FRASER LAB

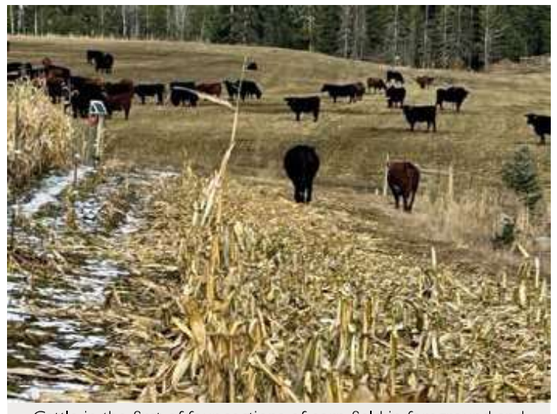
Innovative Agricultural Research Seeks Solutions for Sustainable Beef Production Practices

Tanya Brouwers, John Kang, and Keenan Baker are the students involved in the research being done through The Fraser Lab under the supervision of Dr. Lauchlan Fraser.

The global agricultural landscape continues to evolve in the face of climate change and increasing demands for food production. Researchers at Thompson Rivers University (TRU) are leading projects aimed at addressing key challenges in the ranching industry. **From overhauling overwinter feeding practices to advancing carbon sequestration opportunities in agroforestry to tackling woody species encroachment, these students are looking to add to our understanding of creating and maintaining resilient agricultural systems.**

Cropping Systems to Extend Grazing Season and Sequester Carbon

By Tanya Brouwers, MSc student at TRU



Cattle in the first of four sections of corn field in foreground and forage pro seeded field in the background. November Tanya Brouwers

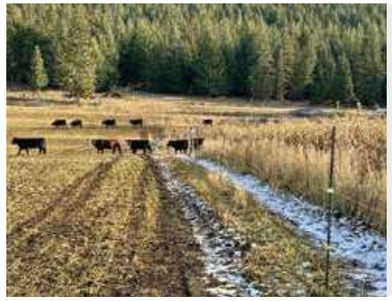
It is well known that overwintering beef cattle is one of the largest costs of a cow-calf operation. With drought and wildfires reducing range feed, and water shortages compromising forage yields, the price of keeping cattle in BC has risen ever higher. TRU, in partnership with BC Living Labs, BC Cattlemen's Association, BC Forage Council and Agriculture and Agri-Foods Canada acknowledges the difficulties facing BC beef producers and is seeking to test, refine and adopt best management practices associated with both grazing season extension and soil carbon sequestration.

As a farmer led initiative, BC Living Labs encourages farmer input during the design and implementation of experimental projects. Since early 2023, we have worked closely with the Devicks, a multi-generational ranching family based in the Kamloops area. For the next four years we will work together to test the potential of cover and annual crop rotations to extend the grazing season.

In year one, a 45-acre test site on the Devick property was divided into two, with one half planted to Forage Pro and the other to a grazing corn crop. Cattle will first access the Forage pro, to graze down the kale, ryegrass, millet, and tubers. Once pasture utilization is complete, cattle will have access to the standing corn. We have collected all forage for analysis to determine how cattle nutritive demands are met with this grazing strategy. The Devicks are anticipating the corn crop to extend grazing 8 to 10 weeks past traditional winter feed start dates.

We will also conduct extensive soil testing. In addition to production, BC Living Labs is focused on practices that utilize a soils-based approach to mitigate climate change. Prior to cultivation for this project, part of the Devick's test field was tame pasture, and another part was forested. We will be analyzing several indictors of soil health, including biological, chemical, and physical, to determine how different management practices affect a soil's capacity to sequester carbon and produce viable crops.

Production gains and climate beneficial practices are the end game of this experiment. The value of collaboration and communication, however, should not be overlooked. Although this project is still at its beginning, the lessons learned from a cooperative approach between farmer and scientist will not soon be forgotten.



Intersection of the forage pro seeded field and the edge of the corn field, showing utilization of forage pro. November Tanya Brouwers

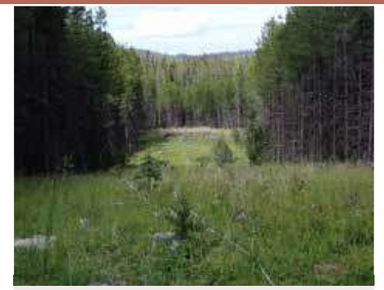
Silvopasture: An Untapped Resource

By Myung Jin (John) Kang, MSc student at TRU

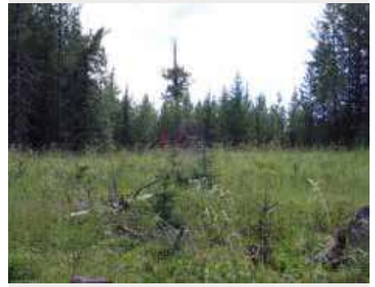
Silvopastures are understudied and underutilized in British Columbia. Almost 200,000 hectares of BC are logged each year, providing a potential opportunity for these lands to be used intentionally for grazing during silvicultural regeneration of forests. A strip-thinning silvopasture research project was established in southern British Columbia through funding from the BC Cattlemen's Association, Beef Cattle Research Council, Agriculture and Agri-Food Canada, BC Ministry of Forests, BC Ministry of Agriculture, and the Natural Sciences and Engineering Research Council of Canada.

The research site is located within a mid-rotation lodgepole pine plantation near Kelowna BC. In 2018, the 45-year old trees were strip-harvested in three different treatment widths (10 m, 15 m, and 20 m). The reserve uncut strips were twice the width as the harvest treatments. Slash was removed from the strips, and the harvested strips were seeded with an agronomic forage mix in the fall of 2018. Grazing by cattle resumed in late summer to early fall of 2019 and has continued since. In 2020, several 10 x 5 m grazing enclosures were installed in selected pasture strips.

My research will assess strip-thinning practice in this silvopasture through the lens of soil carbon sequestration (SCS), which is a measure of soil health and a mitigation factor for climate change. (1) How does conversion to a silvopasture through strip-harvesting at various widths affect SCS after 6 years? (2) Does excluding grazing affect SCS in silvopastoral pasture strips? (3) How does the microbial communities change with strip-thinning width and grazing exclusion? I will be comparing soil nutrients, soil microbial communities, and forage quantity collected throughout the different strip-widths and inside the enclosures. The Fraser Lab is working hard to prepare for the upcoming field season and some results will hopefully be available by the end of 2024.



Strip harvested strip illustrating forage production and natural regeneration. John Kang, July 2023.



Example of the back edge of a 20-meter-wide strip harvested strip illustrating forage biomass and natural regeneration. John Kang, July 2023.

Cut it, Seed it, Graze it: No-till Pasture Rejuvenation in the Cariboo

By Keenan Baker, MSc student at TRU

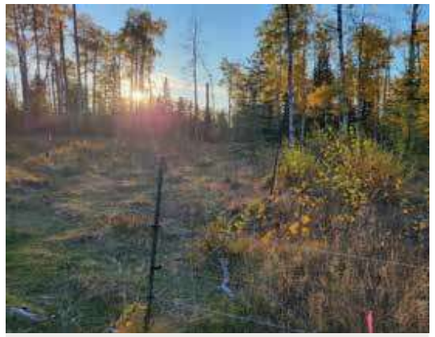
Grass dominated pastureland and native grasslands are threatened by a process known as woody species encroachment, where some areas historically dominated by grasses and forbs are being colonized by native woody species. In the Great Plains region of Oklahoma, this has been referred to by rangeland ecologist David Engle as the "green glacier", equating the extent of vegetative change there to that of the Pleistocene glaciation. This process has been observed in various regions, including the Cariboo region of British Columbia. Localized research is important in understanding management strategies as there is no "silver bullet" method of halting the spread of native woody plants.

The consequences of woody plant encroachment are far-reaching and multifaceted. As trees and shrubs expand in an area, they alter ecosystem processes such as water availability, nutrient cycling, and fire regimes. The displacement of forage grasses and forbs by woody plants reduces livestock carrying capacity and, if left unchecked, woody species create dense stands that limit movement.

Thompson Rivers University, in partnership with the BC Forage Council, BC Climate and Agriculture Initiative, BC Agricultural Climate Adaptation Research Network, Natural Sciences and Engineering Research Council, the Beef Cattle Industry Development Fund, and Industrial Forestry Services developed this project to address the concern of producers dealing with woody species encroachment. We enlisted two ranches, Camel Lake Holding near 100 Mile House and Dragon View Angus near Quesnel and set up three 100 meters by 100 meters research sites to study methods of controlling woody encroachment. Treatments included brush cutting, forage seeding, and cattle grazing. The project started in the early summer of 2021 with final data collection in September of 2023.

Data collection included vegetation community surveys, soil sampling, and the use of remote sensing cameras via drones. On the ground sampling provides information on community composition, forage biomass production, and provides measures of soil health. The drones provided vegetation height information and a measure of plant health using NDVI, which is a measure of "greenness" of vegetation.

Preliminary results show a significant decrease in woody shrub cover in areas that were grazed compared to areas with cattle exclusion. As expected, these treatment areas also saw a significant decrease in species richness and grass cover. Broadcast seeding increased forb richness in 100 Mile House but not in Quesnel and had no measurable effect on grass cover. With the 2023 field season complete, we are excited to analyze the most recent data collected from the project and continue to investigate the differences between treatments.



Visual difference between two treatment areas at one site near 100 Mile House. On the left, brush cutting followed by cattle grazing, on the right, brush cutting followed by the exclusion of cattle. Keenan Baker, Oct 2022.

The same site in late spring of the next year showing regrowth of unmanaged aspen. Keenan Baker, May 2023.

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