraced the interior design slogan of “bringing the outside in” to guide a proactive curriculum development that promotes student civic engagement and social responsibility as a strategy that helps us stay relevant inside, no matter what changes are happening outside, the university. We report the challenges and opportunities in designing geography curriculum in an evolving environment using three cases. The first case is the past participation of geography sections in a CityStudio project about Abbotsford Tourism, the current proposal for an Applied GIS Associate Certificate as the second case, and the case of campus-community engagement of geography students in future extreme heat events in their communities.

Keywords: geography curriculum, engaged students, CityStudio, GIS

Relevance Statement: The presentation will report on three strategies that will be useful in curriculum development that will make a geography program relevant to students.

The ascent of micromobility heralds the emergence of shared mobility systems as a burgeoning trend in urban transportation, offering compelling environmental advantages such as diminished CO2 emissions and a pathway to alleviate private car dependence while mitigating traffic congestion. This comprehensive study seeks to dissect the landscape of micromobility within the Canadian context, delving into existing systems and scrutinizing the pivotal role of public policy, available infrastructure, and user behavior in fostering the adoption of micromobility solutions across urban centers. By elucidating both the merits and challenges inherent in the uptake of micromobility, the study endeavors to furnish invaluable insights and recommendations, thereby crafting a robust framework for policymakers, urban planners, and local public transportation authorities to seamlessly integrate and operationalize micromobility alternatives in the municipalities, with a particular focus on British Columbia.

As we navigate the trajectory of transportation into the future, the significance of this endeavor resonates in its mission to furnish sustainable transport options for all community constituents, curtail carbon emissions, enhance air quality, and fortify urban mobility through the promotion of active transportation initiatives.

Authors: Rufaro Mundangepfupfu – 3rd Year Student Bachelor of Business Administration at Thompson Rivers University.

Dr. Afia Raja- Department Head, Planning, Geography & Environmental Sciences, University of the Fraser Valley

Zubair Raja – Assistant Professor, Thompsons Rivers University.

Keywords: Micromobility, Electric vehicle, E-bike, E-scooter, E-bicycle, Active transportation, Sustainable development, Sustainable transport

A Geomorphic Investigation of Active Faulting on Flores Island, British Columbia

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Few active crustal faults have been identified in British Columbia due to annually low slip-rates, dense forest cover, recent glacial erosion, and lack of high-resolution topographic data. However, newly available airborne Light Detection and Ranging (lidar) data has allowed for the discovery of a potentially Quaternary-active crustal fault scarp on Flores Island, BC. This study uses geomorphic mapping of Quaternary features coupled with analysis of vertical offset along the scarp to determine the approximate timing and magnitude of past slip. This rupture history is critical in understanding how the fault may re-activate and impact surrounding communities in the future. This work is relevant as the coastal location of this fault makes it at high risk of producing tsunamis with much reduced warning times than earthquakes on the well-known, offshore Cascadia megathrust fault, greatly impacting local communities.

Keywords: Flores Island, British Columbia, lidar, active tectonics, seismic hazard, tsunami risk, geomorphology.

Linnea Nelsen

Okanagan College

Student number 30016217

Objective: To examine why Southern Caribou are becoming extirpated by highlighting habitat, threats, and solutions.

Abstract:

The Southern Caribou group is a specific ecotype that range in western Canada from areas such as Mount Revelstoke, Jasper, Banff, and Glacier National Parks (Parks Canada, 2023). They were first seen in Ontario and Quebec about 10,000 years ago from the last ice age before they spread across Canada (The Canadian Encyclopedia, u.d.) Unfortunately, these herds are declining because of habitat loss, predation, human interference, and wildfires. Their seasonal migration patterns are also being disturbed by human activity which is problematic because Caribou are sensitive to alterations of their environment; this stress affects their ability to access fodder and breeding areas. Further, the current research indicates a combination of human and natural disturbances that negatively impact the growth of Caribou populations. (Apps 2006). To support population growth scientists have engaged in risk assessments to determine how to preserve crucial habitats (Apps 2006). This infographic will present possible threats to and solutions for the survival of the Southern ecotype because current solutions are failing, and populations continue to dwindle. The loss of this species would represent a social, environmental, and cultural loss for Indigenous Peoples and the Canadian ecosystem. This poster will present relevant information about the critically endangered status of the Southern Caribou and highlight their importance to the local ecosystem and community. It is imperative that we continue to act to protect the remaining herds for future generations. Therefore, Scientists, Indigenous peoples, and citizens must work together to find more concrete solutions and educate the public.

Key words: Southern Caribou, critical habitat, species at risk, population dynamics, seasonal migration, Indigenous Peoples, Community

Investigating the future of glacier ice and melt processes in the North Shuswap

Tay Powrie

Thompson Rivers University - MSc in Environmental Science

Supervisor: Dr. Tom Pypker

There is limited information or data on the glaciers that drain into the Adams River watershed, in Interior British Columbia. Climate change may affect the quantity, timing, and duration of glacial melt, thereby affecting community water utilization, as well as anadromous and native riverine fish habitat, through changes in stream morphology and temperature, as well as timing and magnitude of flows. The Adams River supports one of North America's largest sockeye salmon spawning migrations; however, in the early 20th century, the Upper Adams Sockeye run was decimated due to the construction of a splash dam. There have been reintroduction efforts and nutrient supplementation programs to re-establish a thriving Upper Adams River Salmon run. Moreover, as a tributary to the Shuswap watershed, and subsequently the South Thompson River, the Adams River provides significant surface flow (~ 29.7% of the South Thompson late summer flow, which provides the source water for Kamloops, BC) for downstream community water utilization. These aspects of the Adams River watershed demonstrate the immense socioeconomic investment in, and importance of, this catchment. This research project will integrate community priorities of the Adams Lake Indian Band and the Shuswap Watershed Alliance, through an analysis of climate change induced glacier recession and water contribution to the Adams River watershed. This project will utilize photogrammetry and ice penetrating radar methods to calibrate a dynamic model of glacier melt and runoff processes from all the glaciers encompassed in the watershed. These methodologies will allow us to quantify changes in the rate of glacier recession, and thus glacier induced changes to stream processes within the watershed that may impact community water utilization and aquation habitat.

Author: James R. Rankin¹

1: University of Northern British Columbia, Natural Resources and Environmental Studies Program

Keywords: Fine sediments, sediment erosion, bank erosion

Abstract

The Horsefly River, located in the Cariboo region of British Columbia, provides significant salmon spawning habitat for three populations listed as “endangered” or “threatened” under COSEWIC. Anthropogenic land use and natural biophysical processes within the watershed have created vulnerable conditions whereby sediment erosion, transport, and deposition lead to degradation of salmon habitat in the system. Within the research undertaken, suspended sediment, water, and floodplain overbank sediments are being collected with the objective to characterize the fine sediment dynamics in this river system, including the transportation and deposition of sediments. Samples will be analyzed for grain size, nutrients, and trace metals to determine contaminant load transportation to downstream habitat, and into the watershed outlet, Quesnel Lake. Floodplain sediment cores dated via radiometric properties such as ¹³⁷Cs and ²¹⁰Pb, in addition to historic hydrometric data, will be used to assess past patterns and trends of sedimentation and contaminant deposition in response to flooding. Analysis of historic satellite imagery and orthographic photographs will be used to meet the objective of assessing past physical channel changes, bank movement, and erosion in key reaches of the river. Assessment of recent and projected trends in weather and river flow will be used to predict likely changes to the sediment dynamics, and therefore salmon habitat, in future decades leading to 2100. Understanding the fine sediment dynamics in the watershed and erosion patterns will inform management strategies to mitigate further habitat loss and degradation in the watershed.

Poster Presentation

Sources of uncertainty in estimating trail usage by mountain bikes in the Three Blind Mice trail network, Penticton, British Columbia

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Statement of relevance: This work is relevant as it explores and assesses the use of multiple methods to estimate trail use by mountain bikes. Understanding the amount of usage trails/networks receive is critical in (1) understanding the value of trails to a community, (2) planning for development (e.g., what do people like to ride) and (3) allocating scarce (often volunteer) resources towards trail maintenance.

Abstract: Mountain biking is growing in popularity in many communities. As the number of riders increase, local governments and cycling organizations require data on trail usage to (1) understanding the value of trails to a community, (2) planning for development (e.g., what do people like to ride) and (3) allocating scarce (often volunteer) resources towards trail maintenance. This project was carried out to quantify the trail use by mountain bikers in the Three Blind Mice trail network near Penticton, BC. Trail usage was assessed through installation of automated counters during the riding season, periodic manual counts and fitness app data (Strava Metro). Each of the measurement methods has benefits and drawbacks. Manual counts are the most accurate, however they are time consuming and limited in spatial extent. Automated counters may be less accurate depending on installation site characteristics but a number of counters can be installed through a trail network to obtain more complete spatial and temporal estimates of usage. Data provided through Strava Metro is limited to only those trail users who use the Strava app which is an unknown subset of the total usage, but provides complete spatial and temporal coverage of the trail network. This poster will examine the uncertainty associated with the three data types, how they can be combined to improve estimates and best practices for estimating trail usage.

Comparing manual and iPad LiDAR measurement of tree diameter across four ecosystems in the southern interior of British Columbia

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Statement of relevance: This work is relevant as it explores and assesses the use of new technologies built into smart phones and tablets for field measurements. While these devices have promise for field measurements, it is necessary to understand the conditions under which they will produce useful and dependable data. The data collection and initial data summary was completed by first-year students in physical geography and environmental science at Okanagan College as part of a lab exercise.

Abstract: Smartphones and tablets continue to incorporate new sensors and capabilities that can be implemented for environmental and geographical data collection. Recent generations of iPhones and iPads contain LiDAR sensors previously only available as dedicated instruments at high cost. Several applications have been developed to allow their use for in various field applications. In this study, we used an iPad Pro (6th generation) with the ForestScanner app (Tatsumi et al. 2022) to measure tree diameters in 100 m² plots at four sites along an elevation gradient near Penticton, British Columbia. The LiDAR measurements were compared with manual diameter measurements taken using a standard diameter tape for the same tree. The data was collected by students in environmental science and geography courses as part of a lab assignment about data collection and analysis. The correlation between LiDAR and manually measured diameter values for the same trees was strong for trees with a diameter-at-breast-height (DBH) of greater than 20 cm. Below they 20 cm DBH threshold, LiDAR measurements tended to be larger than manual measurements, especially for Englemann spruce. In addition, LiDAR measurements were not obtainable for 23% of trees due to dense foliage and/or narrow stems. This poster will highlight the strengths and weaknesses of using iPad-based LiDAR for tree measurements. As well, we will discuss the value of these measurements as a teaching tool for field data collection and data analysis.

The Disappearing Unnamed Glacier: A Case Study of Retreat in Garibaldi Provincial Park, Squamish, British Columbia

Gavin Reis¹ & Crystal Huscroft

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This study describes the pattern and extent of recent retreat using satellite imagery of an unnamed glacier in the Mamquam Range within Garibaldi Park and the Pacific Ranges of the Coast Mountains. The unnamed glacier has shown a unique pattern of retreat as it is a remnant of a once larger cirque glacier that separated from its upper accumulation zone through thinning and down-wasting in the late 20th century. The rate of glacial retreat was determined by comparing satellite images between 1985 and 2022. Comparisons of the images indicate that the glacier receded approximately 325 meters (13 m/y) and down-wasted at a rate of 14.5 m/y. We note newly exposed rock outcrops along all margins of the glacier. Inspection of Sentinel-2 multispectral imagery at the end of the mass balance year indicates that the accumulation area ratio (AAR) was far below the sustainable threshold of 0.3 in 2023. This glacier is projected to expose a concave rock basin, which will host a tarn due to the consistency of retreat. This pattern and rate glacial transformation will continue or accelerate if present climate projections are accurate, and the adjacent tarn provides a good model of the future of this unnamed glacier as it had succumbed to similar physical processes.

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Tensions between Old Growth logging and Marbled Murrelet habitat loss in Coastal B.C.

Completion of the Canadian Pacific Railway in 1886 established British Columbia (B.C.) as a logging center for domestic and international markets. The Marbled Murrelet is a coastal seabird that relies on old-growth trees for nesting and roosting and is protected as a threatened species by the B.C. government. Forestry policy from 2019-2021 increased the total cleared area of old-growth trees along the B.C. coast and Vancouver Island. Data from Sierra Club B.C. suggested that the increase in old growth harvesting contradicted political promises to protect old growth. The loss of old growth trees in B.C. is mirrored in the nesting success of the Marbled Murrelet. Claims from environmental organizations demonstrated that the B.C. government is violating its own species protections by continuing to log along the birds' habitat range. This analysis discusses the risk level that an increase in logging poses to the Marbled Murrelet using habitat projections and recent population data. Historical literature also indicates that the influence of forest resources in B.C has been the primary driver of government action. The largest role in species protection movements has been filled by the public and environmental organizations. The B.C. government must balance social and scientific resistance to continued logging with resource demand. The Marbled Murrelet is limited to small coastal pockets of Western North America and can effectively inhabit a fraction of forest areas. How the Province proceeds with old-growth and habitat management will dictate the survival of the species.

Keywords: logging, forestry, British Columbia, threatened, birds, Marbled Murrelet

The Survival of the Nebula Peak Glacier, British Columbia, Canada
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The recent and late Holocene history of the Nebula Peak glacier, located north of Pitt Lake in the Pacific Ranges of British Columbia, has not been studied. Meltwater from this glacier flows directly into Pitt Lake and is important for the fishery for the surrounding communities. Using Sentinel-2 multispectral imagery and Google Earth Engine timelapse satellite images between 1985 And 2022, we determined that the glacier has retreated at an average rate of 12 m/y to its current reduced area of approximately 460 km². However, the presence of large amounts of fresh snow and a low ratio of exposed glacial ice in Sentinel-2 multispectral imagery captured at the end of the 2022-23 mass balance year, we postulate that if the meteorological conditions were to stabilize to those experienced in the 2022-23 mass balance year, it would not continue to retreat. These positive findings provide a poignant argument for swift and effective climate action, as the very survival of the glacier is at stake. Nonetheless, temperatures are expected to continue to rise, and continued observation of this glacier's retreat pattern is recommended.

Keywords: glacier, global warming, recession, remote-sensing

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Keywords:

Erosion, rainfall simulator, vegetation recovery, wildfire

Assessment of Post-Wildfire Erosion in the Nechako Watershed using Rainfall Simulations and Vegetation Recovery Imagery

With wildfire seasons becoming increasingly severe in recent years across British Columbia, the amount of disturbed soil that is prone to erosional processes is also increasing. Being able to understand how these processes are occurring and how they are impacting the local hydrological system are important requirements for protecting water resources and aquatic habitats. This poster will look at the proposed research I will conduct into post-wildfire soil erosion on hillslopes using a field-portable rainfall simulator and connecting these data with satellite imagery. The rainfall simulator plots will focus on assessing three variables: age, burn severity, and slope. Three different wildfires will be assessed within the Nechako watershed: one from 2018, 2021, and 2023. Having fires from different years provides a longer temporal perspective, which will better show the recovery over time and how the erosion rates change. The burn severity is important for the erosion rates as it determines how the soil characteristics, root systems, and soil water absorption capabilities have changed due to fire. Each of these will influence how the soil interacts with precipitation and snowmelt following a fire. Slope is important as it determines where runoff and eroded soil are transported and influences the amount of energy required to move the soil downslope. The remote sensing component will focus on assessing the vegetation recovery of the fires using the Normalized Burn Ratio. The vegetation recovery imagery and measured soil erosion data will be analysed to determine any relationships between them, and to extrapolate point measurements across the watershed for those areas impacted by wildfires.

Guns and Governance: How Historical, Cultural, and Political Differences Between the United States and Canada Influence Gun Control

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Canada has managed to change their gun policies following tragic events of gun violence, whereas the United States has had little to no changes in gun regulation. The contrast in gun policies between the United States and Canada can be explained by their historical, cultural and political differences. This poster demonstrates how America's individualistic ideology has led to the belief that owning firearms is an individual right. Canadian's communalism has played a role in accepting more government control over their lives, including gun control. Gun ownership is not an inherent individual right in Canada like it is in the United States. Additionally, slavery in America has contributed to the desire for firearms in the country. Slave owners relied on guns to exhibit control over enslaved populations as tools of oppression. Today, it remains apparent in America that firearms continue to be used as instruments to exert control over others. Canada overall collectively sides with gun control policies, while the United States remains extremely polarized in this topic. Interest groups, such as The National Rifle Association (NRA), in the United States have had a large impact on shaping gun policies, further polarizing American citizens in terms of policy options.

Keywords: gun control, individualism, slavery

Past Retreat and Future Survival of Albert Glacier"

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The retreat of alpine glaciers in western Canada is a concern for water resource management. However, the recent pattern of retreat of individual glaciers has received little attention. Albert Glacier is a small alpine glacier approximately 25 km southeast of Revelstoke, British Columbia. This study assesses the likelihood of survival and the glacier's rate and pattern of recession using both optical imagery and Sentinel-2 multispectral images. Here, we demonstrate that although Albert Glacier is receding, if regional conditions remain like those experienced during the 2022-23 mass balance year, it is anticipated that the Albert Glacier would survive current climate conditions as the glaciers' accumulation area ratio was adequate. This result underscores the need to limit warming below 1.5°C as further warming would likely alter the result of this survival assessment.

Keywords: glacier, global warming, recession, remote-sensing

Title: Radiocarbon Evidence of Holocene Wildfires from Horne Lake Caves, Vancouver Island, British Columbia.

Authors: Nikolay Senilov & Gillian Krezoski

Affiliation: University of Victoria, Department of Geography, Victoria, BC.

Abstract: Horne Lake Caves Provincial Park contains a well-developed karst system dating to the Fraser Glaciation (~10,000 years BP) or earlier. Charcoal fragments embedded in fine-grained deposits were identified in the ceilings of two caves in the system: Riverbend and Main Caves. This study presents two minimum-limiting radiocarbon ages of charcoal samples from these sites: the Riverbend sample is dated to ~6.4 ka cal. years BP, and the Main Cave sample is dated to ~9.5 ka cal. years BP. These dates correlate with findings from recent studies of regional fire records on central Vancouver Island, which utilized pollen and lake varve data to construct a regional wildfire record. This research underscores the high preservation potential in cave systems and their efficacy as archives of past environmental variables, and how these environments can contribute to our understanding of changing climate.

Key Words: Climate Change, Paleoclimate Archives, Vancouver Island Wildfire Record, Radiocarbon dating, Horne Lake Caves

Relevance Statement: Paleo-wildfire records provide critical context of contemporary wildfire regimes and illustrate the influence of a changing climate on fire dynamics. This study provides an additional data source to enhance the wildfire record on central Vancouver Island using a straightforward and cost-effective approach for data acquisition, thereby improving the accuracy and comprehensiveness of future wildfire prediction.

Good Hope Glacier, B.C. is experiencing retreat due to Global Warming

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Glacier retreat has been occurring throughout Canada since the end of the Little Ice Age. More recently, human-induced global warming has been responsible for the rapid retreat and disappearance of glaciers worldwide. This case study presents the results of the analysis of remotely sensed images to determine the rate of retreat of Good Hope Glacier, located in British Columbia's Pacific Ranges. Google Earth Engine imagery indicates the Good Hope Glacier has had an average annual retreat of approximately 7 m/yr since the mid 1980s. A survival assessment using Sentinel-2 multispectral imagery accounted for the fact that Good Hope Glacier is a small glacier with an approximate area of 1.75 km². Previous studies indicate that glaciers of this size are only stable if their accumulation area ratio (AAR) is greater than 0.54. Sadly, at the end of the 2022-23 mass balance year (late August) the AAR was far less than 0.54. Therefore, under current climate conditions, Good Hope Glacier is experiencing a negative mass balance, making it unlikely for the glacier to survive as the planet continues to warm.

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The Cost of Canadian Mining: Exploring the Impacts of Canadian Mining and Extraction Linkages on Children in Guatemala

Key words: Environmental Injustice, Guatemala, Children, Mining

Canada maintains a mining presence in Guatemala that is linked to severe humanitarian violence, environmental harms, and community displacement. This mining landscape was constructed in the aftermath of a brutal and lengthy U.S. backed genocide against the Indigenous Maya peoples of Guatemala. Canada exploited the vulnerability of the recovering Mayan groups to illegally purchase both Indigenous land and a status of impunity from the genocidal military leaders before beginning forceful evictions and extraction – beginning a pattern of humanitarian and environmental violence that continues today. Here, I explore how the Canadian mining industry creates a uniquely harmful burden upon children in Guatemala due to childrens’ higher susceptibility to certain illnesses and lack of political voice, and how these linkages between Canadian mining and children in Guatemala can be situated within a wider pattern of harmful Global Northern extractivism taking place in Central America. This examination makes use of an environmental justice framework, arguing that the harms being suffered by Guatemalan children constitute manifestations of unfair and deliberate efforts by Canada to shelve the environmental and human costs of their extractivism upon the shoulders of people that are too vulnerable and lack the political voice to effectively resist. By situating this analysis within a wider framework of Global Northern Extractivism within Central America, I argue that these environmental injustices are manifestations of environmental racism embedded within inequitable power relationships between the Global North South. This paper is relevant as it exposes the complicity of Canada and other Global North countries in severe environmental injustice, and charges each of us to consider children, who suffer some of the most severe harms due to our extractive policies with the fewest opportunities to resist. This paper is relevant because it amplifies discussions of struggle for those whose own voices go unheard.

Comparisons of Urban Food Deserts Between British Columbia and Washington State

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Food deserts can affect any community, but depending on where you live, they may prove a daily issue for certain groups. Food deserts are the incidence of a person who doesn't have ready access to the fresh food that they need to have a healthy diet. On both sides of the Canadian American border studies have shown that women, people of color, and children are the most heavily influenced by lack of access to healthy, fresh food. Though these case studies have been conducted in isolation of each other, this compilation and analysis of the literature reveal patterns of access tied to similar groups on both sides of the border as well as patterns of geographical exclusions in previously segregated neighborhoods especially in Washington. This poster shows these patterns overlaid with each other to help demonstrate these patterns of access or lack thereof to these underserved groups on both sides of the border.

Keywords: food deserts

Cascadia: a Corridor Into the Future

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Cascadia as the region that stretches from Vancouver, BC to Portland, OR, has been identified since the 1970s due its shared ecosystem. There has been some research and analysis as to whether a cross-border union in the area would noticeably benefit the people and wildlife living in the region. There is some agreement that the cities inside of Cascadia have more in common with each other than they do to the rest of the continent, this is reinforced by bioregionalists that argue that it is the physical place that defines cultures, not political borders, so why should this place not be connected more firmly than it is currently? Habitat fragmentation and lack of migration routes for certain species exacerbated by poor management practices threaten the wildlife of the region while the border throttles business between the two countries. Both sides of the border have multiple reasons to want to create a more streamlined and easy border for businesses. And everyone can benefit from more wildlife in the area. Findings indicate that better wildlife management would protect native species but there are wildly different histories of ecosystem management on each side of the border which may make it difficult to integrate policies. Economically there are many upsides and downsides to this theoretical merger but regardless it would certainly make things easier for trade in the region.

Keyword: Cascadia, Cross-Border Region

Ryan Stafford

SWOT Analysis of MAAN Farms

The poster outlines a strategic initiative to elevate accessibility at Maan Farms by aligning with the United Nations' accessible tourism guidelines. Through a comprehensive SWOT analysis, the project identifies existing strengths, such as the farm's family-friendly appeal and accessible amenities, alongside challenges including maintenance and affordability. It proposes a suite of enhancements covering parking infrastructure, pedestrian safety, financial accessibility, and advanced mobility solutions. This study is part of a collaborative endeavor between CityStudio and the University of the Fraser Valley, reflecting a commitment to inclusive community engagement in agritourism.

Pleasure Without Waste: Policy Options to Mitigate Environmental Impact of Cruise Tourism on BC Coastal Ecosystems

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Cruise ship tourism through the West Coast of British Columbia has been an important component of the regional Canadian economy for decades. These cruises, often departing from United States port cities such as Seattle, Portland, or San-Francisco, travel up and down the American and BC coastline to Alaska and bearing the brunt of the environmental impacts of these journeys is BC coastal ecosystems. Due to weaker environmental regulations for coastal waters in Canada and relaxed accommodations made for the cruise industry due to economic benefits, wastewater dumping and air pollution hits BC far harder than any other location these cruises travel. This paper synthesizes existing literature around this topic and develops a greater understanding on what policy options could be taken by both the United States and Canada to mitigate the environmental impact of this cruise tourism on Canadian coastal ecosystems. Findings show several policy options suggested by this study.

Keyword: tourism, cruise ships, environmental impacts

Canada's overlooked housing dilemma: Indigenous veterans housing

Elena Van Buschbach

Abstract: This poster highlights the housing challenges faced by Indigenous veterans in Canada. Drawing on our findings from UFV's PLAN300: Planning for Housing class, we propose innovative solutions to address this critical issue. By showcasing best practices and partnerships, we aim to raise awareness about the intersection of housing insecurity, Indigenous rights, and reconciliation. By sharing insights, recommendations, and successful case studies, our presentation hopes to inspire dialogue, collaboration, and action towards more equitable housing outcomes for Indigenous veterans in Canada.

REASONING SPATIAL REASONING

The Role of Mathematics in
Advancing Methods in Remote Sensing

Ryan Walsh
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Abstract

Mathematics is the Rosetta Stone of spatial reasoning and, as such, serves as an instrumental tool to unravel complex aspects of the Earth and our perception of it. In this paper, we explore the pivotal role that mathematical reasoning plays in solving remote sensing (RS) problems. Advancements in RS can be attributed to fundamental techniques in linear algebra, calculus, statistics, et cetera; their applications to solving problems in image processing and interpretation. Linear algebra, for instance, is used to manipulate imagery through rotations, scaling, and transformation. Calculus shows up in the theory behind energy interactions and signal processing. Additionally, probability and statistics are used in image classification and segmentation, as well as land use and land cover applications such as geostatistics and change detection. Likewise, these areas lay crucial theoretical foundations in the ways we approach data, and a well-informed understanding of these mathematical frameworks enables methodological analysis of RS data, making complex problems surmountable. Through the examination of current methods in image processing, spatiotemporal analysis, energy interactions & signal processing, spatial interpolation, and quantifying physical phenomena, we find that mathematical interpretations constitute significant underpinnings in the research and applications of RS. Moreover, we can see how applying mathematical strategies supports the evolution of RS, and surmise that progression in one coincides with the other.

Implementation of the WRF-Hydro modeling system in glacier-fed watersheds of northwestern British Columbia, Canada

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Abstract

Glaciers are important reservoirs of water that significantly contribute to runoff generation and ecosystem dynamics in mountainous watersheds. The glacier-fed watersheds are highly sensitive to climate change because of their strong atmosphere–cryosphere coupling and therefore can serve as model systems for investigations of climate change impacts on mass balance and meltwater. This study focuses on several glacier-fed watersheds in coastal and mountainous regions of northwestern British Columbia (BC). Our poster will showcase the application of the Weather Research and Forecast Hydrological Model (WRF-Hydro) to simulate key hydrological processes in these watersheds at various spatial and temporal scales. We will discuss the model calibration and validation against observed hydrological data, including streamflow measurements and glacier mass balance records to assess the accuracy and reliability of the WRF-Hydro model system. In addition, we will highlight how this research contributes to enhancing knowledge of glacial-fed hydrological systems and their responses to climate variability and change. The information provided in this poster will be highly relevant for water resources managers and decision-makers to inform sustainable water use and adaptation planning in the western region of northern BC.

Keywords: - *WRF-hydro, Hydrology, Glacier-fed watersheds*

Artifacts of Migration: Examining the Impacts of Canada's Border Policies on a Border Community

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Poster Presentation

Abstract

Between early 2017 and March 2023, approximately 100,000 migrants crossed the Canada-US border through Roxham Road, an unofficial border crossing located in a rural area between Quebec and New York State. This unofficial route developed as a direct result of the provisions outlined in the Canada-US Safe Third Country Agreement, which states that migrants who enter the US first and attempt to make an asylum claim in Canada – or vice versa – can be turned away as they were already located in a “safe” country. The closest city to this crossing, Plattsburgh, New York, has seen firsthand the results of this increase in traffic to the border. Many advocates and community members in Plattsburgh work tirelessly to provide food, accommodation, and transportation to these migrants passing through on their way to the crossing. My research focuses on how this border policy affects the interactions between migrants, advocates, and businesses in this border community, along with a supplemental aspect that examines the role that migrants’ objects or “artifacts” play in this context. In the summer of 2023, I travelled to Plattsburgh to both conduct interviews and do a landscape analysis of this region. I asked Plattsburgh community members involved in the migrant sector of the city about their interactions with migrants and objects associated with migration journeys and observed the distances and spaces that make up this border region. Over the years, Roxham Road has been highly present in the media and has increased conversations surrounding migration and border policies between Canada and the US. Through my work I hope to add to existing research that challenges modern borders and border policies and steer these conversations away from villainizing migrants who are caught in these situations.

Key words: migrants, border policies, asylum seekers, advocacy, landscape

Glacial Geomorphic Mapping of Northern Vancouver Island, British Columbia, Canada.

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The ways in which portions of the Cordilleran Ice Sheet, the last ice sheet to cover coastal British Columbia, retreated on Northern Vancouver Island are still being understood. The purpose of this research is to identify glacial geomorphic features associated with the most recent glaciation of the Northern Vancouver Island region. Here, we map glacial landforms using newly available high-resolution LiDAR imagery (1-5 m). We identify 2692 new features, including lateral and submarginal meltwater channels, moraine crests, ice flow lineations, esker ridges, hummocky terrain areas, undifferentiated ridges, and paleoshorelines.

This work updates previous glacial and geomorphological understanding of the region and significantly advances coarse regional scale mapping. Findings can be used to support future efforts to reconstruct the timing and dynamic behavior of the Cordilleran Ice Sheet as it advanced and retreated during the last glacial period.

Key words: Glacial geomorphology, Mapping, Vancouver Island, British Columbia, Deglaciation, Cordilleran Ice Sheet, Last Glacial Maximum

Untersuchen was ist, und nicht was behagt

(Investigate what is, and not what pleases)

— Johann Wolfgang von Goethe