UNIVERSITY OF CALGARY

FACULTY OF VPR/ Biogeoscience Institute

Barrier Lake
RB Miller
Field Stations

2022/2023 Research and Education Report

https://research.ucalgary.ca/biogeoscience-institute

Welcome back!

With a mission to facilitate and host research, education and community connections in the Canadian Rockies going all the way back to 1950, it is my great privilege to welcome you (back) to the Barrier Lake and R.B. Miller field stations! Unsure about the lingering effects of the "big pause" as we started this past reporting year, we were extremely happy with the result – as detailed in the report, we clocked >10,000 user days! Importantly, we achieved those numbers through robust engagement with all four of our major user groups: research, education, university, and community. Of course, the people and their stories are so much richer than the numbers. In August 2022, we were grateful to host *Iniskim: Return of the Buffalo,* a re-telling of the story of the buffalo in North America. This was followed soon after by

one of our largest public multiday events to date, *Tipis and Telescopes*, which was also the first time we've had tipis on site. This past July, we were host to 50 Indigenous youth from across Canada, as they took part in a series of activities through the national Outland Youth Employment Program. In the report, you'll find more details about these and other exciting events that were held here in the past year, as well as stories about the amazing research facilitated by our facilities. Looking forward, we're looking forward to hosting another robust set of user groups into 2024. Speaking of 1950, we're starting to plan for our 75th anniversary in 2025 – lots of great things in the works! If you'd like to run some programming out of here, including those tied to our big anniversary, please reach out to us at bgi@ucalgary.ca.

Steven Vamosi,

Scientific Director of Biogeoscience Institute

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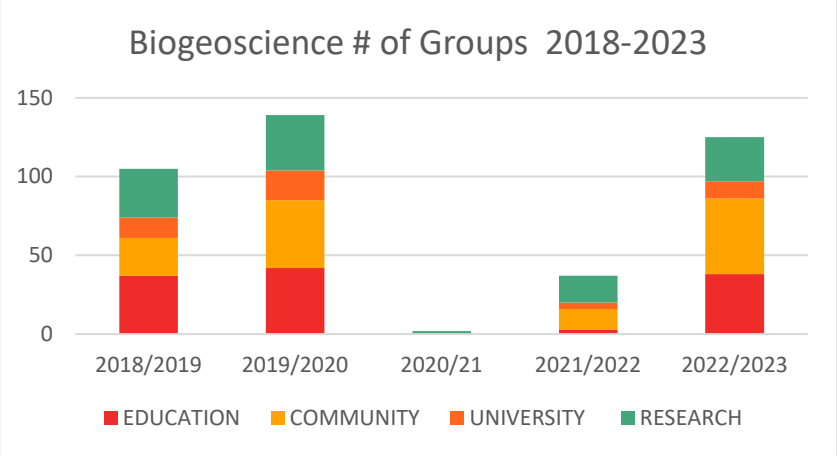
Year in Review

While the BGI was closed to essential services during the pandemic, a full reopening occurred in May 2022 and hosted 125 groups in the 2022/2023 fiscal year.

Group Numbers

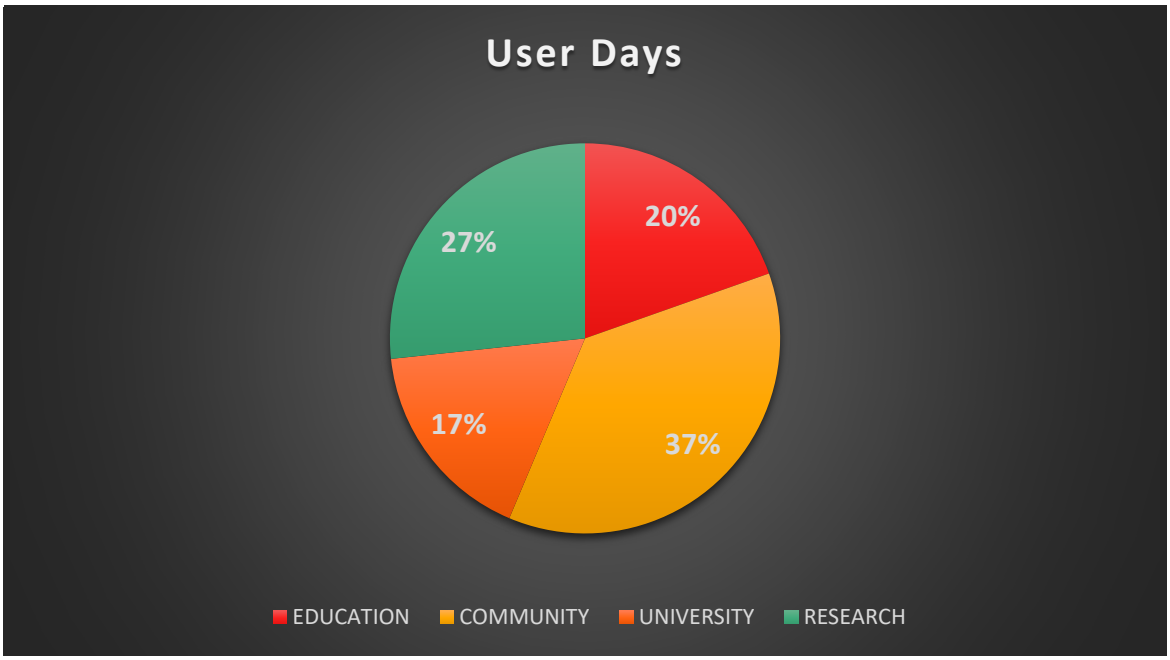
The Biogeoscience Institute welcomes a variety of user type groups including Education (Junior/High School) groups, community groups including all academic institutions/non-profit/government groups hosting conferences and retreats, University credited field courses, and field-based research groups.



We greatly appreciate the support, patience, and trust from all our users who returned to engage with their classmates, peers, and colleagues at the BGI field stations.

User Days

The BGI tabulates the number of user days based on how many people use the field station per day. In 2022/23 we were thrilled to host over 10,000 user days returning to pre-pandemic numbers.



Notes from the field

Briana Van Den Bussche, staff member Biogeoscience Institute, heads to the field each summer to learn and engage with on-site researchers and brings these teachings back to the classroom. Briana's writings are excerpts from UToday News and the following highlights a few of our favourites:

Experience a day in the life of a researcher at reopened Barrier Lake Field Station.

The Barrier Lake Field Station at the beloved Biogeoscience Institute in Kananaskis Country holds a special place in the hearts of many students, staff and alumni — not just from the University of Calgary but from schools across the country and around the world. The imposing Rocky Mountains, sprawling valleys, rugged cliffs and richly forested slopes form a memorable alpine backdrop for a variety of field schools, workshops, retreats, and research projects.

On pause for 18 months, the field station emerged from its pandemic hiatus to much excitement as visitors began safely returning this summer. Read on about the fieldwork by two groups of university students, one from UCalgary and the other from McGill University, who bring us along for a look as they scale hillsides and scan floral habitats, investigating biodiversity in K-Country.

Hanging with trees that thrive in rocky soils

First, let's hang out with Estefania Roldan Nicolau, a PhD student, and Michelle Ives, a master's student, both from UCalgary's Faculty of Science. When we say hang out, we mean it literally: Many of their field sites are on cliffs!

Both researchers are interested in how trees access water in bedrock or other rocky soils. Their work involves scrambling or climbing to these locations to collect data. They use the data gathered from the locations and the trees to determine the amount and location of water within the rocks, a much less invasive method than blasting open the cliffs to locate the roots.

Nicolau's work centres around building a model to help understand how trees regulate their water consumption in habitats with poor water access. She monitors sap flow while also collecting data on weather and precipitation events.

Learning from trees hundreds of years old

Many of the trees at her sites show signs of regulating long-term stress, such as reduced needle cover or a thinner layer of sapwood, the area of the wood where water and nutrients flow. Despite looking a

little ragged with their small size and sparse needles, some trees clinging to cliffs are up to 400 years old.

Ives is also working on creating a model but focuses on the water budget of cracks in the rocks. She hopes to gain insight into the geomorphology of the cracks by measuring surface water, the water used by the trees, and the water lost in surface runoff. She cores trees at each sample site to examine growth rings and get a sense of how growth may be affected by the structure and availability of water in the cracks. She believes the differences in the cracks could be responsible for variation in the growth rings of trees.

“You would think, looking at growth rings, you would see a peak in growth of all the trees in an area during a good year, but we are not seeing those consistent peaks with these trees,” says Ives.

As winter approaches, both women will spend their time in the lab and at home, analyzing their data and working with computer software to create their models, before returning for a final field season next year.

Meadley Dunphy examines equipment at a site on Nakiska ski hill. Photo: Briana Van Den Bussche

Frolicking in the flowers

Visiting from Dr. Anna Hargreaves’ lab at McGill University, Shannon Meadley Dunphy and Olivia Rahn spent their summer focusing on the flowers.

Not just any flowers, but the plant known as yellow rattle (Rhinanthus minor). Both researchers are interested in the plants’ native growing range at different elevations and under various conditions.

Rahn, a master's student, is interested in habitat quality, especially abiotic factors or the non-living part of an ecosystem that shapes its environment. A current theory is that habitat quality declines as a plant nears its species limit. Testing this assumption, Rahn has plots across a range of sites where she looks at germination and seed production to measure lifetime fitness. The Rhinanthus minor is an ideal plant for this kind of study as it is one of few native annuals in the Rockies, which means lifetime fitness can be determined after just one growing season.

Another bonus of working with Rhianthus is that the seeds are relatively large and easy to handle compared to other plant species, making counting and planting less time-consuming. Rahn uses drone imaging techniques to gather mass spectral images which could help determine total biomass in her study areas.

Behold, the Rhinanthus minor

On the other hand, Meadley Dunphy, a PhD student at McGill, chooses sites where Rhianthus should do well based on the characteristics of the plant. As a root parasite, the plant needs to be close to other plants in order to steal nutrients and water. It still needs to photosynthesize, though, so it also requires sunlight. As a small, annual plant, it is a poor competitor against the nearby larger and more established perennials.

Meadley Dunphy's fieldwork involved manipulating the habitat around Rhianthus to adjust its ability to access the roots of other plants as well as sunlight. She used cone-like structures she invented, which do not kill nearby plants, but push them out so they are not shading out the Rhianthus. She also designed special structures to enclose Rhianthus roots, allowing her to control how much they grew and accessed neighbouring plant roots.

Throughout the summer she recorded the growth of her plants, as well as nearby plants. This is the final year of Meadley Dunphy's project, and she will now be analyzing her data in hopes of gaining a better understanding of the impact of sunlight and root access on Rhianthus in relation to its range distribution. Rahn finished her field season by collecting Rhianthus seeds and replanting them in plots. She will return next summer to monitor their growth.

Other UToday Articles based at the Biogeoscience Institute:

- Moving through the meadows: Team studies butterfly dispersal in mountain fields https://ucalgary.ca/news/moving-through-meadows-team-studies-butterfly-dispersal-mountain-fields
- Notes from the field: A day and night in the life of bats, fish, and researchers in Kananaskis Country https://www.ucalgary.ca/news/notes-field-day-and-night-life-bats-fish-and-researchers-kananaskis-country
- A bird's-eye view on saving the bull trout https://ucalgary.ca/news/birds-eye-view-saving-bull-trout
- Are the animals in Kananaskis Country thriving during the pandemic? https://ucalgary.ca/news/are-animals-kananaskis-country-thriving-during-pandemic

- PhD students from three countries produce two academic research papers in just two weeks https://www.ucalgary.ca/news/phd-students-three-countries-produce-two-academic-research-papers-just-two-weeks

- Ready for a Fortress Mountain hike? After a night's rest at the Barrier Lake Field Station, two UCalgary geoscience students spend a day hiking, observing, and collecting data on Fortress Mountain. https://www.ucalgary.ca/news/ready-fortress-mountain-hike

- After 65 remarkable years, beloved Rocky Mountain research facility goes off-grid https://www.ucalgary.ca/news/after-65-remarkable-years-beloved-rocky-mountain-research-facility-goes-grid

Biogeoscience researchers collect samples and data at the Tay River. Photo: Briana Van Den Bussche

Lanterns, camera, action! Immersive puppet-lantern performance honours return of the buffalo

Barrier Lake Field Station hosts story of bison's reintroduction to Banff National Park

AUTHOR
Briana Van Den Bussche, Biogeoscience Institute

In August 2022, visitors to the Barrier Lake Field Station were met with a new kind of wilderness experience as the evening woods were filled with the beautifully haunting sights and sounds of *Iniskim: Return of the Buffalo.* The immersive experience began with guests creating their own lanterns as dusk slowly faded to darkness. As the dark settled in, participants were led on a walk through the woods, with only lanterns, drumming and singing to guide them.

Large bison lantern puppet at the Barrier Lake Field Station. Photo: Adrienne Cunnings

Walkers were enchanted by glimpses of softly glowing lanterns through the tall grasses and trees, accompanied by singing, traditional drumming and ethereal sounds of nature. Lanterns took the form of curious coyotes, sleeping bison or playfully dancing spirits.

Following the walk, intricate lantern and mask puppetry was used alongside spoken word, song and dance to tell the story of the buffalo, from its creation, to its extermination and present-day reintroduction into the nearby Banff National Park. The story wove together First Nations traditional knowledge, historical events and western science, and the experience ended with an opportunity for participants to join performers in a round dance to connect with the land and celebrate the return of the buffalo.

Project re-tells story of the buffalo

Iniskim: Return of the Buffalo is collaborative project presented by the Canadian Academy of Mask and Puppetry which uses lantern sculpture, puppetry, spoken word, traditional Blackfoot song, dance and Nakoda drumming to re-tell the story of the buffalo in North America.

Peter Balkwill prepares to guide participants through the forest to the stage area. Photo: Adrienne Cunnings

The experience was originally created in 2018 by Amethyst First Rider, Troy Emery Twigg. David Lane, Nan Balkwill, and Peter Balkwill with support from elders Tom Crane Bear, Raymond Many Bears, Patrick Twigg, and Beverly Hungry Wolf. A 2022 revised version was presented at the Barrier Lake Field Station from Aug. 8 to 10 as a part of the 2022 World Stage Design Conference, featuring new stories and writing from Thomas King, Leroy Little Bear, Wes Olson and Amethyst First Rider. Peter Balkwill, UCalgary professor in the School of Creative and Performing Arts in drama, was an integral part of this year's production, bringing the stories together and producing the show as a part of his research. The

performance at the Barrier Lake Field Station was led by storyteller Lorne Duquette of the Mistawasis Nehyewak, and featured the return of the Eya Hey Nakota drummers under the direction of Anders Hunter, a song from Olivia Tailfeathers, and the Iniskim Choir.

The puppeteers rehearse during the daytime; Visitors made lanterns prior to dusk. Photo: Adrienne Cunnings

The University of Calgary was honoured to host *Iniskim: Return of the Buffalo* at the Barrier Lake Field Station. The experience was a wonderful success thanks to the many creators, designers, Elders, performers and others who were involved in the project. To find out more about the project, including updates about future performances **visit their website**.

Photo: Adrienne Cunnings

Tipis and Telescopes: A weekend of star stories, ceremony, Indigenous science and community

Greeting the fall weather, the Barrier Lake Field Station hosted 'Tipis and Telescopes' a unique event created by Wilfred Buck and joined by TELUS Spark to bridge Indigenous star knowledge and Western Astronomy. The event welcomed families, communities, and educators to participate in storytelling, star gazing, and traditional sweat lodges. The September weekend brought numerous organizations together including The Canadian Space Agency's Youth STEM Initiatives team, NASA scientist, IndigeSTEAM, and the University of Calgary.

For the Barrier Lake Field Station a particular special moment was the mounting of several family tipis on the lawns with the mountains beaming behind. Photo: Adrienne Cunnings

Wilfred Buck travelled from Manitoba with his portable planetarium to share various First Nations star stories gifted by Cree, Ojibwe, and Nakota Nations with storyteller Dale Worme. The planetarium inflated to approximately five meters in height and six meters in diameter and accommodates 25 people.

“Wilfred continues to gather these (star) stories told by Elders and Knowledge Keepers and looks forward to the day when First Nations astronomy and Indigenous science is universally recognized and revered”.

Due to high winds, the planetarium was placed inside the tipis for support while skies cleared on Saturday evening for participants to view solar systems, nearby planets and listen to enchanting stories while huddled in sleeping bags.

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