AN INVENTORY OF REMNANT PRAIRIE GRASSLANDS WITHIN THE CENTRAL PARKLAND NATURAL SUB-REGION OF ALBERTA

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ALBERTA ENVIRONMENTAL PROTECTION

by

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Notes

This study was a part of a M.Sc. research program that will provide additional important information on specific remnant grasslands within the Central Parkland Natural Sub-Region. From July 14th until August 20th 1996, we sampled detailed vegetation and environmental data on remnants located within the Rumsey Ecological Reserve and on N11-38-17-4, 11-48-14-4, E11-46-14-4, NE21-39-7-4, NW29-41-9-4, and 11-41-10-4.

This report is being placed in the libraries of Park Services (Alberta Environmental Protection, Govt. of Alberta), Elk Island National Park, the University of Alberta, and Parks and Facilities Branch of Saskatchewan Environment and Resource Management.

PART 1

INTRODUCTION

Native prairie grasslands represented an important component of the landscapes in the Central Parkland Natural Sub-Region of Alberta prior to European settlement. Subsequently, agricultural practices and fire suppression have caused extensive fragmentation of prairie remnants and invasion by trees, shrubs, and exotic plant species (North 1976). Approximately 5% (310 km^2) of the Central Parkland Natural Sub-Region remains in a condition similar to pre-European settlement (Van Tighem 1993). Today, remnants are restricted to conservation and recreation areas, to south and southeast facing slopes of the North Saskatchewan River and Red Deer River Valleys, and to some Crown and private lands utilized for grazing.

Not only do native plant populations of remnant grasslands contribute to native plant species and habitat diversity but they also provide essential habitat to rare plant species such as Crowfoot Violet (*Viola pedatifida*), and Silver Leaf Psoralea (*Psoralea argophylla*) and to unknown numbers of small wildlife species such as insects, birds, etc. Native plant species in remnant prairie grasslands of the Central Parkland Natural Sub-Region are probably genetically different from populations further south in the Grassland Natural Region because of spatial isolation (Joyce Gould, personal communications). Catastrophic events such as flood and drought can eliminate plant populations together with dependent wildlife species. An interconnected network of native grassland areas across the Central Parkland Natural Sub-Region landscape would reduce the overall impact of such catastrophic events and is essential for the maintenance of viable native plant populations and their stable productivity over the long term. Small remnant grasslands that connect larger areas of native landscapes ("nodes") represent "corridors" in a "conservation net" (Forman 1995). As fragmentation of natural vegetation progresses, these corridors become critical dispersion routes for plant and small wildlife species. The establishment of conservation nets is probably the only solution for landscape diversity protection in regions heavily influenced by agriculture or urbanization such as the Central Parkland Natural Sub-Region.

Special Places 2000: Alberta's Natural Heritage is a strategic plan for the designation and preservation of natural landscapes in Alberta (Anonymous 1993). One of its objectives is to designate and protect a number of natural areas (including prairie grassland elements) within the Central Parkland Natural Sub-Region. A few relatively big areas and a number of smaller natural landscapes which contain remnant dry grassland have already been protected (e.g. Wainwright and Rumsey ecological reserves) or recognized as Environmentally Significant Areas (e.g. Red Deer Canyon, Morningside, Tolman Badlands) in this region (Sweet Grass Consultants 1988). These isolated nodes of native grassland should also be protected and connected by corridors to develop conservation nets.

The present study was initiated because information on locations of remnant prairie grasslands that might serve as corridors within the Central Parkland Natural Sub-Region was missing. An inventory of fescue prairie in Canada has been initiated (Lorna Allen, personal communications) and our information about these remnant grasslands will make a valuable addition to this database.

Objectives

The objectives were:

1) to locate remnant prairie grassland on Crown land and Ducks Unlimited Canada lands within the Central Parkland Natural Sub-Region;
2) to give detailed descriptions for all quarter sections located including geographical position, physical and vegetation characteristics and current management practices;
3) to suggest future management practices for each quarter section;
4) to propose selected quarter sections as possible candidates for protection;
5) to produce a 1:40000 scale map indicating the quality of grassland remnants and their position with respect to protected areas and Environmentally Significant Areas within the Central Parkland Natural Sub-Region;
6) to provide laser prints of aerial photographs used to locate native prairie grasslands;
7) to provide 36mm slides of prairie grasslands for each quarter section.

MATERIALS AND METHODS

Study Area Description:

The Central Parkland Natural Sub-Region of Alberta is situated between the Boreal Forest Natural Region and the Grassland Natural Region (Achuff 1994). As a transitional zone between aspen forests to the north and prairie grassland to the south, the vegetation of the Central Parkland Natural Sub-Region consists of aspen stands in moist habitats intermingled with grasslands on dry, south or southeast facing sites (Strong and Leggat 1992).

General descriptions of the grasslands within the Central Parkland Natural Sub-Region of Alberta (Moss 1932, Bird 1961, North 1976) provide some information that pertains to the present day grassland remnants. This literature suggests that prairie grasslands mostly occupy glacial outwash, and sand and gravel substrates. Our field surveys have confirmed this. Leading shrub species are *Symphoricarpos*, *Rosa*, *Prunus*, *Elaeagnus* and *Shepherdia canadensis*. Suggested dominant grass species are northern prairie grass species Wheat Grass (*Agropyron* spp.), Rough Fescue (*Festuca halii*), Hooker's Oat Grass (*Helictotrichon hookery*), Blue Grass (*Poa interior*) and southern prairie species June Grass (*Koeleria cristata*), Spear Grass (*Stipa comata*), and Blue Grama (*Bouteloua gracilis*) (Moss 1932).

It was also suggested that the overall composition of the prairie grassland within the Central Parkland Natural Sub-Region depends on soil conditions and herbivory. Remnant prairie grasslands escaped plowing and cropping mostly by being unsuitable for intensive agriculture, but few of them have escaped less dramatic changes caused by grazing (North 1976). On many overgrazed areas, the composition of grassland has been changed by the expansion of more grazing-tolerant species such as Wheat Grass (*Agropyron* spp.), Needle-and-thread grass (*Stipa* spp.), and Oat Grass (*Danthonia* spp.) (North 1976).

Locating Grassland Remnants

Aerial photograph examination:

In consultation with Park Services, Alberta Environmental Protection we decided to concentrate primarily on grassland located on Provincial Crown Land and on the private land owned by Ducks Unlimited Canada. These areas can be more easily designated and protected through *Special Places 2000: Alberta's Natural Heritage* strategic plan than private land owned by individuals and families.

The first selection of potential areas was based on the examination of county maps that cover the Central Parkland Natural Sub-Region of Alberta and a 1:40000 scale map showing protected areas and Environmentally Significant Areas. County of Mountain View, Special Area 4, Municipal District Kneehill, and County of Paintearth were not included in the examination because of time constrains and because they included only small portions of the subregion. Indian and Military Reserves have also been excluded from this study. Remaining quarter sections on Crown land or Ducks Unlimited Canada private land were screened to select quarter sections not yet protected or included in Environmentally Significant Areas. Area screened covered approximately 1670 square kilometers. After screening ca. 610 square kilometers remained for detailed aerial photograph examination.

More than 1000 aerial photographs were examined in order to identify prairie remnants. For each potential remnant we examined a minimum of three aerial photographs taken at different times (1949 as the earliest available, one from the early 1980s and the most recent available). The date when the latest aerial photograph was taken varied from 1992 to 1995.

The examination of the most recent aerial photographs provided an opportunity to exclude all areas that have more than 90% non-grassland vegetation (forest, cultivated areas, wetlands). It also provided information about the vegetation conditions for each remnant. The earlier aerial photographs allowed identification of areas that had been 'broken' (plowed). Such areas were excluded from further study, since our preliminary surveys indicated that they have very low quality grassland consisting mostly of exotic species and a small number of native forbs. Based on this aerial photograph reconnaissance, we identified 301 quarter sections that needed further field inspection for

the identification of the dominant plant species and the quality of prairie remnants. Aerial photographs also provided valuable information on vegetation characteristics (% cover of tree growth within area with prairie grasslands), existence of buffer zones surrounding each quarter section, and disturbances such as pipelines, powerlines and oil wells.

Field inspection:

During the period between June 17th and July 10th 1996, we inspected most of the selected quarter sections. Forty quarter sections out of 301 have not been surveyed because of unfavorable weather conditions, difficult access or time constrains. In the field we collected the following information: prairie grassland type, dominant native plant species, exotic plant species, rare plant species, and current management practices.

A number of 36mm slides showing major landscape characteristics, grassland composition or dominant plant species, have been taken for each quarter section, when weather permitted.

Post-field work:

All selected quarter sections have been mapped on a 1:40000 scale map that contains information on Protected Areas and Environmentally Significant Areas. Adjacent quarter sections with remnant grasslands have been grouped into polygons and named after the nearest town or lake. This map provided the information on links of each polygon to Protected Areas and Environmentally Significant Areas. Each quarter sections within a polygon has been given one of five color codes representing different quality of prairie grassland, or indicating these sites not surveyed (see provided map).

Information collected from aerial photographs, during the field inspection, and extracted from the produced map, has been presented in a Paradox Report Format (Part 2 of this report) giving the complete information for each quarter section surveyed. Nomenclature for the plant species follows Moss 1983; some common plant names have been added from Johnson *et al*. 1995. An electronic database in Paradox has also been provided on diskette.

Four levels (excellent, good, fair, poor) of grassland quality have been assigned based on cover and diversity of native grass and forb species, potential for native seed collection, problem with exotic species and importance as a corridor for native prairie plant species between areas with grasslands of high quality:

Quality of grassland remnants:

> **Excellent** - High cover of native grasses, especially Rough Fescue, and accompanying native forbs, non-existing or minor problem with exotic species; good source for native seed collection; important corridor.

Good - High diversity of native grasses and accompanying native forbs; non-existing or minor problem with exotic species; has value as a corridor.
Fair - Good diversity of native grasses and accompanying native forbs; exotic species such as Kentucky Blue Grass (*Poa pratensis*), Smooth Brome (*Bromus inermis*) and Dandelion (*Taraxacum officinale*) represent significant portion of grassland vegetation; has some value as a corridor.
Poor - Low diversity of native plant species, especially indicator grasses and high cover of exotic species; has low value as a coridor.

A Geographical Information System (GIS) has been used to provide some general statistical information on geographical characteristics of the area surveyed.

Results:

- Preliminary examination of county maps and aerial photographs, along with field surveys showed that most of the quarter sections with remnant grasslands belong either to the Legal Sections 29 (reserved for schools) or to Sections 11 (reserved for the Canadian railway companies). This suggests that not all the remnants "survived" only by being unsuitable for cultivation but also because historically some were set aside for purposes other than agriculture. It further indicates that some of these grasslands may be on arable soils and so may be composed of native plant species and communities that have othervise been lost on cultivated land throughout the Central Parkland Natural Sub-Region.

- Aerial photograph examination of ca.610 square kilometers of Crown and private Ducks Unlimited Canada's land showed that ca. 350 square kilometers (ca. 57%) has once been cultivated or is still under cultivation; ca. 70 square kilometers (ca. 12%) is mostly covered by vegetation other than grassland (forests or wetlands) and ca. 190 square kilometers (ca. 31%) have mostly parkland/grassland vegetation .

- Among the 301 quarter sections surveyed, 256 were in “native” condition, containing indicator grass species such as Rough Fescue, June Grass, Spear Grass, and Blue Grama, and a high diversity of native prairie forbs. Out of these, 28 quarter sections have prairie grasslands in excellent conditions, 179 have grasslands in good condition, and grasslands on 49 quarter sections were in fair condition. Only on 5 quarter sections surveyed we find grasslands in poor condition. This confirms aerial photograph examination as reliable preliminary search method to locate native grassland vegetation within the Central Parkland Natural Sub-Region of Alberta. Forty quarter sections have not been surveyed.

- The 1:40000 scale map attached to this report highlights that the surveyed Crown or Ducks Unlimited Canada land with native prairie vegetation covers an extremely small proportion of the Central Parkland Natural Sub-Region of Alberta. It also indicates that there are very few polygon groupings that represent "corridors " of native grasslands

between Protected Areas and Environmentally Significant Areas (the "nodes"); although slightly denser in the eastern half, they are scattered throughout the Central Parkland Natural Sub-Region.

- Statistical data from the Canadian Land Classification revealed the following information on geographical characteristics of the surveyed lands:

  Soil development groups: About 70 % of the area occupied by surveyed quarter sections contains Dark Brown Chernozemic or Black Chernozemic soils. Regosol occupies less then 20 % of the area while about 10 % belongs to the Black Solonetzic or Dark Brown Solonetzic soils.

  Origin of parent material: Most of the quarter sections are situated on morainal, fluvioglacial, or eolian parent material. Less then 10 % of the quarter sections are situated on undifferentiated, alluvial or lacustrine parent material.

  Calcareous Classes: All sites are calcareous (weakly to strongly)

  Drainage Classes: Sites belong to rapidly or to well to moderately well drained soils (equally represented)

Conclusion

- Because of the small number of available prairie remnants on Crown and Ducks Unlimited Canada lands and their importance as part of corridors for native plant and wildlife species within the Central Parkland Natural Sub-Region, we propose all of the quarter sections surveyed (with exception of 4 quarter sections with the poor quality of grasslands) for protection under the *Special Places 2000* or any subsequent program (see part 2 of this report for details). These quarter sections should be protected either alone, within a polygon, as a group of polygons, or as a part of the nearest Environmentally Significant Area.

- Protecting remnant grasslands on Crown and Ducks Unlimited Canada land could stimulate higher public involvement in future expansion of native grassland protection on private lands.

- During our aerial photograph examination we observed significant areas of native prairie vegetation on private lands. We strongly recommend future surveys to provide information on these grassland remnants.

- If private lands are surveyed, it may be possible to identify complete corridors that link grassland nodes.

- Future management practices have been suggested for each quarter section in Part 2 of the report. There are significant indications that once established on disturbed land, exotic species readily invade adjacent native vegetation and reduce diversity and abundance of native species (White *et al.* 1993, McIntyre and Lavorel 1994). For example, Smooth Brome and Dalmatian Toadflax (*Linaria dalmatica*) are well known examples of exotic species that can strongly modify the composition of native vegetation by extirpating rare native flora and dependent wildlife species (White *et al.* 1993). We recommend restoration studies that seek solution to reestablishing native plant species on formerly cultivated fields and then to manage these restored land to encourage native species further while discouraging exotics. This research could involve experiments using herbicides, fertilizers, grazing and fire.

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