

Prospectus for a Shared Approach to Research:
Conserving and Restoring Rough Fescue Grasslands



Rock and Connelly Creek Forest Reserve Grazing Allotment, Photo Courtesy of Marilyn Neville, Gramineae Services Ltd.

July 2009

Foothills Restoration Forum

Introduction

Native grasslands play a critical role in sustainable land use. Healthy grasslands perform key ecological functions such as capturing and retaining water, sequestering carbon, producing sustainable protein rich forage and supporting a wealth of plant and animal biodiversity. All elements of a functioning, healthy rangeland ecosystem are dependent on healthy native grasslands.

Land owners and land managers understand the need to conserve and restore native prairie and parkland ecosystems for future generations. However, there are a number of technical difficulties inherent in maintaining and restoring native rough fescue grasslands. For over 30 years they have expressed concern over the technical difficulties inherent in maintaining and restoring foothills rough fescue (*Festuca campestris*) grassland ecosystems. The need for research goes well beyond planting seeds or grass plugs.

The Foothills Restoration Forum came together in 2006 as a collaborative research team. This solid stakeholder group includes experienced professionals from provincial agencies (including Alberta Sustainable Resource Development, Alberta Environment and the Energy Resources Conservation Board), the ranching community, conservation organizations, industry, and plant ecology and reclamation disciplines. All are working diligently to meet the challenges of a simple goal: to accomplish the restoration of native grassland ecosystems of southwestern Alberta.

“Native grasslands such as rough fescue plant communities are a key component of biodiversity because they provide essential habitat for wildlife,” explains Mike Alexander, a provincial rangeland specialist for Sustainable Resource Development, based out of Pincher Creek. “But they also perform important ecological functions such as water storage and carbon capture.”

Alexander, one of the initial members when the Foothills Restoration Forum first formed, feels strongly about prairie grasslands. “There is a growing awareness that we lack the tools and knowledge to restore rough fescue grasslands after they are disturbed by land use activities such as road construction, intensive recreational activity, oil and gas development, mineral extraction, long-term overgrazing and country residential developments,” says Alexander. “An adequate supply of native rough fescue seed is often cited as the principal limiting factor in the restoration of these grasslands following disturbance. But a growing number of people ranging from the ranching industry to the scientific community are realizing that the issue is much more complex.”

Restoration research, field trials and monitoring programs are ongoing. However, current research and field studies are not linked or coordinated. One of the main goals of the Foothills Restoration Forum is to provide a venue for shared research results, and a single-source link to the knowledge we already have, to the research we are currently conducting.

“The rough fescue grasslands are notoriously difficult to reclaim,” says Bruce Greenfield with the Energy Resources and Conservation Board. “From our perspective, avoidance is preferred. But we understand this is not always possible. We rely heavily on landowners to raise the issues with us, so we can stay abreast of the issues in the field,” says Greenfield, explaining the need for all parties to work together on the native grasslands issue.

Albertans value their rough fescue grasslands. Rough fescue has been designated as our provincial grass and the grasslands of south western Alberta are often referred to as Alberta’s signature landscape. However the extent and ecological status of these grasslands has not been quantified. Current estimates suggest that only between 16 and 35 percent of the total area that supported these grasslands before settlement remain intact today.

To help address the issue of conserving and restoring the remaining native grasslands, the Forum has developed five key themes, and associated research questions to describe critical gaps in our knowledge base. Identifying these gaps has helped them to document and focus on what research is necessary.

Native grasslands provide another intrinsic value. They offer a connection to the past—a glimpse at what the landscape looked like before our ancestors settled here. No matter what walk of life we may come from, we all benefit from native grasslands in Alberta.

Please consider this prospectus when defining research projects or when allocating research funds. Draw upon the broadly based expertise of the Forum’s Technical Advisory Committee. Help us find the answers to the research questions so that we can sustain these valuable grasslands for future generations.

Barry Adams
Foothills Restoration Forum, 2009



Rough Fescue Research Plots, TAC Tour 2008, Photo Courtesy of Donna Kubian, CorPirate Services

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Resources

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Red Rock Canyon Road, Waterton Lakes National Park, TAC Tour 2009,
Photo Courtesy of Donna Kubian, CorPirate Services

Theme 1

Where are the native grasslands in the southwestern Alberta, what are the plant communities and what is their ecological status?

Mapping and field characterization are key steps to conserving and maintaining the remaining native grasslands of southwestern Alberta. Preliminary mapping based on the Native Prairie Vegetation Inventory (NPVI) suggests that the total area of historic grasslands that remain intact is only between 16 and 35 percent, depending on the natural subregion. Our understanding of where native grassland communities occur and their ecological status is incomplete.

The Alberta Vegetation Inventory (AVI) and ongoing current initiatives such as the Grassland Vegetation Inventory (GVI) and the Provincial Land Vegetation Inventory (PLVI) are all landscape scale mapping initiatives that provide additional mapping detail on the mosaic of public and private lands of southwestern Alberta. GVI and AVI define and map the landscape into range sites and ecological sites providing initial identification of potential native grasslands. However, field characterization of potential grassland sites is also critical to determine if native grassland plant communities are indeed present, and to evaluate their ecological status.

Vegetation inventories and studies have been undertaken in southwestern Alberta over a number



Rough Fescue Grasslands, Waldron Grazing Association,
Photo Courtesy of Marilyn Neville, Gramineae Services Ltd.

of years and for a variety of purposes by private land holders, provincial and federal governments, First Nations, oil and gas companies, non-government organizations (e.g. Alberta Conservation Association, Nature Conservancy Canada, Mistakis Institute) and academic researchers.

However there is no consistency in the methodology used to conduct the assessments or in data collection. The Range Plant Community Guides and the Rangeland Health Assessment protocol, developed by the Range Resource Management program of Alberta Sustainable Resource Development provide standardized tools for the assessment of the ecological status of Alberta's diverse native grassland plant communities.

A standardized method of assessment and a readily accessible portal for information sharing is required to improve our collective knowledge of the location and ecological status of our native grasslands.

Theme 1 Research Questions



Foothills Fescue Grasslands, Waterton Lakes National Park, Photo Courtesy of Donna Kubian, CorPirate Services

- *What are the appropriate, available resources and mechanisms needed to compile accessible information on the location and ecological status of the native grasslands of southwestern Alberta?*
- *What are the knowledge gaps? And how can the knowledge gaps be filled?*
- *How can a grassland information database be created so the information is readily available, spatially defined, user-friendly and regularly updated?*
- *What criteria can be used to evaluate conservation values of native grasslands in decision making?*
- *Can disturbance and reclamation history information be linked to the grassland information database?*
- *How can this information be successfully integrated into land-use planning and resource management decisions?*
- *How can we track and document the long-term trends in grassland plant community distribution and ecological status?*



Rough Fescue Grasslands, Milk River Ridge, Photo Courtesy of Ron McNeil, LandWise Inc.

Theme 2

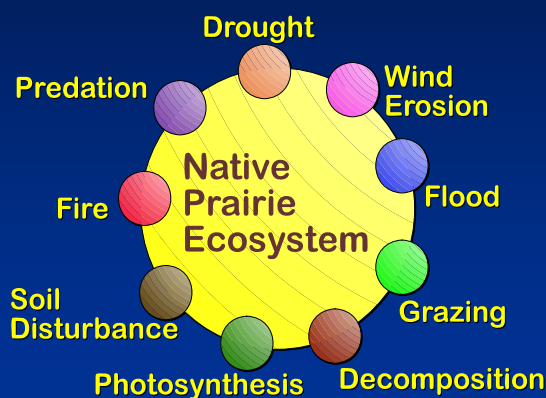
What factors affect the restoration of health and function to the native grassland plant communities of southwestern Alberta?

What factors affect the restoration of native grasslands? It's a critical question, and the answer is not well understood. Research and experience indicate that climate and soils play a major role in restoration success. In native grasslands, drier environments with shallow soils appear to be easier to restore since invasive species (non-native grasses and noxious weeds) are far less competitive. The drier the prairie environment, the greater the restoration potential. It seems counter intuitive but, the moist, nutrient-rich growing environment

of the foothills of southern Alberta has is not proven conducive to native grassland restoration.

What we do know is that site characteristics and disturbance regimes greatly influence vegetation and soils and subsequent recovery potential. Fire and grazing are naturally occurring and integral components of the grassland ecosystem. However increased human activity with agricultural settlement and industrial development has affected many dimensions of the foothills landscape.

Natural disturbance regimes?



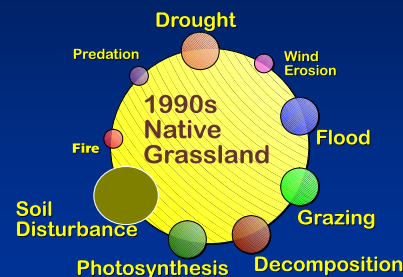
Presentation Slide Courtesy of Bradley & Wallis; Prairie Conservation Forum

Theme 2 Research Questions

- **Natural Processes:** *In order to effectively restore grasslands in the foothills landscape, we need to begin with a better understanding of the historic influences and roles of grazing, fire, and other natural processes in maintaining native plant communities. This includes fire frequency, fuel build up, dynamics of the communities on the landscape, overgrazing, under-grazing, the season, and frequency of grazing. In other words, what would be the natural succession in the absence of modern disturbance regimes? How do development and land use practices alter the historic processes and functioning of these communities? How can these disturbances be used or mimicked to aid in restoration?*
- **Site Sensitivity:** *How do the ecological site characteristics affect restoration success and which sites should be avoided? How can these sites be recognized and what are the key indicators (plant community, soils, abiotic site characteristics, landform, topography)?*
- **Succession:** *Can foothill grasslands be restored? What are the successional pathways following man-made disturbance? What is the successional pathway of seeded stands? How do invasive species influence succession? What is the role of forbs in grassland community succession? What wildlife species are associated with successional communities? How can natural processes be applied to restore altered landscapes?*
- **Soil:** *How does the restoration of soil quality (density, structure, soil moisture, soil biota, soil chemistry) affect native plant community restoration potential? What are the key soil indicators of a restored soil?*
- **Range Health:** *Is it possible to use range health assessment to measure restoration success? What is the role of litter in restoration? How do past and current successional trends impact restoration potential (natural disturbance only, low level disturbance, intensive disturbance)?*
- **Climate:** *How will climate change affect plant community composition and function? How will these effects change with disturbance regime or land use practices?*
- **Hydrologic Function:** *What role do healthy foothills ecosystems play in maintaining hydrologic function?*
- **Carbon Sequestration:** *What role do healthy foothills ecosystems play in carbon sequestration and storage?*

Changes in disturbance

- Cultivation and Industrial Footprint



Theme 3

What practices contribute to restoration success?

Alberta's new reclamation criteria reveal a significant shift in thinking, moving beyond reclaiming to restoring. It's clearly not enough to maintain an equivalent land capability. The new approach seeks to reestablish ecological health and function.

Long-term restoration of disturbances in the Foothills Fescue, Foothills Parkland and Montane Natural Subregions to native plant communities has met with limited success. Industry has been working to reduce the impact of their industrial activities for the past 20 years.

Such methods have included reducing surface disturbance and using various re-vegetative strategies such as natural recovery, seeding with native plant cultivars, wild harvested native seed and planting greenhouse-raised, native plant material. Industry has also used interlocking mats and geotextiles in construction methods to further minimize disturbance to native grassland soils. The goal is to maintain the native grassland plant communities that are so difficult to restore. However only very limited monitoring and evaluation has been conducted in support of the methods used.

Monitoring and evaluation of practices is essential if progress is to be made. Currently, information sharing is limited. The climate along the southeastern slopes of the Rocky Mountains also poses many challenges to industrial development and plays an important role in restoration success. Ultimately further research is required to determine best management practices for any type of industrial activity in the southwestern Alberta landscape.



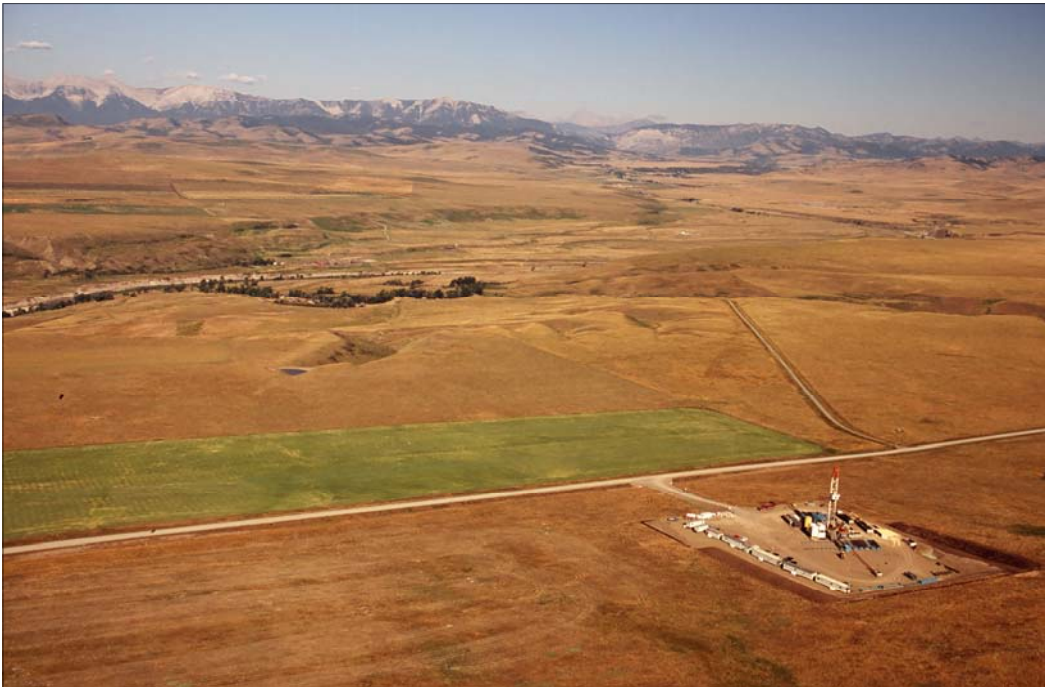
Pipeline Construction Through Rough Fescue Grasslands, Photo Courtesy of Jane Lancaster, Kestrel Research Inc.

Theme 3 Research Questions

- *Can a repository of existing information from previous reclaimed sites and projects be generated? How can they be spatially defined?*
- *What practices (e.g. prescribed fire, grazing management) promote desirable successional pathways, that lead to the eventual establishment of the pre-disturbance plant community?*
- *What soil handling procedures promote rough fescue restoration?*
- *What cultural practices, such as natural recovery seeding, plug planting and sod salvage, promote restoration success?*
- *What are the necessary long-term monitoring and maintenance requirements for restoration success?*
- *What is needed in terms of pre-disturbance site assessment, in order to determine the most appropriate disturbance and restoration practice?*
- *What are the risks? Can a cost benefit analysis be prepared for native grassland restoration?*



Wind Energy, Photo Courtesy of Cheryl Bradley, Alberta Native Plant Council



Oil & Gas Exploration, Photo Courtesy of Ron McNeil, LandWise Inc.

Theme 4

What is the potential for invasive non-native species to convert rough fescue grasslands to non-native communities and can they be restored after invasion?

First Nations were the first to observe the movement of invasive species when they termed Kentucky bluegrass “White Man’s Foot Grass”. They observed its habit of spreading and establishing with the passing waves of early settlers. Invasive species displace native species.

Numerous land use practices can lead to the modification of native grasslands by non-native species invasion. Agricultural seeding of non-native forage crops, feeding hay on native grasslands during the winter, linear disturbances including transportation corridors, access roads and pipelines all lead to increased invasion of native grasslands. The integrity of the remaining tracts of rough fescue grasslands are continually threatened by invasive species. These species do not support the same ecological processes and functions as native species. The result is a significant loss of biodiversity.

Ranchers provide a good example of a community that has valued and maintained native grasslands. Invasive species impose a costly economic burden to their operations that is cumulative over time. Native plant communities provide a rich suite of ecological goods and services to society as a whole. The losses to society are significant when non-native invasive species prevail. As non-native species invade, the useful work, products and benefits that native grasslands provide are steadily diminished. Even the aesthetic appearance of the landscape changes.

Invasive species also expand through the opportunity provided by exposed soil due to man-made disturbances. Disturbance from road construction, oil and gas development, mining, country residential development, long-term overgrazing, logging, and intensive recreational activities all contribute to replacement of desirable native vegetation such as rough fescue plant communities with exposed soil and less desirable modified plant communities.

Note: The term “non-native invasive species” includes invasive agronomic species like smooth brome, timothy and Kentucky bluegrass as well as noxious and restricted weeds.



Invasive Species on Reclaimed Wellsite, Photo Courtesy of Cheryl Bradley, Alberta Native Plant Council

Theme 4 Research Questions

- *What ecological factors and processes (such as moisture, nutrients and biota), convert native grassland communities to communities of non-native invasive species?*
- *What is the relationship between an ecological range site and its risk for invasion?*
- *What land use practices contribute to the conversion of native communities to a modified or non-native invasive plant community?*
- *How can rough fescue communities at risk of invasion be identified and mapped?*
- *What are the mechanisms for invasion (seed, vegetative propagation)? What are the methods of transport?*
- *What role does the condition of the landscape and range health play in determining the risk of invasion?*
- *What are the new non-native species emerging on the landscape?*



Rough Fescue Grasslands, Waldron Grazing Association, Photo Courtesy of Marilyn Neville, Gramineae Services Ltd.

- *What are the most appropriate management practices (for example: skim grazing, multi-species grazing, fire, herbicides, integrated methods), in maintaining rough fescue plant communities to control or limit invasive species? What combination of control measures and management practices can be used to reduce or eliminate invasive species?*
- *How can information on construction and reclamation practices from previously reclaimed sites and projects be compiled, spatially defined and placed in an accessible repository? When compared to new minimal disturbance construction methods, this information base could provide valuable information for industry regarding the future direction of construction and reclamation methods most suited to the land use, climate, soils and native plant communities of southwestern Alberta.*
- *Can rough fescue plant communities be restored following invasion by invasive non-native species?*

Theme 5

How can we measure overall trends in the restoration, maintenance and/or deterioration of native grassland plant communities of southwestern Alberta?

Native grassland plant communities are dynamic by nature. Appropriate tools to measure the restoration, maintenance or deterioration responses of a native grassland plant community are not well-defined or understood.

To some extent vegetation responses in the southwestern

Alberta foothills are currently being measured through long-term range studies and the monitoring of rangeland reference areas. Little is known about the cumulative effects of landscape fragmentation from the human footprint on the sustainability and integrity of native grasslands. However, numerous opportunities exist to carry out this research on the landscape.

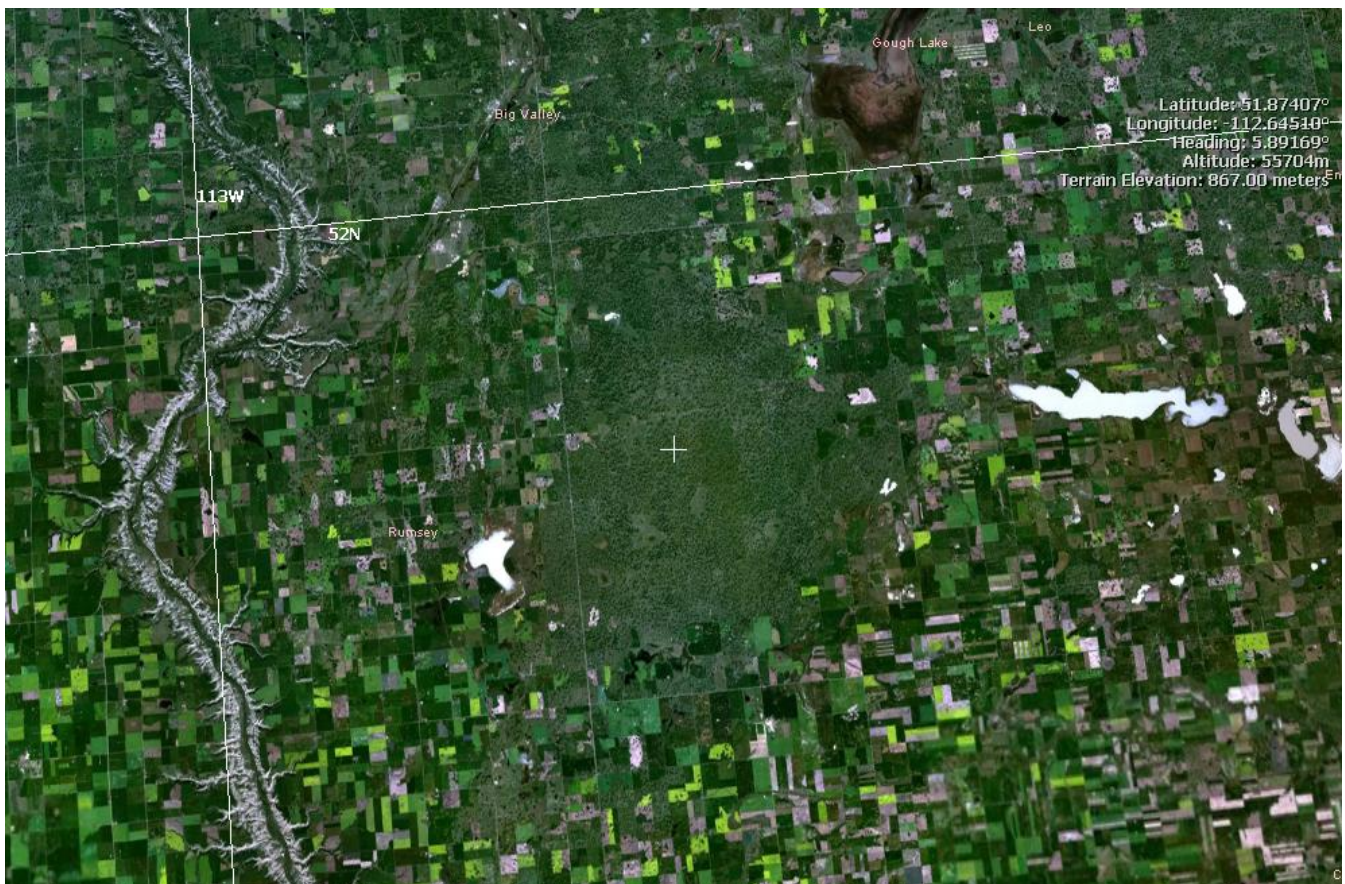


Fescue Grassland Monitoring, Photo Courtesy of Jane Lancaster, Kestrel Research Inc.

Theme 5 Research Questions

- *How do we monitor trends in native grassland plant communities on a landscape scale?*
- *What are the responses of native grassland plant communities to disturbances?*
- *What are the indicators that should be monitored?*
- *Are there thresholds to restoration success? For example, are there thresholds associated with:

 - ~ *the size of native grassland blocks;*
 - ~ *the ecological status or integrity of native plant communities;*
 - ~ *the amount of anthropogenic edge on the landscape; or*
 - ~ *the scale, frequency or intensity of disturbances individually or cumulatively?**
- *What amount of time is appropriate in order to assess restoration success?*
- *What tools could be developed to model and predict trends?*
- *What criteria could be used to evaluate conservation values of native grasslands in decision making?*



Oblique Satellite Image, Rumsey Block, Courtesy of Cheryl Bradley, Alberta Native Plant Council



Prehistoric Natural Disturbance Regime, Photo Courtesy of Steve Demkiw, Alberta Environment

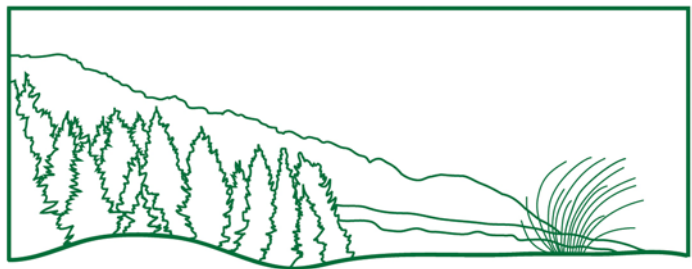


Foothills Rough Fescue, Claresholm Area, Photo Courtesy of Varge Craig, Alta Rangeland Services Inc.

Alberta
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Foothills Restoration Forum

Website Coming Soon...

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