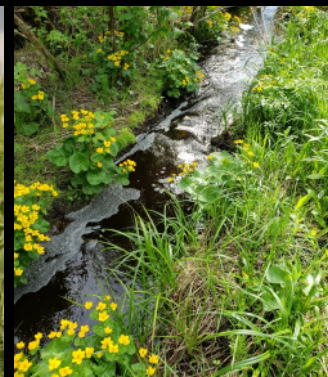




2020 Annual Report

Lakeland Agricultural Research Association



Lakeland Agricultural Research Association

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Vision Statement:

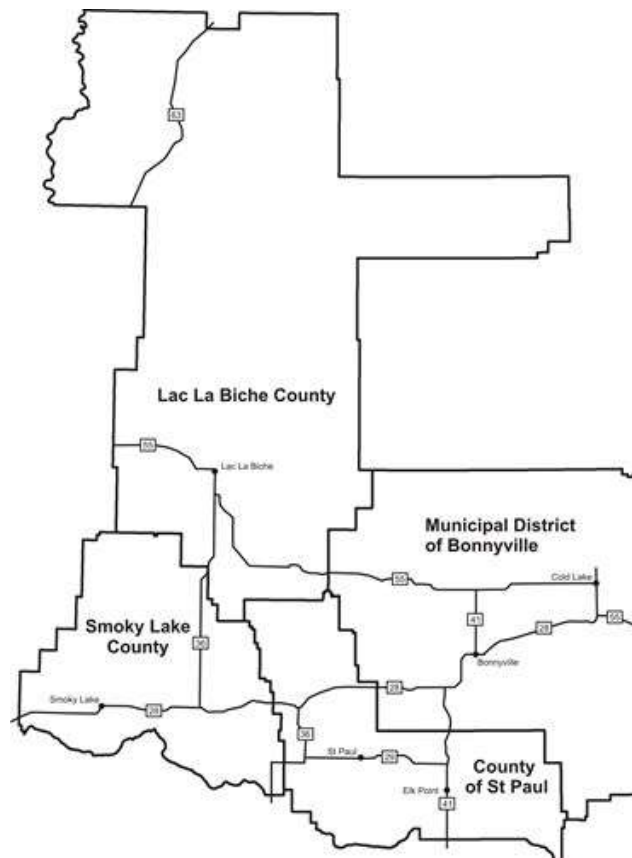
To be a leader in applied research and extension in Alberta

Mission Statement:

Lakeland Agricultural Research Association conducts innovative, unbiased, applied research and extension, supporting sustainable agriculture

What is the Lakeland Agricultural Research Association?

Lakeland Agricultural Research Association (LARA) is an applied agricultural research association that serves the MD of Bonnyville, County of St. Paul, Lac La Biche County and Smoky Lake County. We are a member of the Agricultural Research and Extension Council of Alberta (ARECA). Our goal is to conduct applied research, demonstrations and extension programs that provide valuable and unbiased information to local producers.



LARA is located ½ mile west of Fort Kent, Alberta on Township Road 615.

LARA is open Monday to Friday, 8:00 am to 4:30 pm.

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Message from the Chair

2020 turned out to be a year filled with twists and turns. We were faced with the Covid-19 Pandemic that literally brought the World to its knees. When everything went into a lockdown state, the role that producers play in the big scheme of things was never more apparent and it was shown very clearly how important Agriculture is.

Here in the Lakeland, the crops that had been left in the fields due to the extremely wet fall still had to be harvested. A fairly dry spring helped to make that possible and producers worked many long hard hours every day in order to harvest that crop and then get this year's crop in the ground.

Then the rains began in earnest and it proved to be another wet year. The pastures were beautiful, hay crops like we haven't seen in years and the sun and good drying weather came at the right times for a bumper hay crop. The harvest also proved to be good and the majority of the crops got harvested.

Our staff at LARA were certainly put to the test in many ways and I along with the LARA board of directors want to express our heartfelt thanks for everything they did and their efforts and accomplishments do not go unnoticed! We appreciate everything they do to keep things moving smoothly and making our job as a board much easier to do.

In spite of the Pandemic, extension events were still offered but through a different avenue than usual which was the virtual one! All the plots were planted, maintained and harvested. We had our annual plot tour in MD of Bonnyville and the County of St. Paul, however since the plots in Smoky Lake County and Lac La Biche County were mostly underwater we did not tour them.

A huge thank you goes to Kellie, Amanda & Stephanie as these three stepped up to the plate to share in the management duties when Alyssa went on maternity leave this summer. Thank you to Charlene for looking after the bookkeeping end of things, Vic, who is our all-around handyman keeping things looking good and for his gardening efforts in growing some pretty unique & interesting produce! Dustin, thank you for coming when the call of 'we need help,' goes out!

The board would like to send out a huge thankyou to MD of Bonnyville, County of Smoky Lake, County of St. Paul and Lac La Biche County for your ongoing support. We do appreciate it and by supporting us we are able to better serve all the producers in each municipality.

And last but not least, thank you so much to the board of LARA. It truly is enjoyable serving on a board with so much knowledge and commitment and I thank you for your input.

Sadly we are unable to host our annual Farmer Appreciation Supper and needless to say, we shall miss seeing and visiting with everyone.

Stay safe and when this is all over we will once again be together to mix and mingle and discuss what we all love to discuss and that is 'Agriculture!'

Wanda Austin.

Forage and Livestock Program Report

Entering my first year as a full-time employee at LARA I would say it was challenging but a successful year.

This year high amounts of precipitation not only affected the cropping side in agriculture in the Lakeland. The beginning of the haying season had a higher amount of precipitation which made it difficult to harvest but some areas received warmer weather conditions that allowed some producers to get off dry hay.

On the research side, this was my first year helping with the Regional Silage Trials. Our harvest season started off slow due to the rain and cooler temperatures making our silage trials delayed in maturing.

I want to say a huge thank you to everyone who participated in our field days and webinars in our research and extension programming at LARA this past year, our board of directors and local producers who continue to support our programs. I am looking forward to another successful year in 2021.

Sincerely,

Stephanie Bilodeau

Cropping Program Report

I am super excited to say goodbye to 2020 and hello to 2021! The close of 2020 saw the completion of my first year as the Cropping Program Coordinator.

This past year has brought many challenges, changes in staff positions, a pandemic and adverse weather conditions throughout the Lakeland. Even through all of these we have prevailed. We learned how to work together to change the way we held events for our producers and industry members.

The adverse weather condition this past year not only affected the cropping side of agriculture but also the forage side. With large amounts of precipitation in June and July many counties felt the effects of mother nature and had to claim agricultural disasters as producers were unable to get into their fields.

I would like to say a huge thank you to everyone who participated in our research and extension programming at LARA this past year. Our board of directors and producers are fantastic to work with throughout the year and we greatly appreciate your input. Our exceptional staff here at LARA and our summer students, your hard work and dedication truly does not go unnoticed. I am looking forward to another successful year in 2021.

Sincerely,

Amanda Mathiot

AESA Program Report

This past year presented many challenges and changes to programming and extension at LARA. The 2020 extension started off strong for the first three months before we were forced to change how we do things. I am very happy that the last in-person event was *Shine a Light* with Lesley Kelly, as it had amazing attendance and really important messaging regarding mental health as we moved forward in a crazy time.

Extension moved to webinars and on-line learning and life became a bit more ‘remote’. Delivery of EFP, assistance with funding were still provided throughout. The summer, with socially distanced field days was a nice change of pace and we saw some new faces, and some familiar ones as well.

The one good thing that has come out of COVID, was the ability to undertake my Masters in Water Security on-line through the University of Saskatchewan. I am a firm believer in lifelong learning, which is why my job delivering extension to producers in the Lakeland is such a pleasure. I really enjoy learning alongside all of you, and hosting different workshops/webinars.

I am really looking forward to (fingers crossed) hosting the Soil Health Academy this summer, hopefully in-person events are once again allowed. I want to thank those of you who have come out to our 2020 events and webinars, and have shown interest in environmental stewardship.

Cheers to a great 2021!

Kellie Nichiporik P. Ag.

Environmental Program Manager



2020 Board of Directors

Chair:	Wanda Austin
St. Paul County Rep:	Cliff Martin Kevin Wirsta (alternate)
Lac La Biche County Rep:	George L'Heureux Colette Borgun (alternate)
MD of Bonnyville Rep:	Marc Jubinville Mike Krywiak (alternate)
Smoky Lake County Rep:	Danny Gawalko Johnny Cherniwchan (alternate)
Producer Reps:	Murray Scott – MD of Bonnyville Ulf Herde – MD of Bonnyville Phil Amyotte – County of St. Paul Carl Agnemark – County of St. Paul Wanda Austin – Lac La Biche County Laurier Bourassa – Lac La Biche County Charlie Leskiw – County of Smoky Lake Barb Shapka – County of Smoky Lake
Lakeland Forage Association Rep:	Luc Tellier Chairman, LFA

2020 Staff

Manager and Forage and Livestock Program:	Alyssa Krawchuk
Cropping Program:	Amanda Mathiot
Agronomy Technician:	Stephanie Bilodeau
Environmental Program:	Kellie Nichiporik
Administration/Horticulture:	Charlene Rachynski
Full Time Staff:	Vic Sadlowski Dustin Roth
Summer Staff	Haley Dechaine Madalyn Polvi Hannah Tharle
LFA Pasture Managers:	Bob and Wanda Austin

Acknowledgements

The success of LARA's programs is a testament to the support and partnerships we have with a number of organizations and individuals within our operational area. LARA would like to thank the following contributors and partners in making 2020 another successful year.

Alberta Agriculture and Forestry (AF)
Canadian Agricultural Partnership (CAP)
Agriculture and Agri-Food Canada (AAFC)
Alberta Environment and Parks (AEP)

Municipalities & Counties

MD of Bonnyville
County of St. Paul
Lac La Biche County
Smoky Lake County

Associations & Societies

North Peace Applied Research Association
McKenzie Applied Research Association
Gateway Research Organization
Battle River Research Group
Grey Wooded Forage Association
West-Central Forage Association
Foothills Forage and Grazing Association
Peace County Beef and Forage Association
Chinook Applied Research Association
Agricultural Research and Extension Council of Alberta
Bonnyville Agricultural Society
Alberta Lake Management Society
Beaver River Watershed Alliance
Moose Lake Watershed Society
St. Paul Agriculture Society
Craigend Agriculture Society

Producers

Philip Amyotte
Guy Brousseau
Don Macyk
Luc Tellier

Industry and Producer Commissions

Alberta Beef Producers
Alberta Pulse Growers Commission
Alberta Wheat Commission
Alberta Barley Producers Commission
Alberta Canola Producers Commission
Canola Council of Canada

Agri-Businesses & Collaborators

AFSC Insurance
Agland St. Paul
Canadian Seed Growers Association, AB
Western Committee on Crop Pests
UFA – St. Paul and Vermilion
St. Paul Municipal Seed Cleaning Plant
FP Genetics
Crop Production Services
Cows and Fish
Bonnyville Veterinary Clinic
Bonnyville Municipal Seed Cleaning Pl.
Association of AB Seed Cleaning Plants
Caouette & Sons
Northern Quinoa Production Corp.
Imperial Seed
Mistol Seeds
La Co-op Federee Oats
B-C Ranch
Union Forage
Cover Crops Canada
Secan
Canterra Seeds

And the many, many other suppliers and producers who gave us a great deal of assistance!

Lakeland Agricultural Research Association Projects and Activities – 2020

Research and Demonstration Projects

Cropping Program

Regional Variety Trials – Cereals

- CWRS Wheat
- CPRS Wheat
- Oats
- Triticale
- Barley

Regional Variety Trials – Pulses

- Green Field Peas
- Yellow Field Peas
- Faba Beans

LARA Regional Variety Trial

Impact of Seeding Date on Spring Wheat

Use of ESN in Spring Cereals

- Wheat and Barley

Canola Performance Trial

Canola Seed Size

Liming and Crop Rotations

Pest Monitoring

Forage and Livestock Program

Regional Silage Trials

- Barley
- Triticale
- Pea-Cereal Mixture
- Alternatives
- Winter-Spring Cereals
- Oats

Perennial Forage Project

- Grass/Legume Mixture
- Grasses
- Legumes

Winter Grazing Strategies and Soil Health

Northern Range Enhancement Project

- Heifer Project

Environmental Program

Canada Thistle Stem Mining Weevils

Riparian Health Assessments

Tributary Monitoring Project

Cyanobacteria Monitoring Project

Alberta Soil Health Benchmarking Project

Cover Crops and Soil Health Project

Extension Activities

Workshops, Seminars and Webinars

Feed What You Need

Steve Kenyon and Greener Pastures Ranching

Farmer Appreciation Night

Clubroot Workshop

Cover Crops Workshop Day 1

Cover Crops Workshop Day 2

Moose Lake Watershed Society Annual Meeting

Holistic Management

LARA Research Update and AGM

Farm and Ranch Safety Workshop

Shining a Light on Mental Health in Agriculture

Smoky Lake Summer Field Day

Fort Kent Summer Field Day

St. Paul Summer Field Day

Lac La Biche Summer Field Tour

Soil Health Webinar Series

- Ray Archuleta, Soil Building Secrets
- Dr. Allen Williams, Adaptive Grazing
- Gabe Brown, Lowering Input Costs and Rejuvenating Soils

Water Treatment System Webinar

Soil Health Webinar

Education Events

Classroom Agriculture Program

Grade Seven Wetland Education

Lac La Biche Mad About Science

Alberta Open Farm Days

Demonstrations

Solar Watering System

Wheat Variety Demonstration

Hemp Demonstration

Growing Pulses Agronomic Demonstration

A Short Explanation of Various Statistical Terms Used in this Report

Least Significant Difference (LSD):

- Once the data from a test plot has been collected it can be used to calculate the Least Significant Difference (LSD). The LSD tells if one variety (or bushel weight, etc.) is significantly different than the other varieties in a test plot (same environment and soil conditions).
- Example: The LSD for a test plot has been calculated to be 2 bu/acre. If a test variety Ava differs from the other varieties by more than 2 bu/acre then there is a significant yield difference. We can say one variety yields higher than another. If the varieties are within 2 bu/acre then we cannot say the varieties yield differently.

Yield Grouping:

- Once the LSD is determined, each variety is assigned a yield grouping letter (A, B, C, etc.). By using yield grouping letters we can easily determine which varieties are significantly different. Varieties that share a letter will **NOT** be significantly different, but varieties that **DO NOT** share a letter **WILL** be considered significantly different.
- Example: In this example Bob, and Cora are **not** considered to be significantly different from Ava because they share the Yield Grouping letter A...but David, Evan, Frank and Gary **are** considered to be significantly different from Ava, because they do not have Yield Grouping letter A and therefore, it could be said that Ava has a higher yield than David, Evan, Frank and Gary.

Variety	Yield Grouping
Ava	A
Bob	AB
Cora	AB
David	BC
Evan	CD
Frank	CD
Gary	D

Coefficient of Variability (CV):

- The coefficient of variability (CV) is a measure of the consistency of the data from a plot. A lower CV value means that the data collected from the plot was consistent, which implies that the data collected is reliable and that accurate conclusions/recommendations can be made from these findings. A CV value of less than 20 is considered to be acceptable. The data from any plots that have a CV value of greater than 20 will be discarded to ensure the statistical accuracy of the tests. Discarding plot data that has a CV value of greater than 20 will prevent any skewing of the test results due to inconsistencies in soil quality or unexpected events like droughts or floods.

Bushel Calculation

- All bushels were calculated using 35.2L for volume, and test weight (0.5L) as measured

Smoky Lake County Agricultural Service Board 2020 Overview



Agricultural Pest Act

- 4 Agricultural Pest Inspectors Appointed
- 45 Clubroot Fields Inspected
- 4 Fields Inspected for Virulent Blackleg in Canola
- 3 Bertha armyworms locations Monitored throughout County for AB Ag
- 12 Grasshoppers monitored for AB Ag
- 2 Fields Sampled for Fusarium Head Blight in Wheat
- 44 Dams Blasted
- 41 Beaver tails brought in
- 4 New Water Stabilizers Installed
- 5 repaired/upgraded water stabilizers
- 0 Bottles of strychnine sold
- 504 Pocket Gopher Tails brought in
- 15 1080 pills distributed

Weed Control Act

- 3 Weed Inspectors Appointed
- 0 Weed Enforcements
- 40% of Municipal Rights of way's were sprayed for control of Weeds
- 2 Locations sprayed for Prohibited noxious weeds
- 200 Introduction Letters Sent
- 291 Inspections Completed
- All County roads owed once

Soil Conservation Act

- 2 Soil Conservation Inspectors Appointed
- Monitoring for different types of Soil erosion occurs throughout growing season



M.D. of Bonnyville 2020 – A Year in Review

This past year has been nothing short of a rollercoaster ride for most residents throughout the M.D. Thankfully, given the challenges the COVID-19 pandemic presented, it did not have as large of an effect on agriculture as it did on many other local industries. Looking back on 2020, we managed to accomplish multiple projects ranging from streamlining our clubroot inspections, all the way to completing the third year of our coyote scent post survey.

For clubroot in 2020, we inspected a total of 280 fields which yielded two positive cases, bringing the total positive field count to twelve within the M.D. Conclusive fields are moving eastward, however it appears our yearly cases are decreasing, which could be due to the use of resistant genetics becoming a more common practice. To streamline our clubroot work, we utilized a satellite imaging system to target canola fields during bloom, making it much easier for our inspectors to locate fields requiring inspection. This method will likely be put to use for upcoming years as well.

We have been seeing an increase in some of our prolific noxious weeds, namely scentless chamomile, oxeye daisy, and white cockle. These plants are increasingly difficult to manage, spread aggressively, and are invasive in nature. For those reasons, our inspectors will be out in full force once again come springtime to try and prevent or eliminate any infestations that may affect our fields. It is important to note to keep an eye out for an upcoming local workshop on white cockle that was delayed due to COVID restrictions.

Regarding pests, the 2020 insect survey results were quite variable from species to species. Grasshoppers, Bertha Army Worms, Wheat Midge, Diamondback Moth, and the Cabbage Seedpod Weevil were all below first warning level populations. Pea Leaf Weevil numbers were up and will be something to keep an eye on this spring, as high numbers in the fall are often indicative of a spring infestation. Producers who have seen a similar trend in their operation may want to consider a seed treatment in the 2021 growing season. The coyote and wolf reduction incentive program for the 2020-21 was suspended due to COVID-19 restrictions and will remain as such until further notice. Perhaps some of the data from our final year of the coyote scent post survey will help us understand population numbers for 2021-22.

Overall, we had a very successful and productive year through all the challenges we went up against. Here's goodbye to 2020 and best wishes to producers for a successful and prosperous 2021 growing season.

Matt and Janice



Lac La Biche County Agriculture Review 2020

Lac La Biche County Agricultural Service Board partners with Lakeland Agricultural Research Association to deliver agricultural extension services to producers in the County. The ASB values this relationship.

The County implemented its new Clubroot Management Agreement in 2020. The new agreement considers the uniqueness of each producer to address clubroot issues. The County continued its participation in the Northeast Regional clubroot surveillance program to better understand the movement of clubroot spores. Twenty-eight (28) brassica fields were surveyed in the year for clubroot. Also, six fields were inspected for Fusarium Head Blight disease. An additional six fields were surveyed for grasshoppers.

In 2020, the ASB completed mowing approximately 4,450 km of municipal roads (multiple passes). More than 500 weed inspections were completed in 2020. Thirty-three community garden plots were assigned in 2020. However, due to flooding, only 82.5 % were utilized over the season. The ASB started an industrial hemp project in 2020 and will continue in the coming year.

Lac La Biche County is beautiful by nature and trees are an essential part of this. Hence, this year, the ASB delivered over 596 tree seedlings to ratepayers. Trees that were not sold were donated to individuals and non-profit community groups. John and Mary Jane Knudsen of Lac La Biche received the 2020 Rural Beautification Award, for having the most beautiful farmstead in the County. Using the assistance of contracted trappers, 551 beavers that adversely impacted municipal infrastructure were trapped.

The ASB equipment was rented out to 60 ratepayers for a combined total of 230 days, compared to 120 days in 2019 (91.7% higher in 2020). The County's Agricultural Service Board provided two bursaries to two post-secondary students in natural resource management programs. Due to COVID-19, some extension programs and events were cancelled, including the Agricultural Appreciation Day; but will be re-scheduled as soon as it is safe to do so

Jacob Marfo (PhD, PAg)
Agricultural Fieldman, Lac La Biche County



County of St. Paul Agricultural Service Board 2020

The County of St. Paul and LARA have worked together for decades to bring relevant and innovative research and information to our producers and ratepayers. The ability to have a research organization like LARA in our area gives us the opportunity to access experts and regional information we otherwise would not have. The County of St. Paul supports LARA both financially and with in-kind contributions so they can continue the excellent work to help area producers succeed. LARA also ensures our area keeps the health of our environment foremost as we reap the benefits of our rich soil and resources. LARA and the County are working in our area for area producers.

2020 was the weirdest year I have ever lived through as the way we contact others was changed and we had to look at new ways to meet together and get our jobs done. Wearing masks was something I did only when spraying or shoveling grain but now I bring one along every time I leave the office which is currently in my home! After dealing with the shock of a pandemic producers went and did what they have done every year and that is to find a way to make our area productive and sustainable. Thankfully things found a new normal and we realized that we can overcome even a shortage in toilet paper.

Our County seemed to get adequate moisture and did experience some of the flooding that other areas in the province had to deal with. The early dry spring meant most producers could get their combining and seeding completed and avoid major disaster. There were many water issues caused by beavers this year and the County continued to try and control the rodents with a Reduction Program and hiring two trappers to make sure our roadways and culverts stayed open. Water issues are often difficult to solve but the County has a lot of tools we can use to help our ratepayers. If you are having a water problem, if no one else can help, and if you can call us, maybe you can use...the B-Team. (Note: B stands for Beaver)

We found clubroot on another 12 fields this year. After a high of 30 fields in 2017 we seem to have settled on around 10 new fields a year. The County of St. Paul continues to review our policy on clubroot and ensure it is staying in line with new developments in the industry. We continue to encourage producers to maintain at least a 2 year break in their rotation for canola. The widespread acceptance and use of clubroot resistant varieties of canola in the County is one way we are making sure canola will continue to be a viable crop here.

The County of St. Paul Agricultural Service Board thanks all of our producers for all the hard work they do to make sure we have a safe and bountiful food supply. We look forward to 2021 and working with you again and hopefully we can do it without masks and with plenty of toilet paper!

Keith Kornelsen
Agricultural Fieldman
County of St. Paul

Cropping Program



The producer's resource for pulses, oilseeds and cereals

The total crop production in Alberta has increased over the past five years and will continue to increase in the future. Much of this can be attributed to increased yields, which has been achieved through continuing research into crop agronomics (new varieties, best management practices etc).

With increased competition for land and high input costs, producers are looking to optimize production and maximize profits on their acres. LARA strives to help producer make the most of limited resources by improving agronomic practices, utilizing new technology and understanding the value of production.

The goals of this program are to:

- Aid producers in crop and variety selection
- Increase crop diversity through crop selection and variety selection
- Determine and demonstrate the viability of specialty crops in the Lakeland
 - Demonstrate current and emerging agronomic practices
 - Improve on-farm agronomic practices
- Address local agronomic concerns through demonstration and extension

Regional Variety Trials

Partners: Alberta Agriculture and Forestry
Alberta Wheat Commission
Alberta Pulse Growers
St. Paul Municipal Seed Cleaning Plant
County of St. Paul
Lac La Biche County
MD of Bonnyville
Agricultural Research and Extension Council of Alberta
Agriculture and Agri-Food Canada
Nutrien Ag Solutions
FP Genetics
SeCan
Canterra Seeds
Alliance Seeds
Philip Amyotte

Objectives:

1. To detail agronomic characteristics of new varieties and proven varieties in a specific geographic area.
2. To provide information about new varieties to local producers.
3. To conduct these tests yearly to produce long term data.

Background:

Regional Variety Trials (RVTs) have been used as a means of testing superior varieties under different environmental conditions. One of the goals of the RVTs is to help researchers and producers identify varieties that are suitable for each particular environment. Multi-location trials often show genotype x environment interaction due to differential response of genotypes to different environmental conditions. Information on the genotype x environment response obtained through RVT's may be helpful in identifying and selecting high-yielding varieties with specific or broad adaptations to their environmental conditions.

Efficiency in the RVT's depends on selecting a large number of locations within a region with varying environmental conditions and assigning to each location the variety most likely to succeed. It is also essential to assess varieties in the trial in terms of their productivity and quality, and to assess stability in yields across years.

The regional variety trials (RVTs) have been grown in the Lakeland since 1991. Each variety is tested for three years against a common check variety that is kept in the trial long-term. Each year, new varieties are added and older ones are removed from the trial. How a variety does relative to the check variety can be used as a comparison between varieties that are not grown in the trial at the same time.

The information gathered from these trials is important for producers first, to aid in crop variety selection and, second, to improve economic returns. Determining the cereal varieties that are best suited to production in the LARA area will aid producers in making the most economical decisions for their operations.

The data presented in the following tables is a useful tool for comparing varieties to each other. Information should not be used to determine how much a variety will yield, but **rather as a comparison of how one**

variety will yield in relation to another. The tables will tell how a certain variety yields statistically compared to another variety.

Methods:

The cereal plots for the Regional Variety Trials were seeded at the LARA Fort Kent Research Site (NE25-61-5-W4) and in the County of St. Paul (NE-18-60-9-W4) Agronomic information about the RVTs grown by LARA in 2020 are listed in Table 1. The trials were seeded using the LARA five-row Fabro zero-till small plot seeder. The plots were 1.15m x 6m in area with a 9" row spacing. All trials were seeded to a randomized complete block design with four replicates for pulses and three replications for cereals to reduce error.

Soil samples were taken in spring prior to seeding to check soil fertility and a blend fertilizer was side-banded at seeding for optimum yields. Pre-seeding burn-off and in-crop herbicides were utilized for weed control. Notes on lodging and height were taken during the growing season. The plots were harvested using a Wintersteiger small plot combine and information on yield, bushel weight, 1000 kernel weight and protein were recorded.

Although the varieties in the trials are set by the ABCGAC and seed companies, there is opportunity for local input.

Lodging is rated on a scale of 1-9 where 1 is perfectly erect and 9 is completely flat.

Table 1. Regional Variety Trial Agronomic Information, 2020

Test	Site	# of Varieties	Seeding Date	Fertility	Seeding Rate	Harvest Date	Rain (mm)
Barley	Fort Kent	21	15-May-20	125 lbs/ac 60-30-25-10	270 pl/m2	29-Sep-20	285.8
Barley	St. Paul	21	24-May-20	125 lbs/ac 60-30-25-10	270 pl/m2	02-Oct-20	279.4
CPSR Wheat	Fort Kent	11	15-May-20	125 lbs/ac 60-30-25-10	330 pl/m2	29-Sep-20	285.8
CPSR Wheat	St. Paul	11	24-May-20	125 lbs/ac 60-30-25-10	330 pl/m2	02-Oct-20	279.4
CWSR Wheat	Fort Kent	32	15-May-20	125 lbs/ac 60-30-25-10	330 pl/m2	29-Sep-20	285.8
CWRS Wheat	St. Paul	32	24-May-20	125 lbs/ac 60-30-25-10	330 pl/m2	29-Oct-20	279.4
Oats	Fort Kent	7	25-May-20	125 lbs/ac 60-30-25-10	300 pl/m2	30-Sep-20	260.8
Oats	Lac La Biche	7	20-May-20	125 lbs/ac 60-30-25-10	300 pl/m2	-	-
Triticale	Fort Kent	4	15-May-20	125 lbs/ac 60-30-25-10	310 pl/m2	30-Sep-20	285.9
Triticale	St. Paul	4	24-May-20	125 lbs/ac 60-30-25-10	310 pl/m2	02-Oct-20	279.4
Yellow Peas	St. Paul	13	12-May-20	50 lbs/ac 1-52-0-0	88 pl/m2	02-Oct-20	297
Green Peas	St. Paul	6	12-May-20	50 lbs/ac 1-52-0-0	88 pl/m2	08-Oct-20	297
Faba Beans	St. Paul	7	12-May-20	50 lbs/ac 1-52-0-0	44 pl/m2	08-Oct-20	297

Barley

The RVT barley trials were established at two locations, one in the County of St. Paul (NE-18-60-9-W4) and one at the LARA Fort Kent Research Site (NE 25-61-5-W4). Similar to previous years, all varieties had an overall higher yield at the St. Paul site likely as a result of differences in soil structure and quality as well as the environmental conditions between the locations during the growing season, particularly moisture. Rainfall at the Fort Kent site was 285.8 mm while the rainfall at the St. Paul site was lower at 279.4 mm. The yield data for Fort Kent and St. Paul are shown in table 2 and table 3, respectively.

CDC Churchill was a variety which was in the top five for both Fort Kent and St. Paul. The top variety at in Fort Kent was AB Advantage at 103 bu/ac which was 22% higher than AC Metcalfe. The top variety in St. Paul was KWS Coralie yielding 126 bu/ac which was 38% higher than AC Metcalfe

Overall the barley did very well this year considering the growing conditions and we hope to continue having success growing barley in 2021!

Table 2. RVT Barley Data Fort Kent, 2020

Variety	Yeild (bu/ac)	-	% of check AC Metcalfe	TWT (lbs/bu)	TKW (g)	Height (cm)
AB Advantage	103	a	122	311.23	48	92
CDC Churchill	101	abc	120	314.87	42	68
AB Wrangler	98	abc	116	309.67	41	83
TR18748	96	a-d	114	313.72	45	70
TR18747	96	a-d	114	318.93	46	82
CDC Copeland	89	a-e	106	305.9	42	80
AB Brewnet	89	b-e	105	322.37	48	95
TR 18647	87	b-e	103	306.4	39	83
Sirish	87	b-f	103	303.03	43	76
TR18749	87	c-f	102	317.23	47	85
CDC Copper	87	c-f	102	308.67	43	78
AC Metcalfe	85	a	100	321.67	42	74
AAC Synergy	83	d-g	98	303.37	43	90
KWS Coralie	80	e-h	94	281.57	42	63
AB Tofield	74	f-i	87	307.57	40	91
Esma	74	f-i	87	296.27	45	69
KWS Kellie	71	g-j	84	288.3	42	66
TR16742	67	hij	80	298.93	39	76
FB209	67	hij	80	299.57	46	97
CDC Austenson	67	ij	79	317.2	39	82
Torbellino	59	j	69	284.1	39	75
CV=9.16						

Table 3. RVT Barley Data St. Paul, 2020

Variety	Yield (bu/ac)	-	% of check AC Metcalfe	TWT (lbs/bu)	TKW (g)	Height (cm)
KWS Coralie	126	a	138	310.39	50	73
KWS Kellie	123	a	134	314.9	53	74
AAC Synergy	118	ab	129	331.7	50	105
CDC Churchill	114	abc	125	337.43	51	90
Esma	113	abc	124	323.8	54	75
CDC Copper	112	a-d	123	322.33	51	90
AB Brewnet	111	a-e	122	335.53	53	104
TR18747	110	a-e	121	341.8	57	99
TR18748	104	b-f	114	340.4	56	100
AB Advantage	101	b-f	111	323.47	53	107
TR16742	100	b-f	110	321.3	47	86
CDC Austenson	99	c-f	108	341.93	53	94
AB Tofield	98	c-f	108	329.6	47	102
TR18647	98	c-f	107	332.94	50	95
Sirish	97	c-f	107	325.03	51	77
AB Wrangler	96	def	105	329.4	49	97
Torbellino	95	def	104	310.93	50	77
FB209	93	ef	102	323.87	54	107
TR18749	92	f	101	336.41	55	95
AC Metcalfe	91	f	100	328	49	95
CDC Copeland	89	f	97	330.6	51	102
CV=9.41						

CPSR & CCHNR Wheat

The Canadian Prairie Spring Red (CPSR) and Canada Northern Hard Red (CCNHR) were also wheats grown in both Fort Kent (NE-25-61-5-W4) and St. Paul (NE-18-60-9-W4). WPB Whistler yielded top in both St. Paul and Fort Kent. WPB Whistler yielded 74 bu/ac in Fort Kent which is 18% higher than AAC Brandon and 43% higher than Carberry. AAC Castle was another variety that made top five at both research sites.

The yield data from CPSR & CCHNR wheat from Fort Kent and St. Paul are in tables 4 and 5, respectively.

Table 4. CPSR & CCHNR Wheat Data Fort Kent, 2020.

Treatment	Yeild (bu/ac)	-	% of Check Carberry	% of Check AAC Brandon	TWT (lbs/bu)	TKW (g)	Height (cm)	Protien
WPB Whistler	74	ab	143	118	372.6	39	80	10.96
CDC Reign	70	ab	134	111	380.57	37	74	11.55
HY2068	69	ab	133	110	398.07	34	79	11.38
AAC Castle	69	ab	133	110	376.47	36	84	12.06
CS Accelerate	66	ab	126	105	388.17	31	75	11.48
Pasteur	65	b	124	102	383.8	40	85	11.28
AC Andrew	64	b	124	102	371.3	36	79	10.25
AAC Penhold	63	b	122	101	388.13	42	75	11.97
LNR15-1741	63	b	121	100	380.07	32	75	11.46
AAC Brandon	63	b	121	100	373.9	36	78	11.67
Carberry	52	c	100		393.4	38	77	12.35
CV=8.57								

Table 5. CPSR & CCHNR Wheat Data St. Paul, 2020

Treatment	Yeild (bu/ac)	-	% of Check Carberry	% of Check AAC Brandon	TWT (lbs/bu)	TKW (g)	Height (cm)	Protien
Pasteur	104	a	163	138	358.2	40	92	9.62
WPB Whistler	104	a	163	137	330.47	39	82	8.50
AC Andrew	90	b	141	119	367.81	41	84	8.75
AAC Castle	90	b	140	118	377.4	42	89	10.90
HY2068	88	bc	137	116	373.93	39	94	10.83
CDC Reign	79	bc	124	104	340.56	38	81	10.73
LNR15-1741	79	bc	123	104	378.97	41	86	10.91
CS Accelerate	79	bc	123	104	381.67	39	82	11.30
AAC Penhold	78	c	122	103	385.87	48	82	12.16
AAC Brandon	76	cd	119	100	374.93	44	87	12.46
Carberry	64	d	100	84	372.73	42	85	12.31
CV=8.04								

CWRS & CWHWS Wheat

The Canadian Western Red Spring (CWRS) AND Canadian Western Hard White Spring (CWHWS) were grown in Fort Kent (NE-25-61-5 W4) and St. Paul (NE-18-60-9-W4). The CWRS and CWHWS wheat trial is the largest trial that LARA manages with 32 different varieties in this class. Data for Fort Kent can be found in Table 6. Table 7 illustrates the data that was obtained in St. Paul. The highest yielding variety in St. Paul was PT652 yielding 77 bu/ac which is 30% higher than AAC Brandon and 35% higher than Carberry. The top yielding variety in Fort Kent was AAC Russell yielding 78 bu/ac which was 34% higher than AAC Brandon and 47% higher than Carberry.

Overall, the trial did well and we are looking forward to growing this trial in the 2021 season. The yield data for the CWRS and the CWHWS for Fort Kent and St. Paul are in tables, 6 and 7 respectively.

Table 6. CWRS & CWHWS Wheat Data St. Paul, 2020.

Variety	Yield (bu/ac)	-	% of AAC Brandon	% of Carberry	TWT (lbs/bu)	TKW (g)	Height (cm)	Protein %
PT652	77	a	130	135	389.6	36	85	12.9
SY Gabbro	75	ab	127	132	391.23	43	88	12.59
AAC Redstar	73	abc	124	128	390.83	38	88	12.83
PT599	73	a-d	123	127	386.2	36	89	12.92
Rednet	72	a-e	122	126	386.83	38	85	12.9
AAC Broadacres	72	a-f	121	125	392.3	39	85	11.87
BW5045	72	a-f	121	125	380.6	34	82	12.65
BW5031 CL	70	a-g	119	123	385.73	39	84	12.87
CS11200214-17	68	a-h	116	120	387.43	40	88	12.75
CS Jake	68	a-h	115	120	387.67	37	86	13.98
PT598 CL	68	a-h	115	119	384.43	37	80	12.78
AAC Warman VB	68	a-h	114	118	395.8	38	90	13.09
AAC Russell	68	b-i	114	118	390.77	38	90	12.53
AAC Starbuck	66	b-j	112	116	386.93	35	83	12.4
BW1069	66	b-k	112	116	391.57	35	86	12.98
Daybreak	66	b-k	111	116	391.57	40	82	12.75
LNR15-1405	66	c-k	111	115	375.63	41	80	12.46
AAC Wheatland VB	65	c-k	110	114	385.67	33	80	12.11
Stettler	65	c-k	110	114	386.73	37	84	13.07
AAC Magnet	65	c-l	109	113	390.4	41	87	13.18
CDC Evolve	64	c-l	108	112	362.8	38	107	13
BW1093	64	d-i	107	111	386.33	35	78	12.84
Sheeba	63	e-l	107	111	390.43	40	88	12.49
CDC Ortona	62	f-l	105	109	389.03	36	89	12.64
SY Torach	62	f-l	105	109	383.1	29	77	13.44
SY Steel	61	g-l	103	107	384.67	37	94	13
AAC Brandon	59	h-m	100	104	384.87	38	84	12.55
Ellerslie	58	i-m	98	101	380.63	35	84	12.81
Carberry	57	j-m	96	100	390.1	37	82	12.38
BW5044	57	klm	96	99	384.43	36	81	12.69
CS Tracker	55	lm	94	97	386.1	36	85	13.41
AAC Elie	50	m	85	88	380.4	36	86	12.78
CV=8.98								

Table 7. CWRS & CWHWS Wheat Data St. Paul, 2020.

Variety	Yield (bu/ac)	-	% of AAC Brandon	% of Carberry	TWT (lbs/bu)	TKW (g)	Height (cm)	Protein %
AAC Russell	78	a-e	134	147	383.9	44	94	11.38
BW5045	78	a	133	146	359.7	39	89	11.99
BW1069	76	ab	130	144	379.7	41	93	11.29
BW5031 CL	75	abc	128	141	370.23	42	86	11.383
CS11200214-17	74	a-d	127	140	378.17	45	97	11.833
Daybreak	74	a-e	126	138	371.1	46	92	11.927
AAC Broadcast	73	a-e	125	137	43.387	381	84	11.26
AAC Starbuck	73	a-e	125	137	375.37	40	89	11.66
LNR15-1405	71	a-f	121	134	358.05	47	90	10.96
AAC Wheatland VB	71	a-f	121	133	385.3	41	83	11.34
PT652	70	a-g	120	132	373.97	38	97	12.513
PT598 CL	69	b-g	118	130	380.73	44	82	11.947
PT599	67	c-g	115	127	385.23	40	97	12.507
Ellerslie	67	c-h	114	125	380.5	42	100	12.74
CDC Orthena	66	d-h	113	125	391.17	41	103	12.413
BW1093	66	d-h	113	124	374	33	84	11.947
AAC Warman	66	d-h	113	124	382.9	40	103	12.04
Stettler	66	e-h	112	124	378.53	42	91	12.45
SY Gabbro	65	e-h	111	123	373.1	48	94	12.65
AAC Elie	64	e-h	110	121	375.1	45	84	12.81
AAC Redstar	64	e-h	110	121	392.63	44	92	12.98
CS Jake	64	fgh	109	121	375.17	41	95	13.65
SY Steel	64	fgh	109	120	368.83	42	86	12.697
Rednet	64	fgh	109	120	380.35	42	101	13.003
SY Torach	63	fgh	108	119	375.73	35	81	12.479
BW5044	63	f-i	107	118	375	44	83	12.19
AAC Magnet	61	ghi	104	115	384.77	44	93	13.457
AAC Brandon	59	hi	100	110	377.57	46	84	12.93
Sheba	58	hi	99	109	379.17	41	100	12.303
CS Tracker	58	hi	99	108	377.43	40	102	14.027
Carberry	53	ij	91	100	384.77	42	91	13.027
CDC Evolve	46	j	79	87	360.37	37	120	13.097
CV= 7.85								

Triticale

The Triticale trial this year was grown in Fort Kent (NE-25-61-5-W4) and in Mallaig (NE-18-60-9-W4). The RVT triticale is the smallest trial held at LARA consisting of four different varieties. Triticale is one of the higher yielding cereals variety trials over the past 12 years. This year T256 was one of the top two varieties both in St. Paul and Fort Kent.

Overall the triticale did well this year and we hope to continue having success growing triticale in the future. The yield from the triticale trial are in tables 8 and 9, respectively

Table 8. Triticale Data Fort Kent, 2020

Variety	Yeild (bu/ac)	% of Check Brevis	TWT (lbs/bu)	TKW (g)	Height (cm)
T267	103	109	323.83	49	90
T256	97	102	333.77	48	97
Brevis	94	100	360.53	50	100
Tyndal	80	85	349.03	53	105
CV=5.39					

Table 9. Triticale Data St. Paul, 2020

Variety	Yeild (bu/ac)	% of Check Brevis	TWT (lbs/bu)	TKW (g)	Height (cm)
Brevis	109	100	317.8	50	102
T256	96	88	318.73	50	105
T267	91	83	295.75	52	97
Tyndal	84	77	322.55	52	119
CV=3.8					

Oats

The Oats trials this year were grown in Fort Kent (NE 25-61-5-W4) and Lac La Biche, unfortunately with environmental conditions we were unable to collect data on the oats from the Lac La Biche site

CDC Endure surpassed the rest of the oat varieties yielding 191 bu/ac, which is 29 bu/ac more than AC Morgan which was the second-best yielding variety. CDC Endure was also 39% higher than the check which was CDC Dancer. The average height on the oats trial in Fort Kent was 111 cm. The yield from the oat trial is shown respectively in the table below

Table 10. RVT Oats Data Fort Kent, 2020

Variety	Yeild (bu/ac)	% of Check Dancer	TWT (lbs/bu)	TKW (g)	Height (cm)
CDC Endure	191	139	236.13	44	113
AC Morgan	162	118	226.67	40	108
CDC Skye	160	117	246.1	41	117
AAC Douglas	158	115	234.8	40	112
CFA 1502	156	114	240.13	42	101
CS Camden	153	112	233.83	44	111
CDC Dancer	137	100	242.1	38	114
CV=12.18					

Green and Yellow Field Peas

The field peas were grown in St. Paul with both green and yellow peas being assessed. There were 6 green pea varieties and 13 yellow pea varieties grown. We had difficulty this year with harvesting the peas due to very poor standability. The average height of the green peas was 84cm and the yellow pea's 84 cm.

AAC Comfort is the highest yielding of the green pea varieties at 51 bu/ac. CDC Inca yielded the highest among the yellow pea varieties. Compared to the check AAC Comfort surpassed the check by 13%. CDC Inca surpassed the check by 10%

The yield data for the green and yellow field peas are shown in table 11 and 12, respectively.

Table 11. RVT Green Field Pea Data St. Paul, 2020.

Variety	Yeild (bu/ac)	% of CDC Spruce	TWT (lbs/bu)	TKW (g)	Height (cm)
AAC Comfort	51	113	405.93	258	83
Garde	48	105	406.5	257	83
CDC Limerick	45	101	415.15	219	83
CDC Forest	45	101	409.64	252	86
CDC Spurce	45	100	413.31	272	82
Bluman	45	100	413.95	227	87
CV=9.63					

Table 12. RVT Yellow Field Pea Data St. Paul, 2020.

Variety	Yeild (bu/ac)	% of CDC Spruce	TWT (lbs/bu)	TKW (g)	Height (cm)
CDC Inca	56	110	414.78	262	83
CDC Spectrum	55	107	414.65	244	91
AAC Ardill	53	104	408.12	289	81
AAC Delhi	52	102	411.1	259	98
CDC Amarillo	51	101	409.9	249	85
CDC Lewochko	51	100	422.35	258	84
CDC Athabasca	51	100	407.05	275	78
AAC Barrhead	51	99	411.05	239	86
AAC Lacombe	50	99	410.8	256	79
AAC Profit	50	98	414.48	259	78
AAC Carver	49	96	414.1	269	83
LN4228	49	95	409.54	234	85
CDC Canary	40	79	411.05	251	81
CV = 10.55					

Faba Beans

Faba Beans were seeded in St. Paul this year, this was the first time in years that we were able to take mature faba beans off dry. There were seven varieties of faba beans grown in 2020. Fabelle was the highest yielding variety at 55 bu/ac followed by DL Tesoro at 52bu/ac. Overall we were very impressed with how easy the faba beans were to harvest and look forward to growing them again in 2021.

Table 13. RVT Faba Beans Data 2020.

Variety	Yeild (bu/ac)	-	% of Snowbird	TWT (lbs/bu)	TKW (g)	Height (cm)
Fabelle	55	a	119	410.58	579	112
DL Tesoro	52	a	113	412	623	108
CDC219-16	47	b	101	418.9	396	104
Snowbird	46	b	100	402.65	510	98
Malik	44	bc	96	397.25	648	103
NPZ 16.7610	40	cd	86	412.46	598	110
NPZ 16.7601	36	d	79	417.8	684	115
CV=6.6						

Canola Performance Trial

Partners: Canola Council of Canada
Alberta Canola Producers Commission
Saskatchewan Canola Development Commission
Manitoba Canola Growers Association
County of St. Paul
Philip Amyotte

Objectives:

1. To detail agronomic characteristics of new varieties and proven varieties in a specific geographic area.
2. To provide information on new varieties to local producers.

Background:

The canola performance trials (CPT) represent the next generation in variety evaluations for Western Canadian canola growers. The three Prairie canola grower groups – Alberta Canola Producers Commission, Saskatchewan Canola Development Commission and the Manitoba Canola Growers Association – fund the program. The Canola Council of Canada delivers the program on their behalf. Trials provide relevant and unbiased performance data that reflects actual production practices, and comparative data on leading varieties and newly introduced varieties.

The CPT trial test canola varieties in both small plot and field scale trials. In 2020 there were 34 small plots which showcased 16 standard canola varieties and 18 straight cut varieties. There were also 62 field scale trials in 2020 seeded in Western Canada, within these trials there were 16 standard varieties, 36 straight cut and 10 clubroot resistant varieties. The complete results of the different varieties can be found <https://www.canolaperformancetrials.ca/>.

Method:

The trial was seeded on May 23, 2020 in Mallaig in a randomized complete block design (RCBD) with four replications to reduce error. Prior to seeding soil tests were taken and a fertilizer blend (80-30-30-15) was side banded on at the time of seeding. The seeding rate for the CPT trial is dependent on the thousand kernel weight of the seed and is adjusted accordingly. The trial was seeded using the LARA Fabro five-row, zero till small plot drill. Each individual plot is measured 1.15 m x 6.5 m in area.

Results:

Unfortunately, due to environmental conditions this trial was terminated as it would not achieve statistical due to damage of canola because of excessive moisture. We are looking forward to growing the canola trials again in 2021.

Impact of varying rates of Environmentally Smart Nitrogen (ESN) on the performance Spring Wheat and Spring Barley in Northeastern Alberta

Partners: Philip Amyotte
Don Macyk
County of Smoky Lake
County of St. Paul
Top Gro Agro Ltd.
Canadian Agricultural Partnership
St. Paul Municipal Seed Cleaning Plant

Objectives:

1. To determine the impact of utilizing varying rates of Environmentally Smart Nitrogen (ESN) on spring wheat production in Northeastern Alberta.
2. To determine the impact of utilizing varying rates of Environmentally Smart Nitrogen (ESN) on spring barley production in Northeastern Alberta
3. To determine the economic feasibility of utilizing Environmentally Smart Nitrogen (ESN) in spring wheat production in Northeastern Alberta.
4. To determine the economic feasibility of utilizing Environmentally Smart Nitrogen (ESN) in spring barley production Northeastern Alberta.

Background:

Growth in grain crop yields has been declining in recent years while it is estimated that annual grain crop production will need to increase to around 3 billion tones by 2050 to feed a fast-growing human population (FAO 2009). According to the Food and Agriculture Organization (2009), this increase in crop yield will not come from land expansion in developed countries, but ninety percent will be from higher yields and increased cropping intensity.

A large portion of today's current food production numbers is due to the use of commercial fertilizers with Nitrogen (N), Phosphorous (P) and Potassium (K) and Sulphur (S). However, actual N uptake from fertilizer applied to a grain crop is estimated at only around 50%, with the rest lost through environmental events such as volatilization and denitrification. It can be determined that the use of commercial fertilizers will increase in order to meet production demands. The development of effective nutrient (N, P, K and S) management strategies will be key in maintaining and enhancing current grain crop production in Alberta.

The use of enhanced efficiency fertilizers, such as environmentally smart nitrogen or ESN, is one method of reducing N loss during grain crop production. Environmentally smart N is the most widely used slow-release N product on the market for agricultural crops (Walsh and Christiaens 2014). It is produced through the use of a flexible polymer coating or membrane that protects against loss mechanisms such as volatilization, denitrification or leaching. This coating allows water to imbibe into the granule to create a liquid solution that can then move out of the membrane based on crop N demands and soil temperature. The ability to match fertilizer use to crop requirements could translate into increased yield and overall cost savings to Alberta producers.

Method:

The trials were conducted in the County of St. Paul and Smoky Lake County using a randomized complete block design (RCBD) with four replications to reduce error. Prior to seeding, a soil sample was collected to determine fertility recommendations and a blend fertilizer was side-banded during seeding.

The wheat variety used was Stettler and the barley variety used was CDC Metcalfe. Five different inclusion rates of ESN as a percent of the total nitrogen in the fertilizer were used: 30%, 50%, 70% and 90%. Additionally, a check plot with no ESN was included for comparison. Unfortunately, due to a agricultural disaster in Smoky Lake County the site was partially flooded due to large amounts of precipitation. Because of this there was no data collected from the Smoky Lake plot site. All trials were seeded in May and harvested in October.

Results:

The results for the ESN Barley and Wheat are shown respectively in tables 1 and 2. In both the barley and wheat the treatments with 30% ESN yielded the highest followed by the treatments with 90% ESN.

Table 1. ESN Wheat St. Paul, 2020.

Treatment	Yeild (bu/ac)	% of check	TWT (lbs/bu)	TKW (g)	Height (cm)	Protien
ESN 30%	54	122	378.52	42	85	11.21
ESN 90%	51	113	378.73	44	78	11.11
ESN 70%	50	112	382.53	42	83	11.45
ESN 50%	46	102	382.41	43	82	11.22
Check	45	100	385.81	41	79	10.98
CV=6.45						

Table 2. ESN Barley St. Paul, 2020.

Treatment	Yeild (bu/ac)	% of check	TWT (lbs/bu)	TKW (g)	Height (cm)
ESN 30%	94	112	326.6	52	85
ESN 90%	94	111	327.05	52	84
ESN 50%	92	109	324.33	51	85
ESN 70%	88	104	328.5	53	81
Check	84	100	323.1	52	83
CV=7.38					

LARA RVT

Partners:

Smoky Lake County
St. Paul Municipal Seed Cleaning Plant
Canterra
Secan
Alliance Seeds
Luc Tellier
Jacque Plante
Don Macyk

Objectives:

1. To provide regional data on Oats, Barley and Wheat varieties to local producers
2. To produce long term data for producers

Background:

This trial was based off of the Regional Variety Trials. One drawback to the RVT trials is that a majority of the varieties are in the testing stage and are not registered or available for producers to purchase and grow on their own operations. LARA started the LARA RVT in Smoky Lake this year, the varieties chosen were selected based on previous trials grown at LARA and from the input of local producers.

Methods:

The varieties were seeded in a complete randomized block design (RCBD) with four replications to provide accuracy throughout at the Smoky Lake site. Prior to seeding, a pre-burn had taken place and a soil test had been taken in the spring and a custom blend for fertilizer was created. The fertilizer blend was side banded during seeding to create the total blend of (60-30-25-10). The trial was seeded using the LARA Fabro five-row, zero till small plot drill and seeded plots measured at 1.15m x 6.5 m in area. Notes on lodging and height were taken during the growing season and the trial was harvested on October 5th, 2020

Results:

The LARA RVT was grown to give producers a comparison between regional variety trials and common varieties grown in the area, allowing producers to see the difference in yield and height between different varieties grown in the area. The LARA RVT did well this year even with an overabundance of precipitation that was seen in the Smoky Lake County.

The highest yielding varieties were three oats varieties, with Nassar yielding the highest at 99bu/ac and Arbourg coming in second at 93 bu/ac. The highest yielding barley variety was CDC Coalition at 60 bu/ac followed by Seebe at 50 bu/ac. CDC Indus was the leading wheat variety at 63 bu/ac.

If you grow a different variety of cereals, then the ones in the table below and would like to see it grown in this trial. Please feel free to contact the office at 780-826-7260 and ask for Stephanie or Amanda.

Table 1. Performance data of LARA RVT Trial, 2020.

Treatment	Yeild (bu/ac)	-	TWT (lbs/bu)	TKW (g)	Height (cm)	Protien
Nassar	99	a	243.79	36	109	-
Arbourg	93	a	256.75	44	103	-
Haymaker	91	a	247.95	47	109	-
CDC Indus	63	b	378.16	42	85	7.34
CDC Coalition	60	bc	314.38	46	54	-
Seece	50	cd	322.9	51	73	-
CDC Austenson	49	d	322.21	51	61	-
AAC Brandon	41	d	401.3	40	79	11.76
Redberry	41	d	406	39	96	11.32
AAC Metcalf	40	d	313.59	48	62	-
CV=11.89						

Impact of Soil Temperature and Seeding Rate on Spring Wheat Performance

Partners: Alberta Wheat Commission
Alberta Agriculture and Forestry
MD of Bonnyville

Objectives:

1. To determine the impact on the performance and protein content of two varieties of spring wheat when using varying soil temperatures instead of calendar date to determine time of seeding.
2. To determine the impact on the performance and protein content of two varieties of spring wheat when using three different seeding rates on two different seeding dates (ultra-early and normal).

Background:

Current research has been focusing on the opportunity to seed wheat at an earlier date based on soil temperature than typically considered normal. Research led by Brian Beres of Agriculture and Agri-Food Canada (AAFC) has shown that there is no yield drag observed when planting into soil temperatures of 2-6 degrees Celsius as long as the soil surface is not frozen. These trials indicate that seeding early may require a higher seeding rate for the greatest benefit.

One of the primary risks of seeding early is the threat of early frost. However, wheat seedlings up to about the 5-6 leaf stage can survive short periods of cold temperatures as low as -8 degrees Celsius. At these temperatures, some leaves may be damaged but the whole plant will recover.

Despite the frost risk, there are many positive benefits of seeding wheat early, including:

1. Ability to harvest crops earlier than wheat seeded at higher soil temperatures. This could be particularly important in years similar to 2019 which saw a delay in crop development and harvest stretching well into November.

Although there has been plenty of research looking into the possibility of seeding wheat early, there has been a lack of assessment on the impact of protein content. To help investigate this concept further, LARA partnered with other Applied Research and Forage Associations across the province, Alberta Agriculture and Forestry and the Alberta Wheat Commission to seed two varieties of wheat at two different seeding dates. The two varieties chosen were: AAC Connery is considered an early maturing variety while AAC Brandon, although earlier maturing than some varieties, is later maturing than AAC Connery.

The two seeding dates were:

1. Ultra-Early: when the ground is first able to carry equipment and soil temperatures are between 2-6 degrees Celsius.
2. Normal: seeded at least 10-14 days later or when 'normal' seeding window occurs for the area (soil temperature between 10-12 degrees Celsius).

Method:

The trial was established at the LARA Fort Kent Research Farm (NE 25-61-5-W4) in a randomized complete block design with four replications to reduce error. The "Ultra-Early" seeding date was seeded on April 12, 2019 with snow still on the ground and soil temperatures at +4 degrees Celsius. No pre-seed herbicide was applied due to minimal weed germination prior to seeding. The "regular" seeding date was

seeded on May 13, 2019 using the same RCBD as the first seeding date. Soil temperatures were around +11 degrees Celsius at the time of seeding.

The treatments seeded are outlined below:

1. AAC Connery Light Rate = 71.1 g/plot
2. AAC Connery Medium Rate = 106.7 g/plot
3. AAC Connery High Rate = 142.3/plot
4. AAC Brandon Light Rate = 79.4 g/plot
5. AAC Brandon Medium Rate = 119.1 g/plot
6. AAC Brandon High Rate = 158.8g/plot

In-crop herbicide applications were applied in both blocks of plots based on weed pressure and any weeds not controlled by the application were hand pulled when necessary.

Plant counts were taken two weeks after planting to determine germination rate and head cuttings were taken to determine physiological maturity. The “Ultra-Early” trial was harvested on September 22nd, 2020 and the “Regular” trial was harvested on September 28th, 2020.

Results:

The pre-harvest emergence data for both trials are summarized in table 1. Although not significant, on average, higher emergence rates were seen in the “Regular” trial for all treatments except the light rate of AAC Connery. As expected with both trials, the high seeding rates had the greatest emergence followed by the medium rate and then the low rate.

Table 1. Pre-harvest emergence data, 2020

Treatment	Ultra Early Trial Plant Count	Treatment	Regular Trial Plant Count
AAC Connery High	78	AAC Connery High	92
AAC Brandon High	65	AAC Brandon High	69
AAC Connery Medium	57	AAC Connery Medium	63
AAC Brandon Medium	51	AAC Brandon Medium	51
AAC Connery Low	48	AAC Connery Low	40
AAC Brandon Low	36	AAC Brandon Low	37

After conducting the emergence counts, it was expected that the higher emergence rates with the higher seeding rates would translate into a yield boost at the end of the year. However, in both trials, the high seeding rates were not necessarily the highest yielding treatments. The harvest data for the regular seeding date and ultra-early seeding date are illustrated in tables 2 and 3, respectively.

Overall, the regular seeding date trial yielded an average of a couple bushels higher than the ultra-early seeded trial. AAC Connery, considered an early maturing variety, yielded lower than AAC Brandon in the ultra-early seeded trial and regular trial

Final protein content of the harvested grain varied significantly between the two trials with an average of 9.89% in the ultra-early seeding date trial compared to an average of 10.50% in the regular seeded trial (0.61%) difference between the two trials.

Another point to note is that the 1000 kernel weight (1000 KW) averaged the same between both the regular and ultra-early trial.

Table 2. Regular seeding date harvest data, 2020.

Treatment	Yeild (bu/ac)	Column1	TWT (lbs/bu)	TKW (g)	Height (cm)	Protien
AAC Brandon Low Rate	55	a	399.97	43	83	11.13
AAC Brandon High Rate	54	a	402.45	42	85	10.53
AAC Brandon Medium Rate	46	b	403.01	43	80	9.88
AAC Connery High Rate	44	b	403.69	42	84	10.551
AAC Connery Medium Rate	37	c	400.68	42	82	10.87
AAC Connery Low Rate	36	c	401.91	40	83	10.07
CV=8.77						

Table 3. Ultra-Early seeding date harvest data, 2020.

Treatment	Yeild (bu/ac)	Column1	TWT (lbs/bu)	TKW (g)	Height (cm)	Protien
AAC Brandon Low Rate	54	a	403.74	42	83	8.95
AAC Brandon High Rate	48	a	402.33	44	82	9.23
AAC Brandon Medium Rate	47	a	402.26	44	82	9.38
AAC Connery Medium Rate	40	b	396.65	41	83	10.70
AAC Connery Low Rate	39	b	397	42	82	10.62
AAC Connery High Rate	34	b	396.22	39	81	10.48
CV=9.76						

Impact of Soil pH > 7.2 on Crop Yields (Wheat, Yellow Pea's and Canola)

Partners:

Canadian Agricultural Partnership
Gateway Research Organization
University of Guelph
Canola Council of Canada
Graymont Western Canada Inc

Objectives:

1. To determine the annual impact on yield on plots treated with lime to a soil pH >7.2 vs none limed plots for a typical Alberta crop rotation of Canola, HR Wheat and Yellow peas over a three-year period.
2. Evaluate the effectiveness of different liming products.
3. Evaluate the effectiveness of increased soil pH (>7.2) on clubroot disease spore and disease occurrence on the roots (Gro site only)
4. Assessment of soil health at start of trial year 1 and at the end of trial year 3.

Background:

The number of fields infected with clubroot disease in Alberta, are still growing. Clubroot has been diagnosed in fields as far north as the Northern Sunrise County and as far south as Newell County and continues to spread. It has been found over all the Prairie Provinces.

Clubroot resistant varieties have been developed, launched and some have failed within a few years of becoming available on the market. The resistant has been overcome in close to 200 fields in Alberta (Nicole Fox M.Sc.)

Canola is Canada's most important agricultural sources of revenue generating about 25% of all farm cash receipts. Clubroot disease in canola was first found in Clubroot disease in canola can be considered the largest economic threat. Research done by Nicole Fox M.Sc. (The Evaluation of Lime Products as a Clubroot (*Plasmodiophora brassicae*) Management Tool) indicates that a soil pH >7.2 may be a viable tool for disease management. "Different lime products, and hydrated lime in particular, may represent an effective tool to manage *P. brassicae* in highly infested patches in a field, at field entrances and in acidic soils, by reducing clubroot severity on susceptible and resistant hosts. As such, the application of lime may help to supplement the use of genetic resistance, by reducing disease pressure and the potential for pathotype shifts."

In field trials where hydrated lime was used on a clubroot infected field (2018 - Edberg location, Keith Gabert) are showing some promising initial results.

This proposed project seeks to test different liming products, their effectiveness on clubroot disease management, and the impact of a soil pH (>7.2) on yield of HRS wheat, yellow peas and canola over a 3 year time period.

Increasing the soil pH to > 7.2 is not a common practice. Most of the research that has been done in Alberta or Northern British Columbia on soil pH amelioration has been done in the 1970 to early 1990. Since then many new varieties for wheat and peas have been developed and canola has replaced the production of rapeseed.

Most, if not all, of the research done at the time was focused on increasing soil pH by 1 pH unit to about 6 – 6.5. No information is available on crop yield when soil pH is increased to >7.2.

It is unclear what the impact is, if any, of raising the soil pH to >7.2 level on the productivity of other crops. For most crops it seems that the higher pH is just outside their optimum.

Farming practices and disease management tools have changed and greatly impacted the overall productivity of the crops over the last 30 years. Application of chemical fertilizer and sprays continues to have an acidifying effect on the topsoils with in 2019 about 50% of Alberta soils having a pH of 6.0 and lower (with 15-20% being <5.5pH). In 1970 this was estimated to be 21% of Alberta soils or 2.1 million acres, with 4% having a pH of 5.5 and lower (source: Doug Penney, Lacombe June 26 2019).

Application of lime has been suggested to also improve the soil health (Plant-Soil Interactions at Low pH: Principles and Management pp 703-710) as yield improvement have been recorded even as soil pH has returned to initial pre-treatment levels.

Method:

The three trials were seeded on June 18th at the Fort Kent research site in a complete randomized block design (CRBD) with four replications to reduce error. These trials will keep the same CRBD until 2023. Prior to seeding, two soil samples were taken on each individual plot at 1-3” and 3-6” to determine application rate of lime needed to be applied from a soil curve that was created from the soil tests. Lime was applied to the plots at the appropriate rate required. Treatments can be seen below. This trial was seeded using a fertilizer rate of 125 lbs (60-30-25-10) which was side banded at the time of seeding. The trial was seeded using LARA Fabro five row small plot drill and the individual plots measured 1.15 x 6.5m in area.

Treatments

1. Check (none applied)
2. 100% hydrated lime
3. 75% hydrated lime & 25% zero grind limestone
4. 50% hydrated lime & 50% zero grind limestone
5. 25% hydrated lime & 75% zero grind limestone
6. 100% zero grind limestone

Production and yield measurements are gathered for a three-year crop rotation using Canola, Hard Red Wheat and Yellow Field Peas grown on soil with adjusted pH to >7.2. Soil pH is amended to >7.2 using the following treatments:

Throughout the growing season notes were taken on emergence, height, lodging, disease pressure and yield. The trial was harvested on September 10th, 2020.

Results:

Due to being seeded late, the first year of the trial was seeded into barley that was silage. Data was still collected off of the trial and can be seen in the table below. An observation made from looking at the table below is that the trials that had the highest crude protein was found in the plots that had the higher levels of zero grind limestone.

Table 1. Liming Canola Plots, 2020

Treatment	Ton/ac	Height cm	Moisture %	CP%	ADF%	NDF%
100% 0 -Grind Limestone	4.18	125.7	68	11.69	37.24	54.01
Check,	4.16	123.6	69	11.12	36.3	53.5
75% Hydrated Lime 25% 0 - Grind Limestone	3.81	124.8	68	10.71	39.63	57.84
50% Hydrated 50% 0 - Grind Limestone	3.76	120.8	67	11.5	34.48	49.97
25% Hydrated 75% 0 Grind Limestone	3.72	124.7	71	11.86	38.6	55.89
100% Hydrated Lime	3.71	124.8	68	11.17	36.48	54.19

Table 2. Liming Pea Plots, 2020

Treatment	Ton/ac	Height cm	Moisture %	CP%	ADF%	NDF%
Check,	3.67	118.9	70	12.17	35.9	52.26
100% Hydrated Lime	3.88	126.4	70	11.66	34.81	51.09
75% Hydrated Lime 25% 0 - Grind Limestone	3.58	128.2	72	12.32	34.64	48.95
50% Hydrated 50% 0 - Grind Limestone	3.43	128.7	72	12.54	35.85	60.97
25% Hydrated 75% 0 Grind Limestone	3.54	126.4	70	12.34	36.35	54.35
100% 0 -Grind Limestone	3.56	126	71	12.1	37.52	55.39

Table 3. Liming Hard Red Wheat Plots, 2020

Treatment	Ton/ac	Height cm	Moisture %	CP%	ADF%	NDF%
Check,	3.38	120.2	70	11.96	36.52	54.14
100% Hydrated Lime	3.32	122.8	70	11.62	36.52	54.95
75% Hydrated Lime 25% 0 - Grind Limestone	3.4	124.4	71	11.99	33.44	48.21
50% Hydrated 50% 0 - Grind Limestone	3.9	124.2	70	12.61	36.38	53.75
25% Hydrated 75% 0 Grind Limestone	3.69	125	70	12.85	36.02	54.3
100% 0 -Grind Limestone	3.6	124.5	71	12.66	34.69	50.37

Overall, we were impressed with the results and look forward to growing HR Wheat, Peas and Canola in this trial in 2021.

Demonstrations: Alternative Crops: Quinoa

Partners: Northern Quinoa
County of St. Paul

Objectives:

1. To assess the growth and establishment of quinoa in Northeastern Alberta.
2. To assess the yield and quality of quinoa in Northeastern Alberta.

Background:

With soil borne diseases such as clubroot, producers are often looking for alternative crops that can fit into their rotation and bring a profit. Quinoa is a small grain cereal which is very versatile and has health benefits as it is considered a complete source of protein.

Quinoa thrive in high altitude conditions and adapts well to the growing conditions of the Canadian Prairies. Quinoa favors our cool and dry climate which is similar to the climate in South America where quinoa originates. Regions north of highway 16 are prime candidates for growing quinoa but their higher temperatures can cause sterilization and reduce yields.

Seed bed preparation is very important when growing quinoa, Because the seed is very small the seedling can become stressed if there is too much competition and perform poorly due to weeds, heavy stubble or trash. Picking a field which is clean will help the quinoa prosper as there are no registered herbicides. Another consideration when choosing a field to grow quinoa is what the crop rotation looks like for the field. Field history and what herbicide have been applied is important as quinoa is susceptible to multiple residual herbicides. Quinoa should also not be seeded into a field which was in canola the previous year due to increased risk of volunteers which will compete with the seedlings.

Discussion:

In partnership with Northern Quinoa based out of Saskatoon, SK LARA seeded two trials which were assessed throughout the growing season. The trials were seeded in May and we utilized best management practices that were established for canola such as fertilizer recommendations. The Quinoa did well during the growing season with insect pressure continuing to be an issue this year, causing consistent crop scouting required to ensure timely pest control.



Figure 1,2 & 3. Quinoa grown in 2020

Pest Surveys

Partners: Alberta Agriculture and Forestry
Lac La Biche County
County of St. Paul
MD of Bonnyville
Canadian Agricultural Partnership
SARDA Ag Research
Alberta Wheat Commission
Alberta Pulse Growers
Alberta Canola Producers Commission
Alberta Barley Commission

Objectives:

1. To participate in a complete pest monitoring program for Alberta.
2. To ensure the best, most current pest information is extended in a timely, appropriate manner for Northeastern Alberta producers.
3. To participate in a coordinated network of survey gatherers providing up-to-the-minutes information for Alberta crop producers, media, industry and professionals.

Introduction (Portions of this article are taken directly from the “Alberta Pest Monitoring Network Manual”).

The goal of using Integrated Pest Management (IPM) surveys is to be able to provide enough information for these surveys so that early warnings of an increase in pest population are sent out in Alberta. Some of the pests surveyed in Alberta are Bertha Armyworm, Diamondback Moth, Cabbage Seedpod Weevil, Orange Blossom Wheat Midge, Grasshoppers, Wheat Stem Sawfly, Cutworms, Fusarium Headlight, Fusarium Wilt, Clubroot and Blackleg. For pests that have a short amount of lead-time, the Prairie Pest Monitoring Network provides a dynamic web-based system that updates the risk information on a daily basis. As the surveys are completed and the information is entered, the pest risk map changes to reflect the new information. Being forewarned allows producers and agronomists to be informed about certain pests they should be looking out for so that timely scouting and control tactics can be implemented before crop losses occur. The dynamic nature and timeliness of the information available to the agriculture industry would be a valuable asset to enhance decision making for producers, agronomists, and researchers.

In 2020, LARA participated in the pest surveys which included, Diamondback Moth, Bertha Armyworms, and the Orange Blossom Wheat Midge. The regional data that we collected was then sent to the provincial authorities. The information collected is compiled and can be found on Alberta Agriculture and Forestry website under the Pest Monitoring Network. Producers can see if there are any insect outbreaks that they should be informed about in their area so that a plan for appropriate action can take place in a timely matter.

Methods:

Bertha Armyworm:

Bertha Army worms are one of the most significant pests of canola in Canada. Their impact on crops occurs throughout Manitoba, Saskatchewan, Alberta, and the interior of British Columbia. Severe moth infestation may occur throughout most of this area but are usually limited to the parkland area of the Prairies and the

Peace River region of British Columbia and Alberta. Within our partnering Countyies and Municipal Districts including the M.D of Bonnyville, Lac La Biche County and the County of St. Paul, all trap sites had numbers well below the first warning level of 300 moths. The harsh cold winter of 2019-2020 with a high amount of snow and the cooler growing season with high amounts of precipitation could have had an impact on these low numbers. Approaching the growing year of 2021, the cold winter with a minimal amount of snow that we are currently experiencing in this region may lower the chance of an outbreak of this pest. But staying alert with these surveys and scouting your fields is always a good precaution to take in case of an outbreak.

In most years the population of Bertha's have been kept low due to unfavourable weather conditions such as cold winters, cool growing seasons, higher amounts of precipitation, and disease. These weather conditions can fail in some dry years with mild winters that might allow population to increase dramatically creating potential for widespread outbreaks. In extreme situations, population more than 1,000 larvae per square metre have been reported, but most commonly you would see populations that can fall between 50-200 larvae per square metre.

Infestation outbreaks can be localized or widespread over a number of acres. In the case of widespread outbreaks, crop losses can be minimized by applying an insecticide but only if the infestation was detected early enough. Failure to detect this insect early can lead to incorrect timing of insecticide application resulting in the possibility of severe damage to your crop. Also, high outbreaks may lead to a shortage of pesticide if suppliers are not aware of the potential infestation.

Bertha Armyworm populations are monitored with the use of pheromone baited traps that are used to attract the adult male moths. Two traps are placed a little way in from the edge of a canola crop and are 50 m apart from each other. The traps are checked once a week and a moth count done each time. The traps are put out in the fields from June-August. Each bertha moth (adult) counted is considered one armyworm larvae.

Diamondback Moth:

Diamondback Moths first migrated into North America from Europe over 150 years ago. The insect now occurs throughout North America or wherever the host plant is grown. The diamondback moth larvae typically feed on most plants found in the Brassicaceae family and, in Alberta, canola and mustard are its primary targeted plants. Within our partnering Municipal District of Bonnyville we only had one site for Diamondback Moths and the numbers were well below the economic threshold of 100 to 150 larvae per square metre. This insect is hard to predict what the population could be like for 2021 as it varies on population size in the spring. As well, timing, larvae size, and plant size can contribute to this variable infestation.

The adult moths may overwinter in the prairies but they typically arrive on wind currents in the spring that come from southern or western United States or northern Mexico. Although the Diamondback Moths occur each year throughout the Canadian prairies and north central states, the severity of the infestation varies from year to year due to the arrival time and population size of the spring migrants.

Infestation of Diamondback moths can be very severe when spring conditions are suitable to the population. The insect damage is typically done by the larvae stage as they feed on the canola plants. They prefer to feed on plant tissues such as stems, leaves, flowers, and developing pods. In some years, millions of dollars in damage can be done so prevention tactics should be considered with drier seeding conditions.

The diamondback moth traps contain pheromones that attract the male moths. These traps are typically placed out during the last week of April (1 week prior to seeding). 2 traps are placed at opposite ends of the field approximately 100 metres apart from each other. They are checked weekly by removing the fly paper from the trap and counting the moths. The traps are left out for six weeks but if population increases at a later time the traps may be left out past that time duration.

Orange Blossom Wheat Midge:

Orange Blossom Wheat Midge is found in most acres around the world wherever the host plant is grown. In recent years, there has been cases of population outbreaks reported in Alberta, Saskatchewan, Manitoba, and several regions of British Columbia.

Infestations of wheat midge can be damaging towards your crop yield and the grade of harvested grain. Wheat midge populations can exist in a low population and begin to build up rapidly in some years when favorable conditions are met. Wheat midge damage can be easily mistaken for frost or drought damage if not properly scouted for at the correct timing.

Damage is typically done by the larval stage as they feed on the developing wheat kernels causing them to shrivel, crack, and become disfigured. This damage is not easily seen as there is no physical external change in discoloration, size, or misshapen seed heads. Analyzing the developing kernels in the glumes is the easiest way to assess damage. Damage to the seed kernels can vary within a single wheat head. There may be a few kernels that might not be fully developed and may be too small and light and they will pass through the combine and be disposed with the chaff. And in other cases, a few kernels may be aborted from the plant entirely. Scouting timing is most critical to be done in the time period between heading and flowering stage because if damage is spotted then proper control actions could be put into place.

During the fall of 2020, LARA sent in 11 composite soil samples taken at a depth of 6 inches throughout our operational area. In total, 4 samples were taken from the MD of Bonnyville, 5 samples from the County of St. Paul and 2 samples from Lac La Biche County. Soil samples taken within the County of St. Paul showed larger numbers of cocoons in the soil. Similarly, the samples taken in the MD of Bonnyville and Lac La Biche County saw low signs of Wheat Midge eggs. Consequently, the risk for Wheat Midge outbreaks in 2021 is considered low, but producers should still be aware, keep updated with pest surveys and still scout for them in your crop as wet years can cause an increase in Wheat Midge populations.

Pea Leaf Weevil:

The Pea leaf Weevil is a native insect to Europe. Its attacks were first recorded in Alberta in 2000 near Lethbridge, Alberta. This insect mainly targets pulse crops and has been a problem insect in Faba beans since 2014. In 2020, the Pea Leaf Weevil population migrated to more northwestern portions of central Alberta and southern Alberta has now seen lower populations of the insect. Within the MD of Bonnyville, Pea Leaf Weevil damage from the surveys conducted in late May- early June resulted in increase in the presence of insects in 2020. This is something for producers to keep an eye on. Producers who have seen similar trends on their operation, might want to consider using a seed treatment.

Spring weather conditions have a huge impact on timing and severity of Pea Leaf Weevil damage. With warm weather reaching a temperature around 20 degrees Celsius during the time of late April or early May can cause a spike in early arrival within fields. Early arrival can correspond with early insect damage which can decrease yields. Cooler spring conditions can delay arrival of the insect which can lower the risk of yield damage especially if the plant surpasses the six-node stage before the weevil arrives.

The adult Pea Leaf Weevil feeds on the leaves and growing points of the seedlings of legumes/pulses. This feeding leaves notches in a scalloped pattern along the leaf margins. As for the Pea Leaf Weevil larvae, they are root feeders. They target the nitrogen fixing nodules on the roots of the legume plants resulting in partial or complete inhibition of nitrogen fixation by the plant. A good prevention tool to consider when growing pulses is the use of a seed treatment with your seed.

Canola Sweeps

In 2020, LARA also participated in a regional survey where canola sweeps were taken to identify any unidentified insects. We sampled 4 sites in the M.D of Bonnyville, 2 Sites in Lac La Biche County, and 5 sites in the County of St. Paul. These sites were spread out through each county to get better results and the sweeps were taken at the early bloom stage (25% flower). At each site, 10 sweeps were taken and then placed in a sample bag. From the sweeps taken, there was no new alarming insects found in the crop.

Comments:

Pest surveys are an important tool to use as it allows you to be notified of any insect outbreak that may occur within the growing season. They allow producers to be aware of insect outbreak potential and purchase seed treatments or other chemical beforehand. They are also useful for chemical representatives as they can estimate how much product they should have on hand for producers to purchase if needed. Regarding 2020 pest surveys, it has been overall a very good year for low insect pressure. All of the results from the surveys have been well below the economic thresholds. The forecast for 2021 in the Lakeland should be a relatively good year for low insect pressure. However, it should be in your best practice to continue to monitor the pest surveys as weather conditions may change and be suitable for an insect outbreak of some sorts.

Forage and Livestock Program



The producer's resource for forage production, feeding and grazing

The single most variable cost in livestock production is feed! From grazing in summer on tame and native pastures to feeding in the winter through conventional or extended grazing systems to animal marketing, cost effective production begins and ends with forage/feed. This program aims to aid producers in decreasing their cost of production while increasing their value of production.

The goals of this program are to:

- Demonstrate effective winter feeding systems in Northeastern Alberta
- Reduce costs associated with winter feeding systems
- Improve crop production efficiency through feed testing, ration-balancing, pasture/grazing management etc.
- Determine the highest yielding and quality annual crops for whole-plant forage production
- Aid producers in annual and perennial forage selection
- Provide producers with current marketing options and risk management strategies

Lakeland Forage Association

The Lakeland Forage Association (LFA) was formed in 1972 to promote the management and use of forage crops, and to identify and pursue the forage crop research needs of Northeastern Alberta. The LFA provides forage demonstrations, extension activities and coordination of forage research. The governing board of directors currently has 13 members who are elected for staggered three-year terms at the LFA annual general meeting. They are responsible for the management of the Olympic Lake Grazing Lease.

The Olympic Lake Lease was obtained by LFA in 1985, has grown to 2000 acres and has been used for two main projects: the Northern Range Enhancement Project (NREP) and the Olympic Lake Heifer Project.

Under the NREP, this lease was used as a demonstration for turning boreal forest land into an enhanced, sustainable rangeland. Range improvements have included clearing and breaking the land, windrowing, and spraying and burning. This pasture has been rotationally grazed for 20 years (currently there are 12 paddocks) and so fencing was also involved in the range improvements. Grazing capacity has almost doubled in the past 20 years. Now that the pasture has been developed the focus has changed from development to increasing pasture longevity and rejuvenating older pastures. Projects with this goal have included yearly rotation of fertilizer application, spraying weeds (trials have included Grazon, Remedy, and Restore) and introducing legumes into the pastures.

The Heifer Project has been tracing the effect of body weight and body condition on heifer fertility for over ten years. The heifers are weighed at the beginning and the end of the grazing season. These measurements are then compared to the fall pregnancy test results. From 2010 to 2013, the heifers were weighed two additional times, when they are switched from tame pasture to native brush pastures around the end of July and then when they switch from these native pastures back to the tame pastures around mid-September.

LFA would like to thank Bob and Wanda Austin who have been managing the Olympic Lake Lease for the past ten seasons and doing a great job!

In addition to managing the Olympic Lake Lease the LFA acts as the forage and livestock advisory board for Lakeland Agricultural Research Association (LARA).

Northern Range Enhancement Project

Partners: Lakeland Forage Association
Lac La Biche County
Bob and Wanda Austin

Objectives:

1. To monitor the weight of heifers entering and exiting the pasture.
2. To evaluate methods of pasture rejuvenation.
3. To develop a complimentary grazing system, allowing for maximum utilization of tame and native species.

Background:

The Lakeland Forage Association (LFA) obtained Grazing Lease N. 840055 from the provincial government in 1985. The lease is located in Lac La Biche County near Olympic Lake (NE17-64-14) and was originally 1500 acres. A second lease was obtained by LFA to increase the pasture to 2000 acres. At the time the lease was obtained, the pasture had not been grazed for 15 years and no formal range improvement had taken place.

The LFA has used the Olympic Lake Grazing Lease as a demonstration for turning boreal forest land into an enhanced sustainable rangeland. Four different treatments have been used to increase carrying capacity: 1) clear and break, 2) spray and burn, 3) windrowing and 4) fertilizing. Rotational grazing has been practiced for the past 20 years and management improvements, such as cross-fencing, fertilizing and spraying, have been utilized to increase carrying capacity. The pasture has gone from carrying 998 Animal Unit Months (AUMs) in 1990 to 1607 in 2006. In 2010 1130 AUM's were grazed on the pasture, allowing some recovery from the drought in 2009. The cattle are rotated through the paddocks in a high intensity, low frequency grazing system.

Now that the pasture has been developed the focus has changed to increasing pasture longevity and pasture rejuvenation. Similar to other pastures in Northeastern Alberta, aspen encroachment and old pastures are a problem.

Every year approximately 15 patrons are given allotments for up to 30 heifers and one bull. The grazing season typically runs from mid-June to early-mid October.

In 2020, there was one project at the Olympic Lake Grazing Lease.

1. Heifer project

Heifer Project

Methods:

The heifers were weighed when they entered the pasture on June 3th, 2020. The bulls were pulled on July 30st, 2020, allowing for a 60-day breeding period. At this time the heifers were weighed for a second time. The heifers were removed from the pasture on September 28th, 2020 allowing for adequate grass carryover for the 2021 grazing season. The heifers were weighed for a third time at the time of take-out in September. Similar to previous years, the heifers were not pregnancy checked. The pasture received a total of 15 inches of rain over the grazing season.

Results:

There was a total of 117 days in the grazing season at Olympic Lake Grazing Lease (table 1, figure 1). The average daily gain (ADG) over the grazing season was 1.55 lbs/day (table 2), which is higher than that seen in 2019 of 1.24 lbs/day.

Table 1. Grazing rotation for the 2020 grazing season at Olympic Lake Grazing Lease.

Pasture Rotation - Olympic Lake 2020										
Paddock Name	First Graze					Second/Third Graze				
	Date In	Date Out	# of days	# of head		Date In	Date Out	# of days	# of head	
Headquarters	Jun-3	Jun-4	1	350	12	Sep-27	Sep-28	1	399	0
Pipeline	Jun-4	Jul-6	2	350	12	July-29	July-30	1	399	13
W3	Jun-20	Jun-26	6	399	14	Aug-31	Sep-4	4	399	0
W5	Jun-26	Jul-2	7	399	14	Sep-4	Sep-9	5	399	0
W1	Jul-6	Jul-11	5	399	14	Sep-9	Sep-12	3	399	0
W4	Jul-2	Jul-6	4	399	14	Sep-15	Sep-18	3	399	0
W2	Jul- 11	Jul-16	5	399	14	Sep-12	Sep-15	3	399	0
C2	Jun-13	Jun-20	7	399	14	Jul-22	Jul-27	5	399	14
C2						Sep-18	Sep-21	3	399	0
C3	Jul-16	Jul-20	4	399	14	Sep-24	Sep-26	2	399	0
C4	Jun-11	Jun-14	3	349	12	Jul-20	Jul-22	2	399	14
C4						Sep-26	Sep-27	1	399	0
C1	Jun-6	Jun-11	5	350	12	Jul-27	Jul-29	3	399	14
Pipeline						Sep-21	Sep-24	3	399	0
Headquarters										
S1	Jul-30	Aug-10	12	399	0					
B1										
E1	Aug-10	Aug-31	21	399	0					
		Total:	82				Total:	41		



Table 2. Heifer data by herd for the 2020 grazing season.

Herd	2020 Heifer Weights			Heifer Average Daily Gain (ADG)					
	June lbs	August lbs	September lbs	June 3 – July 30 lbs gained	57 days lbs/day	July 30 - September 28 lbs gained	60 days lbs/day	June 3 - September 28 lbs gained	117 days lbs/day
1	700	868	919	168	2.95	51	0.85	219	1.87
2	774	886	957	112	1.96	71	1.18	183	1.56
3	899	982	1069	83	1.46	87	1.45	170	1.45
4	809	967	1013	158	2.77	46	0.77	204	1.74
5	758	852	905	94	1.65	53	0.88	147	1.26
6	811	949	1027	138	2.42	78	1.30	216	1.85
7	847	975	1029	128	2.25	54	1.0	182	1.56
8	743	810	860	67	1.17	50	0.83	117	1.00
9	653	771	873	118	2.07	102	1.70	220	1.88
10	826	930	981	104	1.82	51	0.85	155	1.32
Average	782	899	963	117	2.05	64.30	1.08	181.30	1.55

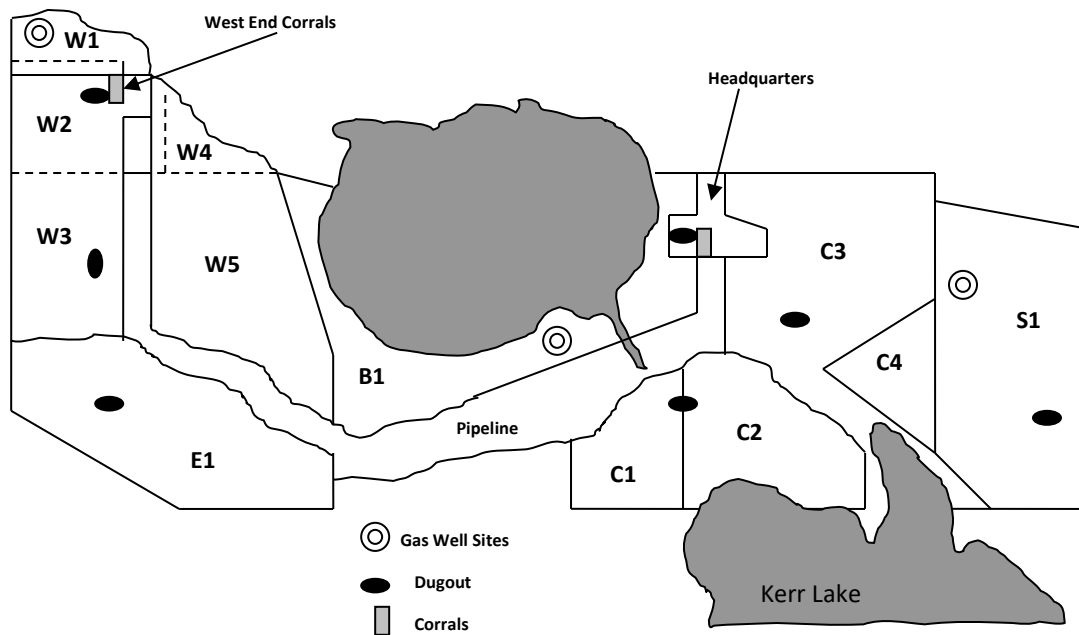


Figure 1. Map of the Northern Range Enhancement Project (NREP) pasture system.

Discussion:

There was a total of 10 patrons grazing cattle at Olympic Lake in 2020 with herd size ranging from 30 heifers and 1 bull to 60 heifers and 2 bulls in partnerships. All red or black angus heifer bulls were used for breeding between June 4th and July 30th.

The average herd entry weight at 782 lbs was 2 lbs lower seen in 2019 which is likely the results of the breed and age of the heifers. The herd weight gain ranged from 117 lbs to 220 lbs over the grazing season with an average of 181 lbs, which is 29 lbs higher than 2019 average heifer weights. The length of the grazing season was longer in 2020 than 2019 due to high moisture throughout the season allowing for

greater grass growth. The average daily gain (ADG) decreased between August and September to 1.08 lbs/day from 2.05 lbs/day seen from June to August. This has consistently been seen throughout the years although the drop in ADG will vary.

The stocking rate at the Olympic Lake Lease has slowly declined since 2009, which has allowed for significant recovery and improvement of the pasture. The historical data for the pasture is summarized in table 3.

The high moisture during the grazing season allowed for excellent pasture growth.

Table 3. Historical data from Olympic Lake Grazing Lease. 2003-2020.

Year	Grazing Season (days)	# of Head	Weight Gain	ADG	% Open
2020	117	399	181	1.55	N/A
2019	113	390	152	1.24	N/A
2018	105	410	123	1.17	N/A
2017	123	388	158	1.29	N/A
2016	121	350	141	1.16	N/A
2015	102	280	-	-	N/A
2014	133	271	266	2.00	28
2013	120	336	205	1.71	17
2012	126	343	139	1.1	9
2011	121	350	223	1.86	14
2010	120	350	170	1.43	14
2009	111	410	124	1.13	19
2008	128	369	224	1.76	14
2007	126	435	130	1.03	18
2006	127	462	-	-	18
2005	127	439	156	1.22	13
2004	127	427	163	1.35	10
2003	131	410	116	0.9	10
Average	124.63	373.71	171.42	1.41	14.5

Regional Annual Silage Trials

Partners: Alberta Agriculture and Forestry
Battle River Research Group
Chinook Applied Research Association
Gateway Research Organization
North Peace Applied Research Association
McKenzie Applied Research Association
West-Central Forage Association
Farming Smarter
SECAN
Association of Albert Co-op Seed Cleaning Plants
Alberta Brand, Canadian Seed Growers Association
A & L Canada Laboratories
Philip Amyotte
Canadian Agriculture Partnership

The Annual Forage Trial (AFTs) began at LARA in 2008 with the purpose of comparing annual forage crops for whole-plant production when considering both yield and quality. Funding was obtained from the Alberta Beef Producers and the Ag and Food Council. The trial was seeded in four blocks of plots (barley, oats, triticale and alternatives) in three locations (Fort Kent, St. Paul and Lac La Biche).

The trial was expanded in 2009 to form the Regional Silage Trials, a provincial partnership between six applied research and forage associations with 11 plot sites across the province. The Alberta Beef Producers provided funding for this initiative and Alberta Agriculture helped coordinate seed. While many of the associations involved have been growing silage trials for a number of years, this is the first coordinated effort to standardize the protocol, variety selection and data reporting. Provincial protocol was established for five blocks of plots: barley, oats, triticale, pulse and late-seeded.

In 2020, the LARA Regional Annual Silage Trial included six blocks: barley (14 varieties), oats (10 varieties), triticale and Wheat (10 varieties), winter/spring intercrop (12 treatments), pulse (12 treatments) and alternative (10 varieties).

In partnership with the Association of Alberta Co-op Seed Cleaning Plants and the Alberta Seed Growers Association, the Regional Annual Silage Trial information will appear in the spring 2021 Alberta's Seed Guide (seed.ab.ca).

Regional Annual Silage Trial

Cereals

Partners: Canadian Agriculture Partnership
Alberta Agriculture and Forestry
Battle River Research Group
Chinook Applied Research Association
Gateway Research Organization
Smoky Applied Research and Demonstration Association
West-Central Forage Association
Farming Smarter
Peace Country Beef and Forage Association
Philip Amyotte

Objectives:

1. To determine the best yielding cereal forage varieties (barley, oats, triticale/wheat and winter/spring intercrop) for whole plant forage production in Northeastern Alberta.
2. To determine the best quality cereal forage varieties (barley, oats, triticale, wheat and winter/spring intercrop) for cattle feed in Northeastern Alberta.

Background:

An important aspect of crop production is variety selection and, with new varieties continually becoming available, current and comprehensive forage variety yield and quality data is essential for Alberta producers. Previous experience with cereal production and the Regional Variety Trials has shown that there can be a 15% increase in production from selecting the best variety, which, on average, can be an increase of \$25/acre.

Through the use of experience, neighbors and publication such as the Alberta Seed Guide (seed.ab.ca), we make variety selection decisions to benefit producers. However, there has been a lack of whole-plant annual forage production information to aid us in making cropping decision for forage production.

The purpose of this trial is to supply producers with current and comprehensive annual forage variety yield and quality data for silage, greenfeed or swath grazing in Northeastern Alberta (crop zones 3 and 5) and across the province.

Method:

The cereal trials were grown in three blocks of plots: barley, oats and triticale/wheat, in two location: St. Paul (SW30-60-9-W4) and Fort Kent (NE25-61-5-W4). The trial blocks were seeded as a randomized complete block design (RCBD) with four replicates to reduce error. The plots measured 1.15 m by 6 m in area.

Agronomic information on the trials can be found in table 1. The trials were seeded using the LARA five-row zero-till small plot drill and blend fertilizer was side-banded at the time of seeding. The trials in Fort Kent were seeded on May 25, 2020 (barley, oats and triticale/wheat) and the trials in St. Paul were seeded on May 28, 2020 (oats) and May 29, 2020 (barley and triticale/wheat). The winter/spring cereal trials in St.

Paul were seeded on June 11, 2020 and the trial in Smokey Lake was seeded on June 22, 2020. The trials were sprayed with a 3-point hitch sprayer once during the growing season.

Total rainfall for St. Paul site was 270.5 mm and the Fort Kent site was 239.1 mm.

Crop height and stage of maturity was recorded prior to harvest with the LARA alfalfa-Omega self-propelled forage harvester. The total plot weight was recorded and samples were taken to assess dry matter content. Additional composite samples were taken from each variety, frozen and sent to A & L Canada Laboratories for wet chemistry analysis. Statistical analysis was conducted using ARM 9, $p = 0.05$.

The following varieties were grown in the Regional Annual Silage Trials in 2020:

Barley

- *CDC Austenson* – 2-row barley variety with semi-smooth awns, short and strong straw and high feed yield.
- *Altorado* – 2-row, spring feed barley with good resistance to lodging and a fair to good resistance to drought conditions.
- *Amisk* – rough awned, 6-row, semi-dwarf general purpose barley with strong straw for decreased lodging potential.
- *Canmore* – high yielding, 2-row general purpose barley variety with good resistance to lodging.
- *CDC Cowboy* – high yielding, 2-row feed barley variety with excellent standability and improved disease resistance.
- *AB Advantage* – 6-row, smooth-awned feed and forage barley with high grain yield and good agronomic performance.
- *Claymore* – 2-row barley variety developed from CDC Copeland x Xena.
- *AB Cattlelac* – semi-smooth awned barley variety with good lodging resistance, good grain yield and excellent disease resistance.
- *AB Wrangler* – 2 row feed grain and silage variety with high tonnage potential, early to medium maturing, moderate disease resistance.
- *CDC Bow* – 2-row, hulled malting barley with good agronomic performance and grain quality that is widely adapted across western Canada.
- *SR18524* – 6 row feed and forage barley, high yields, good lodging resistance.
- *Sundre* – high yielding, 6-row barley variety with good disease resistance.
- *CDC Maverick* – 2-row, smooth-awned forage barley with high forage yields and good drought tolerance.
- *TR18647*- 2 row hulled general purpose barley with potential for forage production, high protein, low NDF and ADF.

Oats

- *CDC Baler* – very leafy, forage oat variety.
- *AC Juniper* – early maturing, general purpose oat variety with high yields and strong straw.
- *AC Morgan* – high yielding, later maturing milling oat with good lodging resistance and is commonly used for silage or greenfeed.
- *CDC Haymaker* – later maturing forage oat variety with high forage yields and quality.
- *CDC Seabiscuit* – high yield milling oat variety with good straw strength for reduced lodging.
- *CS Camden* – milling oat, excellent yield potential, great lodging resistance, short height, and big leaf biomass

- *CDC Arborg* – is a new milling oat with good yield potential, early maturing, lodge resistant.
- *Murphy* – widely adapted forage oat with high yields, improved lodging resistance and is well suited for silage, swath grazing or greenfeed.
- *CDC Nasser* – new feed oat variety with low lignant hull and high oil content.
- *ORE 3542 M* – new white hulled milling oat variety with short, strong straw, good lodging resistance and good grain yields.

Triticale and Wheat

- *Taza* – reduced awn forage and grain triticale variety with good lodging resistance.
- *Bunker* – early maturing, reduced awn forage variety with great digestibility, high fat content and high silage yields.
- *Sunray* – early maturing, spring triticale variety with improve ergot resistance. Short statured for increased resistance to lodging.
- *AAC Paramount* – soft white spring wheat, midge tolerant, high grain protein, good fit for silage production
- *AAC Awesome* – soft white spring wheat, midge tolerant, high yield, and excellent straw strength, good for silage production.
- *AAC Delight* – spring triticale, reduced awn forage variety with low ergot susceptibility and quality high tonnage.
- *T256* – new spring forage triticale variety with reduced awns, shorter stature and increased digestibility.
- *AC Andrew* – soft white spring wheat variety with high yields and short, strong straw.
- *AC Sadash* – semi-dwarf soft white spring wheat variety with high yields, high quality and short, strong straw.
- *KWS Alderon* – high yielding special purpose red spring wheat, short stature, strong straw, late maturing, does well in cooler growing seasons.

Table 1. Agronomic Information 2020.

		# of	Seeding	Seeding	Fertility	Weed	Harvest
Trial	Site	Varieties	Date	Rate	(lbs/ac)	Control	Date
Barley	Fort Kent	14	25-May-20	250 lbs/ac	60-30-25-15 @ 239 lbs/ac	Curtail M	14-Aug-20
	St. Paul	14	29-May-20	250 lbs/ac	60-30-25-15 @ 239 lbs/ac	Curtail M	17-Aug-20
Oats	Fort Kent	10	25-May-20	250 lbs/ac	60-30-25-15 @ 239 lbs/ac	Curtail M	18-Aug-20
	St. Paul	10	28-May-20	250 lbs/ac	60-30-25-15 @ 239 lbs/ac	Curtail M	20-Aug-20
Triticale/Wheat	Fort Kent	10	25-May-20	250 lbs/ac	60-30-25-15 @ 239 lbs/ac	Curtail M	18-Aug-20
	St. Paul	10	29-May-20	250 lbs/ac	60-30-25-15 @ 239 lbs/ac	Curtail M	17-Aug-20
Winter/spring	St. Paul	12	11- June- 20		60-30-25-15 @ 239 lbs/ac	Curtail M	8-Sept-20
	Smokey Lake	12	22-June-20		60-30-25-15 @ 239 lbs/ac	-	-

Results: Barley

The barley trials are aimed to be harvested at the soft dough stage. There were 14 barley varieties grown in the trials this year at both locations. There were 3 new varieties added to the trial in 2020 including SR18524 and TR18647 which are experimental varieties which are not yet released but are being

developed for forage use. AB Wrangler is a new variety that was released and it is showing good promise for forage and livestock production. The yield and quality results of the Fort Kent and St. Paul trials can be found in Tables 2 and table 3, respectively. The Fort Kent trials was harvested 81 days after seeding and the St. Paul trial was harvested 80 days after seeding. Average moisture content of the Fort Kent trial was 69% and the St. Paul trial was 50%,

This year we saw higher yields in our St. Paul location of 4.51 ton/acre compared to an average yield in Fort Kent at 3.42 ton/acre. The highest yielding variety in Fort Kent was AB Advantage at 3.99 ton/acre which slightly exceed AB Cattlelac at 3.90 ton/acre. The highest yielding variety in St. Paul was Sundre at 6.45 ton/acre which was significantly higher than the other varieties.

Quality remained relatively consistent throughout the two trials. When considering Crude Protein (CP), the general rule of thumb is 7-9-11 percent for mid-gestation, late-gestation and after calving. The majority of the varieties are adequate to meet the nutrients requirements through mid-gestation to late-gestation. Similar to the CP the total digestible nutrients (TDN), which is an easy method to estimate the amount of energy in the feed, is adequate to meet the requirements through mid-gestation to late-gestation but it lacks for after calving following the rules of 55-60-65.

Table 2. RST Barley Fort Kent, 2020 (ton/acre, 1 ton = 2000 lbs).

Variety	DM Yield		DM Yield	Height	Lodging	2020 Quality Results							
						CP	ADF	NDF	TDN	Ca	P	K	Mg
	(ton/ac)		(% Austenson)	(cm)	(1-9)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
<i>CDC Austenson</i>	3.39	ab	100.00	85	6	11.70	34.92	49.45	61.69	0.25	0.19	1.03	0.18
<i>AB Advantage</i>	3.99	a	117.87	98	3	12.85	33.00	49.69	63.19	0.46	0.23	1.02	0.22
<i>AB Cattlelac</i>	3.90	a	115.16	94	6	12.84	37.73	56.67	56.51	0.56	0.16	1.11	0.23
<i>AB Wrangler</i>	3.37	ab	99.41	83	4	12.35	35.98	51.80	60.87	0.49	0.18	0.94	0.20
<i>Altorado</i>	3.33	ab	98.46	79	6	12.28	38.71	59.38	58.74	0.34	0.20	1.20	0.23
<i>Amisk</i>	2.97	b	87.68	80	7	13.73	32.01	47.56	63.96	0.50	0.21	1.01	0.21
<i>Canmore</i>	3.28	ab	96.75	79	6	13.88	37.15	57.68	59.96	0.52	0.19	1.07	0.26
<i>CDC Bow</i>	3.43	ab	101.33	87	5	12.32	35.91	54.52	60.93	0.25	0.17	1.25	0.16
<i>CDC Cowboy</i>	3.62	ab	107.00	105	4	12.98	35.66	54.39	61.12	0.45	0.21	1.13	0.23
<i>CDC Maverick</i>	3.58	ab	105.73	103	7	13.02	31.49	48.19	64.37	0.35	0.20	0.86	0.18
<i>Claymore</i>	3.59	ab	106.00	81	6	12.26	35.95	52.07	60.90	0.31	0.20	1.18	0.20
<i>SRI8524</i>	3.00	b	88.60	71	6	12.68	34.89	49.96	61.72	0.41	0.23	1.17	0.21
<i>Sundre</i>	3.08	b	90.99	84	5	12.63	40.04	61.68	57.71	0.56	0.16	1.15	0.24
<i>TR18647</i>	3.36	ab	99.20	90	6	13.48	35.07	52.41	61.58	0.35	0.22	1.04	0.21
<i>Average</i>	3.42		87			12.79	35.61	53.25	61.16	4.37	0.20	1.08	0.21
<i>CV</i>	8.89												

*lodging rated on a 1-9 scale where 1 is erect and 9 is completely flat.

**average moisture content at the time of harvest was 69%.

Table 3. RST Barley St. Paul, 2020 (ton/acre, 1 ton = 2000 lbs).

Variety	DM Yield (ton/ac)		DM Yield (% Austenson)	Height (cm)	Lodging (1-9)	2020 Quality Results							
						CP (%)	ADF (%)	NDF (%)	TDN (%)	Ca (%)	P (%)	K (%)	Mg (%)
<i>CDC Austenson</i>	4.31		100.00	86	1	11.30	35.28	53.27	61.41	0.35	0.19	1.30	0.12
<i>AB Advantage</i>	5.30		123.08	103	3	11.55	34.19	46.48	62.27	0.39	0.20	1.39	0.12
<i>AB Cattlelac</i>	5.05		117.28	94	1	10.83	32.72	46.12	63.42	0.30	0.21	1.07	0.12
<i>AB Wrangler</i>	5.56		129.05	87	4	10.42	35.45	51.52	61.28	0.40	0.17	1.21	0.12
<i>Altorado</i>	4.36		101.21	74	1	10.38	35.23	51.04	61.46	0.32	0.19	1.28	0.11
<i>Amisk</i>	3.09		71.76	66	1	11.99	33.82	46.81	62.55	0.33	0.23	1.37	0.10
<i>Canmore</i>	4.84		112.33	90	1	11.99	32.02	45.32	63.95	0.43	0.21	1.28	0.12
<i>CDC Bow</i>	4.27		99.23	75	1	10.11	34.81	51.16	61.78	0.33	0.19	1.06	0.10
<i>CDC Cowboy</i>	5.05		117.35	107	2	10.46	33.01	47.11	63.19	0.29	0.22	1.08	0.14
<i>CDC Maverick</i>	5.46		126.87	107	2	11.04	32.60	48.87	63.51	0.35	0.21	0.97	0.15
<i>Claymore</i>	4.76		110.61	83	3	10.41	35.03	50.27	61.61	0.40	0.19	1.10	0.12
<i>SR18524</i>	3.62		83.95	75	1	11.18	31.10	45.14	64.67	0.31	0.24	1.13	0.13
<i>Sundre</i>	6.45		80.07	85	1	9.87	35.26	50.40	61.43	0.42	0.20	1.24	0.14
<i>TR18647</i>	4.09		94.94	79	1	10.67	32.78	45.75	63.37	0.22	0.21	1.02	0.12
<i>Average</i>	4.51		104.84	86		10.87	33.81	48.52	62.56	0.35	0.20	1.18	0.12
<i>CV</i>	21.8												

*lodging rated on a 1-9 scale where 1 is erect and 9 is completely flat.

**average moisture content at the time of harvest was 50%.

Oats

The oat trials are aimed to be harvested at the milk stage. There were 10 oat varieties grown in the trial this year in Fort Kent (NE25-61-5-W4) and St. Paul (SW30-60-9-W4). The results of Fort Kent trial can be found in table 4 and the results of the St. Paul trial can be found in Table 5. The average moisture content at the time of harvest in Fort Kent was 68% and in St. Paul it was 58%. This is the third year that the experimental variety ORE3542 M has been included in this trial, which is not yet available to commercial producers. Some varieties that were new to our trial this year were CDC Arbourg and CS Camden.

The Fort Kent trial was harvested at 85 days after seeding and the St. Paul trial was harvested at 84 days after seeding.

The varieties yielded higher at the Fort Kent Location with an average of 4.73 tons/acre compared to an average of 4.21 tons/acre at the St. Paul site. CS Camden yielded the highest in Fort Kent at 5.77 tons/acre. CDC Baler yielded in the top three in Fort Kent at 5.51 tons/acre, this is a common variety that

is typically grown for forage production. CDC Baler yielded the highest at the St. Paul site yielding at 4.84 tons/acre.

The new variety CDC Arbourg yielded in the top three at the St. Paul site at 4.61 tons/acre but yielded at bit lower at the Fort Kent site at 4.51 tons/ acre.

Table 4. RST Oats Fort Kent, 2020 (ton/acre, 1 ton = 2000 lbs).

Variety	DM Yield (ton/ac)		DM Yield (% Baler)	Height (cm)	Lodging (1-9)	2020 Quality Results							
						CP (%)	ADF (%)	NDF (%)	TDN (%)	Ca (%)	P (%)	K (%)	Mg (%)
<i>CDC Baler</i>	5.51	a	100.00	136	4	12.38	36.36	55.35	60.55	0.40	0.12	0.99	0.18
<i>AC Morgan</i>	5.07	ab	92.02	119	1	14.35	37.93	59.13	59.35	0.29	0.12	1.70	0.17
<i>AC Juniper</i>	3.91	cd	77.07	110	3	12.42	39.11	58.85	58.43	0.25	0.14	1.53	0.19
<i>CDC Arbourg</i>	4.52	bc	115.55	123	3	12.52	37.96	56.44	59.33	0.26	0.14	1.23	0.19
<i>CDC Haymaker</i>	5.31	a	117.46	120	6	12.98	36.86	55.61	60.16	0.26	0.18	1.37	0.19
<i>CDC Nassar</i>	4.17	cd	78.58	109	5	13.40	40.79	64.56	57.13	0.33	0.12	1.13	0.20
<i>CDC Seabiscuit</i>	5.52	a	132.25	114	7	11.66	37.45	54.64	59.73	0.24	0.16	1.07	0.14
<i>CS Camden</i>	5.77	a	104.55	109	5	12.41	35.28	50.02	61.42	0.20	0.14	1.33	0.14
<i>Murphy</i>	3.45	d	59.75	113	2	13.01	39.46	61.93	58.16	0.32	0.10	1.22	0.25
<i>ORE 3542 M</i>	4.05	cd	117.65	109	2	12.50	38.80	59.16	58.68	0.21	0.11	1.38	0.16
<i>Average</i>	4.73			116		12.76	38.00	57.57	59.36	0.28	0.13	1.30	0.18
<i>CV</i>	8.53												

*lodging rated on a 1-9 scale where 1 is erect and 9 is completely flat.

**average moisture content at the time of harvest was 68%.

Table 5. RST Oats St. Paul, 2020 (ton/acre, 1 ton = 2000 lbs).

1 trVariety	DM Yield (ton/ac)		DM Yield (% Baler)	Height (cm)	Lodging (1-9)	2020 Quality Results							
						CP (%)	ADF (%)	NDF (%)	TDN (%)	Ca (%)	P (%)	K (%)	Mg (%)
<i>CDC Baler</i>	4.84	a	100	121	1	11.58	34.01	50.30	62.41	0.29	0.17	1.38	0.14
<i>AC Morgan</i>	4.09	ab	84.60	97	1	11.33	37.19	52.47	59.93	0.28	0.21	1.92	0.15
<i>AC Juniper</i>	4.03	ab	98.46	96	1	11.54	35.90	49.58	60.93	0.29	0.18	1.70	0.15
<i>CDC Arbourg</i>	4.61	ab	114.27	104	1	10.28	37.47	53.56	59.71	0.19	0.17	1.36	0.11
<i>CDC Haymaker</i>	4.10	ab	89.03	106	1	11.77	34.89	50.53	61.72	0.34	0.17	1.67	0.17
<i>CDC Nassar</i>	4.40	ab	107.27	101	1	11.57	35.14	50.25	61.52	0.26	0.18	1.90	0.12
<i>CDC Seabiscuit</i>	4.75	a	108.07	103	1	12.01	34.52	47.49	62.01	0.27	0.23	1.12	0.15
<i>CS Camden</i>	3.95	ab	83.17	92	1	11.86	35.88	49.63	60.95	0.33	0.21	1.69	0.17
<i>Murphy</i>	3.84	b	97.22	98	1	10.89	38.04	54.25	59.27	0.31	0.16	2.06	0.14
<i>ORE 3542 M</i>	4.21	ab	109.55	98	1	12.50	35.70	50.58	61.09	0.27	0.17	1.53	0.16
<i>Average</i>	4.21			102		11.53	32.61	60.95	60.95	0.19	0.19	1.63	0.15
<i>CV</i>	8.87												

*lodging rated on a 1-9 scale where 1 is erect and 9 is completely flat.

**average moisture content at the time of harvest was 58%.

Triticale and Wheat

The triticale and wheat trials are targeted to be harvested at the late milk stage. This year there were 3 soft white wheat varieties that were added to this trial, AAC Paramount, AAC Awesome, KWS Alderon. AAC Delight was also added to the trials this year as it is a forage triticale due to its short awns and its resistance to ergot. The results of the Fort Kent and St. Paul trials can be found in tables 6 and 7, respectively. The average moisture content at harvest for Fort Kent was at 60% and at St. Paul it was 58%. The Fort Kent trial was harvested 84 days after seeding and the St. Paul trial was 80 days after seeding.

The trials yielded higher in fort Kent trial at 4.67 tons/acre and 3.39 ton/acre in St. Paul. Bunker yielded the overall highest in both trials at 6.09 ton/acre for Fort Kent and 4.37 ton/acre in St. Paul. In Fort Kent AC Sadash yielded the highest for the soft white wheat at 4.38 tons/ac. In the St. Paul trial, KWS Alderon Yielded at 3.66 ton/acre which was slightly higher than the other soft white wheat varieties.

The quality in Fort Kent trial averaged CP at 13.13% while the St. Paul trial averaged at 11.59 % which still both meet the requirements for beef cattle nutrient requirements.

Table 6. RST Triticale Fort Kent, 2019 (ton/ac, 1 ton = 2000 lbs).

Variety	DM Yield (ton/ac)		DM Yield (% Taza)	Height (cm)	Lodging (1-9)	2019 Quality Results							
						CP (%)	ADF (%)	NDF (%)	TDN (%)	Ca (%)	P (%)	K (%)	Mg (%)
<i>Taza</i>	5.09	b	100.00	118	1	12.85	34.74	56.14	61.84	0.24	0.25	1.27	0.14
<i>AAC Awesome</i>	3.82	c	74.97	92	1	13.59	39.11	58.43	59.52	0.30	0.16	2.06	0.17
<i>AAC Delight</i>	5.26	b	103.30	117	1	11.55	35.12	57.14	61.54	0.17	0.20	0.78	0.17
<i>AAC Paramount</i>	4.28	c	84.04	91	3	13.26	37.55	57.49	59.65	0.27	0.18	1.55	0.19
<i>AC Andrew</i>	3.77	c	73.92	85	1	13.56	33.50	49.32	62.80	0.25	0.22	1.64	0.19
<i>AC Sadash</i>	4.38	c	86.06	83	1	13.10	34.53	51.51	62.00	0.24	0.21	1.38	0.17
<i>KWS Alderon</i>	4.10	c	80.50	80	1	15.15	36.16	57.65	60.73	0.21	0.23	1.72	0.20
<i>Bunker</i>	6.09	a	119.48	134	1	12.10	35.76	56.46	61.04	0.21	0.18	1.13	0.15
<i>Sunray</i>	5.47	b	107.40	109	1	13.04	33.06	51.79	62.15	0.31	0.22	1.17	0.17
<i>T256</i>	4.43	c	87.02	96	1	11.18	33.32	53.32	62.95	0.22	0.21	1.05	0.16
<i>Average</i>	4.67			100		13.13	35.29	54.93	61.52	0.24	0.21	1.38	0.17
<i>CV</i>	8.41												

*lodging rated on a 1-9 scale where 1 is erect and 9 is completely flat.

**average moisture content at the time of harvest was 60%.

Table 7. RST Triticale St. Paul, 2020 (ton/ac, 1 ton = 2000 lbs).

Variety	DM Yield (ton/ac)		DM Yield (% Taza)	Height (cm)	Lodging (1-9)	2020 Quality Results							
						CP (%)	ADF (%)	NDF (%)	TDN (%)	Ca (%)	P (%)	K (%)	Mg (%)
<i>Taza</i>	3.89	ab	100.00	104	1	11.24	36.26	55.37	60.65	0.14	0.25	1.11	0.09
<i>AAC Awesome</i>	3.09	bcd	79.32	89	1	11.68	34.32	55.39	62.18	0.17	0.24	1.56	0.10
<i>AAC Delight</i>	2.56	d	65.68	95	1	12.27	35.28	55.71	61.44	0.16	0.27	1.08	0.10
<i>AAC Paramount</i>	2.61	d	66.91	82	1	11.47	35.96	56.14	60.89	0.16	0.21	1.32	0.10
<i>AC Andrew</i>	3.64	abc	93.50	82	1	11.49	35.24	53.83	61.45	0.14	0.27	1.34	0.10
<i>AC Sadash</i>	3.63	abc	93.12	82	1	11.31	34.88	55.07	61.70	0.17	0.24	1.52	0.10
<i>KWS Alderon</i>	3.66	abc	93.91	74	1	12.44	35.13	54.73	61.51	0.11	0.28	1.40	0.12
<i>Bunker</i>	4.37	a	112.25	121	1	10.95	36.20	57.68	60.68	0.16	0.24	1.14	0.09
<i>Sunray</i>	2.77	cd	71.23	102	1	12.19	32.93	52.84	63.25	0.21	0.26	1.19	0.10
<i>T256</i>	3.65	abc	93.76	88	1	10.91	35.35	57.71	60.57	0.18	0.20	0.97	0.10
<i>Average</i>	3.39		86.97	92		11.59	35.15	55.45	61.43	0.16	0.25	1.26	0.10
<i>CV</i>	13.34												

*lodging rated on a 1-9 scale where 1 is erect and 9 is completely flat.

**average moisture content at the time of harvest was 58%.

Winter/Spring Cereal Intercrop

The winter/spring cereal intercrop trial was harvested at the recommended stage for the spring cereals. The trial was established in St. Paul (SW30-60-9-W4) and in Smoky Lake () and the following three winter cereal varieties were used in mixtures with Taza triticale, CDC Austenson Barley and CDC Baler oats:

- *AAC Wildfire* – hard red winter wheat, short strong straw, good winter survival, excellent lodging resistance.
- *Prima* – fall rye variety with high yields and is well adapted to Western Canada.
- *Luoma* – winter triticale, has no awns, high yield potential, and good disease resistance.

The trial in St. Paul was harvested at the recommended stage for the spring cereals on September 8, 2020 at 89 days after seeding. Results of the trial can be found in table 8. The highest yielding mixture was Luoma/CDC Baler Yielding at 4.77 ton/acre. All three treatments with the winter cereals paired with CDC Baler all yielded in the top 5. CDC Baler still yielded higher than the other monoculture cereal varieties at 4.65 tons/acre as it is a known crop grown for forage productions.

Our Smoky Lake Site was unable to be harvested as there were high amounts of water declaring an agriculture natural disaster within that county. Therefore no data was collected from this trial.

Table 8. RST Winter/Spring Cereal Intercrop St. Paul, 2020 (ton/ac, 1 ton = 2000 lbs).

Treatments	DM Yield		DM Yield (% Taza/CDC Austneson)	Height (Spring) cm	Height (winter) cm	2020 Quality Data							
	(ton/ac)					CP (%)	ADF (%)	NDF (%)	TDN (%)	Ca (%)	P (%)	K (%)	Mg (%)
<i>Prima/CDC Austenson</i>	3.81	bcd	100.00	80	60	10.14	34.87	49.90	61.73	0.28	0.17	1.26	0.12
<i>Prima/CDC Baler</i>	4.50	abc	118.25	132	50	9.85	34.10	48.32	62.34	0.37	0.17	1.26	0.16
<i>Prima/Taza</i>	3.68	cd	96.72	109	58	9.94	35.62	55.90	61.16	0.17	0.21	1.58	0.07
<i>AAC Wildfire/CDC Austenson</i>	3.70	cd	97.11	77	48	9.42	35.05	48.96	61.60	0.36	0.18	1.20	0.13
<i>AAC Wildfire/CDC Baler</i>	4.48	abc	117.73	128	46	9.75	35.40	51.24	61.33	0.28	0.15	1.20	0.12
<i>AAC Wildfire/Taza</i>	3.69	cd	96.80	106	50	10.34	34.43	52.91	62.08	0.22	0.16	1.14	0.10
<i>Luoma/CDC Austenson</i>	3.34	d	87.71	77	44	10.03	37.33	54.44	59.82	0.45	0.12	1.24	0.13
<i>Luoma/CDC Baler</i>	4.77	a	125.34	138	42	10.33	34.68	49.74	61.89	0.36	0.15	1.47	0.14
<i>Luoma/Taza</i>	3.87	bcd	101.63	108	43	10.64	35.09	53.60	61.57	0.24	0.20	1.36	0.09
<i>CDC Austenson</i>	4.21	abc	110.43	81	-	8.79	38.02	55.80	59.28	0.29	0.13	0.98	0.10
<i>CDC Baler</i>	4.65	ab	122.01	128	-	9.39	36.39	52.85	60.55	0.24	0.14	1.17	0.12
<i>Taza</i>	4.28	abc	112.47	110	-	10.14	34.39	49.56	62.11	0.12	0.20	0.88	0.09
<i>Average</i>	4.08			106	49	9.90	35.45	51.93	61.21	0.28	0.19	1.23	0.12
<i>CV=</i>	9.44												

*average moisture content at the time of harvest was 58%.

Regional Annual Silage Trial Pulse Mixtures

Partners: Alberta Agriculture and Forestry
SECAN
Chinook Applied Research Association
West-Central Forage Association
SARDA Crop Research
Battle River Research Group
Canadian Agriculture Partnership

Objectives:

1. To determine which pea-cereal mixtures are a feasible option when compared to conventional cereal forage crops for whole plant forage production, considering both yield and quality.

Background:

The most commonly utilized forage crops are typically monocultures of barley, oats or triticale. Despite this, there are other annuals available that could provide an alternative crop for forage production or to extend the grazing season. The use of corn has significantly increased in recent years as a method of extending the grazing season. The use of alternative annual crops can provide a break in disease from cereal production or as a break in perennial cropping rotation while still providing a forage crop.

The inclusion of peas into the production of an annual cereal crop can provide multiple benefits over the use of a monoculture crop. Fertilizer costs could be reduced due to the ability of peas to fix nitrogen which could also impact overall soil fertility. Peas have a high protein content and will therefore add protein to the overall forage quality.

This year the pea/cereal trial expanded its pulse species and incorporated a Faba Bean treatment into the trial. Fertilizer costs can also be reduced as faba beans have the ability to fix nitrogen which could impact overall soil fertility. As well, faba beans have a high source of protein content which can add protein to your feed quality.

Method:

The trial was established at the LARA Fort Kent Research Site (NE25-61-5-W4) on May 22, 2019 and at our St. Paul site (NE15 59-9 W3) on June 12, 2020 in a randomized complete block design (RCBD) with four replicates to reduce error. The plots were seeded with the LARA five-row zero-till small plot drill to a depth of 1.5 – 2” to try and reach an intermediate between cereal and pea recommendations. The peas were inoculated prior to seeding.

Cereal monocultures of CDC Baler oats, Taza triticale and CDC Austenson barley were established as check treatments for comparison to the pea/cereal mixtures. The trial was seeded with 12 treatments and each cereal variety was seeded in a mixture with CDC Jasper peas, CDC Meadow peas and Snowbird faba beans.

Agronomic information on the trial can be found in table 1. No in-crop herbicide applications were performed for weed control due to the mixture of broadleaf and grassy plants. Therefore, hand-weeding was done where necessary.

The LARA alfalfa-omega self-propelled forage harvester was used to harvest the plots at the recommended cereal harvest date + 10 days. The individual plot weights were recorded and samples were taken to assess dry matter content. An additional composite sample was taken from each variety, frozen and sent to A & L Canada Laboratories for wet chemistry analysis. Statistical analysis of the data was conducted using ARM 9, $p = 0.05$.

The following varieties were used in the pea/cereal trial in 2020:

- *CDC Austenson barley* - 2-row barley variety with semi-smooth awns, short and strong straw and high feed yield.
- *CDC Baler oats* - very leafy, forage oat variety.
- *Taza triticale* – reduced awn forage and grain triticale variety with good lodging resistance.
- *CDC Jasper peas* – forage pea variety with small seed size, good grain yield and high relative feed value.
- *CDC Meadow peas* – consistently high yielding, competitive yellow field pea variety with good lodging resistance.
- *AAC Peacriver peas* – yellow pea, semi leafless field pea, early maturing, and is resistant to powdery mildew.
- *Snowbird faba beans* – zero tannin, medium size seed, resistant to root rot, good source of protein and energy.

Table 1. RST Pea/Cereal Mixture Agronomic Information, 2020.

	Date	Date	Rain			
Site	Seeded	Harvested	(mm)	Treatments	Seeding Rate	Fertility
Fort Kent	12- June-20	1-Sept-20		Austenson	300 plants/m ²	50% of recommended rate*
				CDC Baler	300 plants/m ²	50% of recommended rate*
				Taza	370 plants/m ²	50% of recommended rate*
				Austenson/Meadow	150 pl/m ² , 57 pl/m ²	50 lbs/acre of 11-52-0-0
				CDC Baler/Meadow	150 pl/m ² , 57 pl/m ²	50 lbs/acre of 11-52-0-0
				Taza/Meadow	185 pl/m ² , 57 pl/m ²	50 lbs/acre of 11-52-0-0
				Austenson/Jasper	150 pl/m ² , 57 pl/m ²	50 lbs/acre of 11-52-0-0
				CDC Baler/Jasper	150 pl/m ² , 57 pl/m ²	50 lbs/acre of 11-52-0-0
				Taza/Jasper	185 pl/m ² , 57 pl/m ²	50 lbs/acre of 11-52-0-0
				Austenson/Snowbird	150 pl/m ² , 57 pl/m ²	50 lbs/acre of 11-52-0-0
				Austenson/Snowbird	150 pl/m ² , 57 pl/m ²	50 lbs/acre of 11-52-0-0
				Austenson/Snowbird	185 pl/m ² , 57 pl/m ²	50 lbs/acre of 11-52-0-0

Table 2. RST Pea/Cereal Mixture Agronomic Information 2020.

St. Paul	12-June-20	8-Sept-20		Austenson	300 plants/m2	60-30-25-10 @239 lbs/acre
				CDC Baler	300 plants/m2	60-30-25-10 @239 lbs/acre
				Taza	370 plants/m2	60-30-25-10 @239 lbs/acre
				Austenson/AAC Peacriver	150 pl/m2, 57 pl/m2	60-30-25-10 @239 lbs/acre
				CDC Baler/AAC Peacriver	150 pl/m2, 57 pl/m2	60-30-25-10 @239 lbs/acre
				Taza/AAC Peacriver	185 pl/m2, 57 pl/m2	60-30-25-10 @239 lbs/acre
				Austenson/Jasper	150 pl/m2, 57 pl/m2	60-30-25-10 @239 lbs/acre
				CDC Baler/Jasper	150 pl/m2, 57 pl/m2	60-30-25-10 @239 lbs/acre
				Taza/Jasper	185 pl/m2, 57 pl/m2	60-30-25-10 @239 lbs/acre
				Austenson/Snowbird	150 pl/m2, 57 pl/m2	60-30-25-10 @239 lbs/acre
				Austenson/Snowbird	150 pl/m2, 57 pl/m2	60-30-25-10 @239 lbs/acre
				Austenson/Snowbird	185 pl/m2, 57 pl/m2	60-30-25-10 @239 lbs/acre

Results:

The trial is aimed to be harvested at the recommended cereal stage plus 10 days to try and account for the increased moisture content of the forage with the inclusion of peas. In previous years, the trial was harvested at the recommended cereal stage. However, the Forage Pea trials conducted at LARA for four years found that optimal yields and quality could be achieved if harvest was delayed by at least 10 days. The results of the pea-cereal trial are summarized in table 2 and table 3. The Fort Kent trial was harvested 81 days after harvest and the St. Paul trial was harvested 88 days after seeding.

The trial in St. Paul had a higher average yield of 4.45 tons/acre than Fort Kent trial at 3.99 tons/acre. In Fort Kent trial CDC Austenson/Snowbird yielded the second highest in the overall trial at 4.46 tons/acre. The traditional cereal trials paired with snowbird yield higher than the treatments with field peas. In the St. Paul trial Taza/snowbird yielded the second highest at 5.37 tons/acre. The highest yielding treatment was CDC Baler at 5.41 tons/acre.

Table 3. RST Pea/Cereal Mixture Fort Kent, 2020 (ton/ac, 1 ton = 2000 lbs).

* average moisture at the time of harvest for the pea-cereal treatments was 74% and the cereal treatments was 67%

Variety	DM Yield (ton/ac)		DM Yield (% CDC Austeson)	Pulse Height (cm)	Cereal Height (cm)	Lodging (1-9)	2020 Quality Results							
							CP	ADF	NDF	TDN	Ca	P	K	Mg
							(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
CDC Austenson	4.42	ab	100.00	-	86	1	11.35	34.52	62.01	62.01	0.24	0.12	1.27	0.20
CDC Baler	4.23	ab	95.59	-	134	1	11.50	38.42	57.97	58.97	0.21	0.17	1.24	0.17
Taza	4.81	a	108.66	-	95	1	12.28	31.94	43.31	4.02	0.29	0.18	1.32	0.18
CDC Austenson/CDC Meadow	3.80	ab	85.99	95	63	1	15.05	34.30	47.05	62.18	0.72	0.15	1.46	0.31
CDC Baler/CDC Meadow	3.90	ab	88.04	80	108	1	12.68	37.30	54.92	59.85	0.31	0.22	1.33	0.18
Taza/CDC Meadow	3.68	ab	83.14	87	83	1	13.73	37.25	54.83	59.90	0.44	0.23	1.81	0.22
CDC Austenson/CDC Jasper	3.86	ab	87.14	97	70	1	15.66	34.84	46.70	61.76	0.54	0.20	1.45	0.25
CDC Baler/CDC Jasper	3.60	ab	81.44	98	110	1	13.08	35.02	50.42	61.62	0.32	0.21	1.51	0.20
Taza/CDC Jasper	3.15	b	71.09	98	94	1	16.02	35.92	49.14	60.92	0.57	0.22	1.44	0.24
CDC Austenson/Snowbird	4.46	ab	100.84	99	82	1	14.27	34.70	45.55	61.87	0.49	0.22	1.37	0.30
CDC Baler/Snowbird	3.91	ab	88.27	93	126	1	14.44	33.85	44.80	62.53	0.42	0.23	1.21	0.26
Taza/Snowbird	4.07	ab	92.07	105	112	1	13.70	35.64	47.77	61.13	0.32	0.24	1.62	0.23
Average	3.99		90.19	71	97		13.65	35.31	49.57	61.40	0.41	0.20	1.42	0.23
CV	14.46													

Table 4. RST Pea/Cereal Mixture St. Paul, 2020 (ton/ac, 1 ton = 2000 lbs).

Variety	DM Yield (ton/ac)		DM Yield (% Murphy)	2019 Quality Results							
				CP (%)	ADF (%)	NDF (%)	TDN (%)	Ca (%)	P (%)	K (%)	Mg (%)
CDC Austenson	3.71	d	100.00	9.92	37.27	50.46	59.87	0.8	0.18	1.24	0.16
CDC Baler	5.41	a	145.71	9.37	38.54	52.89	58.86	0.25	0.15	1.44	0.14
Taza	5.12	a	138.09	9.39	36.36	51.41	60.58	0.35	0.15	1.21	0.12
CDC Austenson/CDC Meadow	3.92	cd	105.66	10.54	45.44	59.56	53.50	1.12	0.12	0.88	0.28
CDC Baler/CDC Meadow	4.69	abc	126.36	11.47	36.62	48.46	60.37	0.51	0.20	1.30	0.22
Taza/CDC Meadow	4.21	bcd	113.42	9.60	37.44	49.04	59.74	0.34	0.51	1.63	0.14
CDC Austenson/AAC Peacerville	3.63	d	97.84	9.93	45.08	57.83	53.79	0.80	0.34	0.94	0.19
CDC Baler/AAC Peacerville	5.02	ab	135.18	10.42	41.22	54.33	56.79	0.56	0.80	1.30	0.20
Taza/AAC Peacerville	4.15	bcd	11.81	9.87	46.65	60.71	52.56	0.73	0.56	0.93	0.24
CDC Austenson/Snowbird	3.27	d	88.14	10.52	41.59	57.60	56.50	0.45	0.73	1.20	0.18
CDC Baler/Snowbird	4.95	ab	133.42	9.46	37.52	51.79	59.67	0.33	0.45	0.99	0.18
Taza/Snowbird	5.37	a	144.82	9.21	35.12	50.16	61.54	0.21	0.33	0.91	0.12
Average	4.45		120.04	9.97	39.90	53.69	57.81	0.50	0.21	1.16	0.19
CV	14.76										

* average moisture at the time of harvest for the pea-cereal treatments was 52% and the cereal treatments was 54%

Regional Annual Silage Trial Alternative Crops

Partners: West-Central Forage Association
Chinook Applied Research Association
Peace Country Beef and Forage Association
Battle River Research Group
North Peace Applied Research Association

Objectives:

1. To determine the best yielding alternative forage crops for whole plant forage production in Northeastern Alberta.
2. To determine the best quality alternative forage crops for cattle feed in Northeastern Alberta.

Background:

The inclusion of ‘alternative’ or ‘high nutritive value’ forages, including chicory and plantain that are known for increased energy and protein content and reduced neutral detergent fiber (NDF), in the rations of beef cattle could have an environmental, economical and production benefit to Alberta producers. Currently, research has focused on assessing the yield and quality of cocktail mixtures that contain from 2 to 20 different species with very little data available on individual species. As well, there has been limited research focusing on replicated trials to establish baseline information on these forage species. Consequently, most current recommendations to producers on the use of these crops is coming from anecdotal sources.

Recent research from New Zealand on the use of ‘alternative’ crops in sheep and cattle diets is showing promising results in feed intake and environmental impacts. A study on chicory and plantain has shown the potential of reduced environmental impacts of these forages through decreased rumen ammonia and urine nitrogen in dairy cattle (Minnee et al. 2017). These results are supported by similar research on plantain-fed dairy heifers done by Cheng et al. (2017). A study by Edwards et al. (2014) showed high consumption of forage beet, kale and kale-oat mixtures by grazing dairy cows and almost complete consumption of beet.

The purpose of this trial is to provide current and comprehensive regional yield and quality data on annual ‘alternative’ forage species and varieties for silage, greenfeed and grazing producers across Alberta and Saskatchewan in order to improve on-farm feed production and efficiency.

Method:

The trial was established at the LARA Fort Kent Research Site (NE25-61-5-W4) on June 18, 2020 and at our St. Paul site (SW30-60-9-W4) on June 18, 2020 in a randomized complete block design (RCBD) with four replicates to reduce error. The plots were seeded using the LARA five-row Fabro zero-till drill to a depth of ½ inch.

Soil tests were taken in the spring at both sites and a blend fertilizer (60-30-25-15) was side-banded during seeding at 239 lbs/ac. The trial was hand-weeded during the growing season when necessary. There was no in-crop herbicide application in these trials.

Total rainfall at the Fort Kent site was 132.3 mm and the St. Paul site received 165.8 mm of rain. Crop height and stage of maturity was recorded prior to harvest with the LARA alfalfa-omega self-propelled forage harvester. The total plot weight was recorded and samples were taken to assess dry matter content.

Additional composite samples were taken from each treatment, frozen and sent to A & L Canada Laboratories for wet chemistry analysis. Statistical analysis of the data was conducted ARM 9, P = 0.05.

The following alternative crops were used for the trial in 2020:

- *Japanese Millet* – annual, warm season grass that is commonly grown as a late season green forage. The most rapidly growing of the millet, its fibrous root system makes it an excellent smother crop, erosion protector and trap crop. Highly tolerant of frequent cutting, is fairly drought tolerant once established and tolerant of wet soils.
- *Sorghum Sudan Grass* – tall, fast-growing, heat-loving warm season grass is unrivaled for adding organic matter to worn-out soils. High biomass production and can be a good soil aerator particularly if mowed/cut at least once during the growing season. High seeding rates can allow for excellent weed suppression and can be used as a good crop to break the life cycle of disease pests.
- *Forage Brassica* – fast-growing, high yielding and high-quality forages that are excellent for use in fall pastures. Protein content can range from 18 to 25%. Can be difficult to ensile due to high moisture content but holds quality late into the season.
- *Forage Kale* – fast growing, very competitive against annual weeds, can be planted in the spring or fall time in pastures and cover crops, fast germination rate, winter hardy brassica, and has good feed value.
- *Forage Radish* – fast growing, drought tolerant forage radish that can be grazed multiple times due to its rapid regrowth. Highly digestible to livestock, with high energy levels and great persistence.
- *Forage Turnip* – cold and drought tolerant, can be planted late in the season if wanting to graze in the fall, good feed quality for feeding livestock.
- *Plantain* – highly palatable herb with a fibrous root system that establishes rapidly under the right conditions. Highly tolerant to heat, good pest tolerance and has a high mineral content. Plantain will last 2 to 3 years under grazing conditions.
- *Chicory* – short-lived, leafy herb with a high feed value for livestock. Can be incorporated into rotational grazing systems with good summer forage yields. Has a deep taproot that can support growth in dry conditions and breaks up soil compaction.
- *Phacelia* – unique cover crop species with a very intense soil conditioning effect in the top two inches of the soil. Not a deep-rooted plant, but can be very effective to aggregate soil particles into the crumbly aggregate structure. Fast growing with purple flowers that is excellent as a beneficial insect plant.
- *Red Serbian Millet* – fast-growing, high yielding leafy warm-season grass that can be used for late season grazing systems. Creates a soft-palatable feed and is ideal for high temperature regions.

Results:

The trial was harvested at the industry recommended stage for each individual crop. The yield and quality results from the trial are summarized in table 1. The trial at the Fort Kent Site (LARA) was harvested on Sept 4, 2020. The trial at the St. Paul site was harvested on September 8, 2020.

The Fort Kent trial had a higher yield of 1.42 ton/acre and the St. Paul site was 1.10 ton/acre. The highest yielding variety was the Japanese Millet at 3.03 tons/acre. In St. Paul, the Forage radish yielded the highest at 2.13 tons/acre.

Quality remained fairly consistent with an average CP content of 16.78% in the Fort Kent trial and 16.08% in the St. Paul trial. This will meet the CP requirements for beef cattle nutrient requirements.

Table 1. RST Alternative Crops Fort Kent Data, 2020 (ton/ac, 1 ton = 2000 lbs).

Treatment	DM Yield (ton/ac)		2020 Quality Results							
			CP (%)	ADF (%)	NDF (%)	TDN (%)	Ca (%)	P (%)	K (%)	Mg (%)
Chicory	0.69	d	19.97	33.48	44.06	62.78	1.55	0.35	3.86	0.54
Forage Brassica	1.18	c	18.45	34.21	44.33	62.25	2.90	0.32	4.24	0.83
Forage Kale	0.86	cd	19.11	32.41	40.32	63.67	3.18	0.30	2.66	0.87
Forage Radish	1.35	c	16.36	41.46	49.27	56.58	1.64	0.25	2.50	0.50
Forage Turnip	1.14	c	20.24	33.35	34.76	62.92	3.04	0.38	4.36	0.78
Japanese Millet	3.03	a	14.07	35.26	54.53	61.42	0.48	0.22	2.41	0.42
Millet	2.41	b	15.64	35.32	53.88	61.39	0.36	0.17	2.09	0.50
Phacelia	1.09	c	14.29	42.35	48.67	55.91	2.53	0.24	0.24	0.67
Plantain	1.17	c	15.80	36.15	41.91	60.73	1.85	0.28	2.28	0.56
Sorgum Sudan Grass	1.28	c	13.88	35.38	58.54	61.34	0.49	0.25	1.83	0.34
<i>Average</i>	<i>1.42</i>		<i>16.78</i>	<i>35.94</i>	<i>47.03</i>	<i>60.90</i>	<i>1.80</i>	<i>0.28</i>	<i>2.65</i>	<i>0.63</i>
<i>CV</i>	<i>15.44</i>									

* Average moisture at the time of harvest was 81%.

Table 2. RST Alternative Crops St. Paul Data, 2020 (ton/ac, 1 ton = 2000 lbs).

Treatment	DM Yield (ton/ac)		2020 Quality Results							
			CP (%)	ADF (%)	NDF (%)	TDN (%)	Ca (%)	P (%)	K (%)	Mg (%)
Chicory	1.05	cd	15.84	34.20	41.19	62.26	1.58	0.29	3.33	0.38
Forage Brassica	1.29	c	20.22	33.45	35.81	62.84	3.73	0.33	3.18	0.54
Forage Kale	0.54	de	16.42	35.26	40.05	61.44	2.77	0.34	2.53	0.39
Forage Radish	2.13	a	15.36	42.17	49.79	56.05	1.78	0.23	2.22	0.31
Forage Turnip	1.14	cd	19.39	33.04	41.17	63.16	1.18	0.35	1.82	0.41
Japanese Millet	0.86	cd	14.69	35.30	55.49	61.40	0.71	0.25	2.30	0.26
Millet	0.95	cd	11.49	37.28	57.24	59.86	0.31	0.29	1.57	0.24
Phacelia	1.72	b	16.15	56.66	41.38	47.82	3.44	0.28	2.51	0.46
Plantain	1.05	cd	15.5	33.52	42.39	62.79	2.07	0.25	2.05	0.25
Sorgum Sudan Grass	0.28	e	15.96	34.24	54.11	62.23	1.18	0.35	1.82	0.28
<i>Average</i>	<i>1.10</i>		<i>16.08</i>	<i>37.51</i>	<i>45.86</i>	<i>59.74</i>	<i>1.88</i>	<i>0.30</i>	<i>2.33</i>	<i>0.35</i>
<i>CV</i>	<i>25.39</i>									

* Average moisture at the time of harvest was 81%

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Perennial Forage Project

Partners: Alberta Beef Producers
Canadian Agriculture Partnership
Alberta Agriculture and Forestry
Chinook Applied Research Association
Foothills Forage and Grazing Association
North Peace Applied Research Association
Gateway Research Organization
Battle River Research Group
West-Central Forage Association
Mackenzie Applied Research Association
SARDA Crop Research
Peace Country Beef and Forage Association

Objectives:

1. To provide unbiased, current and comprehensive regional data regarding the establishment, winter survival, yield and economics of specific species and varieties of perennial forage crops.
2. To identify perennial crop species/varieties that demonstrate superior establishment, hardiness, forage yield and nutritional quality characteristics in different eco-regions of Alberta.
3. To assess any benefits from growing mixtures of selected species.

Background:

Perennial forages include a diverse range of grasses and legumes that are utilized by livestock producers for a wide variety of purposes – from hay and greenfeed to summer pasture and winter grazing through stockpiled forage. They make up one of the largest sources of livestock feed on the prairies and the wide diversity in growth characteristics makes them ideal for many purposes.

According to Alberta Agriculture's Agriprofits Benchmarks, two thirds the cost of maintaining a cow is comprising pasture, stored feed and bedding. Consequently, managing the perennial forage supply and having access to high quality and high yielding forage varieties is extremely important to producers.

Historically there has been a gap in perennial forage production knowledge in Alberta and, in particular, regionally specific variety information. There is significant variation in Alberta's ecoregions and varieties that are developed and tested in one location or region will likely not perform the same in another region such as those experienced in Northeastern Alberta.

To help bridge this gap in perennial forage information, the perennial forage trial was developed to test cultivars that have been recently developed but have had limited regional evaluation to provide producers with valuable, region specific data. The province wide project data will be available to all producers in Alberta.

Method:

The trial was seeded as three blocks of plots: legumes, grasses and grass/legume mixtures at the LARA Fort Kent Research Site (NE25-61-5-W4) in a randomized complete block designs (RCBD) with four replicates to reduce error. The legume and legume mixture trials were seeded on June 7, 2016 and the grass trial was seeded on June 2, 2016. Unfortunately, due to slow and patchy establishment, the grass and

grass/legume trials were reseeded on June 19, 2017. Table 1 illustrates the forage varieties seeded in each trial.

Table 1. Perennial Forage Trial Varieties seeded, 2016-2017.

Grasses	Legumes	Grass/Legume Mixtures
Fleet Meadow Brome	20-10 Alfalfa	Fleet/Yellowhead
AC Admiral Hybrid Brome	44-44 Alfalfa	AC Knowles/Yellowhead
Success Hybrid Brome	Assalt ST Alfalfa	Success/Yellowhead
Knowles Hybrid Brome	Dalton Alfalfa	Fleet/Spredor 5
Greenleaf Pubescent Wheatgrass	Halo Alfalfa	AC Knowles/Spredor 5
Kirk Crested Wheat Grass	PV Ultima Alfalfa	Success/Spredor 5
AC Saltlander Green Wheatgrass	Rangelander Alfalfa	Fleet/AC Mountainview
Tom Russian Wilde Rye	Rugged Alfalfa	AC Knowles/AC Mountainview
Killarney Orchard Grass	Spreader 4 Alfalfa	Success/AC Mountainview
Grinstad Timothy	Spredor 5 Alfalfa	
Fojtan Festulolium	Yellowhead Alfalfa	
Courtney Tall Fescue	AC Mountainview Sainfoin	
	Nova Sainfoin	
	Oxley 2 Cicer Milkvetch	
	Veldt Cicer Milkvetch	

Prior to seeding, soil tests were taken and a blend fertilizer was developed (30-22-10-12) and side-banded with the grass trial at seeding. Due to the nitrogen fixing ability of legumes, the legume and grass/legume trial was seeded with 50 lbs/ac of 11-52-0-0 side-banded at seeding. All legumes were inoculated prior to seeding and seeding took place with the LARA Fabro five-row zero-till small plot drill with 9" row spacing. Plots measured 1.15m x 6m in area.

To determine percent emergence and establishment, plant counts were conducted 7, 14 and 21 days after seeding as the number of plants in 3 separate ¼ m squared areas in each plot. Another count was taken 70 days after seeding.

No yield or quality data was taken on the trial in the year of establishment. Since the legume trial was established in 2016, yield and quality data were taken in 2017. Yield and quality data was taken on all three trials in 2018 and 2019. Yield and quality data have been taken for the year 2020.

The seeding rates of each variety are shown in table 2.

Table 2. Perennial Forage Trial Seeding Rates, 2016-2017.

Species	Variety	Seeding Rate (lbs/ac)
Meadow Brome	AC Armada	14
	Fleet	14
Hybrid Brome	Success	12
	Knowles	12
Wheatgrasses		
Pubescent	Greenleaf	10
Crested	Kirk	6
Green	Saltlander	9
Russian Wildrye	Tom	8
Fojtan Festulolium		20
Orchard Grass	Killarney	10
Tall Fescue	Courtney	9
Tmothy	Grinstad	4
Alfalfa	AC Grazeland	8
	Dalton	8
	20-10	8
	Halo	8
	Rangelander	8
	Rugged	8
	Spredor 4	8
	Spredor 5	8
	Yellowhead	8
	PV Ultima	8
	44-44	8
Sainfoin	AC Mountainview	30
	Nova	30
Cicer Milk Vetch	Veldt	13
	Oxley 2	13

The emergence counts and plant count results for the legume, grass and grass/legume mixture trials can be found in table 3, table 4 and table 5, respectively. The higher moisture experienced in 2017 allowed for excellent establishment of the grass and grass/legume trials. However, excessive moisture sitting on the legume site resulting in plots 113 and 114 dying out (Nova Sainfoin and AC Mountainview Sainfoin).

To assess winter survival, plant counts were taken on the legume trial on June 26, 2017 and the results are illustrated in table 3. The alfalfa variety Assalt ST showed the greatest impact of winter on plant survivability with a 56% decrease in plant stand from August of 2016 to June of 2017. Rangelander alfalfa showed a 35% decrease in plant stand while Yellowhead alfalfa and Oxley Cicer Milk vetch only showed a 6% and 8% decrease, respectively. The rest of the varieties showed an increase from 2016 to 2017.

Historically, sainfoin has shown poor survivability in central and northern climates but showed an 18% increase for the new AC Mountainview and a 76% increase for the older variety Nova.

Table 3. Perennial Forage Project Legume Emergence and Plant Counts, 2016-2017.

Variety	Emergence Counts (plants per 1/4 m)			Plant Count	Plant Count	Change
	21-Jun-16	28-Jun-16	05-Jul-16	26-Aug-16	26-Jun-17	(%)
20 - 10	0.00	1.45	3.99	4.92	5.83	18
44 - 44	0.09	1.15	4.32	4.67	7.17	54
Assalt ST	0.00	0.65	2.68	4.58	2.00	-56
Dalton	0.00	0.33	3.09	4.67	5.50	18
Halo	0.00	0.69	4.44	5.33	6.50	22
PV Ultima	0.00	1.02	4.38	5.83	6.42	10
Rangelander	0.10	1.50	3.74	5.50	3.58	-35
Rugged	0.04	0.99	2.97	4.67	6.17	32
Spreader 4	0.00	0.68	3.48	4.83	5.92	23
Spredor 5	0.00	0.43	5.02	5.25	5.58	6
Yellowhead	0.00	1.07	3.57	5.92	5.58	-6
AC Mountainview	0.00	0.79	4.61	5.50	6.50	18
Nova	0.00	1.12	2.72	3.50	6.17	76
Oxley 2	0.00	1.03	3.86	4.33	4.00	-8
Veldt	0.00	0.54	4.15	4.75	5.67	19

The emergence counts of the grass and grass/legume mixture trial are illustrated in table 3 and table 4, respectively.

Table 4. Perennial Forage Project Grasses Emergence Counts, 2017-2018.

Variety	Emergence Counts (pls per 1/4 m)		
	Day 7	Day 14	Day 21
Fleet MB	0.00	8.41	7.50
AC Admiral HB	0.00	5.58	5.50
Success HB	0.00	9.00	6.75
Knowles HB	0.00	7.33	4.58
Greenleaf PWG	0.00	10.50	7.58
Kirk CWG	0.00	4.85	1.50
AC Saltlander GWG	0.00	8.41	6.83
Tom RWR	0.00	9.00	13.08
Killarney OG	0.00	15.83	10.25
Grinstad Tim.	0.00	15.92	15.33
Fojtan Festulolium	0.00	28.83	26.58
Courtney TF	0.00	13.00	10.33

Table 5. Perennial Forage Project Grass/Legume Emergence, 2017-2018.

Treatment	Emergence Counts (plants per 1/4 m)					
	Day 7		Day 14		Day 21	
	Grasses	Legumes	Grasses	Legumes	Grasses	Legumes
Fleet MB/Yellowhead	0.00	0.00	3.08	3.17	5.83	2.08
AC Knowles/Yellowhead	0.00	0.00	2.67	3.33	3.75	3.50
Success HB/Yellowhead	0.00	0.00	4.58	4.00	4.67	3.42
Fleet MB/Spredor 5	0.00	0.00	4.67	2.67	4.50	2.50
AC Knowles MB/Spredor 5	0.00	0.00	3.67	2.08	3.42	3.75
Success HB/Spredor 5	0.00	0.00	3.75	3.17	3.58	3.17
Fleet MB/AC Mountainview	0.00	0.00	3.00	2.75	2.58	4.17
AC Knowles HB/AC Mountainview	0.00	0.00	4.16	1.66	2.58	3.08
Success HB/AC Mountainview	0.00	0.00	3.00	2.88	2.67	3.58

The legume trial was harvested on July 27, 2020 at an average moisture content of 64%. The yield and quality results can be found in table 6. The third and fourth rep were only able to be harvested due to the first 2 reps experiencing winter kill.

Table 6. Perennial Forage Project Legumes Data, 2020 (ton/acre, 1 ton = 2000 lbs).

Variety	DM Yield (ton/acre)	Moisture (%)	2020 Quality Data							
			CP (%)	ADF (%)	NDF (%)	TDN (%)	Ca (%)	P (%)	K (%)	Mg (%)
20-10	3.48	57.83	13.67	42.47	49.60	55.81	1.44	0.2	2.02	0.27
44-44	2.56	64.53	15.55	41.68	49.99	56.43	1.23	0.2	1.99	0.28
Assalt ST	2.84	60.38	14.52	42.96	45.73	55.43	1.56	0.22	2.63	0.30
Dalton	3.40	63.02	13.69	44.19	50.65	54.47	1.14	0.2	2.45	0.24
Halo	2.27	63.46	15.15	41.31	47.62	56.72	1.48	0.25	2.56	0.31
PV Ultima	2.66	61.47	15.69	41.79	48.88	56.35	1.41	0.2	2.30	0.28
Rangelander	3.54	64.45	16.30	39.49	46.30	58.14	1.42	0.21	2.44	0.28
Rugged	2.95	59.47	15.32	42.00	44.67	56.18	1.52	0.23	2.58	0.29
Spredor4	3.40	62.05	15.36	43.63	50.28	54.92	1.52	0.24	2.15	0.30
Spredor 5	3.34	61.8	15.27	40.63	47.57	57.25	1.62	0.17	2.37	0.37
Yellowhead	3.23	63.23	16.02	42.12	49.26	56.08	1.39	0.26	2.00	0.30
AC Mountainview	2.33	63.78	13.25	46.17	52.08	52.93	1.18	0.17	2.08	0.22
Nova	2.47	63.11	15.13	41.62	43.08	56.48	1.71	0.2	2.65	0.31
Oxley 2	2.53	64.92	13.63	43.54	49.22	54.98	1.06	0.22	2.49	0.27
Veldt	2.72	83.78	12.82	48.70	53.99	50.96	1.32	0.18	2.43	0.29
<i>Average</i>	<i>7.00</i>	<i>63.82</i>	<i>14.76</i>	<i>42.82</i>	<i>48.21</i>	<i>55.54</i>	<i>1.40</i>	<i>0.21</i>	<i>2.34</i>	<i>0.29</i>
<i>CV</i>	<i>16.63</i>									

The grass trial was harvested on July 21, 2020 at an average moisture content of 53%. The yield and quality results can be found in table 7. The average yield for the trial was 3.46 ton/acre. Similar to last year, the highest yielding variety was Success Hybrid Brome at 4.69 ton/ac, a winter hardy, long-lived perennial forage grass developed in Saskatchewan. Greenleaf Pubescent Wheatgrass was the highest yielding wheatgrass in the trial at 3.90 ton/acre followed by AC Saltlander Green Wheatgrass at 3.17 ton/ac. The lowest yielding variety was Fojitan Festulolium at 2.15 ton/ac.

Table 7. Perennial Forage Project Grasses Data, 2020 (ton/acre, 1 ton = 2000 lbs).

Variety	DM Yield (ton/acre)		Moisture (%)	CP (%)	ADF (%)	2020 Quality Data					
						NDF (%)	TDN (%)	Ca (%)	P (%)	K (%)	Mg (%)
Fleet Meadow Brome	4.04	ab	51.16	12.35	39.51	50.75	58.12	0.63	0.27	1.98	0.36
AC Admiral Hybrid Brome	3.66	bc	45.17	12.25	40.06	54.50	57.67	0.40	0.25	2.31	0.29
Knowles Hybrid Brome	4.65	a	42.48	8.56	40.60	56.50	57.28	0.41	0.16	1.47	0.24
Success Hybrid Brome	4.69	a	45.11	9.70	37.74	50.57	59.50	0.34	0.20	1.58	0.24
Greenleaf Pubescent Wheatgrass	3.90	abc	48.51	11.17	40.62	58.61	57.26	0.33	0.20	1.48	0.25
Kirk Crested Wheatgrass	2.54	de	50.00	11.34	42.13	50.98	56.08	0.64	0.17	1.35	0.38
AC Saltlander Green Wheatgrass	3.17	bcd	42.27	13.25	41.05	54.42	56.92	0.39	0.20	1.58	0.22
Tom Russian Wild Ryegrass	3.11	bcd	49.05	14.86	43.83	51.92	54.76	0.43	0.22	1.84	0.38
Killarney Orchard Grass	3.04	cd	48.61	11.79	44.20	51.78	54.74	0.51	0.25	1.85	0.40
Grinstad Timothy	3.32	bcd	44.98	8.71	40.08	53.57	57.68	0.30	0.18	1.51	0.22
Fojtan Festulolium	2.15	e	53.60	12.01	39.30	52.00	58.28	0.50	0.19	1.72	0.36
Courtney Tall Fescue	3.22	bcd	52.56	10.42	43.71	56.78	54.85	0.62	0.19	1.81	0.43
<i>Average</i>	<i>3.46</i>		<i>47.79</i>	<i>11.37</i>	<i>41.07</i>	<i>53.53</i>	<i>56.93</i>	<i>0.46</i>	<i>0.21</i>	<i>1.71</i>	<i>0.31</i>
<i>CV</i>	<i>12.47</i>										

The grass/legume mixture trial was harvested on July 21, 2020 at an average moisture content of 52%. The yield and quality results are summarized in table 8. Similar to previous years, the mixtures with Yellowhead and Spreder 5 alfalfa yielded overall highest throughout the trial. Success Hybrid Brome/ Yellowhead yielded the highest at 5.40 ton/acre. The Fleet MB/AC Mountainview yielded the lowest at 3.49 tons/acre. The overall average in the trial was 4.5 tons/acre.

Table 8. Perennial Forage Project Grass/Legume Mixture Data, 2020 (ton/acre, 1 ton = 2000 lbs).

Variety	DM Yield (ton/acre)		Moisture (%)	2020 Quality Data							
				CP (%)	ADF (%)	NDF (%)	TDN (%)	Ca (%)	P (%)	K (%)	Mg (%)
Fleet MB/Yellowhead	4.19	bc	55.81	13.26	42.84	56.47	55.53	0.04	0.04	0.14	0.3
AC Knowles/Yellowhead	4.78	ab	49.03	9.77	39.12	57.14	58.42	0.32	0.11	1.33	0.22
Success HB/Yellowhead	5.40	a	51.56	9.91	40.39	58.48	57.45	0.29	0.15	1.24	0.21
Fleet HB/Spredor 5	4.58	ab	55.61	11.92	40.35	55.69	57.47	0.54	0.18	1.76	0.37
AC Knowles/Spredor 5	4.77	ab	51.06	10.22	39.40	58.32	58.20	0.34	0.16	1.37	0.24
Success HB/Spredor 5	4.86	ab	51.57	9.52	40.52	57.84	57.33	0.32	0.12	1.27	0.21
Fleet MB/AC Mountainview	3.49	c	51.37	10.65	42.55	56.84	55.76	0.4	0.15	1.66	0.27
AC Knowles/AC Mountainview	4.35	bc	50.06	9.35	37.77	56.85	59.48	0.28	0.14	1.49	0.23
Success HB/AC Mountainview	4.08	bc	48.21	9.08	39.36	58.74	58.24	0.28	0.13	1.42	0.17
<i>Average</i>	<i>4.50</i>		<i>51.59</i>	<i>10.41</i>	<i>40.26</i>	<i>57.69</i>	<i>57.54</i>	<i>0.31</i>	<i>0.13</i>	<i>1.30</i>	<i>0.25</i>
<i>CV</i>	<i>9.9</i>										

Long-Term Impact on Soil Biological, Physical and Chemical Health of Four Extended Grazing Strategies in Northeastern Alberta

Partners: Bar LD Ranch
Canadian Agriculture Partnership
Chinook Applied Research Association
Peace Country Beef and Forage Association
Alberta Agriculture and Forestry

Objectives:

1. To determine the long-term impact of four winter grazing strategies on soil physical, chemical and biological health.
2. To determine the long-term impact of four winter grazing strategies on plant productivity and nutritive quality.
3. To determine the economic feasibility of four winter grazing strategies.
4. To compare the environmental impact (soil and forage) and economics of four winter grazing strategies.

Background:

Overwintering beef cows is a major cost in cow-calf production systems across the western Canadian prairies. Producers are looking to decrease winter feeding costs by utilizing extensive feeding systems including bale grazing, swath grazing, stockpiled forage and corn grazing. These systems can utilize both annual and perennial forage crops. Not only do extensive grazing systems reduce winter feeding costs through lower machinery use, fuel consumption and manure handling costs, but these systems can also have a beneficial impact on soil nutrients and plant productivity (Jungnitsh et al. 2011; Kelln et al. 2012).

Jungnitsh et al. (2011) showed a marked gain in nutrient cycling efficiencies and pasture growth using in-field feeding systems when compared to drylot feeding systems. The study also showed higher protein content in forages with in-field feeding compared to hauled manure or compost with a total of 34% of original feed N and 22% of original feed P imported into the fields with extended grazing systems. Similar results were found by Kelln et al. (2012) comparing nitrogen and phosphorous amounts and distribution in swath grazing, straw-chaff bunch grazing and bale grazing. This study also assessed subsequent crop biomass and found a greater positive impact in the extended feeding systems when compared to raw manure and compost manure application.

With the higher concentration of nutrients accumulated in winter feeding sites, care needs to be taken to avoid nutrient overloading. Gburek and Sharpley (1998) stressed the potential environmental risk of exceeding the soil and vegetations phosphorous capacity leading to dissolved phosphorous runoff with precipitation. King et al. (2017) showed a significant increase in nitrate export from applications of solid cattle manure during spring melt when compared to a non-manured control. Extended feeding systems show a greater accumulation on nutrients from excreta at feeding sites (Kelln et al. 2012; Jungnitsh et al. 2011).

Although current studies provide a detailed look into the short-term impact of winter grazing systems on soil nutrients and plant biomass, there is a lack of data assessing the long-term impacts (3+ years) of winter grazing systems on soil health and plant biomass.

In recent years, there has become an increased focus on soil health. Soil health can be defined as “the continued capacity of soil to function as a vital living ecosystem that sustains plants, animals and humans”

(USDA). Recent research into extended grazing strategies and their impact on soil has focused on nutrient cycling, particularly Nitrogen (N) and Phosphorous (P). Although this is an important part of soil health, very little has been investigated into the impact on soil biological health. Much of this has been due to a lack of laboratory testing capabilities in North America to determine soil biology including soil microorganisms. With the opening of Chinook Applied Research Association's (CARA) Soil Health Lab, Alberta now has the ability to determine soil biological health.

References:

Gburek, W.J. and Sharpley, A.N. 1998. Hydrologic controls on phosphorous loss from upland agricultural watersheds. *J. Environ. Qual.* 27.

Jungnitsh, P.F., Schoenau, J.J., Lardner, H.A. and Jefferson, P. 2011. Winter feeding beef cattle on the western Canadian prairies: impacts on soil nitrogen and phosphorous cycling and forage growth. *Agric. Ecosyst. Environ.* 141 (1-2): 143-152.

Kelln, B. and Lardner, H.A. 2012. Effects of beef cow winter feeding systems, pen manure and compost on soil nitrogen and phosphorous amounts and distribution, soil density and crop biomass. *Nutr. Cycl. Agroecosyst.* 92: 183-194.

King, T., Schoenau, J. and Elliott, J. 2017. Relationship between manure management application practices and phosphorous and nitrogen export in snowmelt run-off water from black chernozem Saskatchewan soil. *Sust. Agric. Res.* 6: 03-114.

Method:

The following four extended grazing strategies will be assessed:

1. Bale grazing
2. Swath grazing cereals
3. Grazing stockpiled forage
4. Corn grazing

A detailed historical record of each field used for the treatments was compiled prior to confirming project sites. Similar records will be kept throughout the duration of the project including, seeding costs, fertility costs, baling costs, number of head grazed, days grazed etc. Anecdotal summaries from each participating producer will be kept to demonstrate how each producer felt the system performed on their operation.

Soil Sampling

Soil sampling for the project will utilize CARA's Soil Health Sampling Protocol. Physical soil health parameters will be assessed on site, biological parameters assessed at the CARA Soil Health Lab and soil samples will be sent to an accredited laboratory for analysis of chemical soil health parameters.

Soil health parameters tested will include:

- | | |
|---|---|
| <ol style="list-style-type: none">1. Physical analysis<ol style="list-style-type: none">a. Compactionb. Bulk densityc. Textured. Water infiltration2. Biological analysis<ol style="list-style-type: none">a. Active carbonb. Soil microbial respirationc. Active and total bacteriad. Active and total fungie. Nematode functional groupsf. Protozoa functional group | <ol style="list-style-type: none">3. Chemical Analysis<ol style="list-style-type: none">a. Organic matterb. N,P,Kc. Micro Nutrients |
|---|---|

Over the next three years, each site will be sampled in the fall and spring of each grazing season with sampling beginning in the fall of 2019.

Forage Sampling

Forage samples will be collected, frozen and sent to an accredited laboratory for wet chemistry analysis utilizing best management practices for sampling.

Discussion:

The project began with fall sampling of all four strategies for soil health parameters at Bar LD Ranch located in Bonnyville, Alberta. Results will be made available in early 2020.



Forage Crop Guidelines

The single largest variable cost in maintaining a cow herd is feed. Understanding cow nutrient requirements and ration balancing can help to reduce costs associated with over and under feeding (tables 1 and 2). Previous studies estimate that feeding a balanced ration can save as much as \$0.25/hd/day. Consequently, feed tests are critical to ensuring that rations are based on the actual feed being fed.

Every year LARA sends in multiple feed samples for quality analysis on our trials and demonstrations. In addition, we offer two free feed tests for each producer in our operational area.

Available to all producers is a forage probe that can be borrowed at any time. Contact LARA to see when it is available: 780.826.7260.

Table 1. Forage intake guidelines (as percent of body weight).*

	Straw and Poor Quality Forage (%)	Medium Quality Forage (%)	Excellent Quality Forage (%)
Growing and Finishing Cattle	1.0	1.8 - 2.0	2.5 - 3.0
Dry Mature Cows and Bulls	1.4 - 1.6	1.8 - 2.0	2.3 - 2.6
Lactating Cows	1.6 - 1.8	2 - 2.4	2.5 - 3.0

* as taken from CowBytes

Table 2. Minimum Energy and Crude Protein Requirements for Beef Cattle.

Animal	CP (%)	ADF (%)	TDN (%)
Cows			
Mid-Pregnancy	8	59	50
Late Pregnancy	9	50	55
Lactation	10-12	31.5 - 45.7	56 - 63
Growing Cattle			
400 - 600 lbs - low ADG	11-12	24-39	60-65
400 - 600 lbs - high ADG	12-14	<31	68-75
600 - 800 lbs - low ADG	10-11	<31	60-65
600 - 800 lbs - high ADG	12-13	<31	68-75
>800 lbs	9-12	<31	68-75
Finishing Cattle			
900 - 1000 lbs	10-11	<31	68-75
>1000 lbs	9-10	<31	68-75
Wintering Bulls	9	37-53.5	53-60

Rancher Researcher Project

Partners: Canadian Agriculture Partnership
Chinook Applied Research Association
Foothills Forage and Grazing Association
North Peace Applied Research Association
Gateway Research Organization
Battle River Research Group
West-Central Forage Association
Mackenzie Applied Research Association
Grey Wooded Forage Association
Peace Country Beef and Forage Association
Alberta Beef Forage and Grazing Centre (Alberta Beef Producers, Alberta Agriculture and Forestry, Agriculture and Agri-Food Canada)

Objectives:

1. Provide a framework and process to assist in the adoption of technologies which provide benefit to cattle operations in Alberta.
2. Assess the impact of adoption of specific technologies on 20 operations utilizing financial and production data.
3. Enhance the adoption process of technologies which benefit ranch operations.

Background:

The uptake of new technologies has typically been slow within ranching operations. There are many reasons why this happens including but not limited to, a lack of awareness of specific innovations, lack of knowledge of how and what impacts the practice change may have or perhaps a lack of financial and/or manpower resources to put the tools to use. Despite the data which already exists related to productivity and profitability many ranchers have not been motivated to utilize the tools for making decisions within their operations.

This is an expansion of a Rancher/Researcher Pilot project which monitored the adoption of up to 3 innovations by 8 ranchers in south central Alberta. Selection of specific innovations was determined by the individual ranchers. Several targeted areas were evaluated, including soil, forage and economic parameters, for assessment of the impact the innovations made to the individual ranch operations. The ranchers were provided with the opportunity to consult with various scientists to further their understanding of the new technologies. They were encouraged to participate in Alberta Agriculture's Agriprofits program, which although onerous, provided enlightening results for their operations.

The pilot project demonstrated that an enhanced understanding of the ranch operation (eg. GOLD indicators, long term goals, available resources, etc.) can improve and how an innovation will have a positive impact. Ranch participants also acknowledged the importance of collecting and utilizing production and financial data when making decisions on management change.

While the information gleaned from the pilot was valuable, there was an identification of gaps which can impede consideration of the number of innovations available to the ranching community. This project builds on the experience from the pilot and will improve the successful adoption of various technologies by including a detailed initial interview with the ranchers to help determine selection of technologies relevant

to their operation (rather than self-selected innovations), facilitated linkage with appropriate topic specialist as well as require a financial investment for the new technology. Ranchers will be made aware of the benefits of detailed monitoring of both production and financial ranch metrics. They will be encouraged to participate in Agriprofits. Ranchers from both the pilot and expansion projects will be expected to support the adoption process by providing testimonials and mentorship related to their experience, enhancing peer to peer KTT.

Discussion:

Two ranches were selected to take part in this program; K-Cow Ranch and Tower Farms Ltd. Each ranch was interviewed and their technology was selected.

K-Cow Ranch is located near Stony Lake, in the County of St. Paul, will be implementing a solar powered watering system that can be utilized year round off of a dugout watering source. In addition to existing expertise they have found within industry, LARA staff have and will continue to provide links to expertise as needed. The conditions of 2020 have made installing it in an earlier time frame very challenging, but will be in place for the upcoming grazing season.

Tower Farms Ltd. is located near Smoky Lake and have installed a weigh scale on their feed wagon to improve rations. Previously they were using a feed truck to finish off/background their steers for direct marketing. Originally they fed without a scale, and relied on timing an auger, filling the truck and counting how many pails were filled during that timeframe. This gives them a “rough” estimate as to how much grain the cattle are being fed. The amount of the grain augured out during that timeframe can vary based on moisture of the grain, the type of grain, and the weather conditions. All these variables can cause variations in the amount or total lbs. of grain augers out. By putting a scale on their feed truck they can accurately feed out the amount of grain needed for the animals. It also gives them the ability to adjust the cattle feed intake accurately depending on where they are in the finishing cycle, what the weather conditions are and what type of grain is being fed. They are hoping that this advancement in technology will allow them to be more efficient when feeding these animals, as they will have the ability to adjust the feed, and measure accurately. The system was installed December 22, 2020.

Soil samples, feed tests and other data points will be collected during 2021 and will be analyzed and reported.

Environment and Regenerative Agriculture



Impact of Stem Mining Weevil (*Hadropontus litura*) population density on Canada Thistle Suppression

Canada thistle (*Cirsium arvense*) is an aggressive, colony-forming perennial weed which reproduces by both seeds and horizontal creeping root systems. It is listed under the Alberta Weed Control Act as noxious. Canada thistle has a high tolerance to many different environmental conditions and is highly competitive with other vegetation. It is prevalent in many locations such as riparian areas that do not allow for chemical or mechanical control methods.

The adult lifespan of the Stem Mining Weevil, *Hadropontus litura*, is approximately 10 months as they overwinter in the soil and leaf litter, and emerge in the spring to feed on rosette leaf foliage and stem tissue. Eggs are laid in May and June in the mid vein of the leaf and eggs hatch 9 days later. The larva mine down the stem into the root collar consuming plant tissues.

The majority of previous research on *Hadropontus litura* has been dependant on geographic location. On the west coast of British Columbia and California the weevils have not been very successful compared to the Midwest including Montana. Montana has similar climate to Alberta, therefore weevils may be effective across the region.

Hadropontus litura offers a viable option for Canada thistle suppression in sensitive areas or in conjunction with other control options. The success of *Hadropontus litura* on suppression of Canada thistle will demonstrate:

- Use of a biological control as an alternate means of pest control;
- A possible reduction in chemical use; and
- Weed control in sensitive areas where other traditional methods are not able to be utilized



In 2012, as part of the provincial ARECA Environmental Team protocol, LARA released 1260 adult weevils across 4 sites at various population levels. Each site had a Canada thistle population density of 5 – 10 plants per square meter. Sites were revisited in 2013 to 2017 to monitor for plant damage and presence of weevils. Adults were found this past year and notable damage to the plants was observed.

Demonstration Solar Watering System

In 2006 LARA constructed a portable solar watering system with funding from the Alberta Stewardship Network. The unit, on a pull trailer, contains solar panels, trough, pump, batteries, float and hoses. It can water 150 head of cattle with a 15 foot lift, or 200 head with a 10 foot lift. It can be used for any surface body of water such as a dugout or creek.

This system is available for a free trial and allows the producer a chance to see if an alternative watering system will work for their situation. Call the LARA office to book the system if you are interested.

LARA Watershed Resiliency and Restoration Program

Watersheds are unique, come in many shapes and sizes and can cross many different land uses. The simple definition of a watershed is the area of land that catches precipitation, and drains into a wetland, stream, river or groundwater. The riparian zone is the interface between the upland and a water course. This area is heavily influenced by water, how and where it flows and is reflected in the plants, soil characteristics and wildlife that are found there. Riparian areas have a large role in water quality, quantity and biodiversity. They provide eight key functions to: trap and store sediment; build and maintain banks and shorelines; store water; recharge aquifers; filter and buffer water; reduce and dissipate energy; create primary production; and maintain biodiversity by providing habitat for plants, wildlife and fish. These Ecological Services benefit people, other living organisms, and the overall functioning of interconnected natural systems within watersheds. Conservation and restoration of wetlands and riparian areas in Alberta are needed for sustainably functioning watersheds.

This was the final year of funding for this program.



OFFSITE WATERING SYSTEMS

16 Offsite Watering Systems Installed



RIPARIAN FENCING

14.15 miles of riparian fencing were put in to protect water sources



WATER COURSE CROSSINGS

3 water course crossings were installed to protect water bodies from erosion

WETLAND ENHANCEMENT

Two pond levelers were installed to mitigate effects of beavers, along with 84 acres reseeded along riparian areas



One wintering site relocation was funded.

Environmental Farm Plans

The environment is becoming a more prominent issue. It is a large factor in marketing agriculture and food products in today's global markets. Consumers are demanding more transparency and are demanding high quality and safe products. Reputation of food safety is critical to retain and gain access to domestic and international markets.



Environmental Farm Plans (EFP) provide a tool for producers to assess their own operation and identify environmental risks, current standards, areas for improvement and also highlight what they are doing well.

Having a completed EFP allows producers to access different funding opportunities, such as the Growing Forward Stewardship Program. It is also useful in product branding that demonstrates specific environmental standards. There is a ten year mandatory renewal period for all EFPs. If your EFP is older than 10 years old you will have to renew it to be eligible for funding opportunities.



This year 23 producers completed Environmental Farm Plans.

The EFP Process

An EFP can be completed with one-on-one session(s). The EFP first identifies the soil and farm site characteristics. Following this, the producer completes only the relevant chapters that apply to their operation; such as wintering sites, fertilizer, pesticides, crop management etc.

Upon completion the EFP is submitted to a Technical Assistant for review. Once reviewed, the EFP will be returned along with a letter of completion.

The EFP is a living document and should be reviewed and updated periodically. As of April 1, 2018 there is a mandatory 10 year renewal period for an EFP.

If you wish to complete an EFP or have any questions regarding EFP please contact the LARA office at 780-826-7260.

Riparian Health Assessments

The riparian zone is the interface between the upland and a water course. This area is heavily influenced by water, how and where it flows and is reflected in the plants, soil characteristics and wildlife that are found there. Riparian areas have a large role in water quality, quantity and biodiversity. They provide eight key functions to: trap and store sediment; build and maintain banks and shorelines; store water; recharge aquifers; filter and buffer water; reduce and dissipate energy; create primary production; and maintain biodiversity by providing habitat for plants, wildlife and fish.

This Riparian Health Assessment is a tool designed to evaluate the selected site. It can provide a foundation to build an action plan and identify priorities. The assessment provides a snapshot in time and to be an effective tool for monitoring should be done on the same riparian area several years apart.

If you are interested in having a riparian health assessment completed on your land, please contact the LARA office.



Moose Lake Watershed Society

The Moose Lake Watershed Society (MLWS) is a Watershed Stewardship Group. It was founded in 2002 as the Moose Lake Water for Life committee, and became a society in 2008. This group was formed to address the health of Moose Lake, increase public knowledge and interest, and improve water quality as well as fish and wildlife habitat. This group is made up of volunteers. If you want to get involved with the MLWS please contact the Moose Lake Watershed Society or the LARA office.

Due to COVID, this year all Walking with Moose dates were cancelled. This field trip takes grade fives on an experiential field trip to learn about the watershed, forest ecology, water quality and riparian health and functions.

This was the second year that the MLWS partnered with LICA Environmental Stewards for the Keep Our Lake Blue (KOLB) Campaign. KOLB encouraged people to take action to reduce runoff and pollutants, such as phosphorus, from entering the lake. It consists of residents committing to taking at least one action from a list of a possible 52 actions, to help reduce runoff and pollutants from entering their watershed, and helping to protect and improve water quality of the lake.

What we do in the watershed has compounding impacts on the health of our lakes and rivers. Impermeable surfaces don't allow water to soak into the ground. Instead, this water runs off of the surface, carrying sediments, salts, chemicals, and excess nutrients like phosphorous into the lake. Excess nutrients, like phosphorus, can also result in the formation of cyanobacteria, also known as blue-green algae, which are a unique group of bacteria that photosynthesize. When cyanobacteria decompose, they produce nerve and liver toxins that can pose a serious health risk to humans and animals. You can help prevent algae blooms by reducing runoff, phosphorus, and other pollutants on your property.

This year with funding from the Land Stewardship Centre and Alberta Ecotrust, the focus of programs and projects was phosphorous reduction. In early 2021, a nutrient budget will be released and is the culmination of multiyear tributary, in lake, individual basin water quality sampling, as well as the phosphorous flux and core sampling that was completed in 2019. The nutrient budget will assess the legacy phosphorous and internal and external loading of nutrients. It will be used to focus restoration and projects in the future.



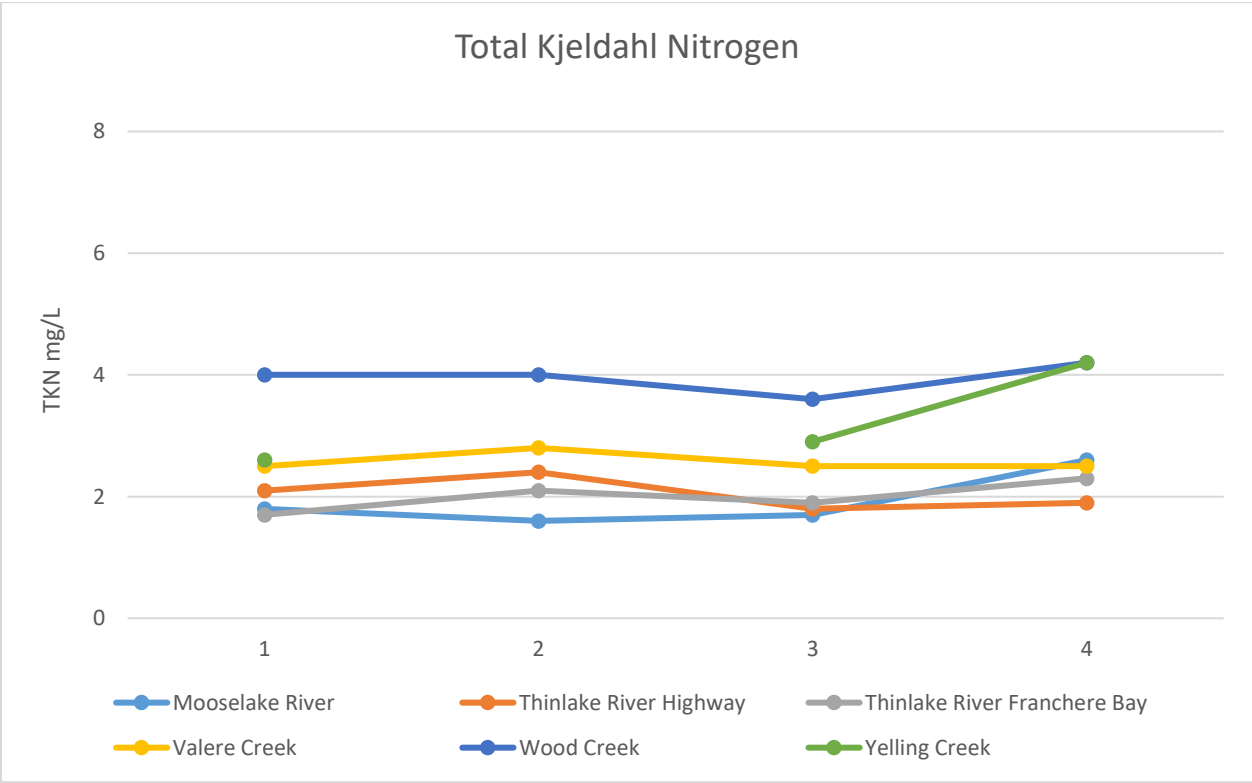
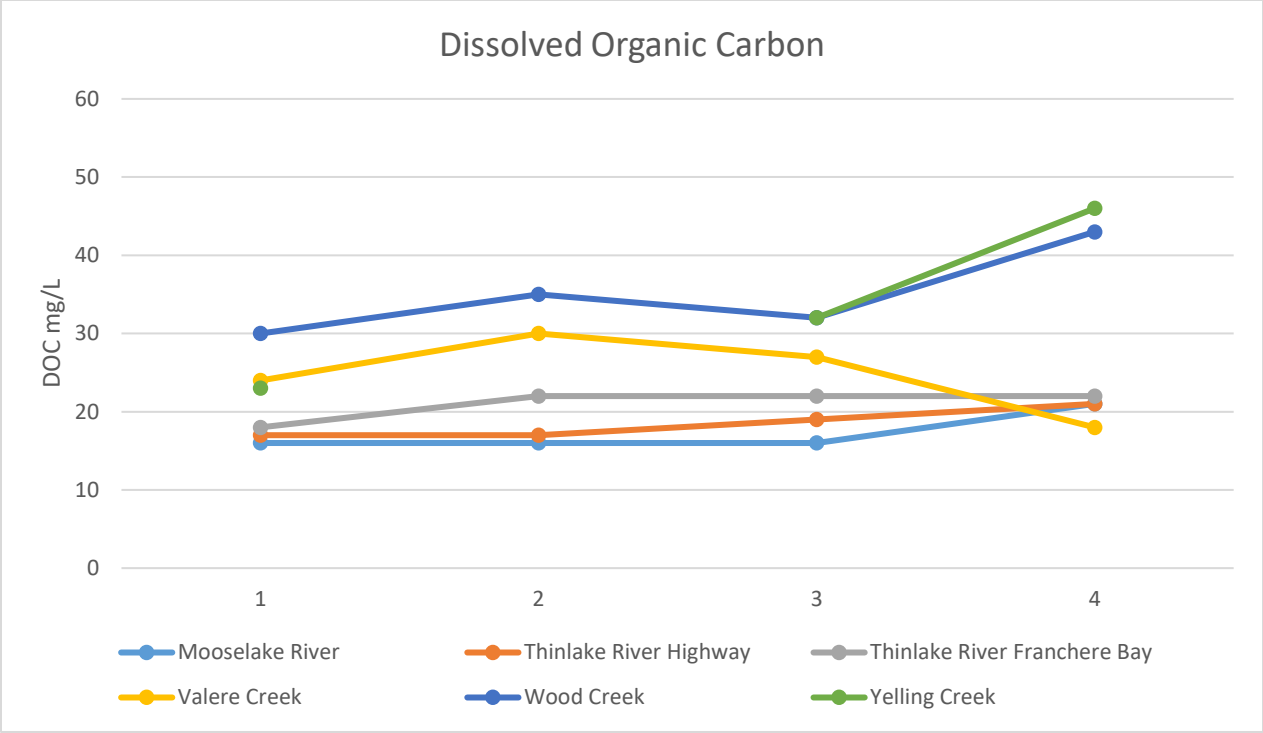
Moose Lake Watershed Tributary Monitoring

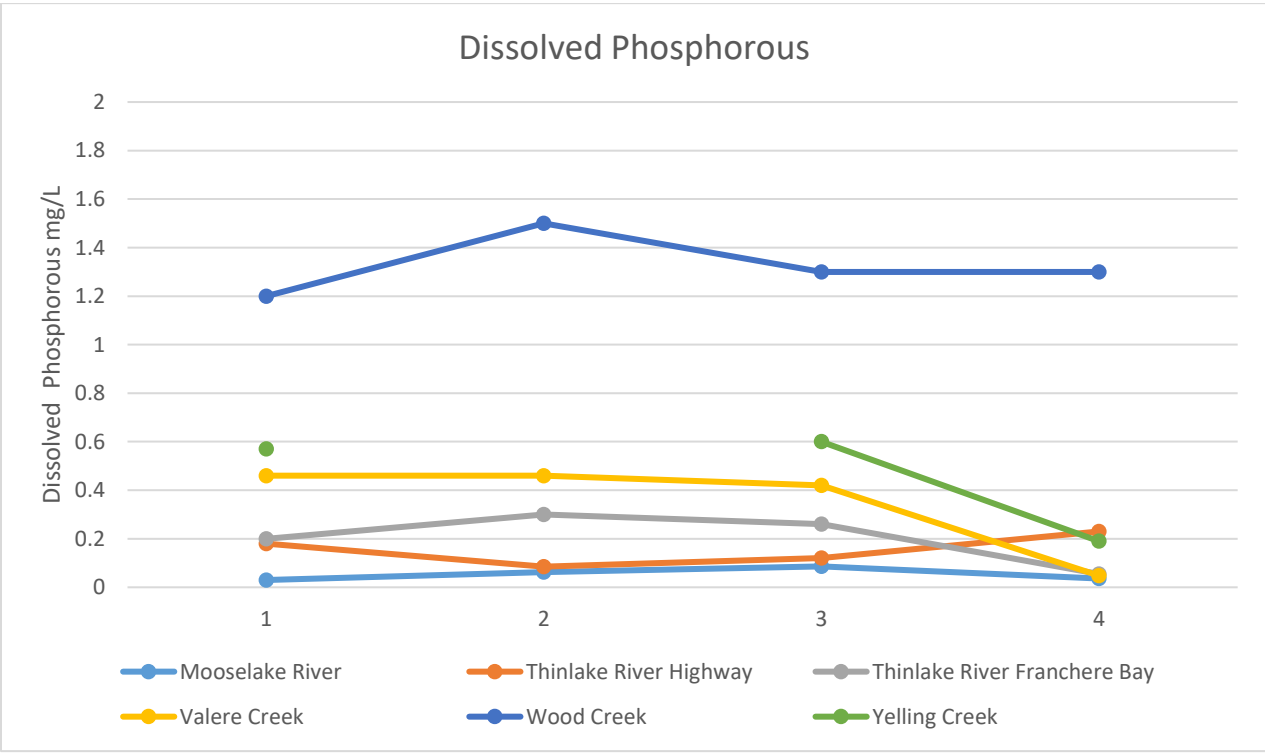
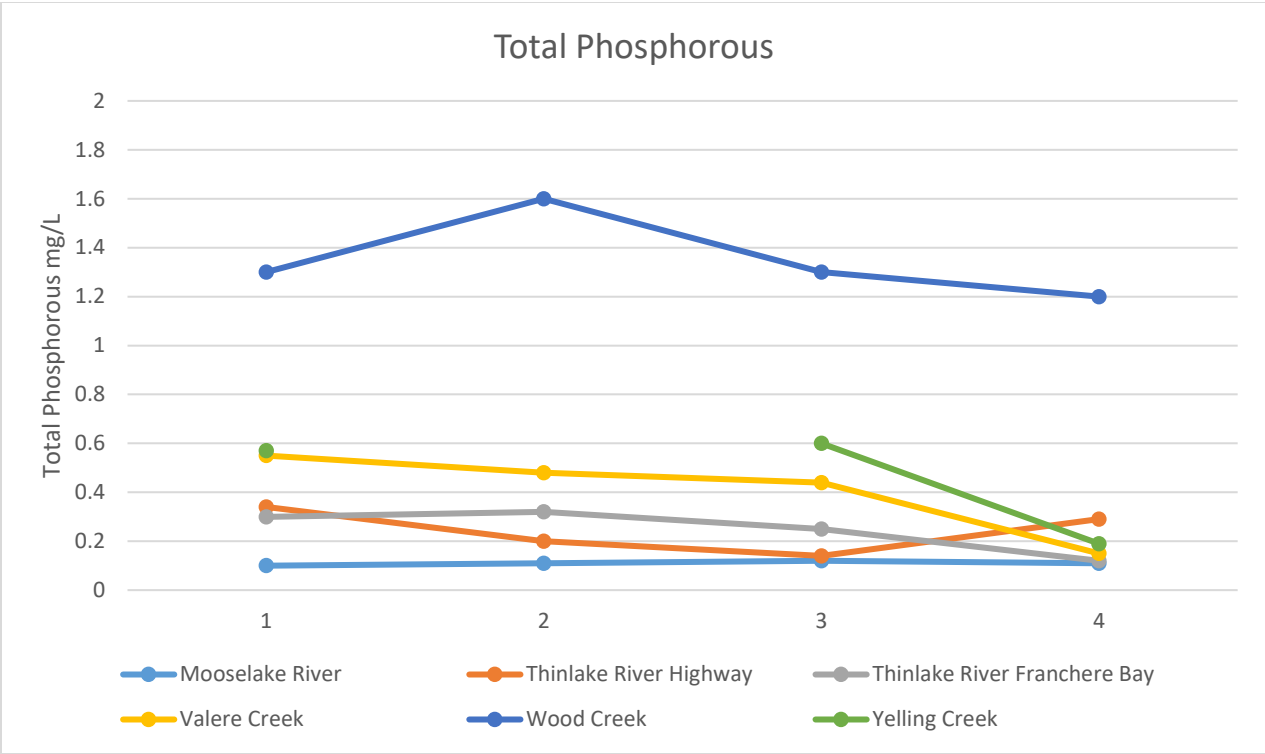
The Moose Lake Watershed Society conducted tributary monitoring four times throughout the summer. The locations were: Valere Creek, Wood Creek, Yelling Creek, Mooselake River, Thinlake River at Highway 28, and Thinlake River near Franchere Bay. Yelling Creek was not sampled on occasion due to extremely low water levels. The four dates sampled were: May 8, June 2, June 18 and August 20. The water was tested once for routine chemical parameters as well as nutrients and all other samplings were only for nutrient contents.

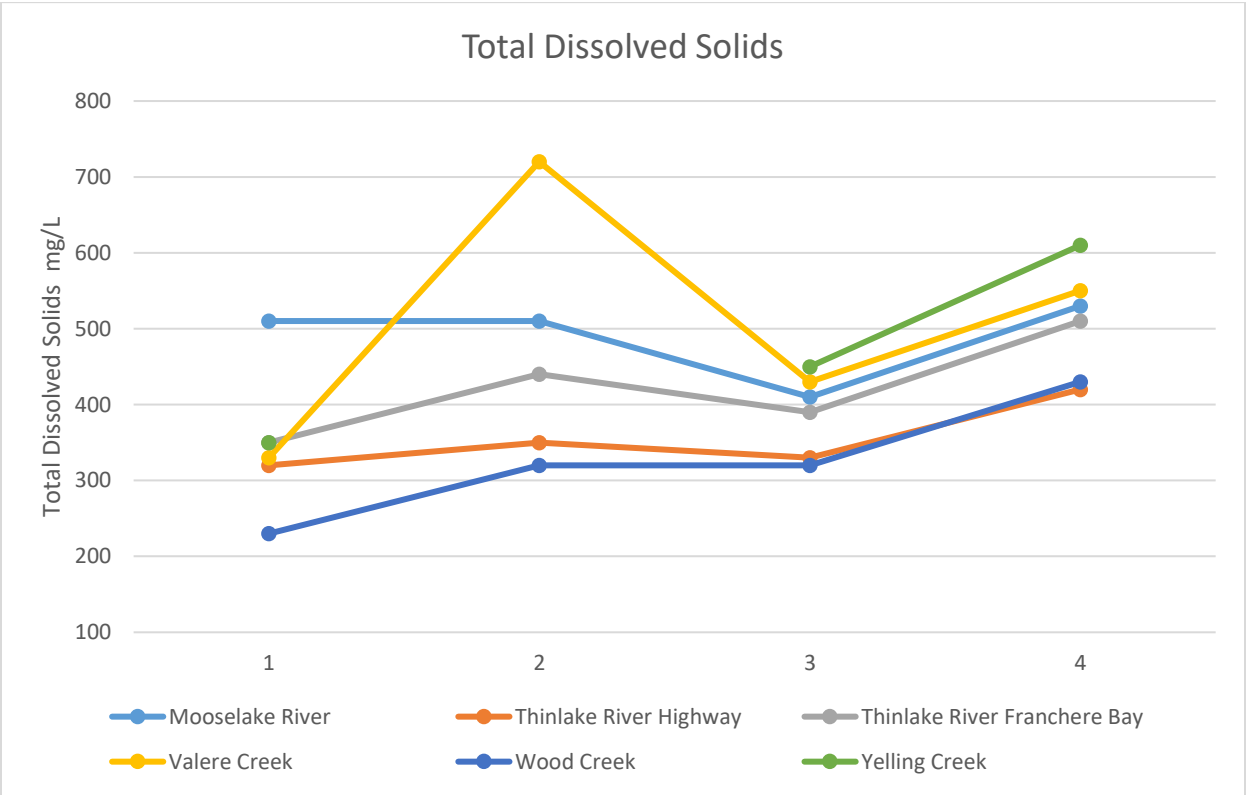
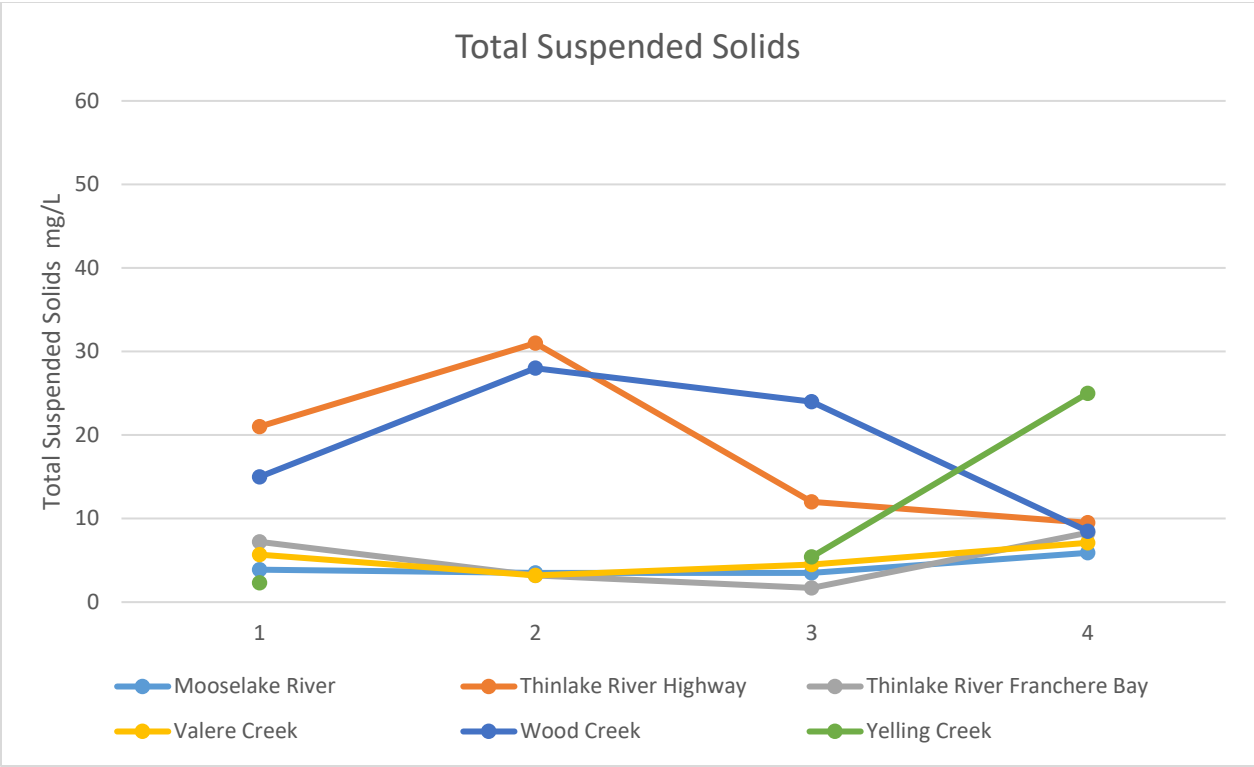
Phosphorous is one of the main driving forces of algae blooms in water bodies. Phosphorous can be in high concentrations due to fertile soils, but can be compounded in the environment by fertilizer use, septic leaks, chemicals and soil erosion. Nitrogen is also needed for plant growth, but generally limits terrestrial plants versus aquatic species that are much more dependent on phosphorous. High amounts of these nutrient lead to algal blooms and cyanobacterial blooms in our water bodies. These can have detrimental effects on fish populations as the blooms increase water temperature, decrease dissolved oxygen content and increase turbidity. Cyanobacteria (blue-green algae) can also be toxic to humans and wildlife which can cause skin irritation to liver damage to even death within a short period after consumption.

Reducing our impacts on the watershed by responsible use of chemicals and fertilizers, keeping vegetation in place and preventing soil erosion and protecting/enhancing our riparian areas can help improve water quality and our ecosystem.





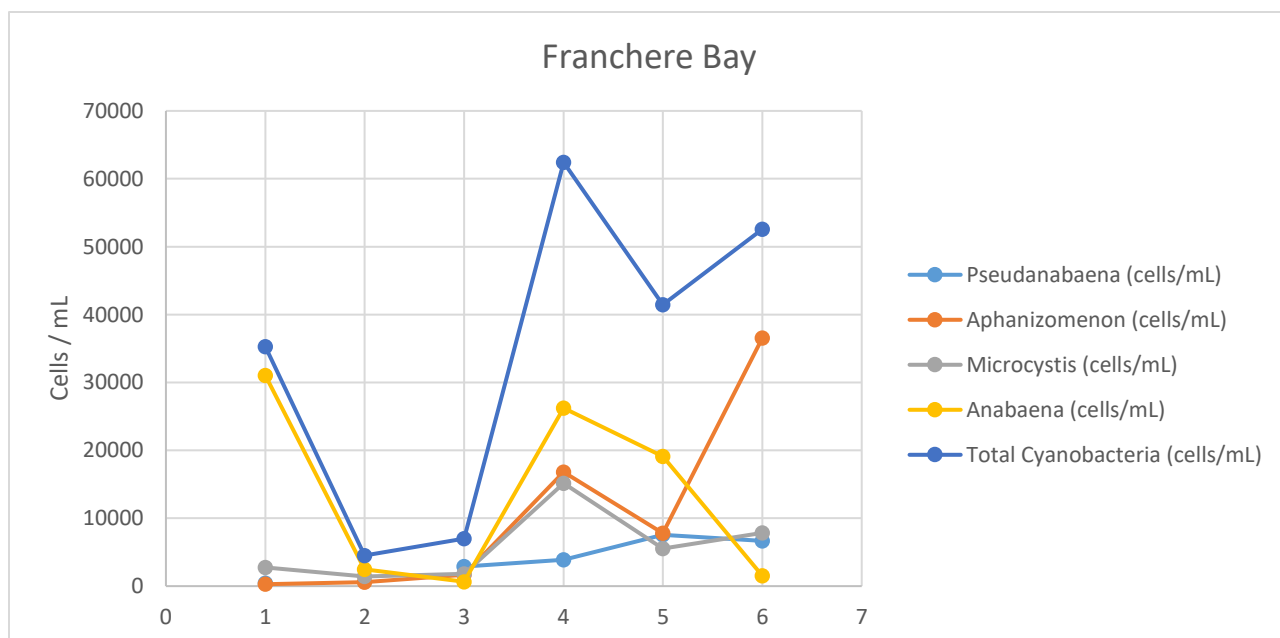
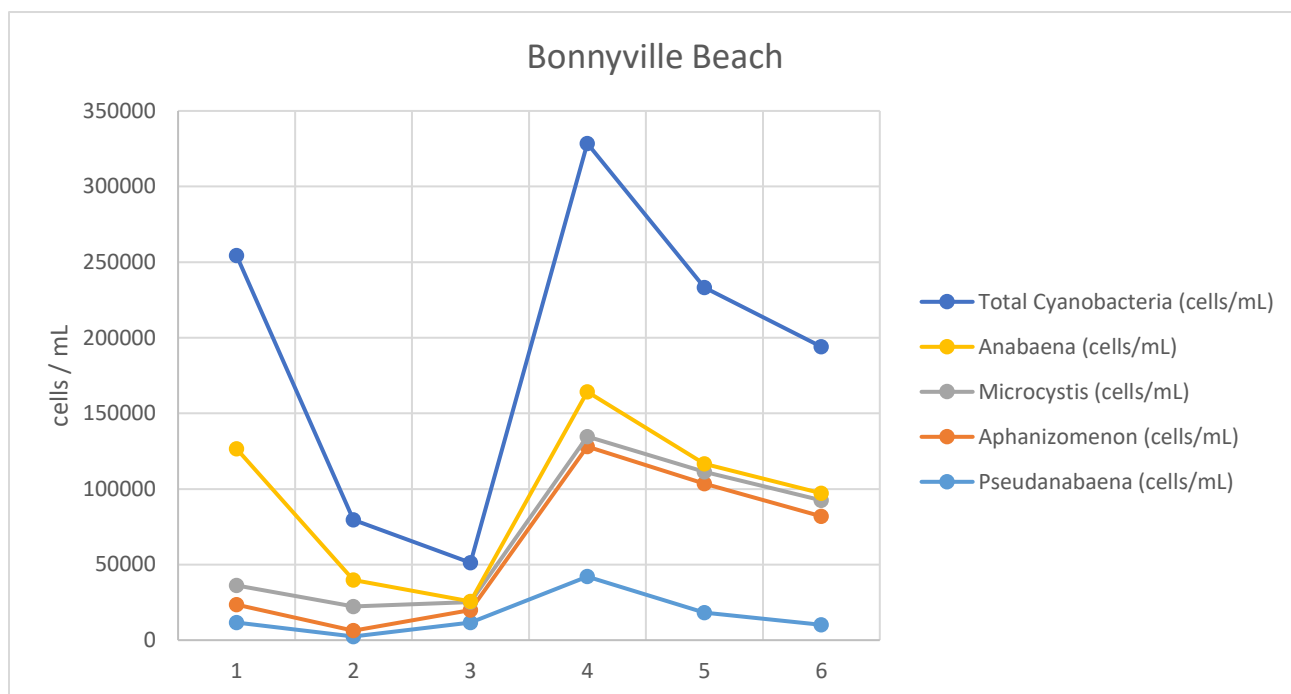


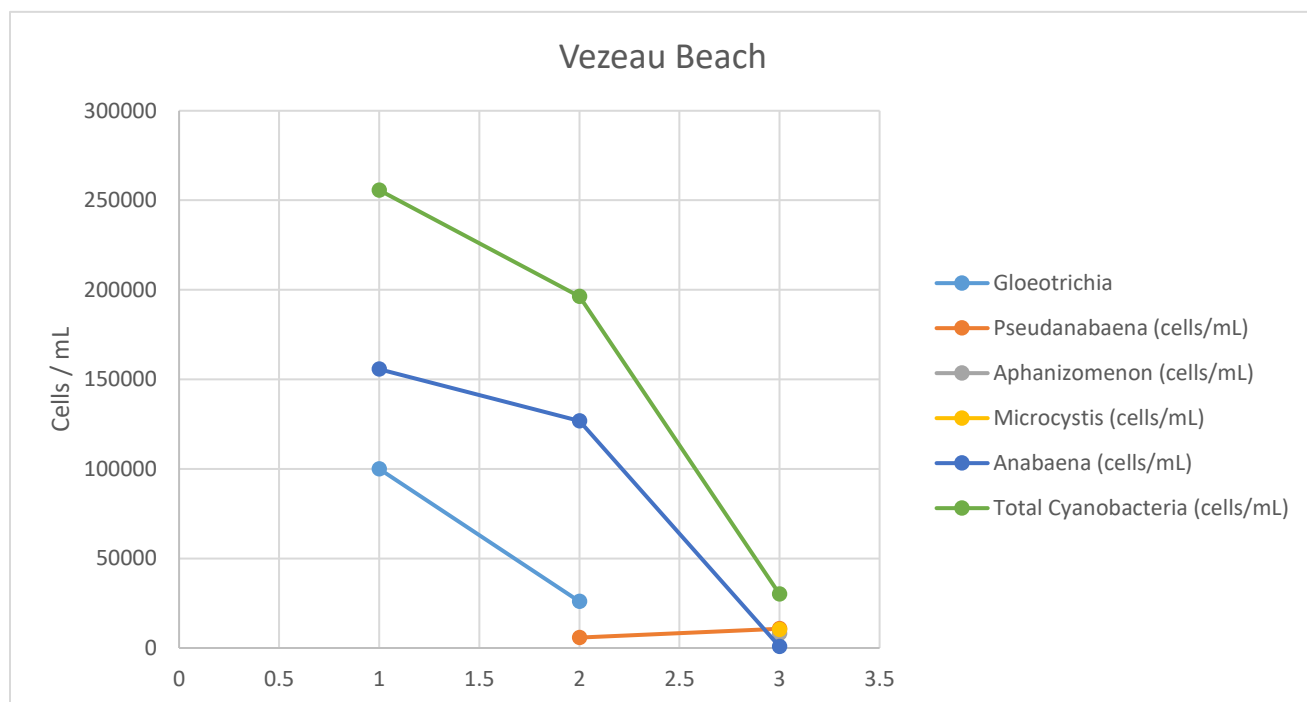
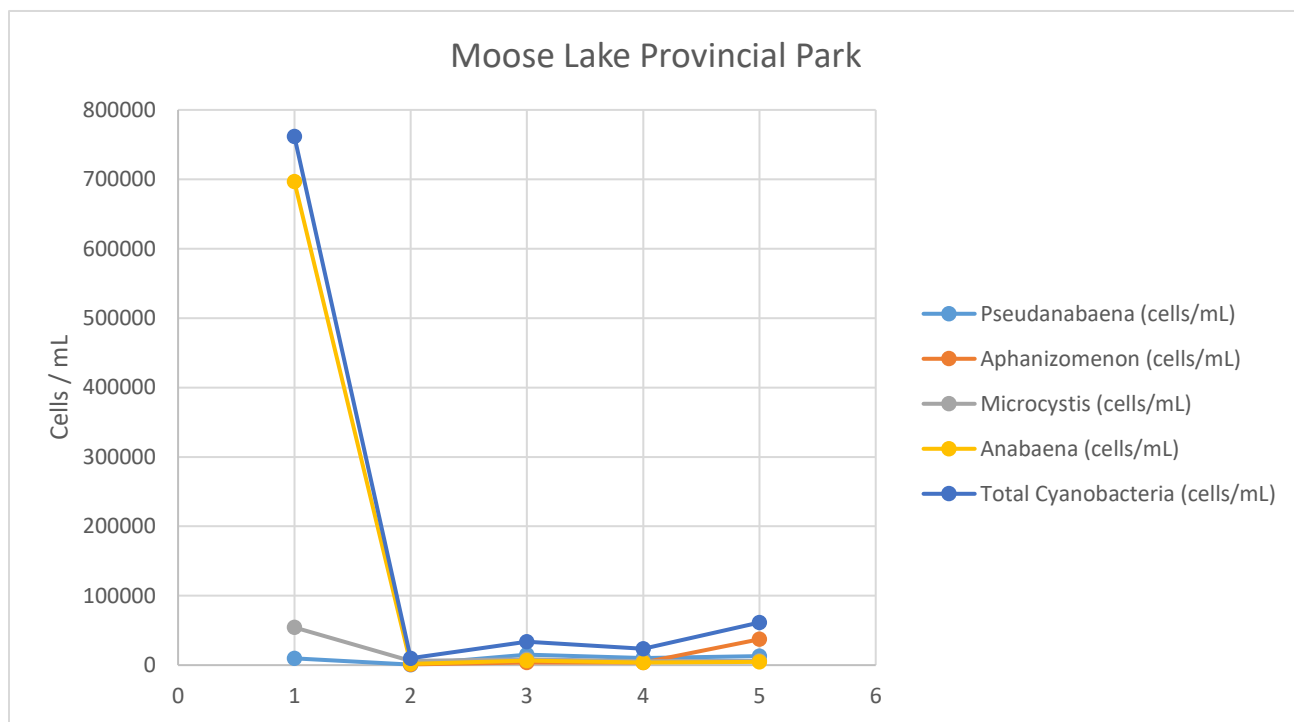


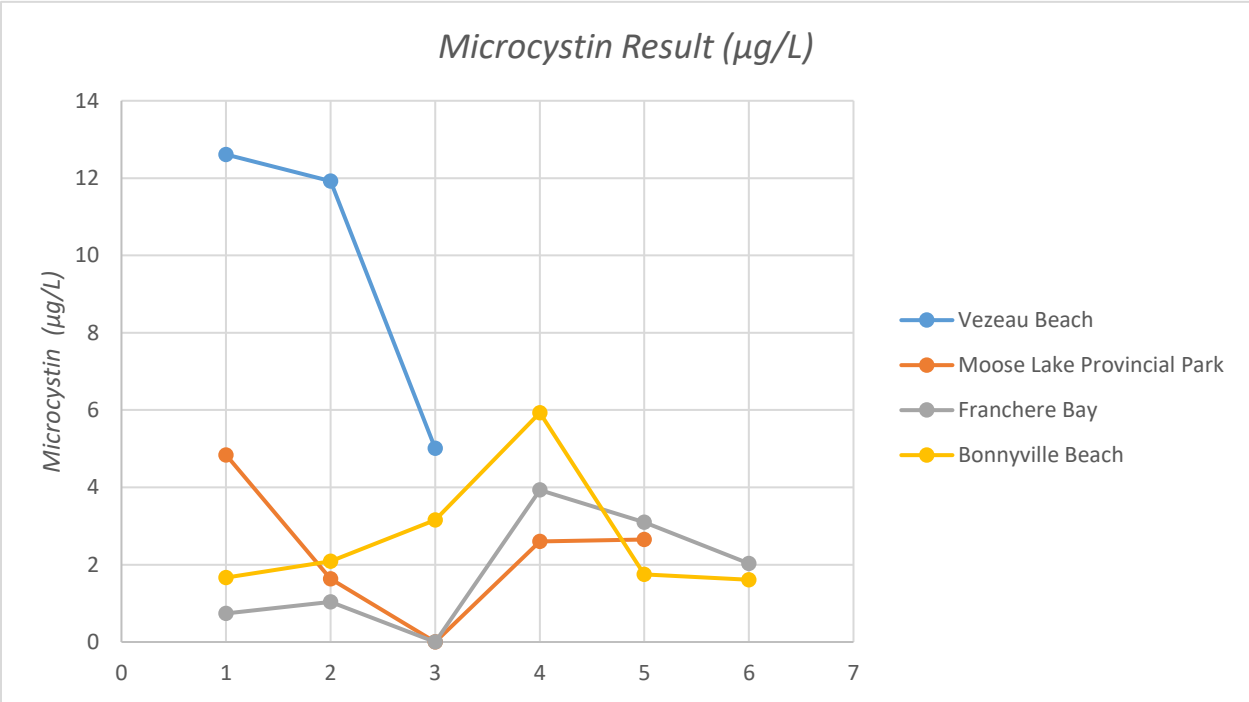
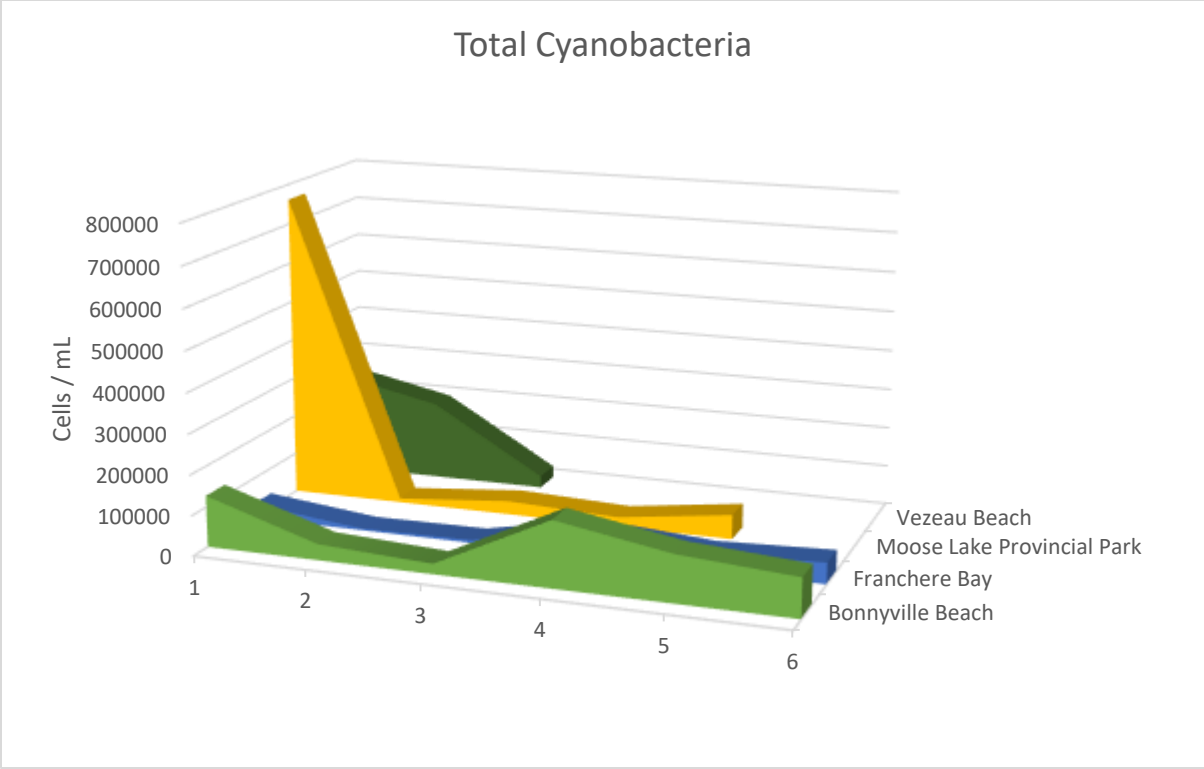
Moose Lake Cyanobacterial Monitoring

Moose Lake Watershed Society, Lakeland Agricultural Research Association and Alberta Health Services, partnered to complete enhanced cyanobacteria monitoring for several weeks in the later part of summer. This was in response to the severe blooms that had occurred earlier in the season, and resulted in the loss of a residents pet.

The samples were collected by volunteers, following AHS procedures.







Alberta Soil Health Benchmark Monitoring Project

Partners: Chinook Applied Research Association
Battle River Research Group
Farming Smarter
Foothills Forage and Grazing Association
Gateway Research Organization
Grey Wooded Forage Association
Mackenzie Applied Research Association
North Peace Applied Research Association
Peace Country Beef and Forage Association
West Central Forage Association
Food Water Wellness Foundation
Canadian Agriculture Partnership
Alberta Agriculture and Forestry

Objectives:

1. Improve the understanding of soil health parameters amongst Alberta producers.
2. Establish a soil health benchmark database representing points across Alberta.
3. Monitor how management practices affect soil health parameters during a 3-year time frame.

Background:

There is an increasing interest in the link between soil health, plant health and ultimately food quality. Society is also concerned with carbon both in the air and soil. Since carbon and soil health are very closely connected, management practices which improve carbon sequestration may result in a healthy soil and nutritious food products.

The status and functionality of a soil should be measured not only by its chemical (fertility) properties but also for its physical and biological properties. Chemical components of soil have been intensively evaluated by commercial soil testing labs in Canada. Chemical fertility recommendations have been based on this knowledge. The role of soil biology, however, is not well understood and physical characteristics have not been monitored. Evaluation of biological soil characteristics has only become available during the past few years in laboratories in the United States and more recently eastern Canada. Existing biological tests have not been calibrated and monitored specifically for Alberta soils. CARA's Soil Health Lab, under the direction of Dr. Yamily Zavala, provides a unique service in evaluating soil health constraint indicators. A biological and physical baseline developed within the province will provide a framework which can help define strategies for managing and improving the productive capacity, and sustainability, of our soils. A diverse micro-biological underground community may contribute to an overall healthier soil by improving soil aggregation, soil water infiltration and storage as well as improved carbon sequestration. The improved aggregation stability will also contribute to enhanced carbon sequestration levels in the soil. Healthy soils produce healthy plants resulting in a higher quality food product.

Understanding soil health will give Alberta producers a valuable tool for use in making strategic management decisions on their farms and ranches. Sustainable productivity of a soil is a function of

physical, chemical and biological soil functions. While chemical (mineral) characteristics are well documented through traditional soil testing, physical and biological components are not.

This project will assess and document soil health indicators at a minimum 220 locations per year across Alberta. Information from soil samples collected for various other projects, including the Rancher Researcher Pilot (8 Alberta Ranches), the Carbon Pasture Management Project (9 sites in Alberta) and Strategies to Reduce Fertility Inputs and Improve Soil Health and C-Sequestration in Mixed Crop/Livestock Systems (Fairview and Sedalia) will be added to the data base. Individual farmer submissions to CARA's Soil Health Lab will also be included in the benchmark inventory. This will result in a base of information from points all across the province which will be a new tool for our agricultural industry.

In addition to the collection and evaluation of soil samples, land owners will be coached in the understanding of soil health in general as well as the analysis related to his/her location. The benchmarks will enable these producers to evaluate their management practices with respect to soil health. Farmers will also have the unique opportunity to be trained and have access to some of the lab equipment within CARA's Soil Health Lab for use in the evaluation of their own soil.

Method:

- 20 soil samples will be collected by each participating group in each of 2018 through 2022; the project will allow for farmers to include additional samples in the benchmark inventory if they wish at their own expense
- No specific land use criteria will be used for site selection other than a willing and interested landowner who has good records of management history for the site; it is anticipated the 1210 samples will be a cross-section of crop, forage and native pasture under various management regimes
- CARA's Soil Health Sampling Protocol will be utilized in the collection of all samples
- Staff from all associations will be trained for collection of samples and site information
- Each association will have a Soil Health Sampling Kit
- GPS coordinates will be recorded for each site
- Site history will be documented
- Parameters that will be analyzed:
- Physical (on-site or at CARA Lab):
 - wet aggregation stability (Cornell University protocol)
 - compaction (penetrometer on site)
 - bulk density (by weight/volume measurement)
 - texture (Bouyoucos hydrometer method)
- Biological (CARA Lab Food Soil Web protocol except as noted)
 - active carbon (Cornell University protocol)
 - C:N ratio (will be done in collaboration with U of A)
 - soil microbial respiration (Cornell University protocol)
 - active & total bacteria
 - active & total fungi
 - nematode functional groups
 - protozoa functional groups

- Chemical (commercial labs)
 - organic matter, pH, EC, etc.
 - N, P, K
 - Micro nutrients
- All information will be entered into a data base
- Information related to specific sites will be shared with the cooperating producers by association staff
- In addition to 220 new sites per year for years 2018-2020, sites will be re-visited 3 years after the benchmark and sampled again in 2021 and 2022 to monitor the impact of management activities

Discussion:

Soil sampling began in 2019 and will continue into 2021. If you are interested in being a part of the Soil Health Benchmarking Project, please contact the LARA office at 780.826.7260.



Water infiltration test on pasture, fall 2019.

Extension



2020 Lakeland Agricultural Research Association Extension Activities

Feed What You Need

On January 22 at the Goodridge Hall, 10 producers attended the workshop to deal with variable forage quality and learn about alternative feed sources.

Steve Kenyon with Greener Pastures Ranching

On January 28 in Craigend and January 29 at Lac Bellevue, forty producers attended to learn about grazing concepts and principles, pasture planning, watering systems, soil health, dormant season grazing, pasture rejuvenation and economics and financing.

Farmer Appreciation Night

On February 7th LARA hosted a Farmer Appreciation Night for area producers. The event was held at the Glendon RCMP hall with supper followed by entertainment with Mind Magic. There were 227 producers who attended the evening.



Clubroot Workshop

On February 10th a Clubroot Workshop was held at Flat Lake Hall. Presentations from Scott Keller, Dan Orchard, Connie Cherniwchan, Desarie Malysh and Amanda Mathiot covered an update on clubroot, patch management of clubroot, unharvested acres and other programs and an update on clubroot in the Lakeland.

Cover Crops Workshop

On February 18th and 19th a cover crops workshop featuring Kevin Elmy was held in Ashmont and Lac La Biche. The workshops focused on increasing profitability through diversity. Twenty seven producers attended these workshops.

Moose Lake Watershed Society Annual Meeting

On February 20, 2020 twenty two people attended the Moose Lake Watershed Society Annual Meeting to discuss water concerns, current conditions and what the Society had accomplished. Guest presentations from Alberta Lake Management Society about the 2019 LakeWatch Water Sampling results and Nicole Kimmel, Aquatics Invasive Species Specialist.

Holistic Management

A six day intensive holistic management course was held on February 21 -23 and March 6-8. Holistic management is a values-based decision making framework that integrates all aspects of planning for sustainable social, economic and environmental considerations. It looks at total farm operational management and profitability.

LARA Research Update and AGM

The Annual Research Update and AGM was held on February 27th at the Malliag Unity Hall. LARA staff presented information on the 2019 research and extension programs such as the variety trials, fertility trials, forage peas, silage baling, quinoa, cover crops and forage variety trials. Mike

Hittinger from the Government of Alberta presented on producer programs in the Canadian Agricultural Partnerships suite of programs. Lakeland Brewing Company gave an overview of their operation and brewing methods paired with a tasting after the AGM. Forty six producers attended the event.

Farm & Ranch Safety Workshop

LARA, in partnership with AgSafe Alberta, hosted a farm and ranch safety workshop at Flat Lake Hall on February 28th. Sixteen producers learned about the new legislation, how to identify hazards and started work to build a safety plan for their operations.

Shining a Light on Mental Health in Agriculture

Sixty six producers attended Shining a Light on Mental Health in Agriculture featuring Lesley Kelly from Do More Agriculture Foundation on March 12 at the Ashmont Agriplex. The head and heart behind the popular High Heels and Canola Fields blog provided an inspirational message on how to promote positive mental health on the family farm.

Smoky Lake Summer Field Day

On July 23rd the Smoky Lake Summer Field Day was held at the Ukrainian National Hall in Smoky Lake. Eleven producers attended the presentations. The field tour portion was cancelled due to flooding.

Fort Kent Summer Field Day

On July 29th LARA hosted its Fork Kent summer field day at the LARA office. It featured our regional cereal variety trials, flax, cover crops, liming and crop rotation trial, and ultra-early wheat trial. Twenty three producers attended the day. Presenters from Imperial Seeds, and Graymont discussed the trials with producers.



St. Paul Summer Field Day

On August 5th near Mallaig, LARA hosted its summer field day. Twelve producers attended to tour our regional variety trials, ESN wheat and barley trials, regional silage trials and alternative pea/cereal silage trial.

Lac La Biche Summer Field Tour

On August 12th LARA hosted the Lac La Biche Summer Field Tour at Craigend Hall. The day featured a presentation from Dr. Jan Slaski on Hemp production and our hemp demonstration. The Canola performance trials in Lac La Biche were also discussed. Nineteen producers attended the day.



Soil Health Webinar Series

LARA partnered with Foothills Forage Association and North Peace Applied Research Association to bring the Soil Health Webinar Series. Three webinars were held over the course of the summer featuring:

- Ray Archuleta on August 4th on Soil Building Secrets
- Dr. Allen Williams on August 18th on Adaptive Grazing
- Gabe Brown on September 1st on Lowering Input Costs and Rejuvenating Soil

The three webinars each had over 100 producer attendees, and over 1000 views since. The webinars are available on the LARA YouTube channel.



Water Treatment System Webinar

On October 29th thirteen attended a webinar to learn about water testing and creating a treatment system based on the results. The webinar also covered different water treatment systems available and the pro and cons of each system.

Soil Health

Kevin Elmy from Cover Crops Canada presented on soil health and how to improve resilience to floods, droughts and decrease reliance on high inputs for profitable operations. This webinar was attended by 43 producers on November 3rd, and is featured on the LARA YouTube channel.

Classroom Agriculture Program (CAPs)

Kellie Nichiporik is the zone 8 Classroom Agriculture Program Coordinator. This year would have marked the 35th year for this important provincial program. There were 71 classes with over 1,500 students registered to receive this program. Due to COVID only a fraction of this program was able to be delivered.



Grade Seven Wetland Education

Kellie presented via online several presentation for grade 7 classes on wetlands, invasive species and water quality and management.

Lac La Biche Mad About Science

The Mad About Science Program was established in 2002 by the Lac La Biche Watershed Project. It is an energetic, up-beat program aimed at educating and encouraging youth to become involved with current environmental issues. This year Kellie presented on invasive species and species at risk.

Alberta Open Farm Days

On August 15th LARA staff Kellie Nichiporik and Amanda Mathiot had a booth at the Alberta Open Farm Day that was held at Charlotte Lake Ranch. There were 368 people in attendance at this all day event to learn about agriculture, local products and where food comes from.

Workshops Cancelled Due to COVID

- Lunch and Learn on ESN fertilizers and alternative pulse production
- Soil Health Workshop
- Verified Beef Production +, BIXS and Sustainable Beef Production

Newsletter

Along with articles in LARA's bimonthly *Grow With Us* newsletter, this year four editions of *The Verdant Element* were produced and distributed to 2100 farm mailboxes in the MD of Bonnyville, County of St. Paul, Smoky Lake County and Lac La Biche County.



Horticulture Program



Fertilizer Trial

For the past three years LARA has trialed a fertilizer blend that Shelley from Gardeners Junction has been developing. The product is in the final stages; presently in Ottawa with CFIA waiting for final approval. For more information contact Shelley @ Gardeners Junction or check out the website gardenersjunction.com

Can you tell which planter had the fertilizer blend applied at planting?



Figure 1. Flowers 3B, July 30, 2020.



Figure 2. Flowers 3A, July 30, 2020.



Figure 3. Tomato 8B, July 30, 2020.



Figure 4. Tomato 8A, July 30, 2020.

Appendices



Definition of Common Feed Nutrient Terms

ADF	Acid Detergent Fibre – the least digestible portion of roughage. ADF content is used to determine digestibility and energies.
AIP	Available Insoluble Protein – the portion of the total available protein which is not soluble in the rumen fluid, but is still available to the cow.
AP	Available Protein – the portion of the total protein which is available to the animal if the animal could completely digest the feed.
BP	Bypass Protein – ingested protein that is not degraded in the rumen.
CP	Crude Protein – the total protein contained in feeds as determined by measuring nitrogen content.
DE	Digestible Energy – the amount of energy consumed minus the amount of energy lost in feces.
GE	Gross Energy – measure of total caloric energy of a feedstuff.
IP	Insoluble Protein – the portion of protein which digestive juices or similar solutions cannot dissolve.
ME	Metabolizable Energy – equal to DE minus energy lost in urine, feces and in methane for ruminants.
NDF	Neutral Detergent Fibre – measures cellulose, hemi-cellulose, lignin, silica, tannin and cutin; used as an indicator of feed intake.
NEG	Net Energy for Gain – amount of energy for gain above that which is required for maintenance; used for balancing rations for ruminants.
NEM	Net Energy for Maintenance – amount of energy required to maintain an animal with no change in body weight or composition.
RFV	Relative Feed Value – an index for assessing quality based on the ADF and NDF levels of a feed. As fibre values increase the RFV of forages decreases.
SP	Soluble Protein – the portion of protein which digestive juices of ruminant can dissolve.
TDN	Total Digestible Nutrients – a term which is estimated from the ADF content and is used to describe the digestible value of a feed.

Forages and Cattle Nutrient Requirements

Table 1. Composition of Some Common Feedstuffs.

Feedstuff	Percent of DM Basis								
	DM	CP	ADF	NDF	TDN	Ca	P	K	Mg
Alfalfa Hay Early	90.5	19.9	31.9	39.3	60	1.63	0.21	2.56	0.34
Alfalfa Hay Late	90.9	17	38.7	48.8	55	1.19	0.24	1.56	0.27
Alfalfa Silage	44.1	19.5	37.5	47.5	63	1.32	0.31	2.85	0.26
Barley Grain	88.1	13.2	5.77	18.1	88	0.05	0.35	0.57	0.12
Barley Straw	91.2	4.4	48.8	72.5	40	0.3	0.07	2.36	0.23
Barley Silage	37.2	11.9	33.9	56.8	60	0.52	0.29	2.57	0.19
Corn Silage Mature	34.6	8.65	26.6	46	72	0.25	0.22	1.14	0.18
Oat Grain	89.2	13.6	14	29.3	77	0.01	0.41	0.51	0.16
Oat Straw	92.2	4.4	47.9	74.4	50	0.23	0.06	2.53	0.17
Oat Silage	36.4	12.7	38.6	58.1	59	0.58	0.31	2.88	0.21
Oat Hay	90.7	9.5	38.4	63	53	0.32	0.25	1.49	0.29
Smooth Brome Early Pasture	26.1	21.3	31	47.9	74	0.55	0.45	3.16	0.32
Smooth Brome Hay Mid-bloom	87.6	14.4	36.8	57.7	56	0.29	0.28	1.99	0.1
Rye Grass Pasture	22.6	17.9	38	61	84	0.65	0.41	2	0.35
Orchard Grass Hay Early Bloom	89.1	12.8	33.8	59.6	65	0.27	0.34	2.91	0.11
Orchard Grass Early Pasture	27.4	10.1	35.6	57.6	57	0.23	0.17	2.09	0.33
Timothy Hay	89.1	10.8	35.2	61.4	59	0.51	0.29	2.41	0.13

Source: NRC 1996. Nutrient Requirements of Beef Cattle (7th Ed.) National Academy Press, Washington D.C.

Note: The values that are presented in the above table are intended for producers to determine if the results of their own feed tests are within normal ranges. The most accurate way to determine if feeds are meeting nutrient requirements of specific groups of cattle is to feed test.

Table 2. Tolerance Information for Some Perennial Legumes.

	Acidity	Alkalinity	Salt	Drought	Winter
Legumes	Tolerance	Tolerance	Tolerance	Tolerance	Hardiness
Alfalfa	Moderate	High	Moderate	Very High	Moderate-High
Cicer Milkvetch	Low	Moderate	Low-Moderate	Moderate-High	Very High
Alsike Clover	Moderate	Moderate	Low-Moderate	Low-Moderate	High
Red Clover	Low	Moderate	Low	Low-Moderate	Moderate-High
Sainfoin	Low	Low	Low-Moderate	Moderate	Moderate
Birdsfeet Trefoil	High	Moderate	High	Moderate	Low-Moderate
Sweetclover	Low	High	Moderate	Moderate-High	Moderate

Table 3. Tolerance Information for Some Perennial Grasses.

	Acidity	Alkalinity	Salt	Drought	Winter
Grasses	Tolerance	Tolerance	Tolerance	Tolerance	Hardiness
Meadow Brome grass	Moderate	Moderate	Low-Moderate	Moderate-High	Moderate
Smooth Brome grass	Moderate	Moderate	Low-Moderate	Moderate-High	Moderate-High
Reed Canary grass	High	Moderate	Moderate-High	Moderate-High	Low-Moderate
Creeping Red Fescue	High	Moderate	Moderate-High	Moderate-High	High-Very High
Meadow Fescue			Moderate	Low	Moderate
Tall Fescue	High	Moderate	Moderate-High	Moderate	Moderate
Creeping Foxtail	High	Low	Low	Low-Moderate	High-Very High
Meadow Foxtail	Moderate		Low	Low	High
Orchard grass	Moderate	Low	Low-Moderate	Moderate	Moderate
Italian Ryegrass	High	Low	Moderate	Low	Low
Perennial Ryegrass	High	Low	Moderate	Low	Low
Timothy	Very High	Low	Low	Low	Moderate
Crested Wheat grass		Moderate	Moderate	Very High	Very High
Intermediate Wheat grass	Low	Moderate	Moderate	Moderate	Moderate
Northern Wheat grass	Moderate	High	Moderate	Very High	Moderate
Slender Wheat grass		High	Moderate-High	Moderate	High
Tall Wheat grass		Very High	Very High	High	Moderate
Western Wheat grass	Moderate	Moderate	Very High	Moderate - High	Moderate
Russian Wildrye	Low	Moderate	High	Very High	High
Altia Wildrye			High	Very High	High
Dahurian Wildrye			High	Moderate-High	Moderate-High

Table 4. Nutrient Requirements for Beef Cattle.

	Daily	Dry Matter	Crud Protein		TDN			
	Gain	Intake		% of		% of	Ca	P
	(lbs)	(lbs)	lbs/day	DM	lbs/day	DM	(%)	(%)
600 lb Calves	1.5	1308	1.32	9.5	9.4	68.5	0.32	0.21
950 lb Bred Heifers	0.9	19	1.5	8	10.3	54.1	0.27	0.02
1200 lb Cows Mid Pregnancy	-	20.8	1.4	6.9	10.1	48.8	0.19	0.19
1200 lb Cows Late Pregnancy	0.9	22.3	1.7	7.8	11.8	52.9	0.26	0.21
1000 lb 2 yr Heifer With Calf	0.5	20.8	2.1	10.2	12.9	61.9	0.31	0.23
1200 lb Cow Nursing Calf (1st 3-4 months)	-	23	2.1	9.3	12.1	55.5	0.27	0.22

Source: NRC 1984. Nutrition Requirements of Beef Cattle (6th Ed.) National Academy Press, Washington, D.C.

Barley Varieties for Forage Production in the Lakeland

A summary of 10 years of research trials

Forages, both annual and perennial, make up the largest portion of livestock feed on the Canadian prairies. While annual forages are not typically utilized in conventional systems as a grazing resource, they are often heavily used as a preserved forage for winter feeding including greenfeed and silage.

Background

Lakeland Agricultural Research Association (L.A.R.A.) has been growing barley varieties for forage production for the past 10 years to help assess the regional adaptability of each variety.

The trials are seeded prior to May 25 of each year using a zero-till drill with a 9 inch row spacing to a depth of 0.5 to 1 inch. Spring soil tests are used to develop a unique blend fertilizer each year that is side-banded during seeding. Seeding rate is for a targeted 300 plants/m².

Prior to seeding, the trial site is sprayed with a glyphosate based herbicide and one to two in crop herbicide applications are done depending on weed pressure. No fungicides are used.

The barley trials are aimed to be harvested at the soft dough stage with an average moisture content of 65%. The trials are seeded in the MD of Bonnyville, County of St. Paul and Lac La Biche County.

Yield Results

Table 1 summarizes the average yield results from the 2008 growing season to the 2017 growing season. The yields displayed in table 1 should not be used to determine how much a variety will yield, but rather as a comparison of how one variety will yield in relation to another.

Table 1. Average yield by location.

Variety	Average Dry Matter Yield		
	St. Paul (ton/ac)	Fort Kent (ton/ac)	Lac La Biche (ton/ac)
CDC Austenson	4.98 ⁷	4.88 ⁷	4.57 ⁴
CDC Cowboy	4.89 ⁹	5.02 ⁹	4.31 ⁶
Busby	4.30 ⁵	4.76 ⁵	4.42 ⁴
Seebe	4.26 ⁷	4.89 ⁷	4.20 ⁶
Ponoka	4.43 ⁷	4.94 ⁷	4.19 ⁶
Vivar	4.10 ⁷	4.84 ⁷	3.92 ⁶
Xena	4.04 ⁷	4.94 ⁷	4.01 ⁶
Trochu	3.74 ⁷	4.65 ⁷	3.62 ⁶
Lacombe	4.14 ³	4.51 ³	4.01 ³
Stockford	3.76 ⁵	4.65 ⁵	3.79 ⁴
Chigwell	4.12 ⁵	4.68 ³	4.03 ⁴
Ranger	4.05 ⁸	4.44 ⁸	3.71 ⁶
Sundre	4.23 ³	4.32 ³	3.80 ⁶
Yorkton	3.25 ⁵	4.33 ³	3.37 ⁶
CDC Maverick	5.07 ⁵	5.24 ⁵	4.41 ²
Muskwa	3.77 ²	5.09 ²	3.53 ²
Gadsby	5.58 ⁵	4.45 ³	4.27 ²
CDC Coalition	4.74 ⁵	4.20 ⁵	3.39 ²
Conlon	3.80 ⁵	4.11 ³	3.01 ³
Champion	5.43 ³	5.27 ³	*
CDC Meredith	5.20 ³	4.18 ³	*
Amisk	5.22 ³	4.10 ³	*
Canmore	5.29 ³	5.04 ³	*
Claymore	6.34 ²	3.75 ²	*
Altorado	6.44 ¹	4.63 ¹	*
Tradition	3.14 ²	4.93 ²	2.84 ³
Standard	2.58 ²	4.10 ²	2.66 ³
Westford	2.76 ¹	4.20 ¹	1.68 ²

* these varieties have never been tested in Lac La Biche County.

¹ indicates the number of years each variety has been tested at a given site.

Quality Results

During harvest, composite samples are taken from each variety, frozen and sent to an accredited laboratory for wet chemistry analysis. The average forage quality results are illustrated in table 2. No significant variations in quality between sites were noted over the past ten years. Therefore, all three site locations

were compiled and averaged for variety comparison.

The data presented should not be used as a replacement for individual crop feed tests. A detailed forage analysis should always be done prior to feeding and a mineral program should be developed to ensure adequate nutrition for your livestock each year.

Table 2. Barley variety quality results.

Variety	CP (%)	ADF (%)	NDF (%)	TDN (%)	Ca (%)	P (%)	K (%)	Mg (%)
CDC Austenson ²	9.63	29.67	48.03	65.80	0.35	0.16	1.81	0.20
CDC Cowboy ³	10.20	26.68	43.82	68.04	0.31	0.21	1.73	0.21
Busby ⁵	10.01	27.04	45.91	67.79	0.42	0.17	0.89	0.16
Seebe ⁷	9.21	31.74	49.15	64.20	0.42	0.18	1.03	0.18
Ponoka ⁷	9.77	27.24	44.42	67.69	0.56	0.15	0.96	0.21
Vivar ⁷	10.55	31.25	50.26	64.56	0.59	0.14	1.14	0.25
Xena ⁷	9.38	29.35	49.75	66.04	0.35	0.16	0.96	0.16
Trochu ⁷	9.52	24.44	39.99	69.87	0.43	0.19	1.20	0.23
Lacombe ¹	9.44	26.40	45.60	68.30	0.43	0.14	1.10	0.23
Stockford ⁵	10.07	31.20	53.19	64.60	0.57	0.17	1.09	0.21
Chigwell ⁵	9.68	27.84	45.16	67.22	0.52	0.16	1.18	0.21
Ranger ⁸	9.37	28.71	49.33	66.47	0.51	0.21	1.97	0.25
Sundre ⁹	10.76	30.37	50.75	65.25	0.53	0.17	1.82	0.20
Yorkton ⁵	10.25	30.80	48.61	64.90	0.71	0.25	1.00	0.19
CDC Maverick ⁵	8.77	28.17	46.16	66.96	0.35	0.17	1.57	0.63
Muskwa ²	9.60	28.50	45.06	65.20	0.63	0.17	1.74	0.16
Gadsby ⁵	9.10	30.31	51.34	64.95	0.40	0.15	1.13	0.15
CDC Coalition ⁵	9.82	28.97	48.35	66.33	0.34	0.18	1.76	0.20
Conlon ⁵	8.90	27.97	47.87	67.11	0.41	0.19	1.47	0.19
Champion ³	11.46	30.06	52.82	65.87	0.33	0.39	1.75	0.17
CDC Meredith ³	8.14	30.48	51.56	66.92	0.35	0.27	1.89	0.18
Amisk ³	9.16	28.14	47.69	67.93	0.43	0.22	1.78	0.19
Canmore ³	10.86	29.28	50.18	67.66	0.38	0.28	1.65	0.17
Claymore ²	9.80	32.99	54.35	63.06	0.34	0.16	1.22	0.15
Altorado ¹	11.22	29.58	50.95	65.82	0.30	0.33	1.70	0.18
Tradition ²	12.87	34.35	54.89	56.10	0.61	0.18	1.89	0.23
Stander ²	11.18	37.45	53.70	60.15	0.51	0.17	1.87	0.23
Westford ¹	13.06	33.73	52.65	55.90	0.52	0.19	2.13	0.23

¹ indicates the number of years each variety has been tested.

* CP = Crude Protein, ADF = Acid Detergent Fiber, NDF = Neutral Detergent Fiber, TDN = Total Digestible Nutrients, Ca = Calcium, P = Phosphorous, K = Potassium, Mg = Magnesium

These trials and publication were made possible by:

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Oat Varieties for Forage Production in the Lakeland

A summary of 10 years of research trials

Forages, both annual and perennial, make up the largest portion of livestock feed on the Canadian prairies. While annual forages are not typically utilized in conventional systems as a grazing resource, they are often heavily used as a preserved forage for winter feeding including greenfeed and silage.

Background

Lakeland Agricultural Research Association (L.A.R.A.) has been growing oat varieties for forage production for the past 10 years to help assess the regional adaptability of each variety.

The trials are seeded prior to May 25 of each year using a zero-till drill with a 9 inch row spacing to a depth of 0.5 to 1 inch. Spring soil tests are used to develop a unique blend fertilizer each year that is side-banded during seeding. Seeding rate is for a targeted 300 plants/m².

Prior to seeding, the trial site is sprayed with a glyphosate based herbicide and one to two in crop herbicide applications are done depending on weed pressure. No fungicides are used.

The oat trials are aimed to be harvested at the milk stage with an average moisture content of 65%. The trials are seeded in the MD of Bonnyville, County of St. Paul and Lac La Biche County.

Yield Results

Table 1 summarizes the average yield results from the 2008 growing season to the 2017 growing season. The yields displayed in table 1 should not be used to determine how much a variety will yield, but rather as a comparison of how one variety will yield in relation to another.

Table 1. Average yield by location.

Variety	Average Dry Matter Yield		
	Bonnyville (ton/ac)	St. Paul (ton/ac)	Lac La Biche (ton/ac)
Murphy	4.60 ⁹	4.59 ⁷	3.86 ⁶
Waldern	4.38 ⁹	4.37 ⁷	3.85 ⁶
AC Mustang	4.06 ¹⁰	4.26 ⁷	3.58 ⁶
AC Morgan	4.12 ¹⁰	4.10 ⁷	3.14 ⁶
Jordan	4.03 ⁷	3.95 ⁶	3.44 ⁶
CDC SO-1	3.93 ⁸	4.52 ⁵	3.39 ⁴
AC Baler	4.33 ¹⁰	4.19 ⁷	3.61 ⁶
Grizzly	4.00 ⁴	3.28 ³	4.04 ³
Foothills	4.08 ⁷	3.87 ⁶	3.66 ⁶
Everleaf	3.34 ⁵	3.02 ⁴	2.66 ⁴
CDC Haymaker	3.92 ⁵	5.06 ³	3.65 ²
AC Juniper	3.52 ⁵	4.42 ⁴	2.88 ³
Derby	4.00 ³	3.13 ²	2.69 ²
CDC Seabiscuit	4.32 ²	6.22 ¹	*
Cascade	3.96 ³	3.13 ²	3.15 ³
Lu	3.69 ²	3.18 ²	2.82 ²
Athabasca	3.49 ²	3.29 ²	2.48 ²
Pendek	4.52 ¹	2.84 ¹	1.63 ¹

* these varieties have never been tested in Lac La Biche County.

¹ indicates the number of years each variety has been tested at a given site.



Quality Results

During harvest, composite samples are taken from each variety, frozen and sent to an accredited laboratory for wet chemistry analysis. The average forage quality results are illustrated in table 2. No significant variations in quality between sites were noted over the past ten years. Therefore, all three site locations

were compiled and averaged for variety comparison.

The data presented should not be used as a replacement for individual crop feed tests. A detailed forage analysis should always be done prior to feeding and a mineral program should be developed to ensure adequate nutrition for your livestock each year.

Table 2. Oat variety quality results.

Variety	CP (%)	ADF (%)	NDF (%)	TDN (%)	Ca (%)	P (%)	K (%)	Mg (%)
Muphy ⁹	10.17	36.98	57.22	61.17	0.32	0.19	1.63	0.19
Waldern ⁹	10.92	39.47	60.50	59.32	0.28	0.18	1.99	0.21
AC Mustang ¹⁰	9.38	35.87	56.39	60.95	0.19	0.21	1.86	0.22
AC Morgan ¹⁰	9.97	33.73	54.38	62.62	0.29	0.22	2.36	0.21
Jordan ⁷	9.20	34.36	55.91	62.13	0.56	0.16	2.22	0.29
CDC SO-1 ⁸	10.26	32.34	53.29	63.70	0.25	0.21	1.92	0.22
CDC Baler ¹⁰	10.77	35.35	55.50	61.36	0.30	0.20	2.02	0.21
Grizzly ⁴	10.81	33.07	53.18	63.10	0.33	0.20	1.49	0.31
Foothills ⁷	11.19	34.08	56.19	62.35	0.31	0.18	2.16	0.27
Everleaf ⁵	11.14	37.27	57.97	59.90	0.32	0.19	2.14	0.37
CDC Haymaker ⁵	11.60	31.34	53.39	64.49	0.28	0.25	1.83	0.20
AC Juniper ⁵	10.46	35.43	56.84	61.29	0.28	0.19	2.57	0.26
Derby ³	10.48	37.52	58.40	56.40	0.37	0.16	1.73	0.25
CDC Seabiscuit ²	10.97	32.76	53.11	63.38	0.24	0.23	1.79	0.20
Cascade ³	11.31	36.70	58.42	60.30	0.34	0.18	1.91	0.25
Lu ²	10.83	44.98	65.42	53.90	0.35	0.08	2.41	0.34
Athabasca ²	9.66	40.91	60.53	51.40	0.33	0.10	2.28	0.28
Pendek ¹	9.69	37.88	59.94	59.40	0.37	0.16	2.20	0.25

^a indicates the number of years each variety has been tested.

* CP = Crude Protein, ADF = Acid Detergent Fiber, NDF = Neutral Detergent Fiber, TDN = Total Digestible Nutrients, Ca = Calcium, P = Phosphorous, K = Potassium, Mg = Magnesium



These trials and publication were made possible by:

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Triticale Varieties for Forage Production in the Lakeland

A summary of 10 years of research trials

Forages, both annual and perennial, make up the largest portion of livestock feed on the Canadian prairies. While annual forages are not typically utilized in conventional systems as a grazing resource, they are often heavily used as a preserved forage for winter feeding including greenfeed and silage.

Background

Lakeland Agricultural Research Association (L.A.R.A.) has been growing triticale varieties for forage production for the past 10 years to help assess the regional adaptability of each variety.

Table 1. Average yield by location.

Variety	Average Dry Matter Yield		
	Bonnyville (ton/ac)	St. Paul (ton/ac)	Lac La Biche (ton/ac)
Pronghorn	5.37 ⁷	4.66 ⁷	4.66 ⁶
AC Utlima	5.26 ⁵	4.32 ⁵	4.65 ⁴
Tyndal	4.68 ⁹	4.73 ¹⁰	4.30 ⁶
Bunker	4.86 ⁹	4.69 ³	4.28 ⁶
Taza	4.39 ⁷	5.31 ⁷	3.89 ³
Sunray	4.71 ⁵	5.56 ⁵	4.75 ²
Companion	4.97 ³	4.26 ³	5.16 ³

* indicates the number of years each variety has been tested at a given site.

The trials are seeded prior to May 25 of each year using a zero-till drill with a 9 inch row spacing to a depth of 0.5 to 1 inch. Spring soil tests are used to develop a unique blend fertilizer each year that is side-banded during seeding. Seeding rate is for a targeted 370 plants/m².

Prior to seeding, the trial site is sprayed with a glyphosate based herbicide and one to two in crop herbicide applications are done depending on weed pressure. No fungicides are used.

The triticale trials are aimed to be harvested at the late milk stage with an average moisture content of 65%. The trials are seeded in the MD of Bonnyville, County of St. Paul and Lac La Biche County.

Yield Results

Table 1 summarizes the average yield results from the 2008 growing season to the 2017 growing season. The yields displayed in table 1 should not be used to determine how much a variety will yield, **but rather as a comparison of how one variety will yield in relation to another.**



Quality Results

During harvest, composite samples are taken from each variety, frozen and sent to an accredited laboratory for wet chemistry analysis. The average forage quality results are illustrated in table 2. No significant variations in quality between sites were noted over the past ten years. Therefore, all three site locations

were compiled and averaged for variety comparison.

The data presented should not be used as a replacement for individual crop feed tests. A detailed forage analysis should always be done prior to feeding and a mineral program should be developed to ensure adequate nutrition for your livestock each year.

Table 2. Triticale variety quality results.

	CP	ADF	NDF	TDN	Ca	P	K	Mg
Variety	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Pronghorn ⁷	9.14	34.51	54.38	61.27	0.20	0.18	1.46	0.15
AC Ultima ⁵	10.64	30.93	49.02	64.81	0.23	0.23	1.98	0.15
Tyndal ¹⁰	7.86	35.18	56.52	61.49	0.17	0.19	1.58	0.15
Bunker ⁹	8.80	36.48	55.59	60.48	0.21	0.17	1.45	0.17
Taza ⁷	8.58	35.65	56.48	61.50	0.18	0.19	1.73	0.14
Sunray ⁵	9.74	29.53	46.89	65.89	0.20	0.20	1.73	0.14
Companion ³	10.10	32.47	48.60	63.61	0.24	0.22	1.24	0.14

¹ indicates the number of years a variety has been tested.

* CP = Crude Protein, ADF = Acid Detergent Fiber, NDF = Neutral Detergent Fiber, TDN = Total Digestible Nutrients, Ca = Calcium, P = Phosphorous, K = Potassium, Mg = Magnesium



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