Lakeland Agricultural Research Association

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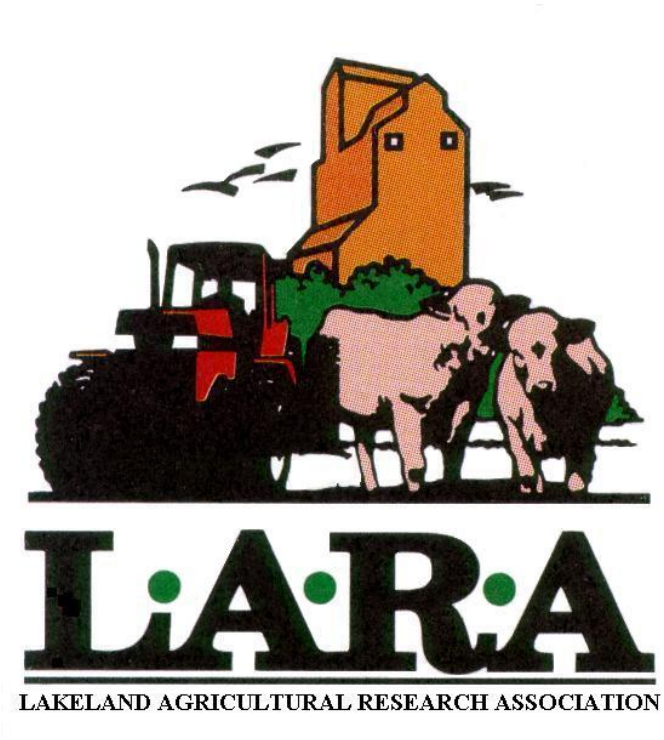
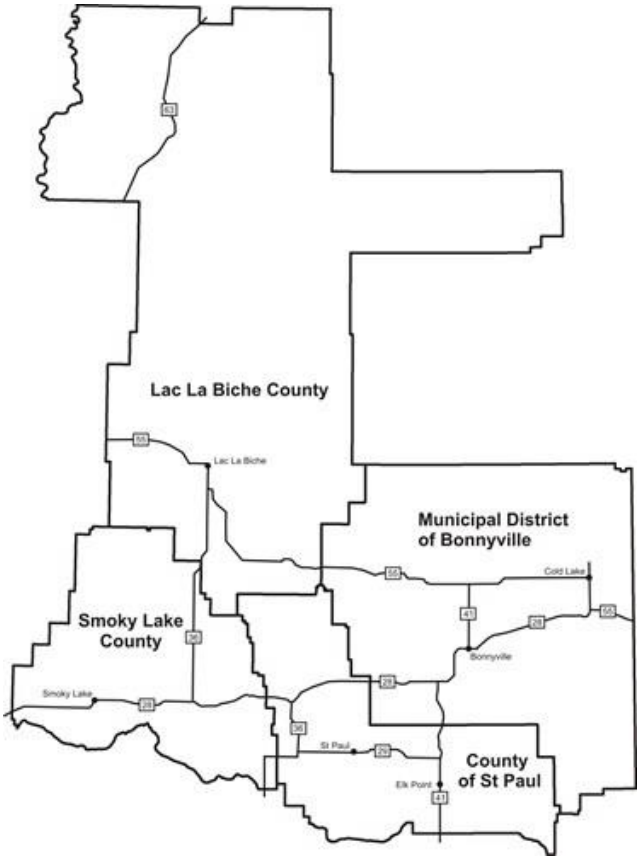


Vision Statement:
To be a leader in applied research and extension in Alberta

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 Chairman

2016 – A year to remember for all of the wrong reasons.

Area cattle producers came into the year with high feed costs, and a rapidly declining cattle market, where prices would fall to nearly 50% of the previous year. An onset of early drought had all cattle producers worried about forage and pasture, while grain producers were faced with germination issues, cutworms, and flea beetle damage.

Then the rains began, and we were headed into what looked like bumper crops again!

Haying season turned into a long drawn out season, from mid June to October. Heavy rain and early snow fall had cereal and crop producers facing their worst harvest on record, with most crops being harvested in late October, November, and even December; with still lots left out in the field.

To our program managers, Alyssa, Kellie, and David, your dedication and commitment to applied demonstration and research programs, as well as providing valuable unbiased information for our producers is why L.A.R.A. is so successful. To our support staff, Vic, for answering the phone, gardening, and keeping the L.A.R.A. office; and Charlene for catering, and bookkeeping. You are all truly assets to the L.A.R.A. organization.

Lastly, I would like to thank our municipalities (Bonnyville, Lac La Biche, Smoky Lake, and St. Paul) for their generous support, and the Board of Directors for being caring and committed to seeing L.A.R.A. strive and prosper into the future.

Sincerely,
Louis Dechaine

Forage and Livestock Program Report

It's hard to believe that I have been at LARA for almost four years now. When I first applied and accepted the job here I had no idea the experiences, both challenges and opportunities, that it would present to me! I can honestly say LARA is an amazing organization and I feel privileged to be a part of it.

To say the least, 2016 was a rocky year; from the dry conditions in early spring to the excess moisture in late summer to the early snow fall in October. The challenges were numerous and, unfortunately, many crops still remain unharvested. On the forage side, this has led to significant variations in feed quality. It is hard to find a hay crop that doesn't have at least one rain shower on it. Consequently, feed testing was even more crucial this year.

One significant concern that came up this year was with mold and mycotoxins in corn left standing as an extensive grazing system. Issues were seen in cattle further south so a large number of feed tests were sent in from the Lakeland. Luckily, the majority of results showed mid to low levels of mycotoxins and were able to be grazed successfully.

I am really excited about two new perennial forage projects that started this year and will be continued for the next couple of years. There has always been a significant gap in perennial forage research and knowledge transfer and the project are looking to change that:

- The Higher Legume Pasture Project is looking at the establishment and persistence of a higher legume (60+ aflafla and sainfoin) pasture by Iron River, AB. The second year of this project will look at grazing high legume pastures.

- The Perennial Forage Project is looking at newly developed grass and legume varieties at a regional level in both a monoculture setting and as mixtures.

A huge thank you to everyone who participated in the research and extension programs at LARA and to the exceptional staff, board of directors and local producers. I am looking forward to the year ahead.

Alyssa Krone
Manager, Forage and Livestock Program

Cropping Program Report

The challenges faced by crops in the 2016 growing season were completely different from last year. High moisture content in crops close to harvest was a serious challenge including the higher levels of diseases during the growing season partly as a result of high moisture in the field during the season.

During the last year, in addition to conducting the RVT trials, LARA conducted surveys for pests and disease within our area and including The MD of Wainwright, County of Vermilion River, Lamont and Two Hills.

I wish to thank the producers who came allowed us conduct trials and surveys on their fields. I am also wish to thank those who participated in our extension events.

Hopefully the next season will be better than the previous one.

David Simbo
Cropping Program Agronomist

AESA Program Report

2016 saw the completion of my seventh year of working at LARA. I am not sure where all the time has gone, but 2016 went by exceptionally quick.

This year marked the completion of my Environmental Resource Management Certificate from the University of Alberta, having graduated in June 2016. It has been a blessing that LARA has been so supportive of me to further my education.

This year was also marked with numerous extension events, wonderful speakers and many children's programs throughout. I continually enjoy running several of our annual workshops such as working well and the solar workshop, and also the opportunity to bring in special speakers such as Nicole Masters from New Zealand to run the advanced soil school. I appreciate the many partnerships that I can be part of, as well as finding new opportunities to expand our reach and diversify our presentations and increase both mine, and other's knowledge base. I am very fortunate to be able to do a job that I love, interacting with a variety of people and constantly learning something new. I truly do feel fortunate to be able to help educate our youth on agriculture, wetlands, riparian areas and ecosystems/watersheds.

I want to thank those of you who have come out to our events and shown interest in environmental stewardship. I look forward to an awesome 8th year at LARA!

Cheers to a great 2017!
Kellie Nichiporik P. Ag.
Environmental Program Manager

Ian Murray, Chair

2016 was a good year for ARECA. We worked with our 9 members associations to deliver programs across the province.

RVTs: 5 of our member associations delivered pea, wheat, barley, oats and flax Regional Variety Trials on 22 sites across the province. Yield data is collected and distributed in the Alberta Seed Guide.

Pest Monitoring: As in the past, 6 of our associations worked with AAF to monitor insect infestations across the province. We monitored 8 insect pests in 260 field visits over the summer and submitted the data for inclusion in the Alberta Insect Pest Monitoring Network releases.

We launched a new website in 2016. It is cleaner, leaner, and is full of information about programs delivered by our member associations (www.areca.ab.ca).

Connections Newsletter: We created and distributed 9 newsletters with the intent of increasing the connection between our member association Boards. Each edition featured one member association. The newsletter is distributed internally to all association Board members.

Janette McDonald, Executive Director

Environmental Farm Plan: In 2016, we introduced the Web 3.0 edition of the EFP. As well, ARECA was instrumental in leading a movement to a national EFP. We hope to move this plan further in 2017. Late in 2016, we started preparing the Alberta EFP 5-year Business Plan for 2018-2023.

Sustainable Sourcing: ARECA was awarded Green Intern funding in 2016 and our intern has completed an excellent summary of potential global sustainability requirements and how those requirements will impact Alberta farmers.

Governance: In 2016, the ARECA Board spent time developing sound processes around how projects are approved and managed within ARECA and between ARECA and our members. Our new processes have resulted in successful programs and co-operation between our members.

Sainfoin Pasture: All associations are collaborating with ARECA and Alberta Agriculture and Forestry (AAF) on a province-wide sainfoin pasture project. We established 10 sites and will be measuring plant health and grazing yield in 2017.

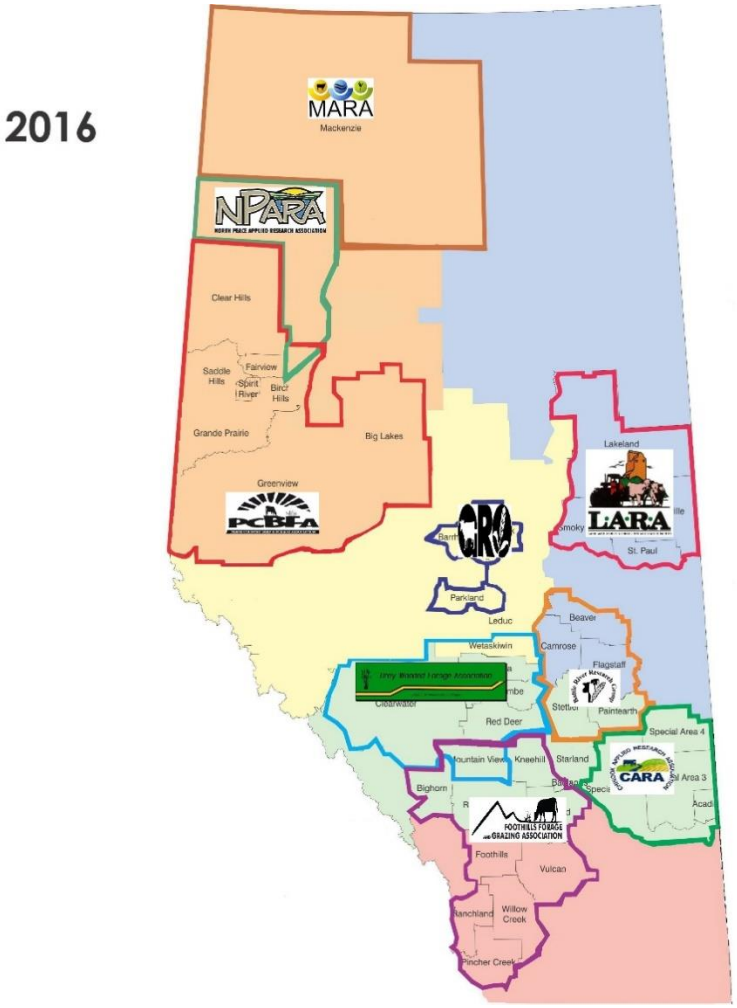
Blackleg Surveillance: ARECA and 7 associations co-operated with AAF to collect and submit samples from 171 canola fields across the province. This project is a significant benefit to canola producers and we have the opportunity to expand it in 2017 and beyond.

Project Management Training: All ARECA associations and their staff manage projects. Project Management is a valued skill. Late in 2016, ARECA paid for training of 10 staff from 7 associations.

This was an excellent course. If we work at what we learned, our projects will get better and better. Some staff comments:

> "We will be more organized and take less time to complete events or projects….Great course!"
> "Projects will be better understood and support more buy –in."
> "This was one of the best training workshops I have ever been to. "

Strategic Planning Conference: In November, ARECA hosted 35 association Board members at a conference in Lacombe. It was an excellent session and will lead to greater collaboration between our associations, government and industry in 2017.



2016 Board of Directors

Chairman:	Louis Dechaine
St. Paul County Rep:	Cliff Martin Frank Sloan (alternate)
Lac La Biche County Rep:	Wanda Austin MJ Siebold (alternate)
MD of Bonnyville Rep:	Don Sinclair David Fox (alternate)
Smoky Lake County Rep:	Ron Bobocel Randy Orichowski (alternate)
Producer Reps:	Murray Scott – MD of Bonnyville Harold Ross – MD of Bonnyville Louis Dechaine – County of St. Paul Carl Agnemark – County of St. Paul Richard Creelman – Lac La Biche County Roger Harbord – Lac La Biche County Charlie Leskiw – County of Smoky Lake Barb Shapka – County of Smoky Lake
Lakeland Forage Association Rep:	Luc Tellier Chairman, LFA

2016 Staff

Manager and Forage and Livestock Program:	Alyssa Krone
Cropping Program:	David Simbo
Environmental Program:	Kellie Nichiporik
Research Technician:	Dustin Roth
Administration/Horticulture:	Charlene Rachynski
Full Time Staff:	Vic Sadlowski
Summer Staff:	Sydney Fortier Amanda Mathiot
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 2016 another successful year.

Alberta Agriculture and Forestry (AF)
Agricultural Opportunity Fund (AOF)
Agriculture and Agri-Food Canada (AAFC)

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

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

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

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
Townend Films

Producers
Todd Brosniak
Guy Brousseau
Evan Chalut
Meghan and Patrick Elsen
Barb and Doug Shapka
Luc Tellier
Don Macyk
Duncan McMillan
Winston Yakoweshen

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

Celebrating 25 Years!
Lakeland Agricultural Research Association

What is Applied Research?

Demonstration and applied research provides the opportunity for technology to be moved from the laboratory and research setting to the farmer's field. Successful agricultural production is highly dependent on the adoption of new and proven technology by today's modern farmers. Applied research and forage associations were established by Alberta producers to connect agricultural research with local production conditions. The information that has been attained through laboratory and field scale research is extensive, but is that information reaching those how can implement new ideas or practices? Extension to farmers and ranchers is a key component in the viability of agricultural research that is often overlooked.

It is important for farmers in Northeastern Alberta that these research and extension practices are being evaluated in areas that are relatively close to their farms; areas with similar soil and weather conditions. The ecoregions in Alberta are widely diverse and what grows in Lacombe will not perform the same in St. Paul. Consequently, applied agricultural research is needed not only to increase productivity but also to find ways that reduce production costs and improve the quality of the product produced.

The establishment of the Lakeland Agricultural Research Association (LARA) in northeastern Alberta has given farmers an opportunity to address specific concerns in the Lakeland area. The Association has created means of linking together all facets of agriculture – agriculture industry and farmers - to produce a team effort towards research work in the area covered by LARA.

Development of LARA

In 1991, the Lakeland Forage Association, Bonnyville Demonstration Farm Association, M.D. of Bonnyville, I.D. #18 (now Lakeland County), and the respective Agriculture Service Boards proposed to organize an applied research group. LARA has worked hard to establish its name and presence in the local community, and to bring useful services to Lakeland residences. In 2003, LARA welcomed the County of St. Paul # 19 and their small research site called the Agricultural Centre of Excellence (ACE) into our Organization. In 2015, we expanded further through the welcoming of Smoky Lake County, which is a testament to the research and extension that LARA has been conducting for the past 25 years in the Lakeland area.

Most of the area covered by LARA is very dependent on agriculture related activities. Local governments by way of their financial contributions have indicated they wish to place a high priority on agriculture and agriculture research. LARA has a good reputation among local producers; we are known for our variety testing and the research farm in Fort Kent. We're considered a good local source of information and expertise unique to the Northeast. Producers know that they can count on LARA for reliable, unbiased information.

The first board of directors included: George Severn (chairman), Harold Ross (vice-chairman), Len Shostak (Treasurer), Cecil Griffith, Harvey Yoder (Alberta Agriculture), Gerard Cloutier, Rodney Lewiski, Neil Cory, Any Wakaruk and Hank Hoeven. Dave Burdek was the first manager of LARA and Guy Bonneau was the first research agrologist. The hard work in setting up this organization put forward by this first group of directors and staff set LARA on the path to becoming where we are today.

In 2016, LARA conducted 32 small plot trials (over 2000 plots) at four locations: Fort Kent Research Site, County of St. Paul, Smoky Lake County and Lac La Biche County. We also established 7 large-scale demonstrations at various locations. Since 1991, LARA has been conducting the regional variety trials, which are a province wide trial system with results published in the Alberta Seed Guide.

Our newsletter *Grow With Us* has continued to grow and expand with the organization and is now a 12 to 16 page magazine that is sent to all registered farm mailboxes in our operational area, which currently includes over 2100 farms! With the development of our environmental program, we now publish a second newsletter that is sent out quarterly called *The Verdant Element.*

Every year, LARA hosts over twenty extension events that range from indoor seminars to outdoor tours and hands-on workshops.

A huge thank you and congratulations to all who have been involved with LARA over the past 25 years and to many more who will be involved with this organization in the future!

Lakeland Agricultural Research Association Projects and Activities – 2016

Research and Demonstration Projects

Cropping Program

Regional Variety Trials – Cereals
- -CWRS Wheat
- -CPRS Wheat
- -GP & SWS Wheat
- -Oats
- -Barley
- -Triticale

Regional Variety Trials – Pulses
- -Green Field Peas
- -Yellow Field Peas

Barley Fertility Trial
Residual N with Pulse Crops
Cover Cropping Mixture Trial
Canola Variety Trial
Pest Monitoring
- -Bertha Armyworm
- -Diamondback Moths
- -Wheat Midge

Blackleg Survey

Forage and Livestock Program

Regional Silage Trials
- -Oats
- -Barley
- -Triticale
- -Pea-Cereal Mixture

Perennial Forage Project
- -Grasses
- -Legumes
- -Grass/Legume Mixture

Sainfoin Establishment Trial
Higher Legume Pasture Project
Northern Range Enhancement Project
- -Heifer Project

Environmental Program

Canada Thistle Stem Mining Weevils

Demonstrations

Cover Crops for Livestock
Brush Control with Reclaim
Corn Seeder vs. Air Drill
Canola Seeding Rates
Solar Watering System
Riparian Health Assessments
Surface Water Quality Sampling

Extension Activities

Workshops and Seminars

Farmer Appreciation Night
Clubroot Information Session
High Quality Forages for Growing and Finishing Cattle
Lets Talk: Managing Inputs and Best Practices for Long Term Soil Health
Generating Electricity from the Sun
Holistic Management Workshops with Kelly Sidoryk
Working Well Workshops
Grazing for Profit and Sustainability
Cow-Calfenomics
Annual General Meeting and Research Update
Getting Into Cover Crops Information Session
Improving Soil Health Workshop
Know Your Runoff
Winter Watering Systems
Crop Production Workshop
Crop Production Spring Tune-Up
Efficient Spraying Workshop
Know Your Runoff and Residues
25th Anniversary BBQ and Field Tour
St. Paul Field Day and BBQ
Smoky Lake Field Day and BBQ
Higher Legume Pasture Project Tour
Pasture Management and Brush Control Bus Tour
Advanced Soils School with Nicole Masters

Conferences

Tactical Farming Conference

Education Programs

Mad About Science
St. Paul Safety Day
Lakeland Regional Career Expo
Classroom Agriculture Program
Walking with Moose

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 by LARA.

Smoky Lake County Ag Service Board 2016 Overview

The growing season started off very dry in Smoky Lake County, but the old saying "seed in the dust and your bins will bust" came true for all those producers who were able to get all of their crop off the field. When the rain came towards the end of May, it hit us right at the start of our roadside spray program. A total of 624 roadside miles were sprayed in 2016, between highways 855 all the way to range road 150. Along with other various spot spray locations. All Smoky Lake County roads were mowed twice with some of the high traffic roads being mowed four times. This serves multiple purposes such as weed, brush control and wildlife visibility. Two locations were sprayed for Hoary Alyssum, which is deemed prohibited noxious in Alberta, and must be destroyed! 48 Weed letters requesting to control noxious weeds on private land were sent. 2073 Weed letter/ fact sheets were sent to Smoky Lake County landowners regarding Common Tansy and Oxeye Daisy. In 2017 Smoky Lake County will be ramping up weed control on private land. We helped host an Ag Conference in March which brought out 120 participants for a talk on agriculture and comedy. In June we hosted a farmer appreciation event in Vilna and had 200 people attend in partnership with the Bellis 4-H achievement day. We also participate in the Classroom Agriculture program, which we spent time at all schools talking about agriculture and showing the kids grain samples. We had 1 Soil Conservation issue due to soil erosion by wind. Smoky Lake County has a Bounty program for beavers, moles, and wild boar. 148 beaver tails, 423 mole tails and 0 wild boar ears were brought in for 2016. Our Ag Services is also busy distributing strychnine in the spring time for producers to control Richardson ground squirrels, 249 bottles of strychnine were sold. We also distributed 33 -1080 tablets for coyote control. During the summer and into the fall months we were busy in the field conducting many crop disease and insect surveys. Bertha army worms, Swede Midge, grasshoppers, Blackleg, Fusarium Head Blight, and Clubroot being the main ones, and assistance with other surveys as requested by Alberta Agriculture. Unfortunately, 10 more positive Clubroot samples were found in 2016 bringing our total to 31 confirmed fields. Fall leads into our Beaver control program with 170 beaver dams removed where they are affecting County infrastructure.

Tori Cherniawsky
Agricultural Fieldman
Smoky Lake County

MUNICIPAL DISTRICT
BONNYVILLE NO. 87

M.D. OF BONNYVILLE A YEAR IN REVIEW

Another year has come and gone and we now look forward to the warming soils of spring for seeding. Looking back on the 2016 season we are happy to relate that we surveyed 337 canola fields and did not detect any more positive clubroot fields within our MD borders. We did however notice a larger than normal population of blackleg and sclerotinia that can be managed through longer rotations and resistant varieties. We did observe ergot in some wheat this year, so you may be looking at some additional cleaning costs. Overall, when we finally did manage to get our crops off they were of average yield.

Grasshoppers, Bertha army worms and Lygus were all in low numbers in 2016, we are predicting low numbers for 2017 growing season as well. The caterpillars came and went without too much destruction and this cycle should be winding down, the good news is it can be another 10 years before we see these high numbers again.

Weeds were very prolific this past year and if you didn't address them, you may be putting a little more in the budget for controlling them this year.

Water levels were high with all the rainfall and the beavers were plentiful, we may have to keep an eye out with the spring runoff to protect our fields from flooding. The coyote and wolf reduction program continued into 2016, the numbers came in lower than in past years and we have had fewer predations reported by our local ranchers and grazing reserves. We are pleased to say we are still rat free and will continue to help keep them out of Alberta.

Wishing all producers a successful upcoming growing season.

Matt and Janice
MD of Bonnyville

Lac La Biche County Agriculture Review 2016

- Over 1000 inspections were completed for prohibited noxious and noxious weeds with 149 weed areas being found. Oxeye daisy was the most prevalent weed accounting for 47 percent of noxious weed population.
- 29 Community garden plots were utilized.
- 1285 tree seedlings were sold
- Mowed over 1000km of roadway, and shoulder sprayed while mowing 380km to increase motorist safety and control unwanted vegetation.
- Thistle spot spraying program completed throughout the county
- Held Agriculture Appreciation Day with over 100 participants.
- Hosted NE Regional Agriculture Service Board Conference in Plamondon.
- Completed Clubroot and Grasshopper surveys throughout the County.
- Nearly $90,000.00 in funding went to agriculture research and veterinary services support

Kyle Beniuk
Agricultural Fieldman
Lac La Biche County

County of St. Paul Agricultural Service Board 2016

The County of St. Paul would like to thank the staff and board at LARA for helping improve agriculture in our area. LARA is a model on how Counties and MD's can work together to bring excellence in agriculture into a region!

Staff has changed at the County of St. Paul this year. Dennis Bergheim retired after serving the County for 35 years! Although he will be missed Keith Kornelsen and Warren Leister are still around to help you with any questions you might have.

The Agricultural Service Board in the County of St. Paul had a busy summer in 2017. This was the first year that we surveyed every canola field in the County for clubroot. Although we found 2 new fields we are confident if we remain vigilant we can keep clubroot from being a major issue for our farmers. When we find a field with clubroot we will notify the owner and impose a 1 in 4 year rotation of canola on the field. The following crop of canola should also be a clubroot resistant variety. We encourage anybody to check out clubroot.ca to become more knowledgeable with this disease.

Weed control is always a big part of our year. Spraying for noxious or prohibited noxious weeds is constant throughout summer. We have some powerful tools we can use whether its spraying our right-of-ways or spraying private land for land owners to control weeds. Our two mowing units also help to keep our roadways free of encroaching brush and weeds.

Our Coyote/Wolf Reduction Incentive Program is heading into its 6th year in 2017. We are seeing a drop-in usage this year. This could be attributed to the success of the program or several other environmental factors this year like the low snowfall.

The ASB also takes care of dog issues in the County of St. Paul. This year we inherited an old ambulance which we turned into our dog control unit. We can, if needed turn on the lights and siren but so far, no emergencies!

As always, no problem is too big or strange for us to handle. From beaver dams to potato diseases to bees we can help you solve your problem!

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
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
Crop Production Services
FP Genetics
Guy Brousseau
Todd Brosniak

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 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 (SE/C 15 58 11 W4), while pulses were seeded in the County of St. Paul (NW-3-59-9-W4). Agronomic information about the RVTs grown by LARA in 2016 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. If you would like to add a variety to any of the RVT trials grown by LARA next year, please contact the LARA office.

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, 2016.

Test	Site	# of Varieties	Seeding Date	Seeding Rate	Fertility	Harvest Date	Rain (mm)
Barley	Fort Kent	14	18-MAY-16	250 pl/m2	141.77 lbs/ac 30-22-10-12	21-Sep-16	276
Barley	St. Paul	14	20-May-16	250 pl/m2	167.90 lbs/ac 30-22-10-12	26-Sep-16	274
CPRS Wheat	Fort Kent	8	26-May-16	280 pl/m2	141.77 lbs/ac 30-22-10-12	21-Seo-16	276
CPRS Wheat	St. Paul	8	17-May-16	280 pl/m2	167.90 lbs/ac 30-22-10-12	26-Sep-16	274
CWGP and SWS Wheat	Fort Kent	10	18-MAY-16	280 pl/m2	141.77 lbs/ac 30-22-10-12	21 Sep-16	276
CWGP and SWS Wheat	St. Paul	10	17-May-16	280 pl/m2	167.90 lbs/ac 30-22-10-12	26-Sep-16	274
CWRS Wheat	Fort Kent	19	18-MAY-16	280 pl/m2	141.77 lbs/ac 30-22-10-12	21-Sep-16	276
CWRS Wheat	St. Paul	19	17-May-16	280 pl/m2	167.90 lbs/ac 30-22-10-12	26-Sep-16	274
Oats	Fort Kent	8	18-May-16	250 pl/m2	141.77 lbs/ac 30-22-10-12	21-Sep-16	276
Triticale	Fort Kent	2	18-May-16	310 pl/m2	141.77 lbs/ac 30-22-10-12	21-Sep-16	276
Winter Wheat	Fort Kent	14	09-Sep-15	310 pl/m2	180.99 lbs/ac 30-22-10-12	21-Sep-16	276
Green Peas	St. Paul	4	13-May-16	88 pl/m2	50 lbs/ac 11-52-0-0	09-Sep-16	274
Yellow Peas	St. Paul	5	13-May-16	88 pl/m2	50 lbs/ac 11-52-0-0	09-Sep-16	274

Barley

The barley trials were established in the County of St. Paul (SE/C-10-58-11-W4) and the MD of Bonnyville (NE25-61-5-W4) this year.

Yields varied significantly in the trial seeded at Fort Kent (Table 2). TR12135 and Vivar produced the highest yields compared to some varieties (although not significantly higher than CDC Bow, CDC Platinum Star, TR13606, TR12225 and TR13740). These two varieties had 38% and 36% more yield, respectively, when compared to AC Metcalfe, which is utilized as the check variety. HB13324 produced the lowest yields (77% compared to the check variety) among the varieties tested at this site this year.

Table 2. Barley Fort Kent, 2016.

Variety	Category	Yield (bu/acre)		Yield % AC Metcalfe	TWT (lbs/bu)	1000 k (g)	Height (cm)
AC Metcalfe	Malt	80	c-f	100	46	48	59
CDC Bow	Malt	106	ab	133	45	50	55
CDC Platinum Star	Malt	99	abc	124	47	47	71
Champion	Feed	79	def	99	47	49	57
Claymore	Feed	88	b-e	110	47	45	55
HB13324	Hulless	68	f	77	57	45	57
Oreana	Feed	79	def	99	47	50	61
TR12135	Malt	110	a	138	45	51	53
TR12225	Malt	93	a-e	116	45	48	62
TR13606	Malt	95	a-d	119	44	49	58
TR13609	Malt	84	c-f	105	46	49	52
TR13740	General Purpose	106	ab	133	47	52	64
TR14928	Malt	75	ef	94	46	48	57
Vivar	Feed	109	a	136	44	48	55
CV: 4.3							

For the St. Paul trial, TR12135 and Claymore produced the higher yields (not significantly higher than CDC Bow, TR1222, TR13606, TR14928 and Vivar). The above-mentioned varieties performed 45% and 44% (Table 3) better than the check variety. As was seen in Fort Kent, HB13324 produced the lowest yields (92% of the check variety) when compared to the other varieties in the trials.

The check variety of AC Metcalfe was one of the lower producing varieties, which can be seen across both trial sites.

Table 3. Barley St. Paul, 2016.

Variety	Category	Yield (bu/acre)		Yield % Metcalfe	TWT (lbs/bu)	1000 k (g)	Height (cm)
AC Metcalfe	Malt	64	g	100	49.5	45	83
CDC Bow	Malt	90	ab	141	46.9	49	83
CDC Platinum	Malt	82	b-e	128	48.6	48	89
Champion	Feed	74	ef	116	50.3	54	82
Claymore	Feed	92	a	144	49.3	48	86
HB13324	Hulless	59	g	92	59.6	41	88
Oreana	Feed	74	f	116	50.2	49	77
TR12135	Malt	93	a	145	46.3	53	83
TR12225	Malt	88	abc	138	48.5	51	85
TR13606	Malt	86	a-d	134	48.7	48	83
TR13740	General Purpose	79	def	123	52.0	51	82
TR13609	Malt	81	c-f	127	50.4	53	82
TR14928	Malt	92	ab	144	49.0	52	73
Vivar	Feed	86	a-d	134	47.4	47	81
CV: 11.2							

CPRS Wheat

The CPRS Wheat trials were established at Fort Kent (NE25-61-5-W4) and St. Paul (SE/C 10 58 11 W4), where there were no significant differences in yields seen between the different varieties (Tables 4 and 5). A comparison between the CPRS wheat varieties in the trial seeded at Fort Kent against the check variety (AC Barrie) showed that, except for AAC Foray, all the other varieties had a trend towards better performance than the check variety. For the St. Paul trial, all other varieties showed a trend towards better performance than the check variety (Table 4). However, these differences were not statistically significant as mentioned before.

Table 4. CPRS Wheat Fort Kent, 2016.

Variety	Yield (bu/acre)		Yield % AC Barrie	Yield % Carberry	TWT (lbs/bu)	1000 k (g)	Height (cm)
AAC Crossfield	71	a	111	120	58	43	78
AAC Crusader	75	a	117	127	59	43	77
AAC Tenacious	61	a	95	103	60	38	101
AC Barrie	64	a	100	108	59	42	89
Carberry	59	a	92	100	60	39	78
Elgin ND	72	a	113	122	59	38	88
HY2013	61	a	95	103	59	35	70
HY537	73	a	114	124	58	36	87
CV: 13.0							

Table 5. CPRS Wheat St. Paul, 2016.

Variety	Yield (bu/acre)		Yield % AC Barrie	Yield % Carberry	TWT (lbs/bu)	1000 k (g)	Height (cm)
AAC Crossfield	67	a	131	120	58	43	81
AAC Crusader	62	a	122	111	59	43	76
AAC Tenacious	55	a	108	98	60	38	97
AC Barrie	51	a	100	91	59	42	82
Carberry	56	a	110	100	60	39	71
Elgin ND	69	a	135	123	59	38	81
HY2013	66	a	129	118	59	35	65
HY537	60	a	118	107	58	36	81
CV: 13.0							

CWGP and SWS

For the CWGP and SWS wheat trials seeded at Fort Kent (NE25-61-5-W4), all varieties performed better than the check varieties (AC Andrew, AC Barrie and Carberry) except for KWS Alderon whose yield were not significantly higher than that of AC Andrew (Table 6). For the trials seeded at St. Paul (SE/C-15-58-11-W4), there were some significant differences in yield between the varieties (Tables 7). KWS Alderon, KWS Sparrow and Belvoir all produced significantly higher yields compared to AC Barrie. KWS Alderon, KWS Sparrow, Belvoir and AAC Innova all produced significantly higher yield compared to Carberry while KWS Alderon had higher yields compared to AC Andrew (Table 7).

Table 6. CWGP and SWS Wheat Fort Kent, 2016.

Variety	Yield (bu/acre)		Yield % AC Barrie	Yield % Carberry	Yield % AC Andrew	TWT (lbs/bu)	1000 k (g)	Height (cm)
AAC Indus	78	ab	142	139	135	58	41	84
AAC Innova	71	b	129	127	122	55	39	74
AC Andrew	58	cd	105	106	100	58	46	74
AC Barrie	55	d	100	98	95	60	41	90
Belvoir	78	ab	142	139	135	53	35	74
Carberry	56	d	102	100	97	59	36	76
GP151	75	ab	136	134	129	60	36	83
KWS Alderon	69	bc	125	123	119	51	34	72
KWS Charing	85	a	155	152	147	58	38	70
KWS Sparrow	75	ab	136	134	129	57	37	75
CV: 11								

Table 7. CWGP and SWS Wheat St. Paul, 2016.

Variety	Yield (bu/acre)		Yield % AC Barrie	Yield % Carberry	Yield % AC Andrew	TWT (lbs/bu)	1000 k (g)	Height (cm)
AAC Indus	82	de	126	137	109	60	42	93
AAC Innova	78	bcd	120	130	104	57	37	93
AC Andrew	75	bcde	115	125	100	59	36	91
AC Barrie	65	de	100	108	87	61	44	109
Belvoir	79	bc	122	132	105	55	37	78
Carberry	60	e	92	100	80	61	10	92
GP151	67	cde	103	112	89	60	40	95
KWS Alderon	96	a	148	160	128	54	35	74
KWS Charing	74	bcde	114	123	99	59	41	84
KWS Sparrow	88	ab	135	147	117	59	40	87
CV: 10								

CWRS

CWRS wheat trials at were seeded at Fort Kent (NE25-61-5-W4) and St. Paul (SE/C 15 58 11 W4). The yield data from Fort Kent show that AAC Cameroon had 29% and 28% higher yields compared to the two check varieties AC Barrie and Carberry, respectively. Other high yielding varieties in the Fort Kent trial include AAV Viewfield and BW968 (Table 8). For the St Paul trial site, AAC Cameron and BW968 produced significantly higher yield compared to AC Barrie but not significantly higher than Carberry although both AAC Cameron and BW968 showed a trend towards higher yields (Table 9).

Table 8. CWRS Wheat Fort Kent, 2016.

Variety	Yield (bu/acre)		Yield % AC Barrie	Yield % Carberry	TWT (lbs/bu)	1000 k (g)	Height (cm)
AAC Cameron	88	a	129	127	60	50	93
AAC Concord	67	g	99	97	58	44	101
AAC Connery	77	bcdefg	113	112	61	42	89
AAC Prevail	76	bcdefg	112	110	61	44	103
AAC Redberry	68	fg	100	99	61	45	89
AAC Viewfield	84	ab	124	122	60	43	76
AC Barrie	68	g	100	99	60	45	100
BW1011	71	defg	104	103	59	437	82
BW488	75	bcdefg	110	109	60	41	68
BW496	80	abcde	118	116	60	42	89
BW968	84	abc	124	122	60	42	81
BW971 VB	81	abcd	119	117	63	46	85
Carberry	69	fg	101	100	60	42	77
CDC Bradwell	79	abcdef	116	114	60	38	74
GO Early	72	defg	106	104	58	45	94
PT250	79	abcdef	116	114	60	46	92
PT588	73	cdefg	107	106	62	46	74
SY479	69	efg	101	100	60	45	104
SY637	72	defg	106	104	61	44	94
CV: 8.5							

Table 9. CWRS Wheat St. Paul, 2016.

Variety	Yield (bu/acre)		Yield % AC Barrie	Yield % Carberry	TWT (lbs/bu)	1000 k (g)	Height (cm)
AAC Cameron	70	a	119	113	61	45	108
AAC Concord	60	bc	102	97	59	40	96
AAC Connery	54	c	92	87	61	42	93
AAC Prevail	60	bc	102	97	60	39	112
AAC Redberry	53	c	90	86	62	38	84
AAC Viewfield	64	ab	109	103	65	40	84
AC Barrie	59	bc	100	95	62	42	105
BW1011	57	bc	97	92	61	44	90
BW488	62	abc	105	100	60	37	90
BW496	59	bcd	100	95	61	38	89
BW968	70	a	119	113	62	40	85
BW971 VB	64	ab	109	103	62	46	93
Carberry	62	abc	105	100	61	41	87
CDC Bradwell	59	bcd	100	95	61	38	96
GO Early	59	bcd	100	95	58	40	108
PT250	58	bcd	98	94	61	43	99
PT588	64	abc	109	103	63	47	91
SY479	56	bcd	95	90	62	42	106
SY637	54	cd	92	87	62	40	104
CV: 9.4							

Oats

The RVT oats trial was seeded at the LARA Research Farm in Fort Kent (NE25-61-5-W4). The variety Akina had higher yields compared to CDC Dancer (the check variety), CFA1220, and OT6011 but not compared to the other varieties (Table 10). Yields observed in Akina was 30% higher than CDC Dancer. CFA1220 and OT6011 produced the lowest yields, 14% lower than yield in the check variety.

Table 10. Oats Fort Kent, 2016.

Variety	Yield (bu/acre)		Yield % CDC Dancer	TWT (lbs/bu)	1000 k (g)	Height (cm)
Akina	171	a	130	39	44	88
CDC Dancer	132	bc	100	37	44	93
CDC Norseman	156	ab	118	38	47	87
CFA1207	158	ab	120	34	48	84
CFA1220	113	c	86	38	43	97
CS Camden	162	ab	123	36	49	91
Kara	157	ab	119	37	44	88
OT6011	114	c	86	35	42	88
CV: 14.0						

Triticale

Two triticale varieties were seeded at Fort Kent (NE25-61-05-W4). AAC Delight showed a trend towards higher yield, with 8% higher than Brevis the check variety. However, this difference was not statistically significant (Table 11).

Table 11. Triticale Fort Kent 2016.

Variety	Yield (bu/acre)		Yield % Brevis	TWT (lbs/bu)	1000 k (g)	Height (cm)
Brevis	80	a	100	55	44	84
AAC Delight	86	a	108	53	50	86
CV: 8						

Winter Wheat

A winter wheat trial was seeded at the LARA research farm at Fort Kent in the fall last year. The trial survived the winter but was damaged by late frost in Spring. The trial was harvested but the variation between the repetitions was very high. Consequently, the results in table 12 should not be taken as a completely accurate representation of how each variety will do in the Lakeland or compare against each other.

Most of the varieties had yields lower than the check variety (AC Radiant) except for AC Emerson which seem to perform better than the check. However, due to the high variability in the data, no statistically significant differences were found in the data.

Table 12. Winter wheat Fort Kent, 2016.

Variety	Yield (bu/acre)		Yield % AC Radiant	TWT (lbs/bu)	1000 k (g)	Height (cm)
Moats	12	a	50	59	36	71
Pintail	10	a	42	58	33	65
AC Flourish	16	a	67	58	39	60
W520	24	a	100	61	37	56
Swainson	15	a	63	61	46	71
AC Radiant	24	a	100	60	41	63
CDC Buteo	23	a	96	61	38	54
AC Emerson	28	a	117	61	33	61
Siunrise	15	a	63	60	40	57
CDC Chase	14	a	58	59	40	57
AAC Wildfire	18	a	75	61	44	60
AAC Icebreaker	7	a	29	60	37	54
AAC Elevate	20	a	83	61	46	53
AAC Gateway	23	a	96	61	40	50
CV: 49						

Green and Yellow Field Peas

Pea is a cool season plant which is grown either as animal feed or for human nutrition. Yellow dry edible pea is the most widely produced although the green pea is popular as well. Green pea is mostly used for human consumption while yellow peas are primarily used as a supplement in animal rations. Dry pea ranks second behind dry beans in terms of worldwide production of pulses. Pea production in Canada has increased more than 500 percent over the last decade, making Canada the leading producer and exporter. The increase could be due to the rotational advantages of pea cultivation and the availability of cultivars adapted to the dry land conditions of the Prairie. Dry pea production occurs predominantly in dryland conditions such as in the Prairies. Optimum temperatures for growth are somewhere between 13°C to 18°C. However, young pea seedlings can withstand temperatures as low as -6°C for short periods with little or no frost damage.

Green and yellow peas trials were established at St Paul. Four green pea and five yellow pea varieties were seeded using our small plot Fabro seeder. These were seeded early in the growing season as they require longer growing periods. Fertilization was given as per the soil test. The results of the trial are shown in Tables 13 and 14 below.

For the green field pea, AAC Royce had a significantly higher yield compared to the other varieties while AAC Radius produced the lowest yield (Table 13). AAC Royce produced 30% higher yield compared to the check variety (CDC Limerick).

For yellow field peas, the yields were statistically similar among all the varieties (Table 14).

Table 13. Green Field Peas St. Paul, 2016.

Variety	Yield (bu/acre)		Yield % CDC Limerick	TWT (lbs/bu)	1000 k (g)	Height (cm)
CDC Limerick	51	bc	100	65	237	76
CDC Greenwater	55	b	108	66	279	68
AAC Radius	37	c	73	65	270	72
AAC Royce	67	a	131	65	259	63
CV: 12.8						

Table 14. Yellow Field Peas St Paul, 2016.

Variety	Yield (bu/acre)		Yield % CDC Amarillo	Yield % CDC Meadow	TWT (lbs/bu)	1000 k (g)	Height (cm)
CDC Amarillo	59	a	100	116	64	251	68
CDC Meadow	51	a	84	100	66	230	72
AAC Carver	59	a	100	116	65	268	71
AAC Barrhead	56	a	95	100	64	260	65
CDC Inca	60	a	102	118	65	260	72
LN4228	60	a	102	118	65	293	68
CV: 12.5							

Barley Fertility Trial

Partners: MD of Bonnyville
St. Paul Seed Cleaning Plant

Objectives:

1. To determine the impact of varying levels of fertilizer application on barley grain yield.

Background:

Fertilizer and fuel constitute 18% of farm expense according to Agriculture and Agri-food Canada. Therefore, a decrease in the amount of fertilizer used to obtained the same yield could increase profits for farmers while protecting the environment at the same time.

An essential component in optimizing crop production is to match the fertilizer application rate to the crop's requirements. Blended fertilizers are mixes of fertilizer materials that are combined to meet crop requirements. While fertilizers can be applied as individual constituents or as a blend, many growers prefer blended fertilizer products in order to meet specified agronomic requirements while reducing spreading costs; preferring make one trip across the field rather than several trips. Blended fertilizers offer several advantages over homogenous fertilizers. They can be specifically mixed to meet required soil conditions and crop needs. Also, multiple passes for spreading individual products can be replaced by a single pass. However, a potential problem is segregation of the components during handling or spreading.

A trial was set up at LARA this year to test the effects of different amounts of fertilizer blend on barley grain yields at Fort Kent.

Methods:

The trial was seeded at the LARA Fort Kent Research Farm (NE25-61-5-W4) in a randomized complete block design with four replicates to reduce error. Prior to seeding, soil tests were taken to determine soil fertility levels and a blend fertilizer was developed based on recommendations. Three different levels of this fertilizer were side-banded at the time of seeding as outlined in table 1. The trial was seeded using the LARA five-row zero-till small plot drill to an area of 1.15m x 6m. In-crop weed management was done using Curtail M and the trial was harvested on September 22, 2016.

Table 1. Barley Fertility Trial Treatments, 2016.

Treatment
0% fertilization
50% of recommended
100% of recommended
200% of recommended

Results:

The treatment with 200% of the recommended fertilization rate appeared to show a trend towards higher yields although this was not significantly higher than the other treatments (Table 2). The possible reason for this lack of differences could be due to the nature of the soil. As it is on our trial site with very good

management practices, the soils tend to stay healthy and therefore may not respond to different fertilization rates as expected.

Table 2. Barley fertility trial Fort Kent, 2016.

Treatment	Yield (bu/acre)		TWT (lbs/bu)	1000 k (g)	Height (cm)
0% Fertilization	84	a	47	46	68
50% Fertilization	86	a	47	46	65
100% Fertilization	88	a	48	48	68
200% Fertilization	100	a	47	48	70
CV: 8.0					

Residual Nitrogen with Pulse Crops

Partners: MD of Bonnyville
County of St. Paul
Lac La Biche County
Smoky Lake County
Don Macyk
Guy Brousseau
Winston Yakoweshen

Objectives:

1. To determine the potential for residual nitrogen in the soil after growing a variety of pulse crops.
2. To determine the potential of utilizing the residual nitrogen left after growing pulse crops as a nutrient source in crop rotations.

Background:

Nitrogen (N) is an essential nutrient that is required by all crops for growth and grain production. However, the majority of soils in Alberta are deficient in N to the levels that are required by crops, particularly high use crops such as Canola. To make up for this deficiency, synthetic fertilizers are typically applied at the time of seeding based on soil test recommendations.

It is well known that pulse crops, such as lentils or field peas, have the ability to fix nitrogen through a symbiotic relationship with rhizobium that form nodules on their roots. Within these nodules, atmospheric N is converted into plant available N that can be utilized by the crop. As a result, N fertilizer inputs are minimal for establishment of a pulse crop. But what happens to the N left in the nodules after harvest? Is this available to the subsequent crop? And could including a pulse crop in rotation reduce fertilizer requirements and, thus, costs?

Nitrogen derived specifically from pulse crops is made available to the subsequent crop by microbial decomposition of surface residues, roots and nodules. This can happen during growth, after harvest and in early spring. However, it can be difficult to predict the N contribution of pulses to the subsequent crop.

A study performed by Jefferson et al. (2014) estimated that the N fertilizer replacement value of pea stubble ranged from 20 kg N/ha to 180 kg N/ha in the dark brown and moist black soil zones, respectively. Similarly, McKenzie et al. (2008) estimated that you can get 1 lb N/acre in the soil for every bu/ac of pea yield.

These studies indicate that the below ground biomass (roots, nodules etc) are far more valuable than the above ground residue as 70% of N in mature pea plants is in the seed. Is there potential for high input cost crops, such as canola, after pulses?

Methods:

The trial was seeded in the MD of Bonnyville, County of St. Paul, Lac La Biche County and Smoky Lake County in a randomized complete block design with four replicates to reduce error. Soil samples were taken prior to seeding to determine fertilizer recommendations and N levels that were in the soil at the time of seeding. The crops were seeded in May with 50 lbs per acre of 11-52-0-0 side banded and were

managed using best management practices (BMPs) as outlined by the Alberta Pulse Growers.

The trials were harvested in September, when additional soil samples were taken to determine any shifts in soil N levels and if there was an increase over the growing season. Unfortunately, due to the early snow in October, the trial in Smoky Lake was not harvested. Agronomic information for the trials can be found in table 1.

Table 1. Agronomic information, 2016.

	Seeding	Seeding Rate	(plants/m2)	Fertility	Harvest	Rain
Location	Date	Field Peas	Faba Beans	(lbs/acre)	Date	(mm)
Fort Kent	12-May-16	88	44	50 lbs/ac 11-52-0-0	30-Aug-16	
St. Paul	13-May-16	88	44	50 lbs/ac 11-52-0-0	26-Sept-16	
Lac La Biche	25-May-16	88	44	50 lbs/ac 11-52-0-0	14-Sept-16	
Smoky Lake	3-June-16	88	44	50 lbs/ac 11-52-0-0	N/A	

Results:

The averaged soil test results from the three harvested trials are illustrated in table 2. All of the trials showed a general trend towards lower soil nitrogen levels after the growing season. As would be expected, the greater draw on soil nutrient levels in the cropped land when compared to the fallow land resulted in a 41% decrease in soil nitrogen versus a 38% decrease in soil nitrogen in the check plots.

The results indicate that there was no accumulation of nitrogen in the soil following cropping with various pulses. However, previous research has indicated that the majority of nitrogen is within the roots and plant material of the pulse crops and this will continue to breakdown in fall and spring. Where possible, the trial sites will be sampled again in the spring to determine if there was additional breakdown of plant material.

The results also do not indicate if there is a change in plant available nitrogen between the spring and fall soil test results. A more detailed analysis would need to be done.

Table 2. Soil Nutrient Profile, 2016.

	Nutrient Profile (Spring)					
Treatment	Ph	OM (%)	N (lbs/acre)	P (lbs/acre)	K (lbs/acre)	S (lbs/acre)
Check	5.7	4.7	70	29	144	14
Snowbird	5.8	4.7	68	28	148	14
CDC Cooper	5.8	5.5	60	24	140	11
CDC Meadow	5.8	5.2	61	22	139	9
Average*	5.8	5.1	63	25	142	11
	Nutrient Profile (Fall)					
Treatment	Ph	OM (%)	N (lbs/acre)	P (lbs/acre)	K (lbs/acre)	S (lbs/acre)
Check	6.1	5.5	45	21	141	9
Snowbird	6.1	5.1	31	14	133	7
CDC Cooper	6.1	5.3	42	25	135	11
CDC Meadow	6.2	5.4	38	14	130	8
Average*	6.1	5.3	37	18	133	9

* average of pulse treatments

Cocktail Cover Crops

Partners: Chinook Applied Research Association

Background:

Soil and water conservation is indispensable for the sustainability of agricultural production systems in the long term (Mirsky et al. 2013). Reduced and no-till production systems were introduced to achieve this end. However, these methods have resulted in an overreliance on herbicides as a weed control method, leading to the emergence of herbicide resistant weeds and an increase in weed control expenses (Price et al. 2011).

The recent development of higher capacity machines to reduce the amount of labour used on farms has increased the risk of soil compaction on agricultural land due to their heavy axle loads (Antille et al. 2016). These challenges, created by current agricultural practices has led to a growing interest in developing a reduced or non-tillage system that integrate the soil-conserving and labor-saving features of conventional no-tillage systems with the soil building practices through the use of cover crops. One of the major obstacle in implementing cover crops on producers' fields is the cost of the forgone cash crop income (Snapp et al 2005).

Selecting a mixture of appropriate annual crop species which could serve both as animal feed and at the same time serve as a cover crop, providing the associated benefits of suppressing weeds, reducing wind erosion, improving soil fertility and quality by increasing organic matter, capturing nutrients from deep within the soil, enhancing soil structure among others will encourage the use of cover crops and replace the forgone cash crop.

Method and Results:

In summer 2016, LARA seeded a cover crop cocktail to test the effect of the cover crop on soil health parameters. A four-acre land was used for the study. The land was spilt into one acre units. Three of the one-acre units were covered with cover crop cocktail made up of millet, pea, Faba beans, oats, triticale and tillage radish at the recommended rate (RR), twice the recommended rate (2R), and three times the recommended rate (3R). The recommended seeding rates were 1.5, 6.5, 4, 3, 3, 0.5 Kg/acre for millet, pea, Faba beans oats, triticale, tillage raddish and sunflower, respectively. Each of these three one-acre units were spilt into two. One half received the rates as a single pass while for the other half, the rates were divided into two and seeded twice in a grid pattern. For example, half of the one-acre plot received the recommended seeding rate seeded as one pass of the seeder while for the other half, the rate was halved and seeded by two passes of the seeder over the same area. The remaining single acre plots was left as a fallow.

In September, four one square meter quadrants from each treatment was harvested and the components plants were separated into the different individual species. These were then weighed to get their fresh weight. The plants were weighed after drying in an oven until constant weight to obtain their dry weight. The dry weight per one square meter quadrant was obtained by summing up the dry weights of the plants from that quadrant.

The recommended rate one pass had statistically higher dry matter production compared to recommended rate two passes and both treatments for twice the recommended seeding rate with a trend towards higher dry matter compared to the other two treatments (Table 16).

The nutritional quality data from the cover crop (Recommended rate one pass- cheaper to grow in terms of amount of seed, seeding time and equipment fuel consumption) is very similar to the values obtained for wheat grown in Fort Kent in 2015. As the nutritional quality is not inferior to cereals grown for feed, this cocktail could be recommended due to its quality and possible soil improvement properties it may have.

Table 16. Nutritional quality and dry matter production of the different treatments, 2016.

Treatment	Dry matter t ha-1	Quality data									
		CP (%)	RFV	TDN (%)	ADF (%)	NDF (%)	Ca (%)	P (%)	Zn (µg/g)	Fe (µg/g)	Mn (µg/g)
1x one way	5.22 ± 0.83 a	12	143	68	26	44	0.30	0.22	27	75	25
1x grid pattern	3.70 ± 0.30 b	14	129	64	32	46	0.58	0.18	31	72	65
2x one way	3.40 ± 0.32 b	7	87	58	40	62	0.40	0.14	17	66	20
1x grid pattern	3.70 ± 0.23 b	10	106	62	35	54	0.51	0.16	21	77	25
3x one way	4.16 ± 0.28 ab	12	148	69	25	44	0.35	0.30	27	64	36
3x grid pattern	4.53 ± 0.08 a	11	107	60	37	52	0.65	0.30	24	51	25

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Pest Surveys

Partners Agriculture Research and Extension Council of Alberta
Alberta Agriculture and Forestry
Lac La Biche County
County of St. Paul
MD of Bonnyville
Smoky Lake County
University of Alberta
Agriculture and Agri-Food Canada
Alberta Innovates Technology Futures
Alberta Research Council
AFSC Insurance
Western Committee on Crop Pests
Stats Branch/Crop Diversification

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 Northeast Alberta producers
3. To participate in a coordinated network of survey gatherers providing up-to-the-minute information for Alberta crop producers, media, industry, and professionals
4. Meet international trade demand

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

The goal of IPM surveys is to develop an early warning system for field crop pests in Alberta that is easy to access, timely and informative. Some of pests surveyed in Alberta are bertha armyworm, diamondback moth, cabbage seedpod weevil, wheat midge, grasshoppers, wheat stem sawfly, cutworms, fusarium headblight, 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 surveying is done and the information entered, the pest risk map changse to reflect that information. Pest forecast maps are available for viewing at AAFRD's Ropin' the Web site. Being forewarned means that producers and agronomists can be watching for specific pests so that timely scouting and control operations can be carried out before crop losses occur. The dynamic nature and timeliness of the information available to the agriculture industry would be a valuable addition to enhance decision making for producers, industry agronomists and researchers.

LARA participated in the provincial pest surveys of diamondback moth, bertha army worm, cabbage seedpod weevil, and orange wheat blossom midge. The regional data that was collected is passed on to provincial authorities. The information collected is compiled and can be found on the Alberta Agriculture and Agri-Food website (click on 'information'). Producers can see if there is an outbreak in their area and take appropriate and timely actions to protect their crop.

Bertha Armyworm

Bertha armyworm is one of the most significant insect pest of canola in Canada. It occurs throughout Manitoba, Saskatchewan, Alberta and into the interior of BC. Severe infestation can occur throughout most of this area but are usually limited to the parkland area of the Prairies and the Peace River region of BC and Alberta. Infestation was severe in 2012, especially in the County of St. Paul. A lot of insecticide was applied in an effort to prevent losses, but some fields were still severely damaged by the worms. Infestations also seemed patchy, with fields just west of Highway 41 in the MD of Bonnyville seeing large armyworm numbers, while the fills at LARA only had a very few. Armyworms can overwinter in the soil, so it is likely that the mild winter 2011-2012 contributed in part to the outbreak in 2012.

In most years, populations are kept low by unfavorable weather condition such as cold winters and cool wet weather, and by parasites, predators and diseases. But when these natural regulators fail, population can increase dramatically, creating the potential for widespread damage to a variety of broad leaved crops. In extreme situations, infestations of more than 1000 larva per square metre have been reported while densities of 50 to 200 larvae per square metre may be common.

Infestations may be localized or spread over millions of acres. Widespread crop losses can be minimized with insecticides if the infestation is detected early. However, failure to detect infestations early may result in insufficient time to apply the chemicals before severe damage is done. Also, there may be temporary insecticide shortages if suppliers are not aware of the potential outbreak.

Bertha armyworm surveys were conducted in canola fields using pheromone traps. These traps were set up on the edge of the fields. The bertha armyworm adult is a moth, and the traps are designed to attract them. Moth counts were taken once a week. Moth numbers are correlated to armyworm numbers. The bertha armyworm traps were checked from June-August.

Diamondback Moth

Diamondback moth was introduced into North America from Europe about 150 years ago. It is now found throughout North America, wherever host plants are grown. Diamondback moth larvae feed on all plants in the mustard family (canola, mustard), cole crops (broccoli, cabbage) and on several greenhouse plants. In Western Canada, canola and mustard are primary targets.

Although the diamondback moth occurs each year throughout the Canadian prairies and north central United States, the severity of the infestation varies considerably from year to year. An infestation of diamondback moths cannot be predicted based on the previous years' population because very few, if any, pupae survive the long, cold Canadian winters. Instead, the severity of the infestation in any given year depends on two factors – overwintering population to the south and strong south winds to transport the moths north into Manitoba, central Saskatchewan and eastern Alberta in the spring.

In years when conditions are right for the moths – that is, when the moths arrive on the wind in large numbers in early May and summer temperatures are hot – diamondback moth infestations can cause millions of dollars of damage.

Diamondback surveys were conducted in canola fields using pheromone traps. These traps were set up on the edge of the fields and checked once a week and counts taken. Diamondback surveys took place from May-July 2012.

Wheat Midge

The wheat midge (*Sitodiplosis mosellana*) is found in most areas around the world wherever wheat is grown. In recent years, significant damage to wheat crops has been reported in Alberta, Saskatchewan, Manitoba, and southern British Columbia.

Infestations of wheat midge can reduce crop yields and lower the grade of the harvested grain. Midge may exist at low population levels for several years before they become a significant problem. But if conditions become favourable, populations can reach epidemic proportions quickly. Producers inexperienced with wheat midge infestations often mistake the symptoms of damage and report that frost or drought was responsible for reduced wheat yields or grain quality.

Crop damage occurs during the larval stage. After hatching, the midge larvae feed on the developing wheat kernel, causing it to shrivel, crack and become deformed. As there are no visible, external changes in colour, size or shape of the affected wheat head, the damage to the crop is not readily apparent. Damage can only be detected by inspecting the developing seed within the glumes. Damage to wheat kernels will vary within a single head. A few kernels may be aborted entirely. Others will not fully develop and will be so small and light, they will pass through the combine with the chaff during harvest. Still others may be only slightly damaged. Some kernels may not be affected at all. Careful, regular monitoring of wheat fields between heading and flowering is necessary both to identify a wheat midge infestation and to take the appropriate action.

Research indicates that wheat heads are most susceptible to damage when egg laying occurs during heading. Kernel damage due to wheat midge declines by 15 to 25 fold between later stages of heading and early flowering or anthesis (first yellow anthers appear on wheat head). Therefore, fields should be inspected daily from the time wheat heads emerge from the boot leaf until anthers are visible on the heads.

The orange wheat blossom midge survey was conducted by LARA in fall and 10 soil samples were taken from the Lakeland area. About 10, 1" diameter soil samples, to a depth of 6 inches, were taken from each location and mixed and then sub-sampled. These subsamples were then sent to Brooks where they were tested for the cocoon of the orange wheat blossom midge. The amount of cocoons found this year was low although there was a slight increase from the previous year.

Verticilium wilt and Blackleg in Canola

Sclerotinia stem rot is one of the most important diseases of canola in Western Canada, causing losses of 5-100%. It is caused by *Sclerotinia sclerotium*. Because resistance is controlled by multiple genes, it is difficult to breed for resistance. The disease is sporadic, occurring when environmental conditions are favourable, prolong humidity during the flowering stage favours the disease. Due to the persistence of the reproductive spores in the soil for long periods of time, and because of a wide range of hosts, control using crop rotations is difficult. Use of fungicides, which may destroy non-target organisms, is one of the option to control the disease.

The severity of stem rot is extremely variable from year to year, region-to-region and even from field to field. Sclerotinia has become more serious as canola production has increased, likely due to a combination

of more acres of canola in rotations and management practices that contribute to high yields, but also produce dense canopies, which are a better microclimate for disease development.

In Alberta, canola fields are infected by the Blackleg disease caused by *Leptosphaeria maculans*, which can result in yield reductions from between 5 to 20% and is therefore one of the canola production constraints in Alberta. Farm cultural practices, in addition to utilizing Blackleg resistant varieties, have been shown to reduce the incidence of the disease. Tillage and crop rotation are two known method easy to use methods to reduce the incidence of the disease. Tillage helps in reducing blackleg by breaking up infected stubble to increase its decomposition, by burying the stubbles protects them from drying out on the soil surface, increasing their contact with and improving the environment for their decomposition. Because of the negative effects of tillage on soil and as tillage doesn't necessarily kill the spores, this method is not commonly used. Lengthening the time between identical crops which serve as hosts will reduce the pathogen population as pathogen infecting one crop may not cause problem in another crop. Crop rotation has been shown as a more effective method of reducing pathogen population and consequently incidence of Blackleg.

Monitoring the severity and distribution of these diseases will help producers manage risk. In 2016, ARECA member associations and municipalities sampled canola fields across Alberta for these diseases. In total, 480 canola fields were surveyed for blackleg. 432 showed symptoms. 311 fields were sampled for *Sclerotinia*, 252 of those fields showed symptoms. The results for LARA area are in the Table 18 below. Most of the fields sampled, tested positive for both diseases.

Table 18. Number of fields sampled for Blackleg and sclerotinia in 2016

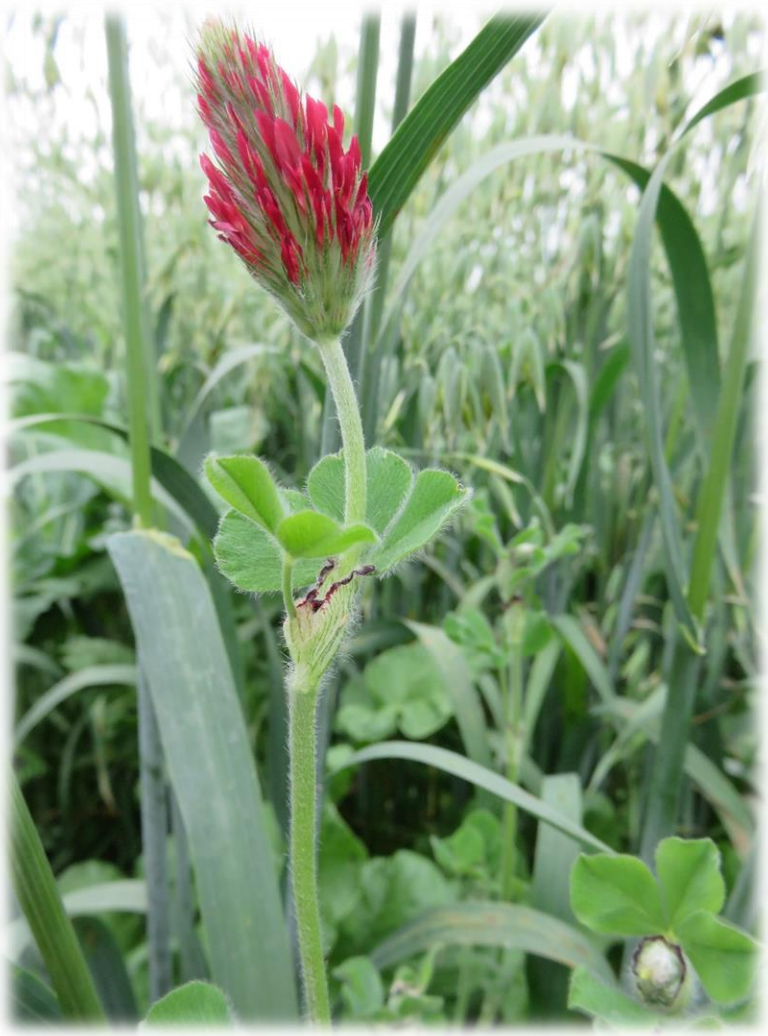
County	Fields infected/ Fields sampled	
	Blackleg	**Sclerotinia**
Bonnyville	3/3	3/3
Lac La Biche	1/1	1/1
Smoky Lake	17/20	2/2
St. Paul	2/2	2/2

Comments

Pest surveys are very important to producers, and the province. With the information that is obtained, proper and accurate forecasting maps can be displayed to inform producers of possible outbreaks. These pest and diseases have a significant impact on crop production. It is important to know proper times of the year when scouting is effective and to know exactly what to look for when out in the fields. Also, crop rotations, varieties, and weather play a great role in determining possible outbreaks. The goal of pest surveys is to help prevent an outbreak from occurring through the collection of this data and to prepare producers so they can manage any possible outbreaks.

It is the second survey are carried out for Verticillium wilt in Alberta after it was discovered on some farms in Manitoba last year in 2014. This was the first case of the disease in Canada.

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 seven 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 2016, 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 1st, 2016. The bulls were pulled on August 3rd, 2016, 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 30th, 2016 to allow adequate grass carry-over for 2017. 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.

Results:

There was a total of 121 days in the grazing season at Olympic Lake Grazing Lease (table 1, figure 1). The average daily gain over the grazing season was 1.16 lbs/day (table 2), which is lower than that seen in previous years of 2.00 lbs/day in 2014 and 1.71 lbs/day in 2013 (table 3).

Table 1. Grazing rotation for the 2016 grazing season at Olympic Lake Grazing Lease.

Pasture Rotation - Olympic Lake 2016										
Paddock Name	***First Graze***					***Second/Third Graze***				
	Date In	**Date Out**	**# of days**	**# of head**		**Date In**	**Date Out**	**# of days**	**# of head**	
				heifers	**bulls**				**heifers**	**bulls**
Headquarters	Jun-1	Jun-2	1	354	12	Sep-29	Sep-30	1	350	0
W4	Jun-2	Jun-5	3	354	12	Sep-12	Sep-14	2	350	0
W1	Jun-5	Jun-10	5	354	12	Sep-14	Sep-18	4	350	0
W3	Jun-10	Jun-15	5	354	12	Sep-18	Sep-22	4	350	0
C1	Jun-15	Jun-22	7	354	12	Sep-26	Sep-29	3	350	0
C4	Jun-22	Jun-24	2	354	12					
C2	Jun-24	Jul-2	8	354	12	Sep-22	Sep-26	4	350	0
W5	Jul-2	Jul-11	9	354	12					
W2	Jul-11	Jul-18	7	354	12					
C3	Jul-18	Jul-26	8	354	11					
C4	Jul-26	Jul-29	3	354	11					
Pipeline	Jul-29	Aug-1	3	354	11					
Headquarters	Aug-1	Aug-3	2	354	11					
S1	Aug-3	Aug-17	14	350	0					
Kerr Lake	Aug-17	Aug-24	7	350	0					
E1	Aug-24	Sep-12	19	350	0					
		Total:	**103**				**Total:**	**18**		

Table 2. Heifer data by herd for the 2016 grazing season.

	2016 Heifer Weights - Average by Herd			Heifer Average Daily Gain (ADG)					
Herd	June lbs	August lbs	September lbs	June 1 - August 3 lbs gained	64 days lbs/day	August 3 - September 30 lbs gained	58 days lbs/day	June 1 - September 30 lbs gained	121 days lbs/day
1	749	865	921	116	1.81	56	0.97	172	1.41
2	773	904	982	131	2.05	78	1.34	209	1.71
3	830	956	1025	126	1.97	69	1.19	195	1.60
4	871	949	1016	78	1.22	67	1.16	145	1.19
5	807	870	916	63	0.98	46	0.79	109	0.89
6	749	852	912	103	1.61	60	1.03	163	1.34
7	880	933	958	53	0.83	25	0.43	78	0.64
8	961	1038	1089	77	1.20	51	0.88	128	1.05
9	892	920	968	28	0.44	48	0.83	76	0.62
10	785	855	921	70	1.09	66	1.14	136	1.11
Average	830	914	971	85	1.32	57	0.98	141	1.16

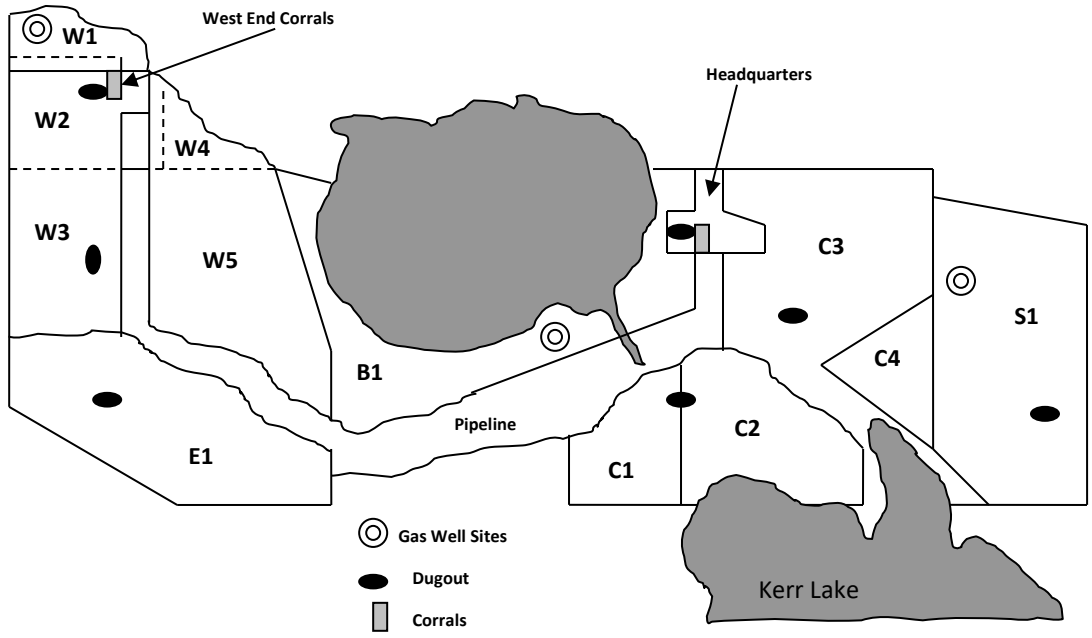


Figure 1. Map of the Northern Range Enhancement Project (NREP) pasture system.

Discussion:

There was a total of 10 patrons grazing cattle at Olympic Lake in 2016 with herd size ranging from 15 to 30 heifers and 1 bull. All red or black angus heifer bulls were used for breeding between June 1st and August 3rd.

The average herd entry weight at 830 lbs was 77 lbs higher than that seen in 2014, which is likely the result of breed and age of the heifers. The herd weight gain ranged from 76 lbs to 209 lbs over the grazing season with an average of 141 lbs. The average daily gain (ADG) decreased between August and September to 0.98 lbs/day from 1.32 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.

Total rainfall at the pasture was just over 10 inches from June through September with the majority of rain falling in June and August. Due to the wet conditions experienced this summer, foot rot posed a bit of an issue at the pasture this year with a total of 22 heifers and 2 bulls being treated. The bulk of the treatments took place in June and July, with two heifers being treated in September.

The heifers were removed earlier than in previous years from the pasture to ensure adequate grass carry over for the 2017 grazing season.

Table 3. Historical data from Olympic Lake Grazing Lease. 2003-2016.

Year	Grazing Season (days)	# of Head	Weight Gain	ADG	% Open
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 Silage Trials

Partners: Alberta Agriculture and Forestry
Battle River Research Group
Chinook Applied Research Association
Gateway Research Organization
North Peace Applied Research Association
Peace Country Beef and Forage Association
Smoky Applied Research and Demonstration Association
West Central Forage Association
SECAN
Association of Alberta Co-op Seed Cleaning Plants
Alberta Brand, Canadian Seed Growers Association
A&L Canada Laboratories

The Annual Forage Trials (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).

This 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 has helped with seed coordination. While many of the associations involved have been growing silage trials for a number of years, this is the first coordinated effort to standardize protocol, variety selection and data reporting. Provincial protocol was established for five blocks of plots: barley, oats, triticale, pulses and late-seeded.

In 2016, the LARA Regional Silage Trial included four blocks of plots: barley (13 varieties), oats (10 varieties), triticale (5 varieties) and pulses (9 treatments). Additional varieties can be added at the request of local producers and seed reps so if there is something you would like to see in 2017, let us know.

In partnership with the Association of Alberta Co-op Seed Cleaning Plants and the Alberta Seed Growers Association the Regional Silage Trial information will appear in the Spring 2016 Alberta's Seed Guide (seed.ab.ca).

Regional Silage Trial – Cereals

Partners: Alberta Agriculture and Forestry
Todd Brosniak
Battle River Research Group
Chinook Applied Research Association
Gateway Research Organization
SARDA Crop Research
West-Central Forage Association

Objectives:

1. To determine the best yielding cereal forage varieties (barley, oats, triticale) for whole plant forage production in Northeastern Alberta.
2. To determine the best quality cereal forage varieties (barley, oats, triticale) 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 to producers. Previous experience with cereal grain production and the Regional Variety Trials has shown that there can be a 15% increase in production from selecting the best varieties, which, on average, can be an increase of $25/acre.

Through the use of experience, neighbors and publications 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 decisions 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, in two locations: Fort Kent (NE25-61-5-W4) and St. Paul (SE15-58-11-W4). The trial blocks were seeded as a randomized complete block design (RCBD) with four replicates to reduce error. The plots measured 1.15m by 6m 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 fertilizer (30-22-10-12) was side-banded at the time of seeding. The trials in Fort Kent were seeded on May 18th, 2016 and the trials in St. Paul were seeded on May 17th, 2016. Unfortunately, due to seeding error, the oat trial in St. Paul was cancelled. The trials were sprayed with a 3-point hitch sprayer: Fort Kent

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 of the data was conducted using ARM 9, P = 0.05.

The following varieties were grown in the Regional Silage Trials in 2016:

Barley

- *Champion* – high yielding 2-row feed barley variety with excellent standability and improved disease resistance.
- *CDC Coalition* – high yielding 2-row feed barley variety.
- *CDC Cowboy* – tall, 2-row dual purpose barley variety that responds well to low moisture and low fertility.
- *CDC Austenson* – 2-row barley variety with semi-smooth awns, short and strong straw and high feed yield.
- *TR13740* – 2-row feed barley variety.
- *Claymore* – 2-row barley variety developed from CDC Copeland x Xena.
- *CDC Meredith* – outstanding 2-row malting barley variety with high grain yield.
- *Sundre* – high yielding 6-row barley variety with good disease resistance.
- *Amisk* -rough awned, 6-row, semi-dwarf general purpose barley with strong straw for decreased lodging.
- *CDC Maverick* – 2-row forage barley variety with high yields. Ideally suited to low input management and lighter soils or drought conditions.
- *Conlon* – early maturing, 2-row feed and malting barley variety with smooth awns.
- *Canmore* – high yielding 2-row general purpose barley variety with good resistance to lodging.
- *Gadsby* – rough awned, 2-row general purpose barley well adapted to the brown and black soil zones. Excellent disease resistance and good quality feed yield.

Oats

- *CDC SO-1* – early maturing, very digestible brown feed oat variety with a high fat content and does not need to be rolled. Short, strong straw for reduced lodging.
- *AC Morgan* – High yielding, later maturing milling oat with good lodging resistance and is commonly used for silage or greenfeed.
- *AC Murphy* – widely adapted forage oat, with high yields, improved lodging resistance and is well suited for silage, swath grazing and green feed.
- *CDC Haymaker* – later maturing forage oat variety with high forage yield and quality.
- *Derby* – late maturing, general purpose milling oat variety with high yields and low hull content.
- *CDC Seabiscuit* – high yielding milling oat variety with good straw strength for reduced lodging.
- *CDC Baler* – very leafy, forage oat variety.
- *AC Juniper* – early maturing general purpose oat variety with high yields and strong straw.
- *Waldern* – late maturing, high yielding feed oat variety with good lodging resistance.
- *AC Mustang* – high yielding silage and forage oat variety with good lodging resistance.

Triticale

- *Bunker* – early maturing, reduced awn forage variety with great digestibility, high fat content and high silage yields.
- *Sunray* – early maturing, spring triticale variety with improved ergot resistance. Short statured for increased resistance to lodging.
- *Taza* – reduced awn forage and grain triticale variety with good lodging resistance.
- *Tyndal* – early maturing, reduced awn forage and silage variety with good lodging resistance.

Table 1. Agronomic Information, 2016.

Trial	Site	# of Varieties	Seeding Date	Seeding Rate	Fertility (lbs/acre)	Weed Control	Harvest Date
Barley	Fort Kent	13	18-May-16	300 pl/m^2	30-22-10-12 @ 141 lbs/ac	Curtail M	02-Aug-16
	St. Paul	13	17-May-16	300 pl/m^2	30-22-10-12 @ 141 lbs/ac	Tundra, Curtail M	05-Aug-16
Oats	Fort Kent	10	18-May-16	300 pl/m^2	30-22-10-12 @ 141 lbs/ac	Curtail M	02-Aug-16
	St. Paul	10	17-May-16	300 pl/m^2	30-22-10-12 @ 141 lbs/ac	N/A	N/A
Triticale	Fort Kent	5	18-May-16	370 pl/m^2	30-22-10-12 @ 141 lbs/ac	Curtail M	16-Aug-16
	St. Paul	5	17-May-16	370 pl/m^2	30-22-10-12 @ 141 lbs/ac	Tundra, Curtail M	16-Aug-16

Results:

Barley

The barley trials are aimed to be harvested at the soft dough stage. There were 13 barley varieties grown in the trials this year at both locations. The results of the Fort Kent and St. Paul trials can be found in table 2 and table 3, respectively. The Fort Kent trial was harvested after 76 days and the St. Paul trial was harvested after 79 days. Establishment at the beginning of the season was slow due to low rainfall, however a total of 139.7 mm (Fort Kent) of rain fell through the growing period. Historical yield data can be found in table 4. Average moisture content of the Fort Kent trial was 59% and the St. Paul trial was 56%.

The varieties yielded very well at both locations, with the average yield in Fort Kent of 4.22 ton/acre being slightly lower than the average yield achieved in St. Paul of 5.37 ton/acre. The highest yielding variety in Fort Kent was CDC Cowboy at 5.47 ton/acre followed closely by CDC Maverick. CDC Maverick is a fairly new 2-row barley variety suited to low input conditions. Gadsby was also one of the higher yielding varieties at 4.83 ton/acre and was the highest yielding variety in St. Paul at 6.09 ton/acre.

Feed quality was higher in the barley varieties grown at the Fort Kent location when compared to the St. Paul trial. This is likely due to a later harvest stage for the St. Paul trial beyond the recommended soft dough stage, which is seen in the lower moisture content of the samples.

Table 2. RST Barley Fort Kent, 2016 (ton/acre, 1 ton = 2000 lbs).

Variety	DM Yield (ton/acre)	DM Yield (% Austenson)	2016 Quality Data					
			CP (%)	ADF (%)	NDF (%)	TDN (%)	Ca (%)	P (%)
CDC Cowboy	5.47	119	8.94	23.84	46.21	70.33	0.17	0.25
CDC Maverick	5.10	111	10.14	23.84	42.78	70.33	0.22	0.23
Gadsby	4.83	105	8.99	28.63	50.50	66.60	0.28	0.17
CDC Austenson	4.56	100	10.30	25.16	44.40	69.30	0.22	0.20
Champion	4.49	98	11.62	26.91	50.83	67.94	0.24	0.22
CDC Meredith	4.33	94	10.65	27.36	48.80	67.59	0.23	0.22
Claymore	4.19	91	9.80	25.42	47.00	69.10	0.25	0.21
Sundre	4.19	91	10.37	31.36	56.19	64.47	0.45	0.17
Canmore	4.06	89	10.86	25.57	46.40	68.98	0.27	0.23
CDC Coalition	3.88	85	11.85	29.37	51.40	66.02	0.30	0.20
TR13740	3.65	80	10.23	25.95	47.55	68.68	0.20	0.17
Amisk	3.29	72	11.28	29.49	52.65	65.93	0.41	0.19
Conlon	2.77	60	11.18	25.39	49.41	69.12	0.41	0.20
Average	4.22	92	10.48	26.79	48.78	68.03	0.28	0.20
CV	8.91							

Table 3. RST Barley St. Paul, 2016 (ton/acre, 1 ton = 2000 lbs).

Variety	DM Yield (ton/acre)	DM Yield (% Austenson)	2016 Quality Data					
			CP (%)	ADF (%)	NDF (%)	TDN (%)	Ca (%)	P (%)
Gadsby	6.09	109	4.97	36.17	57.75	60.72	0.31	0.12
Claymore	5.92	106	5.77	36.10	57.58	60.78	0.41	0.13
Amisk	5.83	104	7.02	26.28	41.00	68.43	0.28	0.20
CDC Meredith	5.64	101	5.62	32.40	53.79	63.66	0.22	0.16
CDC Austenson	5.58	100	5.41	32.66	55.00	63.46	0.30	0.12
Sundre	5.52	99	6.62	36.55	57.57	60.43	0.38	0.16
CDC Cowboy	5.41	97	5.33	33.76	53.72	62.60	0.26	0.16
CDC Maverick	5.40	97	5.95	32.92	54.33	63.26	0.32	0.20
Champion	5.35	96	5.35	35.29	56.50	61.41	0.26	0.13
Canmore	5.24	94	7.45	33.92	56.36	62.48	0.33	0.18
TR13740	5.02	90	8.07	33.39	56.17	62.89	0.25	0.16
CDC Coalition	4.71	84	6.96	34.85	55.28	61.75	0.30	0.16
Conlon	4.15	74	6.38	29.56	50.29	65.87	0.33	0.20
Average	5.37	96	6.22	33.37	54.26	62.90	0.30	0.16
CV	9.69							

Oats

The oat trial is aimed to be harvested at the milk stage. There were 10 oat varieties grown in the trials this year at the Fort Kent location. Unfortunately, due to seeding error, the St. Paul trial was not harvested. The results of the Fort Kent trial can be found in table 5 and the historical yield data can be found in table 6. Average moisture content at the time of harvest was 65%.

The highest yielding oat variety was CDC Baler at 5.30 ton/acre followed closely by Murphy and CDC Haymaker at 5.11 ton/acre and 5.05 ton/acre, respectively. CDC Baler is a well-established forage oat variety that has been widely grown on the prairies. CDC SO-1 has increased in popularity in the last few years although it has consistently yielded low in the regional silage trials over the past three years. The trial was harvested 76 days after seeding.

Table 5. RST Oats Fort Kent, 2016 (ton/acre, 1 ton = 2000 lbs).

			2016 Quality Data					
Variety	DM Yield (ton/acre)	DM Yield (% Murphy)	CP (%)	ADF (%)	NDF (%)	TDN (%)	Ca (%)	P (%)
CDC Baler	5.30	104	10.44	32.32	52.91	63.72	0.2	0.23
Murphy	5.11	100	8.56	32.22	53.57	63.8	0.13	0.23
CDC Haymaker	5.05	99	10.69	27.46	51.56	67.51	0.15	0.25
Waldern	4.64	91	9.52	34.96	52.25	61.67	0.15	0.22
Derby	4.50	88	9.13	29.37	48.20	66.02	0.18	0.23
AC Morgan	4.33	85	9.51	28.74	52.18	66.51	0.16	0.29
CDC Seabiscuit	4.23	83	10.65	27.25	48.56	67.67	0.16	0.23
AC Mustang	4.14	81	9.41	32.28	52.22	63.75	0.17	0.26
AC Juniper	3.82	75	9.18	28.25	51.21	66.89	0.16	0.23
CDC SO-1	3.55	69	9.99	28.39	50.17	66.78	0.17	0.25
Average	4.47	87	9.71	30.12	51.28	65.43	0.16	0.24
CV	9.96							

Triticale

The triticale trials are targeted to be harvested at the late milk stage. There were 5 spring triticale varieties grown in the trial this year. The results of the Fort Kent and St. Paul trials can be found in table 7 and table 8, respectively. Historical yield data is summarized in table 9. Average moisture content at the time of harvest for both the Fort Kent and St. Paul trials was 55%.

A few variety changes were made to the trial this year, with Bunker being added back in as well as a new and upcoming variety currently known as 94L043057. Sunray was among the highest yielding varieties at both location at 4.25 ton/acre and 5.01 ton/acre in Fort Kent and St. Paul, respectively. Tyndal yielded only slightly higher in the St. Paul trial at 5.09 ton/acre. The upcoming variety of 94L043057 was consistently the lowest yielding variety at both locations.

Quality was comparable between locations, with the Fort Kent trial being slightly higher in crude protein content than the St. Paul trial although both locations are adequate to meet beef cattle nutrient requirements.

Table 7. RST Triticale Fort Kent, 2016 (ton/acre, 1 ton = 2000 lbs).

			2016 Forage Quality					
Variety	DM Yield (ton/acre)	DM Yield (% Taza)	CP (%)	ADF (%)	NDF (%)	TDN (%)	Ca (%)	P (%)
Sunray	4.25	125	8.32	27.27	46.74	67.66	0.11	0.21
Bunker	3.72	110	7.80	33.80	53.46	62.57	0.14	0.20
Taza	3.39	100	9.33	29.96	47.93	65.56	0.11	0.22
Tyndal	3.27	96	7.86	33.36	57.78	62.91	0.12	0.21
94L043057	2.98	88	8.94	33.47	57.61	62.83	0.12	0.19
Average	3.52	104	8.45	31.57	52.70	64.31	0.12	0.21
CV	7.04							

Table 8. RST Triticale St. Paul, 2016 (ton/acre, 1 ton = 2000 lbs).

			2016 Quality Data					
Variety	DM Yield (ton/acre)	DM Yield (% Taza)	CP (%)	ADF (%)	NDF (%)	TDN (%)	Ca (%)	P (%)
Tyndal	5.09	104	7.47	35.87	58.45	60.96	0.12	0.18
Sunray	5.01	102	7.18	31.07	48.16	64.7	0.12	0.21
Bunker	4.96	101	6.41	35.36	58.07	61.35	0.12	0.19
Taza	4.89	100	7.08	33.26	54.16	62.99	0.1	0.21
94L043057	4.87	100	6.9	34.69	54.27	61.88	0.1	0.19
Average	4.96	102	7.01	34.05	54.62	62.38	0.11	0.20
CV	9.31							

Look for province-wide results in the 2016 *Alberta Seed Guide*.

Regional Silage Trial – Pulse Mixtures

Partners: Alberta Agriculture and Forestry
Guy Brousseau
SECAN
Chinook Applied Research Association
West-Central Forage Association
SARDA Crop Research
Battle River Research Organization

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.

Method:

The trial was established at the LARA Fort Kent Research Site (NE25-61-5-W4) on May 25, 2016 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 n9 treatments and each cereal variety was seeded in a mixture with CDC Horizon peas or CDC Meadow peas.

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 2016:

- *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 Cooper peas* – high yielding green pea variety with excellent quality.
- *CDC Meadow peas* – consistently high yielding, competitive yellow field pea variety with good lodging resistance.

Table 1. RST Pea/Cereal Mixture Agronomic Information, 2016.

	Date	Date	Rain			
Site	**Seeded**	**Harvested**	**(mm)**	**Treatments**	**Seeding Rate**	**Fertility**
Fort Kent	25-May-16	16-Aug-16	193.7	Austenson	300 plants/m2	50 % of recommended rate*
				Baler	300 plants/m2	50 % of recommended rate*
				Taza	370 plants/m2	50 % of recommended rate*
				Austenson/Meadow	150 pl/m2, 57 pl/m2	50 lbs/acre of 11-52-0-0
				Baler/Meadow	150 pl/m2, 57 pl/m2	50 lbs/acre of 11-52-0-0
				Taza/Meadow	185 pl/m2, 57 pl/m2	50 lbs/acre of 11-52-0-0
				Austenson/Horizon	150 pl/m2, 57 pl/m2	50 lbs/acre of 11-52-0-0
				Baler/Horizon	150 pl/m2, 57 pl/m2	50 lbs/acre of 11-52-0-0
				Taza/Horizon	185 pl/m2, 57 pl/m2	50 lbs/acre of 11-52-0-0

* 70.86 lbs/acre

Results:

The aim is to harvest the pulse trials at the recommended cereal stage plus 10 days to try an 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 by 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 is summarized in table 2 and historical data can be found in table 3.

Similar to previous years, the mixtures with oats (CDC Baler) yielded among the highest mixture treatments at 3.87 ton/acre (CDC Baler/CDC Horizon) and 3.67 ton/acre (CDC Baler/CDC Meadow). The next highest yielding treatments were the Taza mixture with CDC Horizon peas at 3.83 ton/acre. Triticale is known for increased straw strength and reduced lodging, therefore, inclusion in a pea-cereal mixture could help with pea standability and overall harvesting ease. The treatments with CDC Austenson were among the lowest yielding mixtures with the CDC Austenson/CDC Meadow treatment being the lowest yielder at 2.69 ton/acre.

The inclusion of peas in a silage mixture can add up to 1.5% crude protein over cereal silage alone.

Table 2. RST Pea-Cereal Mixture Fort Kent, 2016 (ton/acre, 1 ton = 2000 lbs).

Variety	DM Yield (ton/acre)	DM Yield (% Austenson)	2016 Quality Data					
			CP (%)	ADF (%)	NDF (%)	TDN (%)	Ca (%)	P (%)
CDC Baler	4.02	145	6.83	30.02	51.61	65.51	0.22	0.21
Baler/Horizon	3.87	139	9.05	29.76	45.42	65.72	0.40	0.21
Taza/Horizon	3.83	138	8.88	34.54	51.47	61.99	0.32	0.18
Baler/Meadow	3.67	132	6.27	31.52	49.31	64.35	0.23	0.20
Taza	3.33	120	6.05	34.99	59.12	61.64	0.12	0.18
Austenson/Horizon	3.11	112	5.74	34.18	56.25	62.27	0.26	0.15
Taza/Meadow	2.90	104	7.39	38.72	59.73	58.74	0.43	0.16
Austenson	2.78	100	7.15	26.52	49.87	68.24	0.15	0.22
Austenson/Meadow	2.69	97	7.15	35.03	57.05	61.61	0.44	0.14
Average	3.36	121	7.17	32.81	53.31	63.34	0.29	0.18
CV	13.9							

Winter Wheat for Forage Variety Trial

Partners: Rob Graf
Agriculture and Agri-Food Canada (AAFC)
MD of Bonnyville

Objectives:

1. To determine the potential of utilizing winter wheat for whole plant forage production in Northeastern Alberta when seeded in fall.
2. To determine the best yielding winter wheat variety for whole plant forage production in Northeastern Alberta.
3. To determine the best quality winter wheat variety for cattle feed in Northeastern Alberta.

Background:

Method:

The trial was seeded on September 9th, 2015 in a randomized complete block design (RCBD) with three replicates to reduce error at the LARA Fort Kent Research Farm (NE25-61-5-W4). The LARA Fabro five-row zero-till small plot drill was used for seeding to a depth of 1". The seed was sent pre-weighed from Agriculture and Agri-Food Canada and was treated. Individual plots measured 1.15 m by 6 m in area. Soil tests were taken prior to seeding and a blend fertilizer (---) was side-banded at the time of seeding.

Plant counts to determine fall germination were done on September 30, 2015. To determine winter survival, a second plant count was done on May 11, 2016.

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 of the data was conducted using ARM 9, P = 0.05.

Results:

Unfortunately, due to a late frost (-8 degrees Celsius) on April 14, 2016, the trial suffered significant damage and plant loss (table 1). Prior to the frost, the trial germinated well in early April.

The variety with the lowest percent difference in plant count after frost was W520, followed closely by AAC Elevate and AC Radiant. The variety with the highest percent different in plant stand was Swainson at -76% change. The higher plant count for W520 translated into higher yields at 1.58 ton/acre, which was significantly higher than CDC Buteo at 1.16 ton/acre (table 2).

Table 1. Winter Wheat Plant Counts, 2016.

Variety	Plant Count			
	Fall Count (avg plants/m)	Spring Count (avg plants/m)	Stand Loss (avg plants/m)	Difference (%)
W520	67	27	40	-60
AAC Elevate	59	23	36	-61
AC Radiant	53	20	33	-62
CDC Buteo	70	23	47	-67
AAC Icebreaker	62	20	42	-68
AAC Wildfire	61	19	42	-69
AC Flourish	69	21	48	-70
CDC Chase	64	19	45	-70
AAC Gateway	58	17	41	-71
Moats	55	15	40	-73
Pintail	59	16	43	-73
AC Emerson	72	19	53	-74
Sunrise	65	16	49	-75
Swainson	70	17	53	-76
Average	63	19	44	-69

Table 2. Winter Wheat Fort Kent, 2016 (ton/acre, 1 ton = 2000 lbs).

Variety			2016 Quality Data					
	DM Yield (ton/acre)	DM Yield (% Radiant)	CP (%)	ADF (%)	NDF (%)	TDN (%)	Ca (%)	P (%)
W520	1.58	216	9.07	27.39	42.37	67.56	0.11	0.17
CDC Buteo	1.16	159	9.25	27.35	47.15	67.59	0.15	0.19
AAC Elevate	0.99	136	9.27	29.78	48.25	65.7	0.2	0.2
AAC Icebreaker	0.88	121	9.79	32.06	54.3	63.93	0.26	0.18
Swainson	0.83	114	10.41	25.74	40.25	68.85	0.25	0.23
AAC Wildfire	0.77	105	9.81	29.85	48.17	65.65	0.17	0.19
Pintail	0.75	103	8.91	33.11	58.1	63.11	0.27	0.14
CDC Chase	0.75	103	8.4	30.3	56.75	65.3	0.17	0.17
AC Radiant	0.73	100	9.42	35.87	53.97	60.96	0.28	0.2
AC Flourish	0.66	90	9.26	37.68	59.24	59.55	0.34	0.17
AC Emerson	0.63	86	10.38	28.52	51.16	66.68	0.18	0.21
Moats	0.44	60	10.92	32.85	53.11	63.31	0.37	0.21
AAC Gateway	0.42	58	9.9	36.37	58.26	60.57	0.42	0.18
Sunrise	0.39	53	11.26	36.21	57.53	60.69	0.5	0.18
Average	0.78	107	9.72	31.65	52.04	64.25	0.26	0.19
CV	10.97							

Perennial Forage Project

Partners: Alberta Beef Producers
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 on the of largest sources of livestock feed on the prairies and the wide diversity in growth characteristics makes them ideal for many purposes.
According the Alberta Agriculture's Agriprofits Benchmaks, two thirds the cost of maintaining a cow 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 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 held 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 August 8, 2016. Table 1 illustrates the forage varieties seeded in each trial.

Table 1. Perennial Forage Trial Varieties seeded, 2016.

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 Pubsecent 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	Spreder 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, but will be taken in 2017 when the trial is harvested.

Results:

The emergence counts and plant counts results for the grass, legume and grass/legume mixture trials can be found in table 2, table 3 and table 4, respectively. Due to the early snow this fall, final plant counts were collected later than desired (November 3, 2016).

After reseeding on August 8, 2016, establishment of the grass trial was faster than that seen in the legume trial, with the majority of varieties emerging within 1 week of seeding. The variety with the highest emergence was Fojtan Festulolium at 5.67 plants per ¼ m.

Fojtan Festulolium is the result of a cross between Italian Ryegrass and Tall Fescue and has high yields, strong persistence, drought resistance and tolerance to periodic flooding. As a result, Fojtan is well suited to forage production in many situations. The high yields make it an excellent forage crop and feed values tend to be higher than Tall Fescue but not to the levels of Perennial Ryegrass.

The varieties with the slowest emergence were AC Admiral Hybrid Brome, AC Knowles Hybrid Brome and Kirk Crested Wheat Grass, which showed no emergence 1 week after seeding. Final plant counts showed Fojtan Festulolium well ahead of the other varieties in the trial at 13.50 plants per ¼ m. This is followed by AC Saltlander Green Wheatgrass and Greenleaf Pubescent wheatgrass.

Table 2. Perennial Forage Grass Trial Plant Counts, 2016.

	Emergence Counts (pls per 1/4 m)			Plant Count
Variety	**15-Aug-16**	**22-Aug-16**	**29-Aug-16**	**17-Oct-16**
Fleet MB	1.57	3.25	4.67	12.50
AC Admiral HB	0.00	0.60	1.67	7.33
Success HB	1.69	2.20	2.25	5.83
Knowles HB	0.00	0.66	1.75	7.33
Greenleaf PWG	0.97	3.34	6.33	17.00
Kirk CWG	0.00	0.98	1.83	6.25
AC Saltlander GWG	3.59	5.32	6.83	13.33
Tom RWR	1.33	2.84	3.08	15.25
Killarney OG	1.97	2.00	2.25	12.08
Grinstad Tim.	2.15	3.10	3.17	10.17
Fojtan Festulolium	5.67	8.10	13.50	36.42
Courtney TF	2.45	4.14	4.42	17.67

The legume trial was slow to established, with very few varieties emerging within one week after seeding (44-44 alfalfa, Rangelander alfalfa and Rugged alfalfa). However, by the June 28, 2016 count, all varieties had begun to emerge and establish and by July 5, 2016 plots were starting to fill out.

Final plant counts were taken on August 26, 2016 and showed good establishment with all different varieties (table 3). The Nova sainfoin had the lowest plant count at 3.50 plants per ¼ m, which was 80% fewer plants than the next lowest variety of Oxley Cicer Milkvetch at 4.33 plants per ¼ m. The new sainfoin variety, AC Mountainview, which is being grown in the High Legume Pasture Project, established well at 5.50 plants per ¼ m.

Table 3. Perennial Forage Legume Trial Plant Counts, 2016.

	Emergence Counts (plants per 1/4 m)			Plant Count
Variety	**21-Jun-16**	**28-Jun-16**	**05-Jul-16**	**26-Aug-16**
20 - 10	0.00	1.45	3.99	4.92
44 - 44	0.09	1.15	4.32	4.67
Assalt ST	0.00	0.65	2.68	4.58
Dalton	0.00	0.33	3.09	4.67
Halo	0.00	0.69	4.44	5.33
PV Ultima	0.00	1.02	4.38	5.83
Rangelander	0.10	1.50	3.74	5.50
Rugged	0.04	0.99	2.97	4.67
Spreder 4	0.00	0.68	3.48	4.83
Spredor 5	0.00	0.43	5.02	5.25
Yellowhead	0.00	1.07	3.57	5.92
AC Mountainview	0.00	0.79	4.61	5.50
Nova	0.00	1.12	2.72	3.50
Oxley 2	0.00	1.03	3.86	4.33
Veldt	0.00	0.54	4.15	4.75

The grass/legume trial was slow to establish but, unlike the legume trial, most mixtures emerged within one week after seeding with the Success Hybrid brome/Yellowhead alfalfa treatment being the only one to show no emergence.

Final plant counts showed the Fleet Meadow brome/Spredor 5 alfalfa treatment with the most even emergence of both the legume and grass species at 2.33 plants per ¼ m and 2.83 plants per ¼ m, respectively.

Table 4. Perennial Forage Mixtures Trial Plant Counts, 2016.

	Emergence Counts (pls per 1/4 m)						Plant Count	
	15-Aug-16		22-Aug-16		29-Aug-16		17-Oct-16	
Variety	**Grass**	**Legume**	**Grass**	**Legume**	**Grass**	**Legume**	**Grass**	**Legume**
Fleet MB/Yellowhead	0.37	0.08	1.33	1.17	2.58	1.17	8.75	3.50
AC Knowles/Yellowhead	0.00	0.33	1.15	0.67	1.33	0.83	6.42	2.42
Success HB/Yellowhead	0.00	0.00	1.05	0.22	1.50	0.67	11.58	4.75
Fleet MB/Spredor 5	1.64	0.97	2.20	1.15	2.83	2.33	10.42	5.25
AC Knowles MB/Spredor 5	0.65	0.83	0.99	1.64	1.50	1.92	12.58	4.00
Success HB/Spredor 5	0.89	0.00	0.89	0.44	2.50	0.92	11.08	4.92
Fleet MB/AC Mountainview	0.00	0.06	2.48	0.78	3.25	1.00	6.67	6.83
AC Knowles HB/AC Mountainview	0.10	0.00	0.77	0.00	1.50	0.75	13.83	4.08
Success HB/AC Mountainview	0.72	0.00	1.33	0.00	1.50	0.67	14.25	4.67

Sainfoin-Alfalfa Mixture Trial

Partners: Alberta Agriculture and Forestry
Agriculture and Agri-Food Canada (Lethbridge)
Dr. Surya Acharya

Objectives:

1. To compare the establishment, growth and persistency of new sainfoin varieties to old sainfoin varieties and alfalfa.
2. To compare the forage yield and quality of new sainfoin varieties to old sainfoin varieties and alfalfa.

Background:

Inclusion of legumes into pasture systems can be highly productive stands and are an excellent source of quality feed for grazing cattle. However, cattle grazing a typical high legume pasture stand, such as alfalfa, can be at increased risk of bloat. One bloat mitigation strategy that can be used is the inclusion on non-bloat legumes, including sainfoin. Sainfoin contains tannins, which are a compound in the plant that attaches themselves to the bloat-inducing proteins in alfalfa, thus helping to eliminate the potential for bloat.

In the past, sainfoin has been known as a very uncompetitive legume with poor establishment and longevity when under grazing pressure. However, recent research into the development of new varieties at the Lethbridge Research Centre has produced more resilient cultivars, including AC Mountainview.

To assess and compare the new sainfoin varieties with older sainfoin varieties and alfalfa, the sainfoin-alfalfa mixture trial was established in the spring of 2014.

Method:

The trial was seeded in May of 2014 at the LARA Research Site in Fort Kent (NE25-61-5-W4) in a randomized complete block design (RCBD) with four replicates to reduce error. Soil tests were taken prior to seeding to determine soil nutrient content and 100 lbs/acre of 11-52-0-0 was side-banded at the time of seeding. The plots measured 2.3m x 6m.

Suggested seeding rates were 30 lbs/acre of sainfoin and 12 lbs/acre of alfalfa. As the trial was seeded as alternate row mixtures, seeding rate was reduced by half to 15 lbs/acre of sainfoin and 6 lbs/acre of alfalfa. The monoculture plots were seeded at full rates. The trial was seeded with the LARA five-row zero-till small plot drill at 0.5 – 0.7" deep and all seed was inoculated. Hand weeding was conducted for weed control twice in 2014 and once in 2015.

Plant counts were done four weeks after seeding and percent composition of each treatment was calculated. The plots were cut at 10-15% flower where yield was determined and quality samples were taken. Prior to cutting, biomass samples were taken and sorted to determine species composition and species biomass yield. Where possible, two cuts were made to ensure the sainfoin did not go to seed.

Quality samples were send to A & L Canada Laboratories for wet chemistry analysis. The same procedures were used for each year of the trial.

The following table summarizes the treatments seeded in the trial.

Table 1. Treatments seeded, 2014.

Treatments
AC Grazeland Alfalfa/Nova Sainfoin
Bulklines*
AC Grazeland Alfalfa/Bulklines*
AC Grazeland Alfalfa
Nova Sainfoin

Results:

Results so far show that the experimental bulkline have similar establishment and persistence to the old sainfoin variety used in the trial known as Nova (table 2). Stand composition increased slightly by 2015 for the bulkline and decreased slightly for the Nova. However, there have been no significant varieties in species composition in the mixture treatments. One of the bulkline varieties has recently been registered as AC Mountainview.

Table 2. Sainfoin/Alfalfa trial percent composition, 2014-2015.

	Composition (%)					
	2014				2015	
	Spring		Fall			
Treatment	Sainfoin	Alfalfa	Sainfoin	Alfalfa	Sainfoin	Alfalfa
AC Grazeland/Bulklines	36	64	38	62	43	57
AC Grazeland/Nova	46	54	44	56	42	58
Average	41	59	41	59	42	58

AC Grazeland/Nova treatment has consistently yielded the highest in both cuts of the trial in 2016 at 7072.35 lbs/acre in the first cut and 4540.56 lbs/acre in the second cut. Similarly, AC Grazeland was the second highest yielding treatment in both the July cut and the August cut.

In the first cut, the bulkline treatment yielded higher than the Nova treatment at 5824.90 lbs/acre compared to 5473.07 lbs/acre although this was not significantly different. However, regrowth of the bulkline treatment as a monoculture and as a mixture with AC Grazeland was slower than the Nova which led to decreased yields in the second cut of the trial for both treatments. As well, the AC Grazeland/Bulkline treatment has yielded consistently low in the trial. The results indicate that the bulklines could be less competitive in mixtures with alfalfa than the established Nova variety of sainfoin when seeded in alternate rows.

When considering quality, there does not appear to be any significant trends between the alfalfa, sainoin/alfalfa and sainfoin treatments.

Table 3. Sainfoin/Alfalfa trial yield and quality data, 2016.

Treatment	DM Yield (lbs/acre)		DM Yield % AC Grazeland	Moisture (%)	Quality Data							
					CP (%)	ADF (%)	NDF (%)	TDN (%)	Ca (%)	P (%)	K (%)	Mg (%)
[1]AC Grazeland/Nova	7072.35	a	100	68.74	10.31	50.66	59.68	49.44	0.77	0.14	1.61	0.22
[1]AC Grazeland	6236.26	ab	88	71.06	9.85	47.97	63.38	51.53	0.85	0.15	1.73	0.23
[1]Bulklines	5824.90	ab	82	69.27	14.47	37.17	40.91	59.94	1.27	0.21	1.43	0.39
[1]Nova	5473.07	ab	77	71.03	11.01	43.34	53.19	55.14	0.87	0.20	1.75	0.34
[1]AC Grazeland/Bulklines	5289.69	b	75	71.69	9.02	48.05	60.38	51.47	0.76	0.14	1.52	0.21
Average	*5979.25*			*70.36*	*10.93*	*45.44*	*55.51*	*53.50*	*0.90*	*0.17*	*1.61*	*0.28*
CV	*12.87*			*2.60*								
[2]AC Grazeland/Nova	4540.56	a	100	72.20	17.85	37.44	41.53	59.73	1.08	0.21	2.08	0.28
[2]AC Grazeland	4524.80	a	100	71.71	16.46	44.93	52.24	53.90	1.16	0.17	2.00	0.20
[2]Nova	3822.26	a	84	73.60	12.20	50.26	58.94	49.75	0.83	0.14	1.78	0.21
[2]AC Grazeland/Bulklines	3743.18	a	82	73.37	17.76	39.92	44.25	57.80	1.25	0.20	2.27	0.26
[2]Bulklines	3651.86	a	80	74.44	14.17	45.08	52.40	53.78	1.01	0.16	2.06	0.22
Average	*4056.53*			*73.06*	*15.69*	*43.53*	*49.87*	*54.99*	*1.07*	*0.18*	*2.04*	*0.23*
CV	*23.28*			*3.71*								

[1] data from first cut – July 8, 2016

[2] data from second cut – August 31, 2016

The trial will continue to be monitored in 2017.

Nova Sainfoin, May 16, 2016

AC Grazeland Alfalfa, May 16, 2016

High Legume Pasture Project

Partners: Gordon Graves
Alberta Agriculture and Forestry
Agricultural Research and Extension Council of Alberta
Chinook Applied Research Association
Foothills Forage Association
West-Central Forage Association
Mackenzie Applied Research Association
Gateway Research Organization
Grey-Wooded Forage Association
Peace Country Beef and Forage Association
Battle River Research Group
North Peace Applied Research Association
Farming Smarter
PFRA of BC

Objectives:

1. To determine establishment and longevity of high legume pasture stands.
2. To explore increased productivity, increased forage quality, drought aversion and nitrogen fixing benefits within a high legume stand.
3. To determine high legume pasture stands performance under grazing pressure.
4. To assess bloat mitigation potential of sainfoin in pasture stands.

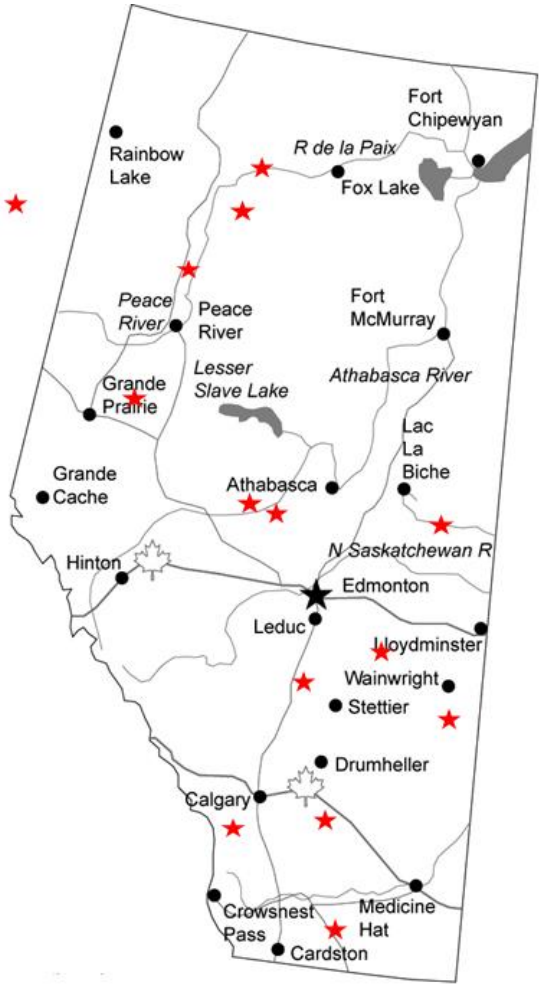
Background:

It is well known that the inclusion of legume crops improves the protein content and digestibility of your forage stand resulting in improved overall quality of livestock feed whether utilized as hay, silage or pasture. However, livestock producers often shy away from high legume pastures due to the risk of bloat in ruminant. To help minimize this risk, there are multiple alternative legume varieties that are considered to be bloat-safe, one of which is sainfoin.

Sainfoin contains condensed tannins which are a compound in the plant that attaches themselves to the bloat-inducing proteins in alfalfa, thus helping to eliminate the potential for bloat. The new sinafoin variety, AC Mountainview, that has been developed at the Lethbridge Research centre is proving to be competitive in forage stands and has higher regrowth than previous varieties, allowing it to regrow at the same rate as alfalfa. Livestock producers could now use AC Mountainview as a natural bloat control and graze higher legume pastures confidently.

To test the new AC Mountainview Sainfoin variety in an applied research setting, 9 of the Agricultural Research and Extension Council's member associations teamed up with Alberta Agriculture and Forestry. Fourteen demonstrations sites were established with a 60% AC Mountainview/Alfalfa and 40% grass mixture across the province and one site in the BC Peace (figure 1).

The goal of this project is to provide farmers with the knowledge necessary to establish a high legume pasture (60+ legumes) and then graze that pasture effectively the year after establishment. High legume pastures have a greater capacity to withstand drought conditions and can be extremely productive, meaning producers could keep livestock on pasture for longer while maintaining good gains.



- Foothills Forage and Grazing Association: Longview
- Foothills Forage and Grazing Association: Gleichen
- MacKenzie Applied Research Association: Fort Vermillion
- Mackenzie Applied Research Association: Buffalo Head Prairie
- Gateway Research Organization: Tiger Lily
- West-Central Forage Association: Camp Creek
- Grey-Wooded Forage Association: Lacombe
- Lakeland Agricultural Research Association: Iron River
- Chinook Applied Research Association: Consort
- Peace Country Beef and Forage Association: Bezanson
- Battle River Research Group: Holden
- North Peace Applied Research Association: Manning
- PFRA of BC: Poucecoupe, BC
- Farming Smarter: Lethbridge

Figure 1. High Legume Pasture Project and Demonstration Site Locations, 2016.

Method:

The trial was seeded on June 8, 2016 to an area of 9.3 acre near Iron River, Alberta (NW34-63-7-W4). Prior to seeding the site was sprayed with Glyphosate on June 1, 2016 at a rate of 0.7 L per acre for control of perennial and annual weeds. Weeds identified at the time of spraying included Foxtail barley, Flixweed, Storks Bill and Canada Thistle. The seedbed was prepared firm with zero-tillage for optimal seed to soil contact.

Seeding was done with an Air Disk Drill with Barton Openers to a depth of 0.5 to 0.75 inches and 15-20-15-10 fertilizer was applied in the seed row at seeding. Due to the ability of legumes to fix nitrogen,

application of high amounts of nitrogen fertilizers can impede legume establishment and overall stand production. AC Mountainview sainfoin and AC Grazeland alfalfa were seeded first and hybrid bromegrass (6 lbs/acre) was seeded after at a 90-degree angle to the legumes.

Dry conditions experienced at the site (20 mm of rain in June) caused germination and establishment to be slow. On June 25, 2015, the field was sprayed with Matador for control of grasshoppers. A cover crop of Cerise Red Proso Millet was seeded on June 27, 2016 at 15 lbs/acre with the Air Disk Drill. No additional fertilizer was applied at seeding.

To determine germination and stand establishment, plant counts were conducted on August 30, 2016 to an area of ¼ m squared at 10 locations throughout the field.

Results:

The results of germination and establishment counts are summarized in table 1. Unfortunately, due to dry conditions experienced throughout the growing season, establishment was slow and patchy, with the final counts indicating a poor plant stand. Touch-up seeding will be conducted in the early spring after snow melt to fill in the stand.

In many perennial forage stands, complete germination does not occur in the year of establishment, but many producers find that growth continues into year two as more seeds germinate.

Table 1. Higher Legume Pasture Plant Counts Iron River, 2016.

Toss	Sainfoin (plants per 1/4 m2)	Alfalfa (plants per 1/4 m2)	Grass (plants per 1/4 m2)
1	0	4	1
2	1	3	0
3	1	0	0
4	3	0	0
5	1	0	0
6	2	0	0
7	0	0	0
8	1	1	1
9	2	2	1
10	1	2	0
Average	1.2	1.2	0.3

Higher Legume Pasture Project – August 4, 2016.

Higher Legume Pasture Project after swathing – August 30, 2016

Demonstrations:

Cocktail Cover Crops for Livestock Feed

Partners: Union Forage
MD of Bonnyville

Objectives:

1. To assess growth and establishment of various cocktail cover crop mixtures.
2. To assess yield and quality of various cocktail cover crop mixtures.

Background:

Cocktail cover crops have been gaining in popularity in recent years, with the acres seeded in Alberta slowly increasing. These crops can be an important tool for producers to generate benefits on farm such as improved soil health, weed suppression, insect management and forage production for livestock feed.

Producers have many different options to choose from when it comes to cocktail cover crop species and each species has different abilities to provide depending on root and plant structure and physiology. Each operation is different and, depending on the desired results of the mixture, cocktail cover crops can be from 5 or 7 to over 15 different species or varieties.

Due to the high nutritional content of many species that are included in cocktail cover crop mixtures, such as brassicas and legumes, it is recommended to seed such species with a cereal crop such as oats or barley to balance out the ration. Recommendations are that brassica species should not comprise more than 50% of the cattle's feed intake.

Cocktail cover crops can be seeded at various times of the year depending on the required end use. Many brassica species will hold quality late into the fall and early winter, making them an ideal method to extend the grazing season. In these cases, later spring seeding is recommended.

Demonstration:

The demonstration was seeded as three blocks, side-by-side at the LARA Fort Kent Research Site (NE25-61-5-W4) in early June. Prior to seeding, soil tests were conducted and a blend fertilizer was side-banded at the time of seeding.

The species composition of each cocktail mixture is illustrated in table 1. Due to the high quality of many of the species included in the mixtures, it is recommended to seed with a cereal crop at least 50% of recommended rate Therefore, each mixture was seeded with CDC SO-1 oats. Seeding was done with a ConservaPak air drill with 12" row spacing and the demonstrations were seeded to a depth of 0.5 – 1".

Prior to harvesting of the demonstration, forage yield samples were taken, weighed and dried to determine dry matter (DM) yield. An additional sample was collected, frozen and sent to A & L Canada Laboratories for wet chemistry analysis.

Table 1. Cover crop cocktail mixtures species composition, 2016.

Cocktail Mixture 1 Union Forage Relay Mixture	Cocktail Mixture 2 Union Forage Ultimate Blend	Cocktail Mixture 3 Union Forage All Brassica Blend
60% Italian Rye Grass	30% Hairy Vetch	25% Winfred
20% Hairy Vetch	25% Italian Rye Grass	25% Goliath
10% Hunter	15% Sorghum	25% Hunter
10% Winfred	10% Crimson Clover	25% Graza
	10% Winfred	
	5% Hunter	
	5% Graza	

Results and Discussion:

The DM yield data results are summarized in table 2. The Union Forage Relay Mixture was the highest yielding treatment in the demonstration at 3.30 ton/acre. The All Brassica Blend was the lowest yielding, likely as a result of the increased moisture content due to the high percental of brassica species in the mixture (75% moisture at the time of sampling). The Relay Mixture and Ultimate Blend were at 69% and 73% moisture at the time of sampling.

Table 2. Cover crop cocktail mixtures yield data, 2016.

Cocktail Mixture	DM Yield (ton/acre
Union Forage Relay	3.30
Union Forage Ultimate	2.64
Union Forage Brassica	2.03

When considering quality, all three blends are adequate to meet the nutritional requirements of beef cows in late gestation and during lactation. The rules of thumb for gestating beef cows is 7% in mid-pregnancy, 9% in late pregnancy and 11% after calving (table 3).

Table 3. Cover crop cocktail mixture quality data, 2016.

Demo	CP	ADF	NDF	TDN	Ca	P	K	Mg
Union Forage Relay	12.97	29.19	46.47	66.16	0.49	0.22	2.12	0.33
Union Forage Ultimate	11.72	34.09	53.28	62.34	0.41	0.21	2.15	0.31
Union Forage Brassica	10.89	32.71	50.16	63.42	0.54	0.22	3.12	0.28

Total digestible nutrients (TDN) represent the digestible portion of the feed and is the easiest way to estimate energy content. Energy is the most important nutrient but is also commonly the most underfed in livestock rations in Alberta. If energy content is limiting, animals will no put any into growth and reproduction but will be utilizing all energy for maintenance (body functions, movement). The general rule of thumb is 55% in mid-pregnancy, 60% in late pregnancy and 65% after calving. The Relay Mixture is adequate to meeting the TDN requirements of gestating and lactating cattle. However, the other two blends have an estimated energy content to meet the requirements for gestating cows, but an energy supplement will need to be supplied after calving.

Neutral Detergent Fibre (NDF) and Acid Detergent Fibre (ADF) are a measure of the fibre content of the feed. It is recommended that NDF does not exceed 59% as increased values may restrict feed intake. The ADF levels in the mixtures are also within acceptable levels of 28-38 % for leguminous feeds.

Union Forage Relay Mixture (August 19, 2016)

Union Forage Ultimate Blend (August 19, 2016)

Union Forage All Brassica Blend (September 13, 2016)

Thank you to Union Forage for providing the seed for this demonstration.

Forage Crop Quality Summary – 2016

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.

This year was an interesting and frustrating year for making good quality feed for overwinter your cattle. The wet weather extended the haying season and caused the majority of hay available to have at least one rain shower.

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 and results from those tests are also included this summary in table 3. Feed analysis from the LARA plots represent crop cut for forage use.

Available to all producers is a forage sample that can be borrowed out 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

Table 3. Quality Analysis Summary, 2016.

Annual Forages	CP (%)	ADF (%)	NDF (%)	TDN (%)	Ca (%)	P (%)	K (%)	Mg (%)
Barley - Fort Kent	10.48	26.79	48.78	68.03	0.28	0.2	1.53	0.19
Barley - St. Paul	6.22	33.37	54.26	62.9	0.3	0.16	1.58	0.13
Oats - Fort Kent	9.71	30.12	51.28	65.43	0.16	0.24	1.59	0.25
Oats - Glendon	8.32	29.63	49.36	65.82	0.24	0.17	2.14	0.16
Oats - Ardmore	10.37	29.43	49.44	65.97	0.2	0.3	1.31	0.18
Triticale - Fort Kent	8.45	31.57	52.7	64.31	0.12	0.21	1.05	0.13
Triticale - St. Paul	7.08	34.05	54.62	62.37	0.11	0.2	1.06	0.08
Pea/Cereal - St. Paul	7.17	32.81	53.31	63.34	0.29	0.18	1.05	0.23
Corn - St. Lina	8.81	31.56	57.07	63.03	0.37	0.26	1.32	0.19
Corn - St. Lina	7.72	29.77	54.71	66.78	0.29	0.19	1.11	0.18
Winter Wheat - Fort Kent	9.72	31.65	52.04	64.25	0.26	0.19	1.55	0.21
Cocktail Cover Crop – Fort Kent	12.97	29.19	46.47	66.16	0.49	0.22	2.12	0.33
Perennial Forages								
Sainfoin - Fort Kent	15.69	43.53	49.87	55	1.07	0.18	2.04	0.23
Alfalfa - Fort Kent	15.39			57.3	1.23	0.29	1.58	0.28
Alfalfa Hay – Cold Lake	14.77	38.05	53.40	57.14	1.22	0.27	1.72	0.22
Mixed Hay - Iron River	10.90	49.01	65.59	50.13	0.89	0.18	1.84	0.18
Mixed Hay – Iron River	13.19	45.11	58.86	55.95	1.06	0.21	1.95	0.21
Mixed Hay - La Corey	7.18	38.83	54.87	61.21	0.35	0.25	1.76	0.14
Mixed Hay - La Corey	8.03	33.54	47.95	70.16	0.30	0.23	1.51	0.13
Mixed Hay – Cold Lake	12.19	39.25	56.79	55.25	1.16	0.24	1.83	0.22
Grass Hay – Cold Lake	11.18	37.40	54.90	61.59	1.12	0.24	1.83	0.23
Grass Hay – Cold Lake	11.27	38.17	56.97	56.68	1.08	0.21	1.64	0.20
Grass Hay - Pierceland	9.46	41.04	55.05	61.79	0.91	0.26	1.29	0.22

Alberta Ranchers Winter Grazing Cattle Video Series

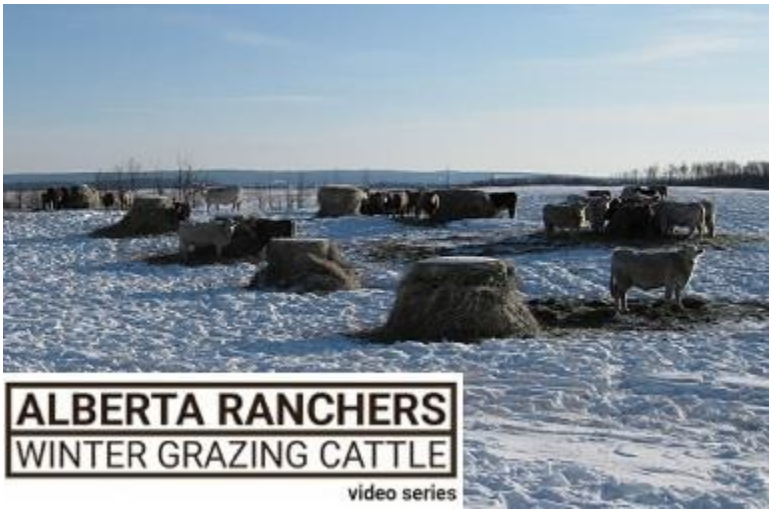
Partners: Alberta Agriculture and Forestry
Alberta Beef Producers
West-Central Forage Association
Chinook Applied Research Association
Townend Films

Objectives:

1. To illustrate a variety of extended grazing systems that are currently being used by Alberta farmers and ranchers.
2. To provide producers with strategies to help manage risks associated with utilizing various extended grazing systems.
3. To provide first-hand and personal experiences from producers who are utilizing various extended grazing strategies.

Background:

The winter feeding season accounts for 40% to 60% of the total production costs for livestock producers in Alberta. Consequently, it makes sense to experiment with different feeding strategies that could help to reduce costs – one of these being extending the grazing season. These systems have been shown to reduce costs/cow/day by decreasing equipment usage, reducing feed handling and reducing manure hauling costs as the nutrient left behind are deposited directly on the field at the feeding site.



Extensive systems include stockpiled forages, swath grazing, bale grazing and corn grazing among others. Producers across Alberta have been utilizing such systems for years and have been doing so successfully. There is no one-fit systems for all operations and each farm needs to be assessed individually to determine which systems will be best suited to your operation.

In partnership with Alberta Agriculture and Forestry, Chinook Applied Research Association and West-Central Forage Association, this series of 47 videos share the personal perspectives and practices of ranchers across Alberta and how they have implemented management practices to reduce risk in winter grazing systems. Many thanks to Scott Townend of Townend Films for his skills and hard work putting it all together. Funding for the project was provided through the Growing Forward 2 Program.

The series is compiled into seven different topic areas to make navigation easier:

- Fencing

- Feed Quality
- Weather
- Water Accessibility
- Management
- Managing Animal Type
- Wildlife

The series is available on the Alberta Agriculture YouTube page or can be accessed through our website under the Trials and Projects tab at www.laraonline.ca/1742.

Environment and Extension

2016 Lakeland Agricultural Research Association Extension Activities

Holistic Management
On January 11, 12 and 13, 2016 LARA hosted three sessions of an introduction to Holistic Management for area producers. The sessions were held in Craigend, Smoky Lake and Flat Lake and were attended by 35 producers.

Managing Inputs and Best Practices for Long Term Soil Health
On January 22nd LARA, in partnership with Smoky Lake CPS hosted a "let's talk" breakfast. The morning featured Dr. Yamily Zavala and Ryan Adams to inform 27 producers on understanding soil properties and optimizing inputs.

High Quality Forages for Growing and Finishing Cattle
On January 29th LARA hosted Dr. Anibal Pordomingo from Argentina and Clayton Robins to discuss forages with 25 producers in Smoky Lake.

Clubroot Information Session
On February 1, 2016 a Clubroot Information Session was held in Flat Lake with partnership of the Municipal District of Bonnyville, County of St. Paul, LARA, Alberta Agriculture and Forestry and the Canola Council of Canada. Over 100 producers attended the information session.

Moose Lake Watershed Society Annual Meeting
On February 3, 2016 twenty four people attended the Moose Lake Watershed Society Annual Meeting to discuss water concerns, current conditions and what the Society had accomplished. A special presentation by Cows and Fish was given to over view the Riparian Health Inventory revisit.

Farmer Appreciation Night
On February 5, 2016 LARA hosted a Farmer Appreciation Night for area producers. The event was held at the Glendon RCMP hall with supper followed by entertainment by Ben Crane. Over 320 producers attended the evening.

Tactical Farming Conference
The Tactical Farming Conference was held on February 10th and 11th, 2016 in Red Deer, Alberta. David Simbo presented on the impact of environmental stressors on agricultural crop production in Alberta. The talk abstract can be found in the Appendices of this annual report.

Generating Electricity From The Sun
On February 10th Rob Harlan from the Solar Energy Society of Alberta presented on grid-tie solar options for farmers and off-grid systems. Sixty-three producers attended to learn about Alberta's solar resource and on-farm applications for solar power.

4-H Speaking Competition
On February 16, 2016 Kellie Nichiporik served as a judge for the 4-H Speaking Competition in La Corey for the local club.

Working Well Workshop
On February 17th a working well workshop was held at the Bonnyville Agriculture Society. Twenty-five people came to learn about their wells, and to increase their understanding of groundwater and driller's reports, common water well problems, rural water treatments, and proper well maintenance. Attendees also learned how to shock chlorinate their wells.

Grazing for Profit and Sustainability
On February 23rd seventeen producers attended the workshop in Craigend to discuss Sainfoin and pasture rejuvenation. Steve Kenyon also presented from Greener Pastures Ranching on grazing 365 days a year.

LARA Research Report and AGM
The Annual Research Update and AGM was held on February 25, 2016 in Smoky Lake. LARA staff presented information on the 2015 research and extension programs such as the variety trials, fertility trials, forage peas, and forage variety trials. Kevin Elmy from Friendly Acres Seed Farms presented on multi-species cover crops. There were 27 producers in attendance.

Getting into Cover Crops Information Session
On February 26th Kevin Elmy from Friendly Acres Seed Farms presented on how cover crops can diversify crop rotation and how to choose the best crops for your operation. There were 21 producers in attendance.

Improving Soil Health Workshop
On March 1st LARA hosted an improving soil health workshop. Presenters included: Dr. Yamily Zavala and Graeme Finn. Thirty-three producers attended to learn more about how to improve the biological, chemical and physical composition of soil, how cover crops can improve the biological properties and biodiversity, how to reduce inputs without reducing yield and how to introduce pulses to your crop rotation.

4-H Regional Public Speaking Competition
On March 5th, 2016, Alyssa Krone served as a judge for the Senior members at the 4-H Northeast Regional Public Speaking Competition held at Notre Dame Elementary School in Bonnyville, Alberta.

Know Your Runoff
On March 21st LARA, in partnership with the Beaver River Watershed Alliance, Municipal District of Bonnyville, CPS, Lakeland CO-OP and Caouette and Sons hosted the Know Your Runoff Workshop. This workshop covered land management and the use of fertilizers and pesticides as well as management of riparian areas, shoreline management and buffer zones. Speakers included Kellie Nichiporik, Shaffeek Ali, John Lunty and Darlene Moisey. There were 43 people in attendance.

Crop Production Spring Tune-Up
On March 31, 2016 LARA in partnership with CPS Smoky Lake hosted a Crop Productions Spring Tune-Up. Speakers included: Neil Blue on production economics and market outlook; Harry Brook on the forecast for pests in 2016; Dean Pawlick on maximizing pulse production; Amanda Corfield on emerging technology for improved records management; Ryan Adams on plant nutrition management; and Brett Elko with a summary on herbicide resistance management. Thirteen producers attended.

Working Well Workshop

On April 20th a working well workshop was held at the St. Paul County office. Twenty-two people came to learn about their wells, and to increase their understanding of groundwater and driller's reports, common water well problems, rural water treatments, and proper well maintenance. Attendees also learned how to shock chlorinate their wells.

Classroom Agriculture Program (CAPs)

Kellie Nichiporik presented the Classroom Agriculture Program in schools in April and May. Information on crops, livestock and sustainability was covered with eleven classes of grade four students at schools across the area to over 250 students.

Efficient Spraying Workshop

On April 7, 2016 LARA hosted an efficient spraying workshop. Topics included: weed and herbicide characteristics; integrated pest management; application equipment and sprayer calibration. Producers had the opportunity to earn pesticide applicator credits for certification. Sixteen producers attended this event.

Grade Seven Wetland Education

Seventy grade seven students from Cold Lake Middle School and five students from Pakan School had a hands-on nature experience at Cold Lake Provincial Park and Pelican Point on June 2, 6, 9 and 14th where they learned about the value of wetlands, riparian areas, ecosystems, abiotic and biotic factors, symbiotic relationships, and food webs.

Walking With Moose

The Moose Lake Watershed Society held several day sessions of Walking with Moose. Walking with Moose allows grade five students to be further educated about the ecosystem of Moose Lake, supplementing their curriculum, learning about biodiversity, healthy shorelines and forest ecology. The students spend half a day at Pelican Point where they collect animals and organisms and place them in containers where they are identified and then returned to their habitat. The students also learn about water quality, wetlands and larger animals that live along the shore such as birds and fish. The students get lunch and then are taken to the Moose Lake Provincial Park. There they are guided by LARA staff, BRWA staff, Municipal District of Bonnyville staff and volunteers and hike though the dry pine forest, learning about wildlife signs and tracks, vegetation such as lichens and dwarf mistletoe, and the forest ecosystem including potential threats such as the pine beetle and fire. This was the ninth year of Walking with Moose with over 300 children going through the program.

Lac La Biche Environmental Week

On June 5th LARA ran a booth at the Lac La Biche County Environmental Week kick-off in Alexander Hamilton Park and ran activities for families in attendance.

Know Your Runoff and Residues

Twenty Seven people attended the Know Your Runoff and Residues workshop in Lac La Biche. Kellie Nichiporik and Shaffeek Ali presented on shoreline development, management and vegetation with regards to riparian areas and riparian area management as well as pesticide use, application and residuals.

Feeder Association of Alberta Regional Meeting

On June 23rd, 2016, Alyssa Krone presented at the Feeder Association of Alberta Regional Meeting held at Eastbourne Hall. The presentation highlighted current and past forage projects conducted at LARA. The event hosted over 40 local producers.

LARA 25th Anniversary Tour and BBQ

On July 6th LARA staff were joined by over 65 people to celebrate LARA's 25th Anniversary. The day featured a tour of the regional variety trials, regional silage trials, corn seeding demonstration, cover crop, cereal fertility trial, perennial forage trial and soil improvement trial followed by a BBQ at the Fort Kent office.

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 agriculture, water quality, riparian areas and biodiversity at sessions in Plamondon, Hylo and Lac La Biche.

Pelican Narrows AGM

On July 9th Kellie Nichiporik presented at the Pelican Narrows AGM regarding invasive species, shoreline development and riparian areas and management. There were over 35 people in attendance.

10th International Rangeland Congress

The 10th International Rangeland Congress was held at the Teachers Credit Union in Saskatoon, Saskatchewan on July 16-22, 2016. The event brought together researchers, academia, farmers and ranchers from across the globe. Alyssa Krone presented during the conference on the work done by Alberta's Forage and Research Associations. The paper published in the conference proceedings can be found in the appendices of this annual report.

LARA Summer Field Days

The St. Paul tour was July 28th and featured our pulse and cereal trial sites. Thirteen producers were in attendance.

The Smoky Lake Summer Field Day was on August 2nd near Waskatenau. In addition to the crop tour there were presentations covering introduction of pulses in rotation, and weed identification and management. Seven producers attended.

Camp Sunshine
On July 20th LARA staff assisted at Camp Sunshine, a grief camp for children aged 6-12. LARA staff led the children with building their lunch followed by planting tree seedlings in remembrance of the person(s) that they had lost.

Boys and Girls Club
On August 2nd and 24th LARA and the Beaver River Watershed Alliance led the Boys and Girls Club of Bonnyville in a riparian adventure to learn about wetlands and the creatures that reside within them.

High Legume Pasture Project
On August 17, 2016 twenty one producers toured the LARA Sainfoin/Alfalfa research plots that were established in 2013 at the Fort Kent site. They then headed out and toured Gordon Graves trial of 9 acres that have been seeded to a Sainfoin/Alfalfa and grass mixture. The day was followed with lunch and producer presentations on their experiences of grazing high legume pastures.

Pasture Management and Brush Control Tour
On August 24th twenty-four people toured the Burdeck Farms brush control demonstration with chemical control, and the Olympic Lake brushing demonstration with Greenedge Precision Fence Inc.

Shoreline Cleanup
On September 22nd at Sandy Beach on Cold Lake over 150 grade 7s and 8s from the Cold Lake Middle School spent their morning removing litter and debris from the shoreline, truly making an improvement in the health of our aquatic ecosystems. Over 150 kilograms of garbage was removed in Sandy Beach. The shoreline cleanup is an annual event and volunteers are always appreciated.

Alberta Beef Producers Zone 8 Meetings
On November 1st Kellie Nichiporik chaired the Zone 8 meeting in Sandy Rapids and also presented on social license and environmental considerations on farming operations. On November 2nd the presentation was repeated for producers in Vilna.

Northeast Regional ASB Conference
The Northeast Regional ASB Conference was hosted by Lac La Biche County on November 1st, 2016 at the Plamondon Festival Centre. Alyssa Krone presented at the event on LARA's current projects and extension activities.

Cow-Calfenomics
On November 8th at the Vermillion Regional Centre 85 people attended the Managing Uncertainty in Alberta's Cow-Calf sector. The topics included: market outlook and marketing options; transition planning; risk management perspectives; cost of productions; and 7 drivers to financial success.

Nicole Masters Advanced Soil School
Over 80 college students attended the one day condensed soil school with Nicole Masters from Integrity Soils on November 21 at Lakeland College. On November 22 and 23rd forty people attended Nicole's two day advanced soil school at the Vermillion Regional Centre. Topics covered included: enhancing the

carbon, nitrogen and water cycles; cover crops and diversity; sources of carbon and good compost; soil mineral and role of major nutrients; and mineral and microbial synergy. Many thanks to our sponsors: The Municipal District of Bonnyville; Government of Alberta; Battle River Research Group; Lakeland Agricultural Research Association; County of Vermillion River; County of Minburn; and Municipal District of Wainwright. More information on Nicole or Integrity Soils can be found at: www.integritysoils.co.nz

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.

Canada Thistle Stem Mining Weevils

In 2012, as part of a provincial protocol, LARA released 1260 Canada thistle stem mining weevils (*Hadropontus litura*) to determine if the weevils can establish native populations for Canada thistle suppression. This species is host specific to Canada thistle, and as adults feed on the leaves, lay their eggs in the stem and the hatched larvae mine down the stem to the roots feeding on plant tissue. This summer Kellie went back to the release sites to monitor for damages to the plants as well as to check for surviving weevils. Sites will continue to be monitored in 2017. If you are interested in this project please contact the LARA office.

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.

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.

This year 6 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.

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.

Growing Forward 2

Growing Forward is an initiative from Agriculture and Agri-Food Canada and Alberta Agriculture to create an industry that is profitable and competitive, being able to retain and access new domestic and international markets and manage risks more effectively, and promote the environment and health of Canadians. Growing Forward 2, which came into effect April 2, 2013 and will run for five years, focuses on three priorities: innovation and research; competitiveness and market development; and adaptability and industry capacity.

For a current list of available programs go to:
http://www.growingforward.alberta.ca/Programs/index.htm

On Farm Stewardship funds Best Management Practices such as: riparian area fencing and management; year round/summer watering systems; wetland restoration; improved manure storage facilities; livestock facility runoff control; livestock facility and permanent wintering site relocation. All the stewardship plans require the producers to have a completed Environmental Farm Plan. The stewardship program is a cost share of 30-70% to a funding maximum of $50,000.

The On Farm Water Management Program requires the completion of a long term water management plan. This program funds projects such as: well construction and rehabilitation; dugouts; dams; spring developments; unshared water pipelines; farm site developments; alternative watering systems for livestock; water tanks/cisterns; water treatment equipment for livestock and several other projects. Special incentive projects include water meters, well level monitors, well pit conversion and well decommissioning by a certified contractor. Approval for the project must be granted before any work is completed. This program is offered at a cost share of 1/3 to a funding maximum of $5,000.

The Food Safety Systems funds items such as cattle squeezes, scales, milk guards, and computer software for tracking animal health. To be eligible producers must be registered with their commodity specific on-farm food safety program.

For more information about Growing Forward 2 go to http://www.growingforward.alberta.ca/index.htm or call the LARA office 780-826-7260.

Moose Lake Watershed Society

The Moose Lake Watershed Society (MLWS) is a sister group to the Beaver River Watershed Alliance. 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.

In 2016 the Moose Lake Watershed Society in partnership with Cow and Fish released the Riparian Health Inventory site revisit report. This report outlined the overall positive changes that have occurred in the watershed's main tributary into the Moose Lake. The original Riparian Health Inventory was conducted in 2008. The report was presented at the MLWS's Annual Meeting on February 3, 2016.

Thanks to Alberta Parks and the BRWA for the partnership and support of the development of Moose Lake tributary signs which were installed in several locations in 2016.

The MLWS continued working with the schools to deliver Walking With Moose to grade 5 students in the area. Walking with Moose allows grade five students to be further educated about the ecosystem of Moose Lake, supplementing their curriculum, learning about biodiversity, healthy shorelines and forest ecology. The students spend half a day at Pelican Point (or full day in Cold Lake Provincial Park) where they collect animals and organisms and place them in containers where they are identified and then returned to their habitat. The students also learn about water quality, wetlands and larger animals that live along the shore such as birds and fish. The students get lunch and then are taken to the Moose Lake Provincial Park. There they are guided by Alberta Parks staff, LARA staff, BRWA staff and volunteers and hike though the dry pine forest, learning about wildlife signs and tracks, vegetation such as lichens and dwarf mistletoe, and the forest ecosystem including potential threats such as the pine beetle and fire. This was the ninth year of Walking with Moose with over 300 children going through the program.

This year with funding from the Summer Village of Pelican Narrows and Bonnyville Beach, MLWS teamed up with Alberta Lake Management Society to test individual bays for the LakeWatch Sampling.

Beaver River Watershed Alliance

The Beaver River Watershed Alliance (BRWA) is the designated Watershed Planning and Advisory Council (WPAC) for the Beaver River Basin under Alberta's Water for Life Strategy, and an independent standing committee of the Lakeland Industry and Community Association (LICA). The roles of the BRWA are to assess and report on the state of the watershed, educate and inform the community about watershed stewardship, and to lead the creation and implementation of a watershed management plan. We are a multi-stakeholder partnership organization bringing together organizations and individuals in the region to work towards a healthier watershed. The BRWA has maintained close ties with LARA for several years, and is proud to have partnered with them on many different occasions.

The BRWA has resumed development of the Integrated Watershed Management Plan (IWMP) with a renewed focus on stakeholder engagement to determine the top regional water priorities. The first draft of the document has assembled all of the background information and has identified a few goals for the plan (see below). In the coming months, we will be holding a municipal forum, and will be engaging with First Nations communities and local watershed stewardship groups. Once we have determined additional recommendations we will re-assemble the Technical Advisory Team to review the plan and its recommendations.

Component	**Draft Goal**
Water Quantity	Secure, reliable water supplies
Water Quality	Maintained in the natural range of variation
Biodiversity	Self-sustaining populations of fish, wildlife and vegetation
Riparian Areas and Wetlands	Contribute to water quality and critical habitat
Land Management	Minimizing the impact of development on water resources
Climate Change	Recognized and considered in decision making and planning
Knowledge and Understanding	Balance of local and traditional knowledge, social science and scientific research.

The BRWA is committed to educating and informing residents of the Beaver River watershed on watershed stewardship, through education and outreach events and programs spread across the watershed, from Fork Lake in the west to Cold Lake in the east. Highlights this year include participation in approximately 100 programs and events. At these events the BRWA spoke and interacted with nearly 3,300 people about the watershed, including topics such as water quality, animal adaptations and local ecosystems. These events included classroom programming, library programs, summer camps, youth groups, workshops and community events.

Our new X -Stream Science program saw a very successful first year! Throughout May and September 2016, the BRWA delivered 7 X-Stream Science programs to 3 local high schools and over 200 students. Students from these schools had the opportunity to sample the water quality of the Beaver River and Marie Creek on half-day Field Studies. The students used scientific protocols to collect aquatic benthic macroinvertebrates (water bugs) and conduct water quality tests to answer the question "What is the health of my local river?" Specific parameters that were tested include surrounding land use, riparian area vegetation, aquatic benthic macroinvertebrates and water quality data, such as temperature,

dissolved oxygen, pH, conductivity and turbidity. We would like to thank LARA for all their help in making this program a success!

To learn more about the BRWA, you can contact them via phone (587-201-5517) or visit their website at www.beaverriverwatershed.ca.

Top Right: Notre Dame High School students participating in X-Stream Science

Right: Notre Dame High School students at the Jessie Lake Shoreline Cleanup.

Above: Bonnyville Centralized High School Students participating in X-Stream Science

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, 2014, 2015, and 2016 to monitor for plant damage and presence of weevils. Adults were found this past year and notable damage to the plants was observed. Sites will continue to be monitored in 2017.

Conferences and Workshops

This year Kellie took part in classes on Applied Soil Chemistry from the University of Alberta, and Introduction to Health and Safety. She also attended several training opportunities to improve delivery of the Environmental Farm Plan to producers. Kellie attended the Watershed Planning and Advisory Council Forum in January and the WPAC Summit in Calgary in October to learn about provincial mandates, funding and WPAC successes.

Picture above: Moose Lake

Picture Right: Kellie Nichiporik, Alyssa Krone and MLA Scott Cry at the LARA 25th Anniversary Celebration

Horticulture Program

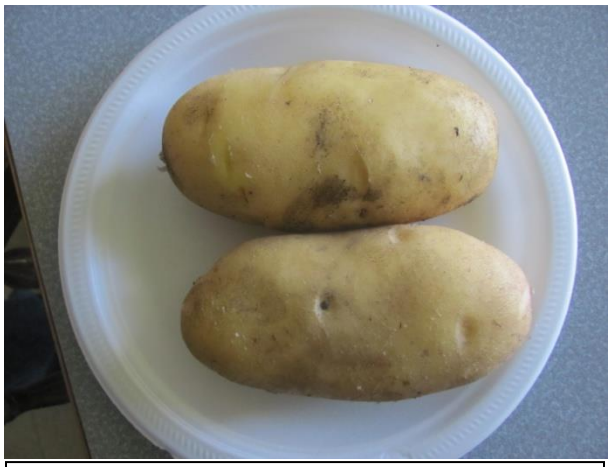
In 2016 the LARA garden included potatoes, corn, beans, tomatoes and garlic. We also included a small number of herbs and ornamentals.

Garlic Two varieties – Italian Hardneck and Music were planted in mid-October, 2015. (Only one of the 46 cloves planted failed to grow.) Both grew and produced extremely well – and were ready to harvest in late July. Many gardeners "toss out" the garlic scapes (see photo) – these were harvested and became an excellent addition to stir-frys or other dishes. (Seed was purchased from West Coast Seeds.)

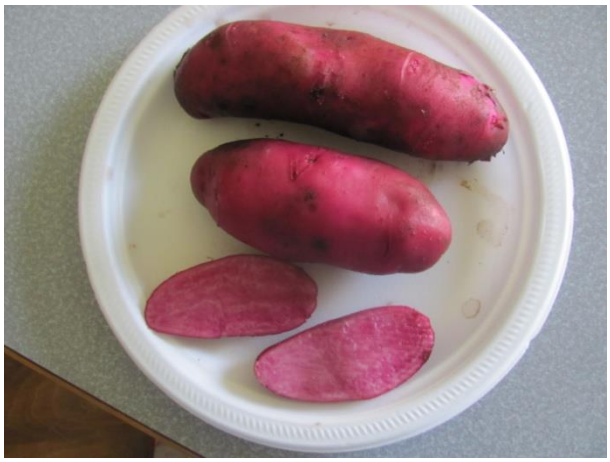
Garlic Scapes

A portion of our harvest

Potatoes Five varieties (Rode Ferstelling, Sieglinde, Nicola, Ruby Gold and Amarosa) were planted. All grew extremely well – no disease or insect damage was present. Seed stock was obtained from Eagle Creek farms, Alberta. Amarosa is a red-fleshed fingerling potato that retains its color after cooking – certainly adding color interest to potato salad, potato chips, etc. Yields are reported in the table on the next page.



Nicola



Amarosa

Variety	July 26 (1 plant) – grams	Sept 22 (10 plants) kg
Sieglinde	721 gm	40.8 kg
Ruby Gold	782 gm	32.4 kg
Nicola	895 gm	33.2 kg
Rode Fersteling	888 gm	26.8 kg
Amarosa		17.3 kg

Corn It seemed to be a "banner year" for corn - all varieties planted (Bodacious, Ambrosia, Extra Early Sweet, Pink Popcorn and Painted Mountain) grew and produced extremely well. Painted Mountain is usually grown as an ornamental and because of its "longer season," plants should be started indoors about one month before the last frost.

Painted Mountain

Ornamentals Every garden should include a selection of flowers –to add the beauty of color; attract pollinators and some are shown to repel certain harmful insects. Below are some of the more unusual flowers we grew in 2016.

Sturt's Desert Pea

Pheasant's Eye

Missouri Primrose

Home Garden Survey

Societal interest in home gardening for food production is increasing in the rural and urban centres in both the developing and developed world (Zypchyn 2012). These gardening activities for food production takes place in various settings; through community gardens, roof tops, balconies and home backyard gardens just to name a few. Due to the increasing interests in these gardening activities, LARA conducted a small survey to understand what crops they grew and why. A semi-structure questionnaire was developed and distributed mostly to people known to LARA staff as a test.

The results indicate that mostly annual fruits and vegetable are grown in home gardens surveyed. Beans (different types and varieties), onions, potato and peas were grown by 80% of those interviewed (Table 17). In terms of the reasons why people prefer growing their own vegetables rather than buying; cheaper, better and safer and free from pesticides were cited by all who participated in the survey. Eighty percent of participants in the survey mentioned doing gardening as some form of recreation, giving them reasons to be outside enjoying some sunlight in summer.

Table 17. List of crops respondents grew in summer, 2016.

Asparagus	Horse radish	Radish
Beans	Kale	Raspberries
Beets	Lettuce	Rhubarb
Cabbages	Onions	Spaghetti squash
Carrots	Parsnip	Straw Berries
Cauliflower	Parsley	Summer squash
Corn	Peas	Swiss chard
Cucumbers	Potato	Tomato
Fennel	Pumpkin	Turnips
Garlic	Radiant Grapes	Zucchini

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.

	Percent of DM Basis								
Feedstuff	**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 Bromegrass	Moderate	Moderate	Low-Moderate	Moderate-High	Moderate
Smooth Bromegrass	Moderate	Moderate	Low-Moderate	Moderate-High	Moderate-High
Reed Canarygrass	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 Fesue	High	Moderate	Moderate-High	Moderate	Moderate
Creeping Foxtail	High	Low	Low	Low-Moderate	High-Very High
Meadow Foxtail	Moderate		Low	Low	High
Orchardgrass	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 Wheatgrass		Moderate	Moderate	Very High	Very High
Intermediate Wheatgrass	Low	Moderate	Moderate	Moderate	Moderate
Northern Wheatgrass	Moderate	High	Moderate	Very High	Moderate
Slender Wheatgrass		High	Moderate-High	Moderate	High
Tall Wheatgrass		Very High	Very High	High	Moderate
Western Wheatgrass	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.

The Impact of Applied Research and Forage Associations Extension Network on the Viability of Alberta Farmers and Ranchers

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Key Words: agriculture, extension, grazing, forage, network

Introduction

Applied research and forage associations were established by Alberta producers to connect agricultural research with local production conditions. Since the late 1900s, Alberta's forage and applied research associations have been delivering information on the most current innovations in forages, grazing and livestock to farmers and ranchers across the province. The maintenance of healthy forages and grasslands have a positive impact on the environment, society and Canada as a whole. The information that has been attained through laboratory and field-scale research on forages and grasslands is extensive, but is that information reaching those who can implement new ideas or practices? Extension to farmers and ranchers is a key component in the viability of agricultural research that is often overlooked. Alberta is home to 12 applied research and forage associations that form a network of extension across the province. Through field tours, workshops, conferences and field schools, these associations bring new ideas and innovations in forages and grazing to the farmers and ranchers who will implement them on their operations.

Materials & Methods

Alberta's forage and applied research associations have a strong extension program at both the individual association level and province-wide. Each association's extension tools vary at the local level, including newsletters, field days, workshops, tours, websites, social media (Facebook and Twitter), conferences, as well as one-on-one interaction with local farmers and ranchers.

Results & Discussion

The results of this network of collaboration are extensive, including:

- Alberta Soil Health Initiative
    - When the United Nations proclaimed 2015 the International Year of Soils, nine regional research and forage associations formed the Alberta Soil Health Initiative. Throughout 2015, these associations hosted provincial, national and international experts on soil at both regional and province-wide events. These events included Peter Donovan of the Soil Carbon Coalition and Dr. Christine Jones, founder of Amazing Carbon.
    - Western Canada Conference on Soil Health culminated the year in Edmonton on December 9th, 10th and 11th 2015. Over 400 producers, industry and academia attended the conference and speakers included Dr. Yamily Zavala, Gabe Brown, Dr. Jill Clapperton, Dr. Allen Williams, Neil Dennis, Jay Fuhrer and Dr. Jeff Battigelli.
- Western Canadian Grazing Conference
    - Held every 2 years, this highly anticipated conference attracts over 200 farmers and ranchers from across Alberta to hear speakers such as Josh Dukart, Dylan Biggs, Jim Bauer and Judith Schwartz.

- Stockmanship Clinics with Curt Pate
    - Curt Pate's personal experience incorporating effective stockmanship principles supports a for-profit mindset and focuses on highlighting the increased economic benefit of handling stock correctly.
- Pasture Walks with Jim Gerrish
    - Jim Gerrish is dedicated to improving the health and productivity of grazing lands around the world through the use of management-intensive grazing practices.
- Perennial Forage Project
    - There has been a gap in perennial forage production knowledge in Alberta and this project, beginning in 2016, will provide farmers and ranchers with performance information on a number of grass and legume varieties by testing cultivars for regional adaptation.
    - A number of field days will focus on the trial across the province and producers will have access to data that is applicable to their local region.
- Improving knowledge and skills of staff
    - Continuing education of forage and applied research association staff is essential to ensure the most accurate and relevant information is provided to Alberta's farmers and ranchers.

Conclusion & Implications

The ability to extend current agricultural research results, new technology and new innovations to farmers and ranchers is an important step in the road to adoption. Alberta's forage and applied research associations provide a valuable extension network across the province and are an established source of unbiased agricultural information.

Presented at the 10th International Rangeland Congress held in Saskatoon, Saskatchewan on July 16-21, 2016. Published in the conference proceedings available at:
http://www.irc2016canada.ca/#sthash.CyGCeT2M.dpbs.

Impact of environmental stressors on agricultural production

By David Simbo

Abstract of Talk presented at Tactical Farming Conference February 10-11, 2016 at the Deer Foot Inn and Casino, Calgary

The world's population will reach 9 billion people by 2050 (FAO 2009a). The increase in population will result to an increase in demand for food. It is estimated that grain production will need to more than double to meet demand by 2050 (Assman 2013). Under the Declaration of the World Summit on Food Security, 70% more food will need to be produced (FAO 2009b). Although crop productivity continues to rise to meet demands overall, there is a decrease in the rate of yield improvements; among the three main crops that feed the world (maize, rice wheat), only in maize has the rate of yield increase been maintained over the past decade (Fischer and Edmeades 2010).

While agricultural productivity clearly needs to increase to meet a growing demand, climate induced stressor tend to reduce productivity. Current climate prediction models forecast a slow but steady increase in atmospheric temperature and an intensification in the frequency of heat and stress (Mittler et al. 2012; Li et al. 2013). The IPCC (2007) has suggested that high temperatures will be followed by extreme weather conditions such as frost and lengthy drought events that would negatively impact crop production worldwide. Drought, salt stress and low temperatures have been identified as the major agricultural challenges as these factors prevent field crops from maximizing their full yield potentials.

It has been estimated that global maize and wheat production from 1998 to 2002 fell short by 3.5% and 5.5%, respectively, due to the combined effects of temperature, drought and other stressors (Lobell et al. 2011). In 2015, several farmers in Alberta, Saskatchewan and Manitoba had to reseed their canola fields because of late frost damage. Several counties in Alberta declared an agricultural disaster due to drought in 2015. At the end of the harvest season in 2015, data from Alberta Crop Report, indicated that yields for barley, oats and dry pea were about 20% below the 5 year average while yields for spring and winter wheat were 12 and 37% below the 5 year average for Region Three (Smoky Lake, Vermillion, Camrose, Provost) (Alberta Agriculture 2015).

There is the need for the development of improved crop varieties that are tolerant to abiotic stresses and able to produce maximum yields in order to meet growing demand while at the same time countering the effects of abiotic stressors on yields (Cominelli et al. 2012).

Some on-farm practices have been shown to reduce run offs, evaporation and increase the water retention capacity on farmers' fields thereby mitigating the effects of drought. These include:

1. Growing drought and other stress tolerant varieties
2. Crop rotation increases water infiltration and rain water use efficiency (Gaudin et al 2016.
3. No tillage and high residues reduces soil water evaporation (Mitchel et al. 2012).
4. Cover crops have been shown in several studies to improve water infiltration and reduce evaporation (Unger and Vigil 1998).
5. Increasing crop diversification has been shown to improve soil water storage and crops access to moisture thereby minimizing the risk of crop failure from drought (Gaudin et al. 2016).

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HIGH LEGUME PASTURES

Creating profit above ground and wealth below. **2016/2017**

High Legume Pastures...

- increase calf and yearling weight gains or cow body condition scores.
- extend pasture productivity beyond the "summer slump" of tame grasses.
- fix nitrogen to reduce fertilizer costs and increase forage production and profit.
- provide root systems to different profiles in the soil, therefore increasing utilization of soil moisture and increasing carbon capture depths.
- are more drought averse.

AAC Mountainview Sainfoin...

- is a no-bloat legume containing tannins that can greatly reduce the risk of bloat from alfalfa when in a mixed stand.
- was developed by Dr. Surya Acharya, AAFC, Lethbridge.
- has a similar growth and regrowth pattern to alfalfa.
- competes with alfalfa, ensuring it stays in the pasture longer to provide bloat control.

Take away lesson from 2016 field days: **When establishing forages, seedbed preparation is key.** Ensure the seedbed is firm prior to seeding using harrow packers or equivalent.

"After close to thirty years working as a forage specialist, I don't think I have ever seen a seedbed too firm prior to seeding a perennial forage stand. But you do need some loose dirt to cover the seed." Lorne Klein, Saskatchewan Ministry of Agriculture

Sainfoin & Alfalfa Seedlings - Consort, AB

Goal was 60% legume establishment in the pasture.

Ultimate Pasture Mix consists of 30% AAC Mountainview Sainfoin and 70% Haygrazer Alfalfa.

Remaining 40% grass/legume was choice of the producer.

In cooperation with ten forage and applied research associations, thirteen producers across Alberta, through the Agricultural Research and Extension Council of Alberta (ARECA), and in consultation with high legume grazing mentors with financial and economic analysis, Alberta Agriculture and Forestry (AF) staff are coordinating a two year field trial to demonstrate the potential of sainfoin in a high-legume pasture mix on field scale level.

Alberta Government

2016 Summer Events

During the summer of 2016, ten events were co-hosted with project teams. In addition to hearing from cooperating producers and seeing the progress in the fields, grazers with many years of involvement in using higher legume pastures came to share their experiences and answer questions at each field day. These "Grazing Mentors" had provided multiple years of economic and financial data to the AgriProfit$ program for analysis and could speak to not only their experience, but also how it affected their financial bottom line .

Site Establishment Update (Sept 2016)

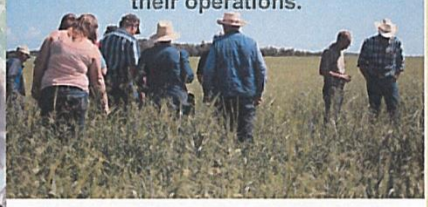
2 Rated 'Excellent'

2 Rated 'Okay'

5 Rated 'Fair'*

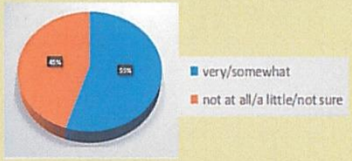
2 Rated 'Poor'*

33% of attendees gained confidence in establishing a high legume pasture in their operations.

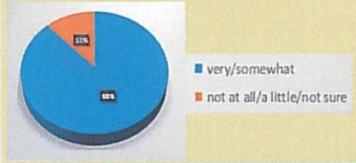


* forage stand touch-up happened in one stand in fall 2016. Other stands will be touched-up Spring 2017.

Field day participants were provided a questionnaire at the start of the day asking how confident they were about grazing high legume pastures. Below is a summary:



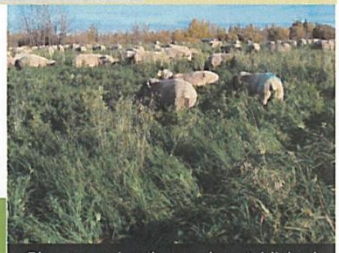
After the field day an evaluation was provided and participants were asked how confident they were about grazing high legume pastures. Below is the summary



Stand Establishment Forage Plant Count:
Excellent = **6+** forage plants/ft2
Okay = **3-5** forage plants/ft2
Fair = **2** forage plants/ft2
Poor is less than **1** forage plant/ft2

Province-wide Project

FFGA: Longview
FFGA: Gleichen
MARA: Fort Vermilion
MARA: Buffalo Head Prairie
GRO: Fort Assiniboine
WCFA: Barrhead
GWFA: Lacombe
LARA: Iron River
CARA: Consort
PCBFA: Fourth Creek
BRRG: Holden
NPARA: Manning
FS: Granum

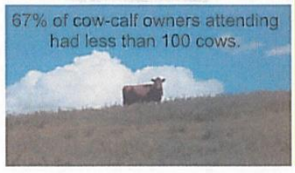


Sheep grazing the newly established site at Stein's (West Central Forage Association) November 2016. The stand establishment is rated as excellent. No sheep bloated.

Watch for more on establishment, and look forward to grazing stories in 2017!

50% attended the field days because they heard about it through their local forage/research association. We are working in the right circles to effectively extend this information.

Foothills Forage & Grazing Association Field Day August 24, 2016



80%

of attendees were very satisfied with the event and no one was dissatisfied.

2015-16 Year in Review

The Agriculture Opportunity Fund (AOF) provided $1.95 million in funding to 13 partner organizations to deliver agriculture extension and research programs. These partners have reported the estimated economic impact of this investment at $250 million. Some of the impacts and partner activities as reported are summarized below.

KNOWLEDGE EXTENSION AND INFORMATION SHARING

- **10,052** producers attended **224** extension events
- **1016** producers attended **seven** conferences
- **941** one-on-one consultations
- **64** newsletter issues published
- Agriculture production information extended to over **50, 910** producers farming over **42,042,122** acres
- One peer-reviewed scientific paper published and **four** more submitted
- **120,079** web hits on partner websites
- **36** AOF partner board members participated in board governance training
- **1077** producers attended **35** field schools
- **142** workshops delivered
- **50** media interviews

REGIONAL APPLIED RESEARCH AND DEMONSTRATION

- **203** applied research projects
- **128** demonstrations of new technologies
- **Nine** partner organizations collected data in **183** sites for the Provincial Pest Monitoring Program
- **13** of 24 Regional Variety Testing sites in Alberta were delivered by AOF partners with final data provided for the 2015 Alberta Seed Guide

INDUSTRY ENGAGEMENT, COLLABORATION AND SUPPORT OF AGRICULTURE AND FORESTRY PROGRAMS

- **119** Agriculture and Forestry staff and **332** other specialists collaborated with nine Applied Research Associations, four Forage Associations and the Agricultural Research and Extension Council of Alberta
- partnered with **54** rural counties and municipal districts to deliver agriculture production extension

Agriculture Opportunity Fund
2015-16 Year in Review

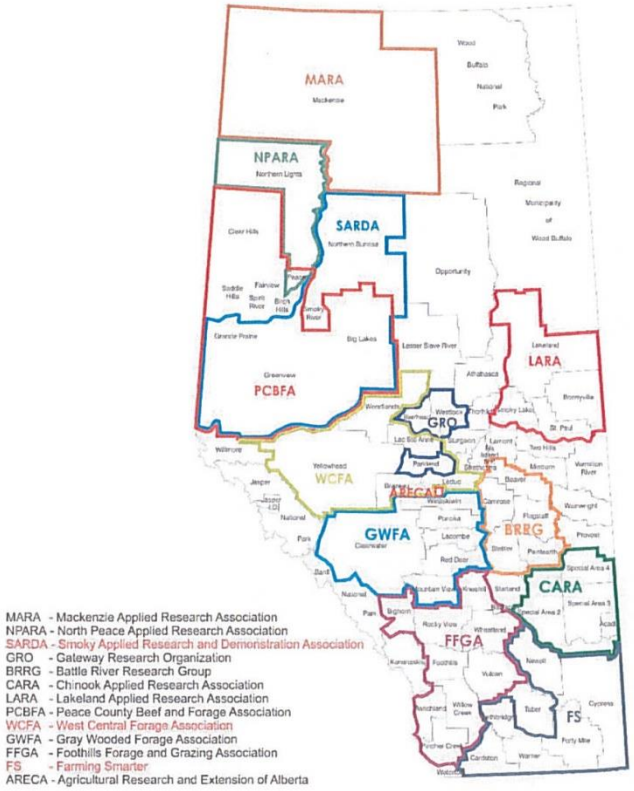
AGRICULTURE STEWARDSHIP PROGRAMS

- **Eight** partners worked with **25** rural counties and municipal districts to deliver environmental extension programs
- **58** Growing Forward 2 supported workshops
- **24** Environmental Farm Plan workshops
- **37** Alberta Environmentally Sustainable Agriculture Program projects

AGRICULTURE STEWARDSHIP PROGRAMS

- Delivered **12** 4-H educational events
- Organized **six** agricultural tradeshows or fairs
- Employed **67** staff employed
- Received **21** staff speaking requests

AOF Partnership Map



MARA - Mackenzie Applied Research Association
NPARA - North Peace Applied Research Association
SARDA - Smoky Applied Research and Demonstration Association
GRO - Gateway Research Organization
BRRG - Battle River Research Group
CARA - Chinook Applied Research Association
LARA - Lakeland Applied Research Association
PCBFA - Peace County Beef and Forage Association
WCFA - West Central Forage Association
GWFA - Gray Wooded Forage Association
FFGA - Foothills Forage and Grazing Association
FS - Farming Smarter
ARECA - Agricultural Research and Extension of Alberta

Alberta Government