Ecological Area Assessment

Lac du Bois Grasslands Kamloops, BC

Working together for the conservation of BC's grasslands

Grasslands Conservation Council of British Columbia

An Ecological Area Assessment for the Lac du Bois Grasslands, Kamloops, B.C.

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Executive Summary

This ecological area assessment presents a strategic plan for maintaining and enhancing the ecological value of the Lac du Bois grasslands area in North Kamloops, within the context of urban and community plans for the long-term growth of the City of Kamloops.

The ecological area assessment is based on the regional grasslands conservation strategy presented in the GCC's *Grassland Portfolio for the Thompson Basin Ecosection.* A total of 75%, or 2464 hectares, of the study area has been identified as priority grassland (GCC 2009).

The results of the ecological area assessment have shown that the entire Lac du Bois landscape is of high importance to the grassland ecology of the region. Grasslands represent less than 1% of the provincial land base but provide habitat for more than 30% of our threatened and/or endangered species. The low elevation grasslands which characterize the study area are especially rare and valuable habitats on a provincial and regional level; urban development represents the most pressing threat to the integrity of these lower grassland ecosystems. Ideally, no further intensive development should take place within the remaining natural grasslands of the Lac du Bois area; however, there is variation in the specific risk to grassland values posed by human development in different portions of the study area.

Based on an assessment of this risk, the GCC has developed land use recommendations for 6 distinct areas within the Lac du Bois grasslands ***(Map 1):***

1. **Batchelor Hills:** provincial park addition and municipal "natural area" park designation
2. **Lac du Bois Gateway:** Environmentally Sensitive Area (ESA) zoning
3. **Halston Hills:** Environmentally Sensitive Area (ESA) zoning
4. **Off-Road Vehicle (ORV) Area:** Continued designation as an approved Off-road Vehicle (motorized recreation) Use Area
5. **Southern Benches:** Open space designation
6. **Westsyde Bluffs:** No specific land use recommendation; manage for connectivity requirements (wildlife corridors)

Within several of these areas, the GCC has identified more detailed management recommendations in order to deal with specific values or issues which are unique to those areas.

Acknowledgements

Partners who have contributed to the Priority Grasslands Initiative include: Ministry of Agriculture and Lands, Integrated Land Management Bureau, Ministry of Environment, Ministry of Forests and Range, BC Gaming Commission, Habitat Stewardship Program, Habitat Conservation Trust Fund, The Real Estate Foundation of British Columbia, Nature Conservancy Canada, Tula Foundation, The Bullitt Foundation, Vancouver Foundation and Western Economic Diversification Canada.

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This document was produced as a collaborative effort between the Grasslands Conservation Council of British Columbia, consultant Terry McIntosh and associates, and the Ministry of Environment, Environmental Stewardship Division, Thompson Region Operation.

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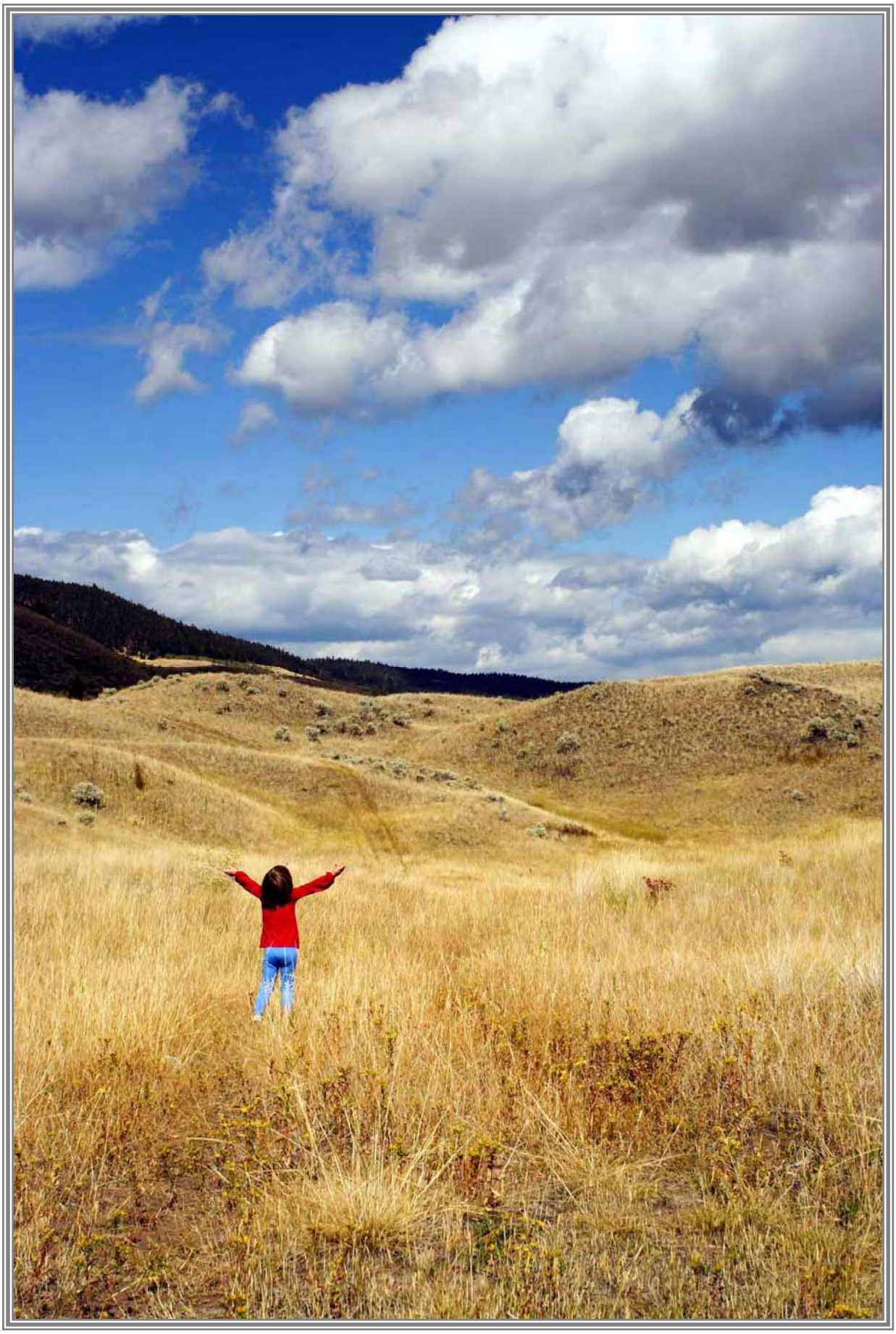
R. Doucette



R. Doucette

Table of Contents

1.0 Introduction to the Project

1.1 Background

This report summarizes the findings and recommendations of an ecological area assessment (EAA) of the Lac du Bois grasslands area within the City of Kamloops. This EAA has been undertaken by the Grasslands Conservation Council of BC (GCC) at the request of the City of Kamloops. In addition to bringing together information contained in the existing scientific literature, this EAA was guided by the results of field surveys conducted by Terry MacIntosh, PhD., and Associates in the summer and fall of 2008. It also incorporates rare species spatial occurrences and technical input provided by the Ministry of Environment.

An ecological area assessment is a strategic process that seeks proactive solutions to emerging conflicts between the needs of an expanding human population, and the integrity of the natural environment which is central to the identity of the Southern Interior region. This ecological area assessment can assist the City of Kamloops in achieving many of the Goals set out in the 2004 Official Community Plan for the City of Kamloops (KamPlan 2004), namely:

> **Goal 1.0 of Regional Growth Strategy:** To create a balance among human settlement, economic development, and environmental conservation such that development does not significantly limit the options of future generations.
>
> **Goal 1.0 of Growth Management:** To develop in a manner which will lead to a more compact, sustainable and efficient land use while maintaining and enhancing the community's liveability.
>
> **Goal 1.0 of Natural Environment:** To protect and enhance the quality of the natural environment and to protect and enhance fish and wildlife habitats in balance with flood protection and recreational access to riverbank and open space areas.
>
> **Goal 2.0 Urban Environment:** To develop and maintain an aesthetically appealing and environmentally sensitive urban environment to enhance the quality of life for residents and visitors alike.
>
> **Goal 4.0 Environmentally Sensitive Areas:** To preserve and protect environmentally sensitive and unique natural areas and

to protect and enhance fish and wildlife in balance with urban development and human use and enjoyment of open space.

Goal 5.0 Agricultural/Resource Lands: To retain public access for recreation and other public use purposes and ensure agriculture lands are preserved for agriculture purposes and to ensure the preservation and protection of environmentally sensitive and unique natural areas.

R. Doucette

This work follows upon the successful completion of a similar assessment for the Aberdeen neighbourhood grasslands of South Kamloops, in February of 2008. By integrating conservation biology and landscape ecology principles directly into the framework of an urban and community planning process, the Aberdeen EA represented a new model for achieving sustainable growth in the BC Southern Interior.

The Lac du Bois EA also integrates the results of the GCC's Grasslands Portfolio for the Thompson Basin Ecosection, released in January 2009. The portfolio provides a regional framework for conservation planning in the Thompson Region, while the Lac du Bois ecological area assessment applies the principles of the *Priority Grasslands Initiative* to a specific ecological landscape. The EA gives specific recommendations that ensure that the values highlighted in the Grasslands Portfolio can be managed appropriately as the population in the Thompson Basin region continues to grow.

1.2 Objectives

The main objectives of this project are to:

1. Identify the natural features of the Lac du Bois grasslands, and the ecological, social, and economic values they represent.

2. Assess the ecological processes which sustain the identified values and the risk posed to these processes by current or future urban development.

3. Recommend land use planning actions that would protect the integrity of these processes and conserve the values they sustain.

4. Propose further measures that would enhance the ecological, social, and economic value of the Lac du Bois grasslands.

R. Doucette

2.0 Recommendations

T. Sargent

The results of the ecological area assessment have shown that the entire Lac du Bois grasslands landscape is of high ecological importance at both a regional and provincial level. A number of species at risk rely on this area for breeding, foraging, migration and as critical habitat for survival, including but not limited to Western rattlesnake, California bighorn sheep, burrowing owl, Great Basin spadefoot, and sharp-tailed grouse. Ideally, no further intensive development should take place; however, the GCC has identified areas of particularly high risk where development would certainly result in impacts on identified species at risk, as well as the permanent loss of significant grassland values.

Should it become necessary for development to take place in the study area, the GCC recommends that the City of Kamloops work closely with the GCC and the Ministry of Environment to ensure that negative impacts are mitigated through the incorporation of Best Management Practices (MoE 2006).

The following general recommendations are the fundamental principles which should be kept in mind when planning for future land use in the Lac du Bois grasslands:

Management Objectives

1. Avoid any further loss of grassland habitat within priority conservation areas, as identified in the GCC's Thompson Basin Grassland Portfolio (GCC 2009).

2. Focus planning efforts on maintaining open corridors between priority areas. In addition to corridor requirements within the study area (discussed below), two areas outside of the Lac du Bois grasslands need to be included in management plans to ensure that this objective can be met:

    - For the Thompson River lowlands between the Kamloops Airport and Tranquille (Map 1), green space designations (including agricultural and recreation uses) are maintained .

    - In the areas of Westsyde where undeveloped slopes come closest to the river and the band of built-up land is narrowest (Map 1), new development is managed to maintain and enhance wildlife access to the river.

3. Direct new development to areas adjacent to existing serviced areas where the servicing is fully subscribed to prevent fragmentation of the grassland landscape.

4. Create buffers (with little to no development) on lands adjacent to the protected area boundary to maintain ecological connectivity between developed areas and Lac du Bois Protected Area.

Planning Recommendations

1. City of Kamloops plans for Lac du Bois at the landscape level, understanding that it functions as an important piece of a larger ecosystem.

2. Amend the KamPlan (Official Community Plan) to include policies for no further loss of grasslands values.

3. Designate biodiversity corridors across the city of Kamloops landscape in the KamPlan, starting with the Lac du Bois study area.

4. Approach conservation planning for the Lac du Bois grasslands as a single component within a larger municipal conservation strategy that balances land uses across the entire City of Kamloops, rather than considering each neighbourhood as a separate ecological landscape.

5. Designate the entire Lac du Bois study area as an environmental development permit area (section 919.1 of Local Government Act) and develop detailed guidelines for development for protection of the natural environment that incorporate the recommendations in the assessment and focus on conserving grassland values.

6. Maintain large lots around Environmentally Sensitive Areas (as designated in this report) through zoning designations.

7. Consult GCC's *Thompson Basin Portfolio* and consider all information provided in planning decisions, with special consideration given to species at risk habitat, unique and special features (e.g. xxxxx) and rare and unique plant communities.

8. Complete an Agriculture Area Plan for the Lac du Bois Grasslands and for other grasslands in the City of Kamloops, as recommended by the BC Cattlemen's Association (2009).

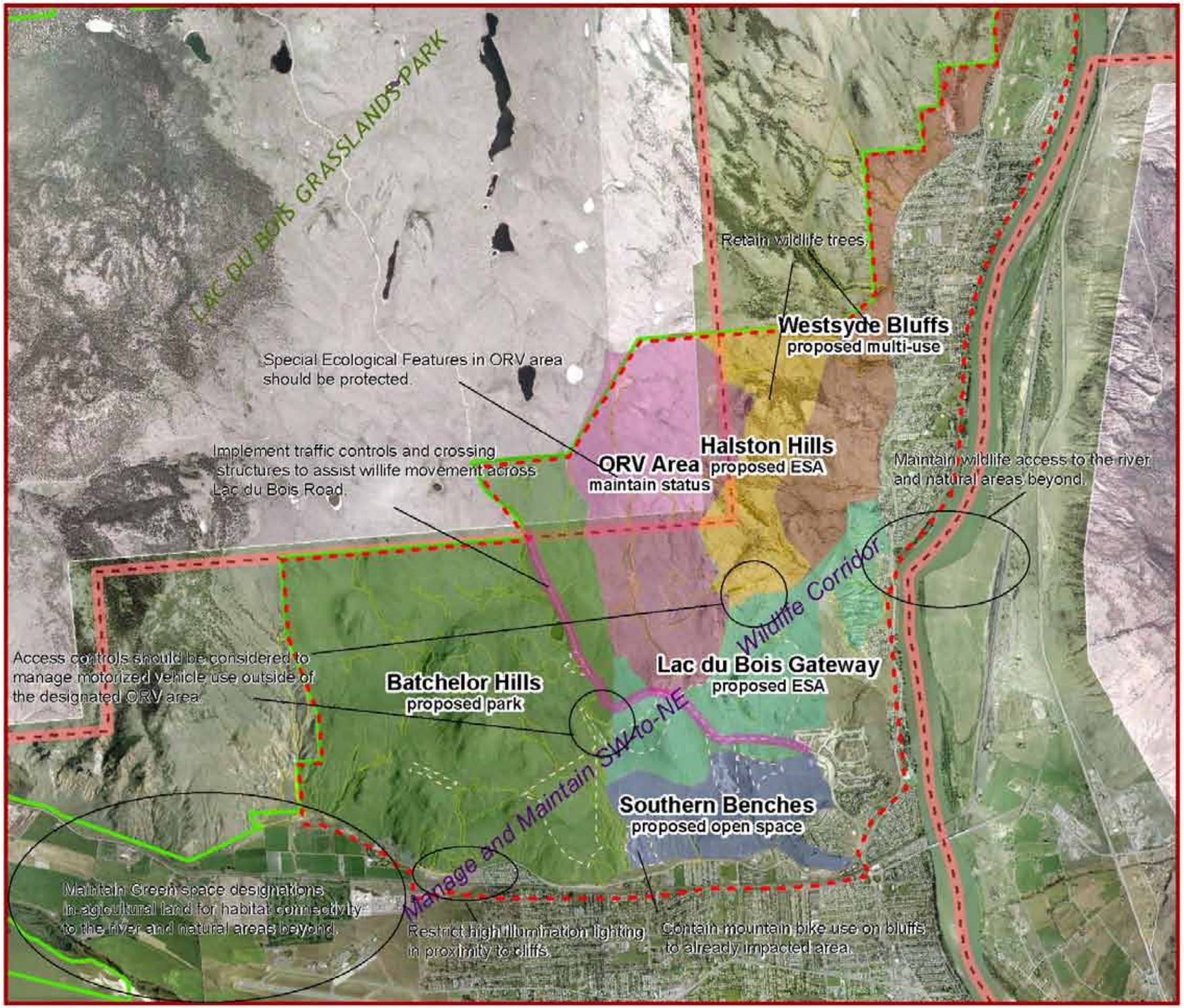
Specific land use and management recommendations have been developed for six landscape units within the study area. Map 1 shows the locations of these six areas. These recommendations are summarized below, along with the values that these

recommendations are designed to manage. More information and rationale can be found in section 6.0 of this document (recommendations in bold).

Area	Designation	Values	Recommendations
Batchelor Hills	Passive Municipal Park Land and implementation of the extension to Lac du Bois Grasslands Protected Area (as approved by City Council in 2002)	Batchelor Lake (important wetland ecosystem); California bighorn sheep Winter Range; burrowing owl reintroduction site; high value rattlesnake habitat; spadefoot breeding ponds; winter habitat for sharp-tailed grouse; important mule deer spring forage area; Provincially, regionally and locally significant plant communities (water birch, giant wildrye, selaginella, Indian ricegrass – needle-and-thread grass); uncommon talus slope and rock outcrop features; high-value livestock spring range; long-term range research trial sites.	• Management of light pollution • Control mountain biking to limit soil erosion and contain noxious weeds. • Manage for connectivity with Lac du Bois Grasslands Protected Area and to the wildlife corridor in Lac du Bois Gateway.
Lac du Bois Gateway	Environmentally Sensitive Area	Significant rattlesnake population and habitat; significant East - West wildlife movement corridor; Provincially, regionally and locally significant plant communities (deciduous riparian shrub communities, fern-leafed desert parsley); unusual low elevation rough-fescue community; significant large talus slope feature; east-aspect lacustrine bluff	• This area could be developed for low-impact recreation activities such as walking, biking, and picnic areas with a focus on best management practices for trail development and use. • Increased signage, access controls such as gates and passive barriers, and a more active enforcement presence should be implemented to manage motorized vehicle use in non-approved areas. • The visual impact of potential

		feature; important livestock watering infrastructure and good range forage value.	land uses should be carefully considered, as this is an important social value. • Lac du Bois Gateway should be managed to encourage continued wildlife movement along this corridor. • Wildlife crossing structures, fencing, increased signage, lower speed limits or other measures, e.g., lower speed limits / speed bumps, should be considered to permit wildlife to cross Lac du Bois Road safely, especially if traffic volumes on this road increase.
Halston Hills	Environmentally Sensitive Area	Excellent habitat potential for Lewis' woodpecker; important ponderosa pine open-forest grasslands; Douglas maple riparian shrub community; good forage values.	• Large standing snags should be retained as wildlife trees for Lewis' woodpecker, birds of prey, bats and other cavity nesting birds.
Off-road Vehicle (ORV) Area	Off-road Vehicle (ORV) Area	Important area for containing high-impact motorized recreation; important Great Basin spadefoot breeding ponds and associated ecosystems; important aspen copse and riparian deciduous plant communities.	• Special ecological features (such as alkaline ponds used by Great Basin spadefoot toads) should be protected by fencing, signage and other measures. • Signage on best management practices should be posted.
Southern Benches	Open Spaces-Development Permit Area	Unique extensive, unbroken big sagebrush – bluebunch wheatgrass flat; important lacustrine bluff feature; significant deciduous shrub communities.	• Land uses in the Southern Benches (Map 1) should be planned for reduced visual impact. Efforts should be made to contain mountain bike use within already impacted areas

Westsyde Bluffs	Multi-use – Development Permit Area	Significant open ponderosa pine stands (high potential Lewis' woodpecker habitat); wildlife movement corridors down to North Thompson River.	• Vegetation strips should be retained along natural corridors like gullies, especially where riparian vegetation is present. • Large standing snags should be retained as wildlife trees for Lewis' woodpecker and other cavity nesting birds. In the areas of Westsyde where undeveloped slopes come closest to the river and the band of built-up land is narrowest (Map 1), new development should be managed to maintain and enhance wildlife access to the river.



Map 1
Integrated Recommendations

0 250 500 1,000 1,500 2,000
Metres

Portion of Lac du Bois Rd in Study Area
high disturbance (outside ORV area)
Study area boundary

Proposed Land Use Designations

Batchelor Hills
Halston Hills
Lac du Bois Gateway - ESA
ORV Recreation Area - maintain status
Southern Benches - open space
Westsyde Bluffs - multi-use
special ecological features
parks and protected areas outline
Municipal Boundary

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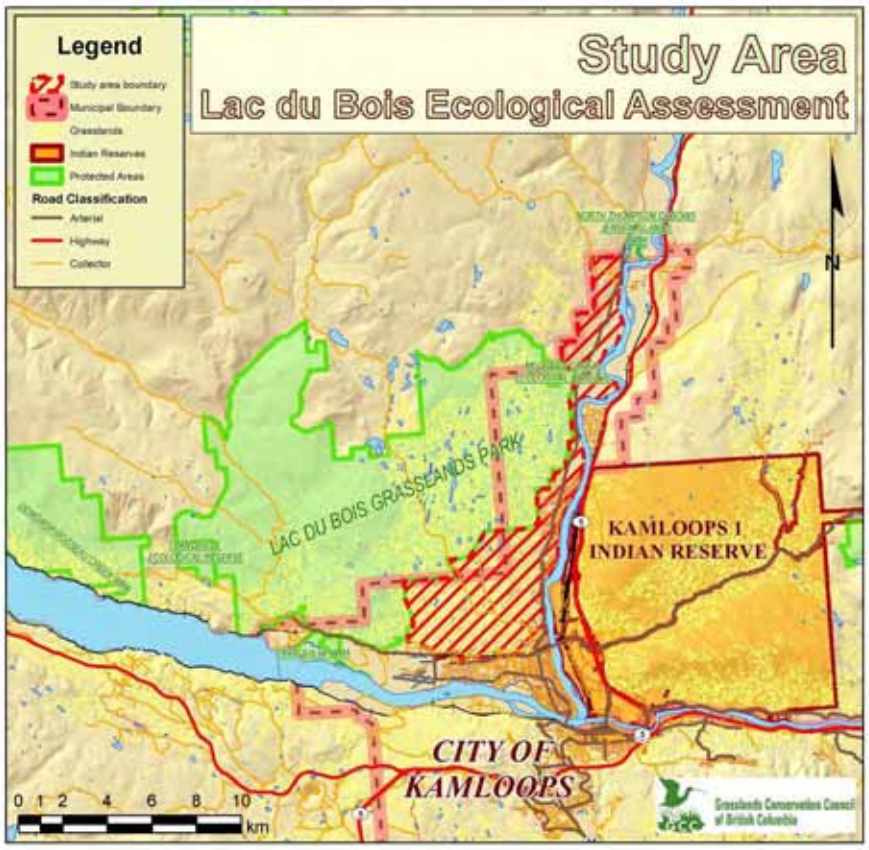
3.0 Study Area Description

3.1 Geographic Location

The focus of this study is the Lac du Bois grasslands area in the north-western sector of the City of Kamloops. To the north and west, the study area borders on Lac du Bois Grasslands Protected Area, and medium-density residential neighbourhoods lie to the east and south. Lac du Bois Road cuts through the middle of the study area; this is the only all-season, public access road.

The study area encompasses approximately 3300 hectares of land ranging in elevation from approximately 350 to 800 metres above sea level. The undeveloped portions of the study area are characterized by open grassland habitat, primarily low elevation grasslands dominated by big sagebrush and bluebunch wheatgrass. These grasslands are an integral part of a larger grassland landscape blanketing slopes and benches of the Thompson Valley from the Dewdrop-Rosseau Wildlife Management Area above Kamloops Lake, through Lac du Bois Grasslands Protected Area to the North Thompson River.



Map 2: Lac du Bois Study Area

3.2 Land Use Status

Although it borders on the Provincial Protected Area under the jurisdiction of BC Parks, most of the study area consists of vacant Crown land. There are a few large parcels of private land along the perimeter of the grasslands, as well as extensive private lands on the alluvial flats of the Thompson River between Kamloops Airport and the old Tranquille Sanatorium. Through a donation agreement with Mr. Phil Theimer, the title to a nine and a half acre parcel adjacent to Ord Road is in the process of being transferred to the Nature Conservancy of Canada to be managed as a private land conservancy.

Nearly the entire study area falls within the municipal boundaries of the City of Kamloops; the exception is an area of 340 hectares of Crown land in the centre of the study area that is outside of both municipal and park boundaries.

A number of different land use designations, at both a provincial and a municipal level, apply to different portions of the study area (Map 3).

Development Zoning

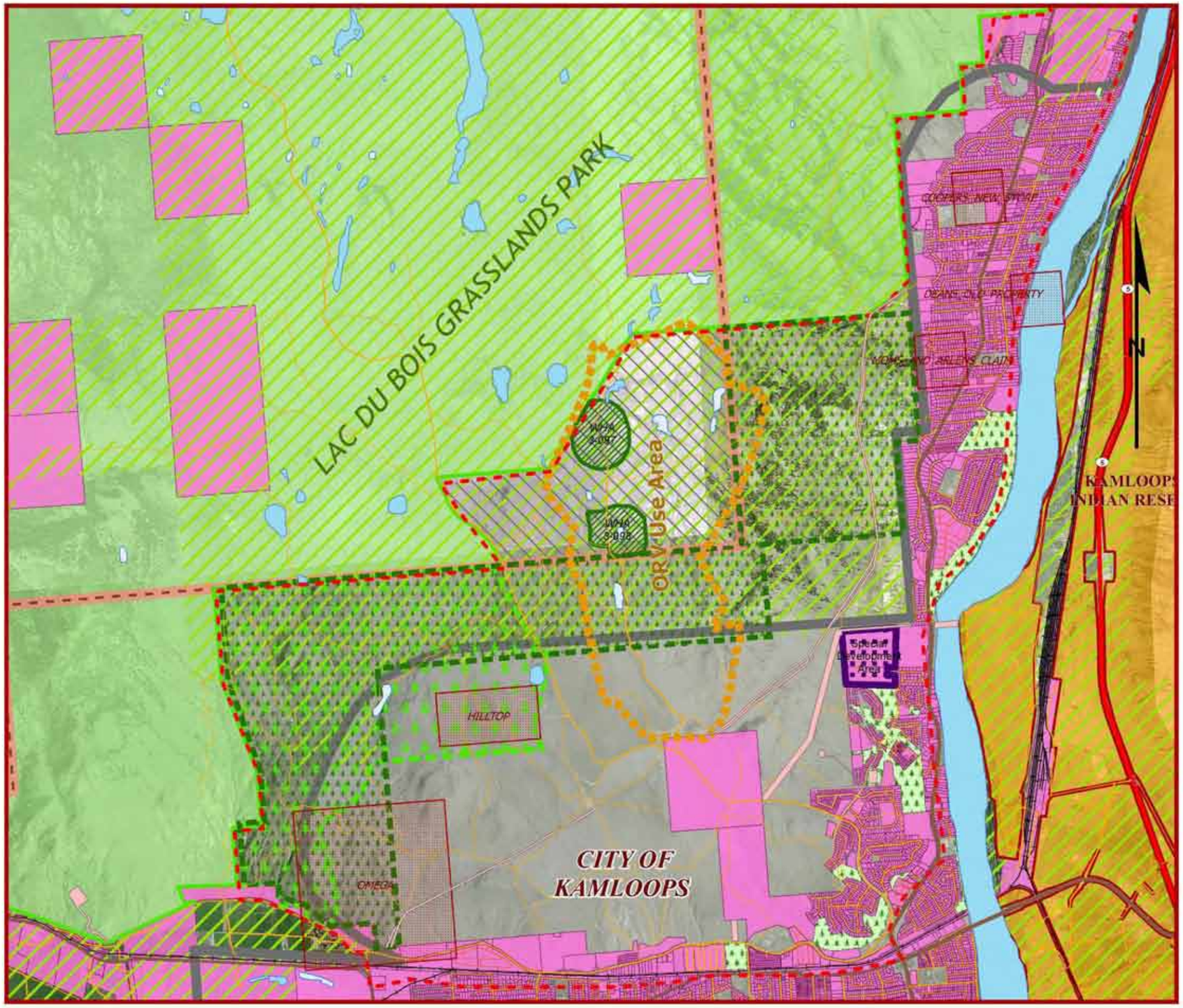
The core grassland portion of the study area is not currently included within any City of Kamloops neighbourhood plans. The Kamloops Official Community Plan (KamPlan 2004), which is designed to accommodate projected growth up to the year 2036, does not include any development zones within the study area other than two small Special Development Areas, one adjacent to existing neighbourhoods in Westsyde, and one at Tranquille.

The North Shore Neighbourhood Plan applies to a small portion of the study area along Ord Road. This plan proposes residential, light industrial, and service commercial zoning for the private parcels along Ord Road (City of Kamloops 2008a).

The Kamloops Land and Resource Management PLAN (LRMP) (KIMC, BC and KLRPMT 1995) identified most of the municipal area outside park boundaries as future settlement zone.

Conservation Designations

KamPlan 2004 identified most of the Lac du Bois grasslands as an Environmentally Sensitive Area, and highlighted several local portions of this landscape – including the Ord Road cliffs and Batchelor Hill – for special consideration. In laying out a vision for future park lands in the City, KamPlan



Map 3
Land Use Designations

0 250 500 1,000 1,500 2,000 Metres

Legend

- Study area boundary
- Private Land
- Right-of-way
- Municipal Boundary
- Portion of Study Area outside City of Kamloops
- Special Development Area (KamPlan 2004)
- Existing Municipal Park
- Proposed Municipal Park (KamPlan 2004)
- Proposed Provincial Park Addition
- Provincial Protected Area
- Wildlife Habitat Areas
- ALR Polygons
- Off-Road Vehicle Area
- Mineral Tenures
- Indian Reserves

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2004 proposes a municipal park bordering the current Lac du Bois Protected Area; elsewhere, however, KamPlan 2004 proposes an expansion of Lac du Bois Protected Area into an overlapping, but not exactly coincident, area of land; this proposal was approved by City Council in 2002.

At a provincial level, the Tranquille Wildlife Management Area (WMA) has had some form of conservation designation since a game reserve was established in the area in 1927 (Howie 2007), and has been a WMA since 1987. Lac du Bois Grasslands Protected Area was established in 1996 (BC Parks 2007), and two proposed Wildlife Habitat Areas (WHA 3-097 and WHA 3-098) for Great Basin spadefoot have been identified by the Ministry of Environment on land just outside municipal boundaries.

Agriculture and Range

About 1300 hectares of the study area is included in the Agricultural Land Reserve (ALR). Aside from the developed agricultural lands along the Thompson River west of the Kamloops Airport, most ALR lands in the study area are found in an east-west band bordering on Lac du Bois Grasslands Protected Area and are actively used for livestock grazing under Ministry of Forests and Range licenses 075385, 076124, and 076328. There are two major pastures in the study area, which are grazed as part of a three-year rotation along with the Westsyde pasture in Lac du Bois Protected Area. The study area has also been used in a long-running series of Agriculture Canada grazing trials, a research project that has been in place since 1948.

Recreational Use

A designated Off-Road Vehicle use area has been managed by the Province since 1976, east of the Lac du Bois Road and adjacent to the park boundary (BC Parks, 2000). The Kamloops LRMP recommended maintaining a motorized access corridor from through Lac du Bois to Nobel Lake, but stated a need to find a replacement recreational motorcycle use area elsewhere.

Mining

There are several active mineral claims, covering 307 hectares, in the study area. These claims are owned by several different tenure holders.

4.0 Values Provided by the Lac du Bois Grasslands

The Lac du Bois grasslands have historically provided a wide range of benefits to the City of Kamloops, as well as to the natural environment.

4.1 Social Values

The Lac du Bois grasslands provide enormous social benefits to the citizens of Kamloops. The open grasslands provide nearly limitless opportunities for various forms of outdoor recreation, from walking and hiking to mountain biking, and off-road vehicle use. This unparalleled access to outdoor recreational opportunities is a key attraction for residents in the city and has an economic value in increased property values close to the areas, increased revenues from tourism, and assists in the viability of many local businesses that provide equipment and services to those that use the areas.

The Lac du Bois grasslands dominate the viewscape of nearly every neighbourhood of the City of Kamloops; the rolling sweep of golden-brown grasslands blanketing these slopes is prominent in the image Kamloops projects to visitors and residents alike. Many businesses and tourism organizations tout Kamloops' sweeping grasslands vistas as a draw.

The same is true of the many wildlife species that make their home within the Lac du Bois grasslands. One of the definitive Kamloops experiences is to see bighorn sheep feeding undisturbed within sight of residential neighbourhoods, as is the case along Ord Road. In 2005 a group of residents opposed to a potential development on the north side of Ord Road presented to city council on their concerns, stating the loss of their viewscape and the bighorn sheep that were frequently on the slopes across from the mobile home park were their biggest concerns and the primary reason they had chosen the area to live.

The City of Kelowna is currently revising its OCP; in a survey that went out to the community, a leading factor in choosing where to live was proximity to natural features (City of Kelowna 2008). The City of Kamloops recognized that expanding natural areas, such as Lac du Bois, is an important component to preserving and enhancing the quality of life for the people of Kamloops (KamPlan 2004). The area is a known social value, which can be translated into economic values as well.

4.2 Economic Values

Grasslands provide a variety of ecological goods and services that translates into natural capital that can be valuated and measured. The cost to replace the ecological goods and services provided by grasslands most often greatly exceeds the cost of allowing the ecosystem to function naturally.

Grasslands provide the following ecological goods and services (Wilson 2009):

- Erosion Control
- Climate Regulation
- Pest Control
- Pollination
- Forage
- Waste Processing
- Flood regulation
- Sediment retention
- Nutrient cycling
- Recreation/Ecotourism
- Aesthetic
- Spiritual
- Cultural/Heritage
- Education

Through its Natural Capital Initiative, the GCC is currently engaged in calculating the direct monetary value provided to communities by these grassland ecological goods and services.

In addition to the general economic services natural grasslands provide to society, the grasslands of BC have always been an essential economic resource for the livestock ranching industry, which has been a foundation of the economy of the BC Southern Interior for more than 150 years. The Lac du Bois grasslands have played a critical role in supporting forage-based agriculture since the very beginnings of the industry. In particular, the warm, low-elevation grasslands found in the study area are crucial to the economic viability of ranching operations. At critical times of year, early spring and late fall, grasslands are the only source of natural forage; without access to low-elevation grasslands, ranchers must support their livestock with imported forage, which has high cost both in dollar terms, and also in carbon emissions (because of the fuel required to transport feed long distances).

Because of the significance of forage-based agriculture as a foundation of the local economy, as a central cultural value for the Thompson-Nicola region, and as an important component of a sustainable, locally-based food strategy for Kamloops, land-use planning in the Lac du Bois grasslands should consider the potential impact of developments on the viability of forage-based agriculture in the region. In their recent position statement on Agricultural reserve land in BC (BC Cattlemen's Association 2009), the BC Cattlemen's Association recommends that Local Governments **incorporate an Agricultural Area Plan into their Official Community Plan process in order to ensure that the needs of agricultural producers are addressed.**

4.3 Ecological Values

The Lac du Bois study area sits at a critical intersection between several of BC's major grassland regions. To the west, continuous grasslands stretch along river valleys to the Cariboo and Chilcotin. To the south, grasslands extend into the Nicola basin and, though separated by forested highland, there are connections to grasslands in the Okanagan and Similkameen valleys. The strain of climate change and urban expansion on wildlife and plants means that many wildlife and plants need to be able to disperse into new areas of the Southern Interior. In this respect the study area acts as a cross-roads that links several different ecological regions.

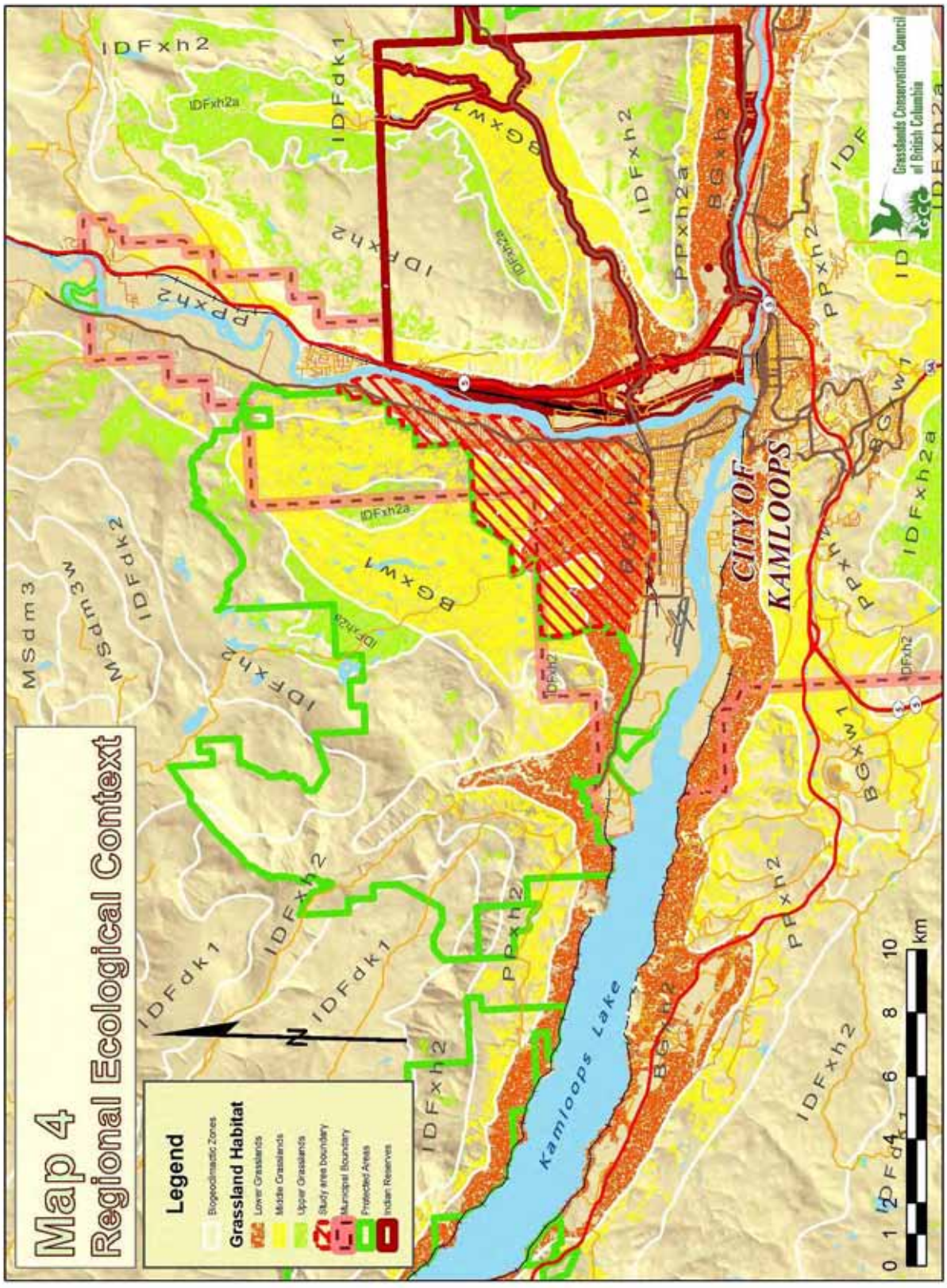
Grasslands in this region are found in localized areas of low winter snowfall and high summer temperatures. Small changes in moisture and temperature regime lead to distinctly different ecological communities within the larger grasslands area **(see Map 4)**. On river flats and lower slopes of the Thompson Valley, extremely hot summer temperatures and nearly snow-free winters in the Lower Grasslands produce big sagebrush and bluebunch wheatgrass dominated communities. Further uphill, from around 700 to 850 metres elevation, higher annual precipitation and lower summer moisture deficits in the Middle Grasslands support bluebunch wheatgrass dominated communities; while on higher slopes and benches bluebunch wheatgrass co-dominates with rough fescue in Upper Grasslands that are intermixed with aspen copses and stands of Douglas fir, whose boundaries have historically been maintained by frequent surface fires.

The study area is largely defined as lower elevation grasslands, the big sagebrush / bluebunch wheatgrass predominating. In fact, 40% of all Lower Grasslands in the Lac du Bois area are inside the study area boundary (McIntosh 2009). These extremely warm and dry grasslands, with their very low snowfalls and early spring melt, play an important role within the larger grassland ecosystem, because they provide food and shelter at a time when other areas are still snow-covered. This is important both to grassland wildlife, and cattle ranching operations that depend on early-season forage to minimize winter feed costs.

It is important to note that the extreme dryness of the Lower Grasslands also makes them vulnerable to impacts, such as overgrazing, off-road vehicle use, or poorly-managed recreational activities. Biological crusts, which bind the soil exposed between widely-scattered perennials and herbaceous annuals, are thin and fragile; disturbance can easily lead to rapid erosion or the spread of noxious weeds, which reduces their ability to support a wide range of grassland-dependent species.

Field surveys identified 14 grassland Ecological Communities within the Lac du Bois study area **(Table 1**). Ecological Communities are distinctive assemblages of plants associated with specific conditions of soil and climate. This ecosystem classification scheme is a refinement of the system introduced in the Aberdeen area assessment (GCC and Biospherics Environmental 2008). Though many of

the communities described here are equivalent to those in the earlier report, some definitions have been changed to reflect distinctive features of the Lac du Bois grasslands and an improved understanding of the local grassland ecosystem. The Ecological Communities described in this report are distinct from other systems used to classify terrestrial ecosystems in British Columbia, such as the Ministry of Forests and Range Biogeoclimatic Ecological Classification, or the CDC Plant Associations. **Appendix 1** relates the Lac du Bois Ecological Communities to their equivalents in other systems.



Map 4: Broad Regional Ecology (Grassland Types)

Ecological Community (EC)
Grasslands
1. Bluebunch Wheatgrass - Big Sagebrush Ecological Community
2. Bluebunch Wheatgrass - Junegrass - Pussytoes Ecological Community
3. Needle-and-thread - Big Sagebrush – Bluebunch Wheatgrass Ecological Community
4. Rough Fescue - Bluebunch Wheatgrass Ecological Community
Shallow Soil and/or Sparsely Vegetated
5. Wallace's Selaginella Ecological Community
6. Talus and Fine Scree Ecological Community
7. Outcrop Ecological Community
8. Gulley and Fan Ecological Community
9. Lacustrine Bluffs - Compact Silt Ecological Community
Forests
10. Shrub-dominated Ecological Community
11. Ponderosa Pine Ecological Community
12. Douglas-fir Ecological Community
Wetlands
13. Alkaline Depression Ecological Community
14. Alkaline Seepage Slopes and Swales Ecological Community

Table 1: Ecological Communities in the Lac du Bois Study Area

5.0 Principles of the Lac du Bois Ecological Area Assessment

The recommendations contained in this report are based on a landscape approach to conservation planning, in which the emphasis is not on the measures required to protect any single value in isolation, but rather on what is required to conserve the ecological system those values depend on, and contribute to. This section will describe the general principles of landscape-scale conservation planning which guided this ecological area assessment, and demonstrate how these principles can be translated into land-use planning objectives.

5.1 Representation

A guiding principle of the ecological area assessment process is to ensure **representation** of grassland values within designated conservation areas. This involves identifying all the distinctive features found within the grassland landscape (such as unique plant communities, or critical habitat areas for grassland dependent wildlife) and ensuring that an adequate sample of all of these features will be included within the designated conservation areas. Planning for representation gives us confidence that the conservation areas we select will provide all of the requisite elements of a healthy grassland ecosystem. However, the effectiveness of representation-based conservation planning depends on maintaining the integrity of all identified conservation areas, since each plays a critical ecological role within the landscape as a whole.

5.2 Significance of Priority Areas

In January 2009, the Grasslands Conservation Council of BC released the Thompson Basin Ecosection Priority Grasslands Portfolio, a compilation of currently-available information about grassland-associated values within the main valley of the Thompson River. As with the ecological area assessment process, a key feature of the priority area selection process was ensuring adequate representation of grassland values. The portfolio identifies 87 priority areas that together represent the **minimum** land-base required to sustain the existing features of the grassland landscape in perpetuity. Because this is a minimum requirement, a fundamental principle of the Priority Grasslands Initiative is that future development in the Thompson Basin region should be directed so as to **avoid any further loss of grassland habitat within identified priority areas** (GCC 2009). **Map 5** shows the location of identified priority areas in relation to the study area.

A total of 75%, or 2464 hectares, of the study area has been identified as priority grassland (GCC 2009). The following priority areas are part of the study area:

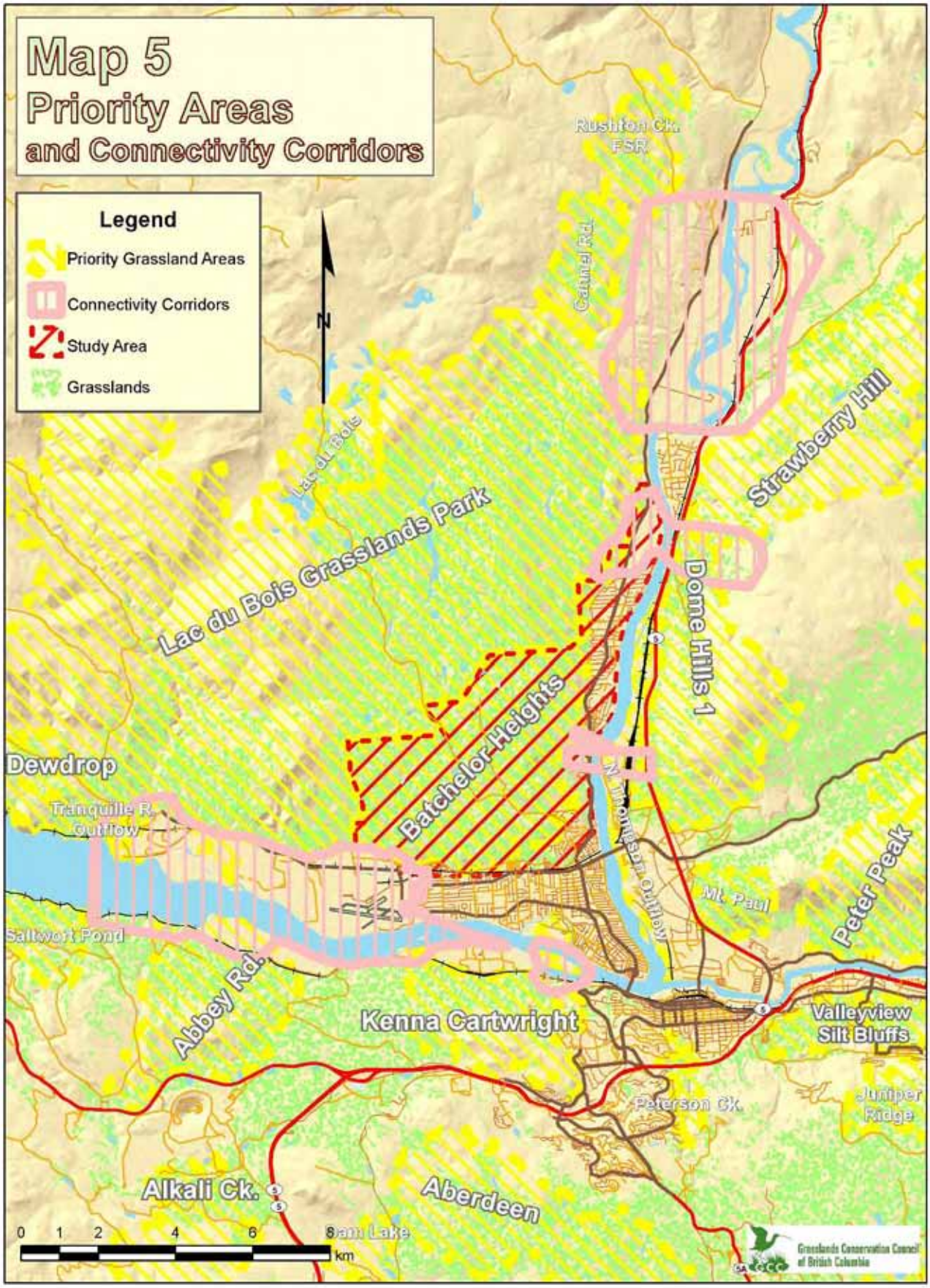
Batchelor Lake:

- Comprised of significant lower, middle, and upper grasslands with **many species at risk values**, which occur adjacent to a highly urbanized environment, with **lower grassland comprising over half of the study area.**
- Provides a very high contribution to **suitable rattlesnake den habitat** (near known rattlesnake dens), as well as a high contribution to suitable rattlesnake den habitat (away from known den sites) and **Lewis's woodpecker suitable habitat** in grasslands.

Lac du Bois Grasslands Park

- The **largest contiguous grassland** area under protection in the Thompson Basin.
- Contains the greatest number of **sharp-tailed grouse leks** and the second greatest number of **western rattlesnake dens** of any priority area in the Thompson Basin.
- **Core habitat area for a wide diversity of wildlife** that also make use of other priority areas and the intervening grassland landscape.
- Provides high contribution to the representation of **badger habitat, burrowing owl habitat, Lewis's woodpecker habitat** in grasslands and cottonwoods, and **sharp-tailed grouse habitat.**
- Very high number of **species at risk sightings.**

Priority area-specific features identified in the Thompson Basin Portfolio should be given special consideration in plans for the study area, since they are critical to the *regional* grassland ecology of the Thompson Basin, as well as being essential components of the *local* ecology of the Lac du Bois grasslands.


Map 5
Priority Areas
and Connectivity Corridors
Legend
Priority Grassland Areas
Connectivity Corridors
Study Area
Grasslands
N
Rushton Ck. FSR
Cariboo Rd.
Lac du Bois
Lac du Bois Grasslands Park
Strawberry Hill
Dome Hills 1
Batchelor Heights
Dewdrop
Tranquille R. Outflow
Thompson Outflow
Mt. Paul
Peter Peak
Saltwort Pond
Abbey Rd.
Kenna Cartwright
Valleyview Silt Bluffs
Juniper Ridge
Peterson Ck.
Alkali Ck.
Aberdeen
Bonaparte Lake
0 1 2 4 6 8 km
Grasslands Conservation Council of British Columbia

5.3 External Connectivity

Though priority grasslands are the core landbase required to maintain the full range of grassland values within the Thompson Basin region, it is not possible for these areas to serve this function in isolation from one another. Interconnections between priority areas allow wildlife to access a diversity of habitats. Avenues of movement between priority areas also prevent genetic isolation of populations, and ensure the adaptability of communities in the face of changing climates.

Priority grasslands within the study area should thus be understood as part of a larger network of grassland areas, and **planning efforts should focus on maintaining open corridors between priority areas. Map 5** shows the location of potential connectivity areas that connect the study area to other priority grasslands in the region.

The most direct connections are between the study area and adjacent priority areas: Lac du Bois Grasslands Park, Lac du Bois Lake, Dewdrop, Dewdrop-Rosseau WMA, Cannel Road, and Rushton Creek FSR. The *Thompson Basin Ecosection Grassland Portfolio* (GCC 2009) provides more detailed and comprehensive information about these and other priority areas.

These areas support a wide range of grassland species, many of which depend on Lower Grasslands inside the study area for part of their life cycle. The same is true of species whose core habitat is inside the study area, but who need to access resources in adjacent priority grasslands. To encourage movement between high-elevation and low-elevation grasslands**, intensive land uses should not be considered for land adjacent to Lac du Bois Protected Area.**

Equally important are connections across the valley of the Thompson River. Being able to access valley-bottom resources as well as lowland areas to access distinctive grassland habitats on opposite valley slopes, will be critical to ensuring that populations will be able to meet all of their life needs and remain resilient in the face of changing environmental conditions.

Two main lowland areas have been identified as vital “stepping stones” between the study area and priority areas on the far side of the valley (Map 5). The first is the agricultural area along the Thompson River west of the Kamloops Airport, along with the wetlands of the Tranquille WMA. **Green space designations (including agricultural and recreation uses) should be maintained** to encourage access to priority areas such as Abbey Road and Kenna Cartwright.

Another important corridor area is found to the east of the study area, where steep slopes leading directly down to the North Thompson River allow species to reach riparian grasslands in Rivers Trail Municipal Park and the North Thompson Outflow Priority Area. They can also cross the river to access upland priority areas such as Dome Hills, Strawberry Hill, and Mt. Paul. Though narrow, this is the only remaining corridor of undeveloped land on the eastern edge of the study

area. **Further development along this stretch of Westsyde Road should be managed to maintain access to the river.**

5.3 Avoiding Fragmentation

An essential characteristic of grasslands as a healthy, functioning ecological landscape is their expansive nature. Having evolved in a landscape with few barriers to movement, grassland species are, in general, highly mobile and have large space requirements. They cannot meet all of their habitat requirements inside small, isolated patches of grassland, even if these fragments are not directly impacted by surrounding developments. Complete grassland ecosystems can be conserved by keeping large, contiguous blocks of land as natural areas. This means that **development should be directed to areas adjacent to existing neighbourhoods**, rather than being intermixed with natural areas in the Lac du Bois grasslands.

5.4 Risk Assessment

When looking at the grassland values identified within the study area, an assessment was made of the risk posed to these values by potential impacts from current and future human developments – especially, the expansion of residential development from existing built-up neighbourhoods in the City of Kamloops.

Risk was primarily assessed in reference to the ongoing viability of identified Species at Risk (SAR) wildlife. SAR wildlife identified in the study area include burrowing owl, western rattlesnake, Great Basin spadefoot toad, and California bighorn sheep. Though limited survey data meant there is not a confirmed occurrence of other SAR wildlife within the study area, suitable habitat exists for several of these species and this was considered in the assessment. Appendix 2 provides a complete list of plant and animal species at risk known or likely to occur in the study area.

Risk to identified wildlife was determined by proximity of given areas to known, actively used important habitat or secondary associated habitat for an identified Species at Risk. Also considered were the most likely corridors used for movement of a species between these core habitat areas, based on inference from the local topography and supported by on-the-ground evidence, such as radio-tracking (telemetry) data, wherever this was available.

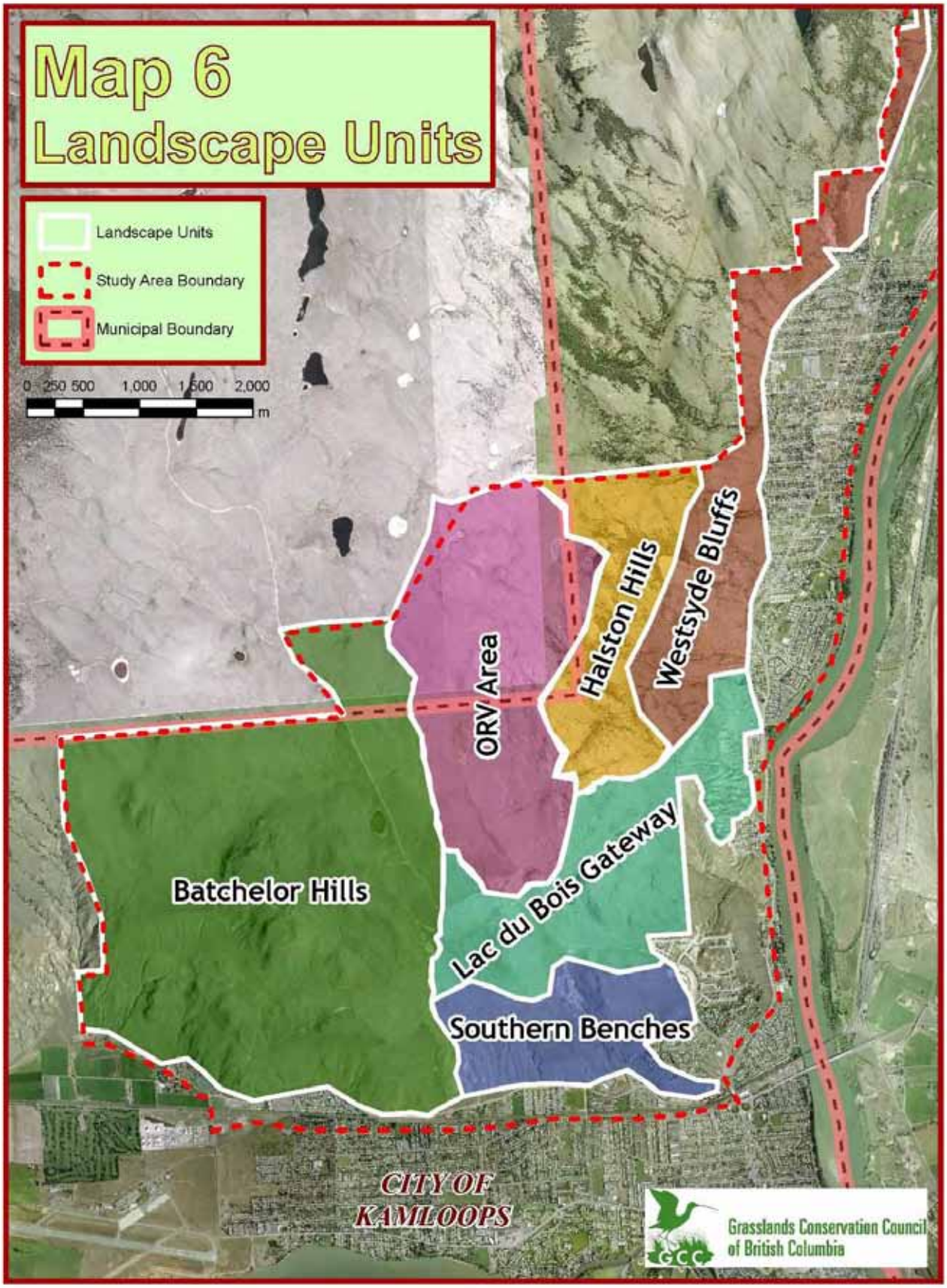
6.0 Landscape Units

Section 5 described the principles which guided this ecological area assessment, and indicated what the general land use planning objectives should be in order to implement these principles within an integrated conservation plan. This section will take a more detailed look at the ecological landscape of the study area, and recommend specific actions that could be taken to protect identified values and maintain the landscape-scale ecological processes which sustain them.

Based on the ecological features within them and their role within the larger ecological landscape, a set of recommendations have been developed for six separate landscape units within the overall study area. These six units are:

- **Batchelor Hills**
- **Lac du Bois Gateway**
- **Halston Hills**
- **Off-road Vehicle (ORV) Area**
- **Southern Benches**
- **Westsyde Bluffs**

Map 6 shows the location of these landscape units and their proposed land use designations. The factors which guided these recommendations are described for each unit individually.


Map 6
Landscape Units
Landscape Units
Study Area Boundary
Municipal Boundary
0 250 500 1,000 1,500 2,000
m
ORV Area
Halston Hills
Westsyde Bluffs
Batchelor Hills
Lac du Bois Gateway
Southern Benches
CITY OF KAMLOOPS
Grasslands Conservation Council of British Columbia

6.1 Batchelor Hills

Due to its high internal ecological value and significant role in connecting the study area to surrounding grassland habitats, **the Batchelor Hills area is an ideal candidate for park protection** (***Map 6***). This could be achieved through a combination of additions to Lac du Bois Grasslands Protected Area (provincial park status) and creation of municipal natural parks.

The Batchelor Hills area is centred on a large core area of rocky hills, surrounded by flat benchlands and broad valleys. An important landscape feature in the area is the mix of rock cliffs and steep silt bluffs along the southern margin of the grasslands. ***Map 7*** shows the broad ecological communities which define the fundamental patterns of vegetation, climate, and geology in Bachelor Hills. The broader scale classification reflects the interaction between vegetation, climate and underlying geology. Batchelor Hills features the presence of rocky outcrops, high hill assemblages and wetter swales.

Batchelor Hills is adjacent to Lac du Bois Grasslands Protected Area and is an important buffer area that serves as an interface between built-up areas and the natural habitats protected by the park.

Significant Features

Map 8 describes the special ecological features of Bachelor Hills. These are locally distinctive, regionally rare, or especially sensitive ecological communities that often serve as ecological focal points for the landscape. Some of these features include:

- The only known water birch community in the study area.
- Large swales and deep gullies.
- The only large alkaline lake within the study area - Batchelor Lake.
- The largest and most vigorous Giant Wildrye alkaline swale community, which also contains a significant-sized patch of the red-listed alkaline wing nerved moss.
- Excellent condition selaginella communities.
- A variety of small to large talus slopes on all major aspects.
- Excellent condition rough fescue slopes and swales on upper portions of Batchelor Hill and including one of the only Spreading Needlegrass communities in the study area.

- The only known Indian Ricegrass – Needle and threadgrass site in the study area.

Batchelor Hills also contains some of the most significant wildlife features in the study area (***Map 9)***. This includes:

- A very important bighorn sheep wintering area on the steep slopes along the south edge of the area; and area below cliffs near Ord Road. The south steep facing slopes below the cliffs of Ord Road provide ample escape terrain and foraging needs to support wintering California Big horn sheep, a regionally significant species that is listed by the province of British Columbia as a species of special concern. On any given day tourists and local citizens enjoy watching sheep graze above the cliffs at Ord Road.

- The Big Sagebrush and swale habitat to the north of Batchelor Lake supports a local population of the Endangered Burrowing Owl. This reintroduction area that has been a focus of recovery efforts for the burrowing owl, and that provides critical habitat features for this vulnerable population.

- A large core area of high value rattlesnake denning habitat, containing 3 known dens sites; also high habitat potential for other snake species, including racer, gopher snake, and rubber boa.

- Batchelor Lake, the largest and most permanent water source inside the study area; supports a distinctive wetland ecological community actively used by waterfowl, including Mallard, Bufflehead, Common Goldeneye, Barrow's Goldeneye, Canada Goose, and Pintail The fence north of the lake has bluebird nest boxes and bluebirds (most recently Western Bluebird) actively nest and use the surrounding area for foraging.

- Several other seasonal water sources, including an ephemeral lake on the west edge and two artificial dugouts further south.

- Great Basin spadefoot breeding populations in Batchelor Lake and in ponds within adjacent portions of Lac du Bois Grasslands Protected Area.

- Individuals of the sharptailed grouse population which breed and raise young in the northern sections of the provincial park have been radio tracked and found to use areas within the study area as winter habitat particularly northwest of Batchelor Lake in the dense sagebrush community and as such is part of this population's home range.

- There is a recorded sage thrasher observation (Red listed bird species) in the area.

- Unique habitat for white-throated swifts, cliff swallows, and canyon wrens in the cliff area along Ord Road.

- The western portion of the proposed park is a recurrently–used spring range for Mule Deer (as reported by several surveys and individual observations).

Because of the high concentration and diversity of ecological values in Batchelor Hills, the best strategy for their conservation is to manage the entire area as parkland; this will ensure that all of these values are adequately protected. However, because of the proximity of some portions of Batchelor Hills to existing developed neighbourhoods, there are some impacts from surrounding areas that need to be considered separately. An example of this is the impact of lights in urban neighbourhoods on bat populations inside Batchelor Hills. Bat surveys conducted as part of the Lac du Bois field surveys found very little bat activity in the area near Ord Cliffs, despite its good habitat potential for bat species. It was concluded that bright lights shining on the cliffs were discouraging use of the area by bats (McIntosh 2009). This indicates that **management of light pollution and other impacts from adjacent urban areas is needed to protect ecological values inside Batchelor Hills.**

Connectivity Requirements (*Map 10*)

Batchelor Hills is the most accessible low-elevation grassland for wildlife populations in Lac du Bois Protected Area. Several natural corridors connect Batchelor Hills to the protected area. These corridors are natural routes for wildlife seeking permanent water sources (and other resources) inside the protected area. Batchelor Hills also provides access to agricultural and wetland habitat along the Thompson River and movement corridors to priority grasslands south of the river, making this is a critical connectivity area for wildlife throughout the study area.

Telemetry studies have shown that western rattlesnakes travel back and forth from den sites in Batchelor Hills to habitat areas in Lac du Bois Gateway (see below); this exchange of individuals is undoubtedly significant for the health of the snake population.

Risk Assessment (*Map 11*)

In most of the Batchelor Hills area, the risk of development causing significant impact on grassland values was considered high, based on the high-value habitat it contains for several identified species at risk.

The rocky terrain in the southern half of the area, with its warm southerly aspect, is highly suitable habitat for both western rattlesnake and bighorn sheep. Several rattlesnake hibernacula (dens) have been identified in this area and given their known average home range size, it is likely that entire areas between these hibernacula is being actively used by the snakes. In winter, a small group of ram sheep are frequently observed in the area below the Ord Road cliffs.

There are also extensive signs of sheep use on benchlands below Batchelor Hill. These sheep are probably part of the Tranquille-Dewdrop herd whose range is on the southwestern portion of Lac du Bois Grasslands Protected Area and the Dewdrop-Rosseau Wildlife Management Area. This means sheep are likely using the upper benches as a travel route back and forth to ranges west of the study area, and development in these areas would disrupt their use of the Ord Road cliffs.

The burrowing owl release site and artificial burrow is in the north part of the Batchelor Hills area. Risk to this site is focussed on the immediate area around the burrows, as the owls mostly stay close to this area.

Range Values *(Map 12)*

The Batchelor Hills area forms the main part of the Batchelor crown range pasture, which is used for critical early and late season forage by three different Ministry of Forests and Range licensees. Batchelor Hills provides some of the most extensive forage resources in the study area, particularly because the availability of water is relatively good. It is estimated that forage within Batchelor Hills provides an annual cost savings of $1200 to local ranching operations.

173 hectares of land in the northwest part of Batchelor Hills is fenced off for use in Agriculture Canada grazing research trials. These studies have been ongoing since 1948, and information gathered from this site is being used to improve the stewardship of grasslands throughout the region.

6.2 Lac du Bois Gateway

Because of its significant wildlife habitat value and extremely significant role as a movement corridor within the study area, the **Lac du Bois Gateway area should be designated an Environmentally Sensitive Area (ESA)** (***Map 6***).

The Lac du Bois Gateway area is an area of mixed topography near the southern edge of the study area. ***Map 7*** shows the broad ecological communities which define the fundamental patterns of vegetation, climate, and geology of the area.

It is a significant interface area between developed residential neighbourhoods and the Lac du Bois grasslands, providing a buffer zone that absorbs impacts from both adjacent built-up areas, as well as from the heavily used corridor along Lac du Bois Road.

Significant Features

Map 8 describes the special ecological features of Lac du Bois Gateway. These are locally distinctive, regionally rare, or especially sensitive ecological communities that often serve as ecological focal points for the landscape.

- Largest Rough Fescue – Bluebunch wheat grass patch, also significant in that it is the lowest elevation occurrence (along with smaller adjacent

patches in gateway) of rough fescue in the study area and likely for the Thompson Basin as a whole.

- Two occurrences of small deciduous vegetation communities – Aspen, Chokecherry, Snowberry, and Saskatoon. Important nesting and feeding area for birds and other animals. Includes lowest elevation occurrence of Aspen in the study area.
- Only known occurrence of fern-leaved desert parsley in study area.
- Several small to large talus slopes, including largest talus slope in the study area; common area for hawks soaring over adjacent open swale.
- East aspect lacustrine bluff ecological community (EC 9; see Table 1, p.16) which is a regionally distinctive ecological and geological feature. This formation is also sensitive to disturbance due to steep slopes and extremely fine soils.

The most significant wildlife feature in the Lac du Bois Gateway is a known western rattlesnake den site and a significant area of heavily-used habitat around it (***Map 9)***. This rattlesnake population has been the focus of past biological research, including radio-tracking (telemetry) studies.

The Lac du Bois Gateway is the primary access point for the entire Lac du Bois grasslands, and as such provides important recreation value, especially for residents of nearby neighbourhoods like Batchelor Heights, North Kamloops, and Westsyde. This is an excellent area to **develop for low-impact recreation activities like walking, biking, and picnic areas**. This accessibility has resulted in significant impacts to the ecological landscape, particularly from unauthorized ATV use along the pipeline access road and in the hills south of the designated ORV area. **Increased signage, access controls such as gates and passive barriers, and a more active enforcement presence should be implemented** to contain motorized recreation within approved areas.

The Lac du Bois Gateway area is highly visible from most neighbourhoods of Kamloops, and **the visual impact of potential land uses here should be carefully considered**.

This area contains a large parcel of private land, the development of which would result in severe fragmentation of the Lac du Bois grassland landscape, as well as interfering with the specific values identified within Lac du Bois Gateway. It is recommended that the city **zone this land as agricultural land and work with the landowner to place a covenant allowing only forage based agriculture on the property to prevent future development**.

Connectivity Requirements (*Map 10*)

The Lac du Bois Gateway spans a significant east-to-west wildlife movement corridor. The topography of the study area generally runs north-south, with

numerous parallel valleys and ridges; the only significant exception is the east-west valley within the Lac du Bois Gateway, which roughly follows the right-of-way of the Terasen gas pipeline. **Lac du Bois Gateway should be managed to encourage continued wildlife movement along this corridor**. This is a natural route of wildlife movement from one side of the study area to the other, as shown by radio-telemetry studies that showed western rattlesnakes travelling back and forth from Lac du Bois Gateway to the den sites in Batchelor Hills; this exchange of individuals is likely significant for the health of snake populations in both areas.

As well as being a focus of internal movement, the corridor through Lac du Bois Gateway also provides opportunities for wildlife to access grasslands outside the limits of the study area. This east-west valley is the most direct and lowest-elevation route from natural areas west of Kamloops to undeveloped lands north and east of the city, and can be used by wildlife to move between priority grassland areas that surround the City of Kamloops.

This corridor is bisected by the Lac du Bois Road, the only all-season public road through the study area. Traffic on Lac du Bois Road, though relatively light, poses a significant risk to wildlife travelling along the corridor; snakes are especially vulnerable while crossing or basking on roads. If traffic volumes were to increase, **wildlife crossing structures, exclusion fencing, strict speed controls, increased signage and/or speed bumps, should be considered to permit wildlife to cross Lac du Bois Road safely.**

Risk Assessment (*Map 11*)

High risk was assigned to the majority of this area as it includes the core home range for a rattlesnake population, as well as the primary movement corridor for this rattlesnake population to those in the Batchelor Hills Area.

Range Values *(Map 12)*

Lac du Bois Gateway is part of the Halston crown range pasture and is used for both spring and fall grazing. Two water troughs have been installed in the eastern portion of the area, supplied by piped municipal water; this is nearly the only reliable water source in the area and is essential to grazing use in the area. It is estimated that forage within Lac du Bois Gateway provides an annual cost savings of $400 to local ranching operations.

6.3 Halston Hills

Because of its high habitat potential for threatened Lewis's woodpecker and other cavity nesting birds, the **Halston Hills area should be designated an Environmentally Sensitive Area (ESA)** (***Map 6***)

The Halston Hills area is a semi-forested range of hills separating the Lac du Bois grasslands from Westsyde and the North Thompson valley. ***Map 7*** shows the broad ecological communities which define the fundamental patterns of vegetation, climate, and geology of the area.

Steep topography here forms a significant natural barrier which protects the Lac du Bois grasslands from direct and indirect impacts arising from residential neighbourhoods in Westsyde (such as harassment of wildlife by domestic pets, noise disturbance, light pollution, etc.).

Significant Features

Map 9 describes the special ecological features of Halston Hills. These are locally distinctive, regionally rare, or especially sensitive ecological communities that often serve as ecological focal points for the landscape.

The open stands of mature ponderosa pine found here provide excellent habitat potential for Lewis's woodpecker, a provincially red-listed species and federal Species of Concern under the Species at Risk Act, as well as other cavity-nesting birds. This ecological community is not found elsewhere within the study area, and it is also an uncommon component of the regional ecological landscape. In order to retain habitat value for Lewis' woodpecker and other species, **large standing snags should be retained for wildlife trees in Halston Hills**.

Halston Hills also contains the only known occurrence of Douglas Maple in the study area, a forest ecosystem associate, found here due to the presence of deep cool-aspect forested gullies.

Risk Assessment (*Map 11*)

Risk is low to identified species at risk in this Halston Hills area; however, this may be due to insufficient surveying in the area. There is suitable Lewis's woodpecker habitat and surveys are needed to determine if the bird is nesting in the area.

Range Values *(Map 12)*

Halston Hills is part of the Halston crown range pasture and is used for both spring and fall grazing. Water availability is reasonably good here, and these relatively high elevation grasslands have high forage value.

6.4 Off-road Vehicle (ORV) Area

In order to keep motorized recreation use concentrated, and prevent the displacement of this activity to undisturbed grassland areas elsewhere in the region, **the Off-road Use Area designation should be made permanent to promote this form of use and actively manage its impacts** (***Map 6***)**.**

The Off-road Vehicle Area has been a designated motorized recreation area since 1976. Though this use has caused significant impacts to the ecological values in this area, the Off-road Vehicle designation has generally been successful in concentrating motorized recreation to a limited area, and thus preventing more extensive impacts on the grassland ecology.

Map 7 shows the broad ecological communities which define the fundamental patterns of vegetation, climate, and geology of the area.

Significant Features

Map 8 describes the special ecological features of the ORV Area. These are locally distinctive, regionally rare, or especially sensitive ecological communities that often serve as ecological focal points for the landscape. Special ecological features, many which are more commonly associated with areas of higher altitude and latitude, include:

- Several small deciduous shrub communities (primarily Aspen dominated) at high elevation areas.
- The largest deciduous shrub community in the study area along the boundary with the Halston Hills area.
- Several medium-sized alkaline depressions (ponds).
- The only known occurrence of Silverweed in the study area (common swale associate in upper grasslands).

Two alkaline ponds outside of city limits have been proposed as Wildlife Habitat Areas (WHAs) for Great Basin spadefoot toad breeding ***(Map 9)***. Several other seasonally flooded ponds here have equivalent habitat potential for spadefoot. These alkaline wetland areas also support a distinctive ecological community (EC 13 – see Table 1, p.16) characterized by a high diversity of rare and threatened species.

Also significant are the aspen-copse shrub-dominated ecological communities (EC 10) found in draws, especially along the eastern edge of the ORV Area. These shrub communities provide excellent cover and food resources for a number of species, including sharp-tailed grouse, an important species at risk.

In order to minimize impacts from motorized use, alkaline ponds and other **special ecological features should be protected by fencing, signage and other measures.**

Connectivity Requirements *(Map 10)*

A significant north-south valley runs through this area, which provides an easy travel route leading to the Long Lake area in Lac du Bois Grasslands Protected Area. There are also several (mostly seasonal) water sources along this corridor.

Risk Assessment *(Map 11)*

The primary risk to a species at risk in the ORV recreation area is to spadefoot toads that occur in and around small ponds along the north-south swale and drainage complex in the centre of the area.

6.5 Southern Benches

Because of its prominence in the viewscape of the City of Kamloops and role as a buffer area for the Lac du Bois grasslands, **open-space designations are recommended, but passive recreation or agriculture could also be compatible uses** (***Map 6***).

The steep slopes bordering the Southern Benches serve as a natural barrier separating the Lac du Bois grasslands from impacts arising in built-up areas (such as harassment of wildlife by domestic pets, noise pollution, light pollution, invasive plants, etc.). ***Map 7*** shows the broad ecological communities which define the fundamental patterns of vegetation, climate, and geology of the area. The area is dominated by a large relatively flat Bluebunch-wheatgrass Big Sagebrush community, unique to the study area in its overall size and topographic simplicity.

Significant Features

Map 8 describes the special ecological features of the Southern Benches. These are locally distinctive, regionally rare, or especially sensitive ecological communities that often serve as ecological focal points for the landscape. Special features include:

- The south-aspect lacustrine bluffs, including several associated large needle-and-thread patches, and deep gullies.
- Deciduous shrub communities in deep gulley near east boundary.

The southern benches contain extensive lacustrine bluff ecological communities (EC 9; see Table 1, p.16) which are a regionally distinctive ecological and geological feature. They are also sensitive to disturbance due to steep slopes and extremely fine soils.

The Southern Benches contain an informal mountain biking area which receives heavy use. There has been significant degradation and erosion of the fragile lacustrine silt bluff ecological communities here. **Efforts should be made to contain mountain bike use within already impacted areas.**

Connectivity Requirements *(Map 10)*

The gully-and-fan complexes that dissect the bluffs along Ord Road are natural pathways between the Lac du Bois grasslands and urban open-space habitats used by birds and other small wildlife species. Retaining connectivity between urban intermix areas and open grasslands will enhance the diversity of species utilizing these smaller open-space areas.

Risk Assessment (*Map 11*)

Risk to identified species at risk is low in this area as there are no recorded occurrences of SAR. However, there is good potential nesting habitat for several

at-risk bird species, and the fine surficial materials are in accordance with American badger burrow and prey requirements.

Range Values *(Map 12)*

This area is part of the Batchelor Pasture and is used for grazing in both spring and fall, when higher elevation pastures are inaccessible due to snow cover. The range potential of the area is limited by a lack of available water, but forage here still provides a potential annual cost savings of $200 for local ranchers.

6.6 Westsyde Bluffs

Because it is isolated from the rest of the Lac du Bois grasslands by the natural barrier of the Halston Hills area, development in the Westsyde Bluffs poses less risk to the identified species at risk than development in other areas (***Map 6***).

Westsyde Bluffs is a mix of level benchland and steep slopes leading down to the neighbourhood of Westsyde. ***Map 8*** shows the broad ecological communities which define the fundamental patterns of vegetation, climate, and geology of the area.

Significant Features

Map 8 describes the special ecological features of the Westsyde Bluffs. These are locally distinctive, regionally rare, or especially sensitive ecological communities that often serve as ecological focal points for the landscape.

Westsyde Bluffs contains semi-forested ponderosa pine habitat similar to Halston Hills; as in Halston Hills, where possible **large standing snags should be retained as wildlife trees for Lewis' woodpecker and other cavity nesting birds.**

Connectivity Requirements (*Map 11*)

There is high potential for wildlife movement through the Westsyde Bluffs area, passing to or from the North Thompson River. This is especially true where existing built-up areas in Westsyde are relatively narrow, and where there are connections to the east-west movement corridor through Lac du Bois Gateway. **Vegetation strips should be retained along natural corridors like gullies, especially where riparian vegetation is present.**

Risk Assessment *(Map 11)*

Risk is low to identified species at risk in this area; however, this may be due to insufficient surveying in the area. There is suitable Lewis's woodpecker habitat and surveys are needed to determine if the bird is nesting in the area.

Map 7
Broad Ecological Communities

0 250 500 1,000 1,500 2,000
Metres

- Landscape Units
- Study area boundary
- parks and protected areas outline
- Municipal Boundary
- Urban Green Space/Open Space
- Swale and Depression
- Riparian Deciduous
- Bench and Bluff
- Low Elevation North Slope
- Rocky Lowland and Cliffs
- Low Elevation Hills
- Long Lake Chain
- Major Drainage Slope
- Mid Elevation Hills
- Middle Grasslands
- Big Basin

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Grasslands Conservation Council of British Columbia

Table 2: Text for alphabetic labels in Broad Ecological Communities Map

A) Rough Fescue community on north aspect; rock outcrop and selaginella community on the crests; gulley and fan community complex and Bluebunch Wheatgrass Big Sagebrush community on the south slopes; Bluebunch Wheatgrass Big Sagebrush (overlaying talus) and talus community on the west slope; and, a large gulley containing deciduous shrub communities below west slope and another deep gulley with shrub vegetation in SE corner.

B) Moderate to large talus communities on south slopes and smaller talus communities forming below small rock outcrops in east. Rocky outcrops and selaginella community on crests. Douglas Fir community with some Ponderosa Pine on north slope; small shrub vegetation community (Aspen dominant) below northeast aspect slope in north and alkaline swales and depressions (including Big Sage). Southern aspect Bluebunch Wheatgrass Big Sagebrush community has considerable arrow-leaf balsamroot presence.

C) Small to moderate sized Rough Fescue patches on the north aspects; Bluebunch Wheatgrass Big Sagebrush community; and, rocky outcrops and selaginella on crests.

D) A complex of several hills with significant drainages running between the hills north-west to south-east. Large talus community on north-east and northwest slopes, smaller talus communities in south. Bluebunch Wheatgrass Big Sagebrush community with some components (particularly pussytoes and buckwheat) of the Bluebunch Wheatgrass - June grass - Pussytoes community, on high elevation areas crests have rock outcrop and selaginella communities with excellent condition rough fescue communities occurring on north aspects and swale communities in the depressions with presence of middle-to-upper grasslands species – Spreading Needle grass.

E) Small alkaline swale and depressions in between peaks; rock outcrops on crests some with selaginella community, some forbs more characteristic of middle grasslands.

F) Series of small hills along a ridge following a SSE to NNW direction. Less dense Big Sagebrush and, presence of Bluebunch Wheatgrass - June grass - Pussytoes community associated with middle grasslands. Some small alkaline swales.

G) Highest elevation hill complex of the “Low elevation hills” broad eco-class; contains plant communities associated with upper grasslands and moister conditions (e.g., Silverweed). Small rough fescue communities on north aspects and moving into level terrain below slope (spatial pattern characteristic of middle and upper grasslands). Predominantly rocky terrain, with very few Big Sagebrush and greater amounts of Rabbitbrush. Several small depressions contain coniferous trees (Ponderosa Pine Douglas Fir) or Trembling Aspen and other deciduous vegetation associated with the shrub ecological community.

H) Large bench with glacio-lacustrine bluff (lacustrine community) containing Ponderosa Pine. Predominantly easterly aspect. There is a greater presence of Douglas Fir, particularly in gullies and drainages as move north.

I) Southerly aspect lacustrine bluffs with Needle-and-thread Grass communities in small patches on low gradient / even terrain areas at lower slope and intersected throughout by gulley and fan community. Otherwise, Bluebunch Wheatgrass Big Sagebrush community.

J) Largest bench in study area comprised of fine surficial materials (sands and silts) and dominated by Bluebunch Wheatgrass Big Sagebrush community.

K) Primarily Bluebunch Wheatgrass Big Sagebrush community on gentle south aspect slope; fine surficial material, including silt (likely glaciolacustrine in origin).

L) Rock outcrops communities with talus communities on southerly aspects.

M) High near-vertical to vertical cliffs with cliff base level with Ord Road levelling off on top to rock outcrop community on crests and/or Bluebunch Wheatgrass Big Sagebrush. A few deep gulley and fan communities. Bighorn sheep use base of cliff and move along paths ascending terrain into rocky areas above.

N) Small rocky hills with some talus communities on steep westerly slopes, high biotic crust (mosses and lichens) on northerly slopes, and a few notable occurrences of the selaginella community. Evidence of sheep and deer use throughout (scat and prints).

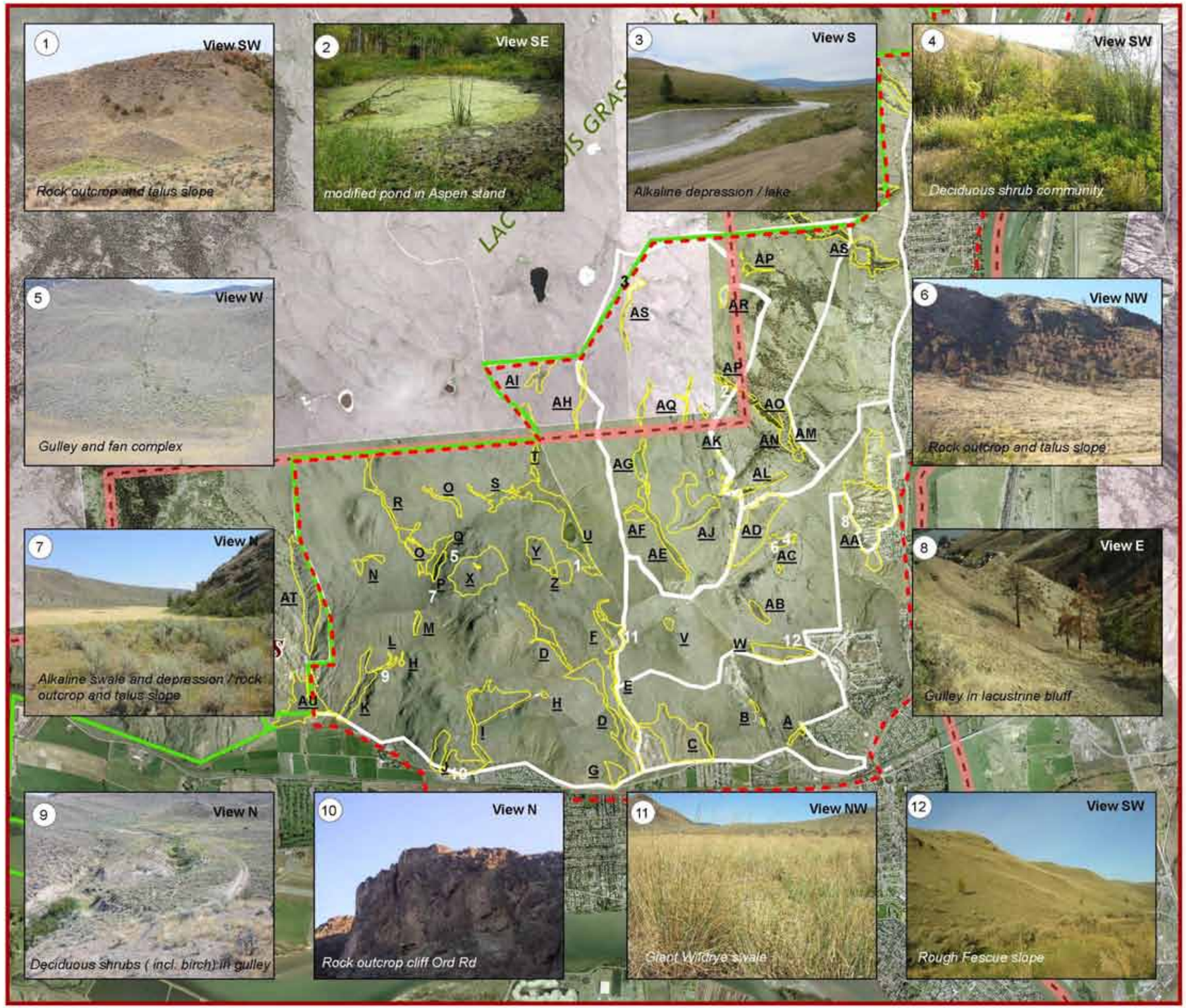
O) Moderately steep easterly aspect slope with dense cover of Douglas Fir in drainages and cool depressions. Presence of plants associated with upper grasslands and forests.

P) Moderately steep easterly aspect slope with high grass cover in open areas (bluebunch wheatgrass and rough fescue close or equal to 100% cover); Extensive presence of Ponderosa Pine (mature trees killed by mountain pine beetle; considerable live sapling presence in understory). Presence of plants associated with upper grasslands and forests.

Q) SW facing moderate slope with Bluebunch Wheatgrass Big Sagebrush and Bluebunch Wheatgrass - Junegrass - Pussytoes communities. Important gulley and fan complex containing considerable deciduous shrub community. Notable high presence of arrow-leaf balsam root at mid-slope.

R) SE and E aspect slopes and SW aspect slope dominated by Bluebunch Wheatgrass Big Sagebrush community; shallow gullies on SW aspect slope and moderate depth gullies on SE and E aspect. Slopes drain into areas creating two of the largest alkaline depressions (one being Batchelor Lake) in the study area.

S) Middle grasslands in rolling terrain; notable are the many alkaline depressions and alkaline swales.



Map 8
Special Ecological Features

0 250 500 1,000 1,500 2,000
Metres

- Study area boundary
- parks and protected areas outline
- Municipal Boundary
- Special Ecological Feature
- Landscape Units

N
W E
S

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Table 3: Text for alphabetic labels in Special Ecological Features Map

A. Deciduous shrub community in short deep gulley. Important winter feeding area for birds.

B. Deciduous shrub community (incl. aspen) within deep gulley.

C. South facing lacustrine bluff with deep intersecting gullies; Needle-and-thread Grass patches on lower slopes; deep rocky gulley on eastern side.

D. Long drainage beginning within hill complex that includes Batchelor Hill in the north, into steep gullies in the lacustrine bluff and ending near Ord Road.

E. Long drainage beginning near Giant Wildrye patch at “F” continuing south through south bench into lacustrine bluffs and ending near Ord Road.

F. Most extensive and vigorous (height and density) Giant Wildrye patch in study area. Unusual short and curved drainage to north has rough fescue on its cool aspect. Also contains a confirmed occurrence of alkaline wing-nerved moss, a red-listed plant species.

G. Needle-and-thread Grass patch with Indian Ricegrass.

H. Small modified water feature – dugout.

I. Long drainage starts on middle bench into deep rocky gulley ending near Ord Road.

J. Steep rocky cliffs at Ord Road.

K. Deep gulley with rocky low hill to east and finer surficial materials to west.

L. Shrub community at start of gulley; only known location for Water Birch.

M. Deep gulley; main drainage from swales and depressions at “Q” to swales and dugout near and at “H”.

N. Alkaline swale and depression.

O. Main gullies into large alkaline swale and depression at “Q”.

P. Cool aspect talus slope community; vigorous shrub vegetation component.

Q. Large alkaline swale and depression.

R. Long gulley from alkaline swale and depression in NW to large fan that then leads into main drainages at “O”.

S. Gulley leading into alkaline swale; small Giant Wildrye patch.

T. Deep gulley / drainage with rushes and other dense vegetation; starts in Giant Wildrye alkaline swale in north into large swale associated with Batchelor Lake in the south. An important part of the Burrowing Owl release habitat.

U. Batchelor Lake; largest water feature in study area.

V. Small rough fescue patch above alkaline swale

W. Largest rough fescue – bluebunch wheatgrass community in study area

X. Upper elevation area of hill comprised of rolling terrain with excellent condition representation of rock outcrop and selaginella communities, rough fescue slopes and swales, and including small patches of middle-to-upper grasslands associate – Spreading Needlegrass (small polygon).

Y. Crest of hill rock outcrop leading into rough fescue community.

Z. Rock outcrop with small caves used by birds with talus community on slope to east.
AA. Lacustrine bluff community with Ponderosa Pine and intersecting gulley and fan communities.

AB. South-west facing talus slope and rock outcrop (contain rattlesnake hibernacula).

AC. Shrub communities with Trembling Aspen and other deciduous vegetation (Chokecherry, Snowberry, Saskatoon, etc.).

AD. South-east facing talus slope; largest in study area; lower portions used by rattlesnake.

AE. Alkaline swales and depressions into long gulley that drains into receiving dugout at ORV staging area.

AF. Small rough fescue patch above alkaline swale.

AG. Highly disturbed alkaline depression, but still retains standing water and given its close proximity to known spadefoot ponds to the north, actions to protect water retaining portions may be warranted.

AH. Alkaline swale and depression in shallow/narrow N-S valley; middle grasslands.

AI. Alkaline depression and swale; middle grasslands.

AJ. Three large gullies containing considerable deciduous shrub vegetation.

AK. Several small depressions contain alkaline ponds and swales with deciduous (Trembling Aspen) and/or coniferous trees (Douglas Fir / Ponderosa Pine).

AL. NE to SW corridor and water-receiving site contain deciduous shrub vegetation (including Trembling Aspen).

AM. Deciduous shrub ecological community (Aspen dominant).

AN. Moderate-to-steep cool aspect slope with high grass cover (near or equal to 100%); low-to-no grazing; Rough Fescue and Bluebunch Wheatgrass.

AO. Deep gulley with Douglas Fir as dominant cover. Important corridor from Westsyde Bluffs through Halston Hills to middle grasslands in ORV recreation area and beyond. Evidence of wildlife use (deer and bear scat).

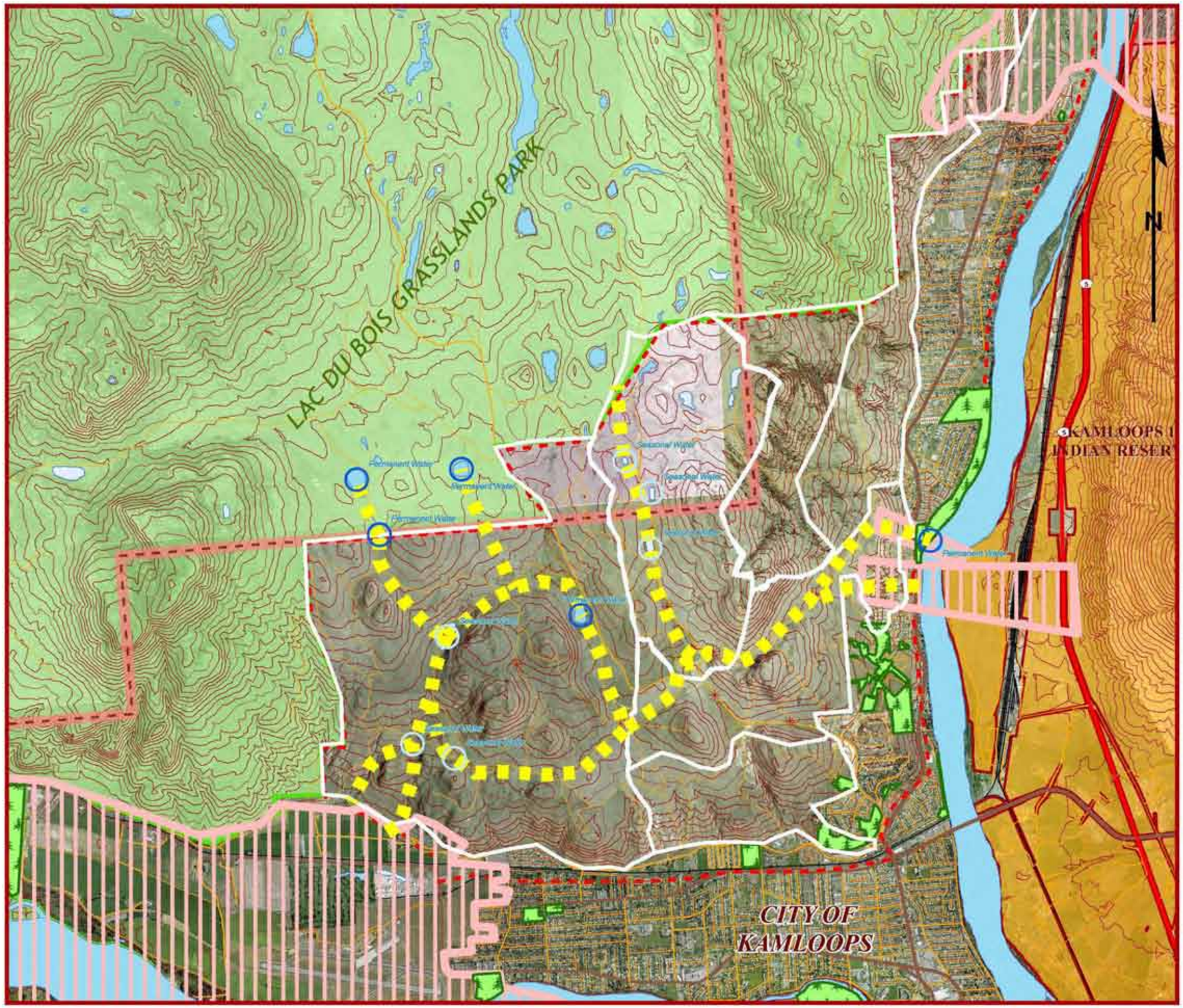
AP. Deciduous shrub community in middle grasslands.

AQ. Alkaline depressions and swales; western ponds are known spadefoot breeding habitat.
AR. Large alkaline depression / lake in middle grasslands.

AS. Important gulley / drainage corridor from Westsyde Bluffs into upper grasslands; mix of coniferous (primarily Douglas Fir) and deciduous (Trembling Aspen) tree cover.

AT. Deep straight drainage through fine surficial material; within provincial park, but along study border and important as leads to large fan at “AU” that is partly contained within the study area.

AU. Largest fan (of gulley and fan community) in study area; largest portion falls within Lac du Bois Provincial Park. It is the only large Sagebrush flat at the study area's lowest elevation (at level of Ord Road); vigorous and dense sagebrush, small patches of deciduous shrub and low gradient drainage channel.



Map 10
Wildlife Movement Corridors

0 250 500 1,000 1,500 2,000
Metres

Legend

Water Sources
- Permanent
- Seasonal
- General Wildlife Movement Corridors
- External Connectivity Corridors
- Landscape Units
- Study area boundary
- Municipal Boundary
- Provincial Protected Area
- Existing Municipal Parks
- Indian Reserves

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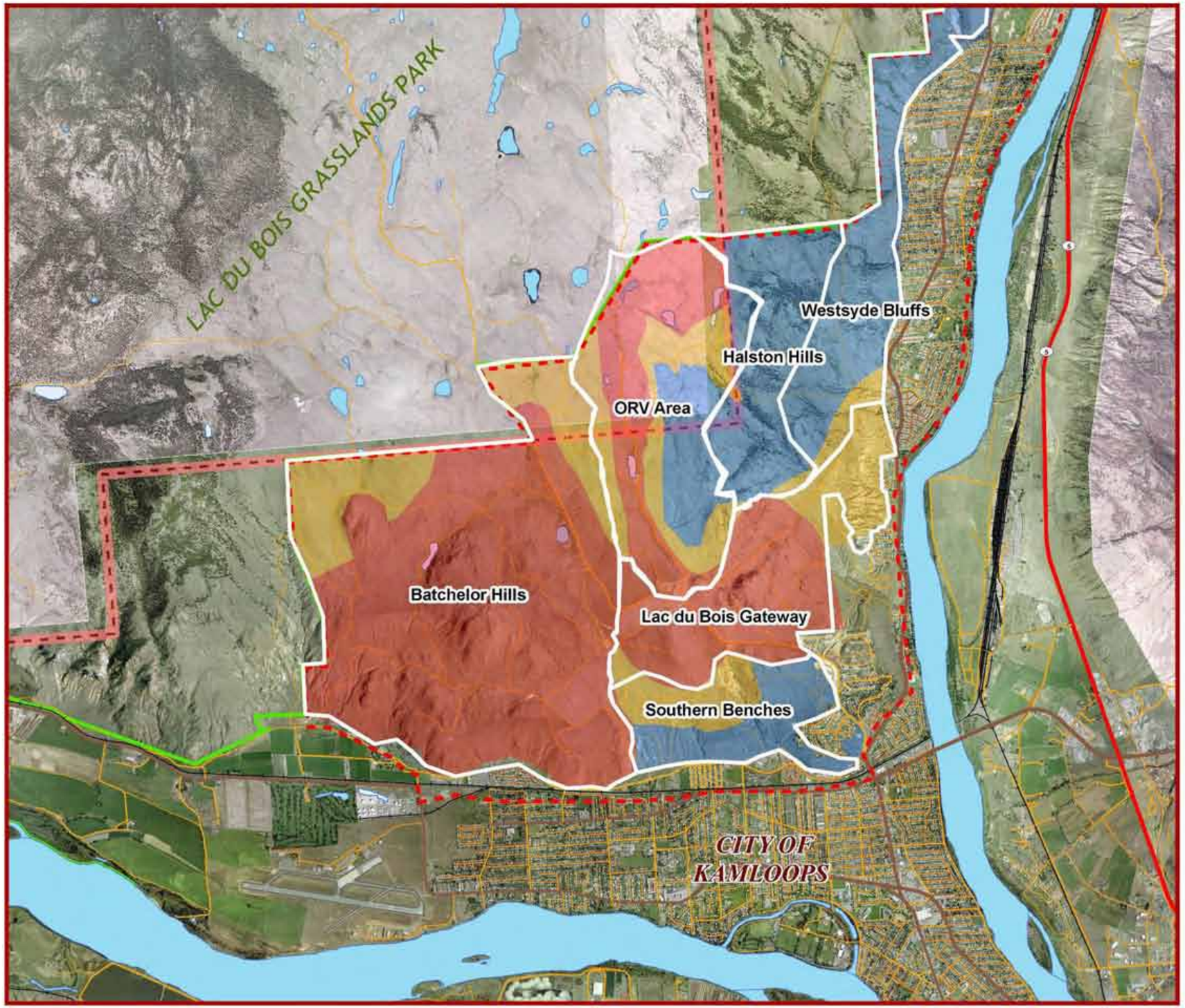

Map 11
Risk SAR wildlife*

0 250 500 1,000 1,500 2,000
Metres

Landscape Units
Study area boundary

Risk to SAR Wildlife

HIGH
MODERATE
LOW
parks and protected areas outline
Municipal Boundary

*Represents the level of risk/threat posed by current and potential future human activity to the key identified wildlife in the study area: western rattlesnake, bighorn sheep, spadefoot toad, and burrowing owl.

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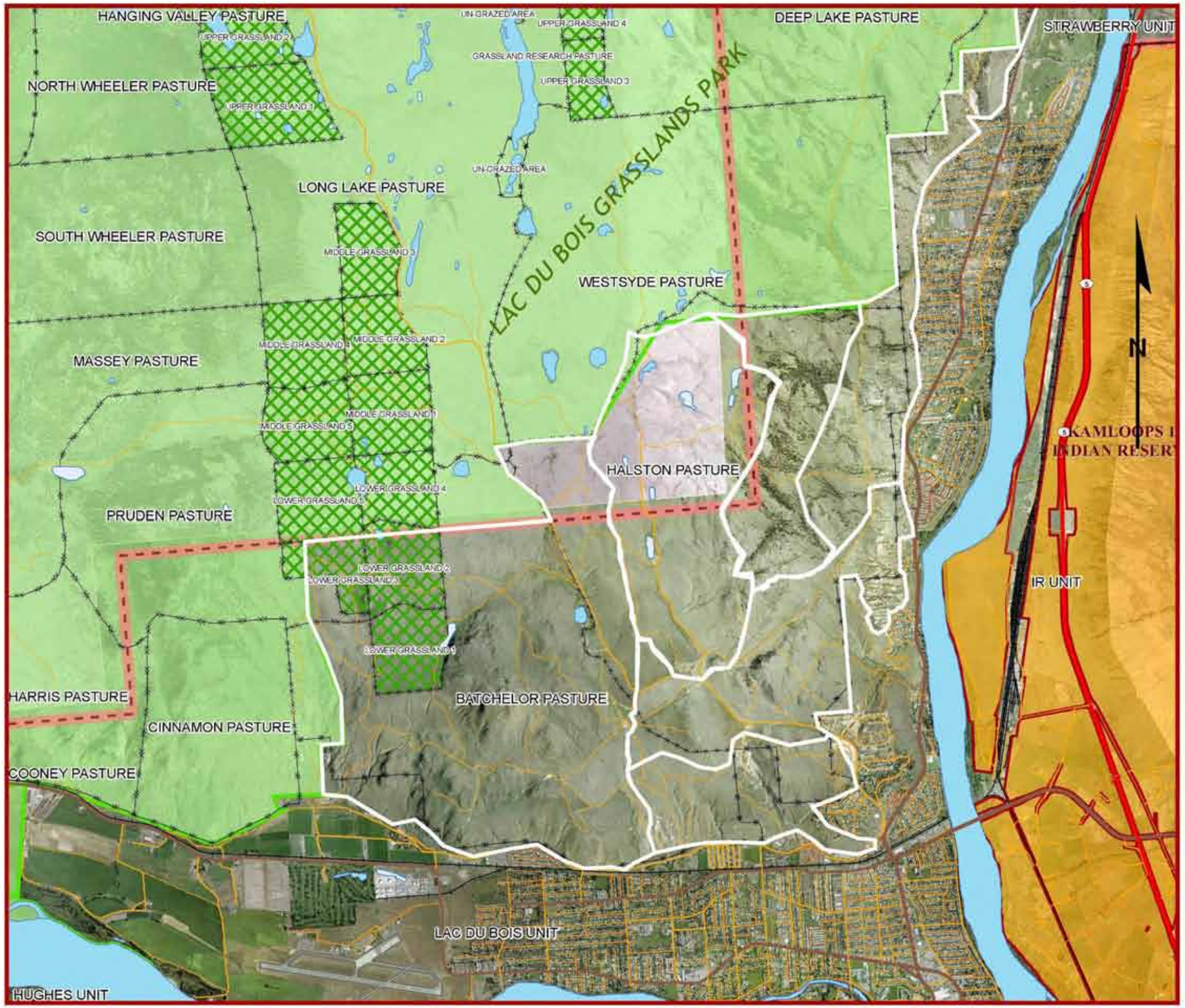

Map 12
Range Values

0 250 500 1,000 1,500 2,000
Metres

Legend

- Pasture Boundaries (fencelines)
- Agriculture Canada Grazing Trial plots
- Landscape Units
- Study area boundary
- Provincial Protected Area
- Indian Reserves

Grasslands Conservation Council of British Columbia

Appendices

Appendix 1: Comparison of Ecological Communities to Other Common Ecological Mapping Categories

Ecological Community (EC)	EC from Aberdeen Ecological Assessment	BEC Site Series	CDC Plant Association	Prov. Rank
Grasslands **1.**Bluebunch Wheatgrass - Big Sagebrush Ecological Community		BGxh2/01; BGxw1/04; PPxh2/05	big sagebrush / bluebunch wheatgrass	Red
2.Bluebunch Wheatgrass - Junegrass - Pussytoes Ecological Community	Bluebunch wheatgrass - dominated	BGxw1/01; IDFxh2a/92	bluebunch wheatgrass - junegrass	Red
3. Needle-and-thread - Big Sagebrush – Bluebunch Wheatgrass Ecological Community		BGxh2/05	big sagebrush / needle-and-thread grass	Yellow
4.Rough Fescue - Bluebunch Wheatgrass Ecological Community	Bluebunch wheatgrass-Rough fescue	BGxh2/06; BGxw1/06; IDFxh2a/91	rough fescue - bluebunch wheatgrass	Red
Shallow Soil and/or Sparsely Vegetated **5.** Wallace's Selaginella Ecological Community	Compact selaginella-dominated	BGxh2/02; BGxw1/02; IDFxh2/92	bluebunch wheatgrass - compact selaginella	Yellow
6. Talus and Fine Scree Ecological Community				

7. Outcrop Ecological Community	Outcrop			
8. Gulley and Fan Ecological Community				
9. Lacustrine Bluffs - Compact Silt Ecological Community				
Forests				
10. Shrub-dominated Ecological Community	Aspen-dominated	BGxh2/07; BGxw1/08; IDFxh2a/95	trembling aspen / common snowberry / Kentucky bluegrass	Red
11. Ponderosa Pine Ecological Community		IDFxh2/05	Douglas-fir - ponderosa pine / pinegrass	Blue
12. Douglas-fir Ecological Community	Douglas-fir-dominated	PPxh2/06; IDFxh2/01	Douglas-fir / common snowberry - Saskatoon	Red
Wetlands				
13. Alkaline Depression Ecological Community	Alkaline pond complex	IDFxh2/Gs01-03;	alkali saltgrass - Nuttall's alkaligrass	Red
14. Alkaline Seepage Slopes and Swales Ecological Community	Alkaline seepage slope	BGxh2/Gs01-03; BGxw1/Gs01-03;BGxw1/07	alkali saltgrass - Nuttall's alkaligrass	Red
			giant wildrye	Red
			spreading needlegrass	Blue

Appendix 2: Species at Risk Data Table

Class	Common name	Latin name	BC list	COSEWIC list	In the study area	Comments
Mammals						
	Fringed Myotis	*Myotis thysanodes*	Blue	Data Deficient	Likely	Highly suitable foraging & roosting habitat along Ord Rd
	Western Small-footed Myotis	*Myotis ciliolabrum*	Blue		Likely	Highly suitable foraging & roosting habitat along Ord Rd
	Spotted Bat	*Euderma maculatum*	Blue	Special Concern	Possible	Tranquille WMA, has been located nearby
	Townsend's Big-eared Bat	*Corynorhinus townsendii*	Blue		Possible	
	Pallid Bat	*Antrozous pallidus*	Red		Possible	
	Great Basin Pocket Mouse	*Perognathus parvus*	Blue		Possible	
	Badger	*Taxidea taxus*	Red	Endangered	Yes	

	California Bighorn Sheep	*Ovis canadensis californiana*	Blue		Yes	Confirmed in 2008
Birds						
	Western Grebe	*Aechmophorus occidentalis*	Red		Yes	Migrant; Tranquille WMA
	American White Pelican	***Pelecanus erythrorhynchos***	Red		Yes	Tranquille WMA
	Double-crested Cormorant	*Phalacrocorax auritus*	Red		Yes	Tranquille WMA
	American Bittern	*Botaurus lentiginosus*	Blue		Yes	Tranquille WMA
	Great Blue Heron	*Ardea herodias*	Blue		Yes	Confirmed in 2008; Tranquille WMA
	Green Heron	*Butorides virescens*	Blue		Yes	Tranquille WMA
	Trumpeter Swan	*Cygnus buccinator*	Blue		Yes	Tranquille WMA
	Swainson's Hawk	*Buteo swainsoni*	Red		Possible	Expected to nest
	Ferruginous Hawk	*Buteo regalis*	Red		Yes	Tranquille WMA
	Gyrfalcon	*Falco rusticolis*	Blue		Yes	Tranquille WMA

Peregrine Falcon	*Falco peregrinus anatum*	Red	Special Concern	Yes	
Prairie Falcon	*Falco mexicanus*	Red	Not at Risk	Yes	
Sharp-tailed Grouse	*Tympanuchus phasianelles columbianus*	Blue		Yes	Confirmed in 2008
Sandhill Crane	*Grus canadensis*	Blue	Not at Risk	Yes	Tranquille WMA
American Golden Plover	*Pluvialis dominica*	Blue		Yes	Tranquille WMA
American Avocet	*Recurvirostra americana*	Red		Yes	Tranquille WMA
Baird's Sandpiper	*Calidris bairdii*	Red		Likely	Likely been seen at Tranquille WMA
Long-billed Curlew	*Numenius americanus*	Blue	Special Concern	Possible	Nest in lower and middle grasslands
Red-necked Phalarope	*Phalaropus lobatus*	Blue		Yes	Tranquille WMA
California Gull	*Larus californicus*	Blue		Yes	Tranquille WMA
Caspian Tern	*Sterna caspia*	Blue		Yes	Tranquille WMA

	Forster's Tern	*Sterni forsteri*	Red		Yes	Tranquille WMA
	Flammulated Owl	*Otus flammeolus*	Blue	Special Concern	Possible	Nests in Fd forests between 650 and 1350 feet (CDC 2008)
	Burrowing Owl	*Athene cunicularia*	Red	Endangered	Yes	Confirmed in 2008
	Short-eared Owl	*Asio flammeus*	Blue	Special Concern	Possible	
	White-throated Swift	*Aeronautes saxatilis*	Blue		Yes	
	Lewis's Woodpecker	*Melanerpes lewis*	Blue	Special Concern	Yes	Confirmed in 2008
	Sage Thrasher	*Oreoscoptes montanus*	Red		Possible	Individual has been recorded
	Brewer's Sparrow	*Spizella breweri breweri*	Red		Possible	Have been recorded in recent years
	Lark Sparrow	*Chondestes grammacus*	Red		Possible	Known to occur inside park boundary
	Canyon wren	Catherpes mexicanus	Blue	Not at Risk	Yes	Confirmed in 2008
	Bobolink	*Dolichonyx oryzivorus*	Blue		Yes	Tranquille WMA
Amphibians						

	Great Basin Spadefoot	*Spea intermontana*	Blue	Threatened	Yes	Ponds in lower grasslands; CDC (2008)
Reptiles						
	Western Painted Turtle - Intermountain - Rocky Mountain Population	Chrysemys picta	Blue	Special Concern	Yes	Confirmed in 2008; Tranquille WMA
	Western Yellow-bellied Racer	*Coluber constrictor mormon*	Blue	Special concern	Yes	Confirmed in 2008
	Great Basin Gopher Snake	*Pitouphis catenifer deserticola*	Blue	Threatened	Yes	Confirmed in 2008
	Western Rattlesnake	*Crotalus viridus*	Blue	Threatened	Yes	Confirmed in 2008
	Rubber Boa	*Charina bottae*	Yellow	Special concern	Likely	Seen in Tranquille Canyon
Insects						
	Monarch	*Danaus plexippus*	Blue	Special Concern	Yes	Tranquille WMA
Vascular plants						
	Geyer's onion	*Allium geyeri var. tenerum*	Red		Possible	Lac du Bois pasture
	Oregon checker-	*Sidalcea*	Red		Possible	Quarter

	mallow	*oregana*				Pasture
	Scarlet gaura	*Gaura coccinea*	Red		Possible	Agriculture Canada pasture
	Awned Cyperus	*Cyperus squarrosus*	Blue		Yes	Wet meadow at Tranquille
	Low hawksbeard	*Crepis modocensis ssp. rostrata*	Red		Possible	Tranquille Range
	Rough pennyroyal	*Hedeoma hispida*	Red		Possible	Mara Hill
	velvety goldenrod	*Solidago mollis*			Yes	observed for the first time in 2008 in BC on the east side of the study area
Non-vascular plants						
	rusty cord-moss	*Entosthodon rubiginosus*	Red	Endangered	Likely	near Tranquille
	Columbian carpet moss	*Bryoerythrophyllum columbianum*	Blue	Special Concern	Likely	east Kamloops
	alkaline wing-nerved moss	*Pterygoneurum kozlovii*	Red	Threatened	Yes	Confirmed in 2008; East side of study area; along the edges of three of the alkaline depressions in the study area
	blue grama	*Bouteloua gracilis*	Red		Yes	Confirmed in 2008

		Crossidium seriatum	Red		Yes	Confirmed in 2008
		Didymodon brachyphyllus	Red		Yes	Confirmed in 2008
		Didymodon nevadensis	Red		Yes	Confirmed in 2008
		Pterygoneurum lamellatum	Red		Yes	Confirmed in 2008
		Aloina bifrons	Blue		Yes	Confirmed in 2008
		Grimmia montana	Blue		Yes	Confirmed in 2008
		Grimmia ovalis	Blue		Yes	Confirmed in 2008
		Hennediella heimii	Blue		Yes	Confirmed in 2008

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