PROCEEDINGS OF THE 11TH PRAIRIE CONSERVATION AND ENDANGERED SPECIES CONFERENCE

Prairie: It's a Happening Place!

Hosted by:

Saskatchewan Prairie Conservation Action Plan

Saskatchewan Prairie Conservation Action Plan

11th Prairie Conservation and Endangered Species Conference
Saskatoon, Saskatchewan
16-18 February 2016

Cover Photo: American bison (*Bison bison*) bull grazing in the West Block of Grasslands National Park, southwestern Saskatchewan. (*photo by V. Kjoss*)

PROCEEDINGS

OF THE

11TH PRAIRIE CONSERVATION AND ENDANGERED SPECIES CONFERENCE

Prairie: It's a Happening Place!

Saskatoon, Saskatchewan
16-18 February 2016

Published by
Saskatchewan Prairie Conservation Action Plan

Edited by
Victoria A. Kjoss

Suggested citation: Kjoss VA (ed) (2016) Prairie: It's a Happening Place. Proceedings of the 11th Prairie Conservation and Endangered Species Conference. 16-18 February 2016, Saskatoon, Saskatchewan. Saskatchewan Prairie Conservation Action Plan, Regina, Saskatchewan. 265 pp.

www.pcesc.ca

TABLE OF CONTENTS

SESSION SPEAKERS' AND POSTER PRESENTERS' PAPERS AND ABSTRACTS

Concurrent Session 2: Large-scale Trends and Impacts

Concurrent Session 3: Bees and Amphibians

Posters - Theme 1 (Status, Trends, Threats, and Issues)

THEME 2: Protection and Conservation

Concurrent Session 4: Maps, Models, and Mitigation

Concurrent Session 5: Conservation and Protection Planning

Concurrent Session 6: Successes, Lessons, and Opportunities

Posters – Theme 2 (Protection and Conservation)

Theme 3: Restoration and Recovery

Concurrent Session 7: Recovery Strategies I

Concurrent Session 8: Recovery Strategies II

Concurrent Session 9: Habitat Mitigation and Restoration

Concurrent Session 10: Invasive Species

Posters – Theme 3 (Restoration and Recovery)

Theme 4: Connecting and Motivating People to Wonder, Care, and Act

Concurrent Session 11: Educating Youth of Today, for Tomorrow

SPONSORS

The 11th Prairie Conservation and Endangered Species Conference Steering Committee gratefully acknowledges the generosity and support of the following sponsors:

PLATINUM SPONSOR ($10,000+):

Environment Canada Environnement Canada

GOLD SPONSOR ($5000+):

Prairie Conservation Forum

PRAIRIE CONSERVATION FORUM

SILVER SPONSOR ($2500+):

Crescent Point
ENERGY CORP

BANQUET SPONSORS ($2000):

Special Areas Board

Trace
ASSOCIATES

TARGETED SPONSORS ($1000):

CANADIAN WILDLIFE FEDERATION

YOUR CONNECTION TO WILDLIFE

City of Saskatoon

BRONZE SPONSORS ($1000+):

Alberta Society of Professional Biologists

Eastern Irrigation District

Enbridge Inc.

Faculty of Science, University of Regina

Husky Energy

Mosaic Company

BRONZE SPONSORS, CONTINUED:

Municipal District of Taber

Nature Conservancy of Canada

Ranchers Stewardship Alliance Inc.

Silvacom Ltd.

Westmoreland Coal – Poplar River Mine

FRIENDS ($500+):

Alberta Biodiversity Monitoring Institute

Government of Alberta

Information Services Corporation

SaskTel

SaskWater

University of Saskatchewan School of Environment and Sustainability

World Wildlife Fund U.S.

TRADE SHOW PARTICIPANTS:

Alberta Biodiversity Monitoring Institute

ALUS - Alternative Land Use Services

Ducks Unlimited Canada

Environment Canada

Kanatan Aski

Multiple Species at Risk (MULTISAR)

Native Plant Society of Saskatchewan

TRADE SHOW PARTICIPANTS, CONTINUED:

Nature Saskatchewan

Pickseed

Prairie Conservation Forum

Society for Range Management

South of the Divide Conservation Action Program Inc. (SODCAP)

Tannas Conservation Services Ltd.

Trace Associates Inc.

Truax Company, Inc.

SILENT AUCTION SPONSORS

Acorn Naturalists
Alberta Conservation Association
American Meadows
Argento Jewellery & Accessories
Ashley Vass
Bennett Environmental Consulting
Big Buck Magazine
Bird Studies Canada
Blazing Star Wildflower Seed Company
Bodhi Tree Yoga
Branimir Gjetvaj
Cabela's
Calgary Zoo
Cameco
Candace Savage
Cindy Hoppe
Circle Y Ranch
City of Regina
Cora's Breakfast and Lunch
Core Connection Pilates Studio
CuppaT
Cypress Hills Eco Adventures
DAVIDsTEA
Dr. Coffee's Café
Ducks Unlimited Canada
Elaine Kennedy Photography
Elkhorn Resort Spa & Conference Centre
Elkhorn Ridge Resort
Ellis Bird Farm
Flora of Saskatchewan
Friends of Wascana Marsh
Geoff Holroyd
Gold's Gym Regina
Grasslands National Park
Heather Peat Hamm
Janet Ng
Jason Lewis
Joanna Lemieux
John Carlson
Kakwa
Karyn Scalise
Kevin Van Tighem
Kicking Horse Coffee
LaraBella Jewelry Design
Lee Valley Tools
Lyric Theatre (Swift Current)
Manitoba Conservation and Water Stewardship
Manitoba Habitat Heritage Corporation
Manitou Springs Resort & Mineral Spa
McDougall Gauley LLP
Meewasin Valley Authority
Menchie's Frozen Yogurt
Mile East Farm
Mooseworld Inc.
Mountain Equipment Coop
Multiple Species at Risk (MULTISAR)
Nature Conservancy of Canada
Nature Saskatchewan
Outdoor Photography Canada Magazine
Outter Limits (Saskatoon)
PotashCorp
Prairie Wind & Silver Sage
Prairies North Magazine
Quarter Circle L Ranch
RCMP Heritage Centre
Rebecca Eberts
Rebellion Brewing
Regina Folk Festival
Regina Symphony Orchestra
Riding Mountain National Park
Royal Saskatchewan Museum
Sage Grouse Initiative
Sageview Art Gallery
Saskatchewan Archaeological Society
Saskatchewan Burrowing Owl Interpretive Centre
Saskatchewan Indian Gaming Association
Saskatchewan Science Centre
Saskatchewan Wildlife Federation
Saskatoon Folkfest
Saskatoon Zoo Society
SaskCentral and Saskatchewan Credit Unions
SaskCulture
SaskOutdoors
SaskTel
Shakespeare on the Saskatchewan
Sharon Butala
SkyNews
Smith & Best Float Studio & General Store
Soap Cutts
Society of Grassland Naturalists
Somers Lab, University of Regina
South of the Divide Conservation Action Program
Southland Mall
Stephanie Bodas Photography
Stevie Lemieux
Sundance Balloons
The Harvest Moon Café
The Manitoba Museum
Tinhorn Creek Vineyards
Tourism Moose Jaw
Tourism Saskatchewan
Trevor Herriot
Very Prairie Cards (V. Kjoss)
Wanuskewin Heritage Park
Western Development Museum Saskatoon
Wholesale Sports
Wild Birds Unlimited - Saskatoon
Willow Park Liquor & Spirits
YMCA of Regina

WELCOME TO THE PROCEEDINGS OF THE 11TH PRAIRIE CONSERVATION AND ENDANGERED SPECIES CONFERENCE

The Prairie Conservation and Endangered Species Conference (PCESC) was established in 1986 to provide a forum to discuss the latest issues, perspectives, challenges, opportunities, information, research, and trends in the conservation of prairie landscapes, species, and Species at Risk. The conference, occurring every three years, and alternating between the three Prairie Provinces, engages people from many backgrounds, including researchers, field personnel, consultants, industry representatives, livestock producers, landowners, naturalists, educators, volunteers, NGOs, aboriginal groups, provincial and federal public servants, private organizations, and community and farm-based organizations. The Conference Steering Committee is pleased to present to you the Proceedings of the 11th Prairie Conservation and Endangered Species Conference, which was held in Saskatoon, Saskatchewan, on 16–18 February 2016.

The first PCESC was held in 1986 in Edmonton, Alberta. That makes this year's conference the 30th anniversary of PCESC! We are pleased about this opportunity to recognize and celebrate our conservation history and provide a forum to discuss our continued work and issues for prairie and endangered species. For the 11th PCESC, the Steering Committee fervently took on the challenge of continuing the traditions and high standards that were established in previous conferences. The 2016 Steering Committee continued the use of the logo that was developed for the 2013 PCESC because of its strong prairie theme, in hopes that it will continue to be a symbol of PCESC. The logo is made of three circles representing the three Prairie Provinces, which overlap to symbolize collaboration. Inside are a plant (rough fescue, *Festuca hallii*), a bird (western meadowlark, *Sturnella neglecta*), and a mammal (pronghorn, *Antilocapra americana*) that are iconic of our native prairies.

The theme of the 2106 PCESC was "Prairie – It's a Happening Place," in recognition of all the things that are taking place on the prairie, as you will discover in these Proceedings. This theme was picked up brilliantly by the plenary and concurrent speakers, pre-conference workshop instructor, and poster presenters who came together for this conference. The conference was well attended and covered a broad array of topics. A total of 304 people from western Canada and the northern United States participated in the conference and heard 10 plenary presentations, 58 concurrent presentations, and viewed over 40 posters. In addition, 66 people participated in a pre-conference landscape restoration workshop, and we enjoyed the company of 15 trade exhibitors. As you can see - prairie is a *very* happening place! It is not often that this many people from over 100 different organizations and disciplines can come together and learn, engage, share ideas, and even develop calls to

action and collaboration. We, much like the species or grasslands that we manage, are all dependent on each other.

We were honoured to continue the tradition of the Prairie Conservation Award, acknowledging deserving individuals from each of the Prairie Provinces who have made a significant contribution to prairie and/or endangered species conservation. In addition, this was the second conference in which the Young Professional Stewardship Grant was awarded to support projects being carried out by individuals between the ages of 18 and 30 that advance the engagement of people in conservation in grassland and parkland ecosystems of the Prairie Provinces. A total of $7500 was raised for this grant through a silent auction held during the conference banquet!

It is our hope that the papers in these Proceedings will stimulate your passion and provide you with new information and approaches to use where you practice prairie and endangered species conservation. For those authors who were unable to provide a manuscript, an abstract of their presentation along with their name and affiliation is provided, should readers wish to obtain further information on their topics. We encourage you to take this opportunity to learn and even network and collaborate based on the information provided in this document.

We would like to thank the Saskatchewan Prairie Conservation Action Plan (SK PCAP) for providing the leadership and administration of this conference. The SK PCAP Partnership brings together 30 agencies and organizations representing producers, industry, provincial and federal governments, environmental non-government organizations, and research and educational institutions working towards a common vision of prairie and Species at Risk conservation in Saskatchewan. The SK PCAP Partnership is an important forum for guiding conservation and management efforts within Saskatchewan's Prairie Ecozone, as it (1) increases communication and collaboration amongst partners, thereby reducing duplications; (2) addresses gaps in native prairie research/activities and programming; (3) guides the development of programs and policies that reward sustainable use and promote ecological health and integrity including Species at Risk recovery; and (4) improves public understanding of native prairie and Species at Risk.

SK PCAP has developed two curriculum-supported, action-oriented environmental education programs called *Taking Action for Prairie* and *Adopt a Rancher. Taking Action for Prairie* reflects the goals and priority areas of SK PCAP and also directly correlates with the new Science Curriculum for students in Grades 6 through 8. *Adopt a Rancher* is an interactive, hands-on learning opportunity for Grade 10 classes in Saskatchewan. The program has been very successfully integrated in schools throughout Saskatchewan and is now available across the province. For more information on SK PCAP, its programs, and partnerships, please visit: http://www.pcap-sk.org.

In closing, we would like to express our sincere gratitude to our many sponsors for their generosity. Without their support, this conference would not have been the success it was. We thank the Honourable Herb Cox, Saskatchewan's Minister of Environment, and Mayor Donald Atchison from the City of Saskatoon for opening the conference. Minister Cox highlighted key examples of the province's commitment to Species at Risk conservation and described the Ministry's efforts at working with on-the-ground land managers and organizations to achieve common goals. Mayor Atchison spoke about some of the environmental initiatives that the City of Saskatoon is undertaking. We would also like to thank the members of the Steering Committee, the various sub-committees, and the numerous volunteers who gave so much of their professional and personal time to make this a successful conference.

The next Prairie Conservation and Endangered Species Conference will take place in Manitoba in 2019. See you there.

We hope you enjoy these Proceedings!

Sincerely,

2016 PCESC Steering Committee

11TH PRAIRIE CONSERVATION AND ENDANGERED SPECIES CONFERENCE ORGANIZING COMMITTEE

STEERING COMMITTEE

Kayla Balderson Burak (Lead) .....Saskatchewan Prairie Conservation Action Plan
(Natasha Wilkie .....Past Lead)
(Tara Mulhern Davidson .....Past Lead)
Donna Bruce .....Nature Saskatchewan
Kaytlyn Burrows .....Nature Saskatchewan
Katherine Conkin .....Saskatchewan Ministry of Environment
Mae Elsinger .....Agriculture and Agri-Food Canada
Heather Facette .....Parks Canada – Grasslands National Park
Joan Feather .....Saskatoon Nature Society
Branimir Gjetvaj .....Nature Saskatchewan
John Hauer .....Saskatchewan Ministry of Agriculture
Kerry LaForge .....Agriculture and Agri-Food Canada
Sarah Lee .....Environment Canada
Kerry Lowndes .....South Saskatchewan River Watershed Agri-Environmental Group Plan
Jessica Martino .....Canada North Environmental Services Limited
Dave Messmer .....Saskatchewan Ministry of Environment
Candace Neufeld .....Environment Canada
Leah Tallis .....South Saskatchewan River Watershed Agri-Environmental Group Plan
Rachel Turnquist .....Saskatchewan Ministry of Agriculture

LOGISTICS, REGISTRATION, AND VOLUNTEERS

Kayla Balderson Burak (Lead) .....Saskatchewan Prairie Conservation Action Plan
Donna Bruce .....Nature Saskatchewan
Branimir Gjetvaj .....Nature Saskatchewan
John Hauer .....Saskatchewan Ministry of Agriculture
Kerry LaForge .....Agriculture and Agri-Food Canada
Dave Messmer .....Saskatchewan Ministry of Environment

BUDGET & SPONSORSHIP

Caitlin Mroz (Lead) .....Saskatchewan Prairie Conservation Action Plan
Kayla Balderson Burak .....Saskatchewan Prairie Conservation Action Plan
John Hauer .....Saskatchewan Ministry of Agriculture
Kerry Lowndes .....South Saskatchewan River Watershed Agri-Environmental Group Plan

PROGRAM

Mae Elsinger (Lead) .....Agriculture and Agri-Food Canada
Donna Bruce .....Nature Saskatchewan
Heather Facette .....Parks Canada – Grasslands National Park
Joan Feather .....Saskatoon Nature Society
Branimir Gjetvaj .....Nature Saskatchewan
John Hauer .....Saskatchewan Ministry of Agriculture
Darcy Henderson .....Canadian Wildlife Service
Yeen-Ten Hwang .....Saskatchewan Ministry of Environment
Tracy Kupchenko .....Alberta Energy Regulator
Sue Michalsky .....Ranchers Stewardship Alliance Inc.

COMMUNICATION

Kayla Balderson Burak (Lead) .....Saskatchewan Prairie Conservation Action Plan
Renny Grilz .....Society for Range Management
Kerry LaForge .....Agriculture and Agri-Food Canada

STUDENT LIAISON

Katherine Conkin .....Saskatchewan Ministry of Environment
Dave Messmer .....Saskatchewan Ministry of Environment

AWARDS, BANQUET, ENTERTAINMENT, AND SILENT AUCTION

Sue Michalsky (Lead) .....Ranchers Stewardship Alliance Inc.
Kayla Balderson Burak .....Saskatchewan Prairie Conservation Action Plan
Kaytlyn Burrows .....Nature Saskatchewan
Brandy Downey .....Alberta Environment and Parks
Chris Friesen .....Manitoba Conservation Data Centre
Caitlin Mroz .....Saskatchewan Prairie Conservation Action Plan
Rachel Turnquist .....Saskatchewan Ministry of Agriculture

EDITOR'S COMMENTS

As indicated in the welcoming remarks, the Steering Committee of the 11th PCESC strove to uphold the strong traditions and high standards established in past conferences. To that end, the logo designed for the 10th PCESC in 2013 was adopted to symbolize the continuity with previous meetings, and future Steering Committees are encouraged to continue using the same logo. In keeping with the idea of creating continuity, I have followed in the footsteps of the previous editors and have adapted the layout and look of the 10th Proceedings to the current document. I encourage future editors to do likewise.

As in previous years, conference presenters were given the option of having their work published in one of three formats: (1) short abstract, essentially as it appeared in the conference program; (2) extended abstract enhanced with additional details (including figures and/or tables and Literature Cited); or (3) a full manuscript. Authors of full manuscripts were asked that data-focussed papers follow standard 'IMRaD' format (Introduction, Methods, Results, and Discussion, as well as a Literature Cited section). Other papers could be structured as befit their content, and inclusion of photographs was encouraged. All three formats are included in these Proceedings, although the majority of presenters chose to publish only their short abstracts. Many thanks to all authors who contributed expanded versions of their work.

I have organized the abstracts according to their order of presentation during the conference, and poster abstracts have been included in the appropriate theme sections. Note that many oral and poster presentations fit into more than one theme section, so the divisions as laid out herein are not rigid. For oral presentations, the presenter's name is shown in bold font.

Abstracts and papers were edited for clarity, and minor changes were made throughout to enhance readability. Acronyms were spelled out at their first use within each abstract/paper, and species binomials were added if they had not already been included. As in the previous Proceedings, an Index is not included, as search functions are easily executed in an electronic document such as this. Literature referenced in full manuscripts and extended abstracts generally follows the Harvard citation style.

With regard to species nomenclature, few topics appear to divide biologists into two opposing camps more than the issue of whether or not to capitalize common names. With apologies to those who belong to the 'Capital Camp,' I opted not to capitalize common names unless they contain a proper noun (e.g., 'Canada goose').

I thank the Steering Committee for giving me the opportunity to work on these Proceedings; I thoroughly enjoyed reading all of the contributed papers and abstracts and have learned much along the way. I hope you will, too.

Happy reading!

V.A.K.
Regina, SK
Spring of 2016

History of the Conference

The first Prairie Conservation and Endangered Species Conference (PCESC) was held in 1986 in Edmonton, Alberta, as a forum to discuss the latest issues, information, research, and trends in prairie landscape and species conservation. Following its success, the decision was made to repeat this conference every three years, and that it should be held in each of the three Prairie Provinces in turn.

The locations and themes of the conferences have been as follows:

1986 – Edmonton, Alberta: Endangered Species
1989 – Regina, Saskatchewan: Implementing the Prairie Conservation Action Plan
1992 – Brandon, Manitoba: Partnerships between Agriculture and Wildlife
1995 – Lethbridge, Alberta: Ecosystem Management for Conservation
1998 – Saskatoon, Saskatchewan: Connection between Prairie Ecosystem Conservation and Economic, Social, and Ethical Forces of Society
2001 – Winnipeg, Manitoba: Sharing Common Ground
2004 – Calgary, Alberta: Keeping the Wild in the West
2007 – Regina, Saskatchewan: Homes on the Range – Conservation in Working Prairie Landscapes
2010 – Winnipeg, Manitoba: Patterns of Change
2013 – Red Deer, Alberta: Engaging People in Conservation
2016 – Saskatoon, Saskatchewan: Prairie – It's a Happening Place!

Published Proceedings

All proceedings are available at http://www.pcesc.ca/past-conferences.aspx

10th PCESC – Holroyd GL, Trefry AJ, Crockett B (eds) (2014) Proceedings of the 10th Prairie Conservation and Endangered Species Conference, February 2013, Red Deer, Alberta. Engaging People in Conservation. Alberta Prairie Conservation Forum, Lethbridge, Alberta

9th PCESC – Danyluk D (ed) (2011) Proceedings of the 9th Prairie Conservation and Endangered Species Conference and Workshop, February 2010, Winnipeg, Manitoba. Patterns of Change: Learning from our past to manage our present and conserve our future. Critical Wildlife Habitat Program, Winnipeg, Manitoba

8th PCESC –Warnock R, Gauthier D, Schmutz J, Patkau A, Fargey P, Schellenberg M (eds) (2008) Proceedings of the 8th Prairie Conservation and Endangered Species Conference and Workshop, March 2007, Regina, Saskatchewan. Homes on the Range: Conservation in Working Prairie Landscapes. Saskatchewan Prairie Conservation Action Plan. Published by the Canadian Plains Research Center, University of Regina, Regina, Saskatchewan

7th PCESC –Trottier GC, Anderson E, Steinhilber M (eds) (2004) Proceedings of the 7th Prairie Conservation and Endangered Species Conference, February 2004, Calgary, Alberta. Natural History Occasional Paper No. 26. Provincial Museum of Alberta, Edmonton, Alberta

6th PCESC – Blouin D (ed) (2001) Proceedings of the Sixth Prairie Conservation and Endangered Species Workshop, February 2001, Winnipeg, Manitoba. Manitoba Habitat Heritage Corporation, Winnipeg, Manitoba

5th PCESC –Thorpe J, Steeves T, Gollop M (eds) (1999) Proceedings of the Fifth Prairie Conservation and Endangered Species Conference, February 1998, Saskatoon, Saskatchewan. Natural History Occasional Paper No. 24. Provincial Museum of Alberta, Edmonton, Alberta

4th PCESC – Willms WD, Dormaar JF (eds) (1996) Proceedings of the Fourth Prairie Conservation and Endangered Species Workshop, February 1995, Lethbridge, Alberta. Natural History Occasional Paper No. 23. Provincial Museum of Alberta, Edmonton, Alberta

3rd PCESC – Holroyd GL, Dickson HL, Regnier M, Smith HC (eds) (1993) Proceedings of the Third Prairie Conservation and Endangered Species Workshop, February 1992, Brandon, Manitoba. Natural History Occasional Paper No. 19. Provincial Museum of Alberta, Edmonton, Alberta

2nd PCESC – Holroyd GL, Burns G, Smith HC (eds) (1991) Proceedings of the Second Endangered Species and Prairie Conservation Workshop, January 1989, Regina, Saskatchewan. Natural History Occasional Paper No. 15. Provincial Museum of Alberta, Edmonton, Alberta

1st PCESC – Holroyd GL, McGillivray WB, Stepney PHR, Ealey DM, Trottier GC, Eberhart KE (eds) (1987) Proceedings of the Workshop on Endangered Species in the Prairie Provinces, January 1986, Edmonton, Alberta. Natural History Occasional Paper No. 9. Provincial Museum of Alberta, Edmonton, Alberta

YOUNG PROFESSIONAL STEWARDSHIP GRANTS

Supporting Young Professional and Aspiring Conservationists

The Young Professional Stewardship Grant was developed to promote future work to achieve success with prairie conservation and endangered species management. The Young Professional Stewardship Grant is for professional or aspiring conservationists between the ages of 18 and 30 who live and/or work in Alberta, Saskatchewan, or Manitoba. Applicants from various disciplines are encouraged to apply and do not need to be enrolled in, or be a graduate of, an academic institution.

Innovative proposals that advance the engagement of people in conservation in Grassland and Parkland Natural Regions of the Prairie Provinces are the objectives of the Young Professional Stewardship Grant. Proposals may consider topics in the areas of land management, ecology, species at risk, or habitat enhancement, with a focus on education and community outreach, a desired outcome, or the use of an integrated management approach. Proposals should take into consideration and avoid unintended consequences, whereby the project may benefit one species to the detriment of another species. Projects should also demonstrate some socio-economic benefit(s).

Individuals and/or groups were encouraged to submit a proposal to be considered for grant(s), the funds for which were raised during the Silent Auction at the 2016 Prairie Conservation and Endangered Species Conference and through specific sponsorship support. Applications were received from across all three Prairie Provinces, and judges made their final selections. The grant recipients were announced at the PCESC Banquet on 18 February 2016.

The recipients of the 2016 Young Professional Stewardship Grants were:

- **Laura Griffin** (Ann & Sandy Cross Conservation Area) from **Alberta**
- **Aaron Bell** (TRoutreach and Saskatchewan Wildlife Federation) from **Saskatchewan**
- **Jordan Becker** from **Manitoba**

Congratulations to all three recipients.

PAST RECIPIENTS OF THE YOUNG PROFESSIONAL STEWARDSHIP GRANTS

	ALBERTA	SASKATCHEWAN	MANITOBA
2013 – LETHBRIDGE	The University of Alberta: Trends in Grizzly Bear Conservation	Nature Saskatchewan: Stewards of Saskatchewan (SOS) project	Friends of Birds Hill Park Inc.: Prairie and Parkland Habitat Education for Youth

2016 RECIPIENTS OF THE YOUNG PROFESSIONAL STEWARDSHIP GRANTS

Alberta: Laura Griffin, Ann & Sandy Cross Conservation Area

PROJECT SUMMARY: *Engaging Communities in Nocturnal Conservation: Why Nocturnal Preserves are Needed in Canada*

The Ann & Sandy Cross Conservation Area (ASCCA) is made up of 4800 acres of rolling foothills and is home to over 400 plant species and an abundance of insects, birds, and mammals. Located just SW of Calgary, the ASCCA protects habitat for native species of wildlife while providing people with the opportunity to experience nature first hand though education programs and hikes. In 2015, the ASCCA became the first Nocturnal Preserve in Canada as recognized by the Royal Astronomical Society of Canada (RASC). This project will focus on two deliverables to engage and educate community members on the importance of preserving dark skies for wildlife.

1. *Produce an educational video on nocturnal preserves and light pollution impacts on native nocturnal species.* Footage of experts, animals, education participants, and the ASCCA will be used to bring a further appreciation about the nocturnal world and its inhabitants to the public. The video will be used as an outreach tool into the community and will showcase simple ways by which citizens and communities can make a difference towards conserving the nocturnal environment in prairie and parkland ecosystems.
2. *Increase community engagement.* Community Learning Events will be designed and delivered to engage community members in the natural surroundings and become better nocturnal stewards. By providing both practical and informative sessions, we will strive to become a leading example in the community of what it means to be a Nocturnal Preserve for wildlife under the RASC's guidelines.

BIOGRAPHY: **Laura Griffin** has been the Educational Interpreter at the ASCCA for over six years, where she enjoys sharing her love of the environment with school groups. She is actively engaged in the creation and delivery of the ASCCA's school programs. Born in Calgary, Laura loved exploring the parks and mountains around her home and was particularly fond of tracking animals at night. Her passion for ecology led her to complete an applied Bachelor's degree in Ecotoursim and Outdoor Leadership (ETOL). Her degree also provided her with opportunities to work as a videographer. She conducted and filmed both interviews and expeditions across Alberta and Baffin Island. Laura is excited to be given the opportunity to work on a project that shares her enthusiasm for protecting the nocturnal world.

Saskatchewan: Aaron Bell, TRoutreach and Saskatchewan Wildlife Federation

PROJECT SUMMARY: *Chasing Tigers: Population Assessment of the Imperiled Gibson's Big Sand Tiger Beetle in the Saskatchewan Sand Hills*

The Canadian Sand Hills are major hotspots of biodiversity in Canada. As a result, the loss of these habitats through gradual dune stabilization presents a serious conservation concern for many dune-adapted species. Tiger beetles are iconic flagship species for conservation of the sand hills due to their use as model organisms of ecology and evolution. Gibson's big sand tiger beetle (*Cicindela formosa gibsoni*) is listed as 'Threatened' by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). However, current population numbers are unknown, and less than a quarter of historical collection sites have been confirmed since initial assessment. Aaron plans on inventorying the abundance and distribution of this tiger beetle while engaging the public to promote stewardship and conservation of sand hill ecosystems in Saskatchewan. School districts from the surrounding areas will actively participate in field activities and workshops orchestrated by TRoutreach staff and volunteers. This project aims to provide information that is crucial to the status report of the tiger beetle while engaging the public to help foster appreciation for biodiversity and promote stewardship of sand hill ecosystems.

BIOGRAPHY: **Aaron Bell** is a naturalist and ecological entomologist from La Ronge, Saskatchewan. Aaron graduated from the University of Saskatchewan in 2012 with an Honours degree in biology. His undergraduate thesis focused on the effects of endocrine-disrupting chemicals on the premigratory behaviour of red-winged blackbirds (*Agelaius phoeniceus*). Although initially interested in birds and fish, Aaron made the leap to studying insects when he began working for a Saskatchewan-based NGO called TRoutreach towards the end of his time as an undergraduate. His work with TRoutreach led to the discovery of several new provincial insect records for Saskatchewan, including a new family of caddisfly

in the Cypress Hills. These exciting discoveries led him to continue his work with insects and on to a Master's degree at the University of Alberta focusing on carabid beetles and the island biogeography of Lac la Ronge. Aaron hopes that through education and awareness, he can help foster a greater appreciation for insects and all they have to offer. When not staring at beetles through a microscope, Aaron spends his time playing music, engaging in sports, and enjoying the great outdoors.

Manitoba: Jordan Becker

PROJECT SUMMARY: Manitoba finds itself in an enviable position, where the majority of its residents can escape to intact natural ecosystems a short distance from their residences. With some of the most beautiful and scenic recreational trails across the Prairies, Manitobans and visitors alike have the opportunity to thrust themselves into the wilderness of Manitoba's varied ecosystems, including the vast mixed-grass prairie expanses of southwestern Manitoba to the wilderness rivers on the east side of Lake Winnipeg. Despite the numerous available opportunities, there is no central repository of information for trail users to utilize when planning outdoor activities. Most of the trail data that are currently available in Manitoba are scattered across numerous forums and do not provide a means to visualize and explore all trails together. The majority of trail data currently available is in the form of coarse paper maps, which provide little detail for trail enthusiasts. For those without an intimate knowledge of the province's trail system, it is difficult to discover new areas to explore.

It is estimated that over 300 established and well-maintained hiking trails are located on non-private land and are open to public use. The goal of this project is to promote the education of natural area conservation through the increased awareness and use of recreational trails in Manitoba. The project will collect recreational trail information and provide it to users in a modern, easy-to-use format. A website, with an incorporated interactive map, will provide users the opportunity to visualize all of the recreation trails throughout Manitoba, including detailed information like trail length, difficulty, ecological information, biodiversity viewing opportunities, and directions/access.

The project also embraces the idea of open data and encourages the public to become involved. All trail information will be available to the public for downloading in a number of formats (GPS, Google Earth, GIS) in order to promote the use and sharing of trail data. Incorporation of user (crowdsourced) data will allow users of the website to become fully engaged in the project and submit trails to the project database. The project will also provide local groups which manage/utilize trails throughout the province an opportunity to promote trail usage to a broader audience across all of Manitoba. In order to facilitate access, a set of guidelines will be developed to ensure trails on non-public lands are only

included with the express permission of the land owner or managing agency. Details outlining hiking best practices will also be included in the guidelines to ensure preservation of ecologically sensitive areas on public lands.

BIOGRAPHY: As an avid outdoorsman, **Jordan Becker** has dedicated both his personal and professional life to environmental conservation. Upon graduating from the University of Manitoba in 2010, his diverse career has included working for various government and non-government organizations and has provided Jordan the means to explore the magnificent ecological diversity across all of Manitoba from the far north to the southern prairies. As a Conservation Biologist with the Nature Conservancy of Canada, Jordan is now able to play an active role in the preservation of biodiversity and ecosystems and be truly engaged in conservation. For him, no place in the world matches the boreal shield for its rugged beauty and tranquility. Jordan spends most of his spare time with his young family and looks forward to introducing his two sons to the world of hiking, camping, skiing, and backpacking in the coming years. When he's not enjoying Manitoba's wilderness, Jordan enjoys spending time in his second adopted home, Italy.

PRAIRIE CONSERVATION AWARDS

The Prairie Conservation Awards, which were created in 1989, are granted to a deserving recipient from each of the three Prairie Provinces once every three years in recognition of significant long-term contributions to native habitat or Species at Risk conservation. Individuals from any walk of life, organizations, or Aboriginal groups can be nominated for these awards.

Five criteria are used in the evaluation of nominations for the Prairie Conservation Awards:

(1) Relationship of achievements to the conservation or understanding of native habitat or endangered species within the Prairies Ecozone.

(2) Demonstration of exceptional commitment or innovation (above and beyond normal livelihood expectations).

(3) Demonstration of enduring commitment.

(4) Significance of the accomplishment in terms of results.

(5) Extent to which granting of an award to this nominee will help native habitat conservation and endangered species efforts within the Prairies Ecozone.

The Prairie Conservation Awards were presented at the 11th Prairie Conservation and Endangered Species Conference in Saskatoon, Saskatchewan.

The recipients of the 2016 Prairie Conservation Awards were

- **The Ross Ranch**, representing Alberta
- **Luc Delanoy** (Meewasin Valley Authority) from Saskatchewan
- **Peggy Westhorpe** (Critical Wildlife Habitat Program) from Manitoba

Congratulations to all three award winners.

PAST RECIPIENTS OF THE PRAIRIE CONSERVATION AWARDS

	ALBERTA	SASKATCHEWAN	MANITOBA
1989 - REGINA	Dianne Pachal and Vivian Pharis	Dr. Stuart Houston	
1992 – BRANDON	Cliff Wallis	Donald Hooper	
1995 - LETHBRIDGE	Francis and Bonnie Gardner	Francis and Bonnie Gardner	Local Government District of Stuartburn
1998 - SASKATOON	Cheryl Bradley	Miles Anderson	Manitoba Naturalists Society
2001 – WINNIPEG	Ian Dyson	Greg Riemer	Rick Wowchuk
2004 – CALGARY	Dawn Dickinson	Dr. David Gauthier	Tony and Debbie McMechan
2007 – REGINA	Barry Adams and Richard Quinlan	Lorne Scott	Marilyn Latta
2010 – WINNIPEG	Dylan and Colleen Biggs Family	Pat Fargey	Dr. Robert E. Jones
2013 – RED DEER	Ken and Nora Balog	Gary Seib	John Morgan

2016 RECIPIENTS OF THE PRAIRIE CONSERVATION AWARDS

Alberta: The Ross Ranch

The Ross Ranch is operated by John Ross and his wife Kathy, along with their son Darren and his wife and two children. The cow/calf operation is located in the dry-mixed grasslands within the County of Forty Mile near the town of Foremost, Alberta. The Ross family has been managing the native grass community on their 62,000-acre ranch for over 100 years, with John being the fourth generation of Ross and his son Darren the fifth. Managing the land means a lot to John: "…it means just about everything---your family, your livelihood, your future. If you screw up the environment, you screw up your future." Their ranch consists of a mixture of private and public leased land dominated by native grasslands. The first thing someone new to the ranch will note is the vastness of the open prairie. This ranch is one of the few properties in southern Alberta on which one can experience the true meaning of being out in the open prairies with very little human disturbance. The Ross family is very proactive when it comes to stewardship activity, as John believes that "small changes can make a big difference in how the land is managed" and "being open to new opportunities" is crucial.

The Ross family has been involved in many prairie conservation initiatives to keep native grassland managed so that it supports a diversity of wildlife. John says, "We may not use the same terminology, but in the end we all want the same thing." Once all sides recognize that we benefit each other, we can be powerful allies. John has shown his dedication to sustainable ranching practices not only through how he manages his own land, but also by his willingness to be involved with programs and organizations such as MULTISAR, Cows and Fish, and the Milk River Watershed Council Canada. John is an example of a landowner who is willing to go that extra step to manage native grassland not only for the benefit of his own cattle, but for the benefit of wildlife species and biodiversity as well.

The Ross Ranch was the winner of the Alberta Prairie Conservation Award

Saskatchewan: Luc Delanoy

Luc Delanoy was nominated by Renny Grilz of the Meewasin Valley Authority, an organization from which Luc had recently retired after a 32-year career. Luc served as Meewasin's Resource Management Officer, where he managed over 60 km of the South Saskatchewan River, and 8400 ha of native prairie, riparian forests, wetlands, and other conservation priority sites. Throughout his tenure, Meewasin expanded its portfolio to include Beaver Creek Conservation Area, Cranberry Flats Conservation Area, Saskatoon Natural Grasslands and the Meewasin North East Swale, to name a few. Luc actively sought and encouraged conservation partnerships with other management organizations and landowners, including the University of Saskatchewan and the City of Saskatoon. Luc employed grazing management using multi-species cattle and goat grazing and was skilled at using prescribed burns to manage areas. He was also a skilled "weed warrior," using his red shovel to remove any and all invasive species he would find. He provided the "alarm bell" regarding movement of invasive alien and invasive agronomic species into the Saskatoon area and across Saskatchewan. He also volunteered on numerous boards, including the Native Plant Society of Saskatchewan as well as Nature Saskatchewan. Luc worked tirelessly to protect the South Saskatchewan River Bank and shared his passion for conservation with hundreds of students and volunteers. His passion, skill, and experience made him the winner for the Saskatchewan Prairie Conservation Award.

Luc Delanoy (left) receives the Saskatchewan Prairie Conservation Award

Manitoba: Peggy Westhorpe

Peggy Westhorpe has had an extensive 40-year conservation career with the Wildlife and Fisheries Branch of Conservation and Water Stewardship, with numerous highlights and achievements. She was instrumental in establishing the Mixed-Grass Prairie Preserve in southwestern Manitoba as well as developing the Manitoba Tall-Grass Prairie Preserve, particularly when it came to sourcing funds. She was also involved in a unique memorandum of understanding among partners, which provided a framework for other partners to cooperate within the province. Peggy demonstrated perseverance throughout her career. When funding became short, she got creative and accomplished plant and animal monitoring, species at risk surveys, and other work that needed to be done by finding alternate funds and developing new ways of doing things. When there was a need for the development of reference material, such as *Naturescape Manitoba* or *Common Native Pasture Plants of Southern Manitoba*, she put extra effort in to ensure that these resources were developed, overseeing aspects of both publications. Whether she was chairing a past PCESC committee, or engaging local landowners, Peggy remained committed to prairie conservation activities in Manitoba. She mentored numerous staff and conservation professionals throughout her career, and her passion and enthusiasm continues to inspire colleagues in Manitoba and beyond.

Peggy Westhorpe accepting the Manitoba Prairie Conservation Award at the 2016 PCESC

MEMORIAL SCHOLARSHIPS

In lieu of traditional gifts for the 2016 PCESC plenary speakers, the Steering Committee opted to donate funds to three memorial scholarships, one in each Prairie Province, on the speakers' behalf. These scholarships commemorate the achievements and contributions of professionals to the Prairie Provinces and beyond, as outlined below.

Alberta: *University of Alberta Rangeland Resources Management Post Graduate Scholarship (in memory of Jennifer Richman)*

Jennifer Richman had deep roots in the prairies, raised on the family ranch on the Old Man River in southern Alberta. A life in the country and a love of the land defined Jenn's passions. She possessed an exceptional gift for connecting with people. In her professional career and in her personal life, Jennifer positively touched many lives. Her commitment to her family, friends, and career was unrelenting. The Practice of Agrology benefited greatly from Jennifer Richman's leadership in research, teaching, and the promotion of the Alberta Institute of Agrologists. She excelled at effective rangeland health assessment field training. Jennifer carefully prepared field sites and presentation materials which enabled participants to apply this information on their own land. She perfected the operation and monitoring of the Grassland Rangeland Reference Area program, which is vital to our understanding of plant community dynamics. Jennifer collaborated with MULTISAR to develop integrated range-planning stewardship and effective wildlife inventories towards species at risk protection. She created and planned the Southern Alberta Grazing School for Women. Jennifer mentored and taught junior staff, students, and landholders to better understand use of range management tools. As the membership director for her local agrology branch, Jennifer promoted Alberta Institute of Agrologists (AIA) membership to colleagues and students. Her love, dedication, and enjoyment of family, friends, and career affected so many. All who knew her appreciate the exceptional memories she created in her 34 years of life.

Saskatchewan: *University of Saskatchewan Alicia Hargrave Memorial Scholarship*

Alicia Hargrave grew up on the Hargrave Ranch at Walsh, Alberta, and received her B.Sc. Degree in Agriculture, specializing in Range Management, from the University of Saskatchewan (U of S) in 2003. She was integral in re-establishing the U of S Student Range Team; she edited, revised, and re-created the SK Range Plant ID Books; and she enjoyed travel and humanitarian work in other countries. She understood how to manage cattle and

grass sustainably and she advocated for landowner rights when dealing with oil and gas development and the impact it can have on prairie species. She passed away in 2007, but her spirit of helping others is carried on through a bursary sponsored by the Prairie Parkland Chapter of the Society for Range Management. The Alicia Hargrave Memorial Bursary Fund, a $1000 award, is awarded annually to a U of S second- or third-year student pursuing a Bachelor of Science in Agriculture with an interest in Rangeland Resources.

Manitoba: *University of Manitoba Roger Evans Memorial Scholarship*

The family and friends of **Dr. Roger Evans** have established an endowment fund at the University of Manitoba in his memory. Dr. Evans was a faculty member in the Department of Zoology from 1966 until his untimely death in June of 1998. Dr. Evans had an outstanding national and international reputation in the area of behavioural ecology. This scholarship is awarded to a graduate student who is working in the fields of animal behaviour or ecology and intends to present his/her research at a national or international conference.

PLENARY SPEAKERS' PAPERS AND ABSTRACTS

PLENARY 1: SETTING THE STAGE FOR PCESC 2016

PLENARY 1-1: HEARTS AND MINDS - DEVELOPING A PRAIRIE STORY

Presented by: **LORNE FITCH[1], BRANIMIR GJETVAJ[2]**

[1] 625-18St. South, Lethbridge, AB T1J 3E9, Canada. Email: lafitch@shaw.ca

[2]Branimir Gjetvaj Photography, 815 Reid Rd, Suite 314, Saskatoon, SK S7N 2W8, Canada. Email: branimir@shaw.ca

Paper by: LORNE FITCH

Abstract: Stories are important - they help us navigate the world, make sense of it, see our place in it, and understand the changes in terms of benefits and consequences. We lack a single, cohesive, cogent prairie story. What we have are myths - fanciful, flawed descriptions of frontiers, endless space, and boundless opportunity. Myths are things that never were, but always are. They lead us, inexorably, to decisions that further erode the size, integrity, and biodiversity of the prairies. We can do better; we need to do better at telling the story of prairie. Based on a career of interacting with prairie, managing it, and thinking about the issues, this paper contains thoughts about the story we should be telling, to change the hearts and minds of people about this fragile, superbly interconnected, impressive, and spiritual landscape.

Two young fish meet an older fish swimming the opposite way. As they pass, the older fish remarks, "Morning boys, how's the water?" After a time one of the younger fish turns to his companion and asks, "What's water?" For this forum, the question might just as easily be asked, "What's prairie?" The point of the parable is that often the most obvious, important realities are the hardest to see and to talk about, like prairie.

That's why stories are important - they help us navigate the world, make sense of it, see our place in it and understand the changes in terms of benefits and consequences. When it comes to prairie, we lack a single, cohesive, cogent story. What we have are myths - fanciful, flawed descriptions of frontiers, endless space, and boundless opportunity. Myths are things that never were, but always are. They lead us, inexorably, to decisions that further erode the size, integrity, and biodiversity of the prairies. We can do better; we need to do better at telling the story of prairie.

A prairie defender, Dawn Dickinson, told me an anecdote about her mother. She had come from the green lushness of England to join her husband, a customs agent at Coutts, on the Alberta/Montana border, in the early years of the 20th century. Writing home, she described her new home this way: "It has more rivers, and less water; it has more cows, and less milk; and, you can see further and see less than any other place on earth." I would submit that our prevailing story of prairie hasn't changed much. So, I'd like to talk to you about the story we should be telling, to change the hearts and minds of people about this fragile, impressive, and spiritual landscape.

Prairie isn't just the space between the Canadian Shield and the Rockies. It is the glue that holds together most of the nation. In prairie is the essential space that defines us, helps us see ourselves, in in Wallace Stegner's terms, as "single, separate, and individual in the world… part of the natural world and competent to belong in it." [1]

Both of my sets of grandparents homesteaded in the aspen parkland of Alberta at the turning of the 20th century. Charitably, they didn't know where they were going; when they got there, they didn't know the place they had chosen to settle. For many, settlement on the prairies was the ultimate in social and ecological crap shoots. Once there, however, like so many others across the prairies, my grandparents started a transformative process of changing the landscape and themselves. What originally seemed to be a benefit, the woods and the water, were alternately cleared and drained.

My mother recalled the walks to the country school a little less than a kilometer away, taking, in 1912, sometimes over an hour to dodge the wetlands, willow jungles, and aspen thickets. I walked the route a few years ago; it took me 20 minutes, and all that impeded me were two barbed wire fences. The former diverse landscape is now a blank perfection of fields.

In living history, the landscape produced a cornucopia of wild fruit, game, and fish. In the photo archives of the Glenbow Museum is an image of six heavily armed men standing over the carcass of a somewhat deflated grizzly bear near Innisfail, Alberta. The image is from 1894, just five years before my grandparents settled in the same area. Yet, nowhere in the family stories are there references to bears, wolves, or elk, all part of the landscape immediately prior to their arrival.

Fish and wildlife populations initially sustained many families but succumbed to intensive harvest pressures and habitat loss. Non-native plants and animals were introduced, both purposefully and accidentally. The natural processes that drove and configured the landscape were modified. This has changed the character, integrity, and how we interact with prairie.

That is not the story currently told. The one that is, mostly a single narrative, is based on a myth. The myth involves real estate, opportunity, growth, prosperity, and transformation. It is of breaking a raw land, a land useless in its native state, an economic imperative, originally to rationalize the building of a transcontinental railroad, and a political priority to keep the land out of the hands of the Americans.

What has driven us is a gardening myth, one of lining things up in a row and making them grow. We didn't see the land as a marvellously drought-adapted place, a finely tuned ecological mechanism, and a place rich in biodiversity. We saw it alternately as a storehouse to be raided and as a place that needed squaring and replanting. A few early ranchers saw it otherwise, but their goals did not align with the prevailing ones of political security and economic growth.

I can't discount that the transformation of the prairies, partly from my grandparents' efforts, has provided me and the rest of us a comfortable and relatively easy life. Comfort and ease breed complacency, however, and add to the perverse narrative of the prairies. This impedes progress on prairie conservation.

We thought the prairie was an eternal frontier; some think it so today, in ways both cyclic and perpetual. The reality is that the frontier was largely gone by the time my grandparents arrived on it. An additive, cumulative series of events has eroded the remainder, and continues to do so.

So, what is a new story? Let me tell you what I think might be included. We've been given the gift of a common problem, crafting a better, more compelling, inclusive story. That new story might ramble between pragmatism and poetry, with elements of both. It must appeal to our hearts, in a visceral sense and to our minds, in a cerebral way.

We must talk of many things. Fundamentally the story must tell us how we fit in this place called prairie. There is guidance from story tellers like Wallace Stegner, W.O. Mitchell, Guy Vanderhaeghe, Trevor Herriot, and Candace Savage. From Ian Tyson, Neil Young, Corb Lund, and Connie Kaldor comes the poetry of song. From past conservationists like William Pearce come the anguish of seeing the transition of parts of the prairie and being largely helpless to change the trajectory.

Losses of wildlife led C. Gordon Hewitt to write, in 1921, "The conservation of our wildlife… can only be achieved when a wider interest in the subject is created in the minds of the majority of our citizens." [2] Dr. Stan Rowe pointed out that if we want to live on the prairies for another hundred years, we better start thinking about what this landscape is and what,

ecologically, that means. His point was, it is hubris to "put our faith in technology and the power of prayer." [3]

We must talk of climate, of climate change, of the range of natural variation and most certainly of adaptation. Our story might be guided by the wise words attributed to Albert Einstein: "The world we have created today as a result of our thinking has problems which cannot be solved by thinking the way we thought when we created them." In other words, barrelling forward with our eyes firmly fixed on the rearview mirror is untenable. Acknowledging there is a range of natural variation, and understanding that droughts within recent history are really part of a wet cycle when viewed over millennia is pivotal. That alone might convince us to consider other, sustainable land-use trajectories.

History teaches lessons in limits. In the understanding of limits, as Wallace Stegner observed: "You may deny it for a while. Then you must try to engineer it out of existence or adapt to it." The long view says "adapt to it." Stegner also points out: "Instead of adapting… we have tried to make the countryside and the climate over to fit our existing habits and desires. Instead of listening to the silence we have shouted into the void." [4] There is a strong sense of limits imposed by the prairie landscape on human aspirations, but we routinely exceed these limits by ignoring them.

Just as prairie sage supports many creatures, the work of prairie sages –scientists, biologists, range managers, bureaucrats, and ranchers– is foundational to prairie conservation. Our stories need to profile, absorb, and remember the legacy provided us with their work. Trail blazers include early ranchers who asked, of their industry and of government, "What can the prairie sustain?" We owe a debt of gratitude to these folks who grappled with limits and motivated the research to be done to set the policy and practices that persist to conserve prairie. For prairie grasslands, forged in aridity, the wisdom of ranchers, long-term and profound, is simply, "the best side is up - don't plow grasslands under."

We cannot forget the rich biological history of the prairie. The journals of Peter Fidler, David Thompson, and others provide a rare glimpse of the living phenomenon that ranged across this landscape: bison, elk, deer, and antelope from horizon to horizon; beaver damming every creek; flocks of wildfowl darkening the sky; grizzlies and wolves.

Following these chroniclers, in less than a human life span, that miracle had largely been erased. We created a new normal for much of the prairie. It's called "shifting the benchmark."

We believe we're seeing the world just fine until it's called to our attention that we're not. Declines in quality and quantity persist until some tipping point is reached. Before that wall is reached, we all think we have at our disposal a full pie's worth of resources. As our memory of the past dims, our perception of the present is that we have lost nothing, and our vision of the future is that we have kept it all. We end up satisfied with less and less, thinking we are achieving more and more. It's the resource that shifts, but not our

perception of the resource. Perception does not mirror reality. It's a case of collective amnesia.

The past lives in memories. But memories must be kept warm; without rekindling, they could turn to ash. If they do turn to ash, we remember nothing, not the losses or the trajectory of future change. Winston Churchill is said to have observed: "The further you can see back, the more you can see forward." Utah Phillips, folksinger, raconteur, and anarchist, said: "Yes, the long memory is the most radical idea in this country. It is the loss of that long memory which deprives our people of that connective flow of thoughts and events that clarifies our vision, not of where we're going, but where we want to go." [5] It is through story that we embrace the great breadth of memory.

We've traded the songs of meadowlarks and pipits for motor noise and traffic. We mined the new coal, the accumulated organic material formed under a cover of prairie grasses, in as little as a human life span. We did so without ever asking, at all the appropriate times in the accumulating number of decisions, whether this is the path on which we want to be. Not only has the landscape shifted under our feet, something of value went missing along the path.

So, our new story needs an embargo on the words "balance, trade-offs, and compromise" related to further prairie losses, fragmentation, and loss of integrity. Most of the native prairie, its wetlands, and its wealth of biodiversity have been lost, compromised, and impaired. We have an imbalance, created over a century of development, and that activity continues to nibble away at what's left. What our narrative requires is a rebalance of development with conservation to reimagine the prairie's future. It will only happen with restoration, a recovery of lost space, integrity, and diversity. This isn't advocating for a return of the bison, at least not completely. What should be reflected in the pathway forward is a sense of size, scale, and variety. Big trumps little in conservation. Big hangs onto nature better than small. We need to think big to save prairie.

Rosanne Cash sings: "A feather is not a bird, the rain is not the sea." [6] Antelope, sage grouse, swift fox, blue grama grass, and fescue are all expressive of prairie, individual indicators of it and essential components of it, but not the entirety. Prairie is place, not just pieces. It's not enough to preserve pieces of prairie; we need to reverse the trend in loss of this landscape and connect the remaining pieces together in a logical form. Ted Williams wisely said, "Conservation of what we have left is no longer enough; we need to start recovering what we've lost." [7]

How can we convince people that the prairie is important, a sustaining sphere, a thing of intrinsic beauty, and an end in itself? This is the place for tough talk about our future as prairie residents. It is also the opportunity to paint a picture of prairie that conveys a willingness to engage with it, at its level. This is what I would say to help our narrative:

The glaciers receded 80 km a century, 800 m a year. We spread over the prairies and populated them in less than a century. Our transformation of them is arguably almost as dramatic as the leavings from glaciation. We live in the aftermath of the Pleistocene, on the dwindling rivulets left over from the ice age and are fed by the glacial grindings of old rock.

Life on the prairie is a delicate dance of life leading back, ultimately, inevitably to that intermittent trickle of water, that cloudburst, the melt of spring snow, the reservoir of fossil water beneath the grass. History in the dry prairie is the thin skin of hydrology. Most of us who live here are a pluvial accident, wedded to rainfall. In *Wolf Willow*, Wallace Stegner quips that with another inch of rain or so, his sod-busting father would have succeeded at farming and the family would have remained Canadian.[8]

Life on the prairies requires patience, cunning, understanding, and nerve. Very few other places on earth provide that sense of a razor's edge of existence. Strip away the delicate and often fleeting surplus of energy and materials that pay for civilization, and life becomes a matter of bare-bones survival again. On a frail mist of humidity ride all our dreams of prairie power and possessions. Our power as prairie people isn't conferred from banks, doesn't emanate from politics, isn't based on cereal crops, potash, or Bakken oil, or derive from nationality. Our narrative needs to reflect that it grows out of the land, from an understanding that we live in semi-arid circumstances and around us are arrayed plants and animals admirably suited to survive and thrive. We will too, if we emulate them.

Given the march of time, the elements that have helped forge plants and animals, the crucible in which they have been tested, and the variation to be encountered in the future, we kid ourselves that our technology, engineering, and big brains are in some way comparable, even superior to nature's ways.

People who raise bison have realized that the way to herd them is to figure out where they're going and to go with them. That lesson might be valuable to us to figure out how to successfully inhabit the prairie for the long term. Maybe, just possibly, rolling the dice with earth time is a better alternative. Learning to pace ourselves to earth rhythms, reinvesting in natural processes, not taking so much, and doing without provides a more sustainable, survivable future. W.H. Auden wrote: "A culture is no better than its woods." [9] Maybe we are no better than our prairies, or at least what's left of them.

At one time the wanton slaughter of wildlife was considered normal because there was so much. Now, it is the pervasive destruction of habitat, again, because we think it is limitless. Social approbation led to laws curtailing wildlife slaughter; when will recognition of habitat destruction lead to change? Aldo Leopold answered that question with: "Our tools improve faster than we do. It is unlikely that economic motives alone, will ever teach us to use our new tools gently. We shall achieve conservation, when and only when, the destructive use of land becomes unethical- punishable by social ostracism. Any experience that stimulates this extension of ethics is culturally valuable. Any that has the opposite effect is culturally damaging." [10]

Random, but cumulative, acts and decisions by governments, industry, and landowners precipitated an ecological crisis in the prairie, of unprecedented dimensions. Sage-grouse are part of it, and as a result of their diminished and imperilled status, we have begun to appreciate the consequences of our actions, many unintended. What is more disturbing, even perplexing is, it all could have been avoided. Rachel Carson helps us understand why it wasn't avoided: "We still talk in terms of conquest- we still haven't become mature enough to think of ourselves as only a tiny part of a vast and incredible universe. … I think we're challenged, as mankind has never been challenged before, to prove our maturity and our mastery, not of nature, but of ourselves." [11]

If one could imagine the prairies before the fence, the road, and the plow, it would be so much sky sitting atop an endless horizon. Remoteness was abolished with roads, space was truncated with barbed wire, and the long view was interrupted with grain elevators, soaring above the skyline. Most people pass through the prairie en route to somewhere else. It is only if you linger that you will begin to appreciate the prairie. It is not simply a place in-between something else.

How do we know a place, unless we know the names of the things in a place and the stories they have to tell? We can't be sustained without a knowledge of the land. Embedded in the landscape are things beyond the surficial, the evident, and the short-term economic value. "We are formed by our surroundings, and our surroundings contain stories, that, if we learn them, form us too. The landscape of the northern prairie, which seems so passive, changeless, and lacking in surprise, is in fact a place of power and mystery to those who know its story and who carry that story on…" writes Kent Meyers.[12]

To the uninitiated, the prairie has a colossal sameness. However, the sameness is not of monotony but of endlessly repeated yet constantly varied patterns and shapes. It is a prodigious repetition, without beginning and with no hint of an end. The prairie is an echoing reminder of time and space. When you stand on the threshold of the huge natural museum that is prairie, you realize you shouldn't enter without preparation. It isn't just about knowledge, because the prairies are less a place and more a state of humility. These are unmanaged landscapes cultivated by time. We have done much to hold off the eternity, the infinity of distance and space on the prairie. We fenced it, broke the land, planted trees, created roads, incorporated cities and towns – anything to give the land some sort of human scale or distinction. Yet, as Stan Rowe has written: "The wide open landscape, the big sky, the singing grass, the meadow lark's song, the wind-waves that roll through the fields, the indigo water of prairie ponds at spring breakup were imprinted on me at an early age." [3] So, in spite of our efforts to form the land, it inevitably forms us.

A stop, a walk, or a sit to ponder these realities can be unnerving, maybe liberating, and surely enriching. Kent Meyers writes lyrically about a place the uninitiated would write off as lacking in appeal: "Classic in its simplicity, the prairies whole character is revealed in the

visual tension between the arch of the sky and the plane of the earth and in their corresponding forces, the wind trying to sweep you away, gravity barely holding you down." [12]

Although Colin Fletcher was speaking about the canyons of the desert southwest, his words also ring true about the prairie. He said: "We do not have to build a Parthenon. Nor to create any work of art. We face a greater and perhaps as difficult a task: to shield from the blind fury of material 'progress' a work of time that is unique on the face of the earth. And we shall be judged, you and I, by what we did or failed to do." [13] The mind has a way of making a detour around these uncomfortable truths unless it is forced to focus on them. To those that look at prairie as real estate temporarily encumbered by wetlands, native grassland, wildflowers, and wildlife, I have no message of support. It is as it was, and always should be.

Edmund Burke observed that: "The only thing necessary for the triumph of evil is for good men to do nothing." [14] I would paraphrase that to read: "The only thing necessary for prairie to go missing is for many of us to do nothing." So, who writes the rules for prairie conservation? We all do. Prairie conservation will be enhanced with a better story. Who should undertake that vital task? Who holds the science, the material, the experience, the passion, and the motivation? You are all the new writers of the purple sage. Work with other writers, the poets, the singers, the photographers, the artists. Make prairie as popular as Prada, as endearing as penguins, as visually stunning as mountains, and as engaging as dinosaurs.

I look forward to seeing, hearing, and reading your narratives. Remember, the future isn't a place that we're going to, it's a place that you get to create.

January, 2016

Bibliographical Notes

[1] Stegner W (1960) "Wilderness letter" to the Outdoor Recreation Resources Review Commission, December, 1960. Available at http://wilderness.org/bios/former-council-members/wallace-stegner

[2] Hewitt CG (1921) *The Conservation of the Wild Life of Canada*. C. Scribner's Sons, New York, NY

[3] Rowe S (1990) *Home Place: Essays on Ecology*. NeWest Press, Edmonton, AB

[4] Stegner W (1981) *American Places*. Dutton, New York, NY

[5] Phillips U, Sorrels R (1996) *Long Memory*. Red House Records, St. Paul, MN

[6] Cash R (2014) *The River & the Thread*. Blue Note Records, New York, NY

[7] Ted Williams, columnist for National Audubon Magazine (a version of this quote, i.e. "Conservation is no longer enough. Instead of just saving what's left we need to restore what's lost" was also used as a subtitle for his Nature Conservancy *Recovery* column)

[8] Stegner W (1955) *Wolf Willow*. Penguin Books, London and New York, NY

[9] Auden WH (1966) *Bucolics, II: Woods.* In: Collected Shorter Poems 1927-1957. Random House, Inc., New York, NY

[10] Leopold A (1949) *A Sand County Almanac*. Oxford University Press, USA

[11] Carson R (1962) *Silent Spring*. Houghton-Mifflin, Boston, MA

[12] Meyers K (1998) *The Witness of Combines*. University of Minnesota Press, Minneapolis, MN

[13] Fletcher C (1967) *The Man Who Walked Through Time*. Alfred A. Knopf, New York, NY

[14] Burke E (1770) Thoughts on the cause of present discontents. Essay (annotated version) available at http://www.econlib.org/library/LFBooks/Burke/brkSWv1c1.html#nn1

Biography for Lorne Fitch (P. Biol.): *Lorne grew up on a mixed farm in the aspen parkland of Alberta. He left the farm, but the experience of growing up in semi-wild circumstances never left him. He has been a biologist for over 40 years, working mostly in Alberta but also in other parts of Canada and with some international experience. For his work on conservation, he has received an Alberta Emerald Award and has been part of two additional Emerald awards. His work on effectively communicating science has been recognized by The Wildlife Society, the Society for Range Management, and the Alberta Society of Professional Biologists. Lorne is a retired Alberta Fish and Wildlife biologist, the Provincial Riparian Specialist for Alberta Cows and Fish, and an Adjunct Professor with the University of Calgary. Lethbridge is his adopted home because the grasslands are a favoured landscape.*

Biography for Dr. Branimir Gjetvaj: *Branimir is a biologist and internationally published environmental photographer specializing in Western Canadian landscapes. He leads photography workshops and is frequently invited to give public presentations on photography, natural history, and conservation biology topics. After moving to Canada from his native Croatia where he worked as the Assistant Curator for Ornithology at the Croatian Museum of Natural History, Branimir received an M.Sc. degree from Dalhousie University and a Ph.D. from Queen's. He is currently enrolled in the Master of Sustainable Environmental Management (MSEM) program the University of Saskatchewan. A key focus of his MSEM research is the potential impact of biofuel crop production on grassland habitats in Saskatchewan. Branimir's formal*

education and interest in photography has led him to use his skills as a vehicle to promote the appreciation and protection of natural environments and cultural legacies. He has participated in numerous nature conservation initiatives and frequently contributes his photographic skills to local environmental organizations. One of Branimir's photography projects culminated in the award-winning book The Great Sand Hills: A Prairie Oasis*. He is currently working on a book about ranching and federal community pastures. Branimir has served volunteer positions on the board of several environmental NGOs and natural history societies in Saskatchewan and Alberta. He is currently Vice-President of Nature Saskatchewan. In 2013, Branimir received Michelle's Prize, jointly award by the Canadian Environmental Law Association and the University of Saskatchewan. The award committee took note of his extensive involvement with environmental NGOs and his use of photography to advance environmental conservation.*

PLENARY 1-2: PANEL INTERVIEW CELEBRATING 30 YEARS OF PCESC: LESSONS LEARNED AFTER 30 YEARS OF PRAIRIE CONSERVATION ACTIONS, AND DIRECTIONS FOR THE FUTURE

Moderator: **DARCY C. HENDERSON**
Canadian Wildlife Service, 1238 Discovery Avenue, Kelowna, British Columbia, V1V 1V9. Email: darcy.henderson@canada.ca

Panel Members: **BARRY ADAMS** (Alberta)
[retired] Alberta Public Lands, Lethbridge, Alberta. Email: bwadams1@telus.net

LUC DELANOY (Saskatchewan)
[retired] Meewasin Valley Authority, Saskatoon, Saskatchewan. Email: suedelanoy@gmail.com

JOHN MORGAN (Manitoba)
Prairie Habitats Inc., PO Box 10, Argyle, MB, R0C 0B0, Canada. Email: john01@xplornet.com

Abstract: This panel discussion brought together experts, each with 30 years of experience working in the Canadian Prairies: an entrepreneur and retirees from a non-governmental agency and a provincial government agency. These individuals worked at different scales (global to local), with different clients (ranchers, urban recreationists and gardeners, resource industries), and represent three different Prairie Provinces. As a wave of baby-boomers retire from our field and employment shifts away from the public and towards the private sector, we want to promote greater knowledge transfer. This panel discussion was intended to stimulate those discussions amongst all participants for the duration of the conference and into the future. To help kick off those discussions, all panel members were asked the same questions:

1. What did you see that worked for prairie conservation and endangered species in the past 30 years?
2. What did you see that did not work in the past 30 years, and that we should avoid in future?
3. What are your hopes for the future of prairie conservation and endangered species recovery?
4. What advice do you have for the next generation of practitioners?

Biography for Barry Adams (M.Sc., P.Ag.)*: Barry Adams recently retired to private practice after a 38-year career with Alberta Environment and Parks – Rangelands. For 32 years, Barry served as the Provincial Rangeland Specialist – Grasslands. A key focus of his work has been to assist ranchers to apply the principles and practices of range management to promote healthy range and a sustainable livestock operation. He has been active in developing new rangeland health tools, including range plant community guides for the Grassland Natural Region, the Grassland Vegetation Inventory (GVI), restoration practices for prairie and parkland rangelands, and grazing management strategies for species at risk. Barry is active in the Society for Range Management and lives in Lethbridge with his wife, Allison.*

Biography for Luc Delanoy: *Luc has been married to Susan for 35 years and they have two children and two grandchildren. They met at Kelsey campus of Saskatchewan Polytechnic, both enrolled in the Renewable Resources program from which they graduated in 1978. Luc spent his formative years in a rural setting in southern Saskatchewan where farming, fishing, hunting, and trapping with his older brother fostered his lifelong interest in nature. Long Creek, Laurier Community Pasture, the hills of the Missouri Coteau, and a spacious award-winning and magical yard in the town of Radville all helped nurture the nature relationship. Luc had the great fortune in furthering this interest in his work life. He started with a summer job with the Department of Northern Saskatchewan in Buffalo Narrows in 1977 which turned out to be one of the most active fire seasons ever recorded in northern Saskatchewan. This short stint was followed up with a second summer of work as a fisheries technician with the Saskatchewan Research Council. This job introduced Luc to some of the finest environmental scientists in the province as part of a team developing environmental baseline for the uranium mines at Cluff and Key Lakes. Luc then landed his first permanent job in the environmental field as Environmental Technician at a uranium mine at Key Lake, Saskatchewan. Three years later he began work with Meewasin, where again he was exposed to many fine environmental scientists over a span of 32 years until his retirement in April 2015. An abbreviated summary of his work is that he spent the first ten years planting trees throughout the valley and the next 22 years knocking them out mainly with fire to promote the fast-disappearing prairie wool.*

Biography for John Morgan (M.Sc.): *John has an Honours degree in Zoology/Ecology and an M.Sc. degree in Natural Resources Management from the University of Manitoba. Born in Ontario, he has lived in Manitoba, Saskatchewan, Alberta, and the NWT. He worked as a research biologist in Canada's high Arctic in the 1970s and as a wildlife habitat biologist on the prairies in the 1980s. John initiated the Tall Grass Prairie Inventory in 1986, which led to Manitoba's Tall Grass Prairie Preserve near Vita. With his wife Carol, he began Canada's first prairie restoration company in 1987, Prairie Habitats Inc., in the Interlake near Argyle. They have tried to put ecological theory into practical ideas. They have made a living for 29 years by doing what they love and believe in: restoring prairie. They have developed seed-harvesting equipment used for local native seed collection in 41 countries worldwide. John co-wrote the book* Restoring Canada's Native Prairies *with colleagues Doug Collicutt and Jackie Thompson. John has received the Friends of Equinox Magazine's Citation for Environmental Achievement, the Government of Canada's 125th Anniversary Medal, the Manitoba Naturalists Society Prairie Crocus Award, and the 2013 Prairie Conservation Award for his work in restoring native prairies.*

PLENARY 2: STATUS, TRENDS, AND ISSUES IN CONSERVATION AND PROTECTION

PLENARY 2-1: UNCOMMON COMMON GROUND - WORLD WILDLIFE FUND'S SUSTAINABLE RANCHING INITIATIVE

NANCY LABBE

World Wildlife Fund, Northern Great Plains Program, 13 S. Willson St., Suite 1, Bozeman, MT 59715 Email: nancy.labbe@wwfus.org

Abstract: World Wildlife Fund's (WWF) Sustainable Ranching Initiative is working to establish a productive dialogue with stakeholders in the beef supply chain. By partnering with ranchers, retailers, regional and national producer groups, consumers, and other conservation organizations, WWF is working to develop a thriving global marketplace for sustainable beef that values intact grasslands, abundant natural resources, and producer livelihoods. The local to global approach is key for WWF. In the Northern Great Plains region, WWF supports the ranching community with capacity-building grants, bird surveys, and outreach support. We're driven by the goal of maintaining intact grasslands in the Northern Great Plains by supporting the ranching community and communicating with consumers about the benefits of ranching on this landscape. More broadly, WWF serves as a key representative on the Global, US, and Canadian Roundtables for Sustainable Beef, influencing the future of the sustainable beef market with a reasonable, informed approach.

Biography for Nancy Labbe: *Nancy is a fifth-generation cattle rancher from the Sandhills of Nebraska. Her upbringing gave her valuable on-the-ground experience and a deep understanding of the issues facing ranchers in the Northern Great Plains. Additionally, she has worked in a variety of capacities in the beef-production sectors. At WWF, Nancy leads direct engagement with the ranching community in North America with a special focus on the Northern Great Plains region, where sustainable beef production goes hand-in-hand with conserving the iconic grassland ecosystem on which it relies. Through the Sustainable Ranching Initiative, Nancy is working to maintain grasslands for generations by identifying and accelerating the use of more ecologically and economically sustainable land management practices. She also works to influence national and global marketplace efforts on sustainable beef production. Through Nancy's engagement, WWF played a key role in the development of the Canadian and US Roundtables for Sustainable Beef, bringing key stakeholders together to identify opportunities for the future of sustainable beef production.*

PLENARY 2-2: STATUS AND TRENDS OF PRAIRIE AND ENDANGERED SPECIES 1986 TO 2016

DARCY C. HENDERSON

Canadian Wildlife Service, 1238 Discovery Avenue, Kelowna, British Columbia, V1V 1V9. Email: darcy.henderson@canada.ca

Abstract: It is no secret that native prairie and the habitat needed by native species has declined rapidly over the past century. Factors driving habitat loss have varied over time to include cultivation, drainage, invasive species, or fire suppression. Similarly, species at risk of extinction were initially threatened by hunting and trapping, but times change, and now each species is threatened by a unique suite of factors. In spite of the overall state, we have many successes that buck the trend, including with bison, whooping crane, and black-footed ferret recovery, and the work of many individuals succeeding in improving the quality and quantity of native prairie. Here I present some facts as we know them about changes in the past, ranking threats faced by the more than 90 prairie Species at Risk in the coming 10 years and describing some of the categories of actions underway to protect, conserve, recover, and restore. I conclude by posing questions about the importance of facts (evidence gathered in search or support of truth), myths (widespread retelling of old stories to reinforce a worldview that does not rely on facts), and credibility (being trusted, believed, and convincing) when working to conserve natural places and natural things.

Biography for Darcy Henderson (M.Sc., Ph.D.): *Darcy's professional career in the Canadian Prairies spans the past 25 years. He received a Ph.D. and M.Sc. from the University of Alberta, where he researched invasive species and soil carbon responses to grazing, burning, and cultivation. He also earned a B.Sc. in biology from the University of Saskatchewan, and Diploma in Renewable Resources from Sask Polytechnic. His work history has included a breadth of field work, teaching and planning in fish and wildlife, forestry, parks, rangelands, and First Nations lands, for private industry, NGOs, universities, and provincial and federal agencies. His career at Environment Canada began in 2006 as a grassland ecologist working on plant Species at Risk recovery planning and grazing and restoration research, and for the past three years, he has been Head of Protected Areas and Stewardship for the Prairie and Northern Region. Among the things his team delivers is $7.5 million in annual funding to organizations, communities, and individuals to protect prairie habitat and recover species at risk, to restore wetlands, to build capacity in First Nations, and to engage Canadians more broadly. Other team members are actively managing and restoring federal protected areas and evaluating the effective protection of critical habitat elsewhere in the Canadian prairies.*

PLENARY 3: CONSERVATION AND RECOVERY OF PRAIRIE AND SPECIES

PLENARY 3-1: FEDERAL PROGRAMS FOR SPECIES AT RISK RECOVERY IN PRAIRIE CANADA

ROBIN BLOOM

Canadian Wildlife Service, Environment and Climate Change Canada, Prairie and Northern Region, 9250 49th St., Edmonton, AB T6B 1K5, Canada. Email: robin.bloom@canada.ca

Abstract: This presentation provides an overview of federal funding programs available to the conservation community to implement conservation measures for species at risk. Examples include new and innovative agreement-based approaches to achieving protection of 'critical habitat' for species at risk. The Public-Private Benefits Framework (PPBF) is used as a means of assessing the relative benefits and costs associated with different types of agreements. The importance of voluntary stewardship activities in the implementation of the federal Species at Risk Act is discussed and highlighted as an introduction to the session.

Biography for Robin Bloom (M.Sc.): *Robin has worked for the Canadian Wildlife Service for 14 years. Prior to joining CWS, his academic studies in eastern Canada focused on disturbance dynamics of plant communities. This background and his subsequent field experience with grassland songbird and plant surveys have given him an appreciation of prairie habitat dynamics. The field work also provided significant opportunities to meet landowners and land managers. This background and experience are part of his ongoing interest in listening and learning about practical challenges of conservation on rangelands and other working landscapes. Robin now works as a funding coordinator in the CWS Prairie Stewardship Unit. Robin's specific role is to develop funding relationships with the agricultural sector under Environment Canada's Species at Risk Partnerships on Agricultural Land initiative (SARPAL).*

PLENARY 3-2: CREATING OPTIMAL HABITAT FOR GREATER SAGE-GROUSE – MULTI-AGENCY/STAKEHOLDER COLLABORATIONS

KELLY WILLIAMSON

Rangeland Consulting Inc., Pambrun, SK S0N 1W0, Canada. Email: rangelandconsultinginc@gmail.com

Abstract: A conservation focus has been initiated in the South of the Divide Region of southwest Saskatchewan. The organization leading this focus is a multi-stakeholder group called South of the Divide Conservation Action Program (SODCAP). Part of this focus involves working with producers dealing with lands with greater sage-grouse habitat. How are these producers going to be engaged, and what tools will be effective? Results-based conservation agreements have been identified as being effective tools in the strategy to produce sage-grouse habitat. This presentation provides a brief history and review on the lead up, development, and delivery of the results-based conservation agreement model. I also discuss what role this tool can play in a broader land use management strategy.

Biography for Kelly Williamson: *Kelly Williamson is a forage, seed, and cattle producer from southwest Saskatchewan. With 20 years of experience as a primary producer, combined with a degree in Agriculture, Kelly uses his experience to practice agrology in the province. His consulting focus is on various agri-environmental projects, always looking towards advancing methods of environmentally sound agriculture, today and into the future. He has kept current with involvement with agricultural linked boards including the Saskatchewan Stock Growers Association, Society of Range Management, Pambrun Conservation and Development, Old Wives Watershed Association, South of the Divide Conservation Action Program, and the Rural Municipality of Whiska Creek.*

PLENARY 3-3: CASE STUDY: ON THE GROUND RECOVERING GREATER SAGE-GROUSE

MILES ANDERSON

Box 86, Fir Mountain, SK S0H 1P0, Canada. Email: labar@xplor.net

Abstract: Greater sage-grouse, silver sage, and cattle – they all live together. What can a land manager do to help a dwindling population? What do we know about sage-grouse and their silver sage habitat? Can land managers, through cattle management, give the sage-grouse its food and shelter throughout its life cycle? These are the types of questions that ranchers are working to answer in sage-grouse habitat.

Biography for Miles Anderson: *Miles ranches near Fir Mountain, Saskatchewan, presently raising cattle on approximately 25,000 acres that consist of 80% native, 10% tame hay, and 10% cultivation. Having Grasslands National Park as a neighbour, there is a considerable amount of research performed in this area. It is in his best interest to do a good job with grazing, as there are not many areas that have a non-grazed area of the size of Grasslands National Park surrounding them to be compared to, and that is what brought Miles to this conference. Being past Chair of the Prairie Conservation Action Plan and Saskatchewan Stock Growers Association has given him experience in advocacy which helps in current life experiences. His ranch has been blessed with sage-grouse habitat, and with the support of Environment Canada, Grasslands National Park, and Saskatchewan Ministry of Environment, all can learn what sage-grouse need to thrive, while keeping in mind that there are other species that live here as well.*

PLENARY 4: CONNECTING AND MOTIVATING PEOPLE TO WONDER, CARE, AND ACT

PLENARY 4-1: SOCIAL MARKETING PRINCIPLES AND PRACTICES - REACHING BEYOND AWARENESS AND ATTITUDE TO CREATE ACTION

KEN DONNELLY

Beyond Attitude Consulting, 3650 Hammonds Plains Road, Unit 14, Suite 371, Upper Tantallon, NS B3Z 4R3, Canada. Email: ken@beyondattitude.com

Abstract: A successful social marketing campaign that results in fostering changes in behaviour rests on three main pillars. First, the target audience must be made aware of the issue at hand and what ought to be done about it. Second, they must be convinced that this is an important issue to them, and have the attitude that they should take action. Third, and most overlooked, is that they must take the action. Social marketers often make the assumption that, with the first two pillars in place, the third one will automatically follow. That assumption is a pitfall, which can be avoided by incorporating some behavioural science into social marketing.

Biography for Ken Donnelly: *Ken Donnelly is the President of Beyond Attitude Consulting, a Canadian-owned firm with clients across Canada and around the world. Ken has been working with government and non-governmental organizations to foster positive individual behaviours for more than two decades, primarily in the areas of environment, health, and occupational health and safety. He has more than 20 years of experience in community engagement and strategic planning.*

PLENARY 4-2: CASE STUDY – A ROADMAP TO THE CONSERVATION CARAVAN

MARA ERICKSON

Operation Grassland Community, Alberta Fish and Game Association, 6924 104 St NW, Edmonton, AB T6H 2L7, Canada. Email: mara.e.erickson@gmail.com

Abstract: Raising awareness and encouraging dialogue about an issue is never easy, even when a relationship with the target audience is well-established. Doing the same with a brand-new, unfamiliar demographic poses its own set of challenges. In creating the *Conservation Caravan* to increase understanding about the positive connections between grassland species-at-risk and ranching, we at Operation Grassland Community found ourselves in the second camp; we had a story of environmental stewardship about which we were passionate, and wanted to share it with an audience who likely had no idea who we were. Our main challenge was that of exposure; i.e., how do we get our target audience—those NOT typically associated with the environmental sector—to even *see* this film? By reaching beyond our familiar networks, as well as using a variety of promotional outlets (television, print media, social media, film festivals, open houses), we were successful in fostering genuine interest from a diverse cross-section of viewers. We also sought assistance from those we deemed 'primary connectors,' i.e. well-known individuals in the community who fit our target demographic and could share the film with their own wide networks. Based on valuable feedback from viewers and partners, we determined that future projects would benefit from more aggressive social media marketing. Viewers also expressed interest in having concrete follow-up activities connected to the film's message, in order to keep them interested and involved. Overall, Operation Grassland Community considered the *Conservation Caravan* a success, and can use the lessons learned to better promote future initiatives.

Biography for Mara Erickson (M.Sc.): *Mara received her M.Sc. in Ecology from the University of Alberta, focusing on avian ecology and conservation. She serves as both the Communications Coordinator for Operation Grassland Community and the Extension & Stewardship Coordinator at the North Saskatchewan Watershed Alliance, combining public outreach and habitat/Species at Risk conservation within an environmental stewardship framework.*

PLENARY 4-3: CASE STUDY – MEEWASIN VALLEY EDUCATIONAL PROGRAMMING, STEWARDSHIP ACTIVITIES, AND CITIZEN SCIENCE PROJECTS

KENTON LYSAK

Meewasin Valley Authority, 402 Third Avenue South, Saskatoon, SK S7K 3G5, Canada. Email: klysak@meewasin.com

Abstract: Created in 1979, the Meewasin Valley Authority is a conservation agency dedicated to conserving the cultural and natural resources of the South Saskatchewan River Valley. Meewasin's conservation zone includes a variety of unique prairie habitats, including Beaver Creek Conservation Area, the Saskatoon Natural Grasslands, and the Meewasin Northeast Swale. In order to promote conservation within the Meewasin river valley, the Public Programs Unit was established to educate the public on the importance of biodiversity and conserving prairie habitats for future generations. Since then, Meewasin has engaged the residents of Saskatoon in taking an active role in local conservation efforts through educational programming, stewardship activities, and citizen science projects. Programs include bird banding, measuring light pollution, studying the benefits of grazing, building bat boxes, and interpreting the natural history of the valley. These educational opportunities are designed to reconnect visitors with nature by providing a hands-on learning experience within a natural setting. By promoting stewardship activities and encouraging the public to visit these natural areas, we hope to increase support for local conservation efforts in the future.

Biography for Kenton Lysak (M.Sc.): *Kenton is a senior interpreter at Beaver Creek Conservation Area where he is actively involved in developing environmental education and stewardship programs for the Meewasin Valley Authority. He received both his M.Sc. and B.Sc. from the University of Saskatchewan, where he specialized in the movement of marine-derived nutrients into terrestrial ecosystems. After working at both the University of Saskatchewan and the National Hydrology Research Centre, Kenton has spent over a decade within the field of environmental education. He has led thousands of students to prairie habitats around Saskatoon, educating them on sustainable practices, ecosystem services, and the importance of conservation. Recently, his work has focused on engaging the public through citizen science projects, including monitoring light pollution through the Saskatoon Dark Sky Initiative and determining local biodiversity at the Meewasin Northeast Swale.*

SESSION SPEAKERS' PAPERS AND ABSTRACTS

THEME 1: STATUS, TRENDS, THREATS, AND ISSUES

CONCURRENT SESSION 1 - Avian Status and Ecology

THE STATUS OF GRASSLAND BIRDS IN MANITOBA: PRELIMINARY RESULTS OF THE MANITOBA BREEDING BIRD ATLAS

CHRISTIAN ARTUSO, ANDREW COUTURIER, SONYA RICHMOND, DENIS LEPAGE

Bird Studies Canada, 115 Front St., Port Rowan, ON N0E 1M0, Canada. Email: cartuso@birdscanada.org

Abstract: The Manitoba Breeding Bird Atlas (2010–2014) used a massive volunteer effort to document the current distribution and relative abundance of all species that breed in the province (1054 registered volunteers; 42,621 field hours in 3006 atlas grid squares; 38,628 point counts in 2256 atlas grid squares). Protocol details are available at: http://birdatlas.mb.ca/pdfkit_en.jsp. We examined the results for threatened grasslands Species At Risk (SAR) and compared this to historical information.

Manitoba lies at the northeastern periphery of the greater prairie ecosystem, which is wetter than elsewhere in prairie Canada, and the patterns of occupancy and abundance of grassland birds here differ somewhat from Saskatchewan and Alberta. The five data-collection years were extremely wet, a fact that must be borne in mind when considering certain results such as burrowing owls (*Athene cunicularia*) being found in only seven atlas squares (Table 1), with no wild birds recorded after 2012.

The grassland SAR listed in Table 1, with the notable exception of bobolink (*Dolichonyx oryzivorus*), have all lost thousands of square kilometres of their historical range in Manitoba (Fig. 1), formerly occupying prairie habitat as far east and north as the edge of the boreal transition zone (Manitoba Avian Research Committee 2003). The ferruginous hawk (*Buteo regalis*) disappeared from Manitoba from the 1920s until 1984, when it began rebounding (Manitoba Avian Research Committee 2003), but had dropped again to 41 pairs by the start of the atlas period and to fewer than 20 pairs by 2013 (Ken De Smet, pers. comm.). Aside from the burrowing owl, the species with arguably the most dramatic loss is Baird's sparrow (*Ammodramus bairdii*; Table 1, Fig. 1), now confined to the extreme southwestern corner of

the province. Baird's sparrow was only assessed as Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in May 2012; however, its losses have been much more severe in Manitoba than all other passerine grassland SAR. Sprague's pipit (*Anthus spragueii*), first listed by COSEWIC in 2001, occurred in five times as many atlas grid squares at 25 times the abundance of Baird's sparrow (Table 1). Nonetheless, Baird's sparrow was found in a few more northern locations in 2015, including four singing individuals in the Ellice-Archie community pasture (C. Artuso pers. obs., marked with a blue asterisk in Fig. 1).

Table 1. Detection rates for grassland species at risk (SAR). COSEWIC categories indicated in brackets include EN = Endangered, TH = Threatened, SC = Special Concern. An asterisk indicates a listing that pertains to a subspecies. # Sqs = number of squares in which species was detected (all atlassing), # PCs = number of point counts on which species was detected, % PCs = the percentage of point counts on which the species was detected, Abund/PC = abundance (number of individuals) detected per point count. For Region 1 PCs, n = 4126; for Region 1–7 PCs, n = 20,823

Species	Region 1 only				Region 1–7			
	# Sqs	# PCs	% PCs	Abund/ PC	# Sqs	# PCs	% PCs	Abund/ PC
Burrowing owl (EN)	6	2	0.05	0.001	7	2	0.01	0.0001
Loggerhead shrike (TH*)	30	5	0.1	0.002	36	5	0.02	0.0003
Ferruginous hawk (TH)	37	2	0.05	0.001	38	3	0.01	0.0001
Baird's sparrow (SC)	18	7	0.2	0.002	18	7	0.03	0.0004
Chestnut-collared longspur (TH)	35	36	0.9	0.02	36	36	0.2	0.004
Sprague's pipit (TH)	91	121	2.9	0.04	112	131	0.6	0.01
Bobolink (TH)	228	533	12.9	0.21	860	1784	8.6	0.17

There is little doubt that the losses and declines of grassland SAR documented by the atlas can largely be attributed to habitat loss, in particular conversion of native grassland and pasture to cropland. Remnant patches of prairie in south-central and southeastern Manitoba are now too small and interspersed to support populations of these species, many of which are area sensitive. Although some pastureland does remain in these areas, it is proving insufficient in extent and quality to prevent the range collapses observed. Pastureland around Riding Mountain National Park is still used by Sprague's pipit and bobolink but now appears to be largely devoid of other grassland SAR (Fig. 1), although there was one record of loggerhead shrike (*Lanius ludovicianus*) just south of the national park in 2010. No individuals of the population of loggerhead shrike that formerly bred around northern Winnipeg, believed to be intergrades between the eastern *migrans* and western

excubitorides subspecies, were detected during the atlas period, nor since 2009, although there were records in two squares in each of Regions 3 and 4. These birds were not detected more than once in those squares and may have been transients.

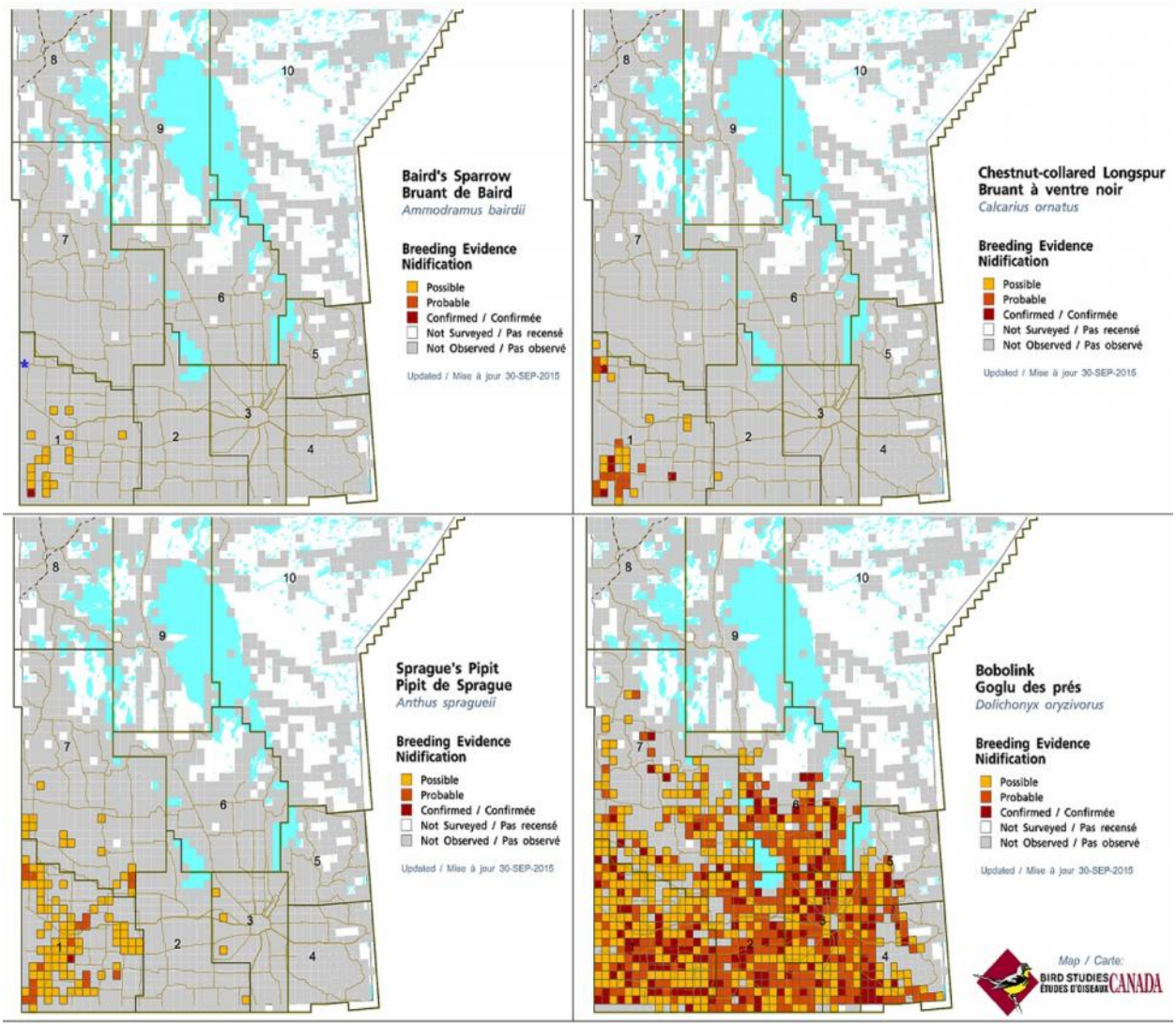

Fig. 1. Comparison of the current distribution of four passerine grassland Species at Risk (SAR), showing the highest category of breeding evidence obtained per atlas grid square and the atlas administrative regions (numbered). The blue asterisk on the map of Baird's sparrow indicates the northernmost location of this species found in 2015

Relative abundances suggest further problems even in the areas where these species remain within atlas Region 1 (Table 1). Atlas point counts are designed to be conducted in proportion to major habitat types available, and do not target grassland SAR; however, the

atlas documented extremely low densities in the current core range; for example, Sprague's pipit density averaged 0.21 individuals per point count when only those squares with point count detections are considered (range: 0.03–0.82, n = 48), chestnut-collared longspur (*Calcarius ornatus*) averaged 0.27 (range: 0.05–0.8, n = 16), and Baird's sparrow averaged 0.1 (range: 0.05–0.25, n = 4). These averages are substantially lower than that of the more widespread bobolink, which is less reliant on native prairie and readily uses forage crops such as alfalfa, averaging 0.32 individuals per PC (range: 0.03–2.45, n = 608). Further analyses on relative abundance are pending. It will be important to compare these densities with the Saskatchewan Breeding Bird Atlas, due to begin in 2017. Understanding the large-scale demographic patterns of loss for these threatened species, and the significance of range-peripheral contexts, will greatly inform conservation efforts.

Literature Cited

Manitoba Avian Research Committee (2003) The Birds of Manitoba. Manitoba Naturalists Society, Winnipeg, MB

THE INFLUENCE OF MIGRATION TIMING ON PARENTAL PROVISIONING RATES AND REPRODUCTIVE SUCCESS IN A SONGBIRD

ALISHA RITCHIE, K.C. FRASER

Department of Biological Sciences, University of Manitoba, Winnipeg, MB R3T 2N2, Canada.
Email: ralisha2309@gmail.com

Abstract: Carry-over effect studies examine how an event or process that occurs during one season can have an impact on an individual's fitness (reproductive success or survival) in a future season (Harrison et al. 2011). Most research has looked at the effects of the non-breeding (winter) season on the reproductive success during the breeding season or migration timing during the spring migration. There is strong evidence that the quality of wintering habitat that an individual uses has an effect on its reproductive success in the following breeding season (Norris et al. 2004). Further, in addition to winter habitat quality, the weather has an impact on the timing of departure for spring migration (Studds & Marra 2011), which affects the arrival at the breeding grounds, which in turn affects the quality of the breeding territory obtained and reproductive success (Marra et al. 1998).

However, no carry-over effect studies have examined how migratory stopover sites affect an individual's future fitness. Migratory stopover sites are areas along migration routes at which individuals stop to rest and refuel important stored resources to complete migration. Stopover sites have important impacts on the body condition of individuals (Pfister et al. 1998). In certain cases, stopover sites can become depleted as more individuals use the same sites (Newton 2004). Use of stopover sites with low food abundance or late arrival at stopover sites, when food availability has been lowered, has the potential to negatively affect the future fitness of individuals by preventing adequate refueling and reducing body condition. Our research is examining how the use of stopover sites affects future reproductive effort in a long-distance migratory songbird. We used the purple martin (*Progne subis*), a long-distance migrant that journeys between North American breeding sites and South American overwintering sites, to determine the effects of migratory stopover sites on breeding productivity. Purple martins are aerial insectivores that are showing a steep rate of decline (Nebel et al. 2010), making this research important for determining what factors may be involved in these declines.

With the availability of new miniaturized tracking technology, the migration routes of small songbirds can now be determined, providing the opportunity to examine how the costs of migration may carry over to affect breeding success. Using light-level geolocators to track migration, we can determine where an individual bird spent the winter and where along the migration route it used migratory stopover sites. We are examining how both the wintering

habitat influences the use of migratory stopover sites and how the use of migratory stopover sites affects reproductive effort. Reproductive effort is being measured not only by the number of young produced and fledged but also by parental provisioning rates. Parental provisioning rates have rarely been investigated due to the difficulties associated with recording them; however, provisioning is a very important and represents a costly part of reproduction, especially for species with altricial young, such as purple martins. We have the opportunity to easily and non-intrusively record provisioning rates of individual birds using a new technology called radio frequency identification (RFID).

Preliminary analysis has shown that individuals differ in how long they spend at stopover sites in relation to the duration of their total spring migration and that individuals who spent longer at spring stopover sites had higher provisioning rates. These results suggest that the individuals who spent more time at migratory stopover sites were able to store more resources on which they could then rely during the breeding season to fuel higher provisioning rates. Future analyses will include examining how the quality of stopover sites influences an individual's provisioning rates and how both the duration and quality of stopover sites used affect the number of young produced by females. This research will help shed new light on how seasonal interactions influence breeding success in a migratory aerial insectivore that is experiencing steep population declines.

Literature Cited

Harrison XA, Blount JD, Inger R, Norris DR, Bearhop S (2011) Carry-over effects as drivers of fitness differences in animals. Journal of Animal Ecology 80:4–18

Marra PP, Hobson KA, Holmes RT (1998) Linking winter and summer events in a migratory bird by using stable-carbon isotopes. Science 282:1884–1886

Nebel S, Mills A, McCracken JD, Taylor PD (2010) Declines of aerial insectivores in North America follow a geographic gradient. Avian Conservation and Ecology 5:1–14

Newton I (2004) Review: population limitation in migrants. Ibis 146:197–226

Norris DR, Marra PP, Kyser TK, Sherry TW, Ratcliffe LM (2004) Tropical winter habitat limits reproductive success on the temperate breeding grounds in a migratory bird. Proceedings of the Royal Society of London Series B 271:59–64

Pfister C, Kasprzyk MJ, Harrington BA (1998) Body-fat levels and annual return in migrating semipalmated sandpipers. The Auk 115:904–915

Studds C, Marra P (2011) Rainfall-induced changes in food availability modify the spring departure programme of a migratory bird. Proceedings of the Royal Society of London Series B 278:3437–3443

HABITAT USE AND MOVEMENT PATTERNS OF MALE AND FEMALE SNOWY OWLS (*BUBO SCANDIACUS*) IN WINTER

ALEXANDER M. CHANG, KAREN L. WIEBE

Department of Biology, University of Saskatchewan, Saskatoon, SK S7N 5E2, Canada. Email: a.chang@usask.ca

Abstract: A large number of snowy owls (*Bubo scandiacus*) overwinter on the Saskatchewan prairies, but their space use and territorial behaviours are not well known here. Based on their larger size, we hypothesized that females would outcompete males for high-quality habitat, causing females to be in better physical condition and experience lower winter mortality than males. Sex-biased mortality in winter would affect breeding population demography, and this effect could be stronger in severe winters. Similarly, we hypothesized that adult owls would outcompete hatch-year owls because of their experience with previous winters. Preliminary results show no differences in relative prey abundance in four common land-use types in rural Saskatchewan, but small mammal abundance is greater near field edges. We are live-trapping owls to analyze patterns of body condition in males and females over the winter to test the prediction that males are in poorer condition than the dominant females. We are also using satellite telemetry to measure and compare home-range sizes and movement patterns (e.g., territorial or nomadic) of snowy owls by age and sex. Data collection is ongoing and will continue during the 2015-16 winter field season.

DEVELOPING PREDICTIVE MODELS FOR THE OCCURRENCE OF SPRAGUE'S PIPIT (*ANTHUS SPRAGUEII*) IN ALBERTA

JULIE P.N. LANDRY-DEBOER[1], PAUL F. JONES[1], BRAD A. DOWNEY[1], BRANDY L. DOWNEY[2], CRAIG G. DEMAERE[3]

[1]Alberta Conservation Association, #400, 817 4th Avenue S., Lethbridge, AB T1J 0P3, Canada. Email: Julie.landry-deboer@ab-conservation.com

[2]Alberta Environment and Parks, 530 8th Street S., Lethbridge, AB T1J 2J8, Canada

[3]Alberta Environment and Parks, Agriculture Centre, #100, 5401 – 1st avenue S., Lethbridge, AB T1J 4V6, Canada

Abstract: Sprague's pipits (*Anthus spragueii*) (SPPI) have experienced a large historic population decline across the prairies and are listed as 'Threatened' by the Canadian Species at Risk Act. Understanding the habitat requirements for SPPI will aid in their future conservation. We used point-count data collected by MULTISAR (Multiple Species at Risk) to examine the habitat requirements for SPPI across the mixed-grass and dry mixed-grass regions of southern Alberta. We used Akaike's information criterion to evaluate which of three hypotheses best explained the occurrence of SPPI: (1) habitat structure, (2) habitat community, or (3) habitat disturbance. A suite of *a priori* models was developed for each hypothesis and consisted of variables determined from vegetation transects, range health assessments, and GIS analysis. We discuss the top models for predicting SPPI occurrence and their conservation implications.

UNDERSTANDING THE FUTURE OF WIND DEVELOPMENT IN THE NORTHERN GREAT PLAINS

CLAIRE HOOD, ANNE GAGE

World Wildlife Fund US – Northern Great Plains Program, Bozeman, MT 59715, USA. Email: Claire.hood@wwfus.org

Abstract: Wind energy is growing across the United States thanks to technological advances, policy and tax incentives, and competitive prices. Wind contributed 4.4% of US electricity in 2014 (AWEA 2015) and is cost competitive with coal and fossil fuels in many parts of the country (Wiser & Bolinger 2015). Canada is also experiencing a surge in wind energy, with 2014 being a record year for new generation. This national development led the World Wildlife Fund's (WWF) Northern Great Plains (NGP) program to ask how the development of wind energy and transmission intersects with WWF's goal of sustaining intact grasslands and enhancing biodiversity in the NGP. Our research has aimed to address this question while developing an official position for WWF on wind development in the ecoregion. We researched wind energy in Montana and Wyoming to understand its drivers and obstacles, determine effects on wildlife, and explore how to develop wind through smart landscape-scale planning.

While Montana wind projects have increased in the last decade, the pace of development has lagged behind other states with similar levels of wind potential. Despite offering some of the highest wind potential in the US, Montana only ranks 21st for installed capacity (AWEA 2014a). This discrepancy can be attributed to two interconnected issues: lack of transmission and lack of demand (both within the state and across the West). These impediments have largely trumped the state's efforts to draw developers to Montana, such as the Renewable Portfolio Standard (RPS) and a general lack of regulation around wind.

Wind development in Wyoming is not impeded by the same issues. Wyoming's installed wind capacity is more than double that of Montana (1410 MW versus 665 MW; AWEA 2014a,b). Wyoming has two major projects under development and over 10,000 MW in transmission planned over the next ten years. Yet state policies do not actively encourage wind; in fact, they seem to create an anti-wind regulatory environment where wind is taxed and the rights of landowners are prioritized. The state's lack of an RPS shows that, while a renewable energy mandate or goal can spur development, it certainly is not necessary for its success. Wyoming's advantage comes down to the same two issues that have impeded

development in Montana: available transmission and demand. Wyoming's geographical location allows it to reach areas of high demand more easily.

Wind energy is often portrayed as a green form of energy with minimal environmental impacts, and wind developers promote this position when proposing new projects. However, while wind energy does reduce greenhouse gas emissions and water usage typical to fossil fuels, it can result in habitat loss and fragmentation and can negatively affect local wildlife. In addition to directly causing bird and bat fatalities, a wind project can have indirect wildlife impacts such as the introduction of invasive species, increased predation, and habitat avoidance. When considering the entire wind project area, land use can increase to between 50 and 200 m^2/MWh (Hertwich et al. 2015). These effects can vary considerably depending on the project's size and siting. The Montana case studies found that three wind farms in the state have responded to environmental concerns in different ways. A project's environmental impacts are determined to some extent by the developer and his or her willingness to work with scientists and conservationists to minimize a proposed project's impacts.

Several variables could alter future wind development in the NGP. Federal policies, such as the Clean Power Plan, could require states to turn away from coal and rely more on renewables. Increases in state RPS or continued reauthorization of the national Production Tax Credit could also spur development. Alternatively, increasing energy efficiency or congressional efforts to limit the spread of renewables could slow industry growth. Lastly, upgrades to and expansion of the national grid could spell better integration of wind into the power system and increased transmission capacity. These efforts, paired with new demand, could drive development across the western US.

WWF's position on wind energy aims to balance wind energy's role in combatting climate change with its landscape impacts. It advocates for no wind projects constructed on or near intact landscapes or sensitive species in the NGP. It promotes full consideration of alternatives and best management practices before project siting, construction, and operation. Lastly, it supports the application of principles, tools, and inclusive, transparent processes in order to make the best possible choices regarding the development of new projects.

Literature Cited

AWEA (American Wind Energy Association) (2014a) Montana wind energy. AWEA, Washington, DC

AWEA (2014b) Wyoming wind energy. AWEA, Washington, DC

AWEA (2015) Wind was largest source of new electricity in 2014, Congress still must provide long-term policy certainty. Washington, DC. Available at http://www.awea.org/MediaCenter/pressrelease.aspx?ItemNumber=7294

Hertwich EC, Givon T, Bourman EA, Arvesen A, and 6 others (2015) Integrated life-cycle assessment of electricity-supply scenarios confirms global environmental benefit of low-carbon technologies. Proceedings of the National Academy of Sciences 112:6277–6282

Wiser R, Bolinger M (2015) 2014 Wind Technologies Market Report. DOE/GO-102015-4702. U.S. Department of Energy, Energy Efficiency & Renewable Energy, Oak Ridge, TN

CEASING OF FEDERAL PASTURES AND A NEW MODEL FOR PUBLIC LAND MANAGEMENT

RICK ASHTON

(Retired Director of Community Pastures and Co-Lead for the Federal Pastures Transition since 2010) 3145 Angus Street, Regina, SK S4S 1P5, Canada. Email: ashtonr@sasktel.net

Abstract: Will the new stewards of the former federal community pastures be able to protect the integrity of the prairie habitats they have inherited? What options exist that can support them in ensuring that these important working landscapes continue to stay healthy to support wildlife, the livestock industry, and public uses? These are key questions that have been asked since the 2012 announcement by the federal government to cease operations on all 84 federally managed community pastures. The community pasture model was a very successful model of public land management that balanced environmental, social, and economic priorities. Operating for more than 80 years, the pastures became a model for other provinces and around the world in using grazing as a management tool to maintain healthy ecosystems. Ninety percent of the land used for pastures is owned by the provinces, and the model emerging for continued use of these lands is cooperative grazing areas under lease. Many interested groups of citizens have expressed concerns about the future of these lands. Is there a collective willingness to work together to conserve these landscapes for future generations? This presentation lays out the potential scenarios and discusses options whereby a balance of public and private uses can be met while ensuring that these important fragments of native prairie are conserved.

EFFECTS OF CLIMATE CHANGE ON ENDANGERED PLANT SPECIES' DISTRIBUTIONS IN MANITOBA

ASHLEY GREENLEY[1], DAVID R. GREENWOOD[2], DION WISEMAN[3]

[1]Master of Science (Environmental & Life Sciences) Program, Brandon University, Brandon, MB R7A 6A9, Canada. Email: greenley9@hotmail.com

[2]Biology Department, Brandon University, Brandon, MB R7A 6A9, Canada

[3]Geography Department, Brandon University, Brandon, MB R7A 6A9, Canada

Abstract: Shifts in global and local climates are altering species distributions because of unique physiological limits that control growth and reproduction (McKenney et al. 2007). Climate change has resulted in warmer temperatures and unpredictable precipitation events at northern latitudes (IPCC 2013). Because of a changing climate, changes in plant species' habitats are predicted to accelerate extinction globally, and should therefore be accounted for in conservation management planning (Sieck et al. 2011). Endangered plant species are expected to be the first and most significantly affected because of their small populations. Of concern is whether existing populations and protected areas are adequate to support these species under predicted future climate.

The effects of climate change were examined for four endangered plant species in Manitoba: small white lady's-slipper (*Cypripedium candidum*; conservation status rank G4 N2 S2), common hackberry (*Celtis occidentalis*; G5 N4 S1), alpine cliff fern (*Woodsia alpina*; G4 N4 S1), and Sitka clubmoss (*Diphasiastrum sitchense*; G5 N5 S1). The climate profile software ANUCLIM 6.1.1 was applied to present-day distribution data from the Manitoba Conservation Data Centre (MBCDC), the Global Biodiversity Information Facility (GBIF 2014), and the University of Manitoba Vascular Plant Herbarium (WIN) to generate quality-controlled climate profiles for these species under recent climate, and to predict how the distributions of these plant species may be affected under future climate change scenarios.

Present species occurrences were restricted to naturally occurring native species with verifiable specimen sources and field surveys with geographic coordinates. ANUCLIM generates output data for range and core climate for different temperature and precipitation parameters (e.g., mean annual temperature; Xu & Hutchinson 2013); the core indicates the climate in which a species can grow and reproduce. Five different climate models were used: second-generation Canadian Earth Systems Model (CanESM2), Community Earth Systems Model v. 1 Community Atmospheric Model (CESM1(CAM5)), Composite-AR5 from the IPCC 5th Assessment Report (AR5), Met Office Hadley Centre Climate Prediction model (HadGEM2-ES), and Earth Systems Model with atmospheric Chemistry v. 5 (MIROC-ESM-CHEM) based on the Coupled Model Intercomparison Project phase 5 (CMIP5). Each model was run with three representative concentration pathways

(RCPs) for carbon dioxide based on the IPCC AR5: RCP2.6, RCP4.5, and RCP8.5. Predicted future climate and other environmental growth restrictions (e.g., soil) were combined to determine whether current conservation management practices (e.g., protected areas) were adequate to provide protection for species survival, or whether new policy recommendations are necessary to prevent species extirpation in Manitoba.

An overlap of GIS data for present plant species occurrences, ideal soil characteristics, and core climates were mapped in Manitoba to determine potential future species distributions. An ensemble of climate models was used to determine the most likely location of a species' core climate under different RCPs and at different time periods. Areas of suitable habitat were considered areas that encompassed ideal soil characteristics and occurred within areas of overlap of three or more core climates. Any locations that contained rare species without protected areas were considered important potential locations for new protected areas. The core climates of all of the species were found to shift north with time and an increase in atmospheric carbon dioxide. *Celtis occidentalis* is currently found within a permanently protected area in Manitoba. *Diphasiastrum sitchense* had no areas of core climate in Manitoba, indicating an increased risk of extirpation for this species in Manitoba. Based on how climate change proceeds, the maps produced from this project can be used to determine areas of conservation significance for select plant species. The methodology in this project can be applied to other provinces and to all of North America, as well as to other plant species.

Literature Cited

GBIF (Global Biodiversity Information Facility) (2014) What is GBIF? Available at http://www.gbif.org/whatisgbif (accessed on 5 November 2014)

IPPC (Intergovernmental Panel on Climate Change) (2013) Summary for policymakers. In: Stocker TF, Qin D, Plattner GK, Tignor M and others (eds) Climate change 2013: the physical science basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, and New York, NY, p 1–27

McKenney DW, Pedlar JH, Lawrence K, Campbell K, Hutchinson MF (2007) Beyond traditional hardiness zones: using climate envelopes to map plant range limits. BioScience 57:929–937

Sieck M, Ibisch PI, Moloney KA, Jeltsch F (2011) Current models broadly neglect specific needs of biodiversity conservation in protected areas under climate change. BioMed Central Ecology 11:1–12

Xu T, Hutchinson MF (2013) New developments and applications in the ANUCLIM spatial climatic and bioclimatic modelling package. Environmental Modelling & Software 40:267–279

CAN WET AREAS MAPPING BE USED TO PREDICT INVASIVE SPECIES IN DRY MIXED-GRASS PRAIRIE?

LORI SCHROEDER[1], JOYCE GOULD[2], ELLEN MACDONALD[1]

[1]University of Alberta, Department of Renewable Resources, Edmonton, AB T6G 2H1, Canada. Email: ldschroe@ualberta.ca

[2]Alberta Environment and Parks, 9820 106 St., Edmonton, AB T5K 2J6, Canada

Abstract: Invasive species have been identified as one of the most serious threats to ecosystem health and to the conservation of biodiversity and endangered species. As such, the presence and abundance of invasive species is often used as a metric/indicator of ecosystem health and of critical habitat as defined under Endangered Species legislation. The rate of invasion of non-native species into ecosystems, however, often exceeds our ability to document their presence and, thus, protect vulnerable ecosystems. With less than 50% of Alberta's native grasslands remaining intact, their persistence, along with that of the high proportion of endangered species they contain, is of particular concern.

Given the above, Wet Areas Mapping (WAM, a LiDar-based digital elevation model of depth to water) has been proposed as a landscape-level tool for predicting patterns of invasion of non-native vascular plant species in grassland ecosystems of Alberta. In summer of 2015, transects were established in the dry mixed-grass prairie of southern Alberta in order to test its suitability for predicting invasive species occurrence and for identifying both rare and particularly vulnerable communities.

Preliminary results indicate that areas predicted by WAM to be moister have a greater abundance of invasive species. Plant communities also reflect the moisture gradient predicted by WAM. Further work will be done in 2016 in an area with less human disturbance to confirm and expand upon these results.

UNDERSTANDING THE EFFECTS OF HABITAT FRAGMENTATION ON GRASSLAND POLLINATION

MARIKA OLYNYK[1], NICOLA KOPER[1], RICHARD WESTWOOD[2]

[1]Natural Resources Institute, 303-70 Dysart Road, University of Manitoba, Winnipeg, MB R3T 2M6, Canada. Email: marikaolynyk@gmail.com

[2]Department of Biology and Department of Environmental Studies, University of Winnipeg, Winnipeg, MB R3B 2E9, Canada

Abstract: With declines in both wild and domestic bees, and the ongoing loss and fragmentation of Canadian grasslands, it is essential to understand how landscape configuration affects pollination in the prairies. Insect pollination service is a key ecosystem process which maintains flowering plant reproduction and contributes to the ongoing diversity and stability of ecosystems (Lundberg & Moberg 2003). Edge effects, i.e., the ecological changes that occur at the boundary of two habitat types, can be used to identify effects of habitat fragmentation (Fahrig 2003). The objectives of this study are to determine whether edge effects influence insect pollination service, and to understand what factors affect pollination service in fragmented grasslands.

To meet these objectives, we collected data in fragmented grassland patches in eastern Manitoba over three sampling periods in 2014 and 2015. Sites were a mix of remnant prairies and tame grasslands with varying amounts of introduced grass and forb species, and all sites were managed by grazing. We used the seed set of *Brassica rapa* phytometers (greenhouse-grown potted plants) as a proxy measure for insect pollination service. The phytometers were placed at plots along transects which began at tree or road edges. We also sampled plots for bee and vegetation data, and, using GIS software, measured land cover types within 1 km of each site. Effects on the seed set of the phytometers and on bee abundance were analyzed using mixed-effects models.

In two of the three sampling periods, increasing amounts of natural or semi-natural habitat within 1 km of the sites resulted in significant increases in seed set of the phytometers. These results highlight the importance of the surrounding landscape to pollination in grasslands, a finding in keeping with previous research in other types of ecosystems (Kennedy et al. 2012).

In one sampling period, increased distance to tree edges resulted in significantly reduced seed set of the phytometers. Similarly, in the two early-summer sampling periods, increased

distance to tree edges resulted in significantly reduced numbers of bees caught in study traps. However, in the only late-summer sampling period, increased distance to tree edges resulted in significantly increased numbers of bees. These results demonstrate that there are edge effects on insect pollination service in grasslands, but that the mechanisms behind these effects may be driven by certain species or pollinator communities. Future work will examine these possibilities to better explain the impact of edge habitats. Ultimately, the results of this study will contribute to informed management of pollinators, as habitat management for larger wildlife does not necessarily ensure habitat conservation for invertebrates.

Literature Cited

Fahrig L (2003) Effects of habitat fragmentation on biodiversity. Annual Review of Ecology, Evolution, and Systematics 34:487–515

Kennedy CM, Lonsdorf E, Neel MC, Williams NM, and 37 others (2012) A global quantitative synthesis of local and landscape effects on wild bee pollinators in agroecosystems. Ecology Letters 16:584–599

Lundberg J, Moberg F (2003) Mobile link organisms and ecosystem functioning: implications for ecosystem resilience and management. Ecosystems 6:87–98

THE CONSERVATION STATUS OF BEES IN THE PRAIRIE PROVINCES – WHY ARE THEY AT RISK?

CORY S. SHEFFIELD[1], JENNIFER HERON[2]

[1]Royal Saskatchewan Museum, 2340 Albert Street, Regina, SK S4P 2V7, Canada. Email: Cory.Sheffield@gov.sk.ca

[2]British Columbia Ministry of Environment, Species Conservation Science Unit, 315-2202 Main Mall, Vancouver, BC V6T 1Z1, Canada

Abstract: As pollinators, bees (Hymenoptera: Apoidea) are vital members of most terrestrial ecosystems, including in grasslands. The Canadian grasslands contain over 380 bee species – almost half of the species occurring in the country, with ca. 25% of these not occurring within other ecozones in Canada. These patterns of diversity and endemism are, in part, due to ecological specialization; many bees have specialized relationships with their food plants (i.e., oligolecty), their specific nesting substrates, and for cuckoo bees, their host taxa. The Prairies Ecozone has the highest proportion of food plant specialist bee species in Canada. Ecological specialization is also one of the main natural factors putting bees at risk. Here we summarize the diversity and taxonomic gaps of bees in Canada with focus on the prairie fauna, and summarize the conservation status, trends, and major threats to these important pollinators via our recent efforts of national assessment for all bee species in Canada.

EFFECTS OF ENVIRONMENTAL VARIABLES ON THE CALLING BEHAVIOUR OF NORTHERN LEOPARD FROGS (*LITHOBATES PIPIENS*)

MARCUS D. SOMMERS[1,2], L.A. RANDALL[1], R.M.R. BARCLAY[2]

[1]Centre for Conservation Research, Calgary Zoological Society, 1300 Zoo Rd. N.E., Calgary, AB T2E 7V6, Canada. Email: marcusdsomm@gmail.com

[2]Biological Science, University of Calgary, 2500 University Dr. N.W., Calgary, AB T2N 1N4, Canada

Abstract: We investigated the relationship between wind, humidity, ice melt, water temperature, and time of day on the breeding call phenology of the northern leopard frog (*Lithobates pipiens*) in southern Alberta using automated recording devices. The date of first calling differed at each site but began 7 to 10 days after the ice melted. No calling was detected at water temperatures below 5°C. At low water temperature (< 7.5°C), frogs called slightly more at midday at Bow Gravel, and as wind and water temperature increased, frogs increasingly called at night. Frogs at Cypress Hills also called more at midday at low and mid-range temperature (< 11.5°C). Most calling at Magrath occurred in the morning, and there was little effect of water temperature or wind on calling. Magrath was the warmest site, so water temperature may have been above the threshold for calling at all times of day; this site was also relatively calm. Our results suggest that auditory surveys between sunset and midnight are not effective at all sites, and presence/absence surveys should include intervals throughout the day, or surveys could result in severe underestimates of occupancy. Moreover, breeding surveys should be delayed until later in the breeding season at high-elevation sites.

DISTRIBUTION OF THE GREAT PLAINS TOAD IN PRAIRIE CANADA

ANDREW B. DIDIUK[1], JOHN A. CONKIN[1], ERIC J. WOODSWORTH[1], J.M. KYLLO[2]

[1]Environment Canada, Canadian Wildlife Service, 115 Perimeter Road, Saskatoon, SK S7N 0X4, Canada. Email: andrew.didiuk@ec.gc.ca

[2]ESRI Canada, 1130 West Pender Street, Suite 610, Vancouver, BC V6E 4A4, Canada

Abstract: The Great Plains toad (*Anaxyrus cognatus*) is listed as a Schedule 1 Species of Concern by the Species at Risk Act (see http://www.registrelep-sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=559). Available occurrence information indicates that the Great Plains toad is widely distributed in southeast Alberta, but very little occurrence information is available for Saskatchewan or Manitoba. One of the broad strategies for conservation in the management plan for the Great Plains toad, prepared by Environment Canada, is to determine the distribution of this species in Canada. This conservation strategy was addressed through implementation of nocturnal calling surveys and larval surveys in the vicinity of the Great Sandhills of southwest Saskatchewan from 2010 to 2012, and in extreme southeast Saskatchewan and extreme southwest Manitoba from 2013 to 2015. The distribution and habitat association information obtained for the Great Plains toad in these two regions are presented and discussed.

BREEDING BIRD ATLASES IN CANADA: INFORMING CONSERVATION EFFORTS AT MULTIPLE SPATIAL SCALES

ANDREW COUTURIER[1], CHRISTIAN ARTUSO[1], ROB BUTLER[1], ANDREW COUGHLAN[1], PETE DAVIDSON[1], CHRISTOPHER DI CORRADO[1], EVA JENKINS[1], DENIS LEPAGE[1], BECKY STEWART[1], KIEL DRAKE[1], PHIL TAYLOR[2]

[1]Bird Studies Canada, 115 Front St., Port Rowan, ON N0E 1M0, Canada. Email: acouturier@birdscanada.org

[2]Biology Deparment, Acadia University, Wolfville, NS B4P 2R6, Canada

Abstract: Canada has seen a proliferation of Breeding Bird Atlases since 2001, with seven provinces either in progress or completed, and others due to commence in the years ahead. Indeed, atlases have emerged as a central component of bird conservation efforts in Canada due to the rigorous information they generate, information that is respected and needed by decision and policy makers. Bird Studies Canada has led these developments in partnership with Environment Canada and in collaboration with provincial governments, a variety of non-government organizations, and industry groups. Atlas methods, approaches, and analytical techniques continue to evolve, in part to meet the increasingly sophisticated needs of scientists and decision makers. One component of this evolution in Canada is the addition of quantitative abundance sampling protocols to the atlas framework and the multitude of resulting tools and applications that support improved decision making and conservation planning. Here, we report on these new developments, particularly as they pertain to conservation planning at multiple scales. Examples include: (1) development and use of province-wide and regional population estimates for birds, (2) modeling species richness patterns, (3) defining conservation priorities at macro- and micro-scales, (4) analyzing and demarcating ecological units, (5) informing forest management, and (6) identifying bird–habitat associations. Saskatchewan is the next jurisdiction to have a Breeding Bird Atlas, with the project scheduled to commence in spring/summer 2017.

DEFINING CRITICAL HABITAT FOR GREATER SHORT-HORNED LIZARDS IN GRASSLANDS NATIONAL PARK, SASKATCHEWAN

KRISTA ELLINGSON[1], SCOTT NIELSEN[2], SHELLEY PRUSS[2,3]

[1]P.O. Box 456, Elrose, SK S0L 0Z0, Canada. Email: krista.a.ellingson@gmail.com

[2]Department of Renewable Resources, University of Alberta, Edmonton, AB T6G 2H1, Canada

[3]Parks Canada, Prairies and Northern Region

Abstract: Identification of critical habitat for species at risk is an essential component of the protection of rare species under Canada's Species at Risk Act. In this study, we identified important landscape-level habitat characteristics for endangered greater short-horned lizards (*Phrynosoma hernandesi*) at their northern range limit in Grasslands National Park, Saskatchewan, Canada. A total of 650 km of transect surveys were used to analyze habitat selection based on locations where lizards were detected relative to available random locations. A model of landscape-scale habitat selection (resource selection function) was estimated for the park using 118 lizard locations and 5000 random available locations sampled along 650 km of random survey strip transects. Habitat selection in summer was predicted best by juniper-dune vegetation community, vegetation patchiness, and perhaps paradoxically, areas of lower solar radiation. This model was used to define critical habitat for conservation management. As new information becomes available for this under-studied species, improvements in the definition of critical habitat should be considered.

LINKING SEASONAL TRENDS IN PREY ABUNDANCE TO NESTLING SURVIVAL IN ARCTIC PEREGRINE FALCONS

K.A. HAWKSHAW, A. FRANKE, L. FOOTE

Department of Renewable Resources, University of Alberta, Edmonton, AB T6G 2R3, Canada. Email: hawkshaw@ualberta.ca

Abstract: We investigated predator–prey interactions in a dense population of peregrine falcons (*Falco peregrinus*) near Rankin Inlet, Nunavut. This population has experienced a decline in productivity over the last three decades despite reductions in pesticide load, raising questions about the manner in which climate change may be influencing the population (Franke et al. 2010). A recent study has described the direct negative effects of climate change on juvenile mortality in this population due to the increasing frequency and severity of summer rainfall events (Anctil et al. 2013). Less understood are the indirect effects of climate change, which may act at lower trophic levels to limit seasonal prey abundance. We stratified the study area into nine habitat types and will use distance sampling (Buckland et al. 2001) and an extension known as density surface modeling (Hedley & Buckland 2004) to estimate abundance of avian prey and arctic ground squirrels, as well as burrow counts and snap trapping to estimate lemming abundance. We also collected data describing reproductive success and phenology for all peregrine falcon nesting sites. The goal of this research is to relate seasonal prey abundance to climate variables such as temperature, precipitation, and spring snow cover, to understand how prey may be responding to long-term climate trends and what that may mean for the future of the Rankin Inlet peregrine population.

Literature Cited

Anctil A, Franke A, Bety J (2014) Heavy rainfall increases nestling mortality of an arctic top predator: experimental evidence and long-term trend in peregrine falcons. Oecologia 174:1033–1043

Buckland ST, Anderson DR, Burnham KP, Laake JL, Borchers DL, Thomas L (2001) Introduction to distance sampling - estimating abundance of biological populations. Oxford University Press, Oxford

Franke A, Setterington M, Court G, Birkholz D (2010) Long-term trends of persistent organochloride pollutants, occupancy and reproductive success in peregrine falcons (*Falco peregrinus tundrius*) breeding near Rankin Inlet, Nunavut, Canada. Arctic 63:442–450

Hedley SL, Buckland ST (2004) Spatial models for line transect sampling. Journal of Agricultural, Biological, and Environmental Statistics 9:181–199

DIVERSITY AND ABUNDANCE OF NATIVE BEES IN ALBERTA'S PRAIRIES

MONICA KOHLER[1], ASHTON STURM[2], JESSAMYN MANSON[1], CAMERON CARLYLE[2]

[1]Department of Biological Sciences, University of Alberta, Edmonton, AB T6G 2E9, Canada. Email: mkohler@ualberta.ca

[2]Department of Agricultural, Food, and Nutritional Sciences, University of Alberta, Edmonton, AB T6G 2P5, Canada

Abstract: Pollination by native bees supports crop production across the globe and is essential to the success of flowering plants in our native ecosystems. Despite the important economic and ecological roles that bees play, little is known about the composition, distributions, or habitat requirements of native bee communities. To investigate the diversity and abundance of native bees, we surveyed bee communities using pan traps and netting in canola fields and rangelands across the agriculturally productive area of Alberta. We collected thousands of bee specimens from five families and at least 23 genera, including social, solitary, and parasitic bees. Using ordination and regression techniques, we are identifying patterns in the bee communities across regions, sub-regions, and site types. The results indicate that bee communities vary at these different landscape scales, with shifts in community composition in different regions of the province, and for certain bees, between rangeland and canola sites. These results represent the first description of broad-scale patterns in Alberta's native bee communities and are contributing to modeling efforts to map the potential value of pollination services by native bees in Alberta.

HABITAT AND RESOURCE SELECTION OF WESTERN PAINTED TURTLES (*CHRYSEMYS PICTA BELLII*) IN AN URBAN ECOSYSTEM

KELSEY A. MARCHAND[1], CHRISTOPHER M. SOMERS[1], RAY G. POULIN[2]

[1]Department of Biology, University of Regina, Regina, SK S4S 0A2, Canada. Email: kelseymarchand@gmail.com

[2]Royal Saskatchewan Museum, 2340 Albert St., Regina, SK S4P 2V7, Canada

Abstract: Reptiles in Saskatchewan live on the edge; the environment is extreme, and the anthropogenic influence on their habitats is extensive. The western painted turtle (*Chrysemys picta bellii*) is one of the most widely distributed subspecies of the painted turtle in North America, reaching the northern limit of its natural range in western Canada. The western painted turtle is not considered at risk of extinction in Saskatchewan; however, populations throughout the western portion of the range are in decline. Despite their status, little is known about the ecology or population biology of western painted turtles in Saskatchewan. One population in southern Saskatchewan resides in Wascana Marsh in Regina. Over the next two years, we are conducting a study on turtles living in this population to begin understanding what habitats and resources are required to survive in this urban environment. The primary goals of the project are to determine population size and demography, home range size, habitat use, and overwintering locations. This will be accomplished through mark–recapture and radio-telemetry tracking, as well as stable isotope analyses. Our work will continue to provide information on important aspects of the ecology of western painted turtles in this area of the species' range.

TRUMPETER SWAN HABITAT SUITABILITY MODELING

DARREN WIENS

EDI Environmental Dynamics Inc., 301 George Street, Prince George, BC, V2L 1R4. Email: dwiens@edynamics.com.

Abstract: Environmental Dynamics Inc. (EDI) developed and implemented a habitat suitability mapping program for trumpeter swans (*Cygnus buccinator*) on Crooked Lake, near Fox Creek, Alberta. Trumpeter swans are listed as being 'at risk' in Alberta, and have recently been downlisted from 'threatened' to a 'species of special concern' according to the Alberta Wildlife Act. The objective of this program was to determine areas of potential high-quality trumpeter swan habitat, using aerial photographs, LiDAR, and field data. EDI created a vegetation mapping base and completed a habitat suitability model based on nesting and foraging potential, as well as adjacency to habitat features and distances to sources of disturbance. The parameters used in the model are transferable between lakes. As such, the model may be applied to other lakes in order to predict and mitigate potential human-caused disturbance (for example, industrial development) in efforts to conserve and protect trumpeter swans. This poster outlines the steps required to produce the model results, and shows a working example as produced for Crooked Lake, Alberta.

THE ECOLOGY OF GRASSLAND SNAKES IN THE BIG MUDDY VALLEY

TERA EDKINS[1], CHRISTOPHER M. SOMERS[1], RAY G. POULIN[2]

[1]Department of Biology, University of Regina, Regina, SK S4S 0A2, Canada. Email: tedkins99@gmail.com

[2]Royal Saskatchewan Museum, 2340 Albert St., Regina, SK S4P 2V7

Abstract: The grasslands of southern Saskatchewan house a unique community of snakes at their northern range limits. Northern snakes require hibernacula to survive cold northern winters; summering grounds; and movement corridors between these areas. Saskatchewan snakes must also deal with habitat loss, which may alter snake movements, leading to subpopulation isolation and genetic differentiation. The objective of this study is to explore the ecology and habitat use of northern snakes and the potential changes to movement caused by human land use in the Big Muddy Valley. Our research will focus on two species of conservation concern in Canada: the threatened eastern yellow-bellied racer (*Coluber constrictor flaviventris*) and the data-deficient bullsnake (*Pituophis catenifer sayi*). During summer 2015, we used radio-telemetry to track bullsnakes (n = 7) and racers (n = 2) in previously unstudied areas of the Big Muddy Valley. Telemetry data will illuminate how snake movement is potentially influenced by habitat type. Mitochondrial DNA will be used to examine genetic structure and gene flow of snake populations around natural and anthropogenic features. The results of examining habitat use patterns of snakes in the Big Muddy Valley may be employed in developing conservation strategies for threatened snakes at their northern range limits.

HABITAT SELECTION OF FEMALE MOOSE DURING THE CALVING SEASON WITHIN THE AGRICULTURAL LANDSCAPE OF SASKATCHEWAN

AMY L. WHEELER[1], MICHEL P. LAFORGE[1,3], NICOLE L. MICHEL[1,4], RYAN K. BROOK[1,2]

[1]Department of Animal and Poultry Science, College of Agriculture and Bioresources, University of Saskatchewan, Saskatoon, SK S7N 5A8, Canada. Email: amw166@mail.usask.ca

[2]Indigenous Land Management Institute, University of Saskatchewan, Saskatoon, SK S7N 5A8, Canada

[3]*Current affiliation:* Department of Biology at Memorial University, St. John's, NL, Canada

[4]*Current affiliation:* National Audubon Society, San Francisco, CA, USA

Abstract: The expansion of moose (*Alces alces*) into the Prairie Pothole Region in Saskatchewan over the last three decades has increased human–wildlife conflicts, raising the question of how to best manage them. In order to support decision making, we initiated a study on the reproductive success of farmland moose. In 2013 and 2014, adult female moose were captured between Saskatoon and Chamberlain, SK, and fitted with global positioning system collars. Daily movement rates and clustering of locations were used to determine the date and location of parturition for 27 adult female moose. The date of parturition was estimated as the date with the lowest movement rate and preceded by a peak in movement rates. Average date of parturition was 21 May (range 13–29 May). Moose were surveyed on the ground using very high frequency radio telemetry in both June and September of each year to visually determine the presence and number of calves. Twinning rates were 33% (2013) and 38% (2014).

Selection ratios were used to compare the habitat of used parturition sites to available sites within the study area (Manly et al. 2002). These ratios indicate that for parturition habitat, female moose selected wetland and riparian areas, as well as trees and shrubs, and avoided cropland (regardless of crop types examined), native grassland, pasture and forages, and developed areas. Females also selected parturition sites that were 15 to 20 km from paved roads and 1.2 to 1.6 km from unpaved roads.

We developed a resource selection function (RSF; Manly et al. 2002) based on use-availability data of 14 female moose with young during the calving season, specifically during a period of 20 days post-parturition. This method corresponds to a third-order (within home range) analysis as described by Johnson (1980). We found that female moose with young selected wetlands, grassland, and cereal crops, and avoided roads and oilseed crops. Wetlands are often used by moose as foraging habitat and thermoregulatory cover (Renecker & Schwartz 2007), and the strong selection of wetlands suggests that during dry

cycles, moose calf survival in the study area may be lower. Based on the results of our RSF, 10.2% of the area within the moose home ranges is categorized as the highest quality of habitat, while 47.8% is considered to be of lowest quality. Our results quantify the importance of wetlands to parturient moose and their vulnerable young and characterize optimal parturition and post-parturition habitat. These findings emphasize the importance of conserving wetlands and riparian areas in the agriculture-dominated landscape for moose calf survival and the persistence of this expanded moose population.

Literature Cited

Johnson DH (1980) The comparison of usage and availability measurements for evaluating resource preference. Ecology 61:65–71

Manly BF, McDonald LL, Thomas DL, McDonald TL, Erickson WP (2002) Resource selection by animals: statistical design and analysis for field studies, 2nd edn. Kluwer, Boston, MA

Renecker LA, Schwartz CC (2007) Food habits and feeding behavior. In: Franzmann AW, Schwartz CC (eds) Ecology and management of the North American moose, 2nd edn. University of Colorado Press, Boulder, CO, p 403–440

GOODBYE, PRAIRIE ROSE

DAVID LARSON

Box 56, Maple Creek, SK S0N 1N0, Canada. Email: dmlarson@sasktel.net

Abstract: Prairie roses (*Rosa* spp.) are undergoing a catastrophic decline in abundance: where there once were banks of roses, only isolated bushes now exist. This decline has been caused by the rose stem girdler (*Agrilus cuprescens*), a beetle introduced to North America from its native Europe. It was first discovered in the southern Canadian prairies in 2000, attacking stems of native roses. A larva eats a spiral tunnel under the bark in the cambium layer, killing the stem. Leaves of such stems turn prematurely red in the fall, indicating their infestation and ensuing death. Each year following infestation, fewer old stems are found within rose patches. Roses cope by producing new stems from the perennial rootstock, but these are shorter and sparser, so where there were once banks of roses, today there are small stems, spaced farther apart. Rose banks provide shelter and protection to other species of plants and wildlife. As they decline, predators and grazers enter these sanctuaries, changing species composition and vegetation structure. Grazing within a patch converts a bush community to grassland. In a prairie landscape, this is largely two-dimensional, and the loss of the vertical dimension provided by shrubs has wide ramifications. Future scenarios and management implications of this outbreak are discussed.

DAKOTA SKIPPER (*HESPERIA DACOTAE*) HABITAT SUITABILITY IN SOUTHEASTERN SASKATCHEWAN

KELSEY M. SEIDLE, ERIC G. LAMB, JEAN-MICHEL DEVINK

School of Environment and Sustainability, University of Saskatchewan, Saskatoon, SK S7N 5C8, Canada. Email: Kms457@mail.usask.ca

Abstract: The Dakota skipper (*Hesperia dacotae*) is a Species at Risk Act (SARA)-listed threatened butterfly species that is limited to mesic mixed-grass prairies within the provinces of Saskatchewan and Manitoba. Dakota skipper populations may be continuing to decline in distribution and abundance due to habitat loss and degradation. There is a current knowledge gap pertaining to habitat suitability and availability. Our objective is to gain a better understanding of the features that define Dakota skipper habitat suitability through vegetation, soils, land use, and thermal units. Surveys conducted in the 2015 field season will help to gain a better understanding of habitat suitability criteria, allow for the development of a landscape-level model in order to map potential suitable habitat, guide the identification of critical habitat in recovery strategies, and develop land-use management plans. This information will also help to better understand the species' historic range and identify where repopulation may be feasible. This increased knowledge is crucial to construct a recovery plan to help secure Dakota skipper populations.

ORNAMENTALS GONE WILD – NEW INVADERS IN THE MEEWASIN VALLEY

ERYN TOMLINSON, RENNY W. GRILZ

Meewasin Valley Authority, 402 Third Avenue South, Saskatoon, SK S7K 3G5, Canada. Email: etomlinson@meewasin.com

Abstract: As humans encroach on native prairie and natural areas, there is an increase in the number of occurrences of new ornamental species escaping yards. These species can outcompete the native species and have the potential to become serious invaders. Meewasin Valley Authority is a conservation agency that strives to create public access to natural areas in Saskatoon's river valley through a mandate to conserve, develop, and educate. Throughout the river valley in Saskatoon, Meewasin manages various protected areas. In the field, Meewasin's Resource Management staff has encountered many new and unique invaders. Some, like common tansy (*Tanacetum vulgare*) and baby's breath (*Gypsophila paniculata*) , have escaped yards some time ago and are now on the noxious weeds list as they run rampant across the city and head into less populated areas via roadways. Others, such as asparagus (*Asparagus officinalis*), are alarmingly widespread with not much data alerting us to its invasive nature. Further, there are new occurrences of ornamental plants naturalizing that may not be on the radar. Education is the key to prevention in the case of these early invaders. By mapping these occurrences and watching for trends, we can alert homeowners and resource managers to what the next big invader may be.

DECLINE OF MIXED-GRASS PRAIRIE IN CORE GRASSLAND CONSERVATION AREAS IN THE SOUTHWESTERN MANITOBA IMPORTANT BIRD AREA, 2010-2015

REBEKAH NEUFELD, CARY HAMEL

Nature Conservancy of Canada – Manitoba Region, 207-1570 18th St, Brandon, MB R7A 5C5, Canada. Email: Rebekah.Neufeld@natureconservancy.ca

Abstract: The status of the three largest native prairie blocks within the Southwestern Manitoba Mixed-Grass Prairie Important Bird Area was examined. These blocks represent some of the last non-fragmented native mixed-grass prairie in extreme southwestern Manitoba and, in combination with adjacent non-native perennial grassland tracts, represent a significant area-sensitive grassland bird conservation opportunity. Orthophoto interpretation and extensive ground-truthing were used to document vegetation cover and land management in both 2010 and 2015. Over this five-year period, 3% of mapped mixed-grass prairie were converted: two-thirds to annual cropland and one-third to permanent forage cover, primarily alfalfa hay mixes. While conversion of non-native perennial grassland occurred, no overall decline was exhibited due to a switch of a roughly equal area of annual cropland to alfalfa hay mixes. Patterns of habitat and land-use change and implications for biodiversity conservation are presented.

ASSESSING STATUS AND TRENDS FOR PRAIRIE PLANT SPECIES AT RISK

SARAH LEE, CANDACE NEUFELD, DARCY HENDERSON

Canadian Wildlife Service Prairie and Northern Region, Eastgate Offices, 9250 – 49th Street, Edmonton, AB T6B 1K5, Canada. Email: sarah.lee@ec.gc.ca

Abstract: The Federal Species at Risk Act requires periodic reporting on the assessment of population and distribution objectives and whether these objectives are being met. For prairie plant Species at Risk, assessing the status and trends in population size and distribution can be complicated by factors such as existence of a soil seed bank, annual variations in weather and phenology, and survey methodology. Within the Suffield National Wildlife Area, Alberta, we now have five consecutive years of population monitoring data for four prairie plant Species at Risk: tiny cryptanthe (*Cryptantha minima*), slender mouse-ear-cress (*Halimolobos virgata*), smooth goosefoot (*Chenopodium subglabrum*), and small-flowered sand-verbena (*Tripterocalyx micranthus*). From these data, we attempt to assess the status and trend in population size and distribution against the Committee on the Status of Endangered Wildlife in Canada criteria while considering the above factors.

DEVELOPING STANDARD METHODS FOR BIOACOUSTIC DATA COLLECTION AND PROCESSING

HEDWIG LANKAU, ERIN BAYNE, SHAWN MORRISON, DAN FARR, ALEX MACPHAIL

Bioacoustic Unit, University of Alberta and Alberta Biodiversity Monitoring Institute, Edmonton, AB T6G 2E9, Canada. Email: shawn.morrison@dryasresearch.com

Abstract: Acoustic monitoring using autonomous recording units (ARUs) is fast becoming the most common way of surveying avian and amphibian communities. The benefits of ARUs include collecting large quantities of data that allow us to survey remote locations and rare species more safely and efficiently. While getting more data is always good, it brings challenges in extracting the information from vast numbers of acoustic files. Using common standards and methods is also important when attempting to combine data sets from multiple locations. The Bioacoustic Unit (http://bioacoustic.abmi.ca/) is a collaboration between the University of Alberta and the Alberta Biodiversity Monitoring Institute, with the goal of finding solutions to the challenges presented by ARU data. Our efforts fall into three main categories: (1) developing standardized field protocols that can easily be implemented by other ARU users; (2) researching efficient and effective ways of extracting species data from the recordings using both human observers and auto-recognition software; and (3) developing a training program for new taxonomists that includes mentorship and training from more experienced staff with respect to species identification and in the effective use of auto-recognition software. Our poster provides examples of solutions we have found to address many of these issues.

ASSESSMENT OF AQUATIC INVASIVE SPECIES THAT THREATEN NATIVE BIODIVERSITY IN PRAIRIES

ZHAOCHANG ZHANG, VLADIMIR KRICSFALUSY

School of Environment and Sustainability, University of Saskatchewan, Saskatoon, SK S7N 5C8, Canada. Email: vladimir.k@usask.ca

Abstract: Over the last decades, the introduction of invasive exotic species has been observed in plains and prairies of central North America, causing serious economic and environmental consequences. Effects of aquatic invasive species (AIS) pose a high risk to native biodiversity, particularly in waterways and wetlands in Saskatchewan. The management of AIS is costly and difficult; therefore, conservation agencies and organizations should focus their limited resources by targeting the species that cause major threats and the areas that are significantly impacted. A multi-spatial scale approach was developed to provide an AIS risk assessment for Saskatchewan (Kricsfalusy & Zhao 2016). Three spatial scales were selected for this risk assessment: (1) local – Redberry Lake watershed, (2) regional – North Saskatchewan River watershed, and (3) provincial – Saskatchewan. The risk assessment was carried out for 16 AIS, including seven species recorded in Saskatchewan and nine species that are likely to enter the province in the near future. These species were assessed, scored, and ranked into impact categories of high, medium, and low. The categorization of AIS provides a basis at which conservation agencies and organizations, from the local to the provincial level, can focus their attention.

Literature Cited

Kricsfalusy V, Zhao Z (2016) Developing decision support tools for control of aquatic invasive alien species in the Canadian prairies. [square brackets] - Convention on Biological Diversity Newsletter for Civil Society 10:14–15

IMPACTS OF URBANIZATION ON NATIVE PLANT SPECIES DISTRIBUTION AND ABUNDANCE IN NORTH AMERICA

VLADIMIR KRICSFALUSY[1], JAVIER ESPARRAGO[2]

[1]School of Environment and Sustainability, University of Saskatchewan, Saskatoon, SK S7N 5C8, Canada. Email: vladimir.k@usask.ca

[2]Amec Foster Wheeler Environment & Infrastructure UK Ltd.

Abstract: The current expansion of urban areas is regarded as one of the major causes of habitat loss and an important threat to biological diversity. Prairie crocus (*Anemone patens* L.) is a perennial herb whose populations can still be found within some urban areas in North America. This allows the study of the factors affecting this species, which can be effectively used in land-use planning and habitat management. The aim of this study was to identify differences in the distribution and abundance of *A. patens* between urban and rural populations and explore the forces that drive these differences. We found that urban populations of *A. patens* are significantly smaller and less dense than rural ones (Esparrago & Kricsfalusy 2015). Human population density and proportion of urbanized land were negatively correlated with *A. patens* population size and density. The effect of individual disturbances seems to be less relevant than the urbanization process. We argue that preservation of sufficiently large natural remnants, grassland management, and restoration projects are necessary for the conservation of urban populations of *A. patens*. Practical efforts should be paired with appropriate species-specific research, tailor-made policies, and public involvement.

Literature Cited

Esparrago J, Kricsfalusy V (2015) Traditional grassland management and surrounding land use drive the abundance of a prairie plant species in an urban landscape. Landscape and Urban Planning 142:1–6

DEVELOPING GRASSLAND BIRD MANAGEMENT TARGETS FOR RESULTS-BASED CONSERVATION IN MIXED-GRASS PRAIRIE

PHILLIP ROSE

Department of Biology, University of Regina, Regina, SK S4S 0A2, Canada. Email: rose200p@uregina.ca

Abstract: Results-based conservation is a growing initiative on native rangelands in Prairie Canada, whereby livestock producers receive funding if their management creates or enhances habitat for species of conservation concern. A critical component of the program is developing meaningful management targets that (1) will enhance and maintain suitable habitat for species of conservation concern and (2) producers can measure and manage for to receive funding once they achieve those targets. The objective of this project is to identify habitat characteristics that can be used as conservation targets for grassland songbirds across extensive soil and moisture gradients. The conservation targets will be determined by quantifying relationships between vegetation characteristics and grassland songbird abundance. Conservation targets will emphasize grassland songbird Species at Risk in Canada, including Sprague's pipit (*Anthus spragueii*), chestnut-collared longspur (*Calcarius ornatus*), Baird's sparrow (*Ammodramus bairdii*), and bobolink (*Dolichonyx oryzivorus*). The assessment of habitat characteristics will be based on the scientific literature and from interviews with ranchers (e.g., cues they use to base their day-to-day grazing management decisions). This will ensure that the habitat features examined are relevant to both grassland songbirds and the livestock producers implementing these management objectives.

GRASSLAND MATTERS: FOSTERING A COMMUNITY OF CONCERN IN SASKATCHEWAN

Presented by: **LORNE SCOTT, JOANNE HAVELOCK**

Public Pastures – Public Interest, Regina, SK, Canada. Email: public4pastures@gmail.com

Paper by: JOANNE HAVELOCK
Contributors: Lorne Scott, Trevor Herriot, Jill Vaisey, Katherine Arbuthnott

Abstract: Grasslands are one of the most endangered ecoregions, with less than 20% of native prairie left in Saskatchewan. The federal government decided in 2012 to phase out the Prairie Farm Rehabilitation Administration (PFRA) Community Pastures Program and transfer the management of the Crown land to the provinces. In Saskatchewan, this represents 1.8 million acres of grasslands on 62 pastures that provide habitat for over 30 Species at Risk. In response, a group of rural and urban citizens formed Public Pastures – Public Interest (PPPI). PPPI has conducted extensive public education to encourage action, linking with people concerned with the pastures' many uses: habitat for Species at Risk; livestock grazing; preserving heritage sites from early settlers, Métis, and First Nations' peoples; indigenous hunting and gathering; nature-watching; photography; educational tours; and scientific research. PPPI has had discussions with ranchers, environmentalists, and government about the best ways to protect the grasslands. PPPI has lobbied federal and provincial governments to keep the Community Pastures in Crown ownership, and has increased concern for other Crown-owned grasslands. PPPI has facilitated public response to development threats to Crown grasslands. New focus points include seeing the pastures as more than just for agricultural use and highlighting these grasslands as critical environmental assets, including biodiversity, soil and water conservation, carbon sequestration, and meeting international environmental commitments.

BRIEF HISTORY OF THE PFRA COMMUNITY PASTURE PROGRAM

During the late 1800s and early 1900s, settlers from Europe were actively encouraged to come to the prairies and farm. The Dominion Lands Act (1872) granted settlers free homesteads of 160 acres if they cleared 10 acres and built a residence within three years. Under the Natural Resources Agreements of 1930, the federal government transferred the responsibility for resources, including land, to the three Prairie Provinces. The Natural Resources Transfer Agreements were bound into law both federally and provincially (see the federal enactment under the British North America Act: http://www.justice.gc.ca/eng/rp-pr/csj-sjc/constitution/lawreg-loireg/p1t164.html).

Following severe droughts in the 1930s, the Prairie Farm Rehabilitation Act came into force in 1935 as a response measure by the federal government "... to secure the rehabilitation of the drought and soil drifting areas in the [Prairie] Provinces ... , and to develop and promote within those areas systems ... greater economic security...".[1] The Prairie Farm Rehabilitation Administration (PFRA) was created to implement this vision of rehabilitating and protecting the land, and contributing to economic security.

In 1939, Saskatchewan and Manitoba made arrangements with Canada to establish Community Pastures to be managed under the Community Pasture Program. The pastures were established with the dual objectives of conservation and economics, to be managed, in modern terms, for 'sustainable development'. Alberta made its own arrangements for managing severely eroded land, including Special Areas and the Grazing Reserves established in 1934.[2] In Alberta, the only PFRA managed lands were owned by the Department of National Defence - the Suffield pasture.

In 1949, the land tenure arrangement between Saskatchewan and PFRA changed. Rather than transferring lands to the federal government, new lands consolidated for Community Pasture purposes were moved from provincial to federal management under a lease arrangement. It was agreed that if the provincial leased lands were no longer used as pastures they would be transferred back to the province.

A few rural municipalities agreed to transfer their title to municipal pastures to the Land Utilization Board for transfer to the PFRA pasture program on condition that they operate as government pastures or be returned to the municipality. At the 2014 Saskatchewan Association of Rural Municipalities (SARM) convention, a motion was passed that, "… if the issues with the original PFRA Transfer Agreements are not addressed to the satisfaction of the affected municipalities, SARM assist with bringing a class action lawsuit against the Province for breach of agreement(s)."[3] SARM later determined that it was not appropriate to spend the organization's money on legal fees for an issue affecting only a small number of RMs, and did not proceed with the motion. However, in March 2016, four municipalities

[1] Government of Canada, Prairie Farm Rehabilitation Act - R.S.C., 1985, c. P-17 (Section 4)

[2] Alberta Environment and Parks "Provincial Grazing Reserves" (http://esrd.alberta.ca/lands-forests/provincial-grazing-reserves/default.aspx)

[3] Saskatchewan Association of Rural Municipalities, 2014 Convention, "Resolution No. 10-14A RM of Mount Hope No. 279, RM of Reno No. 51, and RM of Heart's Hill No. 352 PFRA pastures

The Western Producer, "RMs want Ottawa to return pastureland: Land was to be operated as federal community pasture." 21 March 2014 (http://www.producer.com/2014/03/sask-rms-want-ottawa-to-return-pastureland). Fred Baran, RM Councillor from Dundurn, said the agriculture minister has ignored the requests from affected RMs. He quoted minutes of the Land Utilization Board of 12 December 1939, noting that when an RM transfers title to the board "…for a specific purpose and that purpose no longer exists, the rural municipality be offered a lease on these lands or on their request the title be transferred back to them."

filed a statement of claim at the Saskatoon Court of Queen's Bench, to have their land returned to them by the Saskatchewan government.[4]

Canada (PFRA) leased or purchased some additional land in Saskatchewan and Manitoba and incorporated it into the pastures to fill land gaps or build infrastructure. Some other federal land (e.g., National Defence) was also made available.

The land ownership categories could be summarized as:

(1) Provincial Crown lands of which the Province transferred ownership to the Federal government but retained the right to get the title back following use.

(2) Provincial Crown lands owned by the Province but leased to Canada.

(3) Municipal lands transferred on the agreement that they would be used for grazing purposes.

(4) Federal Crown lands managed by Agriculture Canada for pastures, some of which were purchased directly by the federal government to fill in gaps in the pastures; others were under the Department of National Defence.

For more detailed information on the history of the PFRA Community Pasture Program and land ownership, please see the *PPPI History of the PFRA Community Pasture Land: Factsheet* (https://pfrapastureposts.files.wordpress.com/2013/10/pppi-history-of-community-pastures-factsheet-mar-27-2014-final-1.pdf), the *PFRA Pastures and their Management: Factsheet* (https://pfrapastureposts.files.wordpress.com/2013/10/pppi-pasture-importance-mgt-factsheeet-march-28.pdf), and the *PFRA Community Pastures and PPPI: Factsheet* (https://pfrapastureposts.files.wordpress.com/2013/10/pppi-pfra-pastures-pppi-general-factsheet-oct-15-2013.pdf)

THE CURRENT SITUATION

In April 2012, the Conservative government in Ottawa decided, with no consultation with the public or provincial governments, to abandon the Community Pasture Program managed by the PFRA. The Saskatchewan government then announced its intent to sell the pastures. In response, a group of rural and urban citizens formed Public Pastures - Public Interest (PPPI) in December 2012.

The PFRA Community Pasture Program managed 2.2 million acres of fragile land across the three Prairie Provinces, organized as follows: 62 pastures in Saskatchewan, 24 in Manitoba, and one in Alberta. In Saskatchewan, pastures are found from Maple Creek to North

[4] The Western Producer, "Sask. RMs want Ottawa to return pastureland: Land was to be operated as federal community pasture." 21 March 2014 (http://www.producer.com/2014/03/sask-rms-want-ottawa-to-return-pastureland)

Battleford in the west and from Kelvington to Estevan in the east, in the central and southern regions of the province. The 62 PFRA community pastures in Saskatchewan comprise approximately 1.8 million acres of land, which is larger than the area of Prince Edward Island; of this land, 1.6 million acres will be transferred to the province.[5] Fig. 1 shows the PFRA Community Pastures as they were in 2009.

The sequencing of the pasture transfers was determined according to the complexity of the transfer. The transfers were not planned to occur by region, which would have enabled development of regional services. In Manitoba, the provincial government chose to retain ownership of the pastures, and supported the formation of the Association of Manitoba

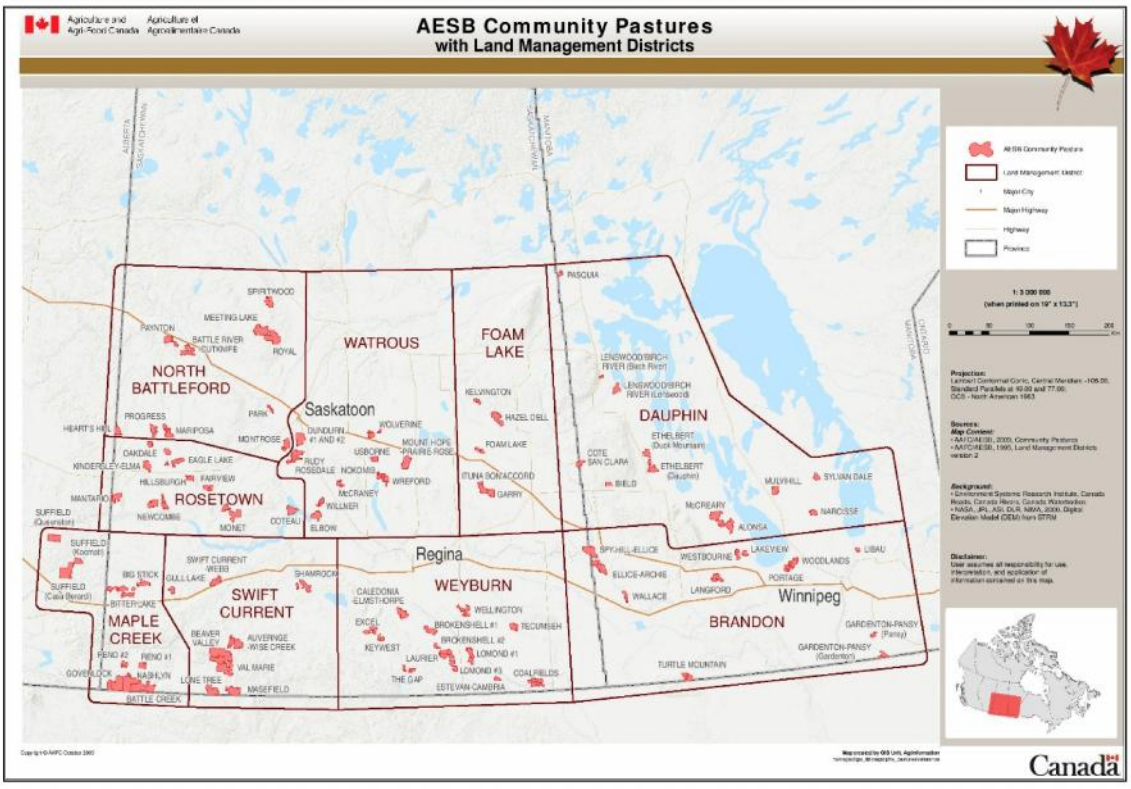

Fig. 1. PFRA Community Pastures in 2009 (AESB: Agri-Environment Services Branch) (Source: http://www5.agr.gc.ca/resources/prod/doc/cpp/docs/AESBCommunityPastures_w_LM_Districts_eng.pdf)

[5] For more detail about the process in the three Prairie Provinces, see pages 2-18 in: Phillips D, Frogworks Consultants (2015) PFRA Pastures Transition Study (http://www.apas.ca/uploads/files/documents/advocacy/Livestock/PFRA-Final-Report%201.pdf)

Community Pastures.[6] In Saskatchewan, the Govenlock pasture, home to several Species at Risk, is largely federally-owned, and the federal land is being transferred to Environment Canada with plans to designate it as a National Wildlife Area and consult with the local community and ranchers on management strategies.[7] One Saskatchewan pasture was on Department of National Defence land.

Since 2013, about 10 pastures a year have been transferred to the Saskatchewan government, for a total of 21, with another 10 slated for spring of 2016. Unless something changes at the federal level, the final grazing season under federal operation for the last pastures to be transferred is the 2017 grazing season. The PFRA-type system will continue for those pastures still under the federal government's responsibility, but the fees and other management set-ups will be different for pastures that have already been 'transitioned' to the province of Saskatchewan (Table 1).

Table 1. Federal PFRA lands transitioning to the Saskatchewan Ministry of Agriculture. AAFC: Agriculture and Agri-Food Canada. (Reprinted with permission from the PPPI Factsheet entitled *Crown Lands Administered by Saskatchewan Ministry of Agriculture*, available at https://pfrapastureposts.files.wordpress.com/2013/10/pppi-ag-crown-lands-table-sept-25-2015-final.pdf)

Land tenure type	**Acres in 61 PFRA pastures prior to transition**	**Acres reverted to Saskatchewan (31 March 2015)**	**Acres still administered by AAFC**
Provincial Agricultural Crown Land (was leased to PFRA)	459,700	111,111	348,589
Federal Reversionary (Federal land that transfers to Saskatchewan as per 1939/49 Federal/Provincial agreement)	1,099,258	246,504	852,754
Federal Non-Reversionary (Federal title acquired after 1949)	115,967	22,985[a]	115,967
Total acres	**1,674,925**	**380,600**	**1,317,310**

[a]License to Occupy

(**Source:** Saskatchewan Ministry of Agriculture – September 2015)

[6] Manitoba Cooperator, "Province steps in with funding for community pasture transition." 17 March 2014 (http://www.manitobacooperator.ca/tag/association-of-manitoba-community-pastures)

[7] Environment Canada media release, "Harper Government takes action to conserve Govenlock Community Pasture." 29 July 2015 (http://www.newswire.ca/news-releases/harper-government-takes-action-to-conserve-govenlock-community-pasture-519406851.html)

Nature Canada media release, "Transfer of Govenlock Grasslands to Environment Canada Important Step towards Protection." 31 July 2015 (http://naturecanada.ca/news/press-releases/transfer-of-govenlock-grasslands-to-environment-canada-important-step-towards-protection/#sthash.G7uuWYjc.dpuf)

The Saskatchewan government has said it does not want to operate the pastures[8] and that it would sell the pastures with conditions including that: (1) only the pasture patrons could purchase the pastures; (2) a Conservation Easement would be placed on a pasture prior to it being sold; and (3) the land would be sold at fair market value.[9]

To date, land has not been sold, but it is being leased by groups of pasture patrons. The patrons have been forced into a process of forming profit, non-profit, or cooperative corporations to manage their pastures, at considerable time and expense for the patrons with limited support.[10] This process had to occur among groups of patrons from each pasture, many of whom had not even met each other prior to 2012. The Community Pasture Patrons Association of Saskatchewan was formed in response. There is concern that the new fee structure will make it too difficult for many small ranchers to continue their cattle operations. In some transferred pastures, numbers of patrons have already decreased. The grazing fees and other conditions of the leases for the pasture patron corporations have been the subject of ongoing discussion between the patrons and the provincial government.[11]

CONSERVATION

No Strategic Environmental Assessment was conducted by the federal government on the likely impact of the closure of the Community Pasture Program and the transfer of land to the provinces, in spite of the fact that federal policy requires such an assessment before decisions are made. While the province has said that any land sold would have a Conservation Easement, the provincial government does not monitor Conservation Easements – it is a complaints-based process, with few if any fines actually being enforced for violations. Once native prairie land is ploughed, it cannot be restored to its original state.

The pasture patron businesses are not being provided the resources for managing ecological resources or public access. The Saskatchewan Minister of Agriculture stated that the

---

[8] Hansard, 31 October 2012; and Hansard, 26 November 2012 (Lyle Stewart, Saskatchewan Minister of Agriculture)

[9] Government of Saskatchewan media releases. "Province Consulting with federal pasture patrons." 17 August 2012 (http://www.saskatchewan.ca/government/news-and-media/2012/august/17/province-consulting-with-federal-pasture-patrons); "Province working with patrons to transition first 10 federal Community Pastures." 19 October 2012 (http://www.saskatchewan.ca/government/news-and-media/2012/october/19/province-working-with-patrons-to-transition-first-10-federal-community-pastures); "Flexible options to help patrons assume pasture operations." 28 March 2013 (http://www.saskatchewan.ca/government/news-and-media/2013/march/28/flexible-options-to-help-patrons-assume-pasture-operations)

[10] Government of Saskatchewan media release. "Funding to help patrons assume pasture operation." 15 November 2012 (http://www.saskatchewan.ca/government/news-and-media/2012/november/15/funding-to-help-patrons-assume-pasture-operations)

[11] Phillips D, Frogworks Consultants (2015) PFRA Pastures Transition Study (http://www.apas.ca/uploads/files/documents/advocacy/Livestock/PFRA-Final-Report%201.pdf)

government wants to treat all of the provincial pastures equally,[12] including the PFRA pastures, the Saskatchewan Provincial Pastures, and the Co-op pastures. This would not indicate providing any additional resources from Saskatchewan Environment or Agriculture departmental operations for managing ecological resources or public goods as had occurred under the PFRA system. By not providing resources to manage the Community Pastures to their previous standard, which was of better quality than the Provincial or Co-op pastures, the government is accepting a reduction in the quality of these lands.

PPPI PRINCIPLES

Based on this knowledge of PFRA and recognizing the imminent threat facing the pastures, PPPI developed six principles for maintaining the pastures as healthy prairie ecosystems and working landscapes. To date, 47 Saskatchewan, national, and international organizations have endorsed PPPI principles for managing PFRA pastures.

(1) Keep ownership of the PFRA pastures in the public domain.

(2) Maintain livestock grazing as a priority.

(3) Utilize professional pasture managers.

(4) Preserve the natural landscapes and ecological integrity of the pastures.

(5) Protect the cultural and historical significance of these heritage rangelands.

(6) Recognize and sustain the investment in the public benefits provided by publicly-owned community pastures.

In addition, as part of a strategy forward, PPPI advocates: (1) working with stakeholders to establish an inclusive Transition Plan and (2) taking the time to get it right. (For a detailed description of the PPPI principles, please see https://pfrapastureposts.wordpress.com/about/six-principles/.)

PPPI's goals are to retain the PFRA pastures under Crown ownership and ensure that there is a management system that protects cultural and heritage resources, ensures long-term sustainable grazing opportunities, and enhances the public benefits of biodiversity, including: protecting Species at Risk, controlling noxious weeds, conserving soil and water, sequestering carbon, and providing well-managed industry and public access to the pastures. These public benefits can be attained in concert with cattle grazing, as shown by the success of the PFRA system.

[12] Community Pasture Patrons Association of Saskatchewan question in debate held by the Agricultural Producers Association of Saskatchewan and the Western Producer, "'Why Ag Matters." 22 March 2016 (https://www.youtube.com/watch?v=geZ8ctjxmzM&feature=youtu.be)

PASTURE MANAGEMENT, ECONOMIC AND SOCIAL VALUE

Pastures play an important role in supporting smaller farmers and cattle producers (Fig. 2). Under PFRA management, patrons' livestock was well looked after, and the number of animals and the length of time they grazed on the pastures was limited so as not to overburden the land. A team of biologists with range and biodiversity expertise supported pasture operations, conducting assessments to determine species diversity and overall rangeland condition. Working together, biologists and pasture managers developed management plans to prevent overgrazing and to ensure that the land was available to other species during critical periods of their life cycle. This safety feature of public pasture management is at risk under a privatized regime wherein each pasture is responsible for its own profitability.

Fig. 2. Top: Herd of cattle at Govenlock PFRA community pasture, Consul, Saskatchewan. Bottom: Cattle round-up. Great Sand Hills, Saskatchewan (photos by Branimir Gjetvaj)

The PFRA system ensured that smaller farmers received the most benefit from the service. On average, before 2012, some 2500 pasture patrons in Saskatchewan depended on these pastures for summer grazing by approximately 73,000 cows mostly with calves. Many pastures also provided high-quality bulls to help improve herd genetics. PFRA fees covered the costs of grazing and breeding services. In 2011, for example, grazing fees were $0.45/cow/day, plus $25.00 per season for calves and $40 per season for cows placed in a breeding field. Other revenues were sourced from surface leases (primarily from the oil and gas industry); rent from pasture managers' houses; sales of capital assets or bulls; and federal funding. The program cost around $22 million annually, and the federal government provided some additional support and administrative services, as well as coverage of municipal taxes.

Economist Suren Kulshreshtha estimated the yearly costs for grazing and breeding activities of the Community Pastures Program to be $11.6 million. Other costs of $10.4 million were for uses benefitting the public and society. Total private and public benefits were estimated at $54.9 million, a benefit:cost ratio of 2.5. Benefits included: economic benefits from livestock grazing and breeding and other commercial activities, local community support, healthy animals and thereby people, wildlife and waterfowl based recreation, technology transfer, access for scientific research, provision of water, land use conversion, soil conservation, carbon sequestration, and protection of biodiversity, endangered species, habitats, watersheds, wetlands, ecosystems, and heritage sites.[13]

Before 2012, PFRA pastures hosted some 60 different scientific research projects annually. Publicly owned pastures were also used by hunters, photographers, Indigenous people, and the general public on educational tours (Fig. 3). Future access for such uses may be at risk if the pastures pass into private ownership.

For more detailed information on pasture management, see the *PFRA Pastures and their Management Factsheet* (https://pfrapastureposts.files.wordpress.com/2013/10/pppi-pasture-importance-mgt-factsheeet-march-28.pdf) and the *PFRA Community Pastures and PPPI: Factsheet* (https://pfrapastureposts.files.wordpress.com/2013/10/pppi-pfra-pastures-pppi-general-factsheet-oct-15-2013.pdf).

[13] Kulshreshtha S (2006) An Update on Determination of a Cost Recovery Framework and Fee Schedule Formula for the Agriculture and Agri-Food Canada - Prairie Farm Rehabilitation Administration Community Pastures Program. Department of Agricultural Economics, University of Saskatchewan, Saskatoon, SK

Kulshreshtha S, Pearson G, Kirychuk B, Gaube R (2008) Distribution of Public and Private Benefits on Federally Managed Community Pastures in Canada. Rangelands 30:3–11

Phillips D, Frogworks Consultants (2015) PFRA Pastures Transition Study, p 21-30. (http://www.apas.ca/uploads/files/documents/advocacy/Livestock/PFRA-Final-Report%201.pdf)

Fig. 3. Walk through Val Marie PFRA pasture, on an old Northwest Mounted Police patrol trail (photo by Branimir Gjetvaj)

FUTURE FOCUS

PPPI has been urging the federal government to halt the transfer of any more pastures to the province of Saskatchewan, and retain the pastures not yet transferred. These efforts have intensified since the election of a new Liberal government in Ottawa in the fall of 2015.

While PPPI started with a focus on the PFRA pastures, we soon realized that all publicly owned grasslands are under threat, not from the people using them but from government policies. We have subsequently expanded our concern to the province's 8.4 million acres of federal and provincial Crown grasslands (Table 2), of which the PFRA pastures are a part.

PPPI identifies these grasslands as vital elements of the public trust every bit as precious as our northern forests and lakes, and every bit at risk as the Amazonian rainforests. There are 5.9 million acres of 'native dominant grasslands' in Crown-leased lands, another 1.8 million acres in PFRA Community Pastures (federal and provincial land), and 0.8 million in the Saskatchewan Pastures Program.

Table 2. Crown land administered by the Saskatchewan Ministry of Agriculture. (Reprinted with permission from the PPPI Factsheet entitled *Crown Land Administered by Saskatchewan Ministry of Agriculture*, available at https://pfrapastureposts.files.wordpress.com/2013/10/pppi-ag-crown-lands-table-sept-25-2015-final.pdf)

Usage	Type	Acreages[a] (July 2015)
Agricultural leases	Forage (hay lands and grazing)	354,000
	Cultivated	269,000
	Native (grazing leases)	5,949,000
	Waste	117,000
Agricultural leases – subtotal		**6,689,000**
Non-agricultural leases	Oil and gas	37,000
	Sand and gravel	4,600
	Public	3,500
	Commercial	1,900
Non-agricultural leases – subtotal		**47,000**
Saskatchewan lands leased to PFRA (prior to any recent transfers)		459,700
Saskatchewan Pastures Program (51 provincial pastures)		803,000
Vacant agricultural land		227,000
Vacant non-agricultural land (recorded lake bottoms, shorelines, forest fringe)		500,000
Pasture and vacant Land – subtotal		**1,989,700**
Crown land administered by the SK Ministry of Agriculture – Total		**8,725,700**
	Overlapping	
Other Crown land uses (overlapping acreages are not included in totals to avoid double counting)	Easements (e.g., oil, gas, utilities)	40,000
	Sand and gravel	26,000
	Exploration permits	3,500
	Road construction	20
	Total – other uses	**69,520**

[a]Acreage usage figures are approximate and are subject to change.

Agricultural leases and the Saskatchewan Pastures Program include Saskatchewan Wildlife Habitat Protection Act (WHPA) lands, 3.4 million acres of the total lands. Based on government interpretation of Crown Land Ecological Assessment Tool analysis, 1.7 million acres of WHPA lands will remain as Crown land, 1.3 million acres may be sold with a Conservation Easement, and 525,000 acres may be eligible for sale without restrictions.

It is also clear that when talking about preserving biodiversity, the condition of the neighbouring private land has an impact on continuity of habitat. Many private ranchers are good neighbours, taking excellent care of land that has been in their families for generations. However, if individual families do not (or cannot) carry on, the land can be sold, and without a Conservation Easement, it can be ploughed for crops. For example, there is now a canola field next to the Govenlock Community Pasture. Fig. 4 shows the clear contrast between native grassland and an agricultural field.

Fig. 4. Native prairie right next to an agricultural field. Great Sand Hills, Saskatchewan (photo by Branimir Gjetvaj)

SUPPORTING ECOSYSTEMS AND SPECIES AT RISK

While grazing is recognized as an important tool in managing grasslands, the pastures have a value beyond agricultural use. The 62 PFRA pastures in Saskatchewan comprise some of the largest intact blocks of native grasslands in the Northern Great Plains and thus preserve landscapes that represent Saskatchewan's natural ecosystems. Sound land management contributes to sound ecology, while also supporting cattle producers. At a quality of 'good' or 'better', rangeland contributes to public objectives such as:

- being a carbon sink, sequestering carbon from the atmosphere;
- providing wildlife habitat;
- contributing to improved water quality by naturally filtering runoff from surrounding agricultural land.

A report by Agriculture and Agri-Food Canada indicated that, on average, over half of the rangeland in Canada is in 'poor' condition, largely due to overgrazing. By contrast, three-quarters of the land in the PFRA Community Pastures is in 'good' (or 'better') condition.[14]

According to the International Union for Conservation of Nature (IUCN),

> *Indigenous temperate grasslands are one of the world's great ecosystems – or so they used to be. Indigenous temperate grasslands are now considered the most altered biome on the planet. The temperate grasslands biome occupies 9 million sq.km or ~ 8% of the earth's terrestrial surface. But of this 8%, only 3.4% are currently protected within the global system of protected areas. 3.4% is even less than half of the next poorly represented ecosystem, Mediterranean forests and woodlands. After cradling the needs of humans for centuries, indigenous temperate grasslands are now the earth's most endangered ecosystem.*
> (http://www.iucn.org/about/work/programmes/gpap_home/gpap_biodiversity/gpap_wcpabiodiv/gpap_grasslands/)

This statement applies to the land of southern Saskatchewan. Climate-change models have predicted more intense droughts in the Prairies, and thus soil conservation will become even more relevant. Desertification is a global problem, as indicated by the creation of the United Nations Convention to Combat Desertification in 1994. Canada was included among the countries with areas at risk of desertification. Canada was also the first country to withdraw from this international convention (in March 2013). In reports to the Convention, Canada identified the PFRA Community Pasture Program as a successful approach to combat desertification.

[14] Bailey AW, McCartney D, Schellenberg MP (2010) Management of Canadian Prairie Rangeland. Agriculture and Agri-Food Canada. ISBN 978-1-100-16647-6

As stated in the PPPI *History of the PFRA Community Pasture Land: Factsheet* (https://pfrapastureposts.files.wordpress.com/2013/10/pppi-history-of-community-pastures-factsheet-mar-27-2014-final-1.pdf), '[the] original historic rationale for conserving and restoring these grasslands is still relevant today: with 82% of our grassland ecosystems now under cultivation to grow crops, these last publicly-owned remnants of native grass must be given the best protection we can offer.'

Well-managed grasslands sequester carbon, thereby mitigating climate change. Most of the carbon held in the grasslands is found in soils. Unbroken native prairie holds a vast deposit of soil carbon – one of Canada's largest carbon sinks. Most of this carbon is lost when prairie is broken. This happens because soil bacteria quickly convert the stores of soil carbon into CO_2, a greenhouse gas that directly contributes to global warming. Well-managed grasslands can hold as much carbon as forested lands.

While a quarter section of agricultural land may contain a few crop species and introduced plant species, a quarter of native prairie will support over a hundred species of grasses and wildflowers and hundreds of animal species including birds, insects, and myriad bacteria and fungi. Sadly, our croplands are biological deserts bereft of almost all of their original native diversity.

The Saskatchewan Representative Areas Network (RAN) includes the Community Pastures in its list of protected land for the IUCN. Canada is a signatory to the UN Convention on Biological Diversity, which, among other things, commits us to protecting at least 17% of terrestrial areas by 2020. If the community pastures lose their conservation purpose and management, 1.8 million acres in Saskatchewan would no longer "count" towards this protected areas target, reducing Saskatchewan's protected areas system from 14.6 M acres to 12.8 M acres, a reduction from 8.7% to 7.6%.

The Community Pastures are substantial proportions of the RAN's representation of the Mixed Grassland Ecoregion (30.9%), Moist Mixed Grassland Ecoregion (46.1%), and Aspen Parkland Ecoregion (14.9%). In the PFRA pastures, native cover ranges between 39% and 100% and averages over 80%.[15] Non-native cover is not ecologically insignificant; it is important to range management over the grazing season, providing early grazing opportunities in the spring, for example, and even sown grasses serve as a continuum of habitat to native grasslands or other native habitat, in contrast to cropland.

Over 30 species of mammals, birds, reptiles, amphibians, insects, and plants listed under Canada's Species at Risk Act (SARA) as Extirpated, Endangered, Threatened, or Special Concern are (or were) found on 54 of 62 PFRA community pastures in Saskatchewan (Table 3).

[15] Phillips D, Frogworks Consultants (2015) PFRA Pastures Transition Study, p 31-34 (http://www.apas.ca/uploads/files/documents/advocacy/Livestock/PFRA-Final-Report%201.pdf)

Table 3. Species at Risk found on PFRA community pastures. Species at Risk Act status is abbreviated as follows; Ext: Extirpated, End: Endangered, Thr: Threatened, SC: Special Concern. (Source: Kristen Martin and PPPI, Factsheet: *Species at Risk on Community Pastures*. Available at https://pfrapastureposts.files.wordpress.com/2016/03/pppi-pfra-and-sar-factsheet-march-27-2014-final.pdf)

Species	Binomial	Ext	End	Thr	SC
Mammals					
Black-footed ferret[a]	*Mustela nigripes*	X			
Swift fox	*Vulpes velox*			X	
Black-tailed prairie dog	*Cynomys ludovicianus*				X
Birds					
Burrowing owl	*Athene cunicularia*		X		
Greater sage-grouse	*Centrocercus urophasianus*		X		
Mountain plover	*Charadrius montanus*		X		
Piping plover	*Charadrius melodus*		X		
Chestnut-collared longspur	*Calcarius ornatus*			X	
Common nighthawk	*Chordeiles minor*			X	
Ferruginous hawk	*Buteo regalis*			X	
Loggerhead shrike	*Lanius ludovicianus*			X	
Sprague's pipit	*Anthus spragueii*			X	
Long-billed curlew	*Numenius americanus*				X
McCown's longspur	*Rhynchophanes mccownii*				X
Peregrine falcon	*Falco peregrinus*				X
Short-eared owl	*Asio flammeus*				X
Reptiles & amphibians					
Eastern yellow-bellied racer	*Coluber constrictor flaviventris*			X	
Great Plains toad	*Anaxyrus cognatus*				X
Northern leopard frog	*Lithobates pipiens*				X
Insects					
Dusky dune moth	*Copablepharon longipenne*		X		
Gold-edged gem	*Schinia avemensis*		X		
Mormon metalmark	*Apodemia mormo*			X	
Dakota skipper	*Hesperia dacotae*			X	
Monarch butterfly	*Danaus plexippus*				X
Plants					
Buffalograss	*Bouteloua dactyloides*			X	
Slender mouse-ear-cress	*Halimolobos virgata*			X	
Smooth goosefoot	*Chenopodium subglabrum*			X	
Western spiderwort	*Tradescantia occidentalis*			X	
Hairy prairie-clover	*Dalea villosa*			X	

[a]At least one pasture contains habitat suitable for ferrets. Declared extinct in 1979, rediscovery of some ferrets enabled their reintroduction in the US and Mexico, and in 2009 in Grasslands National Park.

Many of the native birds and animals of southern Saskatchewan are prairie obligates that require native prairie to survive. Additional species such as the bobolink (*Dolichonyx oryzivorus*) and Baird's sparrow (*Ammodramus bairdii*) have been assessed by the Committee on the Status of Endangered Species in Canada (COSEWIC) as being at risk, but have as yet not been approved to be added to the SARA list. Almost all of the federally-listed Species at Risk in Saskatchewan are found in our native grasslands, not in the boreal forest. This is a direct result of the habitat loss resulting from the conversion of native grassland to cropland, real estate development, cities, roads, and industrial activity.

Additional facts about Species at Risk research on PFRA Community Pastures, why Species at Risk need the PFRA Community Pastures, how Species at Risk have been managed on PFRA Community Pastures, and the future of Species and Risk on Community Pastures can be found in the PPPI Factsheet entitled *Species at Risk on Community Pastures*: https://pfrapastureposts.files.wordpress.com/2016/03/pppi-pfra-and-sar-factsheet-march-27-2014-final.pdf

The Nature Conservancy of Canada supported a project with the pasture patrons' organization now operating the Lone Tree Community Pasture to develop a document that outlines the ways in which pastures can be managed to protect Species at Risk and illustrates the complexities of pasture management.[16]

OIL, GAS, AND GRAVEL

Access to the pastures by the oil, gas, and gravel industries (Fig. 5), under conditions that respect the security of the cattle and the conservation of the land, has provided revenue to federal government in the past, which was reinvested in the Pasture program, helping to achieve the conservation objectives. Fees for surface lease revenues (including seismic and exploration fees) were mainly from oil and gas. Monitoring by pasture managers helped mitigate the impacts of intrusions and overview reclamation of disturbed areas that occurred, with native plant species where possible. However, diligence is required to ensure that companies are able to live up to environmental standards to which they aspire and that they are required to meet.

Under the new Saskatchewan provincial arrangement for the pastures, pasture patron fees can be reduced a certain amount in recognition of the disturbance occurring due to resource extraction. The rest of the revenues will go to the provincial general revenue fund, not directly to pasture management as under the federal Community Pasture Program.

[16] Nature Conservancy of Canada (2015) Lone Tree Community Pasture Beneficial Management Practices for Species at Risk

Fig. 5. Oil jacks and cows on rangeland at Lomond PFRA community pasture, Saskatchewan (photo by Branimir Gjetvaj)

With cooperation from Dr. Emily Eaton, PPPI published a Factsheet in 2014 entitled *Importance of Federal PFRA Management in Mitigating Oil and Gas Impacts*, which provides a detailed summary of how changes to oil and gas monitoring will affect the pastures. This sheet is available at https://pfrapastureposts.files.wordpress.com/2013/10/pppi-oil-gas-mitigation-factsheet-feb-4-2014-final.pdf.

HERITAGE AND INDIGENOUS ISSUES

The pastures contain documented archaeological and ceremonial sites from First Nations (Fig. 6). They also contain graves of early European settlers and remnants of homesteader sites. For example, the homestead where writer Wallace Stegner lived as a child is on the Battle Creek pasture. Most of the lands have not been surveyed and likely contain many more heritage resources that have yet to be catalogued. Public management will help preserve heritage and ecological resources.

PPPI operates with an attitude of respect for the Treaties and for First Nations and other Indigenous peoples and does not speak on their behalf. However, through discussions with Indigenous people from other organizations and within PPPI supporters, a number of issues have been identified.

Fig. 6. Teepee ring. Grasslands National Park, Saskatchewan (photo by Branimir Gjetvaj)

The First Nations Joint Venture Management Initiative arose in 2012 with the concept of First Nations working together with others to manage the Community Pastures. The group produced the video *Community Lands Lost: Canada's Future at Stake*, which highlights the issues and the concerns of a wide range of groups interested in the pastures (watch the video at https://www.youtube.com/watch?v=H9HnAm4Qh3I).

Access to the Community Pasture by Indigenous people will be affected by the changes to the pasture ownership and management. This would affect activities such as hunting, medicinal plant gathering, berry picking, and access to archaeological and ceremonial sites.

In respect of the authority of constitutionally protected Treaty or Aboriginal rights, harvesting fish and wildlife resources for food purposes by First Nations and Métis individuals is part of the province of Saskatchewan's resource management plan. When cattle are grazing the land, the Community Pastures are considered to be 'occupied'. Hunting is only allowed on 'unoccupied land', so this can only occur when the 5-month cattle grazing season is over and the cattle are removed in the fall.

Under PFRA management, anyone wanting to hunt on the land or access it for other purposes was required to first contact the pasture manager. It is not clear who would be available to monitor public access to the pastures if the new pasture patron groups leasing the land only have a manager on staff for part of the year. Any loss of access would not

meet the goal of maintaining 'customary use by Aboriginal peoples of biological resources …, compatible with their conservation and sustainable use' found in Target 12 of Canada's 2020 Biodiversity Goals and Targets (see http://biodivcanada.ca/default.asp?lang=En&n=9B5793F6-1). A loss would also violate provisions of the United Nations Declaration on the Rights of Indigenous Peoples (see http://www.un.org/esa/socdev/unpfii/documents/DRIPS_en.pdf). If the land is sold to pasture patrons, it would no longer be Crown land, so Indigenous access to the land would likely be negatively affected. Lack of adequate environmental monitoring and management could also affect the quality of the natural resources.

The approximately 7% of the land that is federally-owned property is usually in fairly small blocks. Its sale would be open for claims by First Nations using Treaty Land Entitlement (TLE) or other Specific Claims settlement agreements. The province has first offered its pasture land holdings to pasture patrons. If the pasture patrons do not wish to purchase the land, subject to the provisions of the Saskatchewan TLE Framework Agreement, First Nations could purchase the land under TLE or other Specific Claims.

It is very important that Indigenous people are at the table during all discussions of public lands, and how they will be used, protected, and accessed.

GROWING THE COMMUNITY OF CONCERN

PPPI started out by establishing a set of Principles, our *Vision for the Future of Saskatchewan Heritage Rangelands,* which to date has been endorsed by 47 Saskatchewan, Canadian, and international organizations at various levels. A number of these and other groups, including municipal, business, environmental, and agricultural organizations, have also put forward recommendations at various levels on changes needed to the current pasture transfer process.

To advance our understanding of the issues and to keep people informed, PPPI has prepared several factsheets and has supported research on pasture management policy.

From the beginning, we have communicated with and met with elected officials and government staff who were willing to meet with us. We have promoted letter-writing campaigns to the federal and provincial governments, and distributed a postcard ("Premier Wall: Do not sell our Crown grasslands"). For the October 2015 federal election and the April 2016 Saskatchewan provincial election, PPPI prepared handouts that individuals could use to inform and ask questions of candidates at their door or in public meetings. All candidates in the provincial election were sent a handout about what they could do to support grasslands, and a press release outlined "What kind of government would the prairie want?"

We communicate regularly with our large number of supporters, who come from Saskatchewan and outside the province. PPPI also has a website and Facebook page, and some of our members communicate via Twitter. Trevor Herriot's *Grass Notes* blog has been a source of information and ideas. Photographers have been a real asset, as their images of

the landscape, wildlife, and people on the pastures have greatly helped communicate the value of the pastures. PPPI distributes its press releases and event announcements through weekly newspapers as well as big city media. We have had success in obtaining radio and television interviews, and interested authors have published articles in newspapers and magazines and on editorial pages.

In 2013, PPPI partnered with Nature Canada on 'The Prairie Passages Tour' with Margaret Atwood and her husband, Graeme Gibson, who are authors, passionate conservationists, and prominent members of BirdLife International (Fig. 7). Other tour participants included national and international representatives. The tour drew attention to the value of Saskatchewan grasslands, and in particular the PFRA pastures. The Atwood tour included a meeting with local community members in Val Marie and a gala dinner in Regina.

PPPI has held house music concerts as fund-raisers - a good way to bring people together for enjoyment, and a little side discussion on grasslands. Speakers and film nights have been big draws. In 2015, we had a great turnout for an illustrated lecture by Dr. Branimir Gjetvaj, and his photo of a grassland scene was featured on the front cover of the *Regina Leader-Post*. PPPI had very successful showings of the film *Grasslands*, produced by Saskatchewan film-maker Ian Toews, in Regina (which over 300 people attended), Indian Head, and Saskatoon.

Fig. 7. 'Prairie Passages Tour' (June 2013) with Margaret Atwood and Graeme Gibson on their visit to Grasslands National Park and the Val Marie and Webb pastures. Ranchers and other grassland conservationists shared their knowledge and spoke about common concerns (photo by Shelley Banks)

Fig. 8. Screening of the film *Plight of the Grassland Birds*. Among our challenges are the great distances in this province. Electronic media are great, but there is nothing like the opportunity for people to connect personally, as seen in this picture taken after a recent film showing. With our display generating discussion, and like-minded people mixing and mingling, this is an important part of energizing the community (photo by Joanne Havelock)

In November 2015, we had a full house for the film *Plight of the Grassland Birds*, and the panel discussion with biologists that followed (Fig. 8). Our Annual General meetings have featured panels with speakers from a range of organizations, generating some lively discussions.

PPPI members helped coordinate a successful response to the threat of a golf course taking over part of White Butte, a remnant of native prairie and aspen bush near Regina owned by the province and managed by Saskatchewan Parks. We also shared information and encouraged people to respond to a provincial consultation about wind turbines that were planned for native prairie near Chaplin Lake, a pathway for migratory birds.

In August 2015, PPPI co-sponsored a trail ride on Caledonia Community Pasture that provided an opportunity for people to ride horseback over a lovely stretch of grassland (Fig. 9). We also led a tour of the Brokenshell pasture one evening to see the birds and plants. We would like to offer more of these opportunities for people to experience these habitats directly, galvanizing their commitment to conserving these lands and wildlife.

Since it was drawn to our attention early on that Indigenous rights would be affected, we have maintained concern for this on our agenda. One of the organizations with which PPPI

first collaborated was the First Nations Joint Venture Management Initiative. We have also met with representatives of the Federation of Saskatchewan Indian Nations and some Métis individuals and have had Indigenous individuals on our Board. We have held a panel with Indigenous speakers at the University of Regina in 2013. For the Prairie Passages Tour, we held an opening ceremony at the First Nations University of Canada (Fig. 10). PPPI has met formally and informally with people involved in Indigenous organizations. We continue to be open to connecting with Indigenous peoples.

It is critical to listen to what all people have to say about conserving the pastures and grasslands – traditional ranching, Indigenous, and scientific knowledge must all be considered. In that spirit, PPPI has connected with archaeological and heritage organizations and has also established links with ranchers – both the Community Pasture Patrons Association of Saskatchewan and private ranchers. This has involved many discussions, and attending workshops and public meetings in ranching communities in Saskatchewan, Alberta, and Montana.

Fig. 9. Caledonia PFRA pasture ride – group of riders (photo by Branimir Gjetvaj)

What are the things we have done that we feel are contributing to creating a community of concern about grasslands?

- First and foremost, having the dedication and passion to care
- Being blessed with a good team of people from diverse backgrounds
- Linking with individuals and organizations who are interested in grasslands
- Building positive relationships and partnerships with producer and Indigenous organizations

- Responding to a threat always seems to energize activism
- Identifying the value of what is threatened
- Identifying the personal impact

- Developing an analysis based on consultation and factual research
- Establishing principles
- Gaining public support for those principles

- Providing people with tools to express their views - such as letter writing templates
- Conveying positions and ideas to policy-makers and others

- Having people who are willing and able to talk to the media
- Having a good relationship with conventional media at all levels
- Using social media

- Recognizing and using cultural approaches: photography, music, art
- Providing educational opportunities
- Organizing events so people can experience the landscape

PPPI hopes to continue to play a role in bringing together people to engage in dialogue, to draw the pastures and grasslands to public attention provincially and nationally.

With increased public attention to the uniqueness and value of our grasslands, and improvements to policies and actions, there is hope for the future for preserving these landscapes for their natural inhabitants and for their cultural, economic, heritage, educational, and social contributions.

Fig. 10. Welcome for the Prairie Passages Tour, First Nations University of Canada, Regina (photo by Joanne Havelock)

Public Pastures - Public Interest

Gmail: public4pastures@gmail.com
Website: http://pfrapastureposts.wordpress.com/about/
Cell 306-515-0460
Co-chairs: Trevor Herriot and Lorne Scott

PPPI

THE STATUS OF BIODIVERSITY IN THE PRAIRIE AND PARKLAND NATURAL REGIONS OF ALBERTA

KATHERINE MAXCY[1], DAVE HUGGARD[1], TARA NARWANI[1], JIM HERBERS[1], SHANNON WHITE[2], MARIE-CLAUDE ROY[1] (PRESENTED BY **CORRINA COPP[1]**)

[1]Alberta Biodiversity Monitoring Institute, University of Alberta, Edmonton, AB T6G 2E9, Canada. Email: katherine.maxcy@gmail.com

[2]Alberta Environment and Parks, Edmonton, AB T5K 2M4, Canada

Abstract: The Alberta Biodiversity Monitoring Institute (ABMI) reported on the status of the human footprint, native habitat, and biodiversity intactness for the Grassland and Parkland Natural Regions (hereafter Prairie Region) in Alberta, and the High Value Landscape (HVL), an area identified for its high biodiversity values within the Prairie Region. We found:

- The human footprint covered 63.1% of the Prairie Region, an increase of 1.8% between 1999 and 2013. The agriculture footprint covered 55.2% of the area.
- As of 2012, 37% of the Prairie Region was composed of native vegetation. Only 10% of native vegetation in the region was at least 200 m from human footprint.
- The ABMI assessed the status of 197 species in the Prairie Region and found them to be, on average, 53% intact.
- Inside the HVL, human footprint was lower than outside the region. By contrast, native habitat and biodiversity intactness were higher inside the HVL.

Overall, the biggest ecological changes were associated with lower than expected abundance of species that require native prairie habitat, such as Baird's sparrow (*Ammodramus bairdii*), Sprague's pipit (*Anthus spragueii*), and many vascular plant species. Over the next few years, the ABMI will broaden its assessment of biodiversity to include status and trend reporting for lichens and wetlands, and trend analysis for all species groups.

The full report can be viewed here; a colour blind accessible version of the report can be viewed here.

MODELING SPATIAL DISTRIBUTIONS OF THE ENDEMIC PLANT SPECIES OF THE ATHABASCA SAND DUNES OF NORTHERN SASKATCHEWAN

UDAYANGA ATTANAYAKE, ERIC G. LAMB

Department of Plant Sciences, College of Agriculture and Bio-Resources, University of Saskatchewan, Saskatoon, SK S7N 5A8, Canada. Email: aua145@mail.usask.ca

Abstract: The Athabasca Sand Dunes are a unique ecosystem hosting a cluster of nine endemic vascular plant species adapted to an environment of moving sand. While globally rare, these species are locally abundant in a remote area that is difficult to survey. Therefore, this study focused on exploring the possibilities of using geographically limited field survey data to build more precise predictive models using remotely sensed multispectral data (ground reflectance between 0.45 and 2.35 μm) as predictors. The objective is to develop species distribution modeling (SDM) procedures that best estimate the spatial variations of population sizes of each Athabasca endemic species. The utility of multiple SDM methodologies was assessed using the receiver-operating characteristic (ROC) plot. The resulting ROC values (>0.5) suggest that all modeling techniques achieve similar prediction precision for the high-abundance species such as the endemic Athabasca willows (*Salix* spp.). In contrast, differences between modeling methods were apparent for two restricted habitat specialists: common yarrow (*Achillea millefolium*) and sea thrift (*Armeria maritima*). These two species are largely restricted to wet inter-dune slacks and gravel pavement habitats, respectively. Higher standard errors in the ROC estimates indicated modeling instability associated with very limited occurrence data for these less abundant species. The distribution models developed could be applied in Committee on the Status of Endangered Wildlife in Canada (COSEWIC) status updates.

DEVELOPMENT OF A HABITAT SUITABILITY MODEL FOR THE THREATENED POWESHIEK SKIPPERLING IN MANITOBA

RICHARD WESTWOOD, MAHSA HOOSHMANDI

Department of Biology, University Of Winnipeg, Winnipeg, MB R3B 2E9, Canada. Email: r.westwood@uwinnipeg.ca

Abstract: The Poweshiek skipperling (*Oarisma poweshiek*) (Lepidoptera: Hesperiidae) is listed as threatened under the federal Species at Risk Act and as endangered under the province of Manitoba's Endangered Species Act. Previous studies on skipperlings in Manitoba have focused on adult coarse-scale habitat preferences, larval food, and adult nectar plant requirements and the influence of soil factors on population densities. We report on the development of a habitat suitability model to predict adult skipperling distribution in the last remaining sites in Canada.

MIGRATORY BIRDS AND INCIDENTAL TAKE: MITIGATION STRATEGIES USED IN INDUSTRIAL DEVELOPMENT

JOSHUA TRAYLOR

Canada North Environmental Services, 211 Wheeler Road, Saskatoon, SK S7P 0A4, Canada.
Email: joshua.traylor@cannorth.com

Abstract: Population declines are occurring in North American migratory birds. Ubiquitous declines have been documented from aerial insectivores to shorebirds, and habitat loss, pollution, climate change, and incidental take have been identified as population drivers. Incidental take is the inadvertent killing, harassment, harming, or destruction of birds, nests, and/or eggs. It includes the cumulative mortality from cats, collisions with vehicles and infrastructure, and from development. In Canada, the Migratory Bird Conservation Act (MBCA) is federal legislation that protects birds with regulations around hunting and incidental take. With respect to potential MBCA contraventions via incidental take during development, Environment Canada, industry, and consultants work together to reduce project risk and to reduce risk of incidental take. Mitigation measures include actions of due diligence, species detection surveys, implementation of sensitive timing windows, and setback restrictions. Despite these measures, inherent risk remains with project development and incidental take. Development of standards with respect to setback distances, the use of deterrents, definition of a nest, and project reporting would be valuable. Herein, I summarize scenarios to foster an understanding of project risk and mitigation methods to reduce incidental take and ultimately aid in migratory bird conservation.

GUIDING CONSERVATION AT SCALE: WWF'S 'PLOWPRINT,' SUSTAINABLE RANCHING INITIATIVE, AND GRASSLAND BIRDS

KEVIN ELLISON, JEFF NELSON, ANNE GAGE, SARAH OLIMB

World Wildlife Fund US– Northern Great Plains Program, 13 S. Willson Ave., Suite 1, Bozeman, MT 59715, USA. Email: Jeff.Nelson@wwfus.org

Abstract: Recent trends have favored production of annual crops over livestock, resulting in extensive conversion of grassland to cropland. This has put additional pressure on many prairie species already in decline, including grassland birds endemic to the region. To better understand changing habitat patterns across the Prairie Habitat (PHJV), Prairie Pothole (PPJV), and Northern Great Plains Joint Venture (NGPJV) areas, timely assessments are required to identify losses, prioritize conservation actions, and evaluate outcomes. World Wildlife Fund (WWF) has developed a methodology for tracking cumulative cropland conversion, annually, and at a fine scale, called the 'Plowprint.' Using remotely sensed data, this method identifies all lands tilled or in production since 2008 and assesses annual changes from 2009 to 2014. Intact habitat is classified as land outside the Plowprint, minus permanent water bodies and developed areas. In addition to tracking conversion, restored grassland and other newly revegetated areas within the Plowprint also are monitored to provide a full estimate of potential habitat. Starting in 2009, habitat status and loss rate estimates have been developed for each Joint Venture area and for the Northern Great Plains (as defined by WWF).

Since 2009, more than 30 million acres of grasslands and wetlands have been converted to cropland at some point across the three Joint Ventures active in the Northern Great Plains. The average conversion rate across this 336 million acre area, for the period 2009–2014, was estimated at 3.4% annually, ranging from 9.1% in Manitoba and 8.1% in Saskatchewan to as low as 0.3% in Wyoming.

The three Joint Ventures had markedly different rates of conversion. The annual conversion rate from intact grasslands to cropland was highest across the PHJV at 7.3% annually, or 18 million acres of converted habitat since 2009. Although this area still included more habitat than the other areas, at 54.2 million acres as of 2014, more than 28% of what remains was revegetated since 2009. The PPJV conversion rate was estimated at just under 4% annually, and in 2014 supported 47.4 million acres of habitat, of which 16% was revegetated since 2009. The bulk of the combined intact and revegetated habitat remains in the NGPJV of the

area encompassed by these three Joint Ventures. More than 82 million acres remained in this area, where the annual conversion rate between 2009 and 2014 was 0.8%. Only about 4% of grassland habitat was established since 2009.

Most habitat converted to cropland was originally either wetlands, grasslands, alfalfa, or other planted hay/pasture. Of habitat converted to cropland since 2009, just over 8.7 million acres was revegetated to wetlands, grasslands, or shrub as of 2014, with another 5 million acres planted to alfalfa or other forages.

Of the 30 million acres converted between 2009 and 2014, about 54% remained in cropland as of 2014. In the PHJV, an area with glaciated soils, new cropland was planted to canola (27%), wheat/small grains (52%), or pulse crops (18%) during 2014. In the PPJV, corn (28%), soy (33%), and wheat/small grains (26%) accounted for most cropping that year. The largely non-glaciated NGPJV, with poorer soils, saw new cropland planted in 2014 to wheat or other small grains (59%) and other annual crops (25%).

The rate of grassland loss remains relatively high in many parts of the PHJV and the eastern half of the PPJV. Although these losses were offset to some degree by newly established hay and pastured fields, and by the voluntary reestablishment of wetland and upland grasses where planting was prevented, the overall quality of the landscape for prairie wildlife is likely in decline. More supportive farm conservation programs and stronger enforcement of drainage regulations in the U.S. may explain observed patterns of lower conversion rates there than in Canada.

Using the Plowprint, conservation efforts are being focused in selected counties and rural municipalities. Starting with the NGPJV, resources are beginning to be focused on counties most important to sustaining grassland resources. WWF is also using this information in the design of its Sustainable Ranching Initiative, an effort to maintain ranching so that endemic grassland birds and other prairie wildlife, facing threats to their habitat by conversion to cropland, are conserved.

GRASSLAND CONSERVATION PRIORITIZATION MODEL

SAMANTHA SMYTH, **STEPHEN CARLYLE**

Manitoba Habitat Heritage Corporation, 200-1555 St. James Street, Winnipeg, MB R3H 1B5, Canada. Email: scarlyle@mhhc.mb.ca

Abstract: In an era of declining revenues for species at risk habitat conservation, compounded by increasing program delivery challenges, efforts are required to maximize the return on investment for threated and endangered species. The objective of this study was to develop a spatially explicit grassland prioritization model to rank individual land parcels within the eastern mixed-grass prairie area of southwestern Manitoba. An area of 15,510 km^2 was analyzed and 23,199 quarter sections were ranked. Using this list, habitat conservation organizations now have field-level prioritizations for grassland protection and conservation for Species at Risk (SAR).

Twelve spatially explicit datasets were analyzed to create a tri-metric prioritization scheme. This included the generation of model inputs, at a quarter section level, to predict (1) species presence, (2) habitat quality, and (3) urgency for action. These inputs were later combined to create the final Grassland Conservation Prioritization Model and a map displaying top priority quarter sections within the Eastern Mixed-grass Prairie Priority Area, as defined under the Habitat Stewardship Program for SAR.

Base data used for the development of the Species Presence input were provided by the Manitoba Conservation Data Centre and Bird Studies Canada in the form of element occurrence (EO) data for both SAR and non-SAR species. The objective of this input was to produce a species presence value, represented by the number of individual SAR and non-SAR species identified per quarter section. A higher weight was placed on Schedule 1-listed species, with provincially ranked critically imperiled, imperiled, or vulnerable species (S1–S3) being given a value one-tenth that of the Federally-listed SAR. The EO point data were transformed to a surface layer by applying taxonomically relevant buffers to all species occurrences and therefore associating species presence/absence data to each quarter section. As species survey effort maps were unavailable, the absence of an EO record could not be assumed to indicate the absence of the species; therefore, quarter section-level species presence values were interpolated using inverse distance weighting to create a final map of species presence values. Based on these data, all quarter sections were assigned a relative value based on the number of federally and provincially listed species to benefit from conservation activities.

The Habitat Quality input ranked the predicted habitat quality of the study area. Calculated for each quarter section, this model input was negatively or positively influenced by five

habitat quality indicators, including: the number and location of active petroleum wells; relative impact of motor vehicle disturbance as calculated from the distance to highways, collector roads, and grid roads; intensity of agricultural surface ditching (draining); percent of the quarter section covered with grassland; and adjacency to other grassland patches. Locations within the Eastern Mixed-grass Prairie Priority Area with relatively higher habitat quality contributed positively to the final ranking of land parcels, as it was assumed that these lands would provide greater benefit to SAR and other wildlife.

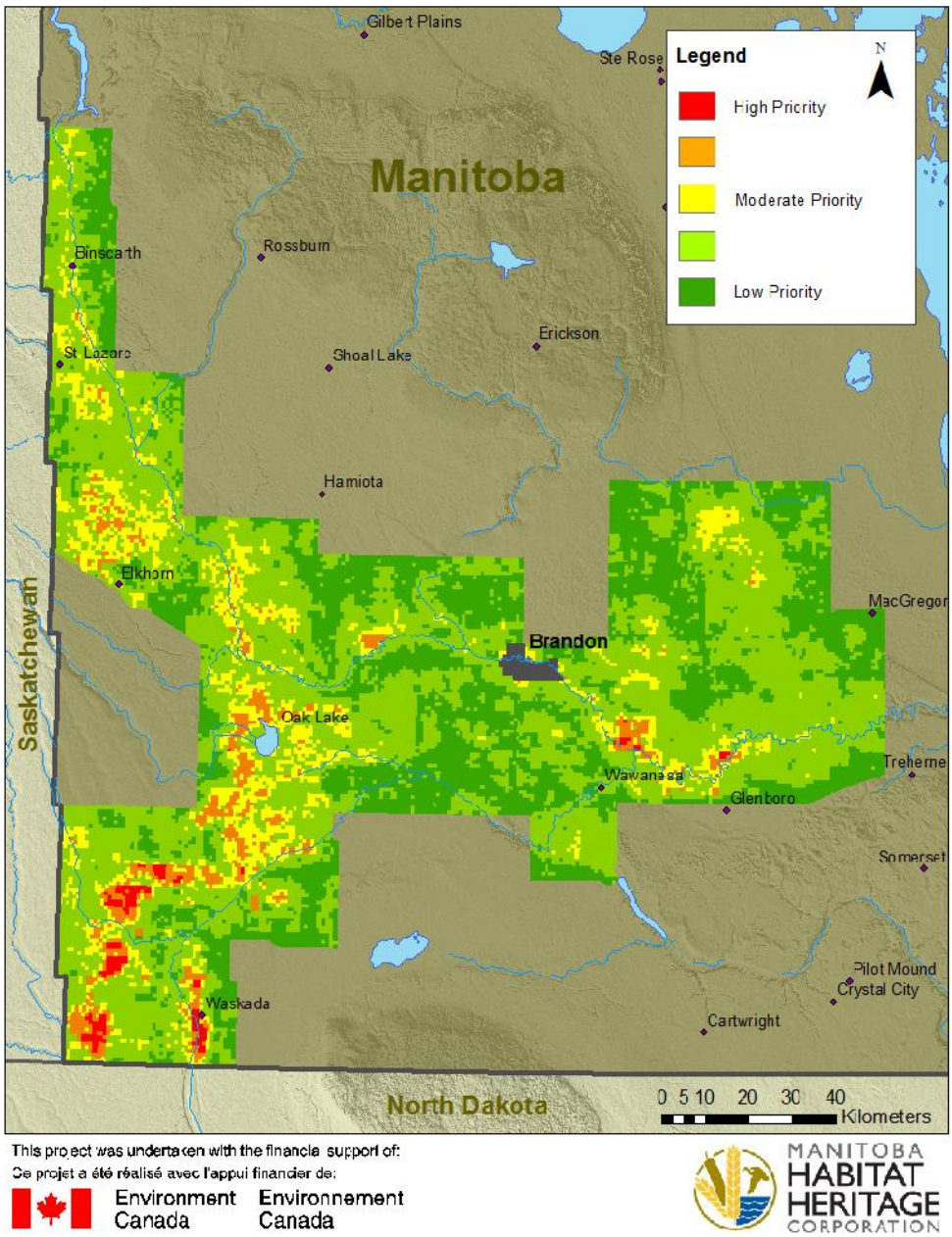

Fig. 1. Results of grassland prioritization in southwestern Manitoba

The 'urgency for action' input identified areas that had the highest conservation need, as determined by six indicators. This input layer incorporated: the Canadian Land Inventory Agriculture Suitability rating, an indicator of cultivation likelihood and corresponding habitat loss; location within or outside a defined petroleum field; the Manitoba Habitat Heritage Corporation's Habitat Hotspot Map, which identifies biodiversity hotspots throughout southern Manitoba; proximity to currently protected lands, therefore maintaining and preserving habitat continuity; probability of ditching, as indicated by proximity to land currently classified as Intensely Drained; and quarter sections with native prairie classified under the Mixed Grass Prairie Inventory as Class A or B, indicating the highest quality natural grasslands with low levels of invasive species. Quarter sections with the highest urgency rank were prioritized for conservation.

The three summary model inputs were combined to produce a final rank for each quarter section within the study area (Fig. 1). Of the approximately 3.7 million acres analyzed, Manitoba Habitat Heritage Corporation (MHHC) identified 9% of the area as being of conservation interest, with a rank of at least 5 out of a possible 10. These ranks reflect areas with a high number of species, are of high habitat quality, and are in urgent need of protection. While some grasslands in Manitoba were ranked high in terms of habitat quality, their relative conservation need (i.e., urgency) was deemed low and they were therefore ranked lower in the final prioritization. These ranked data are actively being used by MHHC in the term and perpetual protection of SAR habitats, with term protection options being limited to only the highest priority quarters.

This work was completed with funding provided by Environment and Climate Change Canada.

THE CONSERVATION STANDARDS PROGRAM: ENVIRONMENTAL DATA IS OUR CURRENCY

K. SCALISE, E. BEVERIDGE

Fish and Wildlife Branch, Ministry of Environment, 4th Floor, 3211 Albert Street, Regina, SK S4S 5W6, Canada. Email: ENV.researchpermit@gov.sk.ca

Abstract: We provide an overview of the Saskatchewan Ministry of Environment's Conservation Standards Program (CSP). The aim of the CSP is to ensure high-quality data submissions on all species, especially those considered to be rare and sensitive. Under the CSP, a recent legislative amendment provides the province with the authority to set standards regarding activities regulated through Research Permits, which are typically issued to researchers and to industry/environmental consultants. Researchers will be required to submit information on species in standardized formats. Industry/environmental consultants will now be required to adhere to requirements regarding the use of standardized Species Detection Survey Protocols and Data Submission Templates. Personnel conducting species detection surveys will be phased into the Ministry's Qualified Persons Registry under qualification standards. These requirements will result in a significant increase in the quality and quantity of data on rare and sensitive species into the Saskatchewan Conservation Data Centre that can be used to inform Ministry approvals and planning.

For more information, visit: http://www.environment.gov.sk.ca/Default.aspx?DN=01006852-b481-4dd8-9941-732c2128c7e0

MEEWASIN NORTHEAST SWALE MASTER PLAN – PROTECTING A PRIZED NATURAL FEATURE

SARINA GERSHER, ALAN OTTERBEIN, NOLA STEIN

Meewasin Valley Authority, 402 Third Avenue South, Saskatoon, SK S7K 3G5, Canada. Email: sgersher@meewasin.com

Abstract: Extending north from Peturrson's Ravine in Saskatoon, Saskatchewan, to the Rural Municipality of Aberdeen, the Meewasin Northeast Swale is a channel scar that is approximately 26 km long and covers 2,800 ha. It is the result of the post-glacial South Saskatchewan River carving one of many paths weaving through the landscape over 15,000 years ago, evolving as the waters subsided into a unique geological, hydrological, and ecological area. This distinctive and rugged landscape has existed for many thousands of years and remained relatively intact in that time. It provides significant ecological services as a diverse, connected network of rare native prairie, riparian areas, and wetlands.

The Swale is unique, not only locally, but within the context of the greater prairie region. It has intrinsic value as a natural system, as urban ecological infrastructure and as a significant neighbourhood, municipal, and provincial amenity. Ongoing protection, selective development, resource management, education, and conservation will support and enhance these values.

From a jurisdiction perspective, the Meewasin Northeast Swale consists of two parts: lands within the City of Saskatoon (the Swale), and lands within the Rural Municipality of Corman Park and Aberdeen (the greater Swale). The Swale, within Saskatoon city limits (primarily owned by the City of Saskatoon), is approximately 300 ha in size and 5 km in length (roughly 10% of the greater Swale area).

The *Meewasin Northeast Swale Master Plan* was developed for the Swale within the City of Saskatoon, to support and foster conservation, education, and passive recreation. It aligns with the Strategic Plans of both the Meewasin Valley Authority (2014) and the City of Saskatoon (2013), and it builds on important previous work including the *Northeast Swale Resource Management Plan* (Meewasin Valley Authority 2013) and the *Northeast Swale Development Guidelines* (2012) (Stantec Consulting Ltd. 2012).

Human activity and urban growth will have long-term impacts on the Swale. Currently this activity includes the planning and development of residential neighbourhoods, the North Commuter Parkway, and the Provincial Perimeter Highway. The Swale is also a significant piece of ecological urban infrastructure, providing a site for stormwater management systems. Given all of these impacts, comprehensive planning and ongoing resource management are necessary to conserve this valuable resource.

The Master Plan process began in early 2014 with the establishment of an internal project team and two committees: Steering and Technical Advisory. A Design Charrette initiated the design process by bringing over 45 experts, key stakeholders, and students together to work in a group format, generating design concepts and ideas. Following the Charrette, design options were refined, and a report was developed. Consultations with the project team, committees, public, and key stakeholders have been ongoing throughout this process.

A design program was developed that identifies the intended outcomes of the Master Plan. These have guided the development of the Plan and include key ideas such as conserving biodiversity (including the accommodation of ongoing resource management), supporting passive recreation activities, accommodating educational programming, interpreting cultural and natural history, and supporting a communications plan. Other critical design considerations include minimizing site fragmentation, accommodating wildlife corridors and connectivity, maintaining nocturnal light levels, providing for pedestrian connections to adjacent areas, and providing for public safety, comfort, and accessibility.

To meet the goals of the design program, proposed amenities include: the Greenway, trails, boardwalks, parking, facilities and amenities, signage, fencing, access control, lighting, and an Outdoor Education Staging Area.

The completed Master Plan provides baseline costing information and proposes a number of sequential development phases with an unknown overall timeframe (the work would be synchronized with adjacent development). Ongoing collaboration with Meewasin's funding partners will be necessary to determine a sound funding strategy for implementation, operation, and life cycle replacement.

The work completed to date has been collaborative, with significant investments in time and consultation from Meewasin, the City of Saskatoon, key stakeholders, and the public. This collaborative approach must continue to ensure the successful implementation of the Master Plan and conservation of this valuable resource. The design ideas and recommendations within this Master Plan are intended to be conceptual, and will require further detailed design as development proceeds. The Master Plan's design ideas and recommendations may also be applied to similar sites such as the adjacent Small Swale and the greater Swale. Having been endorsed by the Meewasin Valley Authority and the City of Saskatoon, this document is a mutually accepted plan that outlines the framework for ongoing planning and development in the Swale.

The full *Meewasin Northeast Swale Master Plan* can found at http://meewasin.com/.

Literature Cited

City of Saskatoon (2013) Strategic Plan 2013-2023. City of Saskatoon, SK

Meewasin Valley Authority (2013) Northeast Swale Resource Management Plan. Meewasin Valley Authority, Saskatoon, SK

Meewasin Valley Authority (2014) A world -class corridor: a vision for the Meewasin Valley 2014-2024. Meewasin Valley Authority, Saskatoon, SK

Stantec Consulting Ltd. (2012) Northeast Swale Development Guidelines (2012). Stantec Consulting Ltd., Saskatoon, SK

TWENTY-FIVE YEARS OF PRESCRIBED MANAGEMENT TO CONSERVE MANITOBA TALL-GRASS PRAIRIE BIODIVERSITY – LESSONS LEARNED

CARY HAMEL

Nature Conservancy of Canada – Manitoba Region, Winnipeg, MB R3L 0P3, Canada. Email: cary.hamel@natureconservancy.ca

Abstract: The 4,650-ha Manitoba Tall Grass Prairie Preserve is characterized by tall-grass prairie, wet meadows, forests, and savannah. Since its establishment in 1989, the preserve has been managed to promote the long-term maintenance of biodiversity. A suite of management techniques have been used to promote the maintenance of a diversity of habitats and successional stages, and the rare and endangered species these habitats support. Management techniques include haying, grazing, fire, prairie restoration, invasive species control, and mechanical encroachment control. Management decisions have been informed by the results of periodic species and ecosystem monitoring, assessments of management effectiveness, over 20 research studies, a climate-change adaptation process, and feedback from local agricultural partners. Regular assessment and integration of new information has resulted in several changes to management approaches. Current and evolving approaches include the integration of multiple Species at Risk recovery considerations, increasing linkages to local natural-area based economic development, and multi-parcel, multi-year planning that incorporates a recurrent disturbance rotation.

ROADSIDE PRAIRIES – CONSERVATION OPPORTUNITIES AT 100 KM/HR

JOHN P. MORGAN

Prairie Habitats Inc., PO Box 10, Argyle, MB R0C 0B0, Canada. Email: john01@xplornet.com

Abstract: Roads and railways on the prairies are ubiquitous, part of nearly everyone's day. We often pay them little heed. Tens of thousands of hectares of mostly publicly-owned habitat with native species occur along highways, section roads, and railways throughout western Canada. The adjacent road allowances and railway rights-of-way (ROWs) often contain an amazing, undocumented, and usually unprotected repository of remnant native plant and animal species. This sometimes also occurs in heavily agricultural, industrial, and urban landscapes where native species often virtually have disappeared. This paper provides an introduction to the exciting native prairie conservation, biodiversity, and restoration opportunities that literally are under our feet and tires. Using examples from Manitoba and other parts of North America, I explore the brave new world of ROW prairie ecology, and its tremendous potential here in western Canada.

> *If the biota, in the course of aeons, has built something we like but do not understand, then who but a fool would discard seemingly useless parts? To keep every cog and wheel is the first precaution of intelligent tinkering.* (Leopold 1972)

The Canadian Prairies

Beginning in the late 1860s with surveyors from the Government of Canada, and the Dominion Lands Act of 1872, nearly 81 million ha of the world's largest single integrated survey grid system created more than 1.25 million homesteads in what would become Manitoba, Saskatchewan, and Alberta (Fig. 1; see Library and Archives Canada: https://www.bac-lac.gc.ca/eng/discover/land/land-grants-western-canada-1870-1930/Pages/land-grants-western-canada.aspx).

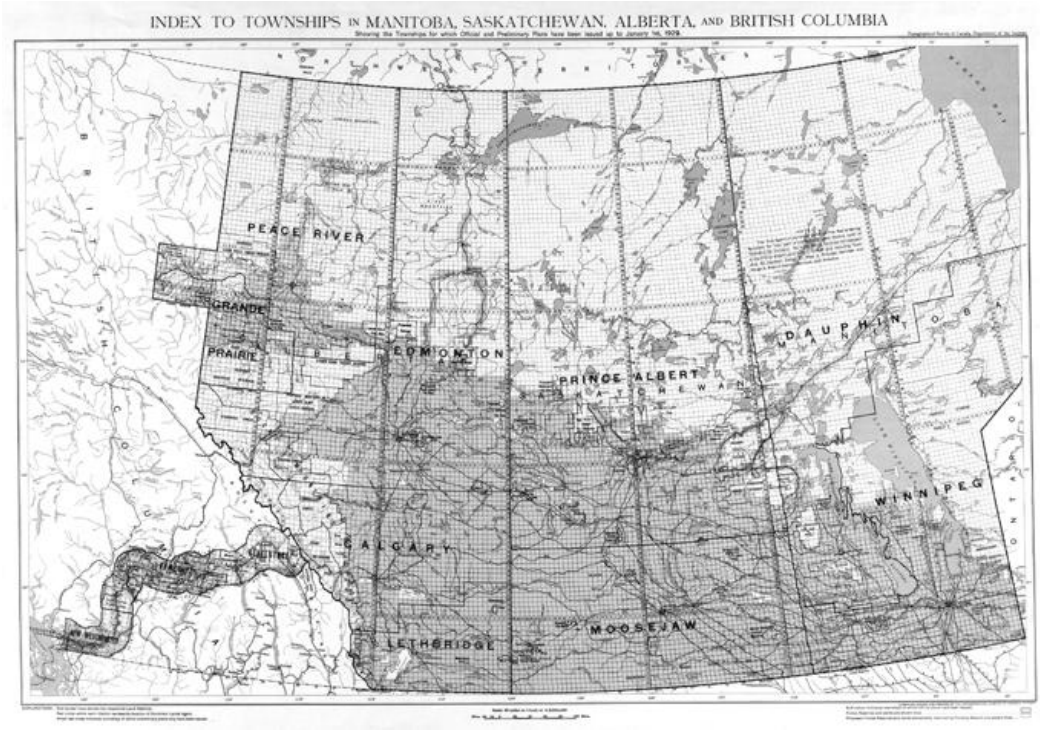

Fig. 1. Surveyed Townships in Western Canada to 1920. Each one of the small squares in the darkest area is a 36 square mile township. Each township has up to 36 miles (58 km) of 20 to 30 m wide road rights-of-way around the square mile sections.
(Source: https://www.bac-lac.gc.ca/eng/discover/land/land-grants-western-canada-1870-1930/Pages/land-grants-western-canada.aspx)

Almost 55 million ha, nearly all of it in the black and brown Chernozemic soils of the Prairie and Aspen Parkland Ecozones of western Canada (Fig. 2), became agricultural land. As western Canada opened up to settlement, surveyed road allowances from 66 to 99 feet (20 to 30 m) wide were set aside as Crown land for public access between each section in Manitoba and parts of Saskatchewan, and every second mile east to west in the remainder of Saskatchewan and Alberta (see https://en.wikipedia.org/wiki/Dominion_Land_Survey). Hundreds of thousands of acres of native prairie, wetland, and forest were largely protected from many of the immediate impacts of one of the largest mass immigrations ever seen in world history.

A typical 30-m road allowance takes up 4.9 ha per lineal mile (1.6 km). A 20-m road allowance comprises 3.2 ha per lineal mile. Even if a section road takes up 60% of this area, it still leaves about 2.0 ha per mile on a 30-m right-of-way (ROW), or about 1.3 ha per lineal mile on a 20-m road allowance. Multiply this by the vast lineal distances of road and rail ROWs on the prairies, and the acreage tally is impressive (Table 1).

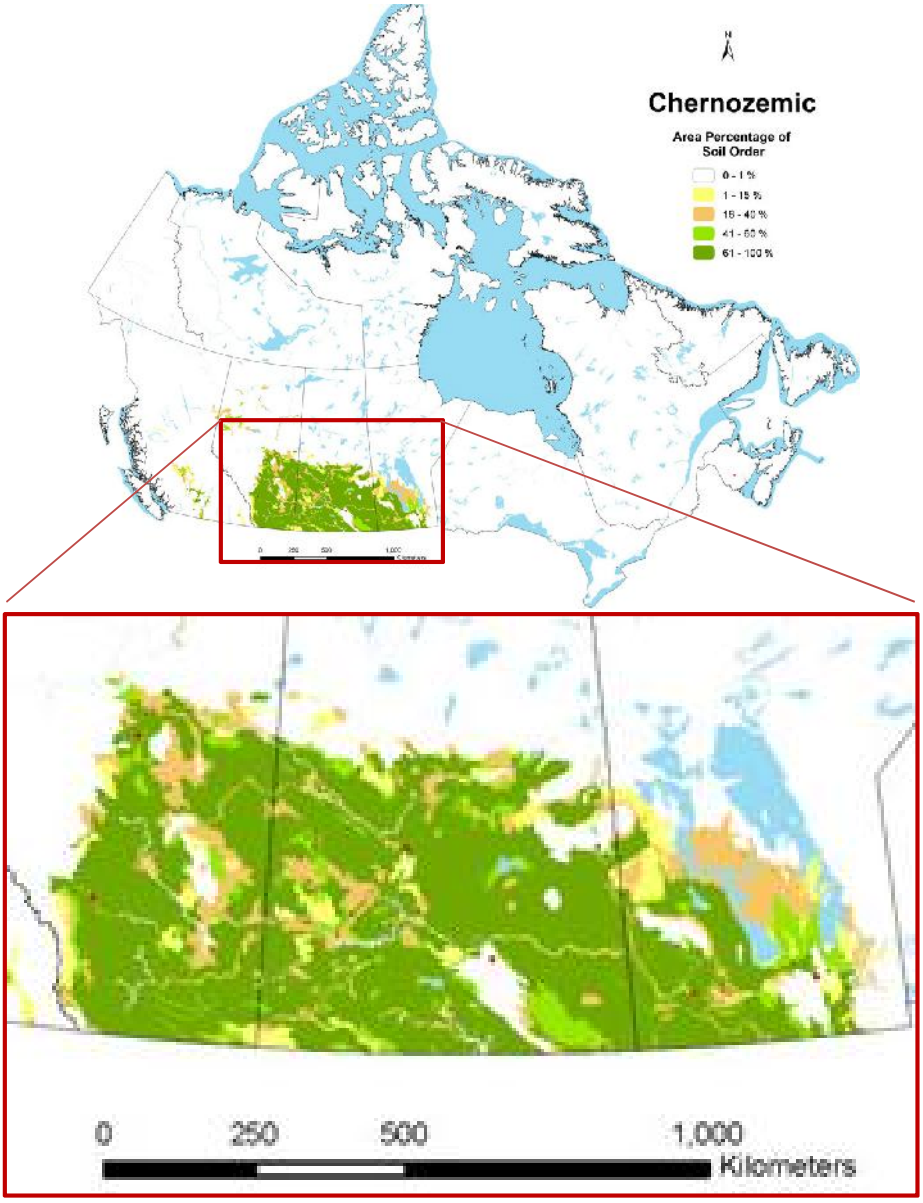

Fig. 2. Agricultural and native prairie region of western Canada. (Source: Department of Soil Science, University of Saskatchewan, http://www.soilsofcanada.ca/images/CC_map.jpg)

Calculations for Table 1 assume that every section had a surrounding 30-m road allowance. In reality, however, only every second section had a surveyed east-to-west running road allowance in western Saskatchewan and Alberta (https://en.wikipedia.org/wiki/Dominion_Land_Survey). The table does not account for the relatively large areas covered by ROWs along main highways such as the TransCanada, Yellowhead, and many other routes; thus, the overestimation of area for municipal/county road allowances is assumed to be compensated for by the under-representation of main highways.

Table 1. Lengths of roads and railways, plus rights-of-way (ROW) areas in Canada's Prairie Provinces

Province	Total area (ha)	Agricultural area		Highways (km)	Municipal & county roads (km)	Railways (km)	Total Hwy, Road, & RR (km)	Area of ROWs	
		Size (ha)	% of total					Size (ha)	% of total
Alberta	64M	21M	33	30,575	149,655	7,000	187,230	226,009	0.4
Saskatchewan	59M	26M	44	25,998	231,473	12,999	270,470	326,490	0.6
Manitoba	65M	8M	12	19,053	54,061	4,214	77,328	93,345	0.1
Total	188M	55M	29	75,626	435,190	24,214	510,815	645,844	0.3

Data sources:

https://en.wikipedia.org/wiki/Roads_in_Saskatchewan
https://en.wikipedia.org/wiki/List_of_Alberta_provincial_highways
https://en.wikipedia.org/wiki/Alberta
https://en.wikipedia.org/wiki/Manitoba
https://en.wikipedia.org/wiki/List_of_Alberta_provincial_highways
https://commons.wikimedia.org/wiki/File:AB-cities-roads.png#/media/File:AB-cities-roads.png
http://www.albertacanada.com/business/overview/railways.aspx
http://www.statcan.gc.ca/ca-ra2006/analysis-analyses/sask-eng.htm
http://soils.gis4ag.com/
http://www.producer.com/2013/03/farmland-in-short-supply-across-alberta/
C. Churchward, MB Infrastructure and Transportation Highway Planning & Design Branch, pers. comm.

At least for the purposes of this study, an exact figure was not considered as important as the approximate area of road and railway ROWs across the Prairie Provinces. The figures are as accurate as possible for a first examination of this topic, and should be taken as a general idea, not a detailed and comprehensive exhaustive first inventory. Railroad ROWs are assumed to be a constant 30 m, although the real figure varies. Table 1 also does not include lands on First Nations Reserves, or those covered by drainage, pipeline, utility, and irrigation ROWs.

In the intervening 145+ years since land surveys began, the situation has changed considerably. Many road allowances were turned into trails, then section roads and sometimes highways. Railways made their way across the landscape (Fig. 3). Thousands of km of railways have been abandoned, and some were removed. An unknown number of ROWs were converted to cropland and urban areas. Today, however, many ROWs remain relatively undisturbed in part, and harbour significant populations of native species. No systematic inventory ever has been done of ROW prairie remnants in western Canada as have been in other parts of North America (e.g., Kansas: Eddy 1992; Minnesota: http://dnr.state.mn.us/eco/mcbs/outcomes/index.html). If done, the results may be a pleasant surprise. The main objective of this study is to broadly survey the ROW native prairie situation in western Canada, and explore the conservation possibilities, using other jurisdictions as examples.

Fig. 3. Present distribution of the main railway lines in Canada, showing the extensive network of railways in the Prairie Provinces. Because these lands have been very well protected from development, nearly all of these rights-of-way (ROWs) in western Canada have significant remnant native prairies. Though unmanaged and often degraded, they still act as a treasure trove of native species, and systematic inventories should begin with the railway ROWs that parallel highways.
(Source: http://www.albertacanada.com/business/overview/railways.aspx)

Table 1 shows that from 9 to 44% of the Prairie Provinces' 204.4M ha is agricultural land. Of that total, nearly 646,000 ha, or about 0.3% of the total areas, are ROWs with potential native species. Saskatchewan has the largest ROW area by far, with nearly 327,000 ha, 30% more than Alberta, and over three times that of Manitoba. Interestingly, Saskatchewan has only 2% of Canada's population, but 20% of its roadways. It has more roads per capita than any other jurisdiction in North America (see https://en.wikipedia.org/wiki/Roads_in_Saskatchewan).

Over 24,000 km of existing and abandoned railroad ROWs exist in the Prairie Provinces, often in addition to and adjoining other roadways, and sharing ROWs. Because the railways mostly were constructed in advance of settlement in an area, today their ROWs harbour the most potential for remnant native species. Railway companies historically vigorously protected ROWs from encroachment, and still do. Prescribed burns for weed and shrub control were a regular practice all along railway ROWs until relatively recently. Combined with periodic wildfires from sparks thrown off by the trains themselves, this has maintained many railway ROWs' fire-dependent native prairie species.

Though railways often were the first lands on the prairies to be broken, disturbed parts of their ROWs were re-colonized by native species from the then surrounding prairies. Paradoxically, most of those adjacent prairies now are long gone, replaced by cultivated,

urban, and industrial lands. The ROWs essentially represent a transect of pre-settlement prairie plant life with a snapshot of many of the species now vanished from the surrounding landscape.

Saskatchewan author Trevor Herriot (2014) eloquently illustrates the diverse flora and fauna found along a roadside trek through a heavily farmed landscape near Regina. Herriot's delightful and perceptive tale is an evocative example of the rich diversity that can be found along many prairie ROWs. Almost none of this richness is documented, protected, or managed. Uncounted thousands of native prairie ROW remnants have been lost, and continue to do so. Incursions of non-native species such as Kentucky bluegrass (*Poa pratensis*), smooth brome (*Bromus inermis*), and crested wheatgrass (*Agropyron cristata*) are common on many ROWs. Many also have been overgrown by shrubs and trees such as snowberry (*Symphoricarpus* spp.), wolf willow (*Eleagnus commutata*), and trembling aspen (*Populus tremuloides*) due to a lack of fire. Appropriate non-native weed and tree control plus managed burns can bring the prairies back to good health and diversity. In the absence of fire, mowing of roadside vegetation has preserved many native species as well. Adapted to grazing by bison, usually long-lived, and often possessing deep root systems, many native prairie plants species can survive decades of mowing with few detrimental effects. While they may not be obvious to the casual eye and overgrown with non-native grasses, a closer look at undisturbed ROWs can reveal a wealth of native plants, as well as the wildlife that depends upon it. All that this wealth takes to express itself is some appropriate management such as reduced mowing, non-native species control, or a prescribed burn. Prescribed burns are a normal part of highway and roadside ROW management in the US, and have been done successfully in Manitoba (Fig. 4).

ROW corridors often provide a continuous, relatively safe passageway for native plants and wildlife movement. With most of our native prairies either gone or significantly reduced, ROWs often are the only connecting strips between the remaining isolated blocks of habitat. Acting as conduits for movement and genetic exchange, they are an important and little-appreciated mechanism for preserving biological diversity. ROW prairies are valuable as habitat corridors for butterflies, bees, and carabid beetles (Bennett 1991, Vermeulen 1993, Ries et al. 2001, Hopwood 2008).

Fig. 4. Top left: John Morgan conducting a controlled burn along PTH 6 and the Prairie Dog Central Railway in Manitoba (photo by Nelson Ridgeway). Top right: Hauber Prairie controlled burn along a section road in Manitoba's Interlake near Argyle (photo by John P. Morgan). Bottom: Fire-killed trembling aspen (*Populus tremuloides*) along the Prairie Dog Central Railway northwest of Winnipeg (photo by John P. Morgan)

Manitoba

In Manitoba, a number of endangered, threatened, and rare native prairie species have been identified on road and railway ROWs (Fig. 5), including the western prairie fringed orchid (*Platanthera preclara*), small white lady's slipper (*Cypripedium candidum*), western silvery aster (*Symphyotrichum sericeum*), *Culver's root (Veronicastrum virginicum), and Riddell's goldenrod (Solidago ridellii) (Collicutt & Morgan 2012*, http://www.manitoba.ca/conservation/wildlife/sar/pdf/culversroot.pdf, http://www.registrelep-sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=640).

Fig. 5. Significant populations of the endangered small white lady's slipper (*Cypripedium candidum*; left) and western prairie fringed orchid (*Platanthera preclara*; centre), along with the threatened western silvery aster (*Symphyotrichum sericeum*; right) have been found along road and rail rights-of-way in southern Manitoba. Photos by D.R. Collicutt

Although a systematic ROW inventory in Manitoba has not been done, enough significant prairie species have been identified to warrant a more detailed examination. I and others have identified many areas of Manitoba roadside and railway ROWs with high-quality native prairie remnants (Fig. 6). These include along the TransCanada and Yellowhead Highways east and west of Winnipeg, Provincial Trunk Highway (PTH) 41 along the Saskatchewan border, Provincial Road (PR) 330 and PTH 75 south of Winnipeg, PTH 6 northwest of Winnipeg, PTH 5 between Carberry and Glenboro, and PTH 23 near Miami. PTH 10 between Dauphin and Cowan includes the only officially protected highway ROW in Manitoba, the Crocus Hill Ecologically Significant Area (http://travelingluck.com/North+America/Canada/Manitoba/_5932729_Crocus+Hill.html). Crocus Hill contains a provincially rare example of rough fescue prairie. PR 201 between Stuartburn and Vita contains numerous S1 endangered western prairie fringed orchids (Fig. 5), as well as many other tall-grass prairie species.

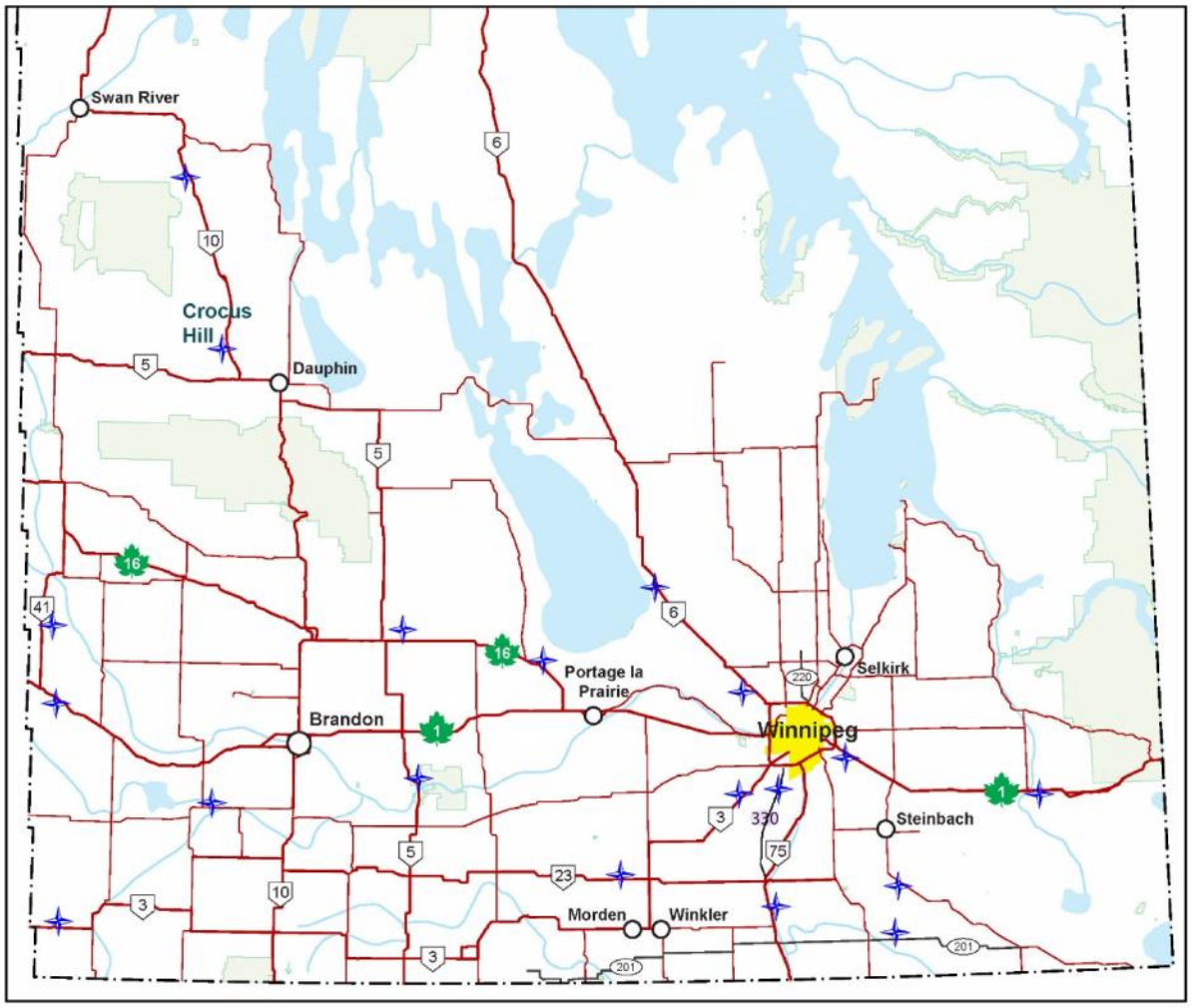

Fig. 6. Selected highway rights-of-way (ROW) in southern Manitoba with high-quality remnant native prairies, indicated by the blue stars. The only officially protected highway ROW in Manitoba, the Crocus Hill Ecologically Significant Area, is indicated in the northwest quadrant, near Dauphin. (Credits: Carol Churchward and Doug Fast, Manitoba Infrastructure and Transportation, Highway Planning and Design Branch, Winnipeg, MB)

Many, but not all, high-quality native prairie ROWs in Manitoba are parallel to existing or abandoned rail lines. Future systematic inventories of all ROWs in Manitoba and across the prairies should start with those along railways. Without a detailed and accurate ROW native prairie inventory, we will continue to lose sites and irreplaceable biological diversity to development. This development would occur without us even knowing or realizing what we had before we lost it. This mirrors the situation of much of Manitoba's tall-grass prairie, where over 99% was lost before it was ever documented or studied (Joyce & Morgan 1989). Remaining ROW prairies are our last chance to conserve a small part of this regional diversity and use it to restore native prairies (Figs. 7 & 8).

Fig. 7. Left: A magnificent, diverse and unprotected right-of-way prairie between PR330 and a CN Rail line near Domain, MB, just south of Winnipeg. Here in the heart of the Red River Valley, less than 1/20 of 1% of the original tall-grass prairie remains. Right: In bloom are big bluestem (*Andropogon gerardii*), the reddish strip along the road shoulder, mixed with non-native smooth brome (*Bromus inermis*), prairie cord grass (*Spartina pectinata*), narrow-leaved sunflower (*Helianthus angustifolius*), many-flowered aster (*Symphyotrichum ericoides*), Canada goldenrod (*Solidago canadensis*), and stiff goldenrod (*S. rigida*). Photos by John P. Morgan

Manitoba Infrastructure & Transportation (MIT) and Prairie Habitats Inc. have developed typical native grass and wildflower lists and local seed recommendations for new highway construction ROWs for revegetation of all regions of the province (Prairie Habitats Inc., unpublished reports and maps). This includes MIT regions within the Tall, Mixed, and Rough Fescue Grassland Ecoregions, as well as the Boreal Forest Ecoregion. The major native grass, wildflower, and legume species of these regions have been identified, and a basic list of the major species has been prepared. All invasive non-native species, such as smooth brome, Kentucky bluegrass, and crested wheatgrass, also have been removed from the list of allowable species that formerly could be planted along provincial highways in Manitoba.

Fig. 8. Another exquisite, diverse tall grass prairie just north of Winnipeg in the right-of-way between the Vintage Locomotive Society's steam rail line (a former CN Rail property) and PTH6. In bloom are big bluestem (*Andropogon gerardii*), meadow blazingstar (*Liatris ligulistylis*), long-fruited anemone (*Anemone cylindrica*), and stiff goldenrod (*Solidago rigida*). Photo by John P. Morgan

In 2008, Paul Mutch of the City of Winnipeg's Parks and Natural Areas Department discovered a diverse tall-grass prairie remnant in the heart of east-central Winnipeg between Raleigh and Gateway Streets along an active CN Rail line. Now abandoned, the rail line grade has been turned into the Northeast Pioneers Greenway, an 8-km recreational trail from the edge of the city nearly to downtown (Fig. 9). The tall-grass prairie restoration was conducted by Prairie Habitats Inc. and the City of Winnipeg Naturalist Services in 2013 using locally-collected seed from the Winnipeg region. Reduced mowing has allowed many native prairie species to recover, including big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), and prairie crocus (*Anemone patens*). Public support has helped restore additional native species.

Fig. 9. The Northeast Pioneers Greenway in Winnipeg: an urban native prairie right-of-way (ROW) that is now a preserved recreation and conservation corridor. Top: The former railway line (now paved) is to the left of the native prairie. In bloom are remnant narrow-leaved sunflower (*Helianthus angustifolius*), yellow or gray-headed prairie coneflower (*Ratibida columnifera*), hairy golden aster (*Heterotheca villosa*), and little bluestem (*Schizachyrium scoparium*) from the original railway ROW prairie, now completely surrounded by the city. Bottom left: Remnant pink-flowered onion (*Allium stellatum*) in bloom. Bottom right: Remnant big bluestem (*Andropogon gerardii*) in seed. Photos by Paul Mutch (City of Winnipeg Naturalist Services)

ROWs and Native Vegetation in the United States

The National Roadside Vegetation Management Association holds annual conferences in the US on the topic (http://www.nrvma.org/). It has produced a manual for integrated roadside vegetation management (IRVM) that emphasizes an ecological approach to roadsides and native species (Arnebeck 1997). The US Department of Transportation Federal Highways Administration (USDOT-FHA) has published numerous studies and guides on native vegetation along American ROWs. One of the best known is a reference for all 50 states (Harper-Lore & Wilson 1999), which details the rationale for roadside native plants with extensive background, references, and suitable roadside local native plant species lists for every state. USDOT-FHA also produced a guide to promote the six-state Prairie Passage Wildflower Route (Bolin 2003). A percentage of US federal funding for the countrywide Interstate system is mandated by legislation to go into native species restoration (B. Harper-Lore, USDOT-FHA, pers. comm.). In the late 1990s, this amounted to over US $250M annually.

Minnesota

Minnesota's tall-grass prairie once covered nearly 7.3M ha or 35% of the over 20.6M ha area of the state (http://www.landscope.org/minnesota/overview/). It was located in the western portion, contiguous with eastern Manitoba, mainly in the Red and Minnesota River Valleys. As with the Manitoba situation, Minnesota has less than 1% of its tall-grass prairie remaining (Fig. 10).

Over 100 companies specialize in growing and supplying local source native seed and plants from Minnesota (http://www.dnr.state.mn.us/gardens/nativeplants/suppliers.html). One company, Prairie Restorations Inc., has collected and planted over 8,000 ha of local ecotype native seed alone (R. Bowen, Prairie Restorations Inc., pers. comm.). Minnesota Department of Transportation (MNDOT) has helped sponsor statewide County Biological Inventories that have covered 72 of Minnesota's 87 counties. MNDOT has a policy of protecting, managing, and restoring native prairies along its ROWs throughout the state. Planting native Minnesota species is a priority, and they even go so far as to specify that native species that are planted on MNDOT ROWs be from that part of the state. Railway ROW inventories started in Minnesota in 1978 (Borowske & Heitlinger 1981). The authors sampled 2,676 km of ROWs and found that A-quality, high-diversity, native tall-grass prairie occurred on 580 km, containing 16 contiguous corridors from 21 to 174 km with a total length of 875 km or 32% of the ROW surveyed. Jacobsen et al. (1992) found that nearly all of the high-quality roadside ROWs identified in another study had adjacent existing or recently abandoned railways. Similar results might be expected in Manitoba, and even more likely in Saskatchewan and Alberta.

Fig. 10. Rest stop with local native grasses and wildflowers along I-94 in Minnesota. In bloom are prairie coneflower (*Ratibida columnifera*), bergamot (or bee balm, *Monarda fistulosa*), upland white goldenrod (*Solidago ptarmicoides*), and big bluestem (*Andropogon gerardii*). Photo by John P. Morgan

Iowa

Cross Minnesota's southern border into Iowa, and you will be struck by the spectacular show of wildflowers and native grasses on interstate and state highways and on county section roads. Iowa was known as the "Tall Grass Prairie State" and "Land Where the Sky Began" (Madson 1982). It was mostly tall-grass prairie at the time of settlement, but less than 1% remains intact today (Madson 1982). Of Iowa's 99 counties, 87 have used local ecotype native Iowa seed for roadside plantings, and 38 counties have full-time IRVM managers or plans to manage and plant diverse local Iowa native species on their county highways and section roads (http://www.iowadot.gov/lrtf/). Iowa Department of Transportation (IADOT) policy includes native species objectives in all aspects of its IRVM delivery (Fig. 11), including to:

- maintain visibility and safety for roadside travelers;
- withstand harsh conditions;
- minimize maintenance costs;
- minimize erosion;

- improve water quality;
- infiltrate stormwater runoff;
- maintain good public relations.

Fig. 11. Integrated roadside vegetation management at work: Using tall native grasses and wildflowers on the backslope keeps snow off a county road in Iowa. Shorter native grasses are planted along the shoulder to eliminate the need for mowing, while wet meadow species in the ditch slow down runoff and enhance water infiltration. Photo courtesy of Iowa Department of Transportation

State legislation in 1988 created the Living Roadway Trust Fund (LRTF), a finance mechanism that has supplied about US$600,000/year (over US$17M since inception) to native roadside research, management, and planting in Iowa. It also created the Integrated Roadside Management Center at the University of Northern Iowa in Cedar Falls (Brant et al. 2015). Now known as the Tallgrass Prairie Center, it still administers the Integrated Roadside Management Program. This research, education, and graduate student hub has greatly elevated the profile of prairie conservation throughout Iowa, the US, and Canada. It was responsible for bringing the 23rd North American Prairie Conference to the University of Manitoba in Winnipeg in 2012. The Center also supports and organizes annual conferences of

200 to 400 people on IRVM and Iowa prairies. Seminars, public education, native species demonstration plantings, and many other activities round out its mandate.

One of the most significant projects of the LRTF was the Iowa Ecotype Project (Fig. 12) (https://www.environment.fhwa.dot.gov/ecosystems/greenerroadsides/gr_winter02p5.asp).

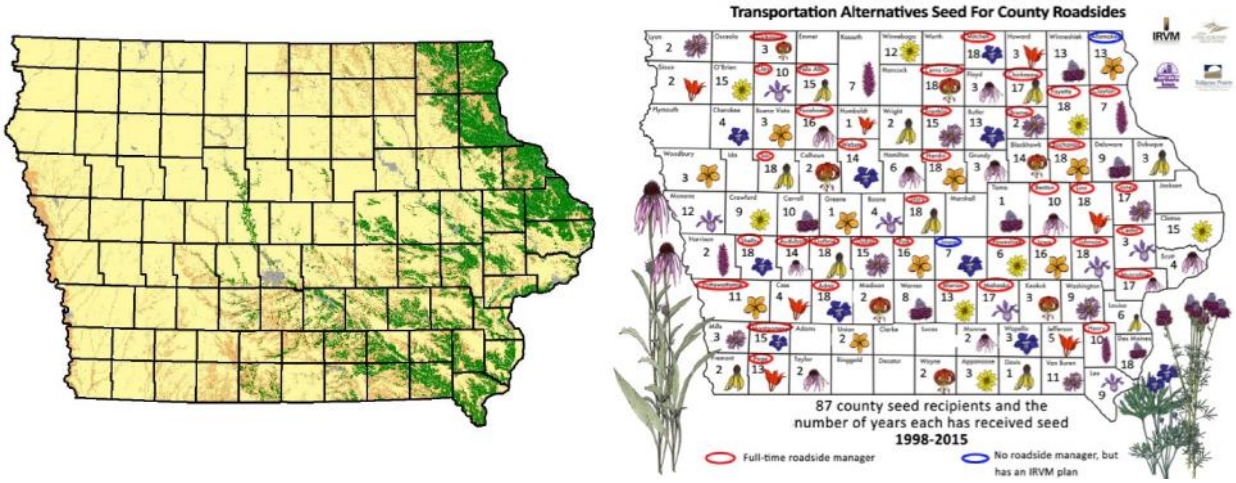

Fig. 12. Left: Pre-settlement vegetation of Iowa in 1850. Iowa was mostly tall-grass prairie at the time of settlement (shown in yellow, with green being forest and brown showing wetlands). Less than 1% of Iowa's tall-grass prairie remains today, but over 20,000 ha of rights-of-way (ROWs) have been replanted with local native wildflowers and grasses. (Source: http://www.iowadnr.gov/Portals/idnr/uploads/Wildlife%20Stewardship/draft_chap2.pdf). Right: Of Iowa's 99 counties, 87 have planted more than 50 species of local native seed along over 20,000 ha of their ROWs. IRVM: integrated roadside vegetation management. (Source: Tallgrass Prairie Center, University of Northern Iowa, Cedar Falls, IA)

Under this project, initiated in 1990 by the Tallgrass Prairie Center's Director Dr. Daryl Smith, seeds of 30 initial species of native Iowa grasses and wildflowers were hand-collected by volunteers all over the state (D. Smith, Tall Grass Prairie Center, University of Northern Iowa, pers. comm.). Iowa was divided into three climatic regions: north, central, and south. Seeds of each species were identified as to their source location; the USDA Natural Resources Conservation Service Plant Materials Center then grew out each species' seed collection in seed increase plots with no artificial selection to maximize genetic diversity. Foundation seed then was provided to interested private growers to establish seed production plots. IADOT commits to buying seeds from the growers, spending ca. US$460,000 in 2015. This provides a ready market to the growers for their seed production. Their source-identified native or 'Yellow Tag' seed is inspected and certified by the Iowa Crop Improvement Association, and now comprises over 50 species of local provenance, high genetic diversity native seed for restoration. In roadsides alone, this has resulted in the planting of over

20,000 ha of local native prairie species. Many thousands more hectares have been planted on Federal, State, County, and private lands (Figs. 12 & 13).

Fig. 13. A typical Iowa county backroad restored with local native tall-grass prairie grasses and wildflowers along a cornfield. Over 20,000 ha of Iowa roadsides have been restored with local ecotype native seed of over 50 species by Integrated Roadside Vegetation Management staff. Shown here in bloom are prairie coneflower *(Ratibida columnifera)*, black-eyed-susan (*Rudbeckia hirta*), sideoats grama (*Bouteloua curtipendula*), switchgrass (*Panicum virgatum*), and big bluestem *(Andropogon gerardii)*. Photo by John P. Morgan

Texas

Farther south at the opposite end of the North American prairie lies Texas. Its nearly 70M ha were mostly tall-grass prairie with oak and longleaf pine savannah on the rich black soils in the east, grading into coastal prairies and wetlands along the Gulf of Mexico, plus drier mixed and short-grass prairie and desert grasslands farther southwest (Fig. 14; also see http://www.beg.utexas.edu/UTopia/images/pagesizemaps/vegetation.pdf). The state wildflower, Texas bluebonnet (*Lupinus texensis*; Fig. 15), is a native species that most Texans know and appreciate, and is related to our native lupines (*Lupinus* spp.) and Indian breadroot (*Psoralea esculenta*). Growing naturally and planted on thousands of km of roadsides, it even occurs on abandoned industrial areas in large cities such as Dallas.

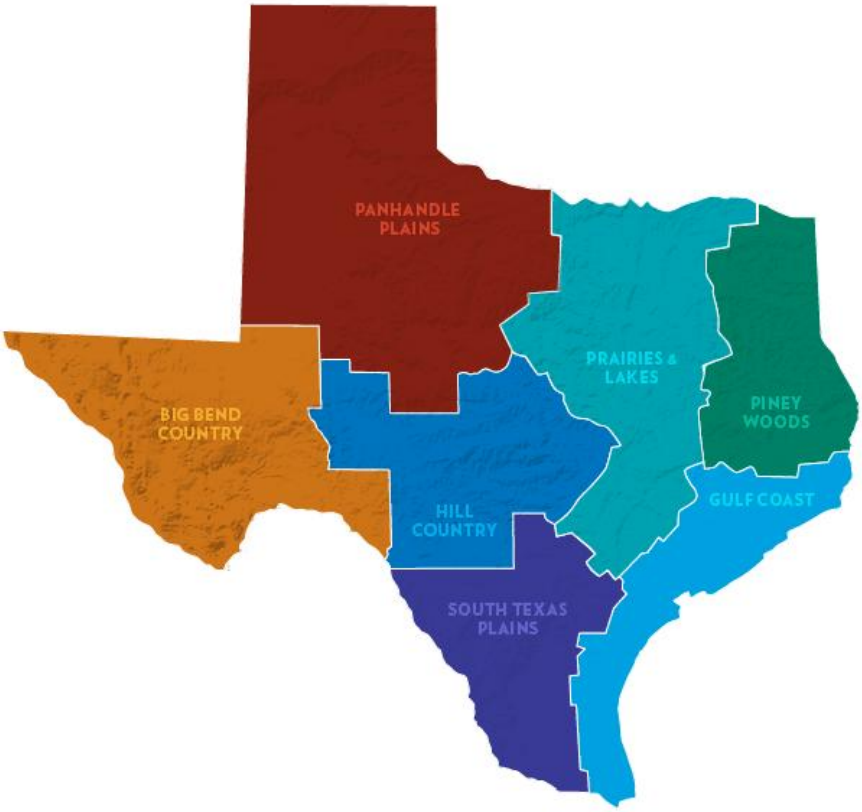

Fig. 14. Natural areas of Texas. Most of Texas was prairie grassland and desert at the time of settlement. Little of the original grassland remains today. (Source: Ladybird Johnson Wildflower Research Center, Austin, TX)

Texas has taken the management and restoration of native species on ROWs to a high level. The Texas Department of Transportation (TXDOT) has encouraged native wildflower growth along its highways since 1932, and annually plants over 13,000 kg of diverse wildflower seed (http://www.txdot.gov/inside-txdot/division/maintenance/wildflower-program.html). In the mid-1960s, native Texan Claudia 'Lady Bird' Johnson's interest in preserving and beautifying America resulted in a renewed emphasis on native species (https://www.wildflower.org/). The Lady Bird Johnson Wildflower Center at the University of Texas in Austin was established as an international focal point for learning, research, and appreciation about native species.

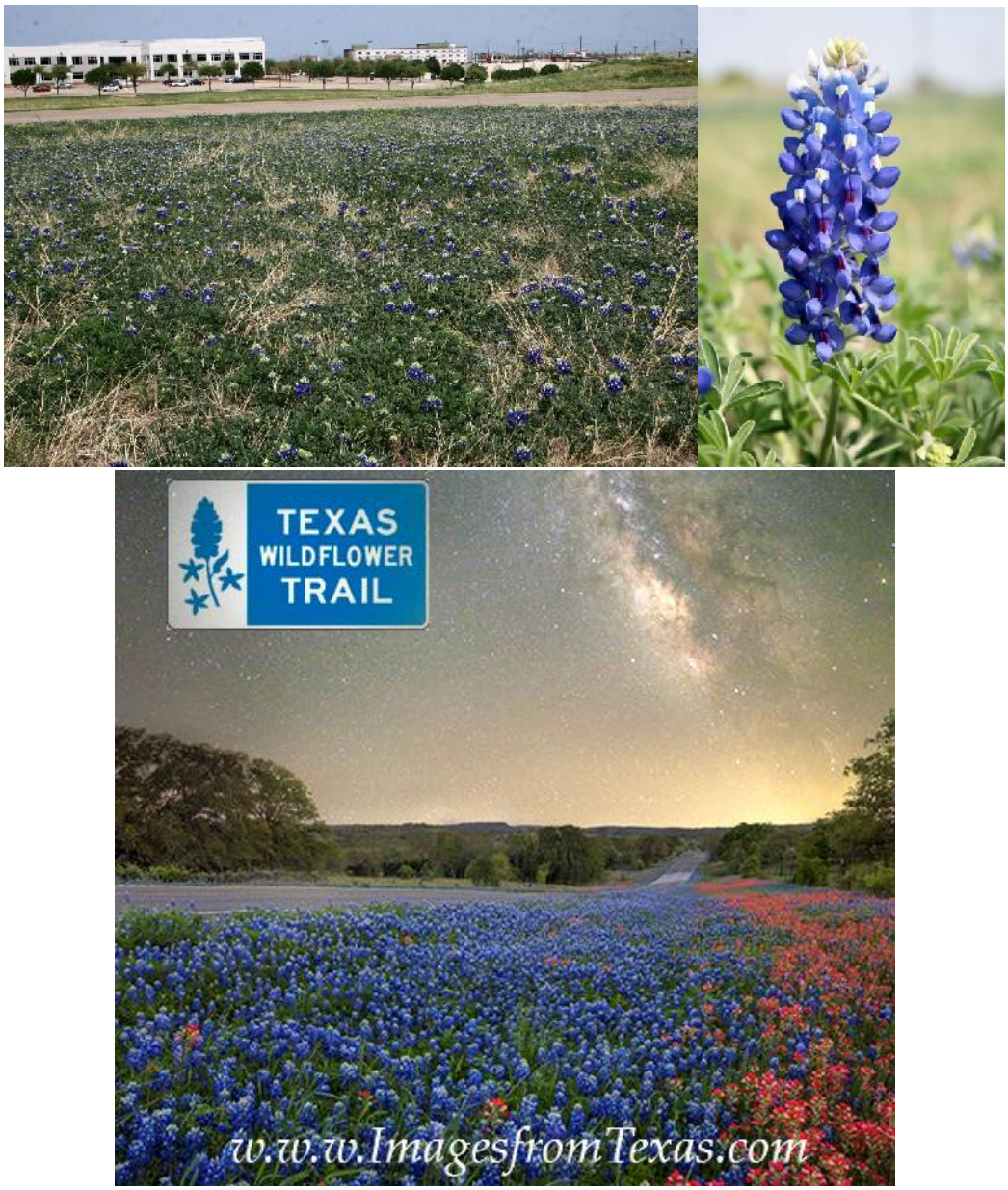

Fig. 15. Top left and right: Native Texas bluebonnets (*Lupinus texensis*) along a roadside near the Dallas Airport. Photos by John P. Morgan. Bottom: Just north of Llano, a spectacular Texas county roadside native bluebonnet vista and interpretive sign. (Photo by Rob Greebon, www.ImagesfromTexas.com)

Texas has a multi-million dollar tourist industry dedicated to roadside native plants (Figs. 15 & 16). Roadside wildflower routes with signage and advertising, public hotlines, community wildflower festivals, and websites abound, encouraging residents and visitors to tour highways, backroads, and small towns to appreciate the state's native flora (http://www.texashighways.com/wildflowers). Visitors come from all over the US and Canada to enjoy the truly incredible roadside displays, especially in spring and fall. Significant

economic, conservation, education, soil, agricultural, and non-native weed control benefits accrue to Texas residents and their landscape from the state's ROW native species management activities.

Fig. 16. A Texas roadside with gaillardia and native grasses. (Photo by Rob Greebon, www.ImagesfromTexas.com)

Conclusion

Native plant species, both on and off ROWs, have numerous benefits to society. From trapping snow away from traffic to increase safety, reducing mowing costs by planting shorter native species along shoulders, increasing aesthetic appreciation, providing habitat for threatened species and crop pollinators, fixing carbon from the atmosphere, connecting corridors among increasingly fragmented natural areas, to reconnecting people with an almost-vanished historical landscape, native ROWs have few drawbacks. Aldo Leopold's (1972) recommendation "…to keep every cog and wheel is the first precaution of intelligent tinkering" is excellent advice. Especially with regard to ROW prairies, preserving some of the last cogs of a once vast natural grassland is essential to the future of many local and regional populations of native prairie species.

A greater appreciation of the value of native species surviving in our prairie ROWs, combined with systematic inventories before they all disappear, will ensure that this vital part of our

prairie heritage remains for future generations. Appropriate provincial and municipal legislation, sufficient public and private funding, education plus media awareness of the importance of prairie ROWs also is crucial. Even more importantly, these representative 'transects' of the original prairies, which often long have disappeared from much of western Canada, can form the basis of local seed collections that can help restore vanished prairie habitats. The irreplaceable genetic stock of thousands of years of adaptation to one of the world's most extreme, yet most productive, biological systems should not be taken for granted. ROW prairies can help connect us with our past, while opening many exciting conservation and economic options for the future (Fig. 17).

Happy planting!!

Fig. 17. Rare native purple coneflowers (*Echinacea angustifolia*) struggle to compete with non-native smooth brome (*Bromus inermis*), Kentucky bluegrass (*Poa pratensis*), and sweet clover (*Melilotus* sp.) along a section road right-of-way in southwestern Manitoba's mixed-grass prairie region. Photo by John P. Morgan

Literature Cited

Arnebeck R (1997) How to develop and implement an integrated roadside vegetation management program. The National Roadside Vegetation Management Association Task Force, Newark, DE. Available at http://www.dot.state.mn.us/roadsides/vegetation/pdf/irvm_howto.pdf

Bennett AF (1991) Roads, roadsides and wildlife conservation: a review. In: Saunders DA, Hobbs RJ (eds) Nature Conservation 2: the role of corridors. Surrey Beatty & Sons, Chipping Norton, p 99–117

Bolin KE (2003) A guide to Minnesota's Prairie Passage Route and sites. Available at https://www.environment.fhwa.dot.gov/ecosystems/greenerroadsides/gr_summer03p5.asp

Borowske JE, Heitlinger, ME (1981) Survey of native prairie on railroad rights-of-way in Minnesota. Transportation Research Records 822:5–13

Brandt J, Henderson K, Uthe J, Urice M (2015) Integrated Roadside Vegetation Management Technical Manual (2015). Faculty Book Gallery. Book 116. Available at http://scholarworks.uni.edu/facbook/116

Collicutt DR, Morgan JP (2012) Developing Predictive Models for Tallgrass Prairie Plant Species at Risk in Manitoba. Available at http://www.naturenorth.com/fall/PM/Predictive_Modeling.html

Eddy TA (1992) The role of prairie road borders as refugia for herbaceous plants in the central Flint Hills grazing region of Kansas. In: Smith D, Jacobs CA (eds) Proceedings of the Twelfth North American Prairie Conference. University of Northern Iowa, Cedar Falls, IA, p 161–163

Harper-Lore BL, Wilson M (1999) Roadside Use of Native Plants. Island Press, Washington, DC

Herriot T (2014) The Road is How. HarperCollins Publishers, Toronto, ON

Hopwood JL (2008) The contribution of roadside grassland restoration to native bee conservation. Biological Conservation 141:2632–2640

Jacobsen RL, Albrecht NJ, Bolin KE (1992) Wildflower routes: benefits of a management program for Minnesota right-of-way prairies. In: Smith D, Jacobs CA (eds) Proceedings of the Twelfth North American Prairie Conference: recapturing a vanishing heritage, held 5-9 August 1990, Cedar Falls, Iowa. University of Northern Iowa, Cedar Falls, IA, p 153–158

Joyce J, Morgan JP (1989) Manitoba's tall-grass prairie conservation project. In: Bragg TB, Stubbendieck J (eds) Proceedings of the Eleventh North American Prairie Conference. University of Nebraska Printing, Lincoln, NE, p 71–74. Available at http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1032&context=napcproceedings

Leopold LB (ed) (1972) Round River – From the Journals of Aldo Leopold. Oxford University Press, London

Madson J (1982) Where the Sky Began - Land of the Tallgrass Prairie. Houghton Mifflin Company, Boston, MA

Ries L, Debinski DM, Wieland ML (2001) Conservation value of roadside prairie restoration to butterfly communities. Conservation Biology *15*:401–411

Vermeulen HJW (1993) The composition of the carabid fauna on poor sandy roadside verges in relation to comparable open areas. Biodiversity and Conservation 2:331–350

ALBERTA PRAIRIE CONSERVATION ACTION PLAN 2016–2020: STRATEGIES AND OUTCOMES FOR FUTURE PRAIRIE CONSERVATION INITIATIVES

KAREN RAVEN[1], KATHERYN TAYLOR[2], IAN DYSON[3], NOLAN BALL[4]

[1]Alberta Agriculture and Forestry, 3rd Fl. JG O'Donoghue Building, 7000 - 113 Street Edmonton, AB T6H 5T6, Canada

[2]Alberta Prairie Conservation Forum, c/o Alberta Environment Southern Region, 2nd Floor, Provincial Building, 200 - 5th Avenue South, Lethbridge, AB T1J 4L1, Canada. Email: info@albertapcf.org

[3]Alberta Environment and Parks

[4]Special Areas Board, Hanna District Office, 212 – 2nd Ave. West, Box 820, Hanna, AB T0J1P0, Canada

Abstract: The 2016–2020 Prairie Conservation Action Plan (PCAP) is the 6th conservation plan developed in Alberta and builds on accomplishments of past action plans and highlights our key strategies, outcomes, and approaches for our future work to support prairie conservation in Alberta. This presentation showcases our past accomplishments in completing inventories and assessments, sharing of knowledge, and promoting stewardship. We discuss our collaborative approach to develop the 2016–2020 action plan through engagement and workshops with our membership and through information from reports we helped initiate and fund to help guide our strategic direction. Finally, we discuss our three primary strategies to achieve our targeted outcomes of maintaining large native prairie and parkland landscapes, conserving connecting corridors for biodiversity, and protecting isolated native habitats, as well as the approaches we have chosen to achieve those outcomes.

MATTHEIS RANCH - A CONSERVATION TRIUMPH

JERRY BRUNEN[1], EDWARD BORK[2]

[1]Executive Director, Western Sky Land Trust, The City of Calgary, Water Resources, Mail Code # 64, PO Box 2100, Stn. M, Calgary, AB T2P 2M5, Canada. Email: jbrunen@westernskylandtrust.ca

[2]University of Alberta, 4-10E Agriculture/Forestry Ctr, Edmonton, AB T6G 2P5, Canada

Abstract: Western Sky Land Trust and the University of Alberta recently completed one of Alberta's largest ever conservation easements. Here we provide an overview of how this partnership guarantees that the Mattheis Ranch, a 5,000-ha research facility and working ranch in the Mixedgrass Prairie Natural Subregion of southeastern Alberta, will be conserved forever, and how it has provided funding for an endowment that will strengthen the University of Alberta's Faculty of Agricultural, Life and Environmental Sciences legacy in supporting prairie agriculture, ecological research, and education. Western Sky is a conservation organization in southern Alberta that is focused on lands with strong watershed values.

Native grasslands comprise an important component of ecosystems across western Canada, but are declining markedly due to disturbances such as urban-industrial sprawl and agricultural intensification. The Mattheis Ranch is located on the western edge of the dry mixed-grass prairie, and offers diverse and unique habitats for many prairie Species at Risk, together with a wide range of other flora and fauna. Early surveys of avifauna documented more than 100 bird species within its boundaries. The Ranch also contains diverse landforms, including floodplains, coulees, rolling sand dunes, loamy prairie, riparian areas, and an extensive network of wetlands. Notably, this vibrant diversity of vegetation and fauna is supported while accommodating land uses such as cattle production and energy extraction. Located in the County of Newell and the Eastern Irrigation District, the Mattheis Ranch represents a 'living laboratory' that is pivotal in supporting the mandates of the Rangeland Research Institute (RRI) and Western Sky.

The RRI was established in 2012 following the donation of the Mattheis Ranch to the University of Alberta by Edwin and Ruth Mattheis. Today, the RRI provides unprecedented research and teaching opportunities, and a forum for public outreach, collectively in support of increasing the environmental and economic sustainability of Alberta's rangelands. Current research activities at the Ranch are wide-ranging, and include a major focus on environmental goods and services (EG & S), which represent critical ecosystem services of benefit to all Canadians. Examples of EG & S derived from grasslands include food production, the provision of wildlife habitat, biodiversity conservation, water purification

and flood mitigation, pollination, and carbon storage. While research in progress at the Mattheis Ranch includes traditional studies on forage agronomy and cattle production, many studies are quantifying EG & S in an effort to initiate policy changes to reward landowners for maintaining them. Additional ongoing studies are examining grassland responses to industrial disturbance, with the aim of developing beneficial practices that minimize future impacts.

The Mattheis Ranch has become a focal point for many investigators. In 2014, 22 research projects were underway on the property, with 71 staff spending time on the Ranch, including 15 graduate students, 14 undergraduates, and many primary investigators, post-doctoral fellows, and visiting scientists. The Ranch has also hosted many undergraduate classes, together with public workshops and field tours. The University of Alberta recently celebrated its Centennial at the Ranch with over 150 guests.

Placement of a conservation easement on the Mattheis Ranch provides added protection for this landscape in three key ways: (1) ensuring that these grasslands remain immune from future sub-division and fragmentation, (2) protecting native grasslands from conversion into cropland, and (3) ensuring the long-term presence of natural wetlands.

A unique and special aspect to this agreement is that Western Sky acquired the conservation easement from the University of Alberta for $3.8 million, using funds provided by the Province of Alberta's Land Trust Grant Program. The University, in turn, established and then placed those funds into a long-term endowment that directly promotes research, teaching, and outreach at Mattheis Ranch. The endowment has grown to more than $4 million, and is expected to grow further, providing long-term security for the Mattheis Ranch in meeting its obligations as a centre for conservation, discovery, and learning. This remains particularly important for investigations involving long-term questions such as climate change.

Mattheis Ranch represents a hallmark in how an academic institution and a conservation organization can both conserve a large and biologically rich landscape and promote the sustainable stewardship and management of Alberta grasslands. It is a unique and innovative partnership generating a lasting legacy that is sure to promote the conservation of mixed-grass prairie and ranching as a way of life for decades to come.

FOCUSING ON NATIVE PRAIRIE MANAGEMENT AS A WAY OF PRESERVING HABITAT FOR MULTIPLE SPECIES AT RISK

KRISTA CONNICK TODD

South of the Divide Conservation Action Program Inc. Email: Krista.connicktodd@gmail.com

Abstract: A significant proportion of the Species at Risk in Saskatchewan live on native prairie. Developing a program to manage for multiple Species at Risk has been difficult in the past, given the variety of specific habitat needs of individual species. One solution for managing multiple species on a working landscape is to simply focus on range health and proper rangeland management. Focusing on range health, rather than individual species' needs, and providing hands-on methods for determining health, can make Species at Risk habitat management a part of the everyday decision-making process of Saskatchewan ranchers. Ranch planning, looking at the operation as a whole, can help identify the mosaic of habitats available and reinforce the importance of different habitats and how they overlap. Education on the specific habitat needs of a variety of species, as well as range health fundamentals and health monitoring protocols, is key.

A Novel Grassland Condition Assessment Methodology that Integrates Biodiversity Management

JORDAN BECKER, CARY HAMEL, REBEKAH NEUFELD, JULIE PELC

Nature Conservancy of Canada – Manitoba Region, 200-611 Corydon Avenue, Winnipeg, MB R3L 0P3, Canada. Email: manitoba@natureconservancy.ca

Abstract: The Nature Conservancy of Canada (NCC) manages more than 6,475 ha of grassland in Manitoba. Grasslands vary topographically and hydrologically and include several distinct types (e.g., tall-grass prairie, sandhill prairie, and perennial non-native grassland). Property-scale conservation planning elucidates biodiversity-linked goals for individual grassland tracts, and management approaches are prescribed to achieve these goals. Grasslands are managed via diverse management regimes depending on proximate and anticipated threats and the desired future condition. The desired condition is linked to conservation-based outcomes, including maintenance or recovery of individual species or suites of species, and ecosystem services such as erosion control and pollination.

We developed a novel approach to evaluating grassland condition in a manner informative of the effectiveness of management at achieving site-specific, biodiversity-linked goals. Our approach includes the incorporation of effects of land use on community composition, habitat heterogeneity, and faunal habitat potential and consideration of grassland contribution to achievement of biodiversity conservation goals. A rapid, in-field grassland condition assessment methodology, examples of in-field assessments, and lessons learned through two years of implementation are presented.

THE NATURE CONSERVANCY OF CANADA – CONSERVING NATIVE HABITAT THROUGH SCIENCE AND PLANNING

MATTHEW BRAUN, JENNIFER MCKILLOP

Nature Conservancy of Canada – Saskatchewan Region, 1777 Victoria Ave Suite 700, Regina, SK S4P 4K5, Canada. Email: Matthew.Braun@natureconservancy.ca

Abstract: The Nature Conservancy of Canada (NCC) conserves and manages land while offering conservation programming across the country with the goal of conserving our natural heritage. The Saskatchewan Region of NCC works in a diversity of ecosystems, from sage-grouse habitat in the south to black bear habitat on the edge of the boreal forest, and has secured over 30,000 acres of fee simple and 100,000 acres of conservation agreements in Saskatchewan as well as implementing programs aimed at education, awareness, and management practices. Using science-based methods, NCC creates adaptive management plans designed to mimic ecosystem processes and disturbances. This requires regular effectiveness monitoring to inform and update management, which generates expertise used in collaboration with partner agencies and fellow land managers. NCC land managers create management plans specific to each property, implement required actions, monitor the results of that management, share those results with the Saskatchewan Conservation Data Centre and others, and advise individuals and groups working in similar areas. Provincial-scale strategies include developing a species at risk curriculum with a First Nations focus, participating in a western Canada prescribed burn group, encouraging research on fee simple properties, and participating in the development of regional land management policy.

RARE PLANT RESCUE GOES DORMANT IN 2015: A SUMMARY OF PROGRAM ACHIEVEMENTS

MELISSA RANALLI

Nature Saskatchewan, 1860 Lorne St, Regina, SK S4P 2L7, Canada. Email: mranalli@naturesask.ca

Abstract: From 2002 to early 2015, Nature Saskatchewan's Rare Plant Rescue (RPR) program worked with rural landowners and land managers to conserve plant Species at Risk and their prairie habitats in southern Saskatchewan, including some of the most pristine native parcels in the province. During this time, RPR worked with 80 program participants, supporting their voluntary conservation of over 100,000 acres of native prairie habitat. RPR provided information and assistance to these landowners and land managers, and made a genuine effort to cultivate respectful, trusting relationships while encouraging their commitment to Species at Risk habitat conservation, e.g., through voluntary stewardship agreements. RPR's field searches for new occurrences and monitoring of known populations led to the downlisting of federally-listed plant Species at Sisk and the expansion of species' distributions. RPR also collaborated with partner organizations on a number of Species at Risk projects, among other important contributions to rare plant conservation. Unfortunately, RPR's important contributions will cease as the program is put on hold in 2015–2016 due to a major funding cut. Highlighted here are some of RPR's major accomplishments over its 13 years, and why it is still very much needed.

The RPR program's main objectives were: (1) habitat stewardship; (2) plant Species at Risk site identification; (3) population monitoring; and (4) increasing education and awareness of Saskatchewan's plant Species at Risk. Program activities focused on eight plant species protected in Saskatchewan both provincially and federally as threatened, endangered, or extirpated: small white lady's-slipper (*Cypripedium candidum*), hairy prairie-clover (*Dalea villosa* var. *villosa*), small-flowered sand-verbena (*Tripterocalyx micranthus*), tiny cryptanthe (*Cryptantha minima*), western spiderwort (*Tradescantia occidentalis* var. *occidentalis*), buffalograss (*Bouteloua dactyloides*), slender mouse-ear-cress (*Transberingia bursifolia* ssp. *virgata*), and smooth goosefoot (*Chenopodium subglabrum*), as well as one species designated as special concern, viz. dwarf woollyheads (*Psilocarphus brevissimus* var. *brevissimus*).

Through surveying (i.e., plant Species at Risk site identification) and monitoring work, RPR has made significant data contributions; these data are available to the public and to government agencies. Some important contributions include:

(1) The discovery of slender mouse-ear-cress north of Moose Jaw (in 2010), which expanded the known distribution of this species ~90 km southeast (Sarah Lee, Environment Canada, pers. comm.);

(2) Contributing to the downlisting of buffalograss and hairy prairie-clover (both downlisted to Special Concern by COSEWIC; S. Lee, pers. comm.);

(3) Re-confirming historical locations of smooth goosefoot and dwarf woollyheads, which is very important for recovery planning purposes (e.g., unconfirmed historical occurrences would not have been included in smooth goosefoot critical habitat identification; S. Lee, pers. comm.);

(4) RPR data being used in four federal recovery documents - the Western Spiderwort Recovery Strategy (2013), Smooth Goosefoot Recovery Strategy (2015), Hairy Prairie-clover Recovery Strategy (which will be written in the next year), and the Dwarf Woollyheads Management Plan (2016; S. Lee, pers. comm.);

(5) RPR occurrences representing ~15% of Environment Canada's rare plant occurrence data for Saskatchewan (S. Lee, pers. comm.); and

(6) The Species at Risk locational data that Nature Saskatchewan's Stewards of Saskatchewan programs provided to the Saskatchewan Conservation Data Centre (SK CDC) from 2010 to 2014, representing an average of 7.2% of the element occurrences added to the SK CDC's database, with RPR occurrence data representing the bulk of these occurrences (Bryshun et al., unpublished data).

RPR has also worked with a number of partner organizations on Species at Risk projects. Two of the more recent initiatives that RPR has contributed to include the SK CDC's Botanical Assessment Working Group (BAWG) and the Native Plant Society of Saskatchewan (NPSS)'s Rare Plants and Ranchers project.

RPR has participated in the BAWG working group since its initiation. This group serves to reassess the outdated sub-national rankings of plant species in Saskatchewan, and to assess plant species that have not previously been assigned a ranking. Between 2011 and 2015, the RPR Coordinator contributed to the re-assessment of 87 species, including six RPR target species.

In 2012, the NPSS launched the Rare Plants and Ranchers project, working with RPR stewards to create site-specific management plans for the plant Species at Risk on their land. Through these plans and access to match funding to implement suggestions, this project aims to improve plant Species at Risk habitat, reduce threats, and build upon past search and monitoring activities. Between 2012 and 2015, RPR recruited 19 interested RPR participants/contacts with plant Species at Risk on their land for this project, and conducted monitoring of rare plant populations on participants' land to determine the effects of recommendations on Species at Risk and their habitat.

Since its initiation, RPR has striven to increase awareness among producers and rural and urban populations about Saskatchewan's plant Species at Risk. While RPR has made extensive progress towards this goal, feedback from a 2013–2014 survey of program participants has highlighted that there is still much work to be done.

NOTE: Laurie Johnson, a past RPR Coordinator, was awarded the Young Professional Stewardship Grant in 2013. Laurie no longer works for Nature Saskatchewan, but this poster was created on her behalf (as one of the grant stipulations).

ASSESSING THREATS AND SETTING PRIORITIES FOR CONSERVATION OF PLANT SPECIES AT RISK IN SASKATCHEWAN

VLADIMIR KRICSFALUSY[1], NICOLAS TREVISAN[2]

[1]School of Environment and Sustainability, University of Saskatchewan, Saskatoon, SK S7N 5C8, Canada. Email: vladimir.k@usask.ca

[2]Urban Forestry, City of Toronto, ON

Abstract: Through the assembly of rare and endangered species lists, decision-makers can allot recovery resources, plan reserve systems, restrict development and exploitation, and report on the state of biodiversity. Because the conservation of biodiversity occurs under time and resource constraints, it is necessary to prioritize species most deserving of attention. By using a few meaningful criteria and data from the W.P. Fraser Herbarium at the University of Saskatchewan (SASK), we developed a priority-setting approach (Kricsfalusy & Trevisan 2014) based on rather limited resources available in contrast to complex multi-criteria methods that have become the norm in nature conservation. The collected data were quantified to develop priority scores using three key criteria: (1) provincial responsibility in species survival, (2) species local population characteristics, and (3) the anthropogenic threats causing species to be rare. The produced list of rare and endangered vascular plants in Saskatchewan is a first step in identifying species deserving of priority attention. The method was deemed to be highly relevant to conservation managers and decision makers due to its scale adaptability and fairly minimal resource requirements.

Literature Cited

Kricsfalusy V, Trevisan N (2014) Prioritizing regionally rare plant species for conservation using herbarium data. Biodiversity and Conservation 23:39–61

THE CONSERVATION STANDARDS PROGRAM: ENVIRONMENTAL DATA IS OUR CURRENCY

K. SCALISE, E. BEVERIDGE

Fish and Wildlife Branch, Ministry of Environment, 4th Floor, 3211 Albert Street, Regina, SK S4S 5W6, Canada. Email: ENV.researchpermit@gov.sk.ca

Abstract: We provide an overview of the Saskatchewan Ministry of Environment's Conservation Standards Program (CSP). The aim of the CSP is to ensure high-quality data submissions on all species, especially those considered to be rare and sensitive. Under the CSP, a recent legislative amendment provides the province with the authority to set standards regarding activities regulated through Research Permits, which are typically issued to researchers and to industry/environmental consultants. Researchers will be required to submit information on species in standardized formats. Industry/environmental consultants will now be required to adhere to requirements regarding the use of standardized Species Detection Survey Protocols and Data Submission Templates. Personnel conducting species detection surveys will be phased into the Ministry's Qualified Persons Registry under qualification standards. These requirements will result in a significant increase in the quality and quantity of data on rare and sensitive species into the Saskatchewan Conservation Data Centre that can be used to inform Ministry approvals and planning.

For more information, visit: http://www.environment.gov.sk.ca/Default.aspx?DN=01006852-b481-4dd8-9941-732c2128c7e0

THEME 3: RESTORATION AND RECOVERY

CONCURRENT SESSION 7 – Recovery Strategies I

EVALUATING THE USE OF MODIFIED FENCE SITES BY PRONGHORN IN ALBERTA

PAUL F. JONES[1], BLAIR SEWARD[1], ANDREW JAKES[2], BRIAN MARTIN[3], MARK HEBBLEWHITE[2]

[1]Alberta Conservation Association, #400, 817 4th Avenue S., Lethbridge, AB T1J 0P3, Canada. Email: paul.jones@ab-conservation.com

[2]Wildlife Biology Program, Department of Ecosystem and Conservation Sciences, College of Forestry and Conservation, University of Montana, Missoula, MT 59812, USA

[3]The Nature Conservancy, 32 S. Ewing, Suite 215, Helena, MT 59601, USA

Abstract: Pronghorn (*Antilocapra americana*) prefer to cross under the bottom wire of a fence rather than jump over. If the bottom wire is too low, the fence becomes a barrier and restricts pronghorn movements. A number of modification techniques have been recommended by wildlife management agencies to facilitate the movement of pronghorn under fences, but few have been critically evaluated. We tested whether pronghorn will use modified fence sites, monitored with trail cameras, using a before-after-control-impact study design. We tested the use of goat-bars (winter 2012–2013) and clip sites (winter 2013–2014) to determine whether they truly do allow for easier passage by pronghorn. We tested whether the magnitude in change of successful crossings (mean successful crossings per day after modification / mean successful crossings per day before modification) was significantly different between modified sites and control sites using an *F*-test. We had two types of modified sites, viz. those where the goat-bar or clips were installed and those where the bottom wire at known crossing sites was lowered. We also had two sets of controls where nothing was done to the site between the before and after period: (1) a fence section near the modification site and (2) at known crossing locations where the wire was not lowered (winter 2013–2014 only). We did not see a significant increase in the use of sites modified for pronghorn for either modification technique. We discuss our interpretation of the results and implications for both techniques to facilitate movement by pronghorn.

PRAIRIE DOGS, PARTNERSHIPS, AND PLAGUE: STRIVING FOR THE RECOVERY OF BLACK-FOOTED FERRETS (*MUSTELA NIGRIPES*)

H. FACETTE[1], A. MOEHRENSCHLAGER[2], **T. STEPHENS**[2]

[1]Grasslands National Park, Parks Canada Agency, Val Marie, SK S0N 2T0, Canada. Email: heather.facette@pc.gc.ca

[2]Calgary Zoological Society, Centre for Conservation Research, 1300 Zoo Rd NE, Calgary, AB T2E 7V6, Canada

Abstract: Grasslands National Park and the surrounding area in southwestern Saskatchewan are home to the northern-most population of black-tailed prairie dogs (*Cynomys ludovicianus*) and the only prairie dog population in Canada. This area was also once home to the black-footed ferret (*Mustela nigripes*), one of North America's most endangered species. This specialist predator of prairie dogs is an integral component of this grassland ecosystem, as these two species have evolved together for millennia. With the generous support and collaborative efforts of many partners, Grasslands National Park became the 19th reintroduction site of the ferret recovery effort in 2009. We report on the past six years of this Canadian recovery effort, including its successes (e.g., second generation of wildborn kits), initial challenges (e.g., public support) and how these were overcome, and the factors that led to a collaborative decision in 2012 to temporarily halt ferret releases. Ferret recovery is a long-term commitment that depends on continued collaborations. With the recent confirmation of sylvatic plague (caused by the Gram-negative coccobacillus *Yersinia pestis*) and fluctuations in prairie dog abundance, Parks Canada and the Calgary Zoo are working together to overcome these latest challenges to returning ferrets to Canada and restoring the prairie dog ecosystem.

USING STEPPING-STONES AND TRANSLOCATIONS TO INCREASE POPULATION VIABILITY OF THE ENDANGERED ORD'S KANGAROO RAT

LIA BRANDS

Department of Geography, University of Calgary, 2500 University Drive, Calgary, AB T2N 1N4, Canada. Email: liakbrands@gmail.com

Abstract: Habitat loss and fragmentation can have a negative effect on animals that have limited dispersal abilities, such as Ord's kangaroo rat (*Dipodomys ordii*). This nocturnal rodent lives in southern Alberta and Saskatchewan. It is endangered due to its small and drastically fluctuating population sizes, restricted distribution, and a decline in its natural habitat: actively eroding sand dunes.

My research focused on two conservation tools that have the potential to help stabilize the Alberta kangaroo rat population: stepping stones and translocations. Using mark–recapture data, I assessed the dispersal ability of kangaroo rats in Alberta. I discovered that the distance between habitat patches likely exceeds the dispersal ability of most kangaroo rats. Habitat manipulation, such as the creation of stepping stone habitat patches, can benefit dispersal by decreasing inter-dune distances. I determined a number of potential stepping stone locations that could restore connectivity between isolated habitat patches in a sub-section of the species' range, and I prioritized them based on their contribution to the overall dune network functional connectivity. Restoring habitat in these prioritized areas can help facilitate natural dispersal.

I also evaluated whether translocations could be used in place of natural dispersal to increase rescue and recolonization of isolated habitats. I conducted experimental translocations by releasing kangaroo rats into artificially constructed burrows. The duration of site occupancy was used as an indicator of success. I determined that translocations could result in successful establishment, with evidence of occupancy occurring in seven of the 16 translocations performed.

My findings indicate that together, habitat management and purposeful, informed translocations have the potential to facilitate dispersal, thereby rescuing populations that are in decline, recolonizing habitats from which the species has become extirpated, and ultimately increasing the viability of the kangaroo rat population in Alberta.

AMPHIBIANS ON THE MOVE: TRANSLOCATION AS A MITIGATION STRATEGY

JESSICA A. MARTINO

Canada North Environmental Services, 211 Wheeler Street, Saskatoon, SK S7P 0A4, Canada.
Email: jessica.martino@cannorth.com

Abstract: Amphibians are declining worldwide; populations on the Prairies are no exception. Loss of habitat via in-fill or wetland drainage due to agriculture and development is a contributing factor to these declines. When it comes to habitat loss and fragmentation, amphibians are more vulnerable than other taxa due to their biology – they have complicated multi-stage life cycles requiring a variety of habitats. Thus, habitat loss in both aquatic and upland habitat may cause population declines and even local extinctions. Additionally, fragmentation may impede dispersal and migration and ultimately limit gene flow. To mitigate the loss of individuals, translocation (i.e., the capture and movement of individuals off site) has become an increasingly common technique and is currently the main strategy used to reduce mortality on projects sites. However, translocation is not without controversy; there are risks associated with this practice, such as potential injury or mortality during capture/translocation, unknowns about habitat suitability at relocation sites, maintaining connectivity to appropriate habitats and other populations, and disease transmission. Despite these risks, translocation remains an important technique for amphibian conservation in the Prairies. Implementation of standardized protocols based on the best available research, as well as post-translocation monitoring, would be highly beneficial.

DESIGNING AND IMPLEMENTING A CANADIAN TOAD TRANSLOCATION PROGRAM FOR BHP BILLITON'S JANSEN POTASH PROJECT

COLE KIRKHAM[1], **ROBYN POLLOCK**[1], L. BOL[2], HOLLY HEFFNER[3], ANTHONY LAMBERT[3]

[1]ERM Consultants Canada Ltd. (ERM), 113-116 Research Drive, Saskatoon, SK S7N 3R3, Canada. Emails: cole.kirkham@erm.com, robyn.pollock@erm.com

[2]ERM Consultants Canada Ltd. (ERM), 1111 West Hastings Street, Vancouver, BC V6E 2J3, Canada

[3]BHP Billiton Canada Inc., 130-3rd Ave South, Saskatoon, SK S7K 1L3, Canada

Abstract. In Saskatchewan, the Canadian toad (*Anaxyrus hemiophrys*) is considered a sensitive species with activity restriction guidelines that aim to protect and conserve the provincial population. As part of the environmental assessment process for the Jansen Potash Project, BHP Billiton committed to translocation of Canadian toads as a mitigation measure where direct disturbance to wetlands could not be avoided during project development. In 2012, tadpoles (n = 21), toadlets (n = 204), and adults (n = 45) were collected, marked (adults only), and translocated to five suitable wetlands outside the development area. During two years of post-translocation monitoring, Canadian toads were detected in two translocation wetlands, including a marked adult and tadpoles, and in two nearby wetlands not previously found occupied. The program was successful in confirming multi-year survival of a translocated individual, observing post-translocation breeding activity within a targeted area, and detecting evidence of successful breeding (tadpoles) in a translocation wetland. Although it involved a small sample size and only a measure of short-term success, our monitoring suggests that Canadian toad translocation may have the potential to be a successful mitigation or conservation tool. We describe the detection and translocation methods, interpret the success of the program, and discuss key learnings for future translocation efforts.

REDEFINING GREATER SAGE-GROUSE KNOWLEDGE TO AID THE PROTECTION, CONSERVATION, AND RECOVERY OF A HIGHLY ENDANGERED SPECIES

KRISTA L. BIRD

Tannas Conservation Services Ltd., Box 31, Cremona, AB T0M 0R0, Canada. Email: k.bird@esrseeds.com

Abstract: Greater sage-grouse (*Centrocercus urophasianus*) have been intensively studied for over 40 years, but many important features of their biology have been left unanswered due to limitations of conventional ecological methods. Genetics has the ability to unearth cryptic behaviours, family structure, and dispersal, all of which contribute to and refine our knowledge of the species and help manage their recovery. The objective of this research was to use sage-grouse to examine basic population dynamics using genetics on 2519 individuals from Alberta, Saskatchewan, Montana, and Wyoming. I found high genetic diversity, low differentiation, and long-distance dispersal despite natural and anthropogenic fragmentation, peripheral and marginal habitat, and declining numbers. At the lek level, I found hybridization, intraspecific nest parasitism, multiple paternity, a high percentage of the male population breeding, low levels of male kinship, and little inbreeding. All of these findings contradict conventional sage-grouse knowledge and lekking theory, which drive current conservation practices. Understanding population genetics and behaviour, and identifying habitat and habitat corridors, are essential to effectively manage sage-grouse recovery in Canada.

POST-RELEASE MOVEMENTS AND HABITAT SELECTION OF TRANSLOCATED GREATER SAGE-GROUSE IN SE ALBERTA

KAYLA BALDERSON BURAK[1], MARK BRIGHAM[1], GAVIN SIMPSON[1], STEPHEN DAVIS[2], JOEL NICHOLSON[3]

[1]Department of Biology, University of Regina, 3737 Wascana Parkway, Regina, SK S4S0A2, Canada. Email: balderka@uregina.ca

[2]Environment Canada, Canadian Wildlife Service, 300-2365 Albert Street, Regina, SK S4P 4K1, Canada

[3]Alberta Environment and Parks, 301 346 3rd Street SE, Medicine Hat, AB T1A 0G7, Canada

Abstract: The current greater sage-grouse (*Centrocercus urophasianus*) population in Alberta is estimated to be only 2.1% of that in 1968. As a result of this decline, an international translocation agreement was undertaken between Alberta Environment and Parks and Montana Fish, Wildlife and Parks. During the 2011–2012 breeding seasons, 41 sage-grouse were translocated from healthy populations in Montana and released onto active leks in southeast Alberta. We used a generalized additive model to analyze the post-release movements of nesting and non-nesting hens in 2012. We found that hens that did not initiate nests (n = 9) had significantly higher post-release movement rates than those that initiated nests (n = 11) and took eight weeks to acclimate to the area. Inhomogeneous Poisson point process modeling was used to analyze movements of translocated sage-grouse relative to anthropogenic and natural features. The models indicate that translocated sage-grouse are less likely to be found closer to all anthropogenic features that were included in the models. Management recommendations which stem from this work include adoption of methods to increase the probability of hens being inseminated prior to translocation to increase the likelihood of nesting. In addition, this work provides incentive for removing anthropogenic features from key nesting habitat.

REALLY BIG BIRD HOUSES: PLATFORMS FOR FERRUGINOUS HAWKS

JANET W. NG[1], ERIN M. BAYNE[1], TROY I. WELLICOME[1,2]

[1]Department of Biological Sciences, University of Alberta, Edmonton, AB T6G 2E9, Canada. Email: janet.ng@ualberta.ca

[2]Canadian Wildlife Service, Environment Canada, Edmonton, AB T6B 2X3, Canada

Abstract: Ferruginous hawks (*Buteo regalis*) naturally nest in trees, on the ground, on cliff sides, and more recently, on man-made structures such as artificial nest platforms. In recent decades, wildlife managers, landowners, and other stakeholders have used artificial nest platforms to increase nest availability for hawks. However, despite widespread use, platform nests are rarely evaluated to determine whether they provide a benefit to ferruginous hawks. Our research: (1) evaluates whether platforms are a valuable management tool for this Species at Risk, (2) identifies scenarios where installation of a platform may be beneficial for the species, and (3) determines which landscapes may be suitable for a new platform. From 2010 to 2014, we monitored nest success (n = 1,200 nest attempts) and nest reoccupancy (n = 649 unique nests) of ferruginous hawks nesting in trees and platforms in Alberta and Saskatchewan. We then developed several habitat models to predict habitat suitability for ferruginous hawk home range selection and nest density. We summarize our results as recommendations for beneficial management practices for ferruginous hawk artificial nest platforms.

MITIGATING IMPACTS TO WETLANDS: AS EASY AS WATER OFF A DUCK'S BACK?

JENNIFER L. LEBLANC

Canada North Environmental Services, 211 Wheeler Street, Saskatoon, SK S7P 0A4, Canada.
Email: jennifer.leblanc@cannorth.com

Abstract: That wetlands have ecological value is well accepted, and it is generally agreed that it is desirable to conserve such habitats and the ecosystem services they provide. In the Prairie Pothole Region, wetlands are impacted by agriculture, infrastructure, and industry development. Federal and provincial regulations and guidelines are in place across Canada and elsewhere to avoid, minimize, and offset impacts. However, across the Prairie Provinces, these regulations are at different stages of development, and are enforced to different degrees. There are many ways by which detrimental effects can be avoided, and avoidance is preferred over other mitigation measures; however, in some instances, negative impact is unavoidable. In addition to avoidance and minimization actions, proponents may be required (or may voluntarily opt) to offset residual wetland impact by creating, restoring, or enhancing other 'replacement' wetlands. Regardless of the compensatory mitigation (or offset) measures to be implemented, the first step is identifying wetland area and function. Not all wetlands are created equal, either in form or ecological function. The extent of impact is also not always visible – factors such as sedimentation, pollutant runoff, or disturbance may be less evident than obvious physical impacts such as infilling. Thus, although guidelines are in place or in development in the Prairie Provinces to help inform and standardize the mitigation process, estimating impact to wetlands is not as straightforward as it may seem. I discuss approaches and challenges to estimating unavoidable development impacts.

SAMPLING METHODOLOGY TO SUPPORT REGULATORY APPLICATION AND IMPROVE OPERATIONAL PERFORMANCE

RON SPARROW

Trace Associates Inc., Lincoln Park Centre, Suite No. 300, 37 Richard Way SW, Calgary, AB T3E 7M8, Canada. Email: rsparrow@traceassociates.ca

Abstract: Trace Associates Inc. (Trace) has worked with a mining client in the grassland natural region of Alberta to develop and implement a Reclamation Assessment Protocol. The purpose of the assessment protocol was to provide an overall approach for assessment of reclaimed land (formerly a combination of native prairie and agricultural lands) that will consider stakeholder needs and meet regulatory requirements for closure and sign-off by regulators. The two main objectives for the assessment protocol were: (1) to develop site-specific, measureable targets that were agreed upon by regulators and supported by stakeholders, which may be applied to confirm that sites have met approval requirements; and (2) to assess the site and evaluate historical reclamation practices, and develop future best management practices. The assessment protocol was developed to provide statistical rigour based on assessment locations, key data collection parameters (vegetation, soils, and landscape), and plot size. Here I present the methodology used and the results obtained, and discuss enhancements to the process. Further discussion will include using the developed methodology in sync with new and evolving systems of remote sensing and vegetation inventories.

SOIL BIOENGINEERING FOR RIPARIAN RESTORATION

DAVID F. POLSTER

Polster Environmental Services Ltd., 6015 Mary Street, Duncan, BC V9L 2G5, Canada. Email: d.polster@telus.net

Abstract: Degradation of riparian areas can be traced to a wide variety of causes, from urban developments to industrial activities, including farming. Soil bioengineering, where living plant materials are used to perform some engineering function, can be an effective tool in reclaiming damaged riparian areas. Soil bioengineering can be used to treat unstable banks where modified flow regimes or riparian clearing has caused accelerated erosion. It can also be used to treat sites where excessive sediment deposition such as from placer mining has modified flow patterns. Soil bioengineering treatments can be used to trap sediments and to re-establish the functions of riparian vegetation, including increasing bank root densities and providing shade, organic matter, and insects for aquatic systems. Soil bioengineering treatments are well adapted to implementation by local stewardship groups and can provide an opportunity for low-cost riparian restoration. Here I explore the soil bioengineering techniques that can be used to treat degraded riparian areas. A variety of case studies from western Canada are presented.

Editor's note: *for the complete version of this paper, see*

Polster DF (2002) Soil bioengineering techniques for riparian restoration. Proceedings of the 26th Annual British Columbia Mine Reclamation Symposium, Dawson Creek, BC, p 230–239. Available at https://buyandsell.gc.ca/cds/public/2014/05/27/951dc2e4183bdf1be722c06c46554ca1/ABES.PROD.PW_NCS.B107.E10183.ATTA016.PDF

For a more recent version of the paper, which includes several photographs in addition to diagrams, see

Polster DF (2013) Soil bioengineering for site restoration. Northern Alberta Institute of Technology, Boreal Research Institute, Boreal Reclamation program. Available at http://www.nait.ca/docs/Soil_Bioengineering_for_Site_Restoration.pdf

PLANT COMMUNITY RESTORATION DURING BANK STABILIZATION PROJECTS IN SOUTHERN ALBERTA

STEVEN TANNAS

Tannas Conservation Services Ltd., Box 31, Cremona, AB T0M 0R0, Canada. Email: steven@tannasenvironmental.com

Abstract: After flooding in 2013, numerous bank stabilization projects were required in southern Alberta to protect critical infrastructure and prevent further shifts within water ways that could cause future damage. However, the historical methodology to protect banks of streams and rivers has been to harden them. In effect, this results in lost habitat for wildlife, plants, and fish. The use of bio-engineering, with other soft erosion-control techniques and the use of a diverse complement of native plants, can allow hardened features to become softened. Although bio-engineering has become popularized, it is typically applied inappropriately or as an afterthought to bank-stabilization projects. Within these nine projects, restoration has become the focus and is integrated into the engineering design from day one to ensure the long-term success of the ecosystem, not just the bank stabilization. These projects represent partnerships between professional agrologists and engineers that have resulted in unique designs for each location, taking into account the unique biology of each site and the needs of the environment surrounding the site. To date, close to 3 km of river banks have been stabilized, with the majority of the projects being fully self-compensating for fish habitat.

DROUGHTPROOFING

ROB GARDNER

Society of Grasslands Naturalists, Box 2491, Medicine Hat, AB T1A 8G8, Canada. Email: gardner@telusplanet.net

Abstract: Ranchers manage their cattle to stay within the carrying capacity of their grassland. If ephemeral streams were given the same consideration, many would soon become permanent, providing many stable sources of water for cattle. Droughtproofing ensures that rangeland has the maximum resilience in the face of water uncertainty. Using 'natural processes,' precipitation is retained for future benefits, both for the rancher and for wildlife. Remarkable improvement in both riparian health and range condition are illustrated. It should be noted that the term 'natural processes' here is code for 'beaver.'

Beaver (*Castor canadensis*) were widespread across the Canadian prairie prior to the fur trade in about 1800. Much of our riparian system still benefits from this past inhabitant. The re-introduction and support of beaver will enable substantial water to be retained on site, while improving the regional hydrology. Intermittent streams often become permanent, providing increased places for cattle to water while increasing the grazing capacity of the riparian area (Fig. 1).

Fig. 1. A chain of beaver ponds creates multiple watering sites for cattle, as well as a refuge for migrating birds. Photo by Rob Gardner

Beaver have many strengths: they work cheap, they do not need water licenses, and they are exempt from international treaties. They would be particularly beneficial in the roadless areas of grassland south of the Cypress Hills, and those parts of Alberta's Special Areas that drain into the Red Deer River.

Wildlife benefits are also substantial, with the vigorous riparian zone supporting uncommon species such as greater sage-grouse and long-eared owls (Fig. 2), as well as becoming refuges for grassland fish.

Fig. 2. Long-eared owl (*Asio otus*). Photo by Mark Schiebelbein

Beaver have been reintroduced to sites without woody vegetation by providing willow and aspen for the transplanted beaver to eat (Fig. 3).

Fig. 3. A beaver dam made entirely of cattails and mud. Cattail roots are widely known for their high nutrition. Beaver really can live almost anywhere, because they make their own habitat. Photo by Rob Gardner

When the dam is complete, the beaver are moved to a new site, or taken back to their original home. When willows are established along the pond, new beaver will soon colonize the site again.

Beaver have some shortcomings as well. They are ambitious and do not take direction well. Sometimes, their dams flood buildings, roads, or crops; however, these dams indicate the location of the natural floodplain. Structures being impacted by dams will likely be damaged by even moderate floods, so for long-term safety, they should be relocated to higher ground. If beaver are a problem, remove the beaver but leave the dam.

Stream valleys that are home to beaver invariably have more woody vegetation, a higher water table, and better grazing (Fig. 4) than nearby valleys without beaver. Allow beaver to increase your ranch's water security while supporting a more diverse natural ecosystem. Your cattle will thank you!

Fig. 4. Lush shrubbery growing in the mixed-grass prairie, courtesy of several beaver dams. Photo by Rob Gardner

REMARKABLE FORAGE CHARACTERISTICS AND GRAZING POTENTIAL OF PURPLE PRAIRIE CLOVER AND WHITE PRAIRIE CLOVER ON WESTERN CANADIAN GRASSLANDS

A.D. IWAASA[1], Y. WANG[2], E. BIRKEDAL[1], R. MURI[1], M. SCHELLENBERG[1], E. SOTTIE[1]

[1]Agriculture and Agri-Food Canada (AAFC) – Swift Current Research and Development Centre, PO Box 1030, Swift Current, SK S9H 3X2, Canada. Email: alan.iwaasa@agr.gc.ca

[2]AAFC – Lethbridge Research and Development Centre, 5403 – 1st Avenue South, PO Box 3000, Lethbridge, AB T1J 4B1, Canada

Abstract: Swift Current and Lethbridge Research Centres (Agriculture and Agri-Food Canada) have been evaluating the forage nutritional constituents, animal health, and grazing benefits of purple prairie clover (*Dalea purpurea* Vent.; 2001–2015) and white prairie clover (*Dalea candida* Michx. ex Willd; 2009–2015) over numerous years. Currently, a number of native prairie plant populations or ecological varieties have been released and are available in Canada and the United States for land reclamation and pasture/forage seeding. Purple and white prairie clovers are widely distributed throughout the south and central Prairies and Parklands in Canada and act as warm-season forbs, with much of their growth occurring during July and August. The clovers are tap-rooted, drought-resistant, nitrogen-fixing, and grow to a height of 30–55 cm. Here we outline the ongoing long-term research on these remarkable native forbs that contain some of the highest levels of extractable condensed tannins (flowering to seed set maturity stages: 85 to 150 g per kg dry matter) that have been identified in western Canada compared to other tame and native forbs, resulting in improved protein utilization and reduction in *E. coli* 0157:H7 activity in cattle. These prairie clovers have good nutritional constituents and forage characteristics, and grazing preference for the purple prairie clover is highest at both vegetative and flowering maturity stages, although it is still grazed at the full seed-set stage by cattle. Both clovers also attract a number of different insect pollinators and therefore improve plant and insect biodiversity. Thus, these clovers would be excellent additions to a pasture to improve the forage nutritional profile, extend the grazing season, provide environmental benefits, and increase animal and human health.

INVASION OF SASKATOON – AN INTEGRATED APPROACH FROM MEEWASIN'S RESOURCE MANAGEMENT

RENNY W. GRILZ, ERYN TOMLINSON

Meewasin Valley Authority, 402 Third Avenue South, Saskatoon, SK S7K 3G5, Canada. Email: rgrilz@meewasin.com

Abstract: Meewasin Valley Authority was created through the Meewasin Valley Act in 1979, which provides the authority to oversee conservation and development along the South Saskatchewan River valley within the Saskatoon region. Meewasin conserves and stewards the Meewasin Valley and several conservation sites to allow for passive recreation use and access for the public. Meewasin's Resource Management program has to be adaptive to deal with the unique pressures created by managing native prairie in an urban setting.

Meewasin's Resource Management program uses an integrated approach to management. Various approaches, tools, and techniques are used to enhance biodiversity, prevent habitat loss, and manage the effects of urban pressures on these natural sites. This integrated approach includes prescribed burning, conservation grazing, invasive species control, ecological restoration, site maintenance, ecological monitoring, and awareness. Meewasin also employs an integrated approach to invasive species management, by using conservation grazing and prescribed burning, physical and mechanical removal, biocontrols, and select herbicides. Awareness and education are also key to prevent the spread of invasive species and introduction of new ones.

In the late 1980s, the City of Saskatoon was in the final stages of developing the Silverspring neighbourhood in northeast Saskatoon. The area was unique, with several tracts of native fescue prairie remaining relatively intact. Local advocacy groups sought to protect a portion of this native prairie for future generations. In 1993, the Saskatoon Natural Grasslands (SNG) was created: a 13.8-ha fescue prairie/aspen parkland site. The site has been managed as an ecological reserve, an educational site for local school programs, and a naturalized park for local residents. In 1994, a detailed Resource Management Plan for the site was completed, including detailed vegetation analysis and site management recommendations.

After 10 years of managing the site, Meewasin undertook comparative vegetation monitoring to determine how the site was fairing since 1993. Monitoring indicated that the site had been shifting to a moister microsite, with an increase in shrub species including wolf

willow (*Elaeagnus commutata*) and western snowberry (*Symphoricarpos occidentalis*), a decline in native grass species including plains rough fescue (*Festuca altaica hallii*), and a significant increase in Kentucky bluegrass (*Poa pratensis*). After several years of sheep and goat grazing with some small prescribed burns, Meewasin revisited the vegetation monitoring transects. Grazing helped increase forb cover and decreased Kentucky bluegrass and native shrub cover. The recommendation was to continue with conservation grazing and prescribed burning programs at SNG – with a focus on more direct, longer-term grazing to shift the site back to a drier microsite.

The Meewasin Northeast Swale is an ancient post-glacier scar of the South Saskatchewan River that runs northeast of Saskatoon for 26 km. It drains into the river in three locations. There are a series of swales in and around Saskatoon, with the Meewasin Northeast Swale (the Swale) being the largest. Meewasin began undertaking resource management work in the Swale, a 300-ha site (approximately 21 times larger than SNG), in the late 2000s. In 2011, Meewasin and numerous partners engaged in an EcoBlitz of the Swale. The ecological significance of the site was determined, with over 200 plant species and 100 bird species recorded and rare species identified. A Resource Management Plan was developed in 2013 and a Master Plan was completed in 2015. Learning from SNG, the Resource Management Plan focused on a more targeted and adapted management. By using conservation grazing with sheep, we focus on specific areas to graze with targeted grazing densities and prescribed burning to create a minimum of 5% disturbance regime annually.

Invasive species management is critical in stewarding conservation sites in an urban setting. Invasive species can attack these conservation sites on two fronts: agricultural weeds, such as common tansy (*Tanacetum vulgare*) and leafy spurge (*Euphorbia esula*), moving into the urban fringes while ornamental species escape from yards into these natural areas. As the communities around the Meewasin Northeast Swale are built up, we are expecting an increase in invasive species in the Swale. We are actively managing the invasives in nearby conservation sites including SNG to ensure that the ecological integrity of the Swale remains.

What have we learned? An integrated approach to resource management is needed by using multiple tools to respond to various opportunities. Ecological monitoring and adaptive management are needed to react to new and emerging situations and to prevent continuing down the same path as before. Taking a 'landscape' approach to management instead of individual sites is needed to deal with the bigger issues facing resource management.

CHALLENGES AND LEARNINGS CONTROLLING DOWNY BROME IN NATIVE PRAIRIE DISTURBANCES

KIRK ELLIOTT

Trace Associates Inc., Lincoln Park Centre, Suite No. 300, 37 Richard Way SW, Calgary, AB T3E 7M8, Canada. Email: kelliott@traceassociates.ca

Abstract: Downy brome (*Bromus tectorum*) is the most common plant in North America, covering over 100 million acres in the United States, and becoming a huge problem in southern Saskatchewan, Alberta, and British Columbia. Here I focus on sites within a small geographic area in southern Alberta, where downy brome has become very prevalent. It is common in roadways and ditches, gravel pits, and oil and gas disturbances in the area. Once a site is disturbed, downy brome is often one of the first weeds to establish and can be extremely difficult to control. Native grassland diversity is significantly reduced once infested with downy brome. Challenges associated with controlling this weed in native prairie disturbances include pressure from landowners, pressure from the client, limited chemical availability, and large disturbances which make hand picking and mechanical control difficult. Trace has attempted several different methods to control downy brome with some success and many challenges.

COMMON TANSY MANAGEMENT THROUGH GOAT BROWSING

NADIA MORI[1], H.A. (BART) LARDNER[2,3]

[1]Saskatchewan Ministry of Agriculture, Watrous Regional Office, Box 520, Watrous, SK S0K 4T0, Canada. Email: nadia.mori@gov.sk.ca

[2]Western Beef Development Centre, Box 1150, Highway 5 West, Humboldt, SK S0K 2A0, Canada

[3]Department of Animal & Poultry Science, University of Saskatchewan, 51 Campus Drive, Saskatoon, SK S7N 5A8, Canada

Abstract: Common tansy (*Tanacetum vulgare*) is a perennial noxious weed of increasing concern in Saskatchewan and neighbouring areas. The essential oils of the plant contain thujone, a neurotoxin that can lead to epileptiform convulsions in animals and humans. Rangeland herbicides that control common tansy also remove desirable broadleaf plants. Roguing or cultivation is usually not practical, and biological control agents are not available. For large-scale infestations where herbicide applications are not feasible, goat browsing of tansy may be an economical alternative given that meat goats are used and the animals are managed in relation to potential plant toxicity. Animal health implications due to thujone toxicity associated with common tansy remains a concern and warrants further investigation. A small paddock at the Western Beef Development Centre's Pathlow pasture near Melfort, SK, was used in a 2-year demonstration trial where an average of 120 meat goats browsed a well-established common tansy infestation. Goat browsing was implemented in early July for periods of up to 10 days. Browsing impact appeared to reduce the vigour of common tansy in about 15 to 20% of the affected area, although no significant reduction of total stems was noted. Containment of common tansy requires repeated long-term browsing impact. Future projects should also include a second browsing or herbicide application on vegetative fall regrowth to increase the impact on common tansy.

IMPACTS OF SMOOTH BROME ON INSECT DIVERSITY AND POTENTIAL FOR VEGETATIVE RECOVERY OF FESCUE GRASSLAND FOLLOWING WEED REMOVAL

VANESSA ROSENKRANZ[1], TERENCE McGONIGLE[2]

[1]Master of Science in Environmental & Life Sciences (MELS) Program, Brandon University, Brandon, MB R7A 6A9, Canada. Email: rosenkranzv@outlook.com

[2]Biology Department, Brandon University, Brandon, MB R7A 6A9, Canada

Abstract: Smooth brome (*Bromus inermis*) is an aggressive invasive grass that effectively out-competes native plant species (Stacy et al. 2005, Otfinowski & Kenkel 2008). In fescue grasslands, for example, *B. inermis* may reduce plant diversity by as much as 70% (Otfinowski & Kenkel 2005). Fescue grasslands are an increasingly rare and diverse ecosystem, supporting a variety of bird and ungulate species. Insects provide food resources for grassland birds and fill several ecological niches (Litt et al. 2014). However, ecosystem theory predicts decreased insect richness and abundance with decreasing plant diversity (Knops et al. 1999).

In Riding Mountain National Park, Manitoba, *B. inermis* is a recognized threat to grassland integrity and is actively managed with mowing and herbicide use. Greenhouse germination was used to examine the relationship between the soil seed bank and *B. inermis* cover to determine vegetation recovery following weed control. The fine scale used for the study revealed no correlations between vegetation cover and seed bank composition. Although *B. inermis* seedlings were not recovered, another exotic grass, *Poa compressa*, was prevalent in the seed bank. Fourteen native forb species were present in the seed bank, providing a resource for grassland regeneration.

Current studies relate *B. inermis* cover to aboveground insect diversity for fescue grassland in Riding Mountain National Park. Insects were collected using both sweep nets and pitfall traps. Using linear regression analysis, negative correlations were found between *B. inermis* cover and total macroarthropod abundance ($p = 0.028$; slope = –0.683), total Hemiptera abundance ($p = 0.042$; slope = –0.260), and sweep-net-collected Diptera ($p = 0.008$; slope = –0.183). These relationships were not significant when abundances were compared with total graminoid cover. Hemiptera species richness was also negatively correlated with *B. inermis* cover ($p < 0.01$; slope = –0.053). In addition, five of the 15 most abundant Hemiptera species showed significant negative correlations with *B. inermis* cover. Further examination will include biomass estimation.

A comparison of insect populations, biodiversity, and biomass with immediate vegetation is valuable for assessing the effect of invasive plants in an ecosystem. The strong negative relationship between overall macroarthropod abundance and *B. inermis* cover indicates a

reduced potential foodbase for wildlife. Our findings reinforce the necessity to manage *B. inermis* in native grasslands.

The seed bank study was used to evaluate existing grassland management practices. Results indicate that mowing and herbicide management would allow limited grassland recovery, but restoration would be threatened by the presence of the exotic grass *P. compressa* in the seed bank. *Poa compressa* is a persistent perennial that is not eliminated by any current park management. However, competitive native grasses may become established if transplanted or reseeded.

Literature Cited

Knops JM, Tilman D, Haddad NM, Naeem S, and 7 others (1999) Effects of plant species richness on invasion dynamics, disease outbreaks, insect abundances and diversity. Ecology Letters 2:286–293

Litt AR, Cord EE, Fulbright TE, Schuster GT (2014) Effects of invasive plants on arthropods. Conservation Biology 6:1532–1549

Otfinowski R, Kenkel NC (2005) Patterns and processes of exotic plant invasions in Riding Mountain National Park. Parks Canada, Winnipeg, MB

Otfinowski R, Kenkel NC (2008) Clonal integration facilitates the proliferation of smooth brome clones invading northern fescue prairies. Plant Ecology 199:235–242

Stacy MD, Perryman BL, Stahl PD, Smith MA (2005) Brome control and microbial inoculation effects in reclaimed cool-season grasslands. Rangeland Ecology and Management 58:161–166

CONTROL OF ABSINTHE WORMWOOD AND COMMON TANSY IN PASTURE USING WIPER APPLICATION

NADIA MORI[1], JOHN HAUER[2], JODIE HORVATH[3]

[1]Saskatchewan Ministry of Agriculture, Watrous Regional Office, Box 520, Watrous, SK S0K 4T0, Canada. Email: nadia.mori@gov.sk.ca

[2]Saskatchewan Ministry of Agriculture, Kindersley Office, Box 1690, Kindersley, SK S0L 1S0, Canada

[3]Ducks Unlimited Canada, Box 1299, Yorkton, SK S3N 2X3, Canada

Abstract: Removing the perennial, broadleaf, noxious weeds absinthe wormwood (*Artemisia absinthium*) and common tansy (*Tanacetum vulgare*) from a perennial forage stand is a desired yet challenging goal. Registered herbicides that control these two weedy species also remove any desirable broadleaf species. Cattle do not graze either plant by choice. Tansy contains alkaloids that are toxic to both humans and livestock, and if dairy cattle consume absinthe on pasture or in hay, the milk will be tainted. Both species also form dense thickets, degrading the wildlife habitat of the range. No biological control options are currently available for absinthe and common tansy. Wiping a concentrated solution of glyphosate herbicide onto the target weeds may be an effective control method. As long as the target plants are at least six inches taller than the desirable forage species, glyphosate can be applied to the target plants without harming the underlying desirable vegetation. Two types of wiping equipment were tested at three demonstration sites across Saskatchewan. Efficacy of control varied based on rigidity and height of the target weed plants, height of the desirable forage sward, and application method. Preliminary results indicate that the rope wick applicator may be somewhat less effective compared to the rotating drum wiper in controlling common tansy and absinthe using glyphosate.

EFFECT OF CONTINUOUS VERSUS DEFERRED ROTATIONAL GRAZING SYSTEMS ON PURPLE PRAIRIE CLOVER (*DALEA PURPUREA* VENT.) PLANT FREQUENCY

A.D. IWAASA, E. BIRKEDAL

Agriculture and Agri-Food Canada (AAFC) – Swift Current Research and Development Centre, PO Box 1030, Swift Current, SK S9H 3X2, Canada. Email: alan.iwaasa@agr.gc.ca

Abstract: Recent research has identified purple prairie clover (*Dalea purpurea* Vent.; PPC) as a beneficial native forb to have in western Canadian grasslands. In 2001, class 3–4 crop land was seeded to two native mixes: a simple (S) mix with six wheatgrasses and one forb, and a complex (C) mix containing 11 grasses (warm and cool season species), one forb, and two shrubs. From 2005 to 2013, a completely randomized study was initiated using the two native mixes (replication = 2) and two grazing systems: deferred rotational grazing (DRG) and continuous grazing (CG). Each DRG group (n = 3) consisted of four pastures (two S and two C). Each DRG group started grazing at a different grazing season period (spring, summer, or fall) at the start of the study, and over three years (one cycle), all three grazing season periods occurred for each pasture type. One group of four paddocks (two S and two C) were used for the CG. Objectives were to determine whether different grazing systems affected PPC plant population frequency after nine years and whether PPC plant frequency differed between native pasture mixtures. The PPC plant frequency was determined by the line intercept method. Data were analyzed using the PROC MIXED procedure of SAS Institute, Inc. The model for PPC plant frequency included the effects of native seed mixtures, grazing system, and interaction. We found no interaction or native mix effects ($p > 0.60$). However, the grazing system did affect ($p = 0.09$) PPC plant frequency, with the DRG (10.5 ± 3.0%) being higher than CG (4.7 ± 0.8%). Therefore, it may be possible to increase the proportion of PPC plants in a native pasture by changing to a grazing system that allows PPC reseeding, such as provided by DRG.

EVALUATING GRAZING TO RESTORE NORTHERN FESCUE PRAIRIES INVADED BY KENTUCKY BLUEGRASS

HILARY PINCHBECK[1], RAFAEL OTFINOWSKI[1], PETER SINKINS[2]

[1]Department of Biology, University of Winnipeg, 515 Portage Ave., Winnipeg, MB R3B 2E9, Canada. Email: hilarypinchbeck@hotmail.com

[2]Parks Canada Agency, Western Arctic Field Unit, P.O. Box 1840, Inuvik, Northwest Territories X0E 0T0, Canada

Abstract: Northern fescue prairies, once common in the Aspen Parkland Ecoregion, have become increasingly fragmented and impacted by agriculture, resource extraction, and exotic invaders. Despite these pressures, fescue prairies remain important habitats for wildlife and Species at Risk. Among exotic invaders, Kentucky bluegrass (*Poa pratensis*) often competes with plains rough fescue (*Festuca hallii*) to reduce the diversity of prairie communities and alter their structure and function. In this experiment, we tested whether grazing by cattle could help restore northern fescue prairies invaded by Kentucky bluegrass. Between 2006 and 2009, we surveyed 23 patches of northern fescue prairie at Batoche National Historic Site, SK, to determine the impact of cattle grazing on Kentucky bluegrass. Using transects, we recorded the frequency of Kentucky bluegrass and used cattle exclosures to examine the impact of grazing on its density. Our results illustrate that Kentucky bluegrass significantly reduced the abundance of plains rough fescue. However, in contrast with plains rough fescue, the density of Kentucky bluegrass declined in the presence of cattle grazing. Our results demonstrate that grazing by cattle and other methods of active restoration are required to restore the diversity and function of remnant northern fescue prairies. We discuss the implications of our findings for the services provided by northern fescue prairie ecosystems, including their historic and cultural integrity.

MONARCH BUTTERFLY CONSERVATION THROUGH TALL-GRASS PRAIRIE HABITAT RESTORATION IN MANITOBA

JULIE SVEINSON PELC, CARY HAMEL, TIM TEETAERT

Nature Conservancy of Canada – Manitoba Region, Manitoba Region, Winnipeg, MB R3L 0P3, Canada. Email: manitoba@natureconservancy.ca

Abstract: In 2011, Nature Conservancy of Canada (NCC) Manitoba initiated a 100-acre (40-ha) tall-grass prairie restoration at the Manitoba Tall Grass Prairie Preserve in southeastern Manitoba. The intention of the project is to restore important habitat for the monarch butterfly (*Danaus plexippus*), which is listed as a species of special concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) due to the decline in overwintering sites in Mexico, climate functions, and the decline in milkweeds (*Asclepias* spp.) – important plants on which Monarch caterpillars solely feed. Adult monarch nectar (i.e. feed) on a variety of flower species. Over 120 locally collected native species were seeded in 2012 and 2014, including milkweeds, goldenrods (*Solidago* and *Oligoneuron* spp.), asters (*Aster* spp.), blazing stars (*Liatris* spp.), prairie-clovers (*Dalea* spp.), sunflowers (*Helianthus* spp.), and northern bedstraw (*Galium boreale*). Ongoing weed management was needed in 2015 to assist in the success of the restoration. To determine the effectiveness of restoration treatments, we are gathering data from a series of long-term vegetation-monitoring plots, and are comparing monarch use to a control representing the pre-restoration condition. Building on our lessons learned from this restoration, NCC Manitoba is exploring approaches to identify priority locations to focus tall-grass prairie restoration efforts, create connections between prairie patches (e.g. roadways), and improve existing prairie conditions (e.g. planting prairie flowers as nectar source plants).

DISCOVERING POTENTIAL TO IMPROVE COVER OF DOMINANT TALLGRASS SPECIES IN NATIVE OR NATURALIZED PASTURES IN MANITOBA

MAE ELSINGER[1], DONALD J. THOMPSON[2], MICHAEL SCHELLENBERG[3]

[1]Agriculture and Agri-Food Canada, PO BOX 1000B, RR3, Brandon, MB R7A 5Y3, Canada. Email: mae.elsinger@canada.ca

[2]Agriculture and Agri-Food Canada, 5403 1st Ave S, PO Box 3000, Lethbridge, AB T1J 4B1, Canada

[3]Agriculture and Agri-Food Canada, PO BOX 1030, 1 Airport Road, Swift Current, SK S9H 3X2, Canada

Abstract: In 2010, we undertook an experiment on a pasture invaded with Kentucky bluegrass (*Poa pratensis*) in southwest Manitoba to determine how climate warming and/or timing of grazing might modify this community. Three clipping treatments and two warming treatments were applied over multiple years on small plots in an area of the pasture that was excluded from livestock grazing only for the duration of the study. Of the two types of treatments, timing of clipping had the most interesting results on the plant species composition. Big bluestem (*Andropogon gerardii*) cover increased with early-season clipping (late June to early July) when compared to the late-season clipping (early to mid-August). We theorize that big bluestem, with most active growth in mid-July to mid-August, performs best in pasture when grazing avoids this critical period. We also hypothesize that, with its larger size, big bluestem can diminish Kentucky bluegrass cover through competition. This reflects observations on PFRA Community Pastures of big bluestem and switchgrass (*Panicum virgatum*) increasing where large fields have been subdivided into small ones that are grazed briefly in the early part of the grazing season, and then left to rest for a significant amount of time before being grazed again in late summer or fall.

Introduction

From 2010 to 2013, we attempted to determine if climate warming and timing of grazing would affect future composition and yield of Western Canadian grasslands. Our only eastern Prairies site, in southwestern Manitoba, provided an opportunity to compare the responses of a cool-season grass, Kentucky bluegrass (*Poa pratensis*), and a warm-season grass, big bluestem (*Andropogon gerardii*), to simulated warming and grazing treatments.

Kentucky bluegrass prefers cooler temperatures, and becomes inefficient or dormant if it is too hot. Its greatest growth and flower development occur in June, when growing

temperatures are relatively cool. Big bluestem prefers heat, and can withstand very high temperatures. The greatest part of its growth and flower development is in mid-July to early August, when temperatures are much warmer.

Most harm from grazing occurs during a plant's most active phase. Grazing also reduces accumulated biomass that insulates soil from heating. This could have an additive effect, with temperature increases expected from climate warming.

Methods

Cattle were restricted from the site from 2010 to 2013 with a temporary electric fence. We selected 36 plots, measuring 1.5 m x 1.5 m. Time of grazing was simulated in the first 3 years with clipping:

- 12 plots early clip: late June/early July
- 12 plots late clip: mid-August
- 12 plots no clip

Warming was simulated for half of each group with clear plastic, open-topped chambers, placed in early June and removed in late October of the first 3 years. In year 4, the plant community was allowed to express itself with no treatments applied.

Soil temperature sensors were placed 2.5 cm deep in half of the plots. Ground cover and plant species composition were visually estimated from a 50 cm x 50 cm frame placed in the centre of each plot, in late June 2010 and mid-August 2013. In August 2013, live biomass was clipped from all plots.

Results

Chambers did not appear to warm the soil – clipping had the most effect on peak soil temperatures (Figs. 1 & 2). Late-clipped plots were generally hottest at the peak of the day, except for a period after early clipping, when early clipped ones became comparable to late clipped ones. Unclipped plots often had the coolest peak daytime temperatures, at times being up to 7°C lower than unclipped plots on sunny days.

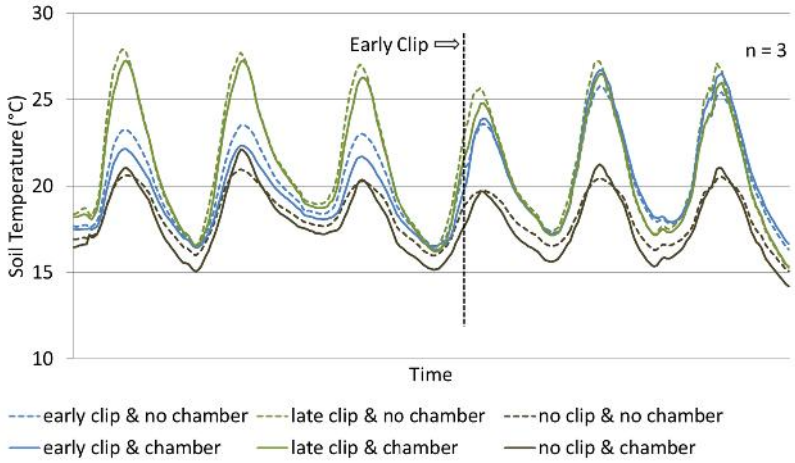

Fig. 1. Average soil temperatures (2–8 July 2012)

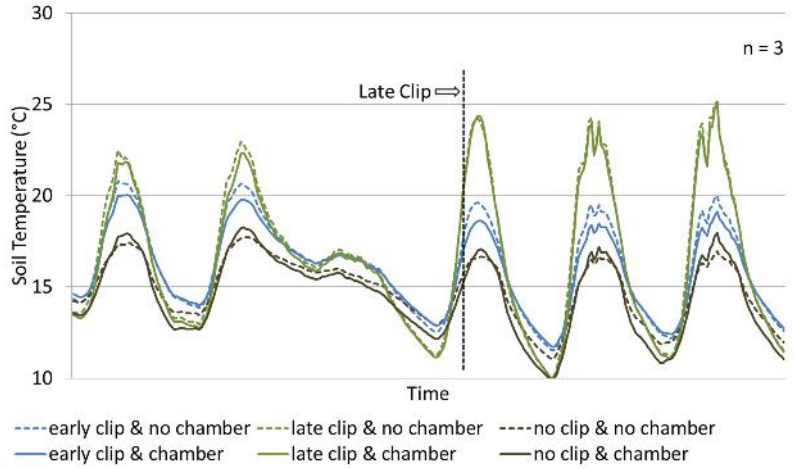

Fig. 2. Average soil temperatures (13–18 August 2012)

Total live herbaceous cover (data not shown) at the study's end was lower in unclipped plots. However, live biomass yield (data not shown) was not limited after 4 years without clipping – the decrease in herbaceous cover was likely due to the accumulation of dead biomass obstructing the observer's view of live plants. Chambers appeared to improve biomass yield for early-clipped plots and unclipped plots, but not for late-clipped plots.

Big bluestem appeared to perform best in early-clipped plots (Fig. 3). Kentucky bluegrass performed best in late-clipped plots but remained subdominant in all plots except for two of the 12 late-clipped plots.

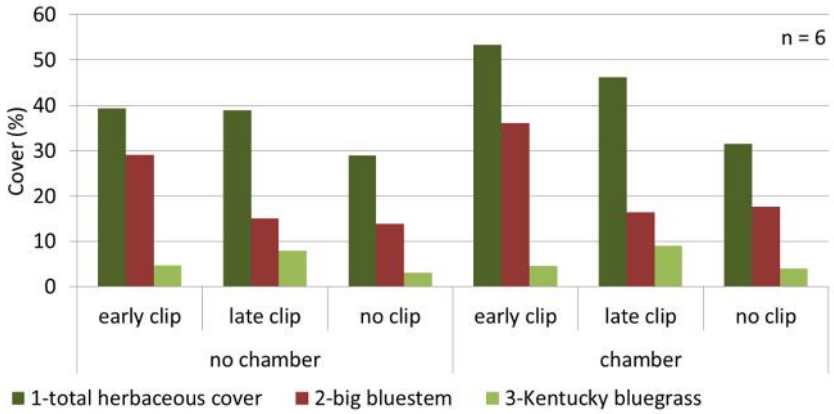

Fig. 3. Average cover of key plants at the end of the study (August 2013)

Discussion

Early summer grazing, followed by rest, may give big bluestem an advantage. Grazing would reduce biomass cover, allowing the soil surface to warm up, creating a favourable environment for big bluestem. Kentucky bluegrass, a cool-season grass, would be disadvantaged due to defoliation during its growth and flowering phase.

Big bluestem would be disadvantaged by mid-summer grazing because it would be defoliated during its growth and flowering phase. Kentucky bluegrass, having finished its growth and flowering, would have a chance to increase.

Grazing exclusion, represented by the no-clip plots, would result in accumulation of dead biomass, thereby keeping soil temperatures cool. These cooler temperatures may restrict the performance of big bluestem.

A strategic rotational grazing plan can be developed to aid in the recovery of big bluestem, while at the same time stifling Kentucky bluegrass. Not all fields in a pasture can be treated at the same time by avoiding mid-summer grazing when bluestem is most sensitive, because grazing must occur somewhere during that time each year. Thus, a long-term plan is needed if multiple areas are to be treated. Once big bluestem cover meets expectations, a different rotational grazing strategy can ensure that it will be maintained at optimal levels in the target area. This can be achieved by allowing a field to be grazed during mid-summer in some years, and rested during mid-summer in other years.

Acknowledgments. We thank Dan MacDonald (site lead and project design); Zane Fredbjornson and Robert Kerr (site access and maintenance); and Rebecca Whittingham, Melanie Thompson, Angela Denbow, Craig Fisher, Swetha Venugopal, and Ryan Beck (site set-up, treatment, data collection).

MEEWASIN NORTHEAST SWALE: BIODIVERSITY THROUGH CONSERVATION GRAZING

RENNY W. GRILZ, ERYN TOMLINSON

Meewasin Valley Authority, 402 Third Avenue South, Saskatoon, SK S7K3G5, Canada. Email: rgrilz@meewasin.com

Abstract: Biodiversity is a reflection of the health of our environment. The Meewasin Valley Authority (Meewasin) is responsible for maintaining natural landscapes with high biodiversity throughout the South Saskatchewan River Valley in the vicinity of Saskatoon. The Meewasin Northeast Swale (the Swale) is a 300-ha urban remnant prairie north of the Silverspring and Evergreen neighbourhoods and adjacent to the developing Aspen Ridge neighbourhood. With support from the Royal Bank of Canada's Blue Water Project, Meewasin has applied conservation grazing as a means to replicate natural disturbance, like that of the Plains bison, at the Swale. Meewasin has re-introduced grazing and fire at the Meewasin Northeast Swale with the goal of enhancing biodiversity and re-invigorating the native prairie landscape.

EUROPEAN BUCKTHORN – YOU MIGHT ALREADY HAVE IT

RENNY W. GRILZ, ERYN TOMLINSON

Meewasin Valley Authority, 402 Third Avenue South, Saskatoon, SK S7K3G5, Canada. Email: rgrilz@meewasin.com

Abstract: The relatively unknown invader European buckthorn (*Rhamnus cathartica*) was brought into Saskatoon to explore its use as a shelterbelt species in the 1930s. This tree has rapidly expanded to every corner of the city, and since 1998, Meewasin and the City of Saskatoon have controlled over 810,000 stems of European buckthorn. After decades of control efforts by Meewasin, we are only beginning to understand the extent to which this tree has invaded and how difficult it is to control. With a grant from Environment Canada, Meewasin and the City of Saskatoon plan to undertake an extensive project to (attempt to) eradicate this species from the river valley in Saskatoon. Phased over three years, the plan encompasses physical removal, chemical control, and education of the public of the invasive nature of European buckthorn with a goal of the three-year project to control 450,000 additional stems. Using papers published in cooperation from Meewasin staff, staggering data of previous control efforts and geographic extent, and field data collected this fall, we can begin to map and quantify the work we have done and what we have left to do.

HABITAT ENHANCEMENT FOR BURROWING OWLS: A SUMMARY OF 15 YEARS OF WORK

REBECCA MAGNUS, KAYTLYN BURROWS, ASHLEY FORTNEY

Nature Saskatchewan, 1860 Lorne St, Regina, SK S4P 2L7, Canada. Email: outreach@naturesask.ca

Abstract: Nature Saskatchewan's habitat enhancement (HE) program offers 50:50 cost-sharing opportunities for Stewards of Saskatchewan program participants to improve habitat for burrowing owls (*Athene cunicularia*), piping plovers (*Charadrius melodus*), and Sprague's pipits (*Anthus spragueii*). Since 2000, Nature Saskatchewan (NS) has contributed to 128 HE projects (most concentrated in the Regina and Wood River Plain areas), resulting in 15,337 acres (6,207 ha) of cropland being seeded back to perennial grass (four of which were native seeding projects resulting in 343 acres seeded to native grass); as well as 62.3 miles (100 km) of fence and 13 watering sites established to protect sensitive areas for prairie Species at Risk. Operation Burrowing Owl has supported 103 of the total HE projects, putting 14,456 acres of cropland back into permanent cover, increasing foraging and nesting habitat for burrowing owls.

Habitat enhancement for burrowing owls is accomplished through strategic cropland conversion to enlarge pastures and reduce fragmentation. From 2000 to 2008, priority was given to areas near pastures that had nesting burrowing owls within the past 16 years that were close to existing pasture (tame and native). Seed mixtures had to exclude smooth brome, crested wheatgrass, and sweet clover. As well, alfalfa could not exceed 10% of the mix by weight. The maximum level of assistance was $25/acre ($42/ha), to a maximum of $10,000 per project. Since 2009, priority has been given to areas near existing pasture (tame or native) within 1 km of a burrowing owl nest active in the past 3 years (confirmed by NS staff, a Conservation Officer/agency, or a research biologist). Projects must use a 100% native grass seed mixture of at least two species. The maximum level of assistance for seed cost is 50% of $100/acre ($247/ha). The maximum level of assistance for labour and the rental of proper seeding equipment for native blends is 50% of $25/acre ($62/ha). For glyphosate-based herbicide applications, the maximum level of assistance is 50% of $17/acre ($42/ha) for up to two applications.

In year one of an HE project, the eligible participant applies to NS for funding; provides objectives, history (herbicide and crop), and soil type (soil test for pH, salinity, and nutrient level); begins weed control using a glyphosate-based herbicide approved by NS to achieve a weed-free seedbed; determines seed mixes with technical assistance from a Professional Agrologist; orders and pays for seed; and submits receipts and seed certificates to NS. In year two, the participant rents proper seeding equipment (broadcast seeding is not allowed), providing proof to NS that appropriate seeding methods have been used; applies

pre-seed herbicide using a glyphosate-based herbicide approved by NS; seeds the project area; provides post-seeding weed control primarily through mowing before the weeds flower in June and July; and spot sprays and mows for additional weed control. In year three, the participant spot reseeds, if needed, and provides weed control through mowing (as in year two).

These HE sites are monitored annually for use by Species at Risk. Enhanced sites first supported owls in 2007 with one nesting pair and one single owl using two enhanced sites. Every year since, burrowing owls have been found nesting at and adjacent to HE sites, supporting the value of HE work. For example, in 2014, Operation Burrowing Owl participants reported four pairs and five single owls nesting on six HE sites, representing a significant proportion of the 30 pairs, 30 singles, and 14 young reported at 23 (HE and non-HE) sites that year. Through financial assistance and logistical support, the HE program has and continues to encourage participants to improve their operations in a manner that benefits both themselves and Species at Risk.

EVALUATION OF MANAGEMENT STRATEGIES TO MAINTAIN BIODIVERSITY OF URBAN GRASSLANDS

RONG SHEN, VLADIMIR KRICSFALUSY

School of Environment and Sustainability, University of Saskatchewan, Saskatoon, SK S7N 5C8, Canada. Email: vladimir.k@usask.ca

Abstract: Grazing and burning are commonly used as management strategies to recover and maintain plant community diversity in North America's grasslands. A moderate level of disturbance offers the maximum species diversity, but this may not always lead to a healthy grassland. Lack of disturbance could lead to loss of native species diversity and increase in exotic invasive species. The Northeast Swale is an ecological corridor in the city of Saskatoon, Saskatchewan. It contains large areas of moist-mixed grassland and possesses high biodiversity. Due to human activities, disturbance regimes in the area have been changed, which has resulted in the loss of biodiversity. We analyzed the effectiveness of grazing, burning, and a combination of these management regimes on species diversity and abundance, floristic quality, and structure of plant communities, as well as their impacts on vegetation cover. We compared the differences of indicators between disturbed and undisturbed sites and assessed the links between indicators and current management strategies in the area. Results of this study will be used by the Meewasin Valley Authority to identify best management strategies and establish long-term biodiversity monitoring of the area.

IMPROVED BIOCONTROL SUCCESS IN MANITOBA AND SASKATCHEWAN

BEVERLY DUNLOP[1], DUSTIN OSTRANDER[2]

[1]Agriculture and Agri-Food Canada, PO Box 1000b, RR 3, 2701 Grand Valley Road, Building 93, Room 132, Brandon, MB R7A 5Y3, Canada. Email: beverly.dunlop@agr.gc.ca

[2]Agriculture and Agri-Food Canada, PO Box 1030, 1 Airport Road, Floor 1, Room 103, Swift Current, SK S9H 3X2, Canada

Abstract: Invasive weed species impose huge costs on Canadian agriculture, and ecologically, they are significant threats to Canadian biodiversity, natural habitats, and ecosystem services (Colautti et al. 2006). In a report commissioned by the Leafy Spurge Stakeholders Group of Manitoba, it has been estimated that losses from leafy spurge (*Euphorbia esula*) in that province total CAN$40 million/year (Rempel 2010). Biocontrol of weeds using insects provides an alternative to conventional herbicides that is self-propagating, has low environmental impact, and is cost effective over the large areas requiring treatment. The ecological benefits of biocontrol of weeds using insects include protection of native biodiversity, endangered species, and water quality by the removal of the invasive plants and by the resulting reduction in herbicide use. Direct economic benefits for producers accrue through reduced long-term input costs for herbicides or other weed control measures.

Literature Cited

Colautti RI, Bailey SA, Van Overdijk CDA, Amundsen K, Maclassac HJ (2006) Characteristics and projected costs of non-indigenous species in Canada. Biological Invasions 8:45–59

Rempel K (2010) Economic impact assessment of leafy spurge in southern Manitoba. Final Report. Rural Development Institute, Brandon University, Brandon, MB

TESTING NON-INVASIVE METHODS FOR MONITORING INACTIVE GREATER SAGE-GROUSE LEKS IN SASKATCHEWAN

BEATRIZ PRIETO, JESSUS KARST

Fish and Wildlife Branch, Saskatchewan Ministry of Environment, 4th Floor, 3211 Albert Street, Regina, SK S4S 5W6, Canada. Email: beatriz.prietodiaz@gov.sk.ca

Abstract: An experimental approach was designed and implemented during 2013, 2014, and 2015 by the Fish and Wildlife Branch of the Saskatchewan Ministry of Environment to develop an appropriate and effective long-term monitoring program for greater sage-grouse (*Centrocercus urophasianus*) in Saskatchewan using non-intrusive and passive surveillance methods for known inactive and historical lek locations. For this purpose, automated recording units and trail cameras were deployed and tested in southwestern Saskatchewan, and the resulting data were analyzed in search of a system to automate identification of the species presence.

THEME 4: CONNECTING AND MOTIVATING PEOPLE TO WONDER, CARE, AND ACT

CONCURRENT SESSION 11 – Educating Youth of Today, for Tomorrow

LEARNING THE LAND: A PRAIRIE CONSERVATION PARTNERSHIP BETWEEN NATURE CONSERVANCY OF CANADA AND TREATY 4 EDUCATION ALLIANCE

JENNIFER MCKILLOP[1], **SCOTT FULTON**[2]

[1]Nature Conservancy of Canada – Saskatchewan Region, 1777 Victoria Ave Suite 700, Regina, SK S4P 4K5, Canada. Email: jennifer.mckillop@natureconservancy.ca

[2]Treaty 4 Education Alliance, Reserve 77A, #120-740 Sioux Avenue, Box 1579, Fort Qu'Appelle, SK S0G 1S0, Canada. Email: sfulton@treaty4ed.com

Abstract: The Learning the Land Program is a collaboration between the Nature Conservancy of Canada – Saskatchewan Region and the Treaty 4 Education Alliance. Supported through the Government of Canada's Aboriginal Fund for Species at Risk, Learning the Land is an environmental education program designed to meet Grade 7 curriculum outcomes that engages First Nations students and communities in environmental education and conservation efforts. It recognizes the incorporation of Elders' and Traditional Knowledge as essential to program success. In year one, we developed the Learning the Land Native Prairie Species-at-Risk Resource Kit and associated Teacher's Manual. The material focuses on Grade 7 students within Treaty 4 schools discovering the workings of native prairie ecosystems and the changes that have occurred in those ecosystems, within a context of traditional First Nations culture and knowledge. In year two, we are testing and implementing these materials through activities on a seasonal basis, field trips, assignments, and group and project-based activities.

ADOPT A RANCHER AND *TAKING ACTION FOR PRAIRIE* – EDUCATION PROGRAMS BY PCAP

NICOLE ANDERSON[1], BARRY PUTZ[2]

[1]Miller Comprehensive High School, 1027 College Ave, Regina, SK S4P 1A7, Canada

[2]Saskatchewan Prairie Conservation Action Plan, Box 4752, Regina, SK S4P 3Y4, Canada. Email: pcap@sasktel.net

Abstract: *Adopt a Rancher* is a complete unit of study that addresses the topic of Climate and Ecosystems Dynamics and fits both the Grade 10 Science and the Grade 11 Environmental Science programs. Students complete a case study of an actual ranching operation in Saskatchewan. Classrooms are paired with working ranchers who will provide information about their operations to the students. By using a student guide and online resources and communicating with the adopted rancher, students answer the question "How can ranching protect Saskatchewan's native grasslands while providing economic benefits for Saskatchewan people?" A field trip to the ranch is included in the program.

Taking Action for Prairie provides targeted prairie grassland conversation education for middle-year students through an interactive, positive group setting. Students in each grade are introduced to the concept of prairie conservation, and then develop and implement their own action project which will make a measurable impact within their community. Students and teachers are encouraged to log action plan progress within their community and share results with other schools via an online web portal.

MOTIVATING AND MOBILIZING YOUTH: CONSERVATION AWARENESS-BUILDING IN ANTARCTICA, THE BACKYARD, AND ONLINE

ALANA KRUG-MACLEOD[1], KAREN KRUG[2]

[1]Aden Bowman Collegiate Institute, 1904 Clarence Ave S, Saskatoon, SK S7J 1L3, Canada. Email: akmacleod@sasktel.net

[2]Formerly of the Centre for the Environment, Brock University, St. Catherines, ON L2S 3A1, Canada

Abstract: This paper identifies various routes through which youth from around the world have been motivated to engage with nature and to enlist others in conservation and sustainability activities. Beginning with (auto)biographical details of the main presenter that led her from ordinary ecological interests to an Antarctic expedition to national awards for environmental activism, this paper identifies ten types of activities known to influence youth to wonder, care, and act. Avenues described include: specialized outdoor learning programs in schools (ScienceTrek); educational expeditions for youth (Students on Ice); competitions funding youth-initiated conservation projects (Caring for Our Watersheds); service programs promoting volunteerism and adventurous journeys (Duke of Edinburgh Challenge); social media, websites, and documentaries deepening awareness and engagement; science, video, and photography competitions and showcases fostering observation and/or research (Get to Know, Where Challenge, Virtual Science Fair, Millennium Youth Camp); environmental summits and exposure tours allowing students to connect and collaborate (EF Tours global citizens program); environmental/sustainability clubs combining action and education (SWITCH); trails and zoos facilitating exploration; and online volunteer options building expertise while contributing to baseline research (citizen science). How, why, and to what extent these avenues successfully foster sustainability is assessed in relation to observation, experience, and literature.

Introduction

It is often argued that the future of the planet rests in the hands of youth, and that young people are the source of hope and inspiration in relation to environmental issues. However, many youth are oblivious to environmental problems, vulnerable to hyper-consumption, focused on individual interests, and unwilling to go out of their way to live ecologically responsible lives. Thus, it is important to identify the avenues that will motivate and inspire youth to be environmental leaders who actively conserve threatened species and habitats. The ensuing survey of routes toward heightened ecological awareness and action begins

with the experience of one young person who has been fortunate to have had many formative experiences that have strengthened her commitment to these environmental objectives. This paper begins with a short biographical summary about this individual environmental journey. From there, it moves to accounts of the avenues that enabled Alana Krug-MacLeod to deepen a nascent interest in ecology and dedicate herself to being a positive agent of change. Identifying the types of opportunities available to youth for learning about conservation and sustainability, and assessing the strengths and potential weaknesses of each could be useful in drawing more young people into these movements.

Interest in animals and active exploration of natural spaces are two of the most common entry points into ecological awareness for children. For Krug-MacLeod, reading about animals, visiting pets and zoos, and exploring outdoors on a family farm and within and beyond city borders led to an interest and understanding of species, habitats, and ecological systems. Attending a permaculture course and being involved in gardening also strengthened her understanding of ecological practices. Books and documentaries expanded this knowledge, and in Grade 7, she leapt at the opportunity to apply to EcoQuest and ScienceTrek – two specialized programs for Grade 8 students. Participating in ScienceTrek enabled her to push herself to commute 9 km by bike to and from school every single day in all weather conditions and to select environmental themes for most projects. Researching and creating an award-winning video for the earth science Where Challenge combined arts and science skills and increased her understanding about the importance of preserving non-renewable resources. Seeing her dedication to environmental values and her interest in animals and ecology, a ScienceTrek teacher recommended the Students on Ice program to Krug-MacLeod. Being selected from Canadian applicants for a Leacross Scholarship that fully funded her participation in an Antarctic Expedition with Students on Ice expanded her awareness, built her confidence, and consolidated her environmental commitments.

She returned, determined, at 14 years old, to engage others through environmental education. She spoke to media, made videos, and began presenting at schools. At this time, she began the Duke of Edinburgh Award program, and directed her volunteer, skills, and adventurous journey efforts toward ecological awareness-raising. She also developed a proposal for the Saskatchewan Caring for Our Watersheds competition, which became one of three such projects she successfully initiated and implemented. Eager to conduct some meaningful environmental research and to learn more about climate change as well as the challenges of human–nature interactions, she joined the Arctic Expedition the summer after traveling to Antarctica. Later, earning a spot as a Global Citizen for the EF Tours environmental program and leadership summit in Costa Rica allowed her to focus on biodiversity issues in an equatorial region. All three trips inspired prize-winning, interactive Virtual Science Fair projects, photographs, and video entries in nature awareness competitions such as Get to Know and Polar Bears International. Volunteer work through her school's SWITCH Club, with Permaculture SK, and an online citizen science program

provided institutional means to have a positive environmental impact and to learn useful skills. Writing research papers, then being selected for an international science camp in Finland that included working with youth from different countries to prepare academic posters and materials for presentation, added a whole new level of complexity to her understanding. Finally, a year at Pearson UWC in British Columbia allowed for engagement in biology and environmental science courses as well exploration of an entirely new ecoregion. From a childhood captivation with animals and their habitats to a mature understanding of social and ecological relationships and challenges, Krug-MacLeod's journey was supported by many outstanding people and programs.

Although this was not the goal, the contributions and inspirational value of these involvements and projects have been acknowledged by local, national, and international organizations through: a Queen Elizabeth II Diamond Jubilee Medal, a Saskatchewan Junior Citizen of the Year Award, multiple Saskatchewan Caring for Our Watersheds awards, the Glocal Challenge WeShare program, EF Global Students Summit Prize, the Museum of Nature's Nature Innovation Award, the Canadian Wildlife Federation's Youth Conservation Award, and Starfish Organization's Top 25 Environmentalists under 25 program. Arriving at the point of being confident enough and dedicated enough to make contributions deemed important by such respected organizations did not happen in a vacuum.

Identifying the types of opportunities that provide openings for future contributions is important in mobilizing the energy of youth worldwide, hence the reflection on this one youth activist's path forward is useful. Ten different types of programs and opportunities are identified that can effectively engage youth in environmental activities. Whether formal or informal, these routes are part of a complex of options that inspire youth.

Programs and Opportunities

1.0 Specialized Outdoor Learning Programs in Schools

Many formal educational institutions have developed programs with a special emphasis on ecology or related areas such as outdoor education, social justice, or science and technology. These programs may be full-year, multi-year, single-semester, or multi-course arrangements. In Saskatoon schools, there are/were several examples, including: EcoQuest, ScienceTrek, EcoJustice, Earthkeepers, Outdoor School, and SEED. While there is considerable variation in the set-up of the programs, all cover aspects of the provincial curriculum and are offered within existing schools.

1.1 ScienceTrek

ScienceTrek (http://www.spsd.sk.ca/Schools/elementaryprograms/sciencetrek/Pages/default.aspx) is a field-based science program in the Saskatoon Public School Division created to inspire Grade 8 students. This program uses 'hands-on' experiences to fuel a passion for science and

other types of learning. Students are exposed to a variety of natural environments (rivers, lakes, forests, conservation areas, badlands; Fig. 1) and constructed settings (the Canadian Lightsource Synchrotron, computer laboratories, university classrooms, and museums) and undertake learning projects and activities on site. ScienceTrek students learn through experimentation, research, videography, presentations, observation, interaction, design, travel, and traditional classroom activities. In that way, the program exposes students to science, technology, engineering, arts, and math (or STEAM) activities. Many projects are interdisciplinary, which is an approach that lends itself to environmental work. The program promotes a lifelong interest in outdoor pursuits by introducing students to a range of activities, such as skiing, snowshoeing, kayaking, dragon-boat racing, canoeing, trail biking, and cross-country running, as well as various forms of active transportation, such as kicksledding, biking, walking, and boarding. ScienceTrek fosters an understanding of the diversity and impact of science on human culture and the environment, producing students who can use the arts and sciences to address important issues.

Fig. 1. Students in the ScienceTrek program are exposed to a variety of natural environments, including badlands

1.2 Benefits of School-Based Outdoor Learning Programs

Specialized outdoor learning programs offer unique educational opportunities that encourage students to attend to and protect their environments. Such programs experientially teach basic science and ecology. Incorporating student-directed projects enhances students' interest, engagement, and commitment. They offer opportunities to explore nature in various settings, develop skills for camping and living with nature, and teach about and model eco-friendly behaviour such as the '3 Rs' ('reduce, reuse, recycle') and sustainable transportation. Such programs integrate scientific research with social issues and conservation strategies. Students are attracted by the novelty and perks of such programs, which allows them to be drawn into ecological understanding and awareness. For those with no previous exposure, the programs broaden their understanding. For students who may not have found like-minded peers in regular schools, such programs can provide a place to share their interests and to deepen their awareness and commitments. Introducing specialized programs in middle school grades helps students gain entry into competitive environment programs accessible to secondary school students, and may favourably influence environment-related post-secondary and long-term career decisions. For many of these reasons, participating in school-based outdoor learning programs opens doors for future involvements in conservation and ecology initiatives.

2.0 *Educational Expeditions for Youth*

While school-based outdoor programs offer opportunities for some students in the centres where they are offered, non-school educational expeditions for youth attract those looking for adventurous educational opportunities that are shorter term, and yet powerful. These types of programs may serve youth in centres that are too small, economically constrained, or remote for alternative programming.

2.1 Students on Ice

Students on Ice (http://studentsonice.com/) is one organization that offers youth unique educational expeditions to Antarctica and the Arctic (Fig. 2). The organization aims to educate youth from around the globe about the importance of polar regions, to inspire and catalyze initiatives that foster global sustainability, and to support continued growth of participants post-expedition. The organization allows youth to inspire other youth both during the expeditions and after the trip. Inspiration and education are part of the "Protect the Poles, Protect the Planet" philosophy.

Fig. 2. Students on Ice offers educational expeditions to Antarctica

2.2 Benefits of Educational Expeditions

Educational expeditions such as these create deep connections with nature and among peers, scientists, educators, researchers, activists, and artists. They teach students in captivating contexts and engage students to educate themselves and others. Expeditions provide youth with confidence about their own capabilities and open doors in the future. Such programs motivate participants to embrace long-term, active engagement on conservation and sustainability issues that matter.

3.0 *Competitions Funding Youth-Initiated Conservation Projects*

Adventure may attract students to expeditions and alternative education programs, but the thrill of competition or the opportunity to win tangible financial or ecological rewards attracts others to competitions (Fig. 3).

3.1 Caring for Our Watersheds

Caring for our Watersheds (http://caringforourwatersheds.com/) is an international program with local branches. It describes itself as an environmental education competition that: encourages creativity, rewards students for innovative ideas, offers implementation funding and mentorship, and partners with communities to create focused solutions to watershed issues.

Fig. 3. Kickstart Change (https://www.facebook.com/KickstartChange), a sustainable transportation project, is an example of a winning project

3.2 Benefits of Conservation Competitions

Competitions funding youth-initiated projects have some distinct benefits. They provide an organized means to capture creative ideas and harness youthful energy. They provide youth with real-world experience and skills in carrying ideas to fruition; skills include developing and pitching proposals, researching, budgeting, raising funds, networking, managing volunteers, setting and meeting timelines, and effective public speaking. By providing funds and support to actually implement ideas, they prove that young people's ideas matter. Such programs have long-term benefits, as they foster community engagement and future commitment.

4.0 *Service Programs Promoting Volunteerism and Adventurous Journeys*

General programs that encourage volunteerism and the planning and implementation of excursions in nature can allow youth with some environmental interests to further develop these interests. Brownies, Scouts, 4-H, and similar organizations incorporate outdoor activities and other skill development that fosters interactions with animals and nature. Combining service and outdoor experiences is a familiar route to building conservation commitments, one that has been handed down through the generations.

4.1 Duke of Edinburgh Challenge

The Duke of Edinburgh Award challenge (http://www.dukeofed.org/) is another program that combines service and outdoor experiences to build sustainability commitments. This program is a non-competitive development program for youth that includes service, skill development and physical recreation, planning and execution of adventurous journeys, and participation in a residential project. Individuals set their own goals to meet the criteria laid out in each of the three levels of the program. Before setting out on their adventurous journeys, participants must read about and be trained to understand and accept expectations designed to avoid causing harm to natural environments; thus, direct education about conservation is part of the program. Participants learn about the importance of leaving natural settings the way they were when entered (for example, not cutting down brush, not taking souvenirs other than photos, and not consuming seeds, berries, or plants that are in short supply; Fig. 4) or in improved condition (garbage collected and packed out, invasive plants removed). Through education, but also through the experience of planning, acting, and reflecting on one's actions and goals, the Duke of Edinburgh Award Program helps young people to contribute to long term sustainability.

Fig. 4. Participants in the Duke of Edinburgh Challenge learn about the importance of leaving natural settings the way they were when entered

4.2 Benefits of Volunteer and Adventure Challenge Programs

These types of programs have multiple benefits that lead toward conservation and sustainability. First and foremost, they provide incentive and structured support for engagement with nature. They also encourage sustained, meaningful volunteer action. Through websites, word of mouth, and sharing amongst leaders and participants, they foster exchange of ideas for worthwhile projects and viable approaches, sharing skills amongst seasoned and novice participants. These types of programs build communities of youth with other-oriented, nature-inspired values and create a climate in which these types of values are deemed important.

5.0 *Social Media, Websites, and Documentaries*

Various forms of electronic media can be directed to the goal of deepening environmental awareness and engagement (Fig. 5). Because electronic media are so much part of dominant youth culture, they are particularly effective for youth.

5.1 Enlightening Electronic Media

Relevant sources of electronic media include online petitions, awareness campaigns, educational documentaries, interactive websites, as well as social media groups and individual connections. Powerful documentaries like *Chasing Ice* (https://chasingice.com/) can emotionally connect individuals to environmental issues such as climate change and ecosystem destruction. Online awareness campaigns spread information person to person with a few clicks. Interactive websites can tailor educational materials to user interests. Social media groups allow individuals with shared interests to exchange information and to connect and build constituencies. These approaches to education, combined with online petitions that allow individuals to influence policy makers and exercise democratic power, can be effective in building youth awareness and engagement.

5.2 Benefits of Electronic Media

While exposure to positive electronic influences is hit and miss, this form of media can be highly effective for youth. It can quickly and easily deepen and broaden awareness. Because it is so popular with youth, it is an easy way to capture their attention. It allows for engagement with many issues and people beyond one's local region. It also demonstrates agency, showing the power of one individual to make positive change when combined with many others.

Fig. 5. Effective use of electronic media to deepen environmental awareness: Slogans conceived by A. Krug-MacLeod were combined with her own photography to produce these powerful posters in support of the #WhyImWatching awareness campaign

6.0 *Science, Video, and Photography Competitions and Showcases*

Various kinds of competitions foster observation of, interaction with, or research about nature and the environment. Stand-alone video and photography competitions may be offered, or these media may be incorporated into research-based competitions as means to engage youth.

6.1 Get to Know

The Get to Know contest (http://www.get-to-know.org/contest/canada/) was designed to encourage youth to explore outdoors, get to know wild neighbours and habitats, and then create nature-inspired art: fine art, photography, videos, music, or writing. Displaying this art in online and physical galleries and awarding prizes offers incentive to encourage involvement. The contest motto "Connect, Create, Celebrate"– summarizes the philosophy

of the program and its intended goal of encouraging youth to pay attention to their natural surroundings.

6.2 Where Challenge

Earth Sciences Canada's Where Challenge (http://www.earthsciencescanada.com/where/) encourages youth to identify the non-renewable Earth resources (NRERs) in everyday objects, then explain why NRERs are important in daily life. It engages students in understanding how non-renewables are processed, used, and reclaimed, and thus connects with issues related to conservation and environmental protection. Monetary prizes and school awards add incentive to entice students to become more aware.

6.3 Virtual Science Fair

The Canada-Wide Virtual Science Fair (http://www.virtualsciencefair.com/) is an online science and technology contest for elementary and high school students across the country but also beyond Canada's borders. Entrants create interactive websites to display experimental, research, and design projects by individuals or teams. Free adjudication of and feedback on projects, school-supported participation, monetary prizes, and academic awards offer incentives to engage students.

6.4 Millennium Youth Camp

The Millennium Youth Camp (http://taf.fi/en/kategoria/millennium-youth-camp-en/), hosted by the Technology Academy Finland, is an international science camp for talented youth passionate about natural sciences, mathematics, and technology. To enter the selection process, applicants must have demonstrated interest through volunteerism and other accomplishments and must prepare research papers related to sustainability topics. Selected participants work on sustainable development-related science projects and prepare academic presentations. Academics and industry representatives share expertise and innovations.

6.5 Benefits of Competitions

Competitions, whether research related or in relation to visual media, promote observation, research, and creativity. They can sharpen artistic and academic presentation skills. Generally, they encourage global or inter-regional sharing to raise awareness about discoveries, approaches, and issues. They spark new ideas; produce groundbreaking, original research; and can encourage cross-disciplinary or inter-disciplinary research. Often, these sorts of competitions have a collaborative element as well, since participants generally view themselves to be part of a larger organization that holds environmental or sustainability objectives which participants also share.

7.0 *Environmental Summits and Exposure Tours*

Environmental summits and exposure tours are another organized approach to conservation and environmental education that allow students to connect and collaborate with one another and with other inspirational activists, academics, and politicians.

7.1 EF Tours Global Citizens Program

The Education First Global Citizens Program (http://www.eftours.ca/global-citizen), established as part of the charitable side of EF Tours, is a way to engage youth in sustainable living and advocacy. Based on creative solutions and ideas conveyed in engaging ways, the organization chooses global citizens for an educational tour, volunteer projects, and a working environmental summit. The program brings promising students together to address social issues. It also fosters global citizenship through building awareness of local–global connections and encouraging representatives to take lifelong responsibility for the well-being of present and future generations.

7.2 Benefits of Summits and Tours

The main strengths and contributions of summits and exposure tours are that they offer novelty, excitement and adventure that attracts youth, they allow students to connect and collaborate, they provide opportunities for youth to generate and share ideas, and they enable youth to support and inspire one another in the long term. Overall, these approaches broaden horizons, increasing understanding, awareness, and commitment.

8.0 *Environmental/Sustainability Clubs*

Environmental and sustainability clubs allow groups of people who share general interests in common to gather regularly to learn about or act on issues of importance.

8.1 SWITCH Club

The SWITCH Club at Aden Bowman Collegiate Institute in Saskatoon is a group for high school students interested in inspiring change in their community. It meets weekly and undertakes projects related to the environment, human rights, and social change. These projects include self-educating through speaker and video series; volunteering at community events such as Seedy Saturday; fund-raising for social causes; book and clothing swaps; growing food in the hydroponic grow room (Fig. 6); and helping maintain outdoor gardens and food forests. This club builds sustainability awareness by connecting social and environmental issues.

Fig. 6. Hydroponic grow room at Aden Bowman Collegiate Institute in Saskatoon, SK

8.2 Benefits of Clubs

Clubs make positive contributions because they integrate interconnected issues, combine action and education, promote positive peer-pressure, and allow like-minded youth to meet others with similar interests while providing a means to expand the interests of peers who may not have previously held those values and commitments.

9.0 *Trails and Zoos*

Another entry point into environmental awareness for youth is interaction with established nature trails and large parks or zoos. Accessible in cities, these settings allow for connection with captive or wild animals and exploration of partially or entirely natural ecosystems.

9.1 Saskatoon Forestry Farm Park and Zoo

The Saskatoon Forestry Farm Park and Zoo (https://www.saskatoon.ca/parks-recreation-attractions/events-attractions/saskatoon-forestry-farm-park-zoo; see also https://saskatoonzoosociety.ca/) defines its role as providing 'a cornerstone of ecology, inspired learning and lasting memories.' Originally the site of a tree nursery that supplied tree stock for a large region of the province, the site also contains indoor and outdoor animal enclosures. Children and youth can be involved in organized programs, school visits, or family excursions that encourage learning, appropriate action, and service (Fig. 7).

Fig. 7. Zoos can build interest in and foster relationships with animals and habitats from an early age

9.2 Meewasin Valley Trail

The Meewasin Valley Trail (see http://meewasin.com/) is an extensive trail system along the South Saskatchewan River. It protects pristine wilderness and permits active exploration while educating about natural and cultural heritage. Whether on their own, with their families, or as members of clubs and organizations or school classes, youth explore the trails on foot, boards, skis, or bikes, and can use watercraft on the river as well.

9.3 Benefits of Trails and Zoos

Trails and zoos facilitate exploration; allow for active pursuits within natural settings; build interest in and relationships with animals and habitats; and educate through signs, encounters, and programming.

10.0 *Online Volunteer Options*

Online opportunities to volunteer on projects set up by researchers around the world allow youth to participate in citizen science activities that educate about conservation and environmental issues.

10.1 Zooniverse Citizen Science

Zooniverse (https://www.zooniverse.org/) is an online platform for collaborative volunteer research as a citizen scientist. The site provides opportunities for people around the world to contribute to real discoveries in fields ranging from astronomy to zoology. Active participants look at digital video footage and assist in scientific research by identifying species and species behaviour.

10.2 Benefits of Online Volunteering

Combining the contributions of many citizens allows time-consuming video analysis to be completed in a much shorter time than would otherwise be possible and without the need for vast financial resources. Volunteering with online projects allows youth to build expertise while contributing to baseline research and to assist researchers with high-volume analysis. It allows for flexibility in location, duration, and time of engagement, thereby enabling youth to volunteer in ways that fit complex and variable schedules. It also permits youth to be engaged in international research without incurring the travel costs or heavy carbon footprint of actual travel.

Conclusion

Every program or approach will be beneficial for some young people in some ways, and each type has its own distinct contribution. Some general observations can be made about the benefits of the various routes to awareness building and activism. An entry point for children

is frequently their early upbringing that includes books and programs, and family initiatives such as zoo visits and exploration of natural settings such as trails. Older youth are usually engaged through school, and particularly via innovative programs and through requirements to participate in competitions and contests that raise ecological awareness. Adventure, whether on local trails or in exotic expeditions, and overseas educational programs also entice youth. Those with a strong interest in people may volunteer with youth programs that engage with nature, or be pulled into environmental activities and projects by friends who care. Meeting youth where they are –which is frequently on electronic media– is another avenue. Both online volunteering through citizen science or encounters with social media that raise awareness and promote political engagement and activism are useful approaches. All of these types of approaches can set youth on a pathway to sustained environmental awareness and action (Fig. 8).

Fig. 8. Title screen for video short prepared by Alana Krug-MacLeod for the "Why?Why Not" climate and environment awareness campaign

However, none of the approaches is entirely effective, and some may promote negative values in unanticipated ways. Alternative lifestyles or positive behaviours that are adopted within certain contexts may disappear or erode once students leave the environments where the expectations were normative or when alternative peer pressures mount. Funding and rewards may provide incentive for initial participation in environmental ventures, but also may involve people for the wrong reasons, leading to temporary or ineffective results. Engaging youth in corporately sponsored programs may allow organizations with negative environmental impacts to look better than they are, covering for their negative environmental impacts. It may also end up influencing vulnerable youth to be predisposed to view corporations favourably even if their interests are at odds with the goals of

conservation. Rewarding only a select few people in competitions may discourage good ideas simply because they are not packaged well enough, are too radical, or are too complex to be easily understood or implemented. Some programs may only be accessible to a few of the much larger group of students or individuals who may be interested, and being unable to participate may discourage those not accepted and will limit the pool of those who should benefit. Focussing on electronic media (websites, digital images, etc.) may take the focus off nature or become a substitute for the real thing. Information that is not fully researched or accurate can easily be distributed or taken as accurate if not carefully assessed, leading to counter-productive results. These are only a few of the potential limitations or dangers of the approaches outline above.

What this discussion shows is that identifying and surveying the ten types of approaches that seem able to draw youth into conservation and sustainability criteria is only the first step in a longer assessment process. There is no single route that will work best. Effectiveness and fit depend on individual characteristics, age, cultural norms, life circumstances, personality and temperament, resources, aptitudes, interests, supports, networks, and a multitude of other factors. For some individuals, certain program costs may be prohibitive, expectations may be too academically challenging, or programs may be inadequately supervised or too unstructured. Different approaches will work for different people in different circumstances, and these may vary over time. Depending on what criteria one uses, keeping as many options open as possible may be the best solution, or being selective may yield the best results.

Academic literature highlights some salient points to keep in mind in assessing which approaches will motivate youth to become engaged. Buttigieg & Pace (2013, p.38–40) warned that single variable approaches cannot be used because people are too complex. Some motivators for engagement in sustainability include: a sense of competence when challenges are met and successful outcomes are achieved; opportunity to do more than allowed at work or school; commitment to an organization that depends upon individual contributions; positive feelings gained from team experiences; sense of deeper relationships than possible otherwise; friendship; recognition for what one does; opportunity for holistic learning in which personal, analytical, and social skills all develop; sense that it is practical and directly applicable knowledge that matters; education and background that may lead to employment; opportunity to see and experience the world while making a contribution. An Alberta study on sustaining youth engagement points to factors that support and limit youth engagement, and each of these factors would be relevant within the programs discussed (Alberta Emerald Foundation 2008). Among other things, youth must be heard, granted meaningful leadership roles, feel that they belong, see results, and have opportunities to exercise their imagination. Wilson (2011) observed that free choice learning is an important piece of youth engagement with nature. Others have emphasized the importance of building relationships with nature. For example, Boudreau (date unknown, p. 18-19), discussing work by Hewitt (1997), pointed out that: "The use of varied educational

strategies, like educational games, allows young people to get more involved in their own learning process, and increases their awareness of current ecological issues. A curriculum that teaches facts and concepts can have a slight effect on students' attitudes toward the environment, but involving them directly in their community and in the resolution of environmental problems encourages them to become more active and responsible." Building on the work of Palmer et al. (1998), Buttigieg & Pace (2013, p.40-41), noted that, "Knowledge . . . on its own is often not enough. [Environment and Sustainable Development] programmes need to provide environmental knowledge that is coupled with direct experiences in nature that provide learners with an enduring sense of personal interconnectedness with nature that fosters environmental concern and respect." Observations about what types of approaches lead to strong sustainability perspectives could be integrated into many of the approaches to youth engagement.

The plethora of existing approaches to youth engagement in environmental issues provides a good starting point for sustainability advocated to build upon. After describing the types of approaches, some conclusions have been drawn based on observation, experience, and relevant literature to assess how, why, and to what extent these avenues successfully foster conservation awareness and sustainability values. It is a more complex process to determine specifically what works and what does not, for whom, and why. Engaging youth in conservation, environment, and sustainability activities is critical for long-term survival, and thoughtful planning about how to best encourage full participation is crucial to mobilizing youth to the cause.

Literature Cited

Alberta Emerald Foundation (2008) Backgrounder on youth environmental engagement in Alberta. Available at http://www.abcee.org/cms/wp-content/uploads/2010/10/Backgrounder-on-youth-engagement-FINAL.pdf

Boudreau G (date unknown) Behavioural Change in Environmental Education. Université De Moncton. Available at http://www8.umoncton.ca/littoral-vie/ecosage/gaston1.rtf

Buttigieg K, Pace P (2013) Positive youth action towards climate change. Journal of Teacher Education for Sustainability 15:15–47

Hewitt P (1997) Games in instruction leading to environmentally responsible behavior. The Journal of Environmental Education 28:35–37

Palmer JA, Suggate J, Bajd B, Hart PKP, and others (1998) An overview of significant influences and formative experiences on the development of adults' environmental awareness in nine countries. Environmental Education Research, 4:445–464

Wilson C (2011) Effective approaches to connect children with nature. Department of Conservation, Wellington, New Zealand. Available at http://www.doc.govt.nz/Documents/getting-involved/students-and-teachers/effective-approaches-to-connect-children-with-nature.pdf

Suggested Reading

Ardoin N, Wheaton M, Bowers A, Hunt C, Durham W (2015) Nature-based Tourism's Impact on Environmental Knowledge, Attitudes, and Behavior: A Review and Analysis of the Literature and Potential Future Research. Journal of Sustainable Tourism. Available at https://people.stanford.edu/nmardoin/sites/default/files/documents/Ardoin_Wheaton_Bowers_Hunt_Durham%202015.pdf

Gillette B (2014) Relationships between Middle Childhood Outdoor Experiences and an Adult Individual's Knowledge of the Environment. PhD dissertation, University of Kansas. Available at https://kuscholarworks.ku.edu/bitstream/handle/1808/18397/Gillette_ku_0099D_13744_DATA_1.pdf?sequence=1

Schusler T, Krasny M (2008) Youth Participation in Local Environmental Action: an Avenue for Science and Civic Learning? In: Reid A, Jensen BB, Nikel J, Simovska V (eds) Participation and Learning: Perspectives on Education and the Environment, Health and Sustainability. Springer, New York, NY, p 268–284

Poster designed by A. Krug-MacLeod in support of the #WhyImWatching awareness campaign

CHILDREN IN NATURE: LEARNING ABOUT INTERRELATIONSHIPS

JANET MCVITTIE, MEAGAN GUTTORMSON

Department of Educational Foundations, University of Saskatchewan, 28 Campus Drive, Saskatoon, SK S7N 0X1, Canada. Email: janet.mcvittie@usask.ca

Abstract: The purpose of this study was to determine what kinds of ecological concepts early learners (children aged 3 to 5 years old) would learn while visiting a one-hectare naturalized garden at least once a week, for 90-minute sessions. The 15 children had a few structured activities, but, for the most part, engaged in free play. When children noticed interesting things, or had questions, they would contact the teachers. Meanwhile, researchers observed and jotted notes about play and conversations. Between activities, children participated in group discussions; as well, they discussed their learning before returning to their day care. Notes of observations and conversations became data for the study. From these data, some preliminary understandings of the children's intellectual growth regarding ecological concepts have been developed. In the paper, a suggestion for a process for engaging with children about ecological concepts is developed.

There are many reasons for children spending more time in nature. Louv (2005) drew on an accumulation of research on the benefits of spending free time in nature, to develop a concept of the 'Nature Deficit Syndrome,' to explain numerous societal and individual ills of North American children. Research has demonstrated that spending time in nature leads to children being healthier physically (Fjortoft 2001), sleeping better at night (Fjortoft 2001), developing better large muscles and coordination (Soerstrom et al. 2013), and concentrating better, with research addressing attention deficit/hyperactive children specifically (Faber Taylor & Kuo 2009). Some research has indicated that children can be very creative in natural settings (Melhuus 2012), and even more research has shown that children can learn numerous curricular concepts while in natural settings. However, perhaps the most important reason for children spending time in nature is for them to come to understand the relationships within the natural world, and that we, humans, are also natural and part of those relationships. The questions that drove this study were: Do children see the world as a world of relationships? What kinds of assistance might adults provide for children, such that they learn humility for interacting with and having relationships with other beings on the planet?

Results of the study demonstrated that these early learners carried typical Western cultural popular notions of the different species they interacted with, but their notions were malleable. For example, a discussion between two boys involved one boy wanting to kill a spider, and the other admonishing him, saying that the spider was "part of nature. Everything is part of nature." The first boy respected this information and left the spider

alone. A little girl said she was afraid of a dragonfly, because "red ones are poison – that's what I learned from my Dad." However, after the adult she was with explained that dragonflies eat mosquitoes, she was more comfortable the next day, saying "I love dragonflies, you know why? They eat mosquitoes." Nonetheless, she continued with a concern, noting that dragonflies sometimes eat birds. (Fear is an emotion some children will choose to experience. It would seem that fear of dragonflies was something this child wished to retain!)

Their cultural stereotypes emerged also when asked to behave like particular organisms in the garden. They did not first observe ground squirrels when asked to 'be' a ground squirrel, but instead dropped to all fours and crawled in the garden. Being a ladybug meant getting on all fours and moving slowly, preferably on leaves (which they had to find on the ground). When asked more challenging questions, they were pushed to show their understandings of relationships. Thus, when asked to 'be sunshine,' the children spread arms and legs and noted that they were shining on this or that natural object in the garden. Children are generally cooperative, and when asked questions about 'things,' they will answer about things; when asked questions about relationships, they will answer that way. Nonetheless, their answers rarely involved close observation.

Our conclusions for this research were to consider what kinds of questions adults could pose that would support children's learning about nature. We concluded that these questions should provoke close observation, and attach the observations to interrelationships. For example, a question could direct the children to find a ladybug and watch it to see if it will eat something, or to find a plant with a flower, and look all over it to see what is living on that plant. Children could be invited to compare different organisms, on aspects that reveal the species' roles – for example, how many legs does a caterpillar have, compared to an earthworm? Where is each found and how might its legs help it where it lives? These kinds of questions should provoke greater learning about how all aspects of nature work together to create a healthy biodiverse environment.

Literature Cited

Faber Taylor A, Kuo FE (2009) Children with attention deficits concentrate better after walk in the park. Journal of Attention Disorders 12:402–409

Fjortoft I (2001) The natural environment as a playground for children: The impact of outdoor play activities in pre-primary school children. Early Childhood Education Journal 29:111–117

Louv R (2005) Last child in the woods: Saving our children from nature deficit disorder. Algonquin Books, Chapel Hill, NC

Melhuus EC (2012) Outdoor day-care centres – a culturalization of nature: How do children relate to nature as educational practice? European Early Childhood Education Research Journal 20:455–467

Soerstrom M, Boldemann C, Sahlin U, Martensson F, Raustorp A, Blennow M (2013) The quality of the outdoor environment influences children's health – a cross-sectional study of preschools. Acta Pædiatrica 102:83–91

GRASSLAND MATTERS: FOSTERING A COMMUNITY OF CONCERN IN SASKATCHEWAN

LORNE SCOTT, TREVOR HERRIOT, **JOANNE HAVELOCK**, JILL VAISEY, KATHERINE ARBUTHNOTT

Public Pastures – Public Interest. Email: public4pastures@gmail.com

Abstract: In 2012, the Conservative Government in Ottawa decided, without any consultation, to abandon the Prairie Farm Rehabilitation Administration (PFRA), including some 1.8 million acres of grasslands in 62 community pastures in Saskatchewan. In response, a group of rural and urban citizens formed Public Pastures - Public Interest (PPPI). The PFRA pastures contain some of the best managed and largest tracks of grasslands in western Canada, home to over 30 Species at Risk. Grazing is recognized as an important tool in managing grasslands. The lands contain heritage sites from early settlers, Métis, and First Nations' peoples, and they are and have been integral to rural life. PPPI has lobbied Federal and Provincial Governments to ensure that the pastures remain in Crown ownership to conserve and protect their natural landscapes, biological resources, and heritage values. Public education via print materials, photos, social media, and events such as speakers, films, an author tour and dinner, musical events, pasture tours, and media coverage have conveyed the values and concerns about the grasslands' future, to connect and motivate people and encourage action. PPPI has also engaged in dialogue with ranchers, environmentalists, and government about the best ways to manage and conserve these critically important grasslands.

THE NORTHEAST SWALE: URBAN ENCROACHMENT AS WE SPEAK

LOUISE JONES

Northeast Swale Watchers, Saskatoon, SK

Abstract: The Northeast Swale is an ancient river channel that runs northeast from Peturrson's Ravine, beginning on the east side of Saskatoon's Central Avenue. In its entirety, it parallels the South Saskatchewan River northeast and re-enters it a distance of 26 km downstream. It represents one of the largest pieces of unbroken prairie/wetland in the Saskatoon region with patches of rare fescue grassland. A rare marl bog at Peturrson's Ravine supports naturally rare plants. The Swale is home to several bird Species at Risk. The Northeast Swale Watchers are a group of concerned citizens including experts in many fields related to the health of the Swale, and many organizations dedicated to conserving and protecting natural species and spaces. Many citizens of Saskatoon share our interest in protecting this jewel in the crown of Saskatoon's natural areas. Having little parcels of land is not the same thing as having continuous wildlife corridors; although the one may appear to serve the same function, it does not. For plants and animals to thrive, areas of native prairie no smaller than 225 ha are required. Urban growth pressures continue, relentlessly, to have a deleterious effect on the natural world and therefore on us, whether we fully realize this or not. Given the preponderance of urban populations in Canada, it is important to engage people in protecting these natural areas within an urban setting. This conference provides an excellent opportunity to discuss such a timely topic as conserving biodiversity and ecological integrity of natural areas within an urban setting. This is a huge challenge to Saskatoon at this time, as we are in a period of rapid growth of suburban neighbourhoods and the associated expansion of our urban boundaries. While our new neighbourhoods are high density, they are still encroaching into surrounding natural areas. The cumulative effects of the neighbourhoods of Evergreen, Aspen Ridge, and, sometime in the future, the proposed UH3 on the Northeast Swale are a case in point.

USING SOCIAL SCIENCE TO PROMOTE COMMUNITY ENGAGEMENT IN CONSERVING PURPLE MARTINS

GLEN T. HVENEGAARD

University of Alberta – Augustana Campus, 4901-46 Ave, Camrose, AB T4V 2R3, Canada.
Email: glen.hvenegaard@ualberta.ca

Abstract: Social science research is critical to support effective wildlife conservation efforts. The purpose of this paper is to highlight how social science research can guide community engagement strategies to support purple martin (*Progne subis*) conservation. Purple martin populations in Canada have declined significantly in the past few decades. Since purple martins in the prairies are almost fully dependent on human-provided nest boxes for nesting, carefully managed nest boxes can double the reproductive success of martins. Therefore, my collaborators and I conducted four social science research projects to promote citizen engagement in purple martin nest box stewardship. First, understanding the motivations of martin 'landlords' (i.e., individuals who provide and maintain nest boxes) helped us better recruit and retain landlords through networking events and information. Second, analyzing our community-based wildlife festival helped us recruit new landlords, as well as promote mutual support, education, and friendly competition among existing martin landlords. Third, we learned how citizen science projects can generate significant benefits for participants, support for wildlife conservation, and engagement in community projects. Last, understanding how martins serve as a flagship species can generate benefits in the larger community for wildlife conservation and greenspace protection.

Introduction

In a time of rapid and widespread global change, the disciplines of wildlife management and conservation biology seek to maintain the earth's biological diversity. To improve performance, these fields need research input from a variety of disciplines, including the basic biological sciences, applied management sciences, physical environment, and implementational environment (Hunter & Gibbs 2007). More recently, and despite the historical separation, wildlife management and conservation biology have begun to embrace the role of social science research in conserving biological diversity (Sandbrook et al. 2013). Indeed, the importance of social science research techniques in conservation (e.g., Newing 2011) has been recognized by groups such as the Society for Conservation Biology (Social Science Working Group 2009), Alberta Parks (Alberta Parks Social Science Working Group 2015), and others (Murphy 2005, West et al. 2006). Social science research is important because it contributes an understanding of the field of wildlife conservation, as well as the

underlying social, political, and economic conditions affecting conservation efforts themselves (Sandbrook et al. 2013). This paper seeks to examine how social science research projects support an overall effort to conserve one bird species of concern in North America.

In a recent review of bird population trends of various taxonomic groups in North America, aerial insectivores have declined by more than 60% since 1970 (NABCI 2012). Moreover, within this group, the subgroup of swallows, swifts, and nightjars has declined by over 80% (NABCI 2012). One of the swallow species, the purple martin (*Progne subis*) breeds in North America (i.e., eastern USA, southeastern Canada, and extending into central Alberta) and winters mostly in Brazil (Fraser et al. 2012). Within Canada, the population of purple martins has declined an average of 1.5% per year since 1970 (Environment Canada 2014), and the Prairie Pothole population has decreased by 5.4% per year since 1999 (Environment Canada 2014). However, the populations in Alberta and Saskatchewan, nesting at the northernmost edge of their range, have increased by an average of 3.6% and 4.1% per year, respectively, since 1970 (Environment Canada 2014).

Why are these populations increasing, while others are declining? Very likely, these trends are due to food availability, habitat loss, pesticide use, and climate change affecting breeding grounds, wintering areas, or migratory routes (Fraser et al. 2012). However, efforts at local conservation might be playing an important role as well. In particular, purple martins east of the Rocky Mountains are almost fully dependent on human-provided boxes for nesting (Fig. 1). Thus, conservation of martin populations requires the natural sciences to build appropriate martin houses, find adequate locations, and attract martins. In addition, these houses require vigilant volunteers (called 'martin landlords') to manage the nest boxes to successfully fledge young martins.

Fig. 1. Purple martins are almost fully dependent on human-built nest boxes for nesting east of the Rocky Mountains

Many landlord programs are run by local communities or by continental conservation organizations (Hill 1995). Diligent landlords regularly maintain and check nest boxes, monitor martin activities, collect standardized data, and protect against exotic species. Many landlords also detect and remove nest parasites and provide food in harsh weather. Indeed, properly managed nest boxes fledge twice as many young as those that are not well maintained (Hill 1997, 1998). Thus, the other challenging part of conserving martins is to engage people in purple martin nest box stewardship, by attracting martin landlords, maintaining their interest, and ensuring that they use appropriate management methods. Therefore, using the case study of Camrose, Alberta, the purpose of this paper is to highlight how social science research can provide guidance for community engagement strategies to support purple martin conservation.

Camrose, located 80 km southeast of Edmonton, has a population of about 17,000 people and is situated at the northern edge of the Great Plains in the aspen parkland natural region. Camrose was the first community in Alberta to use nest boxes to attract purple martins in 1918 (Finlay 1975). In 2002, the Camrose Wildlife Stewardship Society (CWSS) was formed to promote wildlife and greenspace conservation in the area, based on education, policy development, stewardship, and research (Hvenegaard & Barr 2015). In particular, the CWSS uses the purple martin as its flagship species as a way to engage with the local community in wildlife conservation. The CWSS facilitates a group of up to 50 martin landlords in the city, both on private and public property. Of the 109 martin houses throughout the city in 2015, 32 hosted at least one pair of martins and many other houses could also host martins, given enhanced maintenance (e.g., house condition, proximity to trees) and monitoring (e.g., regular inspections, removal of house sparrow nests) by committed landlords. Based on its work, environmental education, and wildlife stewardship, the CWSS was awarded a 2015 Alberta Emerald Award for environmental excellence in the community category.

Motivations of Martin Landlords

The first social science project conducted by my research group focused on the motivations of landlords to manage martin nest boxes (Tremblay & Hvenegaard 2008). Like many wildlife agencies with declining budgets, management programs are increasingly dependent on volunteers to assist with conservation projects. Knowledge about the volunteers would help recruit and retain martin landlords. In 2006, we interviewed 14 of 21 landlords in the Camrose community regarding their initial and ongoing motivations, benefits, and satisfactions regarding their landlord experiences. Regarding gender, 5 respondents were female and 9 were male. For occupation, 8 were retired and 6 were presently employed. Respondents had an average age of 65 years and average of 12 years of landlord experience. Eight were members of, and 9 donated time or money to, an environmental organization. We learned that landlords' participation levels changed over time, with some becoming

more interested and engaged, while others decreased their participation due to physical constraints.

We found that the motivations could be placed into two categories. In terms of egoistic motivations, landlords sought to benefit themselves through interactions with martins (Fig. 2). First, landlords developed a connection with martins by engaging with the birds throughout the nesting process. Second, landlords gained a sense of achievement and pride in their efforts by successfully attracting martins and helping them fledge young birds. Third, landlords were motivated by social interaction with other martin supporters, by sharing enthusiasm, developing friendships, and promoting friendly competition. Fourth, landlords were motivated to participate due to the potential for learning about martin ecology. Last, landlords simply enjoy their participation, and often talk about the fun, joy, and happiness derived from martin conservation.

Fig. 2. A martin landlord holding a purple martin

Next, in terms of altruistic motivations, landlords participated in order to benefit other people or things. Some landlords wanted to support the intrinsic value of nature, or the inherent good of martins, regardless of whether people were helped or not. Other landlords wanted to help martins because they had low populations or were dependent on human-provided nest boxes. Still other landlords wanted to serve the community or future generations, as they would benefit from having healthy martin populations.

From this initial study, we concluded that landlords have a variety of motivations, especially achievement, enjoyment, and learning, but most related to social interaction with people and direct interaction with martins. To meet the needs of landlords, organizers implemented several strategies that addressed education and support of martin management, and placed stewardship efforts in the broader context of martin conservation. Social gatherings to promote information sharing, enthusiasm, record keeping, and friendly competition were key to maintain interest in the landlord program.

Impacts of a Purple Martin Festival

Our second social science project examined the annual Camrose Purple Martin Festival, which was started in 2010. The purpose of the festival is to 'provide a high profile, community-based nature tourism event to showcase the vision and work of the Camrose Wildlife and Stewardship Society' (Hvenegaard & Kaiser 2015, p. 4). The festival raises awareness about purple martins and other wildlife species, promotes networking among nature enthusiasts, and supports a martin landlord and nest box program. In late June of each year, the festival attracts people to hear research presentations, participate in workshop discussions, accompany field trips, and interact with fellow participants. In order to understand the participants better, we surveyed festival participants between 2010 and 2015 about their demographic characteristics, origins, reasons for attending, benefits, and expenditures (Hvenegaard & Kaiser 2015).

An average of 95 people participate each year, with attendance ranging from 80 to 130 participants. The mean female to male ratio was 46:54, with an average age of 60 years. Over 52% of the participants came from outside of Camrose, some from over 1200 km away. Of those external visitors, 95% came specifically for the festival. Over 93% of respondents would definitely or probably attend the festival again. Attendees spent an average of $79.67 per person (as high as $1500), mostly in the Camrose area.

The most common reasons for attending the festival related to interests in birds, wildlife, and nature in general, but specifically related to learning about enhanced management of martin colonies (Fig. 3). Among the most liked aspects of the festival were opportunities to network with like-minded people. Attendees liked information about managing martin nest boxes, the guest speakers, and the tours to nearby martin colonies. By determining these motivations and attractions, organizers were able to continue developing the festival and spreading the word about the purple martin landlord program. Overall, wildlife festivals generate several positive environmental, social, and economic impacts (Hvenegaard 2011). The Purple Martin Festival, in particular, supports a growing and cohesive network of martin landlords, provides funds to purchase an additional nest box or two each year, generates expenditures in the local community, and has stimulated a research program on the nesting and migration dynamics of purple martins (Hvenegaard 2014).

Fig. 3. A martin landlord demonstrating to festival participants how an effective purple martin house works

Benefits of a Citizen Science Project

The migration ecology research project provides valuable information to support conservation initiatives at important sites in Canada and the USA (the breeding territory), throughout Brazil (the wintering territory), and migratory routes and stopover points in between. Building on a larger effort across North America using geolocators to track migration movements (Fraser et al. 2012), the local project started in 2012 and continues to the present. In the Camrose area, students, volunteers, and I attach light level geolocators onto adult martins (Fig. 4), who proceed to migrate south and north with these 1.1-g units; we then retrieve as many as possible when the birds return to Camrose the following summer. The data retrieved from the geolocators provide daily locations and movements, which greatly assist continental conservation programs.

Fig. 4. Geolocator attached to an adult purple martin

The research project supported collaboration between landlords, other martin supporters, and researchers, while producing opportunities for citizen science. Thus, our third social science project studied the expectations, benefits, and perceptions of citizen scientists participating in the project, in order to better manage the project for volunteer engagement (Hvenegaard & Fraser 2014). In November 2013, we interviewed 16 of the 30 citizen science volunteers who participated (i.e., locating, trapping, and handling birds) over the previous two years near Camrose and Lacombe, Alberta. Respondents rated the importance of various motivations and perceived benefits, and explained the impacts of their participation on awareness and engagement.

The average age of citizen scientists was 48 years, and 75% of respondents had a Bachelor's degree or higher. Half of the respondents were involved in the project for one year and the other half for two years. The initial motivations rated highest were helping a species in need and learning about purple martins. Respondents rated the perceived benefits very similar to the initial motivations, with the addition of meeting like-minded people. Other studies of citizen scientists have found that the most important motivations related to helping the environment, social belonging, and learning (Bramston et al. 2011). Overall, respondents were satisfied, with 81% saying that the experience either matched or exceeded their expectations. In addition, by participating in the project, 38% became aware of local

environmental issues (e.g., proper care of martin houses, use of pesticides), and 81% became aware of provincial to international issues (e.g., climate change, deforestation, other martin threats). Similar to other studies (Cronje et al. 2011, Jordan et al. 2011) showing that participation promotes subsequent stewardship behaviours, 44% of citizen scientists became involved in other local projects (e.g., putting up bird nest boxes, volunteering at a bird observatory), and 50% increased their environmentally-friendly behaviours (e.g., feeding birds, reducing greenhouse gas emissions). Most importantly, citizen scientists wanted to continue involvement in the project.

These results show that helping martins and learning about their ecology were key motivations of citizen scientists. Again, as with the martin landlords, social interaction is an added benefit. Researchers may be able to attract citizen scientists with promises of helping wildlife and learning about the target species, but should also ensure positive social interactions (Dickinson et al. 2012).

Martins as a Flagship Species

Our last social science project evaluated how well purple martins can be used as a flagship species, which are species that 'promote conservation awareness and stewardship efforts of people' (Rempel & Hvenegaard 2013, p. 19). A flagship species can generate financial contributions, environmental awareness, citizen science involvement, and general public support for wildlife conservation. We assembled a list of criteria that would support the use of purple martins as a flagship species (Home et al. 2009). Among a longer list, criteria for international flagship species generally include those which are charismatic, large, warm-blooded, carnivorous, and require a large area. Criteria for a local flagship species include charismatic characteristics, easy to see, not linked to human–wildlife conflicts, culturally significant, symbolic of the region, and economically important.

We then interviewed a total of eight representatives of two organizations, viz. the CWSS as a local organization and the Purple Martin Conservation Association (PMCA) as an international organization. The purple martin is the flagship species for the CWSS because '1) martins are strongly connected to people through nest box provision, 2) there is active interest in martins by many community members, and 3) aerial insectivores are in steep decline throughout Canada and North America and need conservation help' (Hvenegaard 2012, p. 26). The martin is the flagship species for the PMCA because it is the focus of the organization. Overall, purple martins met 12 of the 14 criteria for flagship species at the local level and 9 of the 13 criteria at the international level. Most respondents thought the CWSS and PMCA were using purple martins reasonably well as a flagship species, but could increase their impact. Respondents thought that the effectiveness of this flagship species could be strengthened by offering more high-profile events (e.g., martin festivals, roost events) and emphasizing educational programs to people of all ages (e.g., at parks or schools).

We concluded that these types of events could take advantage of the work and enthusiasm of teachers, school administrators, and, most importantly, local landlords. In particular, a focus on martin ecology could increase interest about other aspects of the natural environment, since martins are ecologically connected to predators, prey, other habitats, other countries, and weather and climate. Thus, it appears that the charismatic purple martin can be a valuable flagship species to promote conservation of other aerial insectivores and wildlife in general.

Conclusions

Our efforts to examine the social science factors associated with purple martin conservation have revealed some important lessons. First, information about the social factors in conservation biology can directly support the broader population and habitat goals for the target species (Hunter & Gibbs 2007). In this case, improving local support for, and landlord engagement with, martin nest box stewardship can lead to higher martin populations. In turn, we hope that we can improve our efforts to recruit and nurture landlords over time (Fig. 5).

Fig. 5. A martin landlord showing a martin nest to interested children and adults, all potential future landlords

Second, the results obtained from these social science projects can lead to new initiatives that provide benefits to the martins and to people involved in martin stewardship. For example, opportunities for information exchange, mutual support, and social interactions can provide benefits for landlord satisfaction, sense of achievement, and networking. In addition, like all research projects, these social science efforts have raised other interesting questions worthy of further research (Newing 2011), such as landlord specialization, brand marketing with wildlife, community engagement, value of ecological services, and leakage of economic impacts.

Third, the multi-faceted approach to social science research can support conservation efforts on many fronts. For example, understanding citizen science engagement encouraged more local volunteers. Similarly, documenting the social, economic, and environmental impacts of the wildlife festival led to increased landlord and community engagement. As well, identifying and characterizing a flagship species allowed for potential conservation and community benefits beyond that target species. For example, the CWSS has proposed that Camrose be declared the Purple Martin Capital of Alberta (or Canada) as a means to generate tourism development and regional interest in martin conservation.

Last, wildlife conservation requires an integrated approach (Hvenegaard & Trefry 2011), involving input from a variety of information sources and participants. Conversing with, and learning from, the people involved in martin conservation (i.e., the landlords, citizen scientists, donors, and volunteers) can lead to a great sense of empowerment and engagement. Those involved in any aspect of wildlife conservation need to be heard, supported, and recognized. Social science research efforts can assist greatly in this task.

Acknowledgments. I thank the many research assistants, stewardship coordinators, and students who have helped with this project, including S. Rempel, L. Fraser, C. Tremblay, L. Trefry, A. Kaiser, R. Corcoran, L. Gomez Villasenor, A. Avdeef, and S. Froland. I also thank the many martin landlords, volunteers, and community members in Camrose who have supported this project, especially T. & E. Tomaszewski, R. Pilger, C. Clarkson, D. Olofson, M. Barr, H. Cail, J. Bergstrom, and R. Ross. Special thanks to the organizations who have financially supported the purple martin Festival over the past few years, especially the Alberta Conservation Association and RossAgri.

Literature Cited

Alberta Parks Social Science Working Group (2015) Draft: Alberta Environment and Parks, Parks and Protected Areas Social Science Framework. Alberta Centre for Sustainable Rural Communities, Camrose, AB

Bramston P, Pretty G, Zammit C (2011) Assessing environmental stewardship motivation. Environment & Behavior 43:776–788

Cronje R, Rohlinger S, Crall A, Newman G (2011) Does participation in citizen science improve scientific literacy? A study to compare assessment methods. Applied Environmental Education & Communication 10:135–145

Dickinson JL, Shirk J, Bonter D, Bonney R, Crain RL, Martin J, Phillips T, Purcell K (2012) The current state of citizen science as a tool for ecological research and public engagement. Frontiers in Ecology & the Environment 10:291–297

Environment Canada (2014) North American Breeding Bird Survey - Canadian Trends Website, Data-version 2012. Environment Canada, Gatineau, Quebec. Available at http://www.ec.gc.ca/ron-bbs/P004/A001/?lang=e&m=s&r=PUMA&p=L

Finlay JC (1975) Nesting of Purple Martins in natural cavities and man-made structures in Alberta. Canadian Field-Naturalist 89:454–455

Fraser KC, Stutchbury BJM, Silverio C, Kramer PM, and 10 others (2012) Continent-wide tracking to determine migratory connectivity and tropical habitat associations of a declining aerial insectivore. Proceedings of the Royal Society of London Series B 279:4901–4906

Hill JR (1995) Project Martinwatch: the world's largest team of backyard volunteers needs your participation! Purple Martin Update 6:10–13

Hill JR (1997) Why landlords should conduct weekly nest checks. Purple Martin Update 7:2–5

Hill JR (1998) How to use the baby photos and prognosticator to determine if the martin nestlings have fledged. Purple Martin Update 9:2–4

Home R, Keller C, Nagel P, Bauer N, Hunziker M (2009) Selection criteria for flagship species by conservation organizations. Environmental Conservation 36:139–148

Hunter ML, Gibbs J (2007) Fundamentals of Conservation Biology, 3rd edn. Blackwell Publishing, Malden, MA

Hvenegaard GT (2011) Potential conservation benefits of wildlife festivals. Event Management 15:373–386

Hvenegaard G (2012) Purple Martin festival promotes partnerships for conservation. Purple Martin Update 21:26–27

Hvenegaard G (2014) Geolocators and migration: migration patterns of martins nesting in central Alberta, Canada. Purple Martin Update 23:18–21

Hvenegaard G, Barr M (2015) Engaging the public in wildlife and greenspace stewardship in Camrose, Alberta: an analysis of outcomes, drivers, and lessons learned. In: Hallstrom

L, Beckie M, Hvenegaard G, Mundel K (eds) Taking the Next Steps in Rural Sustainability in Canada. University of Alberta Press, Edmonton, AB, p 43-62

Hvenegaard GT, Fraser L (2014) Motivations and benefits of citizen scientists engaged in purple martin migration research. Human Dimensions of Wildlife 19:561–563

Hvenegaard GT, Kaiser AN (2015) Ecotourism, conservation, and sustainability: a case study of the Camrose Purple Martin Festival. In: Vaugeois N, Parker P, Weighill A (eds) Innovative Leisure Practices: Cases as Conduits between Theory and Practice. Volume 1. World Leisure Center of Excellence in Sustainability and Innovation, University of Vancouver Island, Nanaimo, BC, p 1–10

Hvenegaard GT, Trefry L (2011) Integrated Purple Martin conservation in Camrose, Alberta, Canada. Purple Martin Update 29:22–24

Jordan RC, Gray SA, Howe DV, Brooks WR, Ehrenfeld JG (2011) Knowledge gain and behavioral change in citizen-science programs. Conservation Biology 25:1148–1154

Murphy JM (2005) The role of social science in park management. In: Social Science in Parks and Protected Areas: Proceedings of a Symposium held at the Algonquin Park Visitor Centre March 26 and 27, 2003. Algonquin Provincial Park and the Parks Research Forum of Ontario. PRFO Occasional Paper Series, Occasional Paper No. 3, p 3–5

Newing H (2011) Conducting Research in Conservation: a Social Science Perspective. Routledge, New York, NY

NABCI (North American Bird Conservation Initiative) (2012) The State of Canada's Birds, 2012. Environment Canada, Ottawa, ON

Rempel S, Hvenegaard GT (2013) Can Purple Martins be used as flagship species for wildlife conservation? Purple Martin Update 22:18–21

Sandbrook C, Adams WM, Buscher B, Vira B (2013) Social research and biodiversity conservation. Conservation Biology 27:287–490

Social Science Working Group (2009) Social Science Working Group Strategic Plan, 2009-2014. Society for Conservation Biology, Washington, DC

Tremblay CA, Hvenegaard GT (2008) For me or the martins? Motivations for being a Purple Martin Landlord. Purple Martin Update 17:10–13

West P, Igoe J, Brocking D (2006) Parks and people: the social impact of protected areas. Annual Review of Anthropology 35:251–277

OVER 50 YEARS OF ARCHAEOLOGICAL EDUCATION AND CONSERVATION WITH THE SASKATCHEWAN ARCHAEOLOGICAL SOCIETY

TOMASIN PLAYFORD

Saskatchewan Archaeological Society, 1-1730 Quebec Avenue, Saskatoon, SK S7K 1V9, Canada. Email: ED@TheSAS.ca

Abstract: The Saskatchewan Archaeological Society (SAS) in a non-profit, membership-based, voluntary organization that aims to educate people about archaeology and engage people in the protection and conservation of archaeological heritage. Since its inception in 1951, the identification, protection, and conservation of archaeological sites in Saskatchewan has been an objective of the society. A review of several SAS education and conservation projects will showcase the similarities between archaeological and biological conservation and will highlight the opportunity for possible future collaboration.

MULTIPLE APPROACHES TO HABITAT CONSERVATION: FINDING THE RIGHT FIT ENCOURAGES PRODUCERS TO MANAGE FOR SPECIES AT RISK HABITAT

KRISTA CONNICK TODD

South of the Divide Conservation Action Program Inc. Email: Krista.connicktodd@gmail.com

Abstract: Over the 2014-15 winter period, the South of the Divide Conservation Action Program (SODCAP) interviewed 50 ranchers within the Milk River Watershed, Alberta, asking for feedback on how best to deliver Species at Risk programming in the area. When asked what would be most effective to encourage producers to make Species at Risk a priority in their management decisions, the results varied. Suggestions included results-based agreements, cost-sharing programs for ranch improvements, as well as extension activities. The diversity of opinions and ideas derived from the interviews suggest that a 'one size fits all' approach to Species at Risk stewardship would not be suitable for ranchers in this area of the province. SODCAP'S goal is to develop a variety of approaches to meet many individuals' needs on their respective operations. Providing an assortment of programming, including basic communication of the specific habitat requirements for individual species, will help to conserve and maintain habitat for Species at Risk. The discussions often shed light on the fact that landowners are proud of the habitat that they provide and are willing to continue to actively manage habitat.

RANGE MANAGEMENT - A WAY OF LIFE

DIONNE FREIMARK

Box 107, Walsh, AB T0J 3L0, Canada. Email: lcfreimark@gmail.com

Abstract: My name is Dionne Freimark and I am 17 years old. My family and I ranch north of Walsh in southeast Alberta. I was the International Mountain Section-Alberta representative at the 2015 Society for Range Management's High School Youth Forum in Sacramento, CA. At the 2016 Prairie Conservation and Endangered Species Conference, I represent the youth who do care about the native prairie and are acting to conserve it. I present my perspective as a young rancher on the importance of native prairie, why it should be important to everyone, and how we all depend on it. People need to be informed about the rapidly disappearing native prairie and be engaged in how they can make a difference.

THE MILK RIVER INTEGRATED WATERSHED MANAGEMENT PLAN – A COMMUNITY APPROACH TO MAINTAINING A WATERSHED FOR FUTURE GENERATIONS

TIM ROMANOW

Milk River Watershed Council Canada (MRWCC), Box 313, Milk River, AB T0K 1M0, Canada.
Email: tim@mrwcc.ca

Abstract: The Milk River Watershed Council Canada (MRWCC) is a non-profit Watershed Planning and Advisory Council in Alberta, Canada. The Milk River Integrated Watershed Management Plan was completed in May 2014. The plan is not prescriptive, but provides guidance to resource managers, municipalities, landowners, leaseholders, industry, non-profit organizations, and provincial and federal governments. Through an extensive process of community and stakeholder engagement, desired outcomes related to surface water supply, water quality, groundwater, riparian areas and wetlands, biodiversity, land use, and the economy were determined. The Milk River watershed is fortunate to contain large contiguous tracts of native grassland and a variety of terrestrial and aquatic Species at Risk, many at the northern extent or their ranges. High levels of biodiversity are, in part, a product of the high percentage of Public Land found in the watershed and the stewardship actions of landowners and leaseholders. While biodiversity is highly valued in the watershed, it should not be maintained at the expense of basin residents' abilities to pursue their livelihood or to maintain economically viable farm and ranch operations, nor should it result in the erosion of private property rights. The IWMP seeks balance for biodiversity and economic stability required to maintain a community to steward our watershed.

USING RESULTS-BASED AGREEMENTS TO ENCOURAGE PRODUCERS TO MAKE SPECIES AT RISK HABITAT A HIGH PRIORITY

TOM HARRISON

Executive Director, South of the Divide Conservation Action Program Inc. Email: prairiecloudscape@sasktel.net

Abstract: Results-based agreements have the potential to be a very effective tool for habitat management for species on grazing lands. Results-based agreements provide a financial reward to landowners who meet specific habitat targets for a particular species. These agreements acknowledge that each operation is unique, and manages resources in different ways. In areas of critical habitat, they can make habitat management an important priority in the landowner's everyday decision making, along with the typical herd health and grass management considerations. These agreements, by providing a financial benefit, encourage producers to consider habitat needs in their management decisions. They may be a good tool in guaranteeing that habitat remains an important priority as land is bought and sold in the future. They are an excellent way of providing producer-initiated learning and discovery on specific habitat needs for critical species. Producers in southwestern Saskatchewan have the reputation for being independent and resourceful; over the years, they have conquered many different challenges and have found solutions that work for their individual operations. South of the Divide Conservation Action Program (SODCAP Inc.) feels that these agreements will work well with the independent, innovative attitudes of the producers in our area. Because the agreements are targeted to critical habitat areas, they are also a solid use of public funding, targeting specific habitat needs in areas that will most benefit a specific species. Results-based agreements are currently being piloted in southwestern Saskatchewan.

INTRODUCING WILD ABOUT SASKATOON'S NATURECITY FESTIVAL

CANDACE SAVAGE[1] (PRESENTED BY **JANET MCVITTIE**[2])

[1]Wild about Saskatoon, wildaboutsaskatoon.org. Email: wildaboutsaskatoon@gmail.com

[2]Department of Educational Foundations, University of Saskatchewan, 28 Campus Drive, Saskatoon, SK S7N 0X1, Canada

Abstract: Now in its fourth year, the NatureCity Festival is a week-long celebration of wildlife and wild places within the City of Saskatoon. Sponsored and coordinated by an informal group of volunteers called Wild about Saskatoon, the Festival brings together 70+ organizations and businesses to offer a varied program of nature-related outings, lectures, concerts, art-making, and classroom activities for people of all ages. Our objective is to encourage the residents of Saskatoon to appreciate the special beauty of this place and to value access to nature in their everyday lives, with the ultimate goal of recruiting more voices to advocate for wildness in the city and beyond. A made-in-Saskatoon original, the Festival has already inspired a similar event in Vancouver and has also garnered national attention. This presentation outlines the history, goals, successes, and limitations of the NatureCity Festival, as a model that other communities may wish to adopt and adapt.

SOCIAL MARKETING CAMPAIGN IN SUPPORT OF NORTH AMERICAN GRASSLAND CONSERVATION

COMMISSION FOR ENVIRONMENTAL COOPERATION (PRESENTED BY **SUE MICHALSKY**)

393 St-Jacques Street West, Suite 200, Montreal, QC H2Y 1N9, Canada. Email: suemichalsky@sasktel.net

Abstract: The North American Grasslands Alliance (NAGA) is an alliance of government agencies, ranchers, non-government conservation organizations, and other interest groups. The overall vision of NAGA is that North American grasslands are environmentally healthy and productive ecosystems that sustain working landscapes, conserve biodiversity, and support vibrant rural communities. Three tri-national meetings with partners and experts were held to establish NAGA and develop a multi-faceted collective framework to support North American grasslands. The top priority in the framework was the need to engage both rural and urban society to create broad support for grassland conservation. Under that priority, the Commission for Environmental Cooperation agreed to develop and disseminate a grasslands social marketing package by compiling data that supported the design of regional social marketing campaigns. A series of infographics was developed to convey key messages about the value of grasslands to North America, and the importance of ranching to the conservation of North American grasslands.

PHOTOGRAPHY AND CONSERVATION

BRANIMIR GJETVAJ

Branimir Gjetvaj Photography, 815 Reid Rd, Suite 314, Saskatoon, SK S7N 2W8, Canada. Email: branimir@shaw.ca

Abstract: Conservation efforts predominantly focus on solving biological problems, but solutions reside with people. The biggest threat to the environment is human apathy, i.e., lack of care or action. Vision and emotion drive us. If we are going to change people's perceptions and motivate social change, we have to connect with our audiences through emotion. Humans are visual creatures – we use optical clues to help us gain a sense of place and perspective about our surroundings. Throughout history, stories have been the primary vehicle for conveying messages and the transfer of knowledge. Visual language is a cornerstone of storytelling and a powerful communication tool. It is easy to understand, capable of presenting complex and abstract issues, such as climate change, in a simple and approachable way. To be effective, environmental NGOs must connect with people, inspire appreciation for nature, and convey the importance of living in harmony with the environment. Photography triggers emotional connection and initiates action. Unfortunately, non-profit organizations rarely dedicate sufficient resources for production of high-quality visual communication material to achieve desired goals. Here I present my experiences working in the field of conservation photography, and describe my efforts to deliver visual stories about the environmental and social problems facing our society. I suggest options for non-profits to strengthen their capacity in visual storytelling. My desire is to increase the capacity of environmental NGOs to tell their stories in a powerful and timely fashion in order to inspire, educate, and engage supporters and the public.

To learn more, visit www.branimirphoto.ca

Left: Create a sense of place – North Milk River at Sandstone Ranch, Alberta. Right: Every good story should have a leading character that viewers can connect with. Do we see humans as part of, or distant from nature?

SOCIETY FOR RANGE MANAGEMENT – PRAIRIE PARKLAND CHAPTER: A SMALL GROUP MAKING A POSITIVE SPLASH ON THE PRAIRIE LANDSCAPE

NADIA MORI[1], RENNY W. GRILZ[2]

[1]Saskatchewan Ministry of Agriculture, Watrous Regional Office, Box 520, Watrous, SK, S0K 4T0, Canada. Email: nadia.mori@gov.sk.ca (Society for Range Management – Prairie Parkland Chapter President)

[2]Meewasin Valley Authority, 402 Third Avenue South, Saskatoon, SK S7K 3G5, Canada. (Society for Range Management – Northern Great Plains Section President)

Abstract: Range management is an art and a science. Helping producers and land managers understand the science behind their best management practices is at the heart of the rangeland professionals' work tasks. Since its inception in 1987, the Society for Range Management (SRM) Prairie Parkland Chapter (PPC) has helped connect on-the-ground range managers with the scientific community and public interest. From youth to professional development and networking events, the PPC membership strives to provide leadership for the stewardship of rangelands based on sound ecological principles. Together with the Prairie Conservation Action Plan (PCAP), the SRM-PPC has hosted an annual tour in conjunction with the Native Prairie Appreciation Week (NPAW) for the last 17 years. Over the years, the tour has turned a spotlight on many range management principles and practices, offering a point of connection for ranchers, nature enthusiasts, and range management professionals. Through the support of the PPC, the University of Saskatchewan undergraduate range team has traveled to the SRM annual meetings to participate in the Undergraduate Range Management Exam. The local chapter has shown long-term support in preparing the students for the exam, traveling with them to the meeting and providing financial support to the team. After 28 years, the PPC continues to provide a forum for producers, students, and range management professionals to carry on the art and science of range management.

RARE PLANTS AND RANCHERS – STEWARDSHIP SOLUTIONS TO SPECIES AT RISK CONSERVATION

CHET NEUFELD

Native Plant Society of Saskatchewan, Box 21099, Saskatoon, SK S7H 5N9, Canada. Email: info@npss.sk.ca

Abstract: Rare Plants and Ranchers is a program developed by the Native Plant Society of Saskatchewan. This program is aimed at working with ranchers to develop site-specific beneficial management plans using an ecosystem-based approach to address threats such as invasive species and habitat loss/degradation for federally-listed plant Species at Risk (SAR) and their habitats in Saskatchewan. Participating ranchers are interviewed to gather information about SAR and SAR habitat on the land, and a comprehensive site assessment is then conducted. Based on this assessment, a site-specific management plan is produced for the rancher, containing all of the information collected as well as recommendations to benefit SAR. Ongoing support (logistical and financial) and monitoring ensure plan implementation and the long-term security of SAR populations. The benefits to this program are an increase in rancher knowledge of SAR, increased SAR stewardship, more effective SAR management, and reduction of threats to SAR.

NORTHERN PLAINS CONSERVATION NETWORK – CONNECTING CONSERVATION

CHERYL MANDICH[1], CLIFF WALLIS[2]

[1]American Bird Conservancy, PO Box 249, 4249 Loudoun Ave., The Plains, VA 20198-2237, USA

[2]Alberta Wilderness Association, 455 12 St NW, Calgary, AB T2N 1Y9, Canada. Email: deercroft@shaw.ca

Abstract: The Northern Plains Conservation Network (NPCN) is a collaboration of more than 25 non-profit and tribal organizations working together to conserve and restore the wildlife, habitats, and ecological processes of the Northern Great Plains. Our vision is a sea of grass supporting healthy wildlife populations and human communities. We seek to enable, energize, and inspire participating organizations by linking our efforts in support of this vision.

The NPCN

- Informs people about the vision, and about the ecological values and characteristics of the Northern Plains;
- Develops opportunities for greater participation in key NPCN issues;
- Accesses and analyzes data needed for furthering the NPCN vision;
- Shares approaches and information about common issues of concern to NPCN participants; and
- Identifies initiatives needed to implement the NPCN vision.

Our two current initiatives focus on bison and grassland birds, including greater sage-grouse. NPCN has a website (http://www.npcn.net) with an interactive mapping tool for the Northern Great Plains. We meet twice annually in different venues across the Northern Great Plains and hold webinars on topics related to our initiatives. Participation is open to all who support our vision and mission.

SASKATCHEWAN PLANTWATCH

LACEY WEEKES

Nature Saskatchewan, 1860 Lorne St, Regina, SK S4P 2L7, Canada. Email: lweekes@naturesask.ca

Abstract: PlantWatch is a citizen-based volunteer monitoring program that enables people of all ages and skill levels to participate in climate change research by watching selected plants bloom in the spring and reporting those dates. Since plants flower largely in response to the amount of warmth they are exposed to, earlier flowering occurs after warmer winters and later flowering occurs after colder winters. Simply by watching flowers bloom, participants help contribute to an understanding of how and why our natural environment is changing. Collection of long-term data helps scientists track biological responses of plants to climate change over many years. PlantWatch participants monitor our changing environment and thus develop a connection to their local ecosystem. Citizen science programs like PlantWatch motivate people to get outdoors, wonder, care, and take action against the many factors causing climate change.

(Affiliates: David Suzuki Foundation, Nature Canada, University of Ottawa, Wilfred Laurier University)

UNDERSTANDING RANCHERS' PERCEPTIONS OF HETEROGENEITY IN THE NORTHERN GREAT PLAINS

MAGGI SLIWINSKI, MARK BURBACH, LARKIN POWELL, WALTER SCHACHT

School of Natural Resources, University of Nebraska-Lincoln, Lincoln, NE 68583, USA. Email: maggi.sliwinski@gmail.com

Abstract: Theory suggests that most management on private lands is leading to increasingly homogeneous grassland landscapes, which is problematic for wildlife, habitat, and ecosystem services. We are studying ranchers' perceptions of management techniques that promote grassland heterogeneity and thus support healthy grassland ecosystems, such as patch-burn grazing or using a wider variety of stocking rates. The intent of our research is to better understand how state, federal, and non-profit organizations may engage with ranchers to support common goals of maintaining both grasslands and the ranching industry through innovative management techniques. To complete this project, we will interview ranchers in three states to explore management techniques and incentives using a qualitative research approach. Findings from the qualitative research will be used to develop a survey that will be sent to ranchers in the Northern Great Plains (specifically Nebraska, South Dakota, and North Dakota) to gauge interest in and attitudes towards various management options and strategies that enhance heterogeneity, which will help to improve the ecological function of grassland systems. Results from this research will provide information on how to encourage management for heterogeneity on millions of acres of native grasslands in the Great Plains.

CONNECTING EARLY LEARNERS TO NATURALIZED AREAS THROUGH PLAY

SHANNON DYCK, JANET MCVITTIE

Department of Educational Foundations, University of Saskatchewan, 28 Campus Drive, Saskatoon, SK S7N 0X1, Canada. Email: shannon@4tomorrow.ca

Abstract: The College of Education has a Prairie Habitat Garden right outside its doors. It is easily accessible for early childhood teachers, teacher candidates, and nearby day cares. Plans are in place to re-design the space with a particular focus on connecting children to natural areas through play; encouraging learners of all ages to connect, wonder, care, and act; and restoring the native plantings that have been encroached upon by invasive species. Emphasis will also be placed on supporting the College of Education's teacher candidates to learn --through direct observation and interaction in the garden-- how children interact with the natural world. The benefits of children exploring natural areas independently and with other children, through an open and unguided atmosphere, have been well documented. For example, children become better at assessing risk, their health and confidence improve, and they sleep better. Time in green space has also been shown to reduce the effects of behavioural conditions, such as ADHD. In this poster presentation, a re-design for this naturalized space is presented, which deliberately designs the area for imaginative play, contemplative time, physical challenges, creative productions, and 'discovering' ecological relationships. The poster allowed observers to add their ideas to enhance the garden as a naturalized play area for early learners.

There are many volunteer opportunities and ways to participate in garden activities. If you are interested in getting involved, please contact Shannon directly at shannon@4tomorrow.ca.

SOUTHERN ALBERTA YOUTH RANGE DAYS! – MENTORING TOMORROW'S WATERSHED MANAGERS

TIM ROMANOW, MARY LUPWAYI (on behalf of the Youth Range Days organizational committee)

Milk River Watershed Council Canada (MRWCC), Box 313, Milk River, AB T0K 1M0, Canada.
Email: tim@mrwcc.ca

Abstract: Working agricultural landscapes are critical to environmental sustainability. Youth Range Days (YRD) celebrates our heritage and provides a mentoring environment for youth ages 13 to 18 for fun and learning in an outdoor setting. The Southern Alberta YRD Program is an interactive event for youth and families interested in learning about a variety of rangeland, watershed, wildlife, and other topics related to natural resource management. Youth from all backgrounds, including farms and ranches, acreages or towns, are welcome to attend. Competition and advanced participation in collection of data, interpretation of study research, and creative learning has been built into the program over the years. The YRD information and poster presented will highlight lessons learned and potential means to design, organize, and fund field-based camps like YRD. In 2016, the YRD program will be celebrating 9 years of camps, and the organizational committee has offered to provide mentorship for organizations interested in setting up their own Range Days Camp within the Canadian Prairies Region.

ELLIS BIRD FARM: BIODIVERSITY, INSPIRATION, AND ENGAGEMENT

MYRNA PEARMAN, CLAUDIA LIPSKI

Ellis Bird Farm, Box 5090, Lacombe, Alberta T4L 1W7, Canada. Email: mpearman@ellisbirdfarm.ca

Abstract: Established in 1982 to honour the legacy of pioneer Lacombe-area farmers and conservationists Charlie and Winnie Ellis, Ellis Bird Farm has grown into a unique and popular education and research site. Using the Ellis Homestead farm yard as a foundation, the site has been developed into a world-class and remarkably diverse public NatureScape garden. The site hosts thousands of local school children each year who participate in engaging, hands-on nature exploration. Popular events to celebrate the environment, such as a Bluebird Festival, Bug Jamboree, and BioBlitz, are also held each summer. Ellis Bird Farm has pioneered the use of several technologies, such as closed-circuit TVs, webcams, and nest cavity cams. These technologies provide a window for onsite and online visitors into the otherwise inaccessible world of beaver lodges and nest cavities. In addition to amassing a huge dataset on mountain bluebird (*Sialia currucoides*) productivity, Ellis Bird Farm has also been at the leading edge of purple martin (*Progne subis*) and mountain bluebird migration tracking research through the use of geolocators and GPS units, and has monitored the movements of birds at their nest cavities using radio-frequency identification. The results of this research are shared with visitors through storytelling and other engaging ways.

PRAIRIE AND PARKLAND EDUCATION FOR YOUTH

JONATHON KORNELSEN

Friends of Birds Hill Provincial Park, http://friendsofbirdshillpark.ca. Email: jkornelsen.fobhp@gmail.com

Abstract: Birds Hill Provincial Park (BHPP) is a bio-diverse landscape including native tall grass prairie and aspen–oak parkland nestled in a matrix of agricultural rangelands, aggregate extraction areas, and rural residential development northeast of Winnipeg, MB. To conserve natural areas within a developed landscape, the public needs to appreciate their value. The goal of this project is to educate young people about the importance of preserving native flora in BHPP. The 2013 Prairie Conservation and Endangered Species Conference Young Professional Stewardship Grant allowed Friends of Birds Hill Park (FoBHP) to deliver workshops on plant identification (native and exotic) and host volunteer events to remove invasive plants. These events were well received and led to the delivery of in-class workshops to local schools in the region. This was our organization's first attempt to engage young people. We plan to build on this experience by involving youth in the restoration of prairie patches along a popular trail in the park.

McDonald's Canadian Verified Sustainable Beef Pilot Project

PEGGY STRANKMAN

Where Food Comes From Inc., 221 N. Wilcox St., Castle Rock, CO 80104, USA. Email: strankmanp@gmail.com

Abstract: What is sustainable beef? Every type of beef production system can be sustainable; the important consideration is that all aspects of the beef value chain, from farm to fork, are environmentally sound, socially responsible, and economically viable. With the advice and support of stakeholders and experts along the entire beef value chain, McDonald's is running a pilot project to demonstrate and verify the sustainability of the Canadian beef supply. The Canadian Pilot Project is designed to "enable Canadian beef producers to demonstrate their commitment to sustainable beef production through a self-assessment process followed by independent third-party ranch, feedlot, and processor on-site verifications by the uniquely qualified professionals at Where Food Comes From" (see http://www.vsbpilot.ca/ and www.wherefoodcomesfrom.com/). The pilot indicators are designed to be outcome-based to enable Canadian beef producers to demonstrate the positive outcomes they achieve. This is in contrast to practice-based indicators that prescribe the practices producers use. The indicators can be viewed at www.vsbpilot.ca/indicators/index.htm.