

RANGELAND RESEARCH INSTITUTE (RRI)

2015-2016 Annual Report



UNIVERSITY OF ALBERTA
FACULTY OF AGRICULTURAL,
LIFE & ENVIRONMENTAL SCIENCES
Rangeland Research Institute

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1. Introduction

The University of Alberta's Rangeland Research Institute (RRI) has the unique mandate of promoting relevant research, teaching and outreach activities, with a collective goal of improving the environmental and economic sustainability of rangeland ecosystems. Established in 2011 by the Faculty of Agricultural, Life and Environmental Sciences (ALES), the RRI has undertaken a wide range of research in support of understanding how rangelands inherently function, and improving their stewardship under ongoing land uses such as grazing and energy extraction. While focused to a large extent on the University of Alberta Mattheis and Kinsella Research Ranches, the footprint of the RRI extends well beyond these locales. The RRI also uses numerous privately owned land bases and publicly administered grazing leases and allotments across Alberta and beyond, thereby ensuring widespread applicability of its scientific work.

This report summarizes key activities undertaken by the RRI from April 1, 2015 through March 31, 2016. Included is a brief overview of research activities, including a special feature on recently completed projects on Alberta rangelands; an update on activities associated with expanding research capacity; a summary of major communication and outreach activities for the RRI; a review of role of the RRI Strategic Advisory Council; as well as a financial summary of the previous year.



Scenic overview of Matzhiwin Creek situated on the south end of the University of Alberta Mattheis Research Ranch.

2. Research

Rangelands are important terrestrial ecosystems across the globe, with grasslands and shrublands covering approximately 40% of the earth's terrestrial surface. They comprise large regions of western Canada. Alberta contains more than 10 M ha of rangeland and introduced grassland, which combined, helps support 40% of the Canadian beef cattle breeding herd. Additionally, public land in Alberta provides as much as 20% of the summer feed supply for cattle. These complex ecosystems sustain livestock, wildlife, ranchers, and rural communities by supplying a wide variety of ecological goods and services (EG & S). While the historical role of rangelands in providing forage for the livestock industry is relatively well-known, the key role that rangelands play in providing other critical environmental services is only recently being addressed in research. The latter includes greenhouse gas mitigation and carbon sequestration, the provision of habitat and biodiversity conservation, as well as pollution abatement and flood control. To date, many of these services considered crucial for human existence remain poorly understood and un-quantified, and as a result, limited policy exists to effectively reward rangeland managers for maintaining or improving them. By focusing research attention on rangelands, the RRI aims to build a more complete understanding of the complex ecological function and socio-economic value of these important activities for all Canadians.

During 2015-16, researchers affiliated with the RRI addressed a wide range of topics of key importance to those concerned with sustainable rangeland management. Research topics included cattle grazing behavior and feed efficiency, grazing management impacts on forage agronomy and rangeland biodiversity, invasive species mapping and evaluation, the assessment of pollinator populations and associated functional impacts in agro-ecosystems, soil re-vegetation following industrial disturbance, as well as soil nutrient cycling dynamics, carbon storage and greenhouse gas (GHG) mitigation. A complete list of these projects is shown in Appendix I. Many of these activities took place entirely or partially on the Mattheis and/or Kinsella Research Ranches, which effectively serve as 'living laboratories'. These land bases enable researchers to conduct a variety of studies ranging from *in-situ* retrospective assessments of existing biota, to highly manipulative experimental studies of ecosystem responses to a variety of human land uses or other natural disturbances.

A total of 48 individual researchers, including 11 principle scientists, 17 graduate students, 11 undergraduate and 9 visiting scientists, post-doctoral fellows or senior technicians, spent time on the Mattheis Research Ranch during 2015-16, spending 982 person-days at the facility. The most active researchers were from the Faculty of ALES, with strong representation from several others, including Biological Sciences, Earth and Atmospheric Sciences, and Anthropology. Additionally, the Mattheis Ranch was visited by researchers from the University of Calgary, Agriculture and Agri-Food Canada, Environment Canada, Alberta Environment and Parks, Livestock Gentec, Alberta Agriculture and Food, the Agricultural Financial Services Corporation, and the Alberta Biodiversity Monitoring Institute. Most of the projects being undertaken are highly collaborative in nature and many involve numerous study sites distributed regionally across the province. Having multiple study sites is critical in ensuring that research results apply to as broad a range of agro-climatic conditions as possible, and they also contribute greatly to public outreach by providing local sites for demonstration through field tours and workshops. Along with collaboration from public land agencies (i.e. Alberta Environment and Parks), a number of projects have strong participation from private organizations, which helps maintain relevance to issues of significant concern to ranchers and industry.

During 2015-2016, a strategic decision was made not to have a call for Competitive Grants through the RRI. This was done to maximize the short-term financial resources available to direct into the Rangeland Ecology and Management Fund (discussed below). Competitive Grants will resume in the winter of 2017.



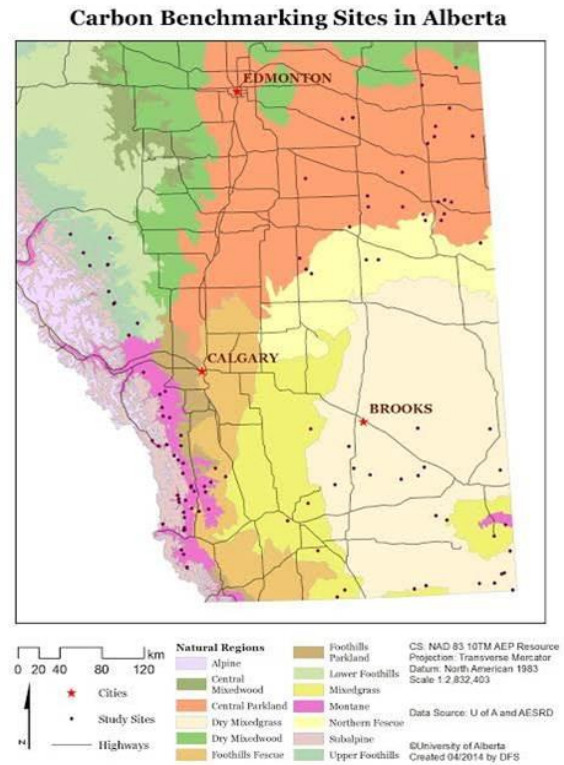
Early morning sunrise over the headquarters of the Mattheis Research Ranch prior to a long day of cattle processing. Photo by Carolyn Fitzsimmons.

3. Research Profiles

Carbon Benchmarking in Alberta Grasslands *Prepared by E. Bork*

A team of researchers from across Alberta, including the University of Alberta, Agriculture and Agri-Food Canada, and Alberta Environment and Parks, recently completed a study evaluating the long-term effects of ongoing exposure to cattle grazing on EG & S derived from public lands at 114 sites. This investigation, supported by the Alberta Livestock and Meat Agency and the Provincial Rangeland Management Branch, provided unique insight into how grasslands across widely varying agro-climatic zones respond to livestock grazing, including changes in plant biomass, diversity, and carbon stocks. Grazing was associated with increased grassland diversity in areas with intermediate rainfall (i.e. Parkland and Foothills Fescue), and boosted grassland shoot and root biomass in wetter Montane environments of SW Alberta, a response that coincided with an increased presence of introduced plant species. The diversity of introduced plant species within grasslands of other regions appeared to be relatively unresponsive to grazing. Across all regions, long-term grazing tended to increase soil organic carbon mass, with considerable carbon stored in the surface organic mulch layer of grassland ecosystems. Notably, grazing was also associated with lower shrub cover in foothill grasslands and could be an important mechanism to help conserve grasslands threatened by shrub encroachment.

Comparison of native grasslands with alternative agricultural land uses, such as introduced pasture and cropland, revealed the former had up to 1.6 times greater total



Study sites sampled covered a wide range of soil, climatic and vegetation conditions, including the Upper Foothills, Montane, Foothills Fescue, Aspen Parkland, and both the Mesic and Dry Mixedgrass.

carbon mass, improved soil structure, and a superior ability to deliver water during periods of moisture stress. The value of carbon currently retained in native grasslands of Alberta was estimated to exceed \$ 9B. This value is derived using current market values for CO₂ based on compliance costs for large emissions and current areas of each land use. Conversely, the value of carbon already lost by past land use conversion is much larger at nearly double this figure.

In summary, results from this project highlight both the importance of native grasslands and the compatibility of livestock grazing in maintaining, and sometimes increasing, a variety of environmental goods and services, including forage production, biodiversity and ecosystem carbon storage. While mechanisms exist to reward crop farmers and feedlot operators to reduce their carbon footprint, currently there is no market mechanism for native grassland managers to benefit from enhanced carbon stocks. This study provides an improved baseline to inform regulators and policy makers on the role of grasslands in providing these EG & S, including directing future strategies for valuing existing carbon stores. For more information, contact Dr. Edward Bork (edward.bork@ualberta.ca).



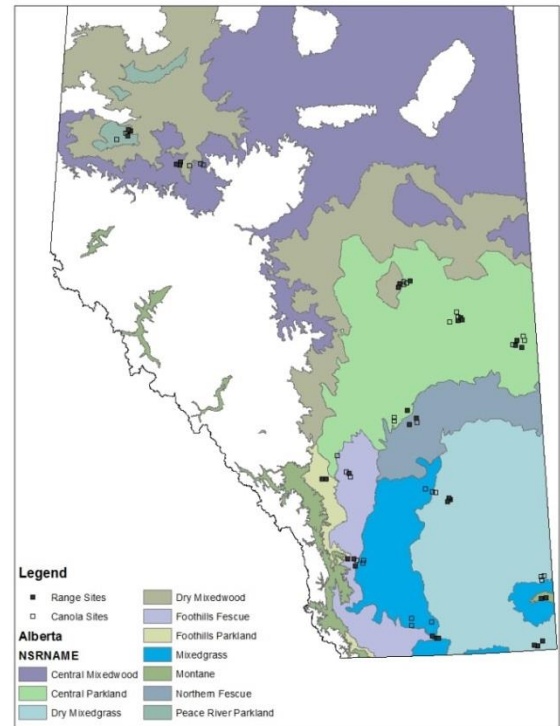
Example of a long-term rangeland reference area used to examine the long-term effect of cattle grazing.



Native grasslands such as this plains rough fescue community appear critical in storing carbon and reducing greenhouse gases, particularly within surface mulch and organic matter enriched soil.

Native Bees in Alberta's Agricultural Landscape
Prepared by C.N. Carlyle

Over the past two years a team of researchers from the University of Alberta have been surveying bee communities in grasslands and canola fields throughout southern and central Alberta. Recent studies have demonstrated that not only are commercial honey bees declining, but there have also been drops in native bee numbers, likely due to threats such as changes in land-use, pathogens, pesticides and climate change. Alberta is home to nearly 300 species of bee but there have been no systematic survey of their distribution and abundance, despite their importance for flowering plants in both native ecosystems and croplands. Many of these bees are less successful in nesting within disturbed soils, including soils tilled for crops, and are dependent on other habitats, such as grasslands. However, grasslands that support cattle may affect the plant communities and soils through grazing and trampling, which may have repercussions for bees. The researchers surveyed 35 grassland sites and 33 canola sites over two years for bees and measured characteristics of the vegetation, including use by cattle.



Sites sampled in 2014 and 2015 for pollinators were located throughout Alberta's southern natural regions. The study design had 12 clusters of locations, each cluster included both grassland and canola to enable comparison of land uses.

The study found over 230 species of bee. Bee communities varied across the province, with more individuals and more species found in drier parts of the province. Within rangeland sites, areas assessed as healthier, according to the Alberta Rangeland Health Assessment, tended to have both more bees and more diverse bee communities. The declines in bee abundance and diversity in less healthier grassland is attributed to changes in the flowering plant community on which the bees depend. The communities of bees using canola fields and rangelands differed from each other. While there tended to be more bees in canola fields, likely due to the large supply of pollen and nectar for bees, these areas bloom for only a short period of time. In contrast, the

diversity of flowers in grasslands helps to ensure a more continuous food source for bees throughout the season, and indeed we found more bees in areas with more diverse plant cover. We also briefly examined bee communities in relation to surrounding land-use cover and found that areas surrounded by more grassland in a 2 km radius had both more bees and more diverse bee communities. Finally, we found a modest positive relationship between bee diversity and forage quality, which we attribute to the maintenance of more diverse forb communities, which tend to be higher in protein than grasses.

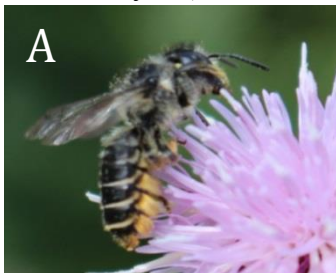
The results of this study demonstrate the importance of grassland for bees, but also show that management of grasslands for a healthier condition can increase bee abundance and diversity. These practices may extend beyond the grassland as bees can forage up to 3 km from their nest, in turn potentially increasing the yield of crops like canola. Monitoring changes in the distribution and abundance of bees may be critical for understanding the future of the vital pollination services provided by these insects. For more information on this project, please contact Dr. Cameron Carlyle (cameron.carlyle@ualberta.ca).



A graduate student targeting large bodied bees for capture and identification in a canola field.



An undergraduate student field assistant targeting large bodied bees for capture and identification in native grassland.



Some of the different types of bee found in Alberta, examples of A) leaf cutter bee, B) miner bee, C) bumble bee and D) cuckoo bee (which lay their eggs in the nests of other bee species).

4. Capacity Building

The 2015-16 year was marked by three key events critical to further enhancing the capacity of the RRI and its ongoing activities. The first was completion of a Memorandum of Understanding (MOU) between the University of Alberta and Alberta Environment and Parks in March 2016. The MOU provides a common framework integrating research and outreach activities for the Onefour and Stavely Research stations into working rangeland landscapes that includes livestock production. Both locations have a rich history of scientific enquiry and public outreach, as these were part of the Agriculture and Agri-Food Canada network of research stations until recently. Following the shut-down of these facilities by the federal government in 2014, the Government of Alberta, as the primary administrator of these lands, and the University of Alberta embarked on discussions to help ensure that the legacy of

these important land areas would continue to support rangeland research, teaching and outreach. Ultimately these discussions culminated in an MOU that provides the University of Alberta with a key voice in the activities taking place on these public grazing lands. The University of Alberta will play an important role in preserving the history of previous long-term research projects taking place on these lands. For example, the long-term stocking rate project at Stavely, which has been underway since 1949, and the grassland monitoring study at Onefour that dates back to the mid 1920's. Located in the Dry Mixedgrass and Foothills Fescue regions, respectively, Onefour and Stavely provide additional 'living laboratories' that are highly complementary to the Kinsella (Parkland) and Mattheis (Mixedgrass) Research Ranches. These research stations greatly expand



South end of Onefour Heritage Rangeland Natural Area. Photo from Barry Adams.



Stavely Research Ranch. Photo from Barry Adams.

the core infrastructure available to other biophysical environments for the testing of questions relevant to rangeland stakeholders across Alberta. Perhaps equally important, the maintenance of these stations provides additional opportunities to achieve improved training of highly qualified personnel, as well as maintain outreach to local area ranchers.

Secondly, the past year has seen a significant expansion in housing available for researchers, students and visiting staff to the Mattheis Ranch. This new housing unit will accommodate up to 24 additional staff on the station at any one time, and is sufficient to allow moderate sized undergraduate classes to visit the facility for advanced field training in grassland ecology and land use exercises.

Finally, the Rangeland Ecology and Management Fund (REMF) is a key component of the long-term infrastructure for the RRI. The REMF was established in 2014 to provide the necessary resources to ensure that the RRI can continue to meet its goal of becoming a leading center for rangeland research, teaching and training in the long-term, including the dissemination of beneficial management practices impacting all rangelands. Much of the initial investment in the REMF is associated with proceeds arising from the placement of a Conservation Easement on the Mattheis Ranch. This easement provides an added layer of environmental protection to the unique ecosystems of the property by preventing further cultivation, subdivision and wetland draining, while still allowing for both research and continued agricultural land use.



Expanded housing facility at the Mattheis Research Ranch. Photo by Cameron Carlyle



Red Deer River swollen with summer rainfall and adjacent riparian habitats on the north end of the Mattheis Ranch. Photo by Ellen Macdonald.

5. Communications

An important role of the RRI is to facilitate technology transfer of emerging research results to ranchers, rangeland managers, and other public stakeholders. This ensures the timely utilization of new information by those most likely to directly benefit in the management of rangelands, as well as enhance ecological sustainability. This is done through a variety of means, including the organization of public field days, participation in grazing schools, presentation at workshops and information sessions, and the development of popular press articles. In early July 2015, in conjunction with the ALES faculty, the RRI organized and hosted a field day at the Mattheis Ranch that was attended by more than 150 farmers, ranchers, rangeland managers, researchers, naturalists, and other interested persons. This event also celebrated the 100 year Centennial of the ALES faculty. Attendees were able to learn about new methods to assess soil health, discuss research on mixedgrass disturbance ecology and beef cattle behavior, as well as visit a site where a Centrosaur that lived some 60 M years ago was being excavated by U of A paleontologists. Several weeks later in late July, the Mattheis Ranch was host to the Southern Alberta Women's Grazing School. This sold out event brought nearly 70 women from across south-central Alberta to the Mattheis Research Ranch to examine its diverse grasslands, learn plant identification, conduct a riparian health assessment, and hear about ongoing research activities taking place.

Researchers affiliated with the RRI also presented their findings at numerous other events throughout the past year (See Appendix II). This includes presentations to the Alberta Beef Producers, the Foothills Fescue Restoration Forum, the Ladies Lessons



Attendees at the ALES Centennial celebration (top) and Southern Alberta Women's Grazing School (bottom) learn about research on EG & S at the Mattheis Ranch. Photos by Michel Proulx and Laura Blonski.

Learned Ranchers Forum, the Gateway Research Association annual meeting, and the International Meeting of the Society for Range Management, among many others. Collectively, these events have greatly aided the dissemination of knowledge on rangeland ecology, grazing management, and best management practices, and increased the profile of the RRI, the University of Alberta, and its various Research Ranches.

6. Strategic Advisory Council

The Strategic Advisory Council (SAC) provides key insight and guidance to the Rangeland Research Institute's Director and staff on the vision, direction and activities of the RRI. The current composition of the SAC as of March 31, 2016 is provided in Table 1. The SAC held its annual meeting at the Kinsella Research Ranch in October 2015, during which members heard about the current activities of the RRI, both research and communications, and discussed future directions. Additionally, SAC members had the opportunity to tour a portion of the 5,000 ha Kinsella Research Ranch and learn about its natural environment, new and ongoing research activities, as well as discuss emerging opportunities for research and training of highly qualified personnel.

Table 1. Members of the RRI Strategic Advisory Council, March 2016.

Name	Position, Agency	Location
Barry Adams*	Head, Rangeland Resource Management Program <i>Alberta Environment and Sustainable Resource Development</i>	Lethbridge, AB
Dr. Stan Blade	Dean, Faculty of Agricultural, Life & Environmental Sciences, <i>University of Alberta</i>	Edmonton, AB
Dr. Edward Bork	Director, Rangeland Research Institute; Professor and Mattheis Chair in Rangeland Ecology & Management, <i>University of Alberta</i>	Edmonton, AB
Dr. Cameron Carlyle	Assistant Professor, <i>University of Alberta</i>	Edmonton, AB
Jordon Christianson	Director, Property Administration, <i>Special Areas Board</i>	Oyen, AB
Cherie Copithorne- Barnes	Producer and Chief Executive Officer, <i>CL Ranches Ltd.</i>	Jumping Pound, AB
Floyd George	Producer; Director, <i>Eastern Irrigation District</i>	Gem, AB
Joyce Gould	Science Coordinator, <i>Alberta Parks</i>	Edmonton, AB
Edwin Mattheis	Producer (Retired)	Calgary, AB
Ruth Mattheis	Producer (Retired)	Calgary, AB
Karen Raven	Agriculture Land Use Specialist, <i>Alberta Agriculture and Rural Development</i>	Edmonton, AB
Karen Schmid	Beef Production Specialist, <i>Alberta Beef Producers</i>	Calgary, AB

Josie Van Lent	Producer; Dean, Agricultural Sciences & Human Service, <i>Lakeland College</i>	Vermillion, AB
Dr. Walter Willms	Researcher (Emeritus), <i>Agriculture & Agri-Food Canada</i>	Lethbridge, AB
Dave Zehnder	Producer; Program Coordinator, <i>Ecological Services Initiative</i>	Invermere, BC

* Chair of RRI Strategic Advisory Council

7. Financial Overview

The Rangeland Ecology and Management Fund (REMF) was established as an endowment in 2015, and included funding contributions from powerline construction, a contribution from the Alberta Beef Producers, and significant contributions associated with the placement of a conservation easement on the Mattheis Research Ranch. The current value of the REMF as of March 31, 2016 was \$4,218,789 (Appendix III). The balance of the revenue from the conservation easement will be deposited into the REMF over the next 1.5 years, as matching contributions from the University of Alberta. The REMF will serve as a critical source of long-term funding for rangeland research, thus allowing the RRI to better fulfill its mandate.

A summary of the 2015-16 financial statement for the RRI is provided in Appendix IV. This statement includes a review of income, primarily surface lease revenue from oil and gas activity and utility (powerline) development, as well as expenses. Expenses include costs associated with outreach and communications, administrative operations of the RRI including the Program Coordinator, ongoing secondary support of various research activities, capacity development, and the direct costs associated with the RRI Competitive Grants Program.

Appendix I. Summary of ongoing research projects led by RRI affiliates

All projects listed are being undertaken by various research affiliates associated with the RRI during 2015-16. * Indicates projects that have received support from the RRI Competitive Grants Program.

Project Title	Principle Investigators
Grazing effects on the plant-pollinator relationship: a contrast of native legumes with an invasive (<i>Astragalus cicer</i> L.)*	Cameron Carlyle
A proposal to conduct baseline archaeological research on the Kinsella and Mattheis Ranches*	Jack Ives
Mitigation of high voltage powerline construction on mixedgrass prairie	Edward Bork, Cameron Carlyle & Sylvie Quideau
Tools to guide management of invasive species in rangeland ecosystems*	Ellen Macdonald & Joyce Gould
Seedbank dynamics in rangelands relative to disturbance history	Edward Bork & Linda Hall
Mechanisms for smooth brome invasion and the possibility of an invasional meltdown*	James Cahill
Testing cow/calf feed efficiency under open-range grazing	Edward Bork, Graham Plastow, John Basarab, Colin Coros & Carolyn Fitzsimmons
Long-term monitoring of rangeland ecosystem functions on the Mattheis and Kinsella Research Ranches*	Cameron Carlyle
Agroforestry systems for reducing GHGs	Scott Chang, Edward Bork & Cameron Carlyle

Differentiating and understanding the roles of soil nutrient and soil community heterogeneity on plant growth, carbon storage and biodiversity*	James Cahill
Defoliation and altered precipitation effects on forage agronomy	Edward Bork
Defoliation and altered precipitation effects on soil microbial communities on the Mattheis Ranch*	Scott Chang
Quantifying the carbon balance and associated ecosystem properties at the Mattheis Ranch*	John Gamon
Beef and biodiversity	Dan Farr, Edward Bork, Cameron Carlyle, James Cahill, Tim McCallister & Mike Alexander
GHG assessment in grasslands under contrasting grazing regimes	Cameron Carlyle, Edward Bork & Scott Chang
Biophysical quantification and mapping of soil quality at the Mattheis Ranch*	Guillermo Hernandez-Ramirez
Evaluating pollinators in Alberta rangelands	Cameron Carlyle & Jessamyn Manson
Nutrient cycling in rangelands under grazing regimes	Edward Bork, Cameron Carlyle, Scott Chang & Daniel Hewins

Appendix II. Select presentations by RRI affiliates in 2015-16

Table IIA. Presentations of RRI-supported research at the 69th Society for Range Management Annual International Meeting, Corpus Cristi, TX, Jan 29 - Feb 5, 2016.

Title (Format)	Presenter/Author(s)
Linking seed bank composition and spatial variation in vegetation to pipeline disturbance in mixedgrass prairie (Presentation)	Pyle, Bork, Hall
Divergent management effects legume seed bank composition and other functional groups in northern temperate pastures (Poster)	Pyle, Bork, Hall
Population dynamics of native, invasive and introduced legume species in Alberta's aspen parkland and mixedgrass prairie (Presentation)	Pyle, Bork, Hall
Testing performance of cattle on pasture with divergent molecular breeding values for residual feed intake (Presentation)	Moore, Lansink, Basarab, Fitzsimmons, Nielsen, Plastow, Bork
Using GPS collars and pedometers to track cattle grazing behavior under open-range grazing (Poster)	Moore, Lansink, Basarab, Fitzsimmons, Nielsen, Plastow, Bork

Table IIB. Other select outreach and promotional activities undertaken in support of the RRI during 2015-16. *Indicates activities that were not reported in the 2014-2015 RRI Annual report.

Abbreviated title	Presenter(s)	Venue	Audience(s)	Date
Pollinator diversity and abundance in Alberta's Agricultural Landscape*	Carlyle, Phung, Sturm, Kohler, Manson	Society for Range Management	Academics, professionals, policy-makers, students	February 2015
Pollinator diversity and abundance in Alberta's Agricultural Landscape*	Carlyle, Phung, Sturm, Kohler, Manson	Alberta Biodiversity Monitoring Institute	Academics, practitioners, managers	February 2015
Bumble bee biology*	Manson	RE Peter Conference	Academics, students	March 2015
Keeping bees: nature history and biodiversity of native pollinators*	Manson	Sierra Club of Canada	General audience	March 2015
Native bees of Alberta*	Sturm, Kohler	Edmonton Seedy Sunday	General audience	March 2015

Minimizing hybrid poplar tree mortality and plantation yield losses	Bork, Macdonald, Thomas, Henkel-Johnson, Goehing	Alberta Pacific Forest Industries	Industry staff	June 2015
The role of priority effects on neighbor relations among four grasses	Carlyle, Fraser	Roy Turkington Botany Symposium	Academics, students	June 2015
Trees increase bacteria and carbon storage	Chang, Baah-Acheamfour, Banerjee, Fatemi, Lim, Chen, Carlyle, Bork	North American Agroforestry Conference	Academics, professionals, resource managers	June 2015
Invasive plants and native pollinators	Phung	Nature Conservancy of Canada	Professionals	July 2015
<i>Field tour:</i> Mattheis ranch history and stewardship model	Bork	Southern AB Women's Grazing School	Professionals, general public	July 2015
<i>Field tour:</i> Evaluation of residual feed intake	Bork, Moore, Lansink	Mattheis Open House/Centennial	General public	July 2015
<i>Field tour:</i> Mitigation of high voltage powerline construction	Bork, James, Najafi	Mattheis Open House/Centennial	General public	July 2015
Linking seed bank composition and community change to pipelines	Pyle, Bork, Hall	Botany Conference	Academics, professions, managers, students	July 2015
Biodiversity and abundance of Alberta's native bees	Manson	Ecosystem Services and Biodiversity Science Symposium	Academics, professionals	September 2015
Native bees: a look at their natural history & ecology	Manson	Science Outreach	General audience	October 2015
Biodiversity in Alberta's rangelands	Carlyle	Foothills Restoration Forum	Practitioners, professionals, policy-makers, researchers, general public	November 2015
Feral horse habitat preferences in Alberta	Bork	IMS/SRM Fall Meeting	Practitioners, professionals, policy-makers, researchers, general public	November 2015

Principles to maintaining healthy, productive grasslands	Bork, Irving	Siksika Agricultural Workshop	Professionals, general public	November 2015
Protecting Alberta's pollinators	Manson	Nature Alberta	General public	December 2015
Contemporary rangeland research supporting sustainable pasture management	Bork	Ladies Livestock Lessons	General public	January 2016
Overview of current GHG research in Alberta grasslands	Bork, Carlyle, Hewins	Alberta Beef Producers	Industry	February 2016
Mattheis Ranch: A conservation triumph	Brunen, Bork	Prairie Conservation and Endangered Species Workshop	Practitioners, professionals, policy-makers, researchers, general public	February 2016
Integrating herbicides, fertilization, and rotational grazing for weed control	Bork	Gateway Research Organization Annual Meeting	Producers, general public	February 2016
An introduction to the Rangeland Research Institute	Bork	Range Management Branch, AEP	Professionals	March 2016
Overview of grassland research: EG&S, carbon and drought	Bork, Carlyle, Hewins	Alberta Forage Industry Network	Practitioners, professionals, researchers	March 2016

Appendix III. Rangeland Ecology and Management Fund Financial Statement of Actuals, April 1, 2015 to March 31, 2016

	Actuals
Principal	
Opening Balance (April 1, 2015) ¹	\$4,218,789.00
Contributions ²	\$0.00
Closing Balance (March 31, 2016)	\$4,218,789.00
Spending Allocation	
Opening Balance (April 1, 2015)	\$2,500.87
Current Year Endowment Spending Allocation ¹	\$124,867.92
Current Year Expenditure	\$0
Closing Balance After Encumbrances³	\$127,368.79

¹Opening balance from contributions in previous year (2014/2015): Conservation Easement (CE) Grant Transfer (\$3,168,789), Oil/Gas Utility Right of Way revenue (\$1,000,000), Alberta Beef Producers donation (\$50,000).

²There were no contributions in 2015/2016 but in early 2016/2017 there has been a transfer of \$897,348 of Mattheis oil and gas revenue to the endowment based on surplus revenue carried over from 2015/2016 and some revenue received in early 2016/2017. This contribution to the endowment in 2016/2017 will trigger the remaining \$626,211 of the CE grant to be transferred to the Rangeland Ecology & Management Endowment in 2016/2017. This will be reflected in next year's report.

³Closing balance from 2015/2016 is carried forward and available in 2016/2017 along with the 2016/2017 spending allocation.

Appendix IV. RRI Financial Statement of Actuals, April 1, 2015 to March 31, 2016

	Actuals
Opening Balance	\$718,640.00
Revenue	
Lease Revenue	\$445,853.75
Utility (Powerline) Revenue	\$45,120.20
Total Revenue	\$490,973.95
Expenditures	
Legal Costs	\$1,752.75
Property Taxes	\$2,069.13
Academic Assistant	\$37,528.29
Temp Support Staff	\$28,326.66
Benefits ¹	\$12,335.99
Supplies	\$29,287.79
Hospitality	\$4,615.79
Travel Expenses	\$4,790.17
Rentals and Leases	\$21,423.47
Equipment	\$14,128.33
Research Projects	\$198,931.33
Total Expenditures	\$355,189.70
Net Balance	\$854,424.25
Net After Benefits Adjustment¹	\$866,760.24

¹ University covered benefits at year end

Note: This summary excludes U of A (in-kind) support to the RRI through academic staffing, which is currently valued at over \$250,000 annually