

OCCASIONAL PAPER #6



The State of Alberta's Prairie and Parkland: Implications and Opportunities


Karen Raven, Livio Fent, Ian Dyson, and Barry Adams

March 2022

This paper is in follow up to the analyses and technical report of "State of the Prairie: Technical Report", with the goal of providing greater context to the report's findings. The implications and potential opportunities arising from the findings will also be discussed.

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Foreword

To fulfill its goal to raise public awareness, disseminate educational materials, promote discussion, and challenge our thinking, the Prairie Conservation Forum (PCF) launched an Occasional Paper series and a Prairie Notes series.

The PCF's Occasional Paper series is intended to make a substantive contribution to our perception, understanding, and use of the prairie environment - our home. This series offers an alternative to scholarly journals for those authors who would like to get their message into the hands of a wider audience, including: landholders, industry representatives, environmental advocates, farmers, ranchers, government and non-government resource management professionals, and members of the broader public. Topics covered in this series will contribute to the wise use and conservation of biological diversity in the northern prairies.

We encourage the submission of papers that take a holistic perspective on issues affecting prairie conservation, that synthesize existing knowledge, that offer practical and applied advice on best management practices, that question existing points of view or that open doors to new ways of seeking harmony and promoting the sustainability of our prairie environment. Interested individuals are encouraged to submit draft essays, articles, and papers to the PCF Board of Directors for review as a future Occasional Paper or Prairie Note. Prospective authors may wish to contact the PCF Coordinator to discuss potential ideas and proposals before commencing with a writing project.

Manuscripts should be submitted in electronic form to the PCF Coordinator at info@albertapcf.org. Accepted articles will be posted on the PCF's web site and Occasional Papers may be published.

Disclaimer

The ideas and viewpoints that are contained in this paper are those of the author(s) and do not necessarily represent the opinions or position of the Prairie Conservation Forum.



About the Authors

Karen Raven holds a bachelor of Natural Resource Science and a Master of Science in Rangeland Resources. She is currently an independent consultant working in the NGO and agri-environmental sector in British Columbia. Karen has worked in the conservation and agriculture sectors throughout her career in both Alberta and British Columbia. Her previous roles in government in Alberta include rangeland management, environmental stewardship, and land use. These roles focussed on leading and supporting innovative multi-stakeholder initiatives at the municipal and provincial level to enhance environmental stewardship and conservation, with a special focus on native grassland ecosystems. Key highlights of this work include her involvement as co-lead on the Southeast Alberta Conservation Offset pilot, contributions to the McDonald's Pilot Project for the Canadian Roundtable for Sustainable Beef, provincial carbon offset development for tame and native grasslands, as well as serving as Land Use and Rangeland technical session chair for the Alberta Soil Science Workshop. She also served on provincial committees including the Endangered Species Conservation Committee, Operational Grazing Stakeholder Committee, Land Trust Grant committee and the Biodiversity Technical Team. Her current work focusses on facilitating and providing collaborative and integrated solutions for long term stewardship success. Karen served as a director and Chair of the Alberta Prairie Conservation Forum and has co-led the State of the Prairie project from its inception.

Livio Fent has a long history with the Alberta Government working in a diversity of fields including: Research & Development in aerial photography/remote sensing in the 80s, administering Alberta's climatological network in the northwest and southern areas of the province in the early 90s, managing the GIS and ecological resources for the Prairie Region latter 90s, and heading the Province's GIS Mapping and Ecological Data Stores in the 2000s. In his role as provincial GIS data manager he facilitated the development of the Grassland Vegetation Inventory for the Government's Land Use Framework initiative and the Prairie Conservation Forum in the southern portion of the province. He is currently retired but finds the time to teach the odd climate/climate change course or scientific/introspective photography course at Metro Continuing Education and UofA.

Ian Dyson retired as a senior manager responsible for transboundary outcomes with Alberta Environment and Parks in July 2017. He is a geographer and planner with 35 years of experience dealing with integrated resource management, water resources, protected areas, land use, and regional cumulative effects management systems in Alberta, Canada. His career experiences have focused on building and sustaining partnership approaches to environmental management, conceiving management systems approaches to address landscape level environmental cumulative effects, and facilitating institutional and societal capacity to define and meet common, place-based environmental outcomes across boundaries and borders. He initiated the Prairie Conservation Forum in 1989.

Barry Adams is a Professional Agrologist and retired as provincial program head of the Rangeland Resource Stewardship program of Alberta Sustainable Resource Development in 2015 where he worked for 38 years, primarily as a rangeland management specialist. Over his career Barry worked with a team of rangeland professionals' delivering a program of research, extension and policy development in the public rangelands sector. Since retirement Barry entered the consulting field developing a range of field studies including management plans for protected areas and supporting Canada and First Nations in the development of land claim studies to document the loss of agricultural lands. Barry serves on the board of Plateau Perspectives Canada a charity that focuses on grassland conservation and human wellness in the Central Asian Plateau.



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1. Introduction

Without habitat there is no wildlife.

Without habitat there is no wildlife. It follows that native prairie is the foundational element for native biodiversity. While many species, including native species, can persist in

human modified landscapes, these landscapes are invariably simplified and modified environments. They have a reduced suite of species, diminished ecosystem services performance and greater prevalence of non-native and invasive species. The structural and functional integrity of native prairie and parkland ecosystems is tied to the 'native', so knowing where this habitat is, and its condition, is essential to targeting efforts in support of prairie conservation.

Prior to the State of the Prairie Technical Report (State of the Prairie) analysis, information on the extent of native grassland in prairie and parkland areas occurred at different scales, points in time and were often not comparable. These discrepancies created challenges for discussions, planning and decision-making on native grassland and parkland conservation. In early 2017, several Prairie Conservation Forum (PCF) members met to discuss what was known about the state of native prairie in Alberta. Specifically, how could information collected at different scales and times be assessed and consolidated to reflect what is known to date about the extent of native prairie and change over time? Over the next two years numerous existing inventories were analyzed, new information was collected and detailed results documented in a technical report. This comprehensive evaluation and the resulting maps of Alberta's prairie and parkland, from the natural region to the municipal level, provide a clear foundation for all sectors to use in decision making.

It is important to note that because these data are remotely sensed, by either air photos or satellite, the results do not reflect the condition or health of the prairie and do not address fragmentation or the status of invasive species. Graminoid cover captured by satellite inventories is also likely to include rangelands that have been re-seeded to introduced grasses. Definitive results require fine-scale, site-specific, field-level analysis.

1. Native prairie in Alberta: the value of native ecosystems

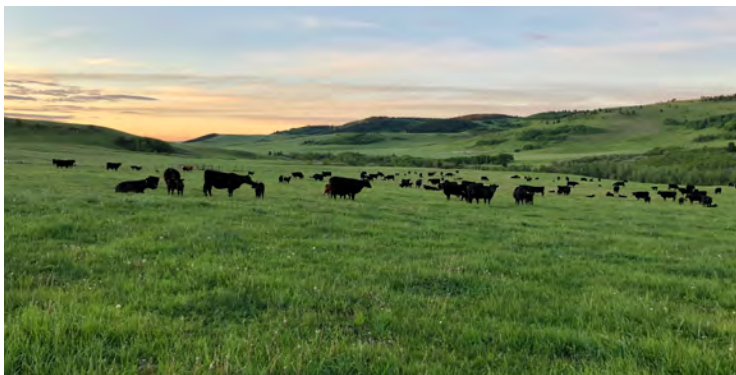
In a world dominated by human-modified landscapes, natural or native ecosystems are increasingly scarce and valuable. Temperate grasslands are considered by the International Union for Conservation of Nature (IUCN) World Commission on Protected Areas (WCPA) as one of the most at-risk ecosystems in the world and the International Rangeland Congress calls them critically endangered. Alberta's prairie is no exception. With much of Alberta's human footprint focused on these landscapes, it is unsurprising that over three quarters of Alberta's species at risk are found in the grasslands.

The prairie and parkland regions are of overwhelming importance to the Province of Alberta. Although comprising slightly less than one quarter of its land base, these regions contain the bulk of Alberta's population, including the province's four largest cities: Calgary, Edmonton, Red Deer and Lethbridge. They also contain the bulk of the province's productive agricultural land base, including the largest irrigated area in Canada. The dominant engines of Alberta's economy, with the exception of large-scale forestry, are also here; the largest are employers in manufacturing, food processing, biotechnology and transportation, as well as government, financial and academic

State of the Prairie
Technical Report
https://www.albertapcf.org/rsu_docs/state-of-the-prairietechnical-report_final-including-summary.pdf

Graminoid:
grass and
grass-like plants.

IUCN WCPA
Temperate
Grasslands Specialist
Group <https://www.iucn.org/commissions/world-commission-protected-areas/our-work/temperate-grasslands>
Mission: To reverse
the trend of
biodiversity loss
in the grasslands
biome.



services. A significant portion of the conventional energy sector and the vast majority of the renewable energy sector are also located here.

So, what value do the remaining natural or native prairie and parkland landscapes have? Shaped by climate, soil and vegetation, native landscapes maximize the richness of ecological services

that the earth can provide in any given location. In prairie and parkland Alberta, sunlight produces grasses, shrubs, forbs (broad leaved plants, including cacti), lichens and more, which regulate greenhouse gasses by sequestering carbon, cycling nutrients, sustaining rich and diverse invertebrate and microbial communities, and providing food and habitat for mammals and birds and pollen for insects. These processes also support soil formation, control erosion, retain sediments and regulate biological control while providing clean water and sustaining genetic resources. The ecological services provided by native prairie landscapes help partially compensate for the ecological deficits associated with the intensive human land uses that dominate the region as a whole.

The rich, productive environment of the prairies supported free-roaming herds of tens of millions of bison and the Indigenous peoples that have relied on them for thousands of years. It also attracted European settlers and the resulting transformation of much of the native prairie to agricultural croplands. Even today, almost all of the remaining native prairie is managed under an agricultural land use as it is grazed by livestock, providing livelihoods for a ranching community that is an iconic feature of western Canada.

The prairies are an unforgiving and extraordinary landscape with vast expanses of space, extremes of heat and cold, drought and fertility, under the biggest sky anywhere. People have shaped this land and it has shaped us. Alberta's remaining native prairie provides a myriad of ecological services as well as a suite of cultural, scientific, educational, spiritual/inspirational and recreational opportunities. Here are a few examples of the many tangible benefits that our native prairies continue to provide:

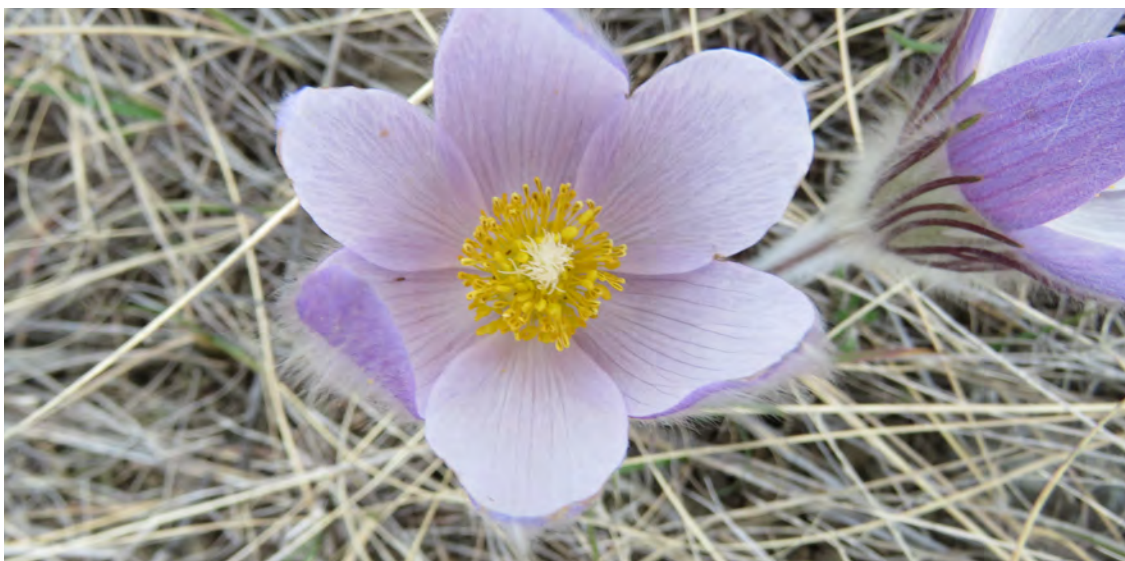
- **Carbon storage:** Alberta's native fescue grasslands are estimated to contain up to 200 tonnes of carbon per hectare within the first metre of soil. An estimated two to three billion tonnes of carbon are held within the uncultivated grasslands of western Canada. From a global perspective, grasslands store approximately 34% of the global terrestrial stock of carbon.
- **Wetlands and riparian areas:** Prairie wetlands are even more productive than grasslands and as much as one-third of North American waterfowl populations breed on the Canadian prairies. These unique ecosystems provide migratory stopovers, breeding areas, staging, and molting habitats as well as dietary nutrients for hundreds of thousands of waterfowl, wading birds and colonial nesting birds. Riparian ecosystems are probably the single most productive type of wildlife habitat in the semi-arid Great Plains and breeding bird densities in southern Alberta riparian cottonwood communities are amongst the highest in Canada.
- **Food** (contributes economically to the community and the province while also providing important wildlife habitat.

Genetic resources: any plant, animal or microbial material that contains functioning genes that could be of actual or potential value.

- Source of traditional and new medicines: From time immemorial, Indigenous peoples have relied on the native plants for food and medicine to ensure their health and survival. The Dr. Jim Coutts Prairie Research Program at the University of Lethbridge is studying the anti-cancer and anti-viral chemical properties of native prairie plant species, including cockerel (*Hymenoxys richardsonii*), buffalo bean (*Thermopsis rhombifolia*), snowberry (*Symphoricarpos albus*), shooting star (*Primula pauciflora*) and prairie crocus (*Anemone patens*).
- Reintroduction of native buffalo: Through the linnii Initiative and with the support of non-government organisations and land managers, the Blackfoot Confederacy are reintroducing buffalo to portions of their historic range. Buffalo shaped the native prairie landscape and are fundamental to the cultural and spiritual health of the Blackfoot Confederacy.
- Nature appreciation: A January 2021 Ipsos Reid poll found that 94% of Canadians find nature helps relieve their stress and anxiety. During COVID-19, 86% of Canadians say spending time in nature is important to their mental health and 74% say spending time in nature is more important to them now than ever before. For Albertans who have experienced the wide-open freedom of native prairie landscapes and seen or heard pronghorn antelope, Sprague's pipits, prairie rattlesnakes, sage grouse or burrowing owls, the experience is transformative.

linnii Initiative <https://blackfeetnation.com/iinnii-buffalo-spirit-center/>
 "In 2009, the linnii Initiative was launched by the leaders of the four tribes that make up the Blackfoot Confederacy (Blackfeet Nation, Kainai Nation, Piikani Nation, and Siksika Nation) to conserve traditional lands, protect Blackfeet culture, and create a home for the buffalo to return to."

Grassland and Parkland Natural Regions in Alberta provide these (and other) important ecological, cultural, social, and economic values and ecosystem services to all Albertans, highlighting a complex ecological and human inter-relationship that is in our collective interest to conserve. As a result, by having a clear understanding of what native grassland and parkland we have and where the changes are occurring, we can have more informed approaches to balancing multiple needs and finding creative ways to support retaining this natural landscape for the benefit of current and future generations.



prairie crocus (*Anemone patens*)

Medicinal plants:



arrowleaf
balsamroot
(*Balsamorhiza
sagittata*)



white evening
primrose
(*Oenothera
caespitosa*)



shooting star
(*Primula pauciflora*)



buffalo bean
(*Thermopsis
rhombifolia*)

1.1.1 Canadian prairies and American plains inventories

The native prairie in Alberta is part of a larger continental grassland – the North American Great Plains (Figure 1). Our Grassland and Parkland Natural Regions are an important part of the lifecycle for many birds and wildlife whose ranges span an area from Canada to Mexico (or beyond). Any significant loss of these regions to other uses or impacts, such as invasive species or infrastructure, may affect and cause the decline or loss of these species.



Figure 1. North American Great Plains including Transboundary Grasslands Partnership Area

Great Plains and 849,839 hectares (2.1 million acres) across the entire Great Plains (Figure 1). This rate of loss (“four football fields per minute”), while slower than recent years, is a rate too high to support wildlife habitat in the long term. The authors also note that very little of the remaining native grasslands are within parks; ranchers, native American and Canadian First Nations own and steward 90% of the remaining grasslands.

Provincial land inventories have been undertaken at various points in time to support a variety of initiatives and government program needs related to Alberta’s White/Green Areas, Southern Region/Prairie Region and the Land Use Framework initiatives but have not always included all subregions within the Grassland and Parkland Natural Regions (Figure 2).

Both the Saskatchewan Prairie Conservation Action Plan and the Alberta PCF have undertaken their own inventories. Saskatchewan’s Taking Stock report used 1994 Southern Digital Land Cover data and highlighted that an estimated 80% of the native prairie had been converted to crop production and only 2% of native prairie remained in the high-value crop production areas. Overall, the majority of Saskatchewan’s remaining native grassland occurs in only three ecoregions: the Mixed Grassland Ecoregion (50%), the Aspen Parkland Ecoregion (20%) and the Moist Mixed Grassland Ecoregion (20%).

These inventories consistently reveal the loss of native grassland, especially those in areas of higher moisture. These deep fertile soils are ideal for annual crop production, which contributes significantly to the economic outcomes for individuals, as well as local, provincial/state and national economies. Losses due to impacts from industry, roads and residential housing expansion also contribute to the overall decline of this valuable landscape.

Recognizing the values and benefits derived from native prairie and the resulting competition for these lands for a variety of economic and societal interests, organizations across North America have completed inventories on these landscapes on provincial, national, and international scales. The National Audubon Society, North American Grassland and Bird Report highlights the ongoing loss of grasslands and an overall 40% decline of grassland birds, especially those considered grassland specialists. Overall, only 11% of the tallgrass prairie, 24% of the mixedgrass and 54% of the shortgrass (dry mixedgrass in Alberta) prairie remains across the continent. The tallgrass through to the shortgrass is on a declining moisture continuum (from high precipitation to low precipitation) with the tallgrass prairie most suited to annual crop production. The World Wildlife Federation annual Plowprint series (2016-2020) reports on grassland loss to cultivation across the Great Plains in Canada, the U.S. and Mexico. In 2020 alone, this series noted a loss of approximately 222,982 hectares (approximately 551,000 acres) in the northern

Tallgrass prairie: dominated by grass species that can exceed 1m in height. Fire is a natural component of tallgrass prairie, contributing to overall health and persistence.

Mixedgrass: characterized by an intermingling of short and medium grass and sedge species, typically occurring as two layers.

Shortgrass or dry mixedgrass: dominated by fescue grass species.

Annual GIS, remote sensing and satellite-based inventories of the extent of various plant communities, including native grasslands, are available for free from the federal Government of Canada and the U.S. Government.

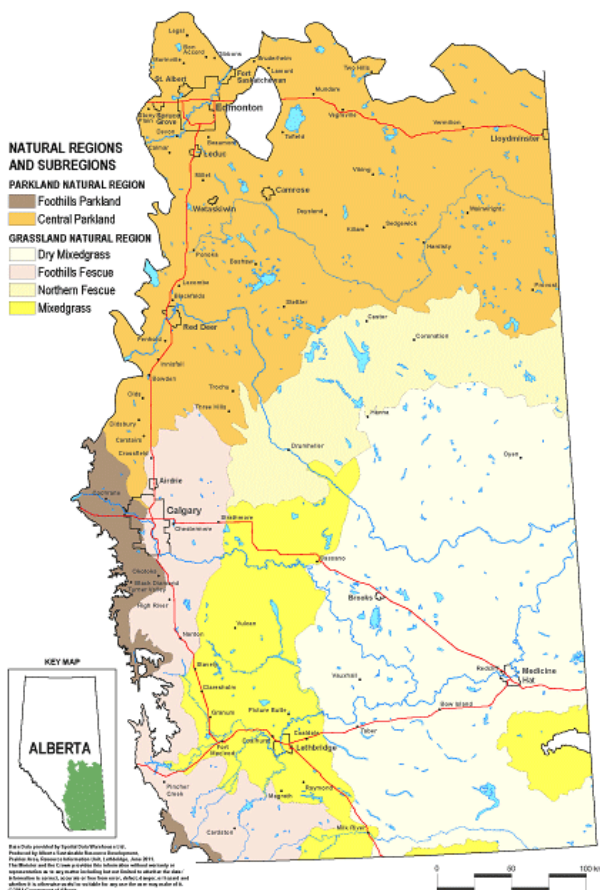


Figure 2. Natural Regions and Subregions of Alberta

The State of the Prairie Technical Report identified six large landscape inventories from the 1980s to 2016; four of these inventories were satellite-based classifications produced by the federal government and two were air photo, human interpreter-based classifications produced by the provincial government. Of these six inventories, the Technical Team settled on three of the six inventories to cover both the Grassland and Parkland Natural Regions: the provincial Grassland Vegetation Inventory (GVI) covering the Grassland Natural Region and the federal Agriculture and Agri Food Canada Land Use Inventories for 1990 and 2010 (AAFCLU90 and AAFCLU10) covering both the Grassland and Parkland Natural Regions. The provincial Native Prairie Vegetation Inventory (NPVI), the Grassland Natural Region's air photo-based inventory compiled between 1991 and 1993, was used for standardizing the land cover classification classes. A summary of all the remote-sensed inventories conducted in Alberta that have generated information at the Natural Region scale are listed in Appendix I.

Humans have linear boundaries versus those found in nature, and these boundaries affect the overall management and conservation of the grasslands – the impacts in one jurisdiction have impacts and consequences in another. Changes such as the reduction in support for the Conservation Reserve Program in the U.S. as a result of the 2007 Energy Independence and Securities Act led to 1,092,651 hectares or 2.7 million acres of grassland being cultivated, creating more fragmentation and negatively impacting transboundary wildlife populations. Integrating grassland inventories across boundaries and supporting multi-jurisdictional communications and partnerships, such as the Transboundary Grasslands Partnership, can help bring greater awareness, reduce unintended consequences, and create collaborative solutions to conserve native prairie.

1.1.2 Inventories of native prairie and parkland in Alberta

Inventories of the native cover in the Grassland and Parkland Natural Regions number in the hundreds. They are most often associated with localized scientific assessments such as Rumsey Natural Area, Cypress Hills, and the Hand Hills Ecological Reserve. Complete, region-wide inventories of native cover are significantly more limited.

Transboundary Grasslands Partnership

<https://www.albertapcf.org/about-prairies/transboundary-grasslands>

In 2016, Alberta Prairie Conservation Forum initiated the Transboundary Grasslands Partnership recognizing that the environment doesn't respect human boundaries.

For a complete list of inventories for the Grassland and Parkland Natural Regions, please visit <https://open.alberta.ca/opendata?q=vegetation+inventories&sort=score+desc>



2. State of the Prairie Project

2.1 Objectives

The State of the Prairie Project had the following three main objectives: 1) determine the amount of native land cover left in the Grassland and Parkland Natural Regions; 2) identify the amount of change in native land cover occurring between two time periods; and 3) investigate the viability of an innovative remote sensing data processing technique (Timescan) for quantifying native cover and change. Objective 3 was undertaken to determine if remotely sensed land cover evaluation methods could be used in the future for consistent ongoing comparison as many existing data sets use different methodologies and only cover short time periods due to changing funding and program needs.

2.2 Participants

This collaborative project was undertaken through the leadership of the Alberta PCF Board and the State of the Prairie Steering Committee with in-kind staff expertise from Alberta Agriculture and Forestry, Alberta Environment and Parks and independent volunteer consultants. Funding for the time scan analysis by Maapera Analytics Inc. (Maapera) was provided by Alberta Agriculture and Forestry and the Alberta PCF with in-kind support through the provision of data from the German Aerospace Center (DLR). See Appendix 3 for the full list of individuals, agencies and companies contributing to the project.

2.3 Limitations and caveats

The range of inventories include air photo-based inventories such as the relatively coarse 1991-1993 Native Prairie Vegetation Inventory (NPVI) where the spatial classification unit is the quarter section, to the Grassland Vegetation Inventory (GVI) where the minimum size polygon is two hectares (4.94 acres). The satellite-based inventories are all based on the Landsat 30m pixel standard. These values represent the spatial resolution of the information units but not necessarily the feature derivation of the information. For example, NPVI was photo interpreted using black and white 1:30,000 aerial photography with conventional stereoscopes (~2m resolution) but, the GVI was photo interpreted using 0.4m digital color infrared aerial photography using 3D digital software (softcopy photogrammetry) techniques. Finally, the 30m satellite inventories were classified by computer algorithm. In what seems like a chaotic mix of data sources, a level of standardization was possible by reducing the classification classes to the coarsest inventory – the NPVI. The NPVI's six cover classes (graminoid, shrub, treed, wetland, riparian, and water) form the basis of cross-inventory comparison and change analysis for the State of the Prairie. Additionally, the error varies widely between datasets. The early inventories (NPVI, AAFCLU90) typically state inventory accuracies of about 70 to 80% while the later inventories (GVI, AAFCLU10) state accuracies of 92 to 95% for native/non-native land class differentiation. There is also error within the land cover classification (i.e., agricultural land mistaken for native prairie). It can be extremely difficult to detect tame grass species or invasive species in land identified as native grassland. As a result, field-level analyses and ground-truthing are required to determine the true condition of the native grassland.

The caution in the error and accuracy discussion above is relevant when considering the amount of native vegetation but that caution is also mitigated by the different inventories converging over the same area, each arriving at comparable findings. For example, the air photo based NPVI states that the amount of native cover for the Grassland Natural Region is about 42% as of 1991-1993. The satellite based AAFCLU90 (1990) states that the amount of native cover is about 50%. Considering the error margins within the two inventories, there is no statistical difference in these two values. Overall, these are very general findings that provide the quantitative foundation for the more localized assessments.

2.4 What was done

Early in the project, the NPVI was considered a key inventory tool for quantifying native land cover in Time 1 (1991-1993). As it was the “lowest common denominator” in terms of data resolution, all other inventories were standardized to the NPVI’s six native cover classes and quarter section resolution. This enabled cross-inventory comparison and validation, especially with the polygon based GVI. As the project proceeded, the AAFCLU90 and AAFCLU10 were used to determine change in both the Grassland and Parkland Natural Regions. Using GIS techniques, the inventories were layered by Natural Subregion, Ecodistrict, and administrative areas including Municipal Districts, Counties, military bases and First Nations Reserves (where at least 75% of the administrative area is within the Natural Region). The GIS coverages were also queried by tenure representing public and private lands. Native land cover areas and percentages were derived and compared for each of these units for Time 1 (1990) and Time 2 (2010).

The Timescan remote sensing pilot was an assessment of 3-year, multiple Landsat images analysed and classed using supervised classification techniques and pixel statistics. The process developed by the DLR and Maapera showed promise, especially in making use of older archived Landsat cover classification. The results, however, were deemed inconclusive for making definitive statements on ‘state’ and ‘change’ of native cover in the Grassland and Parkland Natural Regions.

Both the GVI and AAFCLU10 provide the most recent coverage of the Grassland Natural Region. Arguably, the most accurate and reliable current inventory is the GVI but it was compiled over a period of 10 years (2006-2016) and it only covers the Grassland Natural Region. Alternatively, the AAFCLU10 is year specific (2010) and covers both the Parkland and Grassland Natural Regions. Together these two inventories provide the foundation for estimating and comparing the current extent of native cover in the two Natural Subregions.

2.5 Findings

2.5.1 The Grassland Natural Region

According to the GVI/AAFCLU10 inventories, the Grassland Natural Region still contains around 44%/48% native cover, respectively. Its distribution is concentrated in general areas of the central and southeastern portions of the region (Figure 3). Note, the white areas denote both areas outside the Grassland Natural Region and annual crop production or lands that are not considered native cover within the Grassland Natural Region.

The Dry Mixedgrass Natural Subregion contains the highest amount of native cover at 54%/60% (GVI/AAFCLU10), while the Foothills Fescue and Mixedgrass Natural Subregions contain the lowest amount at 32%/29% and 37%/37%, respectively). The Cypress Hills Ecodistrict is the area with the greatest amount of native cover at 82%/92% while the Vulcan Plain Ecodistrict is the area with the lowest amount at 12%/10% (Figure 4).

Referencing the AAFCLU10 inventory, the administrative areas with the highest amount of native cover include Cypress County, Special Areas 2 at 76% and CFB Suffield at 98%. Lethbridge and Wheatland Counties are lowest at about 16% and 18%, respectively (Figure 5). The First Nations Reserves (IR) range from a high of 75% in the Piikani IR 147 to a low of 34% in the Kainai IR 148.

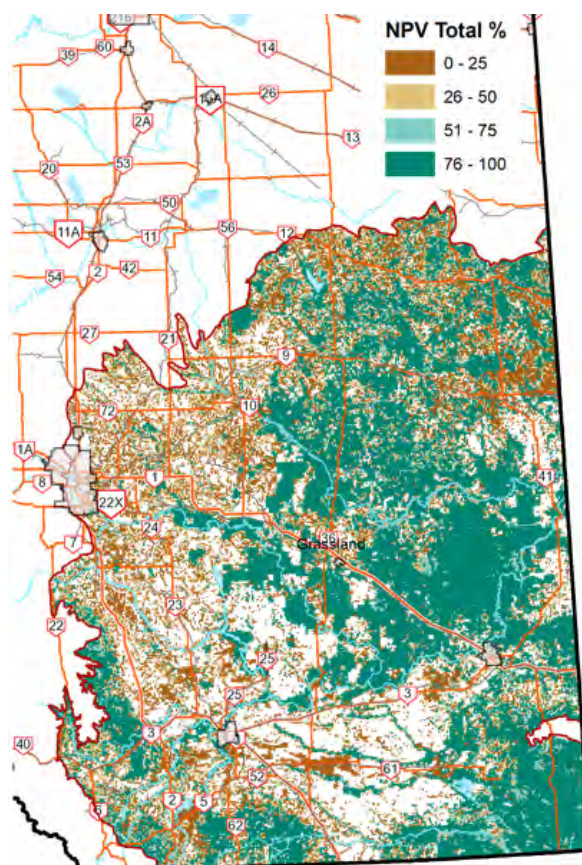


Figure 3. Spatial distribution of native vegetation cover for GVI. Data shown in quartiles.

The amount of native cover in the Grassland Natural Region can also be viewed from the tenure perspective. Of the 47.8% total native cover in the Natural Region, 26.5% is found on public land and 21.3% is on private land. Public lands are covered by 87.5% native cover while private lands are covered by 30.6%. While the importance of public land to native prairie in this region is well understood, an important observation from the above statistics is that 45% of the native cover in this natural region is in fact on private land.

2.5.2 The Parkland Natural Region

The Parkland Natural Region is represented exclusively by the AAFCLU10 data. Approximately 20% of the area still consists of native species (Figure 6). The Natural Region is represented by two Natural Subregions, with the Foothills Parkland at 49% under native cover and the much more extensive Central Parkland at 18% under native cover. Narrowing the area of focus to Ecodistricts, the Ribstone Plain in the east and the Black Diamond Upland along the foothills contain the highest native cover at 71% and 49%, respectively, while the Olds Plain north of Calgary and the Provost Plain in the east are lowest at 7% and 8%, respectively (Figure 7).

The amount of native cover for municipal administrative areas ranges from 10% to 34%. Canadian Forces Base (CFB) Wainwright, a federal administrative area, has 92% native cover. The First Nations Reserves (IR) range between 26% and 76% (Figure 8).

The tenure-based distribution of native cover shows that public lands have about 6% native cover remaining while private lands have about 14% remaining, whereas, public lands are 54.4% native landscapes while private lands are 15.8% native. Since this Natural Region is almost 90% private land, it is clear that most of the remaining native cover in this Natural Region is on deeded land.

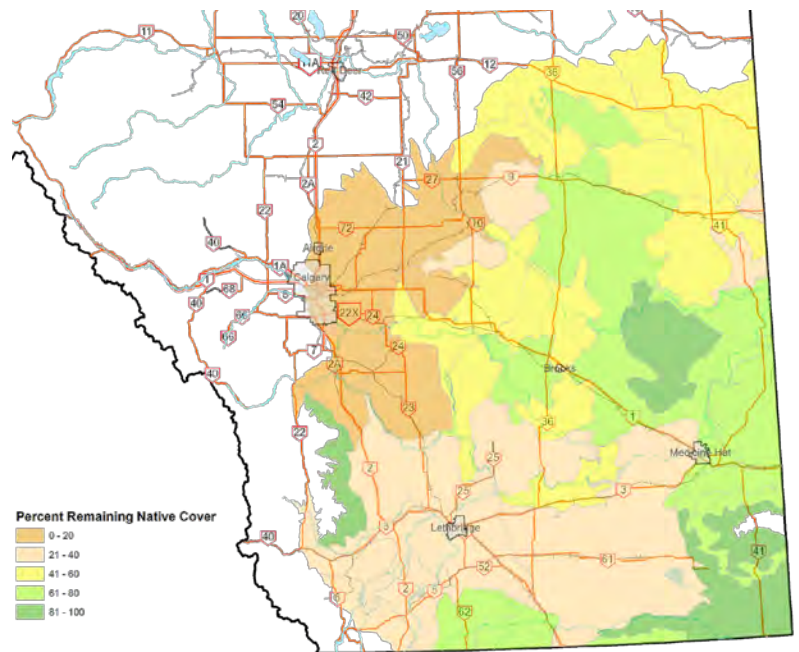


Figure 4. Percent native cover remaining for the Grasslands Ecodistricts based on AAFCLU2010 data.

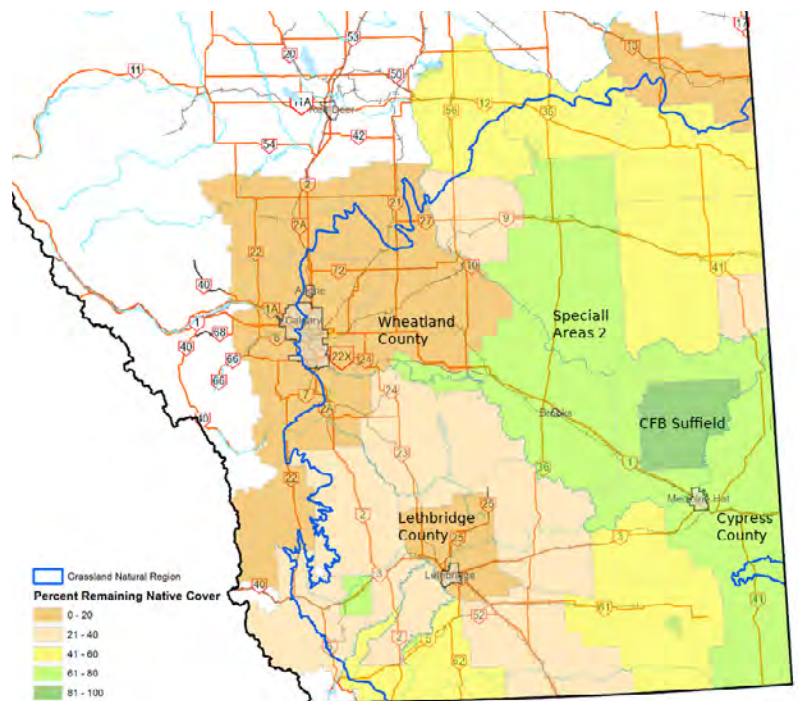


Figure 5. Percent native cover remaining for Grassland Region Administrative Areas using AAFCLU2010 data.

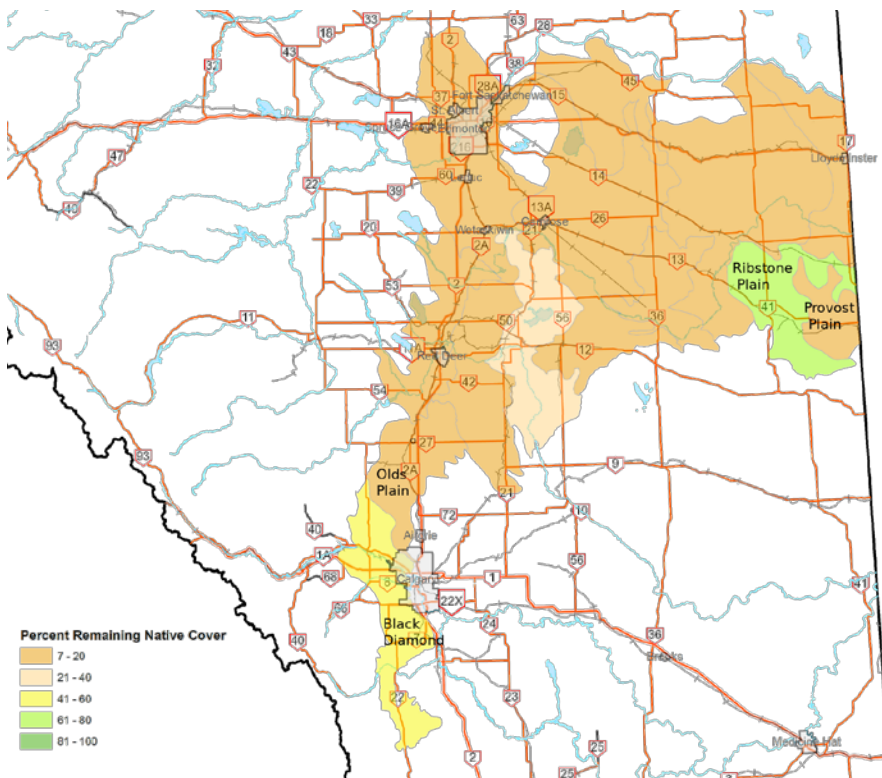
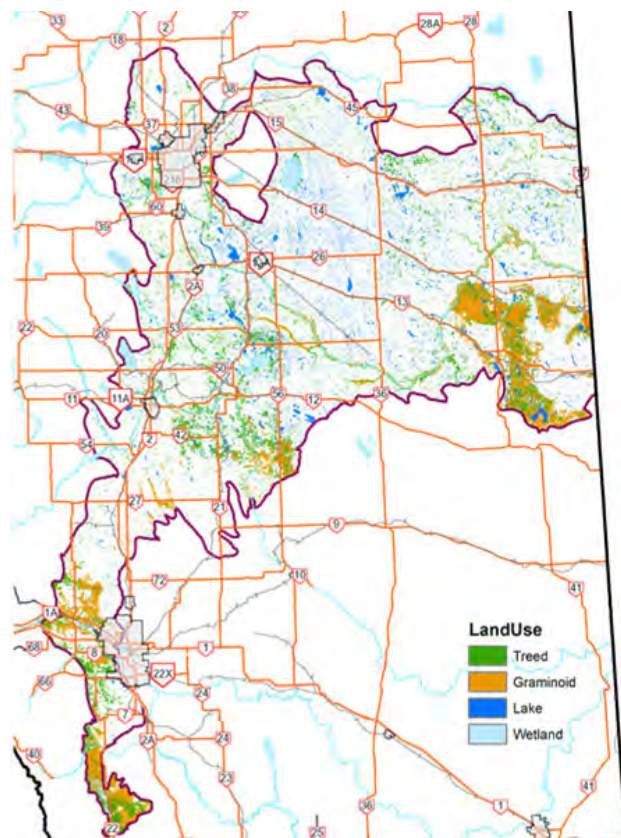


Figure 6. Spatial distribution of native vegetation cover (four classes) for AAFCLU2010 for the Parkland Natural Region.

Figure 7. Percent native cover remaining for Ecodistricts in the Parkland Natural Region using AAFCLU 2010 data.



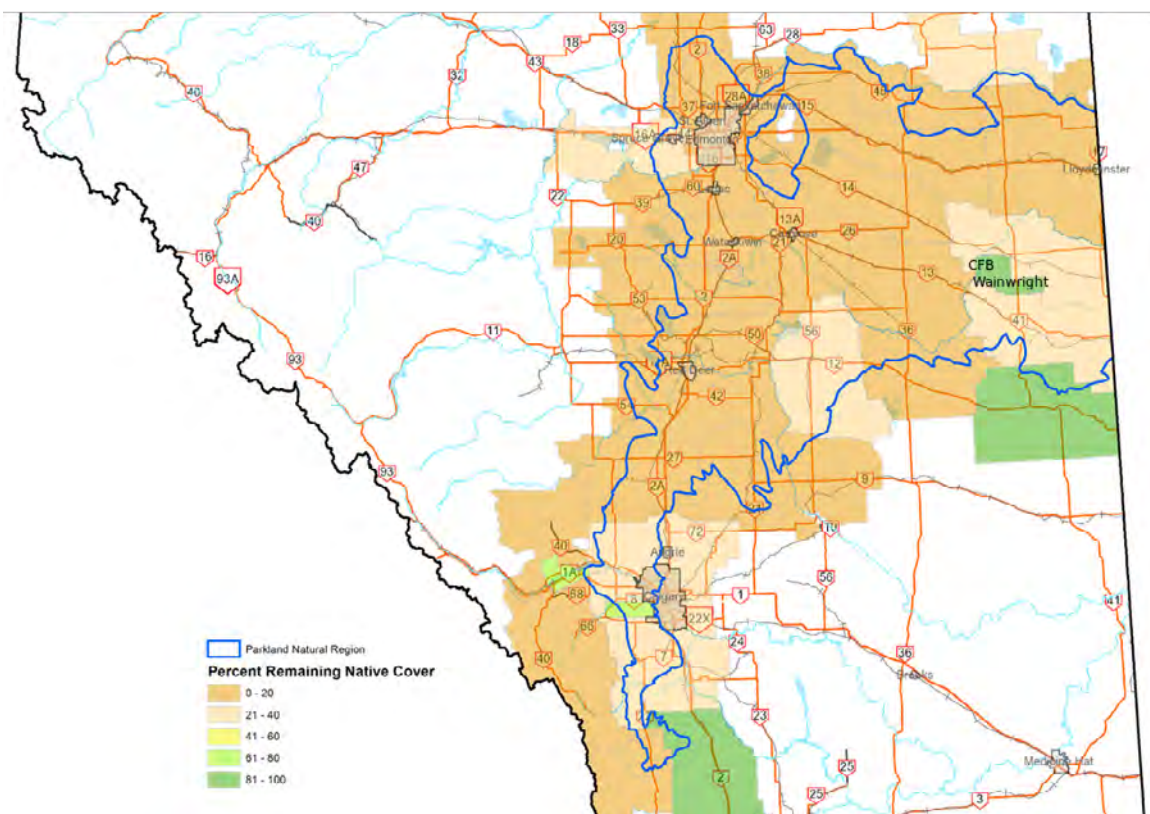



Figure 8. Percent native cover remaining for Parkland Natural Region administrative areas using AAFCLU 2010 data.

The Parkland Natural Region was also assessed from the tenure perspective. Total remaining native cover for this Natural region is 20%, of which 6% is on public land and 14% on private land. All the public lands contain 54.4% native cover while all the private lands contain 15.8% native cover. A couple of observations come to light with the above statistics; native cover is found on only a little more than half the public lands (one would expect more) and that since most of this Natural Region is deeded land (almost 90%), most of the remaining native cover is on private land.

Overall, within both Natural Regions the municipal and administrative areas with the least native prairie cover are those most suitable for annual crop production and with the least limitations in soil, climate, and landscape under the land suitability rating system (LSRS). Also, within these areas in the Grassland Natural Region, irrigation expansion for a variety of crops has facilitated conversion to annual crops making inherently drier areas within the dry-mixedgrass area more suitable for high value annual crops. Some municipalities and administrative areas closer to large population centres also experience conversion to other uses such as residential housing and industrial activity.

2.6 Changes to native prairie in the Grassland and Parkland Natural Regions

The change in native cover for both the Grassland and Parkland Natural Regions is best represented by the AAFCLU data and can be compared between 1990 and 2010 for both Natural Regions. The change in native cover between the two dates is 2.6% and 2.3% for the Grassland and Parkland Natural Regions, respectively. This change falls within the natural variance or error within the data. Where we see change at greater magnitudes



is when smaller areas in the Natural Regions are considered. For example, the greatest change by Subregion in the Grassland is found in the Mixedgrass with a loss of 5% and by Ecodistrict the greatest change is noted in the Lethbridge Plain with a loss of 8%. From the administrative areas' perspective, the greatest losses are found in the Municipal District of Willow Creek at 5% and the Kainai IR 148 at 19%. Similarly, in the Parkland Natural Region, the greatest losses by Subregion and Ecodistrict are found in the Foothills Parkland and the Black Diamond Upland at 5.5% and 6%, respectively. From the administrative areas lens, this view of the data is somewhat compromised as most of the areas are not wholly contained in the Parkland Natural Region; however, the greatest change is noted in the MD of Provost with a loss of 3%.

3. Shaping the Future

3.1 Contrast between Natural Regions

The State of the Prairie clearly shows that the Grassland Natural Region retains roughly four times the native cover compared to the Parkland Natural Region. When comparing these two Natural Regions, post-colonial human settlement and subsequent agricultural development have been shaped by differences in climate, soil productivity and topography. The Parkland, with its more favourable precipitation regime, rich chernozemic soils and more moderate topography, has experienced significantly greater conversion pressure from native cover to crop production. In the Grasslands, especially the semi-arid portions, ranching has been correlated with and adapted to the vast majority of remaining areas of native cover. Cultivated agriculture has developed where soils and climate have been suitable, with additional areas of expansion into native landscapes with irrigation.

Agriculture has been the initial major driver of native cover loss, but other drivers persist as well. Large urban centres like Calgary and Edmonton have significantly expanded in population over the past 30 years. This expansion is a result of natural population growth and immigration of people from other parts of Canada, largely driven by Alberta's oil and gas industry and the associated growth of supporting tertiary industries. As the urban centres grow, development pressures on adjacent areas also grow. Whereas the Natural Regions show losses within the margin of error of the data of 2% to 2.5%, losses of 5% to 6% have been noted in the Counties of Parkland and Strathcona adjacent to Edmonton and in the Black Diamond Upland Ecodistrict southwest of Calgary.

3.1.1 Public and private land challenges and opportunities

The South Saskatchewan Regional Plan (2014-2024, updated 2018) recognizes the importance of native grasslands. The plan includes specific strategies to achieve outcomes in biodiversity and ecosystems highlighting integrated stewardship on public land and stewardship and conservation on private land to ensure their retention. Alberta Environment and Parks is currently examining ways to "encourage and increase the use of development credits and conservation offsets in provincial development policy". Conservation offsets are a tool that have been introduced under the Alberta Land Stewardship Act (ALSA) as an action taken to counteract impacts from development that remain after appropriate efforts have been taken to avoid and minimize those impacts.

Pilot projects to test conservation tools such as conservation offsets have also been undertaken in the South Saskatchewan Region to support the development of additional tools for conservation. The multi-stakeholder Southeast Conservation Offset Pilot is one example of this type of regional or provincial approach to grassland conservation.

Chernozemic: soils having surface horizons darkened by the accumulation of organic matter from the decomposition of grasses and forbs representative of grassland communities or of grassland-forest communities with associated shrubs and forbs.

Within this context, perhaps the largest potential impact for projecting what remains of native landscapes in both Natural Regions may be guided by the policies that government maintains and enhances with respect to public grazing lands, the largest areas of which are managed by Alberta Environment and Parks and by the Special Areas Board. Government can foster a high standard of rangeland resource stewardship through policies like 'Extended Grazing Disposition Tenure for Exemplary Stewardship' where the terms of grazing leases are granted for an extended time period when superior stewardship practices are applied. Also, as ranchers manage private land in conjunction with public grazing leases, their good stewardship can be leveraged if recognized and supported through a variety of initiatives so competition for land and land prices does not lead to conversion for other uses.

Many private landowners and non-government organizations throughout these regions support and undertake initiatives that conserve, and/or enhance native prairie and parkland and the associated wetlands within. Specific programs include the Multiple Species at Risk Program (MULTISAR), a partnership between the Alberta Conservation Association, Alberta Environment and Parks and the Alberta PCF. This program works with ranchers and other landowners to develop, maintain and enhance wildlife habitat for multiple species on their land that also align with the rancher's stewardship and management goals. The Nature Conservancy of Canada (NCC) and other land trusts work with landowners through funding conservation easements and, in the case of the NCC, providing grazing opportunities on NCC lands for local landowners in exchange for adoption of beneficial management practices for biodiversity enhancement. Ducks Unlimited and Alternative Land Use Services (ALUS) Canada are additional organizations that engage with private landowners to support conservation. ALUS works through local municipalities and producer advisory groups who provide payment for ecosystem services to landowners for the adoption of beneficial management practices.

These provincial, municipal and non-government organization initiatives help address and potentially mitigate the underlying economic barriers in retaining native grasslands in light of other land use pressures. Through an integrated approach with provincial and municipal governments and non-government organizations, the opportunity to leverage policies, conservation tools, funding and expertise to retain native prairie is achievable with consistent effort.



As ranchers manage private land in conjunction with public grazing leases, their good stewardship can be leveraged if recognized and supported through a variety of initiatives so competition for land and land prices does not lead to conversion for other uses.

Conservation offsets are actions that compensate for the unavoidable ecological losses arising from land development. Offsets are the fourth step in the mitigation hierarchy to address any impacts from development when avoidance, minimization and onsite mitigation are not sufficient or feasible.

Southeast Conservation Offset Pilot <https://www.alberta.ca/southeast-alberta-conservation-offset-pilot.aspx>

This pilot project focused on testing a voluntary, market-based approach to address industrial impacts on southeast Alberta's native grasslands

MULTISAR helps landowners conserve Species at Risk by performing free assessments and working with them to maintain or create habitat and benefit agricultural operations. <http://multisar.ca/>

3.2 Caution on complacency

Loss of native cover is ongoing.

The State of the Prairie confirms conventional wisdom: loss of native cover is ongoing. We are unlikely to see a measurable, future increase in native grassland as the adjacent lands are under annual crop production or other uses which provide larger economic returns. An increase in native grassland also requires governmental policies that place much greater value on prairie and parkland landscapes, either by protecting those in the public domain or incenting private landowners to maintain them on private land. Such policies and strategies are highlighted in the South Saskatchewan Regional Plan; however, time is of the essence and implementation is essential in the very short term and on a provincial scale. We cannot be complacent, as even with action today recovering today's modified landscapes is not an easy endeavour. Field studies carried out by the Grassland Restoration Forum demonstrate that full restoration of disturbed native prairie, such as pipelines and well sites, will take multiple decades. Depending on the specific area and intensity of the disturbance, restoration can be extremely costly and difficult as some species such as rough fescue are not likely to re-establish well or at all. Climate change also adds uncertainty to the outcome, especially when compounded with a variable human response.



3.3 Prairie conservation initiatives

The State of the Prairie builds on other PCF initiatives highlighted in the Prairie Conservation Action Plan such as Minimizing Surface Disturbance of Alberta's Native Prairie: Background to Development of Guidelines for the Wind Energy Industry and The status of biodiversity in the Grassland and Parkland Regions of Alberta. These documents and other previous collaborative work on grassland inventories provide greater context on the biodiversity within grassland and parkland ecosystems and the management practices that support their ongoing health and existence. The current work on the state of the prairie provides the comprehensive assessment from which we can apply this knowledge to our current and future management and conservation.

Native prairie is the foundation of all major initiatives undertaken by the PCF in recent years. Indeed, the State of the Prairie itself would not have been possible without PCF leadership and support in the development of two of the major provincial inventories that partially underpin it: the NPRI and the GVI mentioned above.

The vast majority of native prairie in Alberta is a "working landscape", with industrial activity superimposed on the rangeland land use. Over much of the landscape, industrial intensities are low, but some areas are heavily impacted. Impacts at all stages of development, from planning through production and distribution to decommissioning or abandonment, can dramatically affect outcomes for native prairie and all surface disturbances are pathways for invasive and modified plant communities. As part of the PCF's enduring commitment to working with industry and government, the organization has highlighted energy sector impacts on native prairie and developed tools to support the development of policies, plans and best practices to conserve native prairie. As a result, the measures to reduce the impact of both conventional and renewable energy sector development on native prairie, as well as land use planning controls to retain and conserve native prairie, have been adopted by government regulators and land and resource management agencies.


Prairie Conservation Action Plan <https://www.albertapcf.org/about-prairies/prairie-conservation-action-plan>

The goal of these five-year plans is to use collaborative approaches among our diverse member stakeholders and partners to initiate and sustain prairie-wide efforts to conserve and manage native prairie species, communities and habitats.

Minimizing Surface Disturbance of Alberta's Native Prairie: Background to Development of Guidelines for the Wind Energy Industry https://www.albertapcf.org/rsu_docs/wind-energy-background-final-december-2010.pdf

The status of biodiversity in the Grassland and Parkland Regions of Alberta <https://abmi.ca/home/publications/401-450/424>

PCF Industry Recommendations and Guidelines <https://www.albertapcf.org/about-prairies/industry-recommendations-guidelines>



As mentioned earlier, to better understand the value of native prairie to native biodiversity, the PCF partnered with the Alberta Biodiversity Monitoring Institute to assess the status of biodiversity in the grassland and parkland. The resulting report looks specifically at an area that the PCF refers to as the 'High Value Landscape', an area characterized by large, mainly intact tracts of native grasslands. The ABMI assessed the status of 197 species in the Prairie Region and found them to be, on average, 69% intact inside the High Value Landscape and 43% intact outside.

If Albertans do not understand or value native prairie, then it has no future.

If Albertans do not understand or value native prairie, then it has no future. Providing educational resources and opportunities to inform Albertans about the value of native grasslands has been a core function of the PCF since its inception in the late 1980s. In addition to the PCF website there have been several projects, including "Deep Roots" an educational videoconferencing tool aimed at schoolchildren in grades 4-7.

Since the overwhelming majority of native prairie is in rangeland, working with ranchers is critical to conserving it. Historically, the provincial Public Lands Division provided range stewardship courses. In recent years the PCF has worked with multiple partners including government, non-government organizations and the beef industry, to develop and deliver an annual Alberta Range Stewardship Course that is provincial in scope and regional and local in delivery. The PCF also partners with the Alberta Conservation Association and Alberta Environment and Parks in support of the MULTISAR program.

Whether spore, bird, seed or mammal – life moves.

The vision has remained constant -- conserving the biological diversity of native prairie and parkland ecosystems.

Whether spore, bird, seed or mammal – life moves. And if the pathways essential to that movement are broken, native prairie ecosystems are at risk. In recent years the PCF has devoted efforts to understanding and conserving the connectivity requirements of native grassland species and ecosystems, both within Alberta and beyond. The native prairie in Alberta is part of a larger North American continental grassland, the Great Plains (Figure 1) that spans an area from Canada through to Mexico. Loss of significant portions of grasslands or impacts

due to invasive species or infrastructure, may affect and cause the decline or loss of these species. In 2016 the PCF initiated the Transboundary Grasslands Partnership, working with Saskatchewan and Montana partners to embrace a vision of native prairie conservation that connects across borders.

Finally, nothing that we value can be taken for granted and sticking with our collaborative, multi-stakeholder conservation efforts is a prerequisite to being on a trajectory toward something better. The 2021-2025 Prairie Conservation Action Plan is a seventh generation product. Since 1989 successive five-year blueprints have been crafted to address emerging issues, capitalize on opportunities, and continue the journey, but the vision has remained constant -- conserving the biological diversity of native prairie and parkland ecosystems.

Deep Roots <https://www.albertapcf.org/current-education-programs>

Alberta Range Stewardship Course <https://www.albertapcf.org/about-prairies/range-stewardship>

PCF Connecting Corridors <https://www.albertapcf.org/connectivity>

Transboundary Grasslands Partnership <https://www.albertapcf.org/about-prairies/transboundary-grasslands>

4.0 Applications

4.1 Maintaining intactness of native grassland and parkland – regional plans and deeded land incentives

With the uncertainty of a changing climate and various land use pressures that either fragment or outright convert native prairie to other uses, it is critical to retain what native prairie and parkland we have left to ensure ecosystem function that supports viable habitat for wildlife, resilient grasslands for livestock grazing, and other cultural and societal values. This is especially critical within the High Value Landscapes (Appendix 2) identified in The Status of Biodiversity in the Prairie and Parkland Regions of Alberta: Preliminary Assessment 2015. These High Value Landscapes are critical as native vegetation accounted for 69% of the area, compared to only 43% outside of this area. The High Value Landscapes are comprised of public and private lands primarily used for grazing. Supporting this complementary and sustainable land use will be critical to maintaining these high value landscapes. By knowing where the major areas of prairie and parkland have been subject to fragmentation and loss, as well as where the larger, more intact native prairie remains, we can be better prepared with tools and strategies to maintain landscapes that support ranching, wildlife conservation, watershed protection and drought resiliency.

Where there is greater human footprint there is less overall biodiversity and a greater presence of invasive species. While many species can thrive in disturbed or converted landscapes resulting from increased human activities, many cannot. This is especially critical for species that require intact or unfragmented grasslands for their survival, such as Western meadowlark and Sprague's pipit. Minimizing our human footprint will enable the conservation of and reduced impacts to the landscape both within and outside these High Value Landscapes, ensuring we retain native grasslands and the ecosystem services they provide.


Many tools are needed to enable both decision-makers and landowners in their conservation actions. In the words of A.E. Cross, "Take care of the land and it will take care of you". Effective conservation practices will enable economic resilience, which in turn supports the maintenance of native prairie by government, the ranching community, and the Alberta public. If landscapes are to be managed, they must be effectively monitored with meaningful metrics. The Alberta Biodiversity Management Institute continues to develop and refine landscape-level biodiversity assessments, providing much needed metrics for assessing ecological intactness and fragmentation. The data and map products from the State of the Prairie will facilitate more integrated decision-making with sectors and agencies working from a common data set, one that can be re-evaluated over time.



Sprague's pipit



Western meadowlark



Programs and policies are needed to incentivize conservation as competing land uses that provide more taxation revenue and economic drivers, such as land and commodity prices, often create a disincentive to the retention of native prairie. Payments for ecosystem services have been suggested as one way to recognize the importance and value of these services and to reward the practices that maintain them and the ALUS program does just that. Such financial rewards are an essential tool, especially for those services that constitute a public good (e.g., water filtration, carbon storage). These are not monetized like food production but are contributed to through the private stewardship and management by landowners at their individual cost. Currently, 16 municipalities are participating in ALUS programs in Alberta and are successfully rewarding activities that provide ecosystem services for the public good.

4.2 Transboundary, provincial and municipal initiatives

4.2.1 Transboundary Grasslands Partnership

The Transboundary Grasslands Partnership brings together partners from Alberta, Saskatchewan, Montana, and First Nations. The Transboundary Grasslands Partnership was established to foster collaboration, the sharing of information and strategy development. This partnership sets the stage for further pooling of resources and data through a transboundary-scale grasslands mapping initiative to support conservation efforts. Working with GIS experts across jurisdictions we can find ways to integrate or use data that will build a comprehensive picture of change within this area and identify the key areas of greatest impact to focus our efforts on relevant policy and conservation actions.

The AAFCLU data is a national inventory and is available for a broader national grasslands approach, such as the Pan-Canadian Approach to Transforming Species at Risk Conservation in Canada initiative sponsored by Environment and Climate Change Canada and the Canadian Wildlife Service.

4.2.2 Provincial: agriculture and energy sectors

Provincial ministries are collectively responsible for the development and implementation of environmental, wildlife, agricultural and industrial land used policy through a variety of programs. A consistent set of data and maps provides a common foundation for these Ministries and overarching regional plans to discharge their collective conservation mandates with a cost-effective and provincially uniform approach.

4.2.2.1 Agriculture

Recently, a province wide initiative with agricultural commodity groups and Alberta Agriculture and Forestry to support prioritization of funding through the Canadian Agriculture Partnership (CAP) program utilized the State of the Prairie data as part of this prioritization approach. This program funds agricultural management practices that provide environmental benefits and supported the delivery of cost-effective funding to achieve positive environmental outcomes through a GIS-based prioritization approach. This approach focused on key areas of value and risk identified and ranked by the stakeholders, such as native prairie (using the State of the Prairie map layer).



4.2.2.2 Oil and gas and renewable energy

The updating of reclamation criteria for well sites and access roads by the Government of Alberta in 2010 was a significant development in support of prairie conservation. The modernization of this criteria established an expectation that disturbed native plant communities would be reclaimed to an ecological pathway, leading eventually to a state resembling the pre-disturbance condition. The reclamation criteria recommend avoiding native plant communities where possible, and if not, to minimize disturbance and apply ecologically-based methods for reclamation. Organizations like the Grassland Restoration Forum have crafted science-based recovery strategies that assist industry in applying ecological knowledge to achieve better environmental outcomes. This updated criteria have also fostered a renewed interest in the Principles for Minimizing Surface Disturbances in Native Grassland: Principles, Guidelines, and Tools for All Industrial Activity in Native Grassland in the Prairie and Parkland Landscapes of Alberta.

As the focus on managing the cumulative effects on native prairie continues to grow, the government requires industries, such as the oil and gas sector, to use the same data and maps as the provincial and municipal governments. The focus must be on the siting of industrial activities away from native prairie and parkland to minimize impacts and reclamation costs. This further complements other government mapping information for protecting habitat for wildlife, especially species at risk.

4.2.2.3 Municipal


The Miistakis Institute has worked with the Counties of Wheatland and Newell through the Least Conflict Lands project, resulting in the Least Conflict Lands: Municipal Decision Support Tool for Siting Renewable Energy Development. This study was undertaken to determine the optimal areas for renewable energy development in these municipalities that minimized impacts to agriculture, environment, and aesthetics. Participants in both the agriculture group and the environmental group highlighted native prairie as extremely important to retain.

4.3. Conservation: developing a common focus

The State of the Prairie project defines the extent, location and areas of change for native landscapes at multiple scales for the Grassland and Parkland Natural Regions of Alberta. This resource will assist government and non-government organizations to develop a common focus for retaining large blocks of prairie and parkland, which are critical to wildlife and a variety of ecosystem services. Protection efforts can be prioritized by areas, tools, and programs both to understand the causes of loss and to mitigate the impacts. There is no single approach or tool that will address all issues and working together in partnership using this information is key to implementing long term solutions for Prairie conservation.

4.4 Next steps: improving our knowledge and understanding through finer-scale analyses

While the State of the Prairie provides a better understanding of prairie and parkland losses and amount remaining, we do not have a clear understanding of the overall condition of native prairie in the Grassland and Parkland Natural Regions, including the intactness and ecological integrity of native plant communities. While the Province of Alberta has given some consideration to landscape-level cumulative effects management, little has been achieved to date and there is continuing fragmentation of native grasslands into ever smaller and more vulnerable pieces by a host of land use practices. This process brings with



it the insidious incursion of invasive species, including noxious and restricted weed species and agronomic perennial grasses like smooth brome and Kentucky bluegrass, and annuals like Downy brome. These species fundamentally change the character of prairie vegetation and reduce the prairie's ecological health and function. The disruption of historic natural fire regimes also results in the expansion of shrub and tree species, which significantly alter plant community structure, and ultimately, soil chemistry.

Agronomic: a plant species developed for the purpose of agricultural use.

A number of ecological health metrics have been evolving for use within the prairie and parkland ecosystems. The province of Alberta has developed a Rangeland Health Assessment tool for provincial grazing lands. Range health has been further adapted to wildlife habitat studies including species at risk by MULTISAR, site management planning by several land trusts, and as a restoration metric in reclamation criteria employed by the energy sector. The Alberta Biodiversity Monitoring Institute has also demonstrated the application of their assessment protocols in the 2015 Status of Biodiversity in the Grassland and Parkland Regions of Alberta report. This work included the analyses of the impacts of invasive species and the human footprint on biodiversity and could further inform strategies and areas of focus for conservation and stewardship.

Wider collaboration is required to integrate various provincial and municipal approaches to track land fragmentation and invasive species within the context of varied land ownership and administrative jurisdictions. Also looming large is the spectre of climate change with the prospect of unpredictable and potentially catastrophic changes to prairie and parkland ecosystems. With this in mind, some suggest tailoring conservation strategies to the realities on the ground. Landscape-level conservation strategies should be adopted for the largest, mostly intact blocks. Many of these are Crown lands under the jurisdiction of Alberta or Ottawa. Coordinated strategies are required on interspersed Crown and deeded lands along the foothills, on the Milk River Ridge and in the Special Areas. In other areas, notably grasslands in the Parkland (comprising only 4% of the Natural Region) the focus needs to be on conserving remnants, with conservation and non-government organizations playing a key role.

Further selective fine-scale site inventories should be conducted on a representative selection of grassland and parkland landscapes to understand the on-the-ground reality, especially with regard to reseeding, fragmentation, invasive species, and condition. This will not only help provide a sense of the true extent of native prairie on the ground, but also help tailor specific strategies to maximize effective conservation outcomes.

In our current society, land use decisions respond quickly to policy and pricing signals and there is a tendency to support uses with the potential for higher short-term economic returns. This often conflicts with long-term environmental sustainability, which has less tangible monetary benefits, especially in the short-term. Retaining viable native prairie ecosystems will require consistent and enduring policy, planning and economic frameworks. On Crown lands this would include retaining lands under long-term grazing lease tenure, continuing the policy of not selling native prairie Crown lands, and adopting allowable quarter section-based linear disturbance limits for all native prairie lands. Consideration should be given to further limiting or eliminating the disturbance footprint on specific high value landscapes. Because of the extensive disturbance footprint required for renewable energy developments, current policy prohibiting these developments on provincial Crown lands should be retained. Legislation, policy, plans and financial inducements that incent future anthropogenic disturbances to take place on human-modified landscapes would pay vast dividends for the future of our native prairie ecosystems.

On deeded lands and First Nations lands, land use controls to conserve native prairie should be adopted, but local governments and landholders need to be encouraged and supported by focused economic incentives from provincial and federal levels of government. This is in

addition to targeted grant funding under the federal and provincial Canadian Agricultural Partnership and the federal Species at Risk Program on Agricultural Lands.

Targeted efforts by conservation and non-government organizations will also continue to be extremely important. Prairie and parkland Alberta will be a continuing a prime location for energy development in this province and the centre of a burgeoning renewable energy sector. However, the development footprint must be shifted to human-modified landscapes if we want to retain functioning native prairie and parkland ecosystems along with the benefits they provide.

4.4.1. Impacts of climate change on native grassland and parkland

The emerging effects of climate change will have direct relevance to native landscapes in the prairie and parkland regions. Human modification of the natural environment that has taken place over the past 150-200 years magnifies the impacts of climate change. Agriculture, industrialization, urban expansion, dams and irrigation are among the stressing influences. Climate change further introduces a complicating variable in what is currently measured as a trend towards progressive loss in native cover.

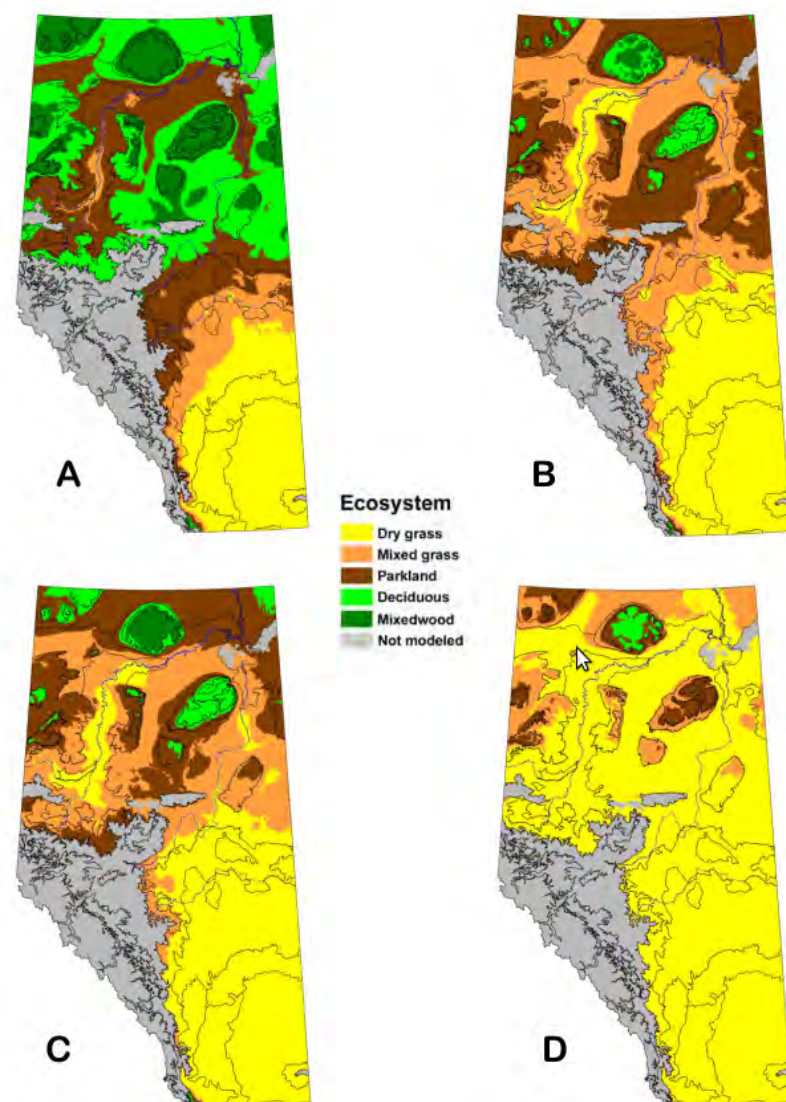



Figure 9. Grassland to boreal bioclimatic envelope model for the 2080s: Panel A= cool model; Panel B = median model; Panel C = dry model; Panel D = hot model. Reprinted with permission from Alberta's Natural Regions Under a Changing Climate: Past, Present and Future.



That Alberta's climate and weather patterns are changing is indisputable. Since the late 1940s the average temperature of the prairies has increased by 1.9°C. Edmonton's mean temperature increased 1.7°C and Calgary's 1.3°C, while in Medicine Hat, Coronation, and Lethbridge the temperature increases were 1.0°C, 0.6°C, and 0.4°C, respectively.

The rate of temperature increase has been greater in the Parkland Natural Region than in the Grassland Natural Region following the global trend of increased rate of warming observed from south to north. Conservative climate models (maximum effort in carbon emission reduction) predict increases of about 3°C, for say Red Deer, by the end of the century, whereas the more liberal models with modest carbon emission reduction predict an increase of 4.2°C.

Increasing temperatures mean more evapotranspiration and generally more moisture stress for all vegetation in the Grassland and Parkland Natural Regions. A northern expansion of a grassland-type environment into today's aspen parkland is likely. In fact, modelling by Schneider suggests grassland and parkland climatic conditions reaching Alberta's northern border by 2080 (Figure 9).

Another significant climate change-related impact on the Grassland and Parkland Natural Regions is connected to the seasonal availability of freshwater. Human water use is already creating uncertainty about water supplies and dams up and down the foothills of the eastern slopes negatively impact native riparian systems. Climate change is an additional stressor on an already stressed system. Water storage and water flow downstream of these storage structures will impact agriculture, especially from irrigation purposed dams, and likely affect the stability of the water supply to the two regions' five major urban centres.

Precipitation, although more variable, has shown an overall increase of 7% since the late 1940s and is also expected to increase by 6% (conservative model) to 15% (liberal model) by the century's end. However, the predicted higher temperatures and associated potential evapotranspiration eradicate any perceived benefit associated with higher precipitation, resulting in the two natural regions being drier.


Shank and Nixon and Schneider provide some insight on how climate change will affect Alberta's Natural Regions and species vulnerability via impacts on natural habitat. The Grassland Natural Region is noted to have the highest vulnerability of species in all of Alberta as already marginal native habitat becomes further stressed. It should be noted, however, that the stress is mitigated by more adequate grassland conditions progressing north into today's parkland, which itself would migrate northwards with warmer temperatures as predicted by the climate models. But the 'state of the prairie' in the Parkland Natural Region is already severely compromised, containing only 20% native cover, and much of that is localized in and around the Wainwright and Black Diamond areas.

Furthermore, with reduced water flow from source water in the Rockies and higher evapotranspiration, agriculture could be stressed such that current productive land could be transformed into unproductive, thus benefiting some plant and wildlife species. Current climate change trends favor less intensive agriculture and more native land use related activities, such as ranching, in these two Natural Regions. It should be noted that land cover recovery is a process that spans multiple decades to century-long time scales to revert. And, of course, the process is an open system, with humans constantly affecting outcomes.

Understanding the complex interactions when trying to isolate cause-and-effect associations with climate, ecosystems, and the influence of humans in general is a significant challenge. What we do know is that we are in the midst of a significant biodiversity transformation driven by climate change and humans, and that the longer-term outcome is not certain. Therefore, it is imperative we collaborate across sectors, sharing information and strategies, and continue to work together for the conservation and stewardship of these lands to ensure as best we can that they are resilient to these changes.

Evapotranspiration: the sum of water evaporation from the land surface plus transpiration from plants.

Transpiration: the conversion of water from a liquid to gas as it passes through plant stomata, small openings on the undersides of vascular plants.



At a broad regional scale, multiple inventories provide a combined verification on the location of Alberta's major remaining tracts of native prairie. Priority landscapes constituting "the best of the last" include the Foothills fescue grasslands fringing the Rockies, the Milk River Ridge, the great block east of Writing on Stone and south of Medicine Hat, the two federal military bases(CFB Suffield and CFB Wainwright), as well as the intervening lands in the Special Areas. These landscapes encompass portions of six Natural Subregions and contain riparian zones, badlands, sand hills and sagebrush flats, as well as upland grassland and parkland environments.

Despite all the historical and cumulative human land use impacts since European settlement began, Alberta is fortunate to have retained extensive tracts of native prairie ecosystems. This is largely due to rangeland use of native prairie, which has historically been, and continues to be, a valued land use, one that is broadly compatible with sustaining the structural and functional integrity of the native ecosystem. There is, however, no room for complacency for several reasons. First, the overall hectares of native prairie at the natural region level may overestimate what remains. As discussed, this is attributable to the scale of the analyses and changes are more marked at the more localized or subregion scale. A finer-scale analysis is likely to reveal more information on the true condition of native grasses, including reseeded grassland and significant fragmentation and infestation by invasive species.

Alberta's grasslands are among the planet's most resilient ecosystems and are likely capable of continuing to produce a suite of ecological services – as well as the best beef on the planet – far into the future.

Second, traditional human impacts have not stopped. Inexorably and cumulatively, there are ongoing impacts from the conversion of native prairie for agricultural purposes, energy sector development, urbanization and transportation and transmission infrastructure. These impacts are often cyclical and in response to economic or political signals.

Third, and more worryingly, are likely new human impacts associated with renewable energy. Without strong policy and guidance, an extensive footprint from significant energy developments such as wind and solar, are likely to take place on the lowest dollar

value landscapes. This means native rangelands, both deeded and Crown. Green energy that destroys native biodiversity is not green at all. It is critical to have policy frameworks and land use planning mechanisms to support our economy in a way that does not compound negative impacts on native biodiversity. The completion of the updated guidelines for wind development, Wildlife Wind Energy Directive by the Alberta government and the work by municipalities and the Miistakis Institute in developing a Least Conflict Lands: Municipal Decision Support Tool for Siting Renewable Energy Development, lead efforts to this end.

Finally, the greatest challenge of all: climate change. Climate change and the prospect of a drier, hotter, and more variable climate that is likely to place stresses on native biota beyond the ranges where they evolved. The climatic stressor, of course, will be layered on top of historical, ongoing, and future impacts.

Our native grass ecosystems in Alberta have developed in a post-glacial period in the rain shadow of one of the world's great mountain ranges. They tolerate fire and extreme winds, temperatures ranging from -40°C to +40°C as well as extended drought and wet periods. Alberta's grasslands are among the planet's most resilient ecosystems and are likely capable of continuing to produce a suite of ecological services – as well as the best beef on the planet – far into the future. Their many values to humanity are likely to endure if we work together across sectors to ensure their conservation and ongoing resilience.

Wildlife Wind
Energy Directive
<https://www.alberta.ca/wildlife-wind-energy-directive.aspx>

Least Conflict
Lands: Municipal
Decision Support
Tool for Siting
Renewable Energy
Development:
<https://landusekn.ca/resource/least-conflict-lands-municipal-decision-support-tool-siting-renewable-energy-development>

Albertans have long memories, and value symbols of our province's strength. One of these symbols is the Heritage Savings Trust Fund. Why? Because the concept of stewardship of valuable resources for the benefit of current and future generations of Albertans not only resonates strongly, but the idea doesn't age. Alberta's greatest Heritage Savings Trust Fund lies in the native landscapes of Alberta, including those in prairie and parkland Alberta where so many of us call home.





5. Bibliography

Bradley, C, F. Reintjes and J. Mahoney. 1991. The Biology and Status of Riparian Poplars in Southern Alberta. World Wildlife Fund Canada and Alberta Forestry, Lands and Wildlife, Fish and Wildlife Division. 85pp, plus appendices.

Canada's Changing Climate Report. 2019. Bush, E. and Lemmen, D.S., editors (2019): Canada's Changing Climate Report; Government of Canada, Ottawa, ON. 444 p.

Clarke et al., 2015. Projected Deglaciation of Western Canada in the twenty-First Century, *Nature Geoscience* 8, 372-377 (2015).

Hammermeister, A, D. Gauthier, K. McGovern, 2001, Saskatchewan's Native Prairie: Taking Stock of a Vanishing Ecosystem and Dwindling Resources. 17pp

Hayhoe, K. and A. Stoner, 2019. Alberta's Climate Future, Final Report 2019, Atmos Research and Consulting, Lubbock, Texas, USA.

Janzen H.H., B. H. Ellert, J.F. Dormaar and *D.C. Henderson 2002. Rangelands. A Storehouse of Carbon. Paper presented to the Western Range Management Seminar, Alberta Agriculture and Agri-Food Canada, Lethbridge, Alberta, Canada, *University of Alberta, Edmonton Alberta. 4pp.

Lee, T., K. Learned, K. Sanderson, 2018. Municipal Decision Support Tool for Siting Renewable Energy Development. Miistakis Institute. 62pp.

Neville, M., M. Alexander, B. Adams, C. DeMaere, D. Lawrence, and S. McGillivray. Principles for Minimizing Surface Disturbance in Native Grassland. Alberta Government. 2016. 40pp

Schneider, R., 2013. Alberta's Natural Subregions Under a Changing Climate: Past, Present, and Future. Prepared for the Biodiversity Management and Climate Change Adaptation Project, Alberta Biodiversity Monitoring Institute (ABMI), Edmonton, Alberta.

Shank, C. and A. Nixon, 2014. Climate Change Vulnerability of Alberta's terrestrial biodiversity: a preliminary assessment, Prepared for the Biodiversity Management and Climate Change Adaptation Project, Alberta Biodiversity Monitoring Institute (ABMI), Edmonton, Alberta.

The Alberta Biodiversity Monitoring Institute. 2015. The Status of Biodiversity in the Prairie and Parkland Regions of Alberta: Preliminary Assessment. Alberta Biodiversity Monitoring Institute, Alberta, Canada. 52pp.

Wilsey, C.B., J. Grand, J. Wu, N. Michel, J. Grogan-Brown, B. Trusty. 2019. North American Grasslands. National Audubon Society, New York, New York, USA. 57pp.

World Resources Institute 2000. World Resources 2000-2001: People and Ecosystems: The Fraying Web of Life. Canada. World Resources Institute. 389pp.

World Wildlife Federation. WWF 2020 Plowprint. 4pp.

6. Web Links

[af-agriculture-statistics-factsheet-2019.pdf](#)

<https://www.alberta.ca/fragmentation-and-conversion-of-agricultural-land.aspx>

<https://open.alberta.ca/publications/annual-report-land-use-changes-in-alberta>

https://www.albertapcf.org/rsu_docs/jan27-abmi_grasslands_cb-2016-final_web_singles.pdf

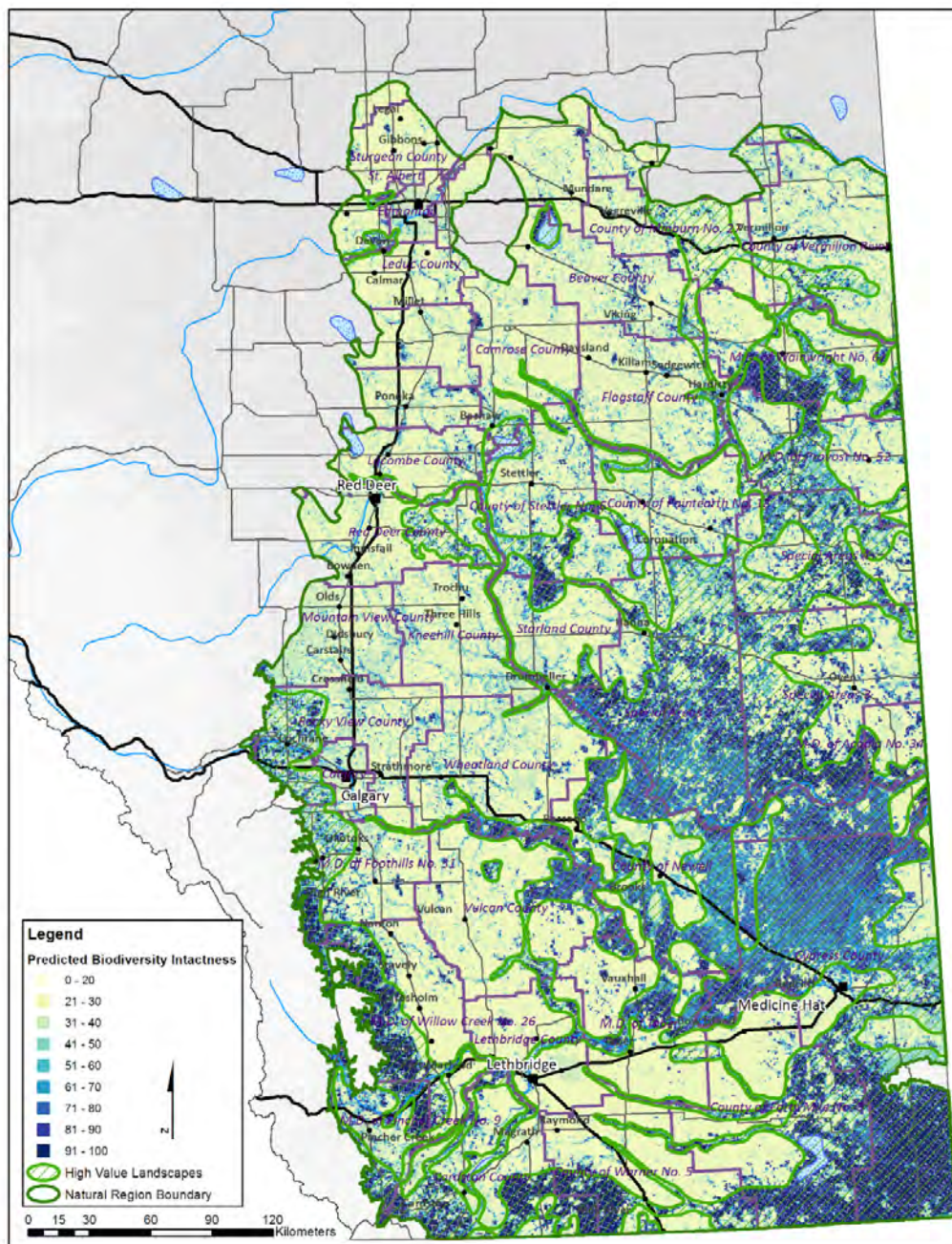
<https://open.alberta.ca/dataset/13ccde6d-34c9-45e4-8c67-6a251225ad33/resource/e643d015-3e53-4950-99e6-beb49c71b368/download/south-saskatchewan-regional-plan-2014-2024-may-2018.pdf>

<https://www.mrlc.gov/>

Appendix I. Summary of remotely sensed inventories considered for the 'State of the Prairie'.

Name of Inventory	Date(s) of Inventory	Data Source Base	Compilation Process	Extent
Native Prairie Vegetation Inventory (NPVI)	1991-1993	1:30 000 Panchromatic Black and White Aerial Photography	Air photo interpretation – quarter-section resolution using stereoscopes	Grassland Natural Region
Grassland Vegetation Inventory (GVI)	2006-2016	0.4m resolution Color Infrared digital aerial photography	Digital Softcopy Photogrammetry – 2 ha minimum polygon size	Grassland Natural Region
Prairie Farm Rehabilitation Administration Land Cover (PFRA)	1995	Landsat 30m	Supervised (?) Classification	Grassland and Parkland Natural Regions
Agriculture and Agri-Food Canada's Annual Crop Inventory (AAFCACI)	2016	Landsat, AwiFS, Radarsat 30m	Supervised (?) Classification	Grassland and Parkland Natural Regions
Agriculture and Agri-Food; Canada Land Use Inventory, 1990 (AAFCLU90)	1990	Landsat 30m	Supervised (?) Classification	Grassland and Parkland Natural Regions
Agriculture and Agri-Food Canada Land Use Inventory, 1990 (AAFCLU10)	2010	Landsat 30m	Supervised (?) Classification	Grassland and Parkland Natural Regions

Appendix 2. Biodiversity intactness within the Parkland and Grassland Natural Regions: The status of biodiversity in the Grassland and Parkland Regions of Alberta, ABMI 2015





Appendix 3. State of the Prairie Technical Committee and Project Members

Prairie Conservation Forum 'State of the Prairie' Steering Committee

Ian Dyson
Ron McNeil
Karen Raven
Bryanne Aylward
Katheryn Taylor
Christyann Olson
Megan Jensen
Grace Wark
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Technical Team

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David Spiess**
Patrick Wensveen*
Barry Adams
Ed Karpuk*

DLR – German Aerospace Center
Maapera Analytics Inc. (Preston Sorenson)
Corrina Copp- Alberta Biodiversity Monitoring Institute

*Current or Former AB Environment and Parks

** Current or Former AB Agriculture and Forestry