Collaborative Thinking About Water—the Alberta Water Council

Submitted by Anuja Ramgoolam

Our quality of life depends on having a safe and sustainable supply of water for our communities, the environment, and the economy. With extreme weather events, climate change, development, and population growth, the need for a collaborative decision-making forum for groups to come together and discuss water management challenges and opportunities is necessary.

Under the *Water for Life* Strategy, the Government of Alberta established the Alberta Water Council (AWC) to serve as a collaborative partnership for providing advice on provincial water management issues. The Council is comprised of 24 members organized into four sector groups - industry, non-government organizations, government, and the Government of Alberta and Provincial Authorities. For more than a decade, the Council has reviewed the *Water for Life* Strategy's progress, provided policy advice, resources, tools, and served as a forum for the discussion of important water management challenges and opportunities.

The AWC adheres to a consensus decision-making process whereby members work collaboratively to craft decisions that satisfy their respective interests. Each member brings a unique perspective that requires respect and consideration. Consensus decision-making fosters a process where the resolution of issues is likely to meet the social, economic, and environmental priorities of members. Each member has an equal opportunity and responsibility to speak to an issue and to influence the results of the discussion and the shape of the solution. The Council has a hierarchy of consensus-based discussions on any given issue. Having received direction from its board of directors, working groups, project teams, or committees are tasked with tackling specific issues, working towards consensus on defining the problem, understanding its consequences, and providing advice, tools, and resources on how to resolve the issue.

Since its inception, the AWC has worked collaboratively with its members to review the implementation progress of the *Water for Life* Strategy five times, produce 20 reports with valued policy advice, and address a diversity of provincial water management challenges. Examples include lake watershed management, aquatic invasive species, water literacy, and water conservation, efficiency and productivity among others.

At the Council, work is underway in areas of source water protection and multi-year drought resiliency. The Source Water Protection Project Team is tasked with documenting existing approaches and providing guidance for protecting public, private, and individual drinking water sources in Alberta. The team is expected to synthesize source water protection practices, processes and risks to drinking water sources in Alberta, examine approaches and risk management models in selected jurisdictions, and develop a guidance document that highlights best practices by the end of 2019.

The Building Resiliency to Multi-Year Drought Project Team is tasked with producing a guide and workshop materials to assist Watershed Planning and Advisory Councils engage municipalities and communities within their watershed to plan for, mitigate, respond to and recover from multi-year droughts. The project will highlight the importance of multi-year drought management in Alberta,

compile existing drought management information and resources in the province, and facilitate the delivery of customizable information to support small urban and rural municipalities before, during and after a drought by the end of 2019.

The AWC continues to bring together important groups to develop solutions to Alberta's water management challenges and be as a platform to inform, discuss, and raise the profile about perspectives on water management through newsletters, videos, symposiums, webinars, and other means.

For more information about the AWC's work please go to https://www.awchome.ca/

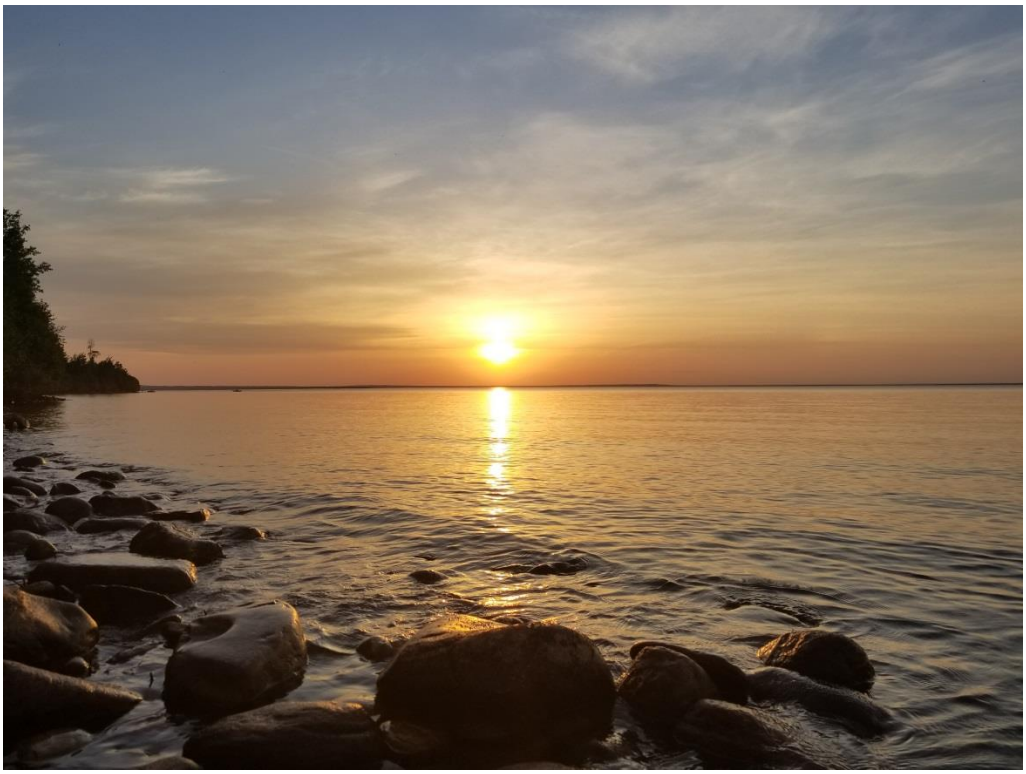


Photo credit Alberta Water Council

Canadian Agricultural Partnership (CAP), Farm Energy Agri-Processing (FEAP), and On-Farm Solar Photovoltaics (OFSVP) Programs Update

Submitted by Alberta Agriculture and Forestry

Canadian Agricultural Partnership (CAP): https://cap.alberta.ca/CAP/

ENVIRONMENTAL SUSTAINABILITY AND CLIMATE CHANGE THEME

1. **Environmental Sustainability and Climate Change** – Producer https://cap.alberta.ca/CAP/program/STEW_PROD

The purpose of the Environmental Stewardship and Climate Change - Producer program is to support producers in reducing negative impacts on the environment while enhancing sustainable production, managing climate change and increasing profitability in the agriculture sector.

Funding list as of Sept 6th, 2018: https://cap.alberta.ca/CAP/download/AGUCMINT-2686740

Producer applications are processed through first come-first serve merit or by panel review, consisting of Subject Matter Experts. First come-first serve merit will cover applications that do not require a site inspection, the risk can be clearly identified on the application and verified by aerial photos and by the applicant responses. Applications will be scored to determine the government/applicant cost share percentage. The scoring criteria will consist of questions to determine the level of risk present, the degree to which that risk will be mitigated, and the project's technical ability to address that risk.

All other applications that require a site inspection will be processed through panel review. The program has scheduled dates throughout the year; this ensures applicants are aware of the deadlines for application submission and know when a decision for their project will be made. The panel reviews each application and determine the cost share percentage. The cost shares range from 30%, 50% and 70%, maximum funding is $100,000. The funding list contains several of the types of projects seen under the GF2 Confined Feeding Operation and On-Farm Stewardship Programs. The funding list acts as guide; if the program receives an application that addresses a water quality or GHG risk but may not fall under the prescribed funding list activities, it will still be reviewed by the program.

A valid EFP is a prerequisite to the program. EFP has implemented a 10-year renewal starting 2018, an EFP completed before 2008 will not be considered valid.

2. **Environmental Sustainability and Climate Change – Groups and Agricultural Organizations:** https://cap.alberta.ca/CAP/program/STEW_GROUP

The purpose of the Environmental Stewardship and Climate Change - Group program is to support extension delivery, carry out applied research, and strategically manage data (through producer groups and agricultural organizations) that improve producer understanding of key environmental practices that, when implemented, can increase market access for the producer.

Funding list as of Sept 6th, 2018: https://cap.alberta.ca/CAP/download/AGUCMINT-2623973

This program will also be a merit based with a minimum of two intake cycles per year. Upcoming intake dates can be found on the CAP Group website. Eligible applicants include: Applied Research Associations, Forage

Associations, Agricultural Commodity Groups, Rural Municipalities, Agricultural Watershed Groups. There is no prescribed cost share, maximum funding is still being determined.

This program seeks to address climate change in agriculture by:

- Helping industry position itself for success in a low-carbon economy.
- Helping industry improve its 'carbon literacy' and understand its risks and opportunities regarding GHG emissions.
- Helping industry organize itself in light of its GHG risks and opportunities.
- Help Industry work towards sustainability goals relating to water quality, air quality, soil health and biodiversity.
- Data collection related to environmental issues
- Data analysis related to environmental issues.
- Strategy development.
- Minimizing resource waste, optimizing resource utilization.
- This program is NOT seeking to share capital costs on technologies that will reduce a producer's GHG emissions (that's what On-Farm Energy Management is for).

Example (but not limited to) projects that could qualify for funding are:

- A commodity group organizing a series of energy audits for its members, with the aim of identifying opportunities and benchmarking performance.
- A commodity group undertaking a Life Cycle Assessment of its product, with the aim of identifying opportunities to reduce GHG emissions.
- A group investigating barriers to no-till adoption among its members.
- A group looking to promote the 4R system of managing nutrients.
- A group investigating economic consequences of pursuing lower-carbon options by its members.
- A group doing extension activities regarding industry's GHG risks and opportunities.

Question
Under Section 2, groups and association would internal AF (research) applicants be accepted, and would universities (i.e. U of Lethbridge, U of Alberta) be able to apply for these funds?
Answer
No to internal applicants. Yes to universities and colleges, however the program will only cover applied research. The aim of the program is producer extension related to our outcomes which could include applied research and data development

3. On-Farm Water Management https://cap.alberta.ca/CAP/program/FARM_WATER
Objectives:

- Support producers to improve their water supply security and more effectively and efficiently manage their on-farm water resources.
- Support producers to protect their water resources through beneficial management practices.
- Provide technical assistance to producers to complete an assessment for the management of their water resources (e.g., Long-Term Water Management Plan).

Funding List as of Sept 6th, 2018: https://cap.alberta.ca/CAP/download/AGUCMINT-2623534

Activities:

- Construction of new water sources such as wells, dugouts, spring developments, dams, and pipelines, and connections to multi-user water supply pipelines.
- Protection of new and existing manmade water sources using beneficial management practices (e.g., off-site watering for dugouts and vermin-proof caps for wells).
- Management of water supply risks through well decommissioning, well pit conversions, water meters, and water well depth measurement equipment.

Recipients:

- Producers, corporations and not-for-profit organizations with an active agricultural business in Alberta.

Noteworthy:

- First-come-first-served.
- Off-site watering will be an eligible activity for new man-made water sources and existing dugouts and spring developments.
- New wells will be required to have vermin-proof caps, higher stickup (18”), 2hr pump/2hr recover test and drawdown measurements, and well ID tag attached to new well once they are available from a certified driller. A new well will not be eligible if it has a pumphouse put on it.
- Tie-ins will be moved from special incentive to standard incentive (1/3 up to $5000).
- Well decommissioning will still be a special incentive. Each decommissioned well will require a decommissioning report to be submitted by a driller. Cost sharing will change: 50% for one well, 60% for two wells, 75% for three or more wells if all submitted on same application. Maximum of $2000 per project.

4. Irrigation Efficiency https://cap.alberta.ca/CAP/program/IRR_EFFICIENCY

Outcome:

- Reduced greenhouse gas emissions and increased water savings in irrigated agriculture by assisting producers with the purchase of more efficient irrigation equipment and systems.

Funding List as of Sept 6th, 2018: https://cap.alberta.ca/CAP/program/IRR_EFFICIENCY

Proposed Eligible Equipment Upgrades:

- New low pressure centre pivot to replace a gravity, side-wheel or high pressure centre pivot.
- Retrofit of a high pressure centre pivot to a low pressure centre pivot, including booster pumps, nozzle packages and pump modifications.
- High efficiency sprinkler nozzles and related equipment to upgrade an existing low pressure centre pivot.
- Variable-rate irrigation equipment (controllers and software).
- Control panel upgrades, including base stations for telemetry.
- Surface or subsurface drip irrigation systems.

Eligible Applicants:

- Operate as a producer in Alberta.
- Own an irrigated agricultural operation in Alberta.
- Have a Long-Term Irrigation Management Plan.
- Have not been previously approved for payment from the Program on the given parcel.

Proposed Grant Payments:

- 40% of the costs for eligible equipment upgrades on a given parcel up to a maximum of $5,000; or
- $15,000 for an upgrade on a given parcel from a gravity, side-wheel or high pressure centre pivot irrigation system to a new low pressure centre pivot or subsurface drip irrigation system (minimum 20 acres).

PUBLIC TRUST THEME

Theme Guiding Principles for funded projects:

1. Committed to producing products that are environmentally, economically and socially sustainable.
2. Committed to producing safe, nutritious food.
3. The diversity of Alberta's agriculture and agri-food industries is respected.
4. Strive to be sustainable and efficient in the face of emerging challenges.
5. Diversifying Alberta's economy through innovation, leading-edge research and investment in new technologies.
6. Offer challenging and rewarding career options.

Current Submission Deadlines for all 3 programs:

- Friday, September 21st 2018
- Thursday, November 15th 2018

5. Public Trust - Public Agriculture Literacy: https://cap.alberta.ca/CAP/program/PUBLIC_LITERACY

Outcome:

- This program supports initiatives that build industry communication capacity to increase public and consumers' awareness and understanding of agriculture and the food production system.

Funding List as of Sept 6th, 2018: https://cap.alberta.ca/CAP/download/AGUCMINT-4387772

Eligible applicants include:

- Agricultural groups registered under the Societies Act, such as applied research/forage associations;
- Commodity groups;
- Incorporated not-for-profit;
- A recognized form of rural municipal government.

Eligible Activities include:

- planning, organizing and hosting agriculture literacy awareness summits, workshops and conferences;
- recruitment and training of agriculture industry spokesperson;
- development of resources such as videos, website, educational materials, displays, publication and other awareness and educational resources;
- development and implementation of strategic communication campaigns; and
- benchmarking studies or needs assessments.

Noteworthy:

- ideally, proposed projects involve partnerships or collaboration with multiple organizations/groups
- the grant will support creative and innovative approaches to communication capacity-building and communication strategies

- any non-agriculture group must demonstrate collaboration with an agriculture group who can provide in-kind contributions (manpower, equipment), resources and expertise

Funding:
- Grant max per applicant per year: $200,000
- Cost share: 50%

6. **Public Trust - Agriculture and Food Assurance Sustainability Initiatives:** https://cap.alberta.ca/CAP/program/PUBLIC_ASSURANCE

Outcome:
Provide support industry associations and industry-led non-profit assurance initiatives to develop and enhance sustainability certification or assurance systems to demonstrate to the public the quality, safety and sustainability of products produced by producers and food companies.

Funding List as of Sept 6th, 2018: https://cap.alberta.ca/CAP/download/AGUCMINT-4387770

Eligible applicants include:
- an industry-led non-profit assurance initiative;
- an agricultural group registered under the Societies Act, such as an applied research/forage association;
- a commodity group; or
- an incorporated not-for-profit organization.

Eligible Activities include:
One or more of the following activities related to the development and/or enhancement of sustainability certification or assurance systems are eligible for funding and may be included in an Application:
- benchmarking studies including life cycle analyses, environmental foot-printing and gap analyses;
- short-term funding for operating costs related to pilot studies, audits;
- development of governance;
- administrative support directly associated with the Project;
- promotion of label and certification standard associated with the sustainability assurance initiative;
- support for industry organizations to develop sustainability assurance programs; and
- support communication efforts regarding consumer perceptions, verification standards, BMPs and performance metrics.

Noteworthy:
- This program relates to the development or enhancement of an entire assurance system
- If the project relates to a single component of an assurance system (e.g. environment, animal welfare), it may be covered by a different program

Funding:
- Grant max per applicant per year: $250,000
- Cost share: 50%

7. **Public Trust - Youth Agriculture Education:** https://cap.alberta.ca/CAP/program/YOUTH_EDUCATION

Outcome:

- Supports the development and delivery of effective agriculture education programs that are science-based, topic-driven, curricular-linked and help students use critical thinking to engage in meaningful and informed conversations about issues that affect public trust in agriculture.

Funding List as of Sept 6th, 2018: https://cap.alberta.ca/CAP/download/agucmint-4387775

Eligible applicants include:
- An agricultural group registered under the Societies Act
- A commodity group
- A university or college*
- A school district*
- An incorporated not-for-profit organization*, or
- A recognized form of rural municipal government in Alberta

Noteworthy:
- Funding is for programs and associated resources
- Programs must be new, or they must be adapted in some way or expanded to broaden their reach
- Collaboration with new partners, in new ways, is highly encouraged and any non-agriculture group must demonstrate collaboration with an agriculture group
- All programs must deliver impact evaluations to students and teacher to measure impact on public trust in agriculture

Funding:
- Grant max per applicant per year: $120,000
- Cost share: 60% grant 40% applicant

PRODUCTS, MARKET GROWTH, and DIVERSIFICATION THEME

8. **Products, Market Growth, and Diversification - Products to Markets (Small Program, grants less than $50,000):** https://cap.alberta.ca/CAP/program/MARKETS_SMALL

Outcome:
The purpose of the Canadian Agricultural Partnership Products to Markets Program is to support growth of Alberta's agricultural industries by supporting the development of New Products and/or Processes, commercialization of products in New Markets, and expansion into local, domestic and international markets

Funding List as of Sept 6th, 2018: https://cap.alberta.ca/CAP/download/AGUCMINT-4602003

Eligible Applicants include:
- Bio-Industrial Processors
- Food Processors
- Processor Organizations
- Producer Organizations
- New Entrants
- Producers who are:
    - Adding value past primary agricultural production
    - Involved in international market development activities

Contact:

- Email: AF.AG-GRANTS@GOV.AB.CA

9. **Products, Market Growth, and Diversification – Value Added Products to Markets (Large Program, grants greater than $50,000):** https://cap.alberta.ca/CAP/program/MARKETS_LARGE

Outcome:
The purpose of the Canadian Agricultural Partnership Value-Added Products to Markets Program is to support growth of Alberta's value-added Food Processors and Bio-Industrial Processors. The Program targets Projects that enable growth of their businesses through increased sales related to the development of New Products, adoption of state-of-the-art processes, commercialization of products in New Markets, and expansion of their business in local, domestic and international markets.

Funding List as of Sept 6th, 2018: https://cap.alberta.ca/CAP/download/AGUCMINT-4602224

Eligible Applicants include:

- Bio-Industrial Processors
- Food Processors

Contact:

- Phone: 310-FARM (3276)
- Email: af.ag-grants@gov.ab.ca

OTHER CAP PROGRAMS

Watch the CAP website for more programs to roll out in the Fall/Winter: https://cap.alberta.ca/CAP/

Risk Mitigation
Accelerating the Advancement of Agricultural Innovation
Adapting Innovative Solutions in Agriculture
Emergency Preparedness
Emerging Opportunities in Food and Agri-Processing
Surveillance

Farm Energy Agri-Processing (FEAP) Program: www.agriculture.alberta.ca/feap

FEAP is a combination of two discontinued GF2 programs:
On-Farm Energy Management Program
· Accelerating Agricultural Innovation Program (Stream C)
By combining these two programs, a single program can be offered across the whole agricultural value-chain, for energy efficiency and energy management projects.

Program Description:
The Farm Energy and Agri-Processing Program shares costs with the agriculture and agri-processing sector on energy efficiency investments. The Program is designed to encourage energy management which will result in cost savings, energy conservation, and ultimately, reduced greenhouse gas emissions.

The Program offers financial support, subject to financial constraint, to Applicants who incorporate high efficiency equipment that is identified in the applicable Funding List in their construction and/or retrofitting projects.

Key Messages:

- This program is RETROACTIVE to April 2016.
- Applicants with eligible receipts dated April 2016 and later can apply.
- Retroactive projects are subject to current eligibility criteria.
- 50% cost share on most items. See Funding List for full details.
- Up to $250,000 maximum grant per Applicant per year
- Funding Timeline is from now to Feb 2020
- An EFP is NOT a prerequisite for this funding
- Applications will be processed in a first complete, first served basis. Incomplete applications will not secure a spot in line.
- Once applications have been approved, producers can watch for emails from the grant management system: "Grant_Management_System@agric.gov.ab.ca" They will get notifications from this email address as their application moves through the steps.

For More Information:
Visit www.agriculture.alberta.ca/feap for:

- Application forms
- Producer Funding List
- Processor Funding List
- Program Terms and Conditions

On-Farm Solar Photovoltaic (OFSVP) Program: http://www1.agric.gov.ab.ca/general/progserv.nsf/all/pgmsrv464

This program is now a provincial program. Details and applications can be found on the Alberta Agriculture and Forestry website under the On-Farm Solar Photovoltaic Program.

Key Messages:

- This program is retroactive back to April 15th, 2017.
- An applicant must have an Electrical Distribution Rates that is rated as farm, irrigation, grain drying or equivalent.
- Grant funding is calculated as follows:
  - ≤100 kW: $0.75/W to maximum 35% eligible cost share
  - 100.01 – 150 kW: $0.56/W to maximum 27% eligible cost share
  - System must be tied to the grid.

For more information, email the program at af.farmsolarpvprogram@gov.ab.ca or contact an Energy Outreach Officers:

- Vern Steinborn with SouthGrow in Lethbridge can be contacted at 403-894-0050.
- Lyle Lawrence with Lakeland College in Vermilion can be contacted at 780-581-8403
- Amber Kenyon with Gateway Research Organization in Westlock can be contacted at 780-307-7849.

On-Farm Solar Photovoltaic (OFSVP) Program Poster

Partner Profile: Rural Municipalities of Alberta

Submitted by Tasha Blumenthal

Who is RMA?

Rural Municipalities of Alberta (RMA) is an independent association comprising Alberta's 69 counties and municipal districts. Since 1909, we have helped rural municipalities achieve strong and effective local government by providing our members with advocacy and aggregated business services, including RMA Trade, RMA Fuel, and RMA Insurance. RMA is committed to leading in a proactive, responsive, and collaborative manner; to operate with integrity and honesty; to be accountable and transparent in our actions; to be connected with and trusted by our members; and to be stewards of the environment. To learn more about RMA, check out our Strategic Plan and our most recent Annual Report on our website, rmalberta.com.

Rebranding Our Organization

For more than 100 years, we have made it our mission to ensure the interests of rural municipalities in Alberta are effectively represented. Over time, we've evolved with the changing needs of our members and associate members, both within Alberta and beyond, to remain relevant and valued to those we serve. As we continue to grow, we recognize the importance of having an identity that resonates with our members and partners, and unifies all divisions of our organization. In the spring of this year, we made the decision to retire the name Alberta Association of Municipal Districts and Counties (AAMDC). Rural municipalities in Alberta are diverse, forward thinking, and support rural Alberta as one of the key economic drivers in the province. Alberta's municipal districts and counties deserve a unified voice. The RMA is proud to serve in that role. We believe that our renewed brand makes it easier for people to comprehend who we are and what we represent. It also gives us greater flexibility to market ourselves to a wider audience, to grow our advocacy, and expand our business for the benefit of all members. Our organization continually seeks to be accountable and transparent in our actions, while operating with integrity on behalf of our members and with various levels of government and other stakeholders. We continue to provide the same proactive leadership and collaborative work ethic to address the needs of our members.

Mission Statement:

RMA empowers its members through proactive leadership, strategic partnership, effective advocacy, and collective business services.

Vision Statement:

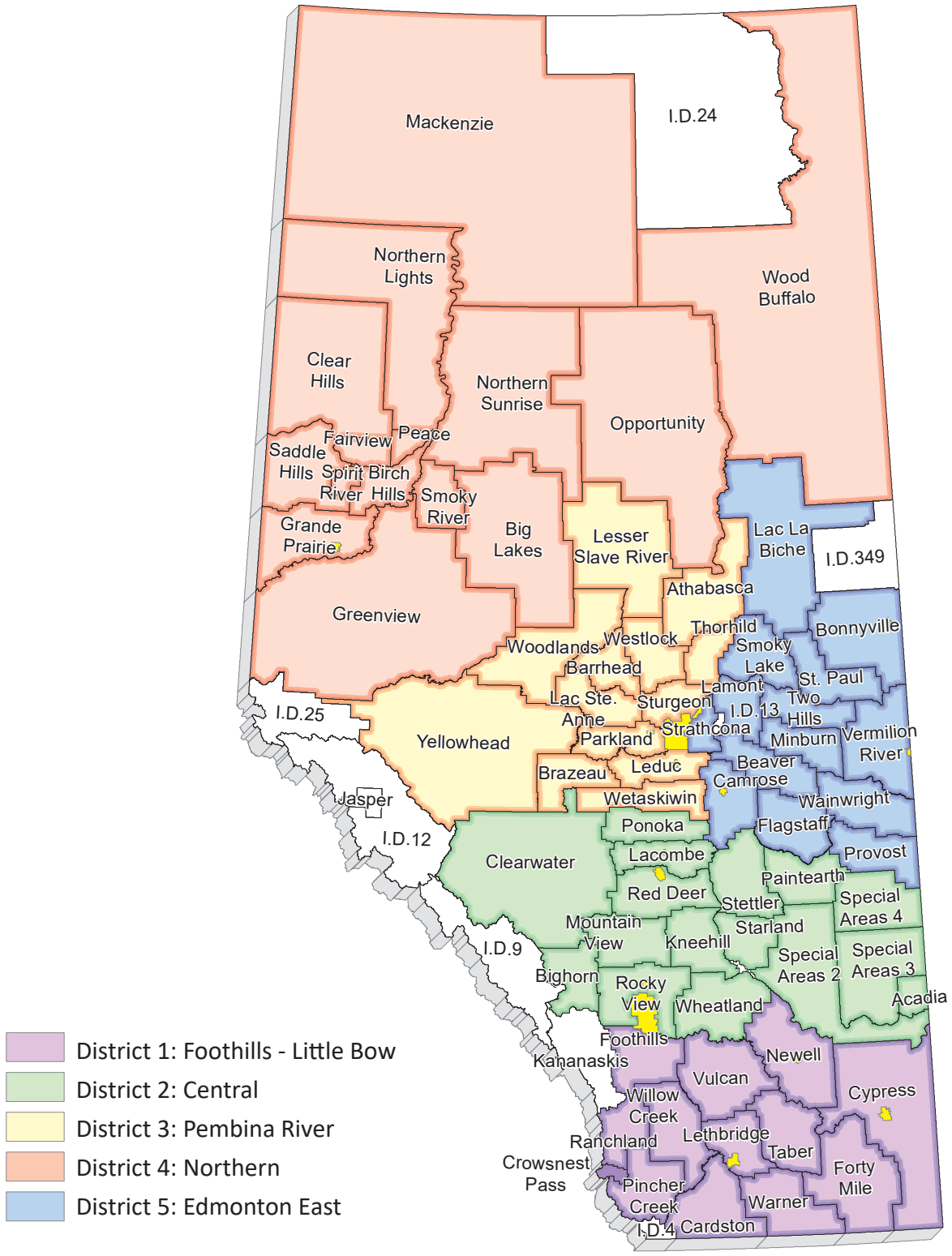
Strong, vibrant, and resilient rural communities.

For more information contact:

Tasha Blumenthal
Director of External Relations and Advocacy
2510 Sparrow Drive, Nisku, AB
tasha@rmalberta.com

RMA
RURAL MUNICIPALITIES of ALBERTA

MEMBER MAP



Frost and Snow Maps, Fall 2018

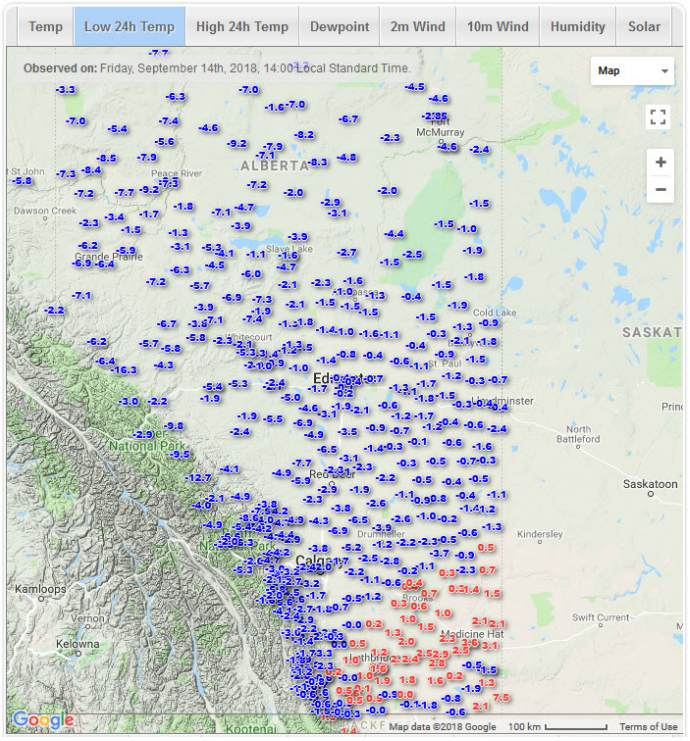
Submitted by Ralph Wright and Daniel Itenfisu of the Alberta Climate Information Centre (ACIS)

Welcome to ACIS, an interactive tool that helps producers, farm consultants, and researchers to see Alberta weather forecasts, browse over 10000 maps of Alberta weather and Alberta climate related information, and access near real time station data from over 350 meteorological stations operating in the province of Alberta. The maps and weather data describe Alberta's weather, climate and related agriculture features to help with your long-term planning and decision-making throughout the growing season.

Note that the snow map is expressed in mm of water. To get a rough estimate of snow depth, multiply by 10.

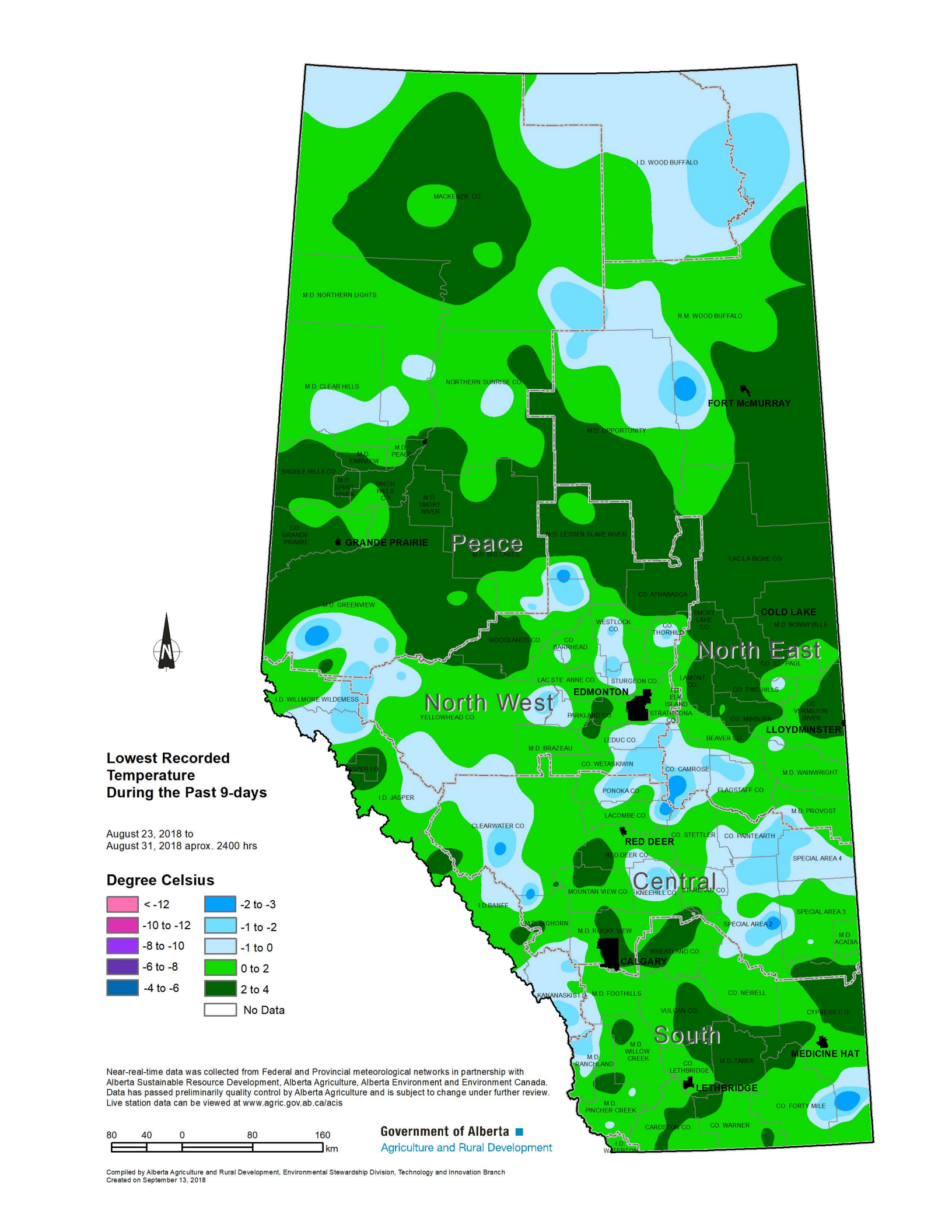
Desktop link: https://agriculture.alberta.ca/acis/

To create your own map on a desktop (without the colors but with current numbers), click on 'Weather Conditions Map' under the headings of 'Maps' about half way down the left side, then click on Temp, Low 24h Temp, etc as desired on the top of the page.



Mobile users go to: https://agriculture.alberta.ca/acis/m#!data

For interactive maps of world weather, see: https://www.windy.com



Lowest Recorded Temperature During the Past 9-days

August 23, 2018 to
August 31, 2018 aprox. 2400 hrs

Degree Celsius

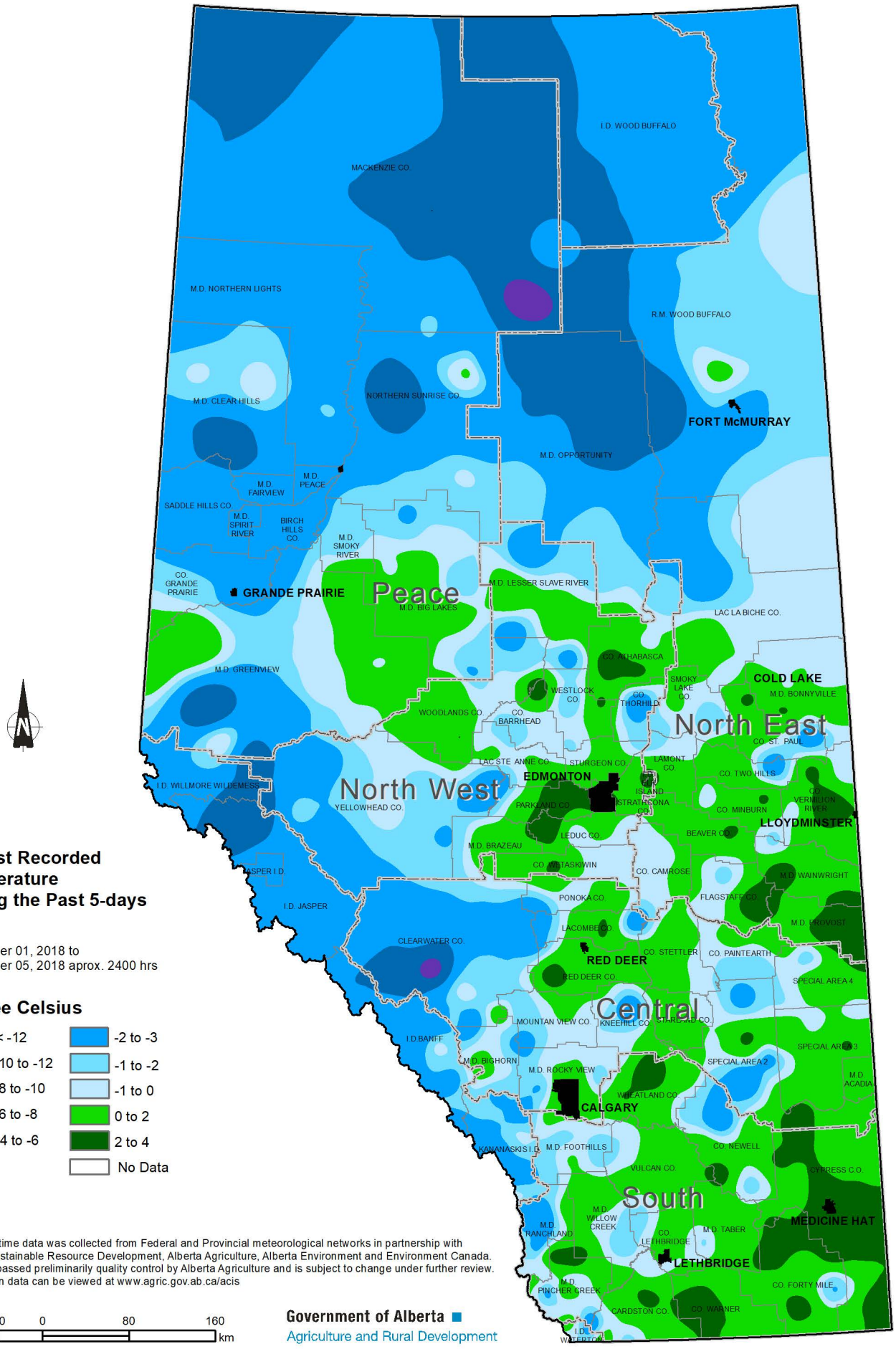
< -12	-2 to -3
-10 to -12	-1 to -2
-8 to -10	-1 to 0
-6 to -8	0 to 2
-4 to -6	2 to 4
	No Data

Near-real-time data was collected from Federal and Provincial meteorological networks in partnership with Alberta Sustainable Resource Development, Alberta Agriculture, Alberta Environment and Environment Canada. Data has passed preliminarily quality control by Alberta Agriculture and is subject to change under further review. Live station data can be viewed at www.agric.gov.ab.ca/acis

80 40 0 80 160 km

Government of Alberta
Agriculture and Rural Development

Compiled by Alberta Agriculture and Rural Development, Environmental Stewardship Division, Technology and Innovation Branch
Created on September 13, 2018



Lowest Recorded Temperature During the Past 5-days

September 01, 2018 to
September 05, 2018 aprox. 2400 hrs

Degree Celsius

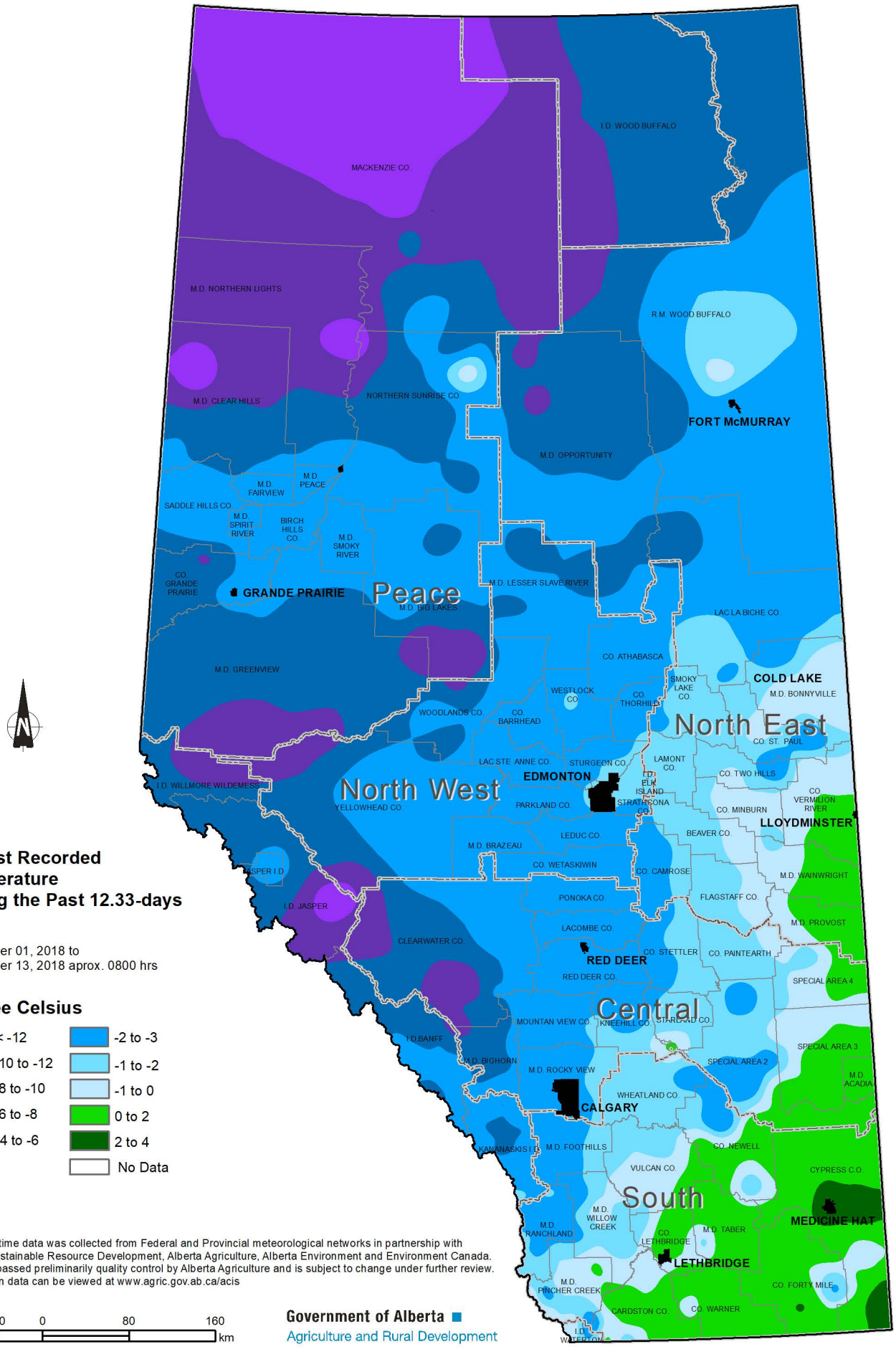
< -12	-2 to -3
-10 to -12	-1 to -2
-8 to -10	-1 to 0
-6 to -8	0 to 2
-4 to -6	2 to 4
	No Data

Near-real-time data was collected from Federal and Provincial meteorological networks in partnership with Alberta Sustainable Resource Development, Alberta Agriculture, Alberta Environment and Environment Canada. Data has passed preliminarily quality control by Alberta Agriculture and is subject to change under further review. Live station data can be viewed at www.agric.gov.ab.ca/acis

80 40 0 80 160 km

Government of Alberta
Agriculture and Rural Development

Compiled by Alberta Agriculture and Rural Development, Environmental Stewardship Division, Technology and Innovation Branch
Created on September 13, 2018



Lowest Recorded Temperature During the Past 12.33-days

September 01, 2018 to
September 13, 2018 aprox. 0800 hrs

Degree Celsius

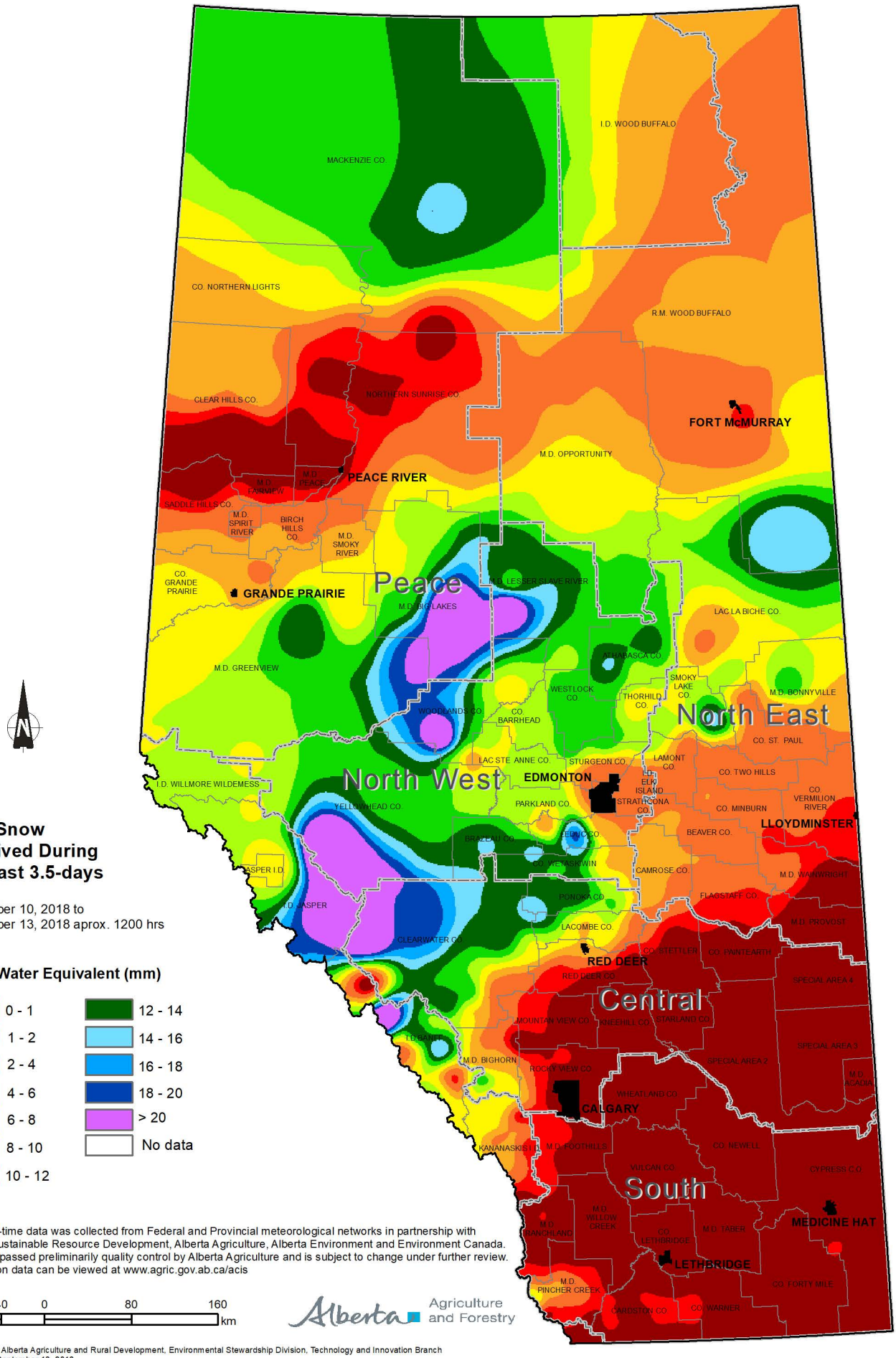
< -12	-2 to -3
-10 to -12	-1 to -2
-8 to -10	-1 to 0
-6 to -8	0 to 2
-4 to -6	2 to 4
	No Data

Near-real-time data was collected from Federal and Provincial meteorological networks in partnership with Alberta Sustainable Resource Development, Alberta Agriculture, Alberta Environment and Environment Canada. Data has passed preliminarily quality control by Alberta Agriculture and is subject to change under further review. Live station data can be viewed at www.agric.gov.ab.ca/acis

80 40 0 80 160 km

Government of Alberta
Agriculture and Rural Development

Compiled by Alberta Agriculture and Rural Development, Environmental Stewardship Division, Technology and Innovation Branch
Created on September 13, 2018



New Snow Received During the Past 3.5-days

September 10, 2018 to
September 13, 2018 aprox. 1200 hrs

Snow Water Equivalent (mm)

0 - 1	12 - 14
1 - 2	14 - 16
2 - 4	16 - 18
4 - 6	18 - 20
6 - 8	> 20
8 - 10	No data
10 - 12	

Near-real-time data was collected from Federal and Provincial meteorological networks in partnership with Alberta Sustainable Resource Development, Alberta Agriculture, Alberta Environment and Environment Canada. Data has passed preliminarily quality control by Alberta Agriculture and is subject to change under further review. Live station data can be viewed at www.agric.gov.ab.ca/acis

80 40 0 80 160 km

Alberta Agriculture and Forestry

Compiled by Alberta Agriculture and Rural Development, Environmental Stewardship Division, Technology and Innovation Branch
Created on September 13, 2018

Visit weatherdata.ca for additional maps and meteorological data

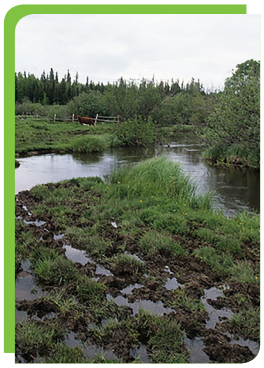
CANADIAN AGRICULTURAL PARTNERSHIP
Innovate. Grow. Prosper.

HOW TO GET LIVESTOCK ACROSS A CREEK-WATERCOURSE CROSSING

Why did the cow cross the creek? To get to the other side of course! Is this a problem?

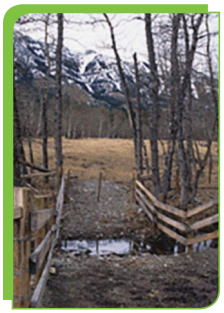
Sometimes crossing streams does cause problems. Problems can originate from unrestricted or improperly constructed crossings including:

- loss of riparian vegetation, increased erosion and sediment deposition in streams,
- water contamination from manure or urine,
- reduced water quality leading to reduced water intake and potential for reduced weight gain in livestock,
- increased risk of livestock injury or death,
- negative impacts on fish and other aquatic creatures and,
- enforcement actions leading to fines and costly corrective actions.



Although impacts are often localized, they can severely impact downstream areas and persist for extended periods. A variety of options exist to modify or improve livestock watercourse crossing sites, limit the impacts and steward shared resources.

Considerations for watercourse crossings:



To cross or not to cross? This is the question.

The development of a crossing has a planning aspect as well as financial considerations, both in terms of construction and maintenance costs. There are also environmental and regulatory considerations, like increased erosion and impacts on downstream neighbors and fish populations. It's good to first ask: Do I need a crossing? Is there a way to avoid building or using one?

If the answer is, "yes, I need to develop a crossing" then it is imperative to consider the various regulations governing watercourse crossing by both provincial and federal agencies. Provincial agencies regulate activities around permanent waterbodies including the bed and shorelines while federal agencies regulate fisheries, fish habitat and navigation. Depending on the situation, authorizations may be required under some or all of the regulations. Information and links to related Acts and Regulations are highlighted at the end of this factsheet.

Riparian areas are productive and can be reliable producers of forage, shelter, fish, wildlife and water. These areas are a buffer, an insurance policy especially useful to have when drought or flood occurs. They are part of a healthy, functioning landscape and form part of an extensive drainage basin within every watershed.

Although riparian areas make up only a small fraction of our landscape, they are disproportionately important to fish and wildlife, recreation, agriculture, and society in general.

Goals for a good crossing: The goal should be to get livestock across a watercourse as quickly and safely as possible while avoiding riparian and aquatic impacts, and meeting regulatory requirements. The purpose of a constructed crossing is to maintain or improve water quality, maintain bank stability and reduce the amount of time cattle spend in the waterbody. Pasture management changes like using an off-site watering system or changing season of use to when ground and water are frozen would help greatly reduce the impacts. If an open water crossing cannot be avoided, then other questions need to be considered.

What is the intensity and frequency of livestock crossings?

How many livestock and how frequently they cross a watercourse will determine how much impact a crossing will have.

Alberta

Canada

Daily use by large numbers will have a greater impact than periodic use by a few cows. The season of use will also determine how much of an impact livestock have on the riparian area and its ability to filter out sediment from entering the watercourse.

Goals for a good crossing: If livestock numbers are large and they are crossing frequently, then a raised crossing such as a bridge or culvert should be used. This will prevent constant trampling of streambank vegetation and provide better, safer access in all weather situations, while minimizing impacts. Low level crossings such as hardened fords should be reserved for situations where crossings are infrequent or by a few livestock. Culverts placed incorrectly or which are undersized for high flows can have extensive erosion on the downstream end, leaving a large vertical gap between the culvert and stream bed, known as a hanging culvert and can prevent fish passage.

What do I need to know about my watercourse to design a good crossing?

It's important to know what the range is between flood flows and low flows (data available from https://wateroffice.ec.gc.ca/). The extent to which your watercourse has flooded, or could flood, provides an indication of the design capacity for a bridge or culvert to pass flood flows. If there is any uncertainty about the magnitude of flood flows, a clear span bridge, or culvert with an open bottom and large flow capacity should be considered, to avoid loss of the structure, possible channel shifts because of the structure, expensive repairs and the possibility of increased erosion downstream. Altered flow patterns resulting from an improperly designed crossing can impact riparian health and downstream neighbors.

In fish bearing waters, any projects that change water flow, impact fish passage, or permanently alter or destroy fish habitat are subject to the *Federal Fisheries Act* and may require approval. Fisheries and Oceans Canada (DFO) has developed a tool that proponents can use to assist in determining whether a culvert can provide fish passage (http://www.fishprotection-tools.ca/index.html). It is important to consult with a qualified professional to ensure the proposed crossing meets your objectives as well as any regulatory requirements.

Tips & Tricks for Construction:

- » place crossings where livestock already use a site, if it is suitable,
- » reduce the number of crossings to the bare minimum required for access,
- » locate crossings on straight sections of a watercourse, and
- » if using culverts, ensure they cause no downstream erosion, are of sufficient capacity for flood flows, and will not impede fish passage.

Stream bottom type also plays an important role in watercourse crossings. Watercourses with harder substrates such as large gravels or cobbles may provide good footing to cattle and not require much alteration or improvement. These substrates may also reduce the risk of injury for livestock.

Geotextile foundations allow for natural substrate while creating a hardened crossing. Once installed, the combined strength of the geocell plus aggregate gravel provides a stable hardened surface for low-level fords. This crossing type is ideal for a "low energy" environment with low channel velocities and minimal scour potential. Geotextile fords are primarily used in situations that have low frequency of use by cattle or vehicles.

In comparison, crossing watercourses with muddy, fine substrates can cause increased siltation downstream as the particles are easily disturbed and transported. This can affect fish by reducing egg survival, available habitat and impact downstream water quality. In these situations, a combination of a geotextile foundation with the addition of a gravel/cobble overlay is necessary.

Goals for a good crossing: Crossings should not impede or alter the natural flow regime in any way, or cause additional erosion downstream. Consideration should be given to how flows may change in conditions of heavy rainfall and fast runoff. Crossings that occur on waterbodies with fine sediments should be constructed so that they do not increase sediment transport downstream. Each site should be considered on an individual basis and a qualified professional should be consulted to ensure that the most appropriate approach is applied.

Photo courtesy of Trout Unlimited Canada

What is the slope of the bank at the crossing location?

Crossing sites with steep slopes are at greater risk of erosion, loss of riparian vegetation and livestock may have problems using the site.

Goals for a good crossing: Where banks are higher than 2 m (top of bank to water level) and water depth exceeds 0.6 m, a culvert crossing or bridge should be developed, but before establishing a steep crossing, look for other locations with less slope (http://www.transportation.alberta.ca/Content/docType245/Production/Complete_Fish_Habitiat_Manual.pdf). In general, crossings should not be placed along bends as this can also increase the risk of erosion and loss of the crossing during floods. Soil characteristics at the site are also important in considering crossing options. Soil type, steepness of slope and depth to a rock substrate will affect bank erosion, longevity of the crossing and future maintenance of the crossing.

Are there fish present in the waterbody?

Fish may be present and need to be considered in the planning and construction of any watercourse crossing. It is important to note what kinds of fish are present as there are different restrictions for sportfish, non-sportfish and fish that are at risk. There are restricted instream construction periods based on the fish species present. These restricted activity periods focus construction or maintenance to certain times of the year to prevent disturbance to fish during critical reproductive periods. Fish use a variety of habitats, including as refuges during floods, for spawning or for feeding; altering the flow could reduce the amount of habitat available. The ability of fish to successfully travel upstream is also a consideration in designs. Sportfish and fish species at risk have specific requirements for water quality in order to survive, and these can be different from non-sportfish. Unplanned, poorly constructed crossings can lead to reduced amounts of riparian vegetation, increased erosion and higher water temperatures. All of these parameters affect the quality of fish habitat an influence which species are able to live in an area.

Goals for a good crossing: If the crossing is on a waterbody that contains fish, or if you are unsure about fish presence it is wise to consult with regulatory bodies or other qualified individuals before making any changes. It may be that fish passage upstream is important.

Culvert placement needs to match the base of the streambed and slope of existing channel bed, to prevent hanging culverts, like this one, which blocks fish passage.

If so, clear-span bridges or arch rib culverts (with an open bottom) are the choices to make. Care should be taken to maintain healthy riparian vegetation along the bank and reduce activities that will cause increased erosion. Efforts to improve crossing conditions should take into account the specific requirements of the fish species present at the site as well as those downstream.

LAWS AND REGULATIONS

There are several laws and regulations related to working in and around water.

Legislation to be aware of when contemplating a livestock crossing:

FEDERAL

Fisheries Act

Any waterbody that contains fish at any time during any given year or is connected to a waterbody that contains fish at any time during any given year is subject to the *Fisheries Act*. Under section 35(1) of the *Fisheries Act*, "No person shall carry on any work, undertaking or activity that results in serious harm to fish that are part of a commercial, recreational, or Aboriginal fishery, or to fish that support such a fishery." DFO interprets serious harm to fish as the death of fish, permanent alteration to fish habitat, and destruction of fish habitat. Projects that have the potential to obstruct fish passage, modify flow, or result in the entrainment of fish may also cause serious harm to fish. Seek advice from a qualified environmental professional if you are unsure about whether your project requires a review by DFO. For more information check out DFO's "Projects near water" webpage http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html.

Navigation Protection Act

The *Navigation Protection Act* is administered and enforced by Transport Canada and is designed to protect the public right of navigation. The *Navigation Protection Act* requires approval for any works that may affect navigation on Canada's busier navigable waters that are listed in a schedule to the Act. For more information on Transport Canada's Navigation Protection Program, please visit https://www.tc.gc.ca/eng/programs-621.html. More information on the proposed *Canadian Navigable Waters Act* can be found at https://www.canada.ca/en/services/environment/conservation/assessments/environmental-reviews/navigation-protection.html.

Species at Risk Act

The federal *Species at Risk Act* protects endangered and threatened species and their habitats across Canada. This act and regulations may also apply if your property is home to at risk species and/or their habitat. For more information: https://www.ec.gc.ca/alef-ewe/default.asp?lang=en&n=ED2FFC37-1.

PROVINCIAL

Water Act

The *Water Act*, administered by the Alberta Ministry of Environment and Parks (AEP), regulates any activity that:

- changes the flow or level of water,
- changes the location of water or the direction of flow of water,
- causes or may cause the siltation of water or the erosion of any bed or shore of a water body, or
- causes or may cause an effect on the aquatic environment.

Under the *Water Act* a waterbody "means, for the purpose of this Code of Practice, a water body with defined bed and banks, whether or not water is continuously present, but does not include fish bearing lakes." Projects including the placement, construction, maintenance, replacement or removal of a watercourse crossing must ensure that they follow the *Water Act*'s Codes of Practice. Regulations vary depending on the type of watercourse and crossing. Watercourses in Alberta are classified according to size and fish habitat. Schedule 2 of the Code of Practice includes standards for carrying out watercourse crossing work to ensure the risk of adverse impacts is minimized.

Maps are available from AEP (http://aep.alberta.ca/water/legislation-guidelines/water-codes-of-practice.aspx) to determine your watercourse's classification and any restricted activity periods. A qualified person, as described in the code of practice, who can assess the proposed crossing and any impacts to the fish and watercourse habitat is recommended to help you complete the application. Higher risk projects include projects that change the substrate, or alter the flow, which has potential to alter fish habitat and downstream hydrology.

Other provincial, federal and/or municipal regulations may apply in some situations, always be sure to check with local authorities before completing any work.

Overall, you should aim to maintain or restore riparian functions to ensure long-term riparian health. For more information on grazing in riparian areas please see "Caring for the Green Zone: Riparian Areas and Grazing Management" or contact Cows and Fish for more informationon riparian grazing or riparian health (www.cowsandfish.org; riparian@cowsandfish.org; 403-381-5538).

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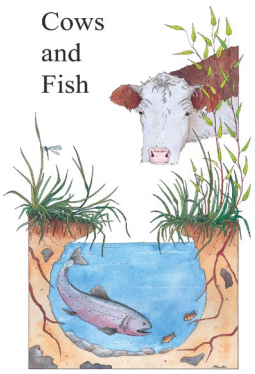
Illustrations and photos provided by Cows and Fish.



August 2018

REDUCING THE RENEWABLE ENERGY FOOTPRINT ON YOUR NATIVE GRASSLANDS

INFORMATION FOR ALBERTA LANDOWNERS

Renewable energy development can have many benefits for Albertans; however, some projects could potentially cause adverse impacts to native grasslands. As a landowner, you can play a vital role in minimizing such impacts on your land.

RENEWABLE ENERGY DEVELOPMENT

Alberta aims to reduce coal-powered electrical generation and increase renewable energy generation. In 2017, renewable sources supplied about 9% of Alberta's electricity. The goal is to increase that to 30% by 2030. This has implications for current land use.

Wind, solar and other renewable energy projects offer such benefits as stimulation of local economies, diversification of energy supplies, and decreased greenhouse gas emissions. However, these projects can have adverse environmental impacts, particularly if they are sited in native grassland or parkland areas that support livestock production and a variety of wildlife and cultural activities. The impacts may include fragmentation or loss of native grasslands and wildlife habitat, soil degradation, and invasive weed problems. Examples of other potential impacts include noise, increased traffic and dust, or alterations to the surrounding view, depending on the project.

Renewable energy projects need to be properly planned, developed, operated and decommissioned to minimize the risk of potentially negative impacts. The Alberta Government has set out regulations, guidelines and other tools for renewable energy development and an approval process to determine if proposed projects are in the social, economic and environmental interests of Alberta. The recent amendment to the Conservation and Reclamation Regulation enables the Government to develop conservation and reclamation requirements and to require a developer to obtain a reclamation certificate at the end of a project's operations.

Landowners can help reduce adverse impacts of renewable energy development on native grassland and parkland areas through:

1. contract negotiations with developers;
2. input into consultations on proposed projects; and
3. having their own renewable energy equipment to meet their own energy needs.

WHY NATIVE PRAIRIE MATTERS

Healthy native grasslands are crucial for water storage and purification, high quality forage for livestock, wildlife habitat, biodiversity and carbon storage. These landscapes are also valued for their aesthetic beauty, recreational opportunities and cultural history. Considerable losses of native grassland, parkland and wetland habitat have already occurred and continue to occur in Alberta. Continued stewardship of the remaining native areas is important to maintain ecological, economic and social sustainability.

NEGOTIATING CONTRACTS WITH DEVELOPERS

As a landowner, you will want to consider many factors before signing an agreement with a renewable energy company. To assist landowners in negotiating such agreements, the Farmers' Advocate Office (FAO) has published ***Renewable Energy in Alberta.***

That publication emphasizes how important it is for the landowner to negotiate with the developer to make sure the wording in the agreement is right for the landowner's needs. The FAO recommends consulting your lawyer, accountant and municipality, and talking with your neighbours before finalizing the agreement.

Leasing your land for a renewable energy power plant is completely voluntary. If you don't like the proposed contract, you don't have to accept it.

However, siting of transmission lines associated with a power plant could potentially be imposed on you or your neighbours. If agreements cannot be reached with affected landowners, then the Alberta Utilities Commission ***(AUC)***, which regulates Alberta's utilities sector, will determine if the proposed routing is in the public interest, through a public proceeding.

Utility-scale renewable energy projects require the AUC's approval. Before submitting a proposal to the AUC, the developer must notify and consult with local landowners, residents and occupants. Municipal approval is required to make sure the proposal complies with local land-use plans and bylaws. As part of the environmental requirements, the developer must review any wildlife survey information and wildlife mitigation plans with Alberta Environment and Parks (AEP), and a Wildlife Referral Report from AEP must accompany the submitted proposal. AEP's report is guided by its wildlife directives and beneficial management practices (BMPs) for renewable energy projects.

To learn about BMPs for renewable energy, see ***Beneficial Management Practices for Renewable Energy Projects; Reducing the Footprint in Alberta's Native Grassland, Parkland and Wetland Ecosystems***.

You can help conserve native grasslands on your property by discussing those BMPs during your lease negotiations with the developer. For example, you might:

- Require the developer to avoid or minimize disturbances to native prairie habitat, riparian areas, wildlife corridors, and other environmentally sensitive or culturally important areas.
- Make sure you are satisfied with the developer's plans for restoring the native plant community (including requiring a professional to sign off) and for protecting water and soil resources, such as soil management practices during construction.
- Let the developer know about any existing conservation easements or agreements on your land.
- Discuss options to minimize the need to build new access roads, such as possibly using your existing farm or ranch trails or locating the project near existing transportation corridors.
- Specify how weed control will be conducted; the responsibility for weed control could be contracted back to you to ensure it will meet your requirements.

Any requirements that are important to you should be written into the final contract.

NEIGHBOUR INPUT ON PROPOSALS

As a nearby landowner, you can raise concerns about a proposed project's potential impacts on native grasslands through the developer's consultation process, the municipal approval process, and the *AUC's review process.*

All renewable energy applications to the AUC go through a multi-step process with several opportunities for landowner and public involvement, and a requirement that nearby landowners be notified and their concerns considered. More details can be found on the *AUC's website.*

YOUR OWN SMALL PROJECT

Having your own small renewable energy project to meet your own needs can contribute to a sustainable rural landscape in multiple ways. Such projects decrease the need for additional transmission infrastructure in remote locations, reducing the risk of impacts to native grasslands. Also, you can avoid native grassland when choosing a location for your equipment. For instance, if the project will be providing energy to your residence or outbuildings, you can place the equipment on altered or disturbed land near the buildings.

The *AUC website* has information on approval processes for small renewable energy projects. Some small projects do not need to apply to the AUC if they meet the exemption criteria or if they are *micro-generation projects*, which generate less than 5 megawatts. The Alberta Government has *incentive programs* for some types of small projects.

Rural Albertans will likely see a rapid increase in renewable energy development in the coming years. You can play a part in shaping a sustainable future for Alberta through your stewardship and conservation of resources including native prairie, and your discussions with developers.

CONTACT

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2018

PRAIRIE CONSERVATION FORUM

PHOTO: MIISTAKIS INSTITUTE

Reducing the Renewable Energy Footprint on Native Grasslands: Summary Information for Renewable Energy Developers

Introduction

This summary sheet provides industry-specific beneficial management practices for renewable energy developments in native prairie landscapes.

Practical, beneficial management practices that sustain prairie biodiversity at the species, community and ecosystem levels help maintain one of the most threatened ecosystems in the world: the native prairie ecosystem.

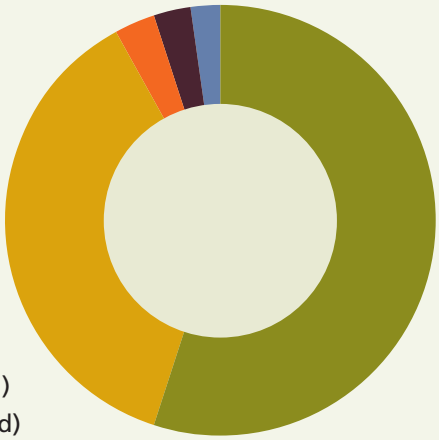
The prairie region covers an area of 156,318 km^2 or 24% of Alberta.

Native prairie is home to **80% of Alberta's species at risk**.

PHOTO: ANNETTE HERZ

Why do Alberta's Native Grassland, Parkland and Wetland Ecosystems Matter?

Temperate native grasslands are among the most threatened ecosystems in the world. In Alberta, as of 2013, native prairie region land use is as follows:



- 55.2% agriculture (converted)
- 36.9% remaining native prairie
- 2.8% transportation (converted)
- 2.5% urban and rural (converted)
- 2.3% industrial (converted)

Native prairie is valued for its biodiversity, habitat for wildlife, water storage and purification, as a reservoir for carbon and for providing a reliable and high-quality source of forage for livestock.

It is also valued for less tangible benefits including its aesthetic beauty, the recreational opportunities it provides and preservation of cultural history linked to indigenous people and Alberta's traditional ranching lifestyle.

Fostering a stewardship ethic around all current and future users of native prairie rangelands is critical to the success of prairie conservation efforts in Alberta. It demands an enlightened understanding of ecological and economic relationships and an ability to resist persistent pressures to fragment land and intensify land use for short-term economic gains. A strong stewardship ethic strives to maintain long-term values and benefits.

How Might Renewable Energy Development Negatively Impact These Ecosystems?

When a large scale renewable energy project (solar or wind) is developed, site disturbance occurs. This involves transporting equipment to the site, in some cases stripping and re-grading the site and installing footings to secure the technology.

For wind, the disturbance is dispersed over the landscape.

PHOTO: OLC FIBER

For solar, the disturbance is concentrated to one intact parcel of land.

PHOTO: MICHAEL MEES

Once disturbance occurs, whether it's a temporary or permanent disturbance, it is difficult to return the affected site to native prairie. These disturbances can introduce invasive weeds, create runoff, impair species movement, and remove native vegetation permanently changing the existing ecosystem. Additionally, renewable energy development can impact these ecosystems in ways different than footprint, including noise and light pollution.

What are the Advantages of Avoiding Native Prairie Ecosystems?

By avoiding native prairie, important ecosystem services in Alberta are protected. This provides essential environmental benefits to Albertans, species and habitat.

Site restoration in native prairie can be very expensive and take a very long time to achieve positive results. As part of the approvals process, Alberta Environment and Parks (AEP) requires final reclamation plans for decommissioning and abandonment of the renewable energy infrastructure. From a project lifecycle perspective, it is potentially more economically feasible to avoid siting projects on intact native prairie if there are non-native prairie options available.

Where are Alberta's Native Grassland, Parkland and Wetland Ecosystems?

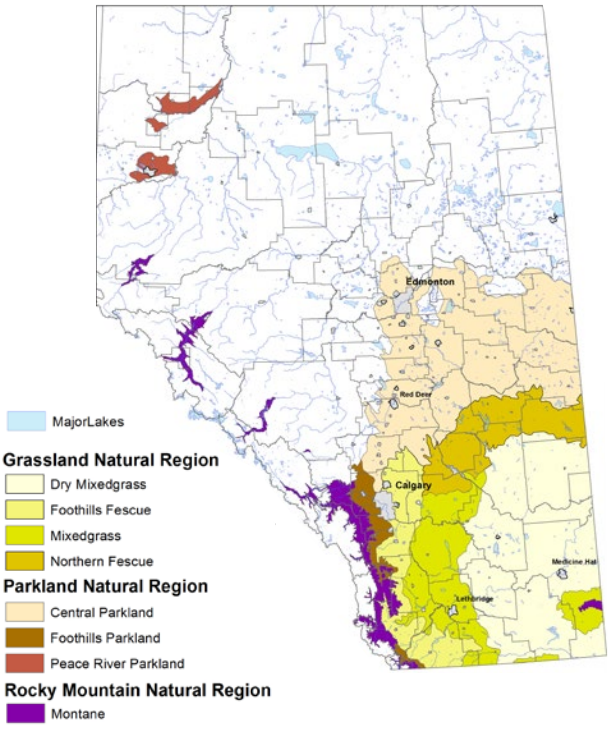


FIGURE 1: GRASSLAND AND PARKLAND NATURAL REGIONS AND MONTANE NATURAL SUBREGION (Alberta Community Development, Agri-food and Agriculture Canada)

What Can Be Done to Reduce Negative Impacts on Native Prairie Ecosystems?

Minimum disturbance practices that avoid or reduce the area of surface disturbance are essential tools in the management of cumulative impacts of native grasslands.

For lands where native plant communities remain intact and functioning, these principles are recommended:

AVOID

siting renewable energy projects on intact native prairie

Avoid native ecosystems by staying clear of isolated areas of native prairie, ridge tops, riparian areas, and watercourses and known wildlife corridors within the project footprint / **Plan site developments** close to or with in urban centers / **Minimize disruption** by utilizing existing disturbed sites such as industrial sites, brownfields, marginal croplands or re-grassed cultivated lands / **Site developments should align** with existing transmission lines with load capacity to support the project / **Use appropriate datasets** and decision support tools (see Resources on page 4) and tools listed to the right.

BENEFICIAL MANAGEMENT PRACTICES

should be utilized to reduce impact on native prairie ecosystems if avoidance of native prairie is not possible.

Adjust project boundaries to minimize disturbance / **Initiate construction** when native grassland vegetation is dormant, and the soils are dry and or frozen / **Control** invasive species / **Schedule activities** to take place at optimal times to reduce impacts on soils, native plant communities, wildlife, wetlands and water courses / **Utilize existing** trails and roads / **Monitor and adjust** the project in operation, ensure all environmental requirements are met and adapted if necessary, and convey corporate commitment to environmental protection to all staff.

RESTORATION AND RECLAMATION

is a last resort when avoidance and minimization are not possible.

Harvest native seed materials prior to construction / **Enact erosion control** procedures during construction / **Interim reclamation** to minimize surface disturbance / **Final reclamation plans** for full restoration of ecological health

REQUIREMENTS FOR RENEWABLE ENERGY DEVELOPMENT RELATED TO NATIVE PRAIRIE ECOSYSTEMS

- Water Act
- Alberta Wetland Policy
- Wildlife Directive for Alberta Solar Energy Projects
- Wildlife Directive for Alberta Wind Energy Projects

PHOTO: KATHERYN TAYLOR

About the Prairie Conservation Forum

The Alberta Prairie Conservation Forum (PCF) is a non-profit organization that is committed to conserving native prairie and parkland in Alberta and raising public awareness of the stewardship challenges faced in maintaining these ecologically important landscapes for future generations.

The membership is composed of organizations and individuals with jurisdiction or interests in the prairie and parkland landscapes including government and non-government organizations, landowners, the oil and gas industry, conservation organizations, the agricultural sector and environmental consultants.

www.albertapcf.org

This summary sheet is based on the document commissioned by the Prairie Conservation Forum titled, Beneficial Management Practices for Renewable Energy Projects: Reducing the Footprint in Alberta's Native Grassland, Parkland and Wetland Ecosystems (Neville, 2017).

Resources

ACIMS Alberta Conservation Information Management System

FWMIS Fish and Wildlife Management Information System

GVI Grassland Vegetation Inventory

HRV Historic Resource Values

PLVI Primary Land and Vegetation Inventory

AGRASID Agricultural Region of Alberta Soil Inventory Database

Least Conflict Lands for Renewable Energy Development, a stakeholder driven tool to view areas of high development potential and low risk potential

Beneficial Management Practices for Renewable Energy Projects (Neville, 2017)

PRAIRIE CONSERVATION FORUM

PHOTO: MIISTAKIS INSTITUTE