APPENDIX 5.2.2-A1

Terrestrial Baseline Surveys: Star-Orion South Diamond Project

TERRESTRIAL BASELINE SURVEYS:
STAR-ORION SOUTH DIAMOND PROJECT

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- Table of Contents -

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1.0 INTRODUCTION

1.1 Background

The following report presents the results of the terrestrial baseline survey work conducted by EcoDynamics Consulting Inc. for the Star and Orion Diamond Project areas between August, 2007 and November, 2008. This baseline work was completed in support of the environmental assessment of the Star-Orion South Diamond Project. The scope of the terrestrial baseline program focused on the conduct of a variety of biophysical field surveys related to wildlife, vegetation and soil and terrain resources, at both local and regional scales within the Fort-a-la-Corne Provincial Forest.

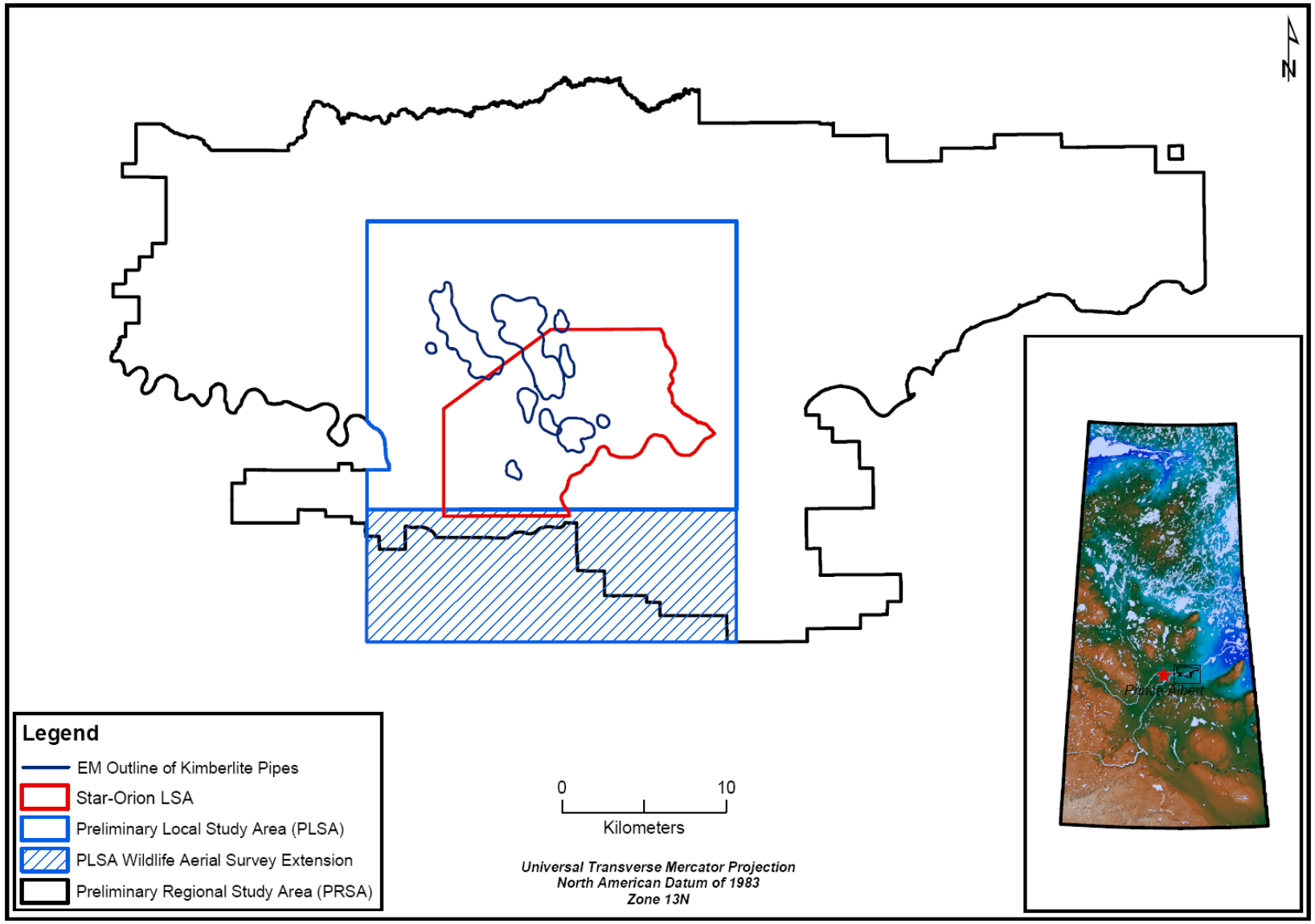
1.2 Study Areas

When the terrestrial baseline program was initiated in the latter half of 2007, the study area boundaries portrayed in the Star-Orion project proposal (Shore Gold Inc., 2008) had not yet been designated, and there was uncertainty as to the nature and extent of the future development footprint. Many larger mammals, such as elk, deer, moose, bears and wolves are also known to range over relatively large areas, requiring surveys that may extend well beyond a given development footprint. Therefore, a *preliminary* local study area (PLSA) was designed to cover the Star, Orion and Taurus diamond exploration areas (Figure 1-1). An extension to the south was added to provide better coverage of the Saskatchewan River valley during wildlife aerial surveys. In total the PLSA (including the south extension) covers approximately 57,514 ha. Vegetation and soil surveys were also focused within this PLSA.

A *preliminary* RSA (PRSA) encompassed the entire Fort-a-la-Corne Provincial Forest (FalCPF) (approximately 133,000 ha), which is completely surrounded by agricultural land, and therefore functions as an isolated and regionally distinct terrestrial ecosystem.

With the subsequent development of a conceptual mine plan, including proposed road and transmission corridors, a smaller, project-specific LSA (12,163 ha) was developed by Shore Gold covering the Star and Orion South projects. This new LSA is designated in this report as the Star-Orion LSA. Once this final LSA was designated, baseline work and reporting was refocused to this newer LSA.

Figure 1-1. Preliminary study areas and the current Star-Orion Local Study Area.



2.0 SOIL AND TERRAIN RESOURCES

2.1 Introduction

This section of the terrestrial baseline report describes the existing (baseline) state of soil and terrain resources within the vicinity of the Star-Orion Diamond Project. The general objectives of this component were to:

- map and describe the soils regionally within the FalCPF and locally within the Star-Orion LSA;
- assess land capability for agriculture and forestry regionally and locally using the soil survey results; and
- sample selected soils within the LSA for laboratory analysis.

2.2 Methodology

2.2.1 Existing Information

An existing regional soil survey (1:125,000 scale) covers the Fort-a-la-Corne Provincial Forest (Anderson and Ellis, 1976). A digital copy (ARC/INFO .EOO format) of the map was obtained on-line from the Agriculture Canada website. This map was utilized for the regional discussion of soils. Map units used for this map and described in the accompanying report formed the basis for more detailed mapping within the Star-Orion LSA, allowing more direct comparison of soils regionally and locally.

2.2.2 Field Surveys

The soil survey of the LSA was conducted in a manner consistent with Survey Intensity Level (SIL) 3 guidelines (Mapping Systems Working Group, 1981), providing the basis for reliable mapping for the chosen presentation scale range of between 1:30,000 and 1:50,000.

Prior to fieldwork, the existing 1:125,000 regional soil map (Anderson and Ellis, 1976), a 1:50,000 Digital Elevation Model (DEM), and available satellite and aerial photographic imagery were reviewed to gain preliminary understanding of soil-terrain-vegetation. Subsequent soil inspection sites were selected based on apparent differences in surficial geology, landforms, and vegetation patterns, accessibility and preliminary mine infrastructure plans. Most soil inspection sites were established along major roads and trails.

Soils were described and classified at each inspection site according to the Canadian System of Soil Classification (CSSC, 1998) and standard Canadian soil survey field methods (Agriculture Canada Expert Committee on Soil Survey, 1987). Soil inspections were conducted using a shovel and hand auger down to approximately 1 metre. Soil descriptions included: thickness and depth of horizons, Munsell color, texture and structure. Landscape characteristics such as parent material, landform, slope class and surface stoniness were recorded. The geographic location of

each soil inspection site was determined by use of a handheld GPS. Figure C-1 (Appendix C) illustrates the distribution of soil inspections.

During the course of the soil survey, soil profiles were sampled across the Star-Orion LSA for detailed description and laboratory analysis. Samples were dried and archived pending analysis.

2.2.3 Soil and Terrain Mapping

Soil map coverage for areas outside the Star-Orion LSA relied directly on the existing soil survey (Anderson and Ellis, 1976). A more detailed soil map covering the Star-Orion LSA, was also prepared; this map was designed presentation at scales between 1:30,000 to 1:50,000. Preliminary soil polygons (linework) for the LSA soil map were drawn on laser photocopies of 1:30,000 stereoscopic aerial photography (2004) obtained from the Ministry of Environment, Forest Service. This preliminary linework was subsequently adjusted using a variety of digital mapping and imagery datasets including: a digital copy of the existing regional soil survey; a detailed vegetation map covering the LSA (Section 3.0); a regional 1:50,000 Digital Elevation Model (DEM); a georeferenced image of a LIDAR DEM obtained from the Shore Gold website; project-specific IKONOS satellite imagery; and publicly available LandSat satellite imagery.

The soil mapping conventions used in this report, and on accompanying maps, follow Canadian soil mapping practices as applied in the existing soil survey covering FalCPF (Anderson and Ellis, 1976). As such, specific soil and map unit names used in this report derive from this previous survey (Anderson and Ellis, 1976). However, creation of a new map unit complex - *Wetland Complex (Wx)* – was necessary for the present survey for mapping complex wetland areas along ravines. Additionally, four project-specific *Hillwash (Hw)* map units were also created to describe colluvial soils along ravines.

The *soil association* and *soil complex* are the two basic soil classification units used on the soil map (Figure xx). Each soil association or complex consists of a number of *soil series* (i.e., a given soil subgroup on a given parent material), which have been combined into *map units* for ease of map development. Each map unit is differentiated on the basis of the kind and amount (dominant or significant) of each soil series present. The *dominant series* in the map units comprise greater than 40 % of the map unit, while *significant series* (if present) occupying between 15 and 40 % of the map unit. In map units where there are no significant soils listed, the dominant soils occupy greater than 85 % of the map unit area. Other soil series that comprise less than 15 % of any given map unit, termed *inclusions*, are indicated only when they have potential soil quality implications.

Each soil map polygon is labeled with a descriptor or *map edit* which identifies the soil map unit or map unit complex present, the dominant topsoil texture(s), and the dominant slope class and landform. Map edits may exhibit map unit symbols comprised of a single soil association (e.g., Pn1) or may show combinations of two soil associations, called *map unit complexes* (e.g., Lc1-Pp5). Map unit complexes are used wherever the soils are highly variable and cannot be separated into single map units at the present scale of mapping. The first soil unit listed in a map unit complex is considered most common or dominant.

A regional terrain map was prepared for FalCPF using the existing regional soil survey of Anderson and Ellis (1976). Similarly, a local terrain map for the Star-Orion LSA was prepared using surficial (parent) material and landform information derived from the LSA soil map.

2.2.4 Land Capability Assessment

Soil map units were interpreted for dryland agricultural and commercial forest capability according to criteria and methodologies established by the Canada Land Inventory for agricultural and forest land capability assessment in Saskatchewan (Shields et al., 1968; Kabzems et al., 1972), as applied in the existing regional soil survey (Anderson and Ellis, 1976).

2.3 Baseline Terrain Resources

2.3.1 Bedrock Geology

The bedrock immediately underlying the Fort-a-la-Corne Provincial Forest consists of approximately 200 m of Lower Cretaceous Mannville Group sandstones and Colorado Group shales that have been intruded by diamond-bearing kimberlites (Saskatchewan Geological Survey, 2003). These Cretaceous rocks are underlain by approximately 400m of Paleozoic carbonate rocks, which in turn overly Precambrian basement rocks (Saskatchewan Geological Survey, 2003).

2.3.2 Surficial Geology and Geomorphology

The uppermost bedrock deposits are covered both regionally and locally by a complex series of glacial and recent sediments approximately 100m thick (Saskatchewan Geological Survey, 2003). The glacial sediments consist of a mixture of glaciofluvial, glaciolacustrine, fluvial-lacustrine (deltaic) and till materials deposited during the Pleistocene Epoch. Locally, the uppermost glacial materials were in turn modified by wind erosion, water erosion and gravity during post-glacial time forming eolian, alluvial and colluvial deposits respectively. Elevations within the LSA range from approximately 315m to 550m.

The majority of the uplands of the Fort-a-la-Corne Provincial Forest consists of gently undulating to moderately rolling sandy fluvial-lacustrine deposits of deltaic origin (Anderson and Ellis, 1976). A significant portion of these sandy materials have been locally reworked by wind, producing a complex series of eolian dunes and dune-track ridges, particularly in central FalCPF. Interdune areas consist mainly of gently undulating fluvio-eolian (i.e., mixed glaciofluvial and eolian) deposits.

Along the Saskatchewan River Valley, the terrain consists of a series of dissected and often steep valley slopes, interspersed by abandoned glaciolacustrine or alluvial terraces, and the active alluvial flood plains of the modern Saskatchewan River. A series of prominent north-south trending tributary stream valleys (ravines) enter the Saskatchewan River valley along its course through southern Fort-a-la-Corne Provincial Forest.

Proceeding from upper slope to mid-slope positions along the river valley and many tributary streams, the course-textured fluvial-lacustrine and eolian sediments transition to moderately-course to medium textured glaciolacustrine materials consisting of fine and very fine sands interbedded with silt and clay. In the lower reaches of most tributary ravines and along the valley itself, moderately-fine textured, silty to clayey glaciolacustrine materials increase in abundance, and are sometimes in complex with the medium-textured glaciolacustrine deposits. Some of these finer materials appear to have been deposited as terraces by a former glacial lake temporarily occupying the Saskatchewan River valley during deglaciation (Saskatchewan Geological Survey, 2003). In other areas these finer materials appear to derive from earlier glaciolacustrine or deltaic phases, which were subsequently covered by sandy materials, and later exhumed through post-glacial erosion, particularly along ravines and other dissections (Anderson and Ellis, 1976).

Along the banks of the modern Saskatchewan River, are a series of moderately course to fine-textured alluvial deposits, consisting of both active floodplain and recently abandoned alluvial floodplain terraces. In many places the down-cutting action of the Saskatchewan River appears to have been slowed by armouring of the channel bottom by boulder and cobbles. This 'lag' deposit is derived from erosion of the uppermost glacial till unit. This till is moderately to strongly calcareous, medium to moderately-fine textured, and is exposed (and often highly dissected) along many river-side locations, as well as along the lower reaches of some tributary stream valleys. In an assessment of the entire glacial drift sequence southwest of Smeaton, Thorleifson and Garrett (2000), noted a number of distinct till units, all of which were calcareous.

Colluvial deposits frequently form a shallow veneer (<1m thick) over the glacial materials along valley and ravine slopes. These materials tend to be sandy in upper slopes and become progressively more silt- and clay-rich as finer materials are encountered further down slope.

Organic or peat deposits of various thickness have been deposited in post-glacial times in many low-lying, wet areas of the landscape. Peat is derived from the slow decomposition of mosses, sedges and woody materials under water-saturated (anoxic) conditions. Variations in the thickness, origin and decomposition rate of these organic materials, results in a variety of wetland types, including fens, swamps, bogs and marshes.

The terrain maps illustrate these regional and local geomorphological variations (Figures 2-1 and 2-2). Tables 2-1 and 2-2 present the areas of each terrain unit regionally and locally.

Table 2-1. Terrain unit distribution within the FalCPF.

Terrain Unit	Area (ha)	% of Area
Av	1,144	0.86%
Ov	4,004	3.02%
C	1,544	1.17%
O	13,839	10.44%
E	39,802	30.04%
FE	8,350	6.30%
FL	37,704	28.45%
GLs	18,275	13.79%
Glsi	6,834	5.16%
Water	1,010	0.76%
Totals	132,505	100.00%

Table 2-2. Terrain unit distribution within the Star-Orion LSA.

Terrain Unit	Area (ha)	% of Area
Av	282	2.32%
Ov	207	1.70%
C	1,504	12.36%
O	1,029	8.46%
E	3,310	27.21%
FE	1,333	10.96%
FL	3,244	26.67%
GLs	691	5.68%
Glsi	155	1.28%
Water	410	3.37%
Totals	12,164	100.00%

Additional terrain symbols used in Figure 2-2.

Slope Class	Slope %
1	0 - 0.5
2	0.5 - 2
3	2 - 5
4	6 - 9
5	10 - 15
6	16 - 30
7	30 - 60

Landform	Description
u	undulating
h	hummocky
r	ridged
i	inclined
d	dissected
t	terraced

Figure 2-1. Terrain map covering the FalCPF.

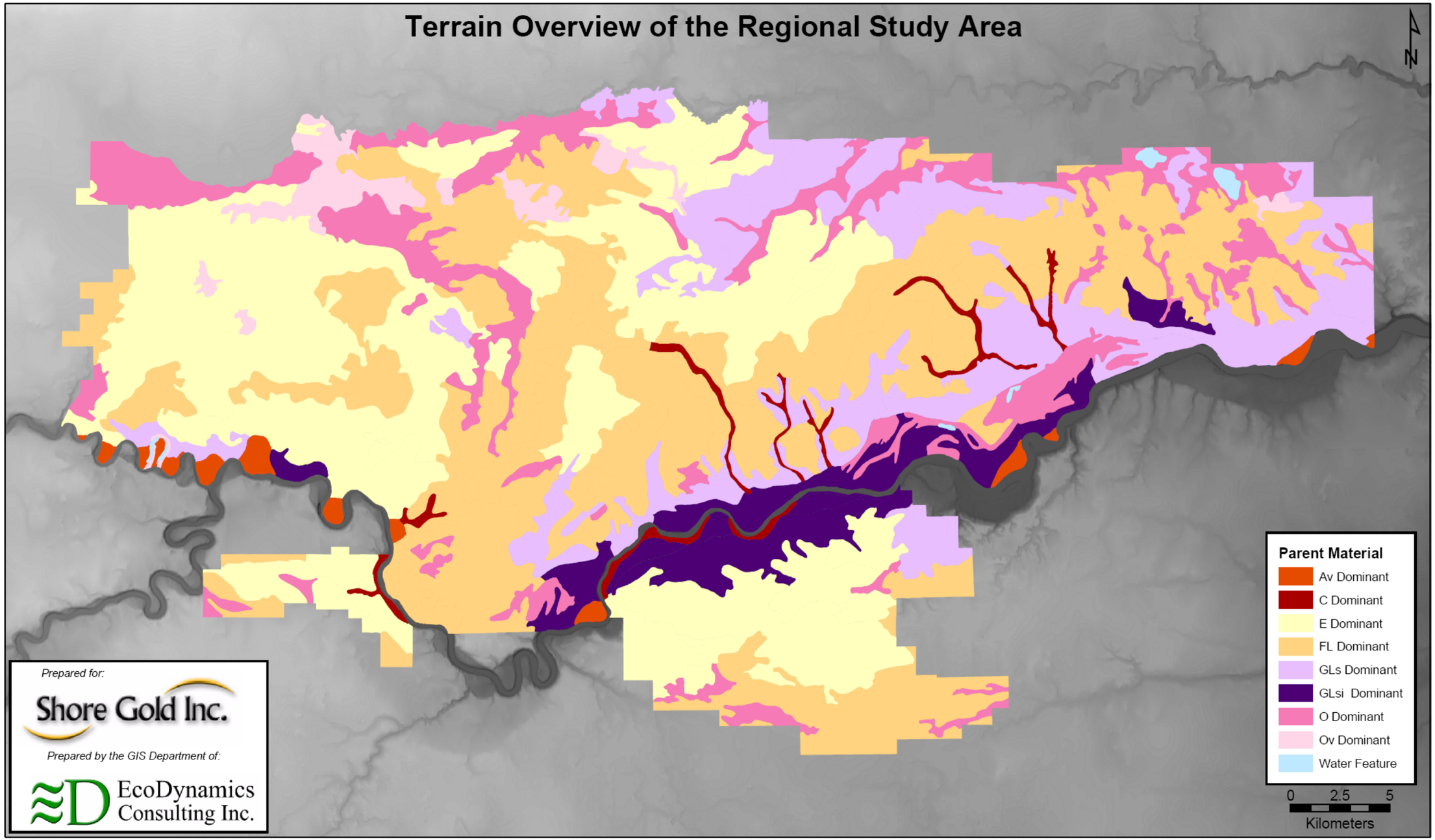
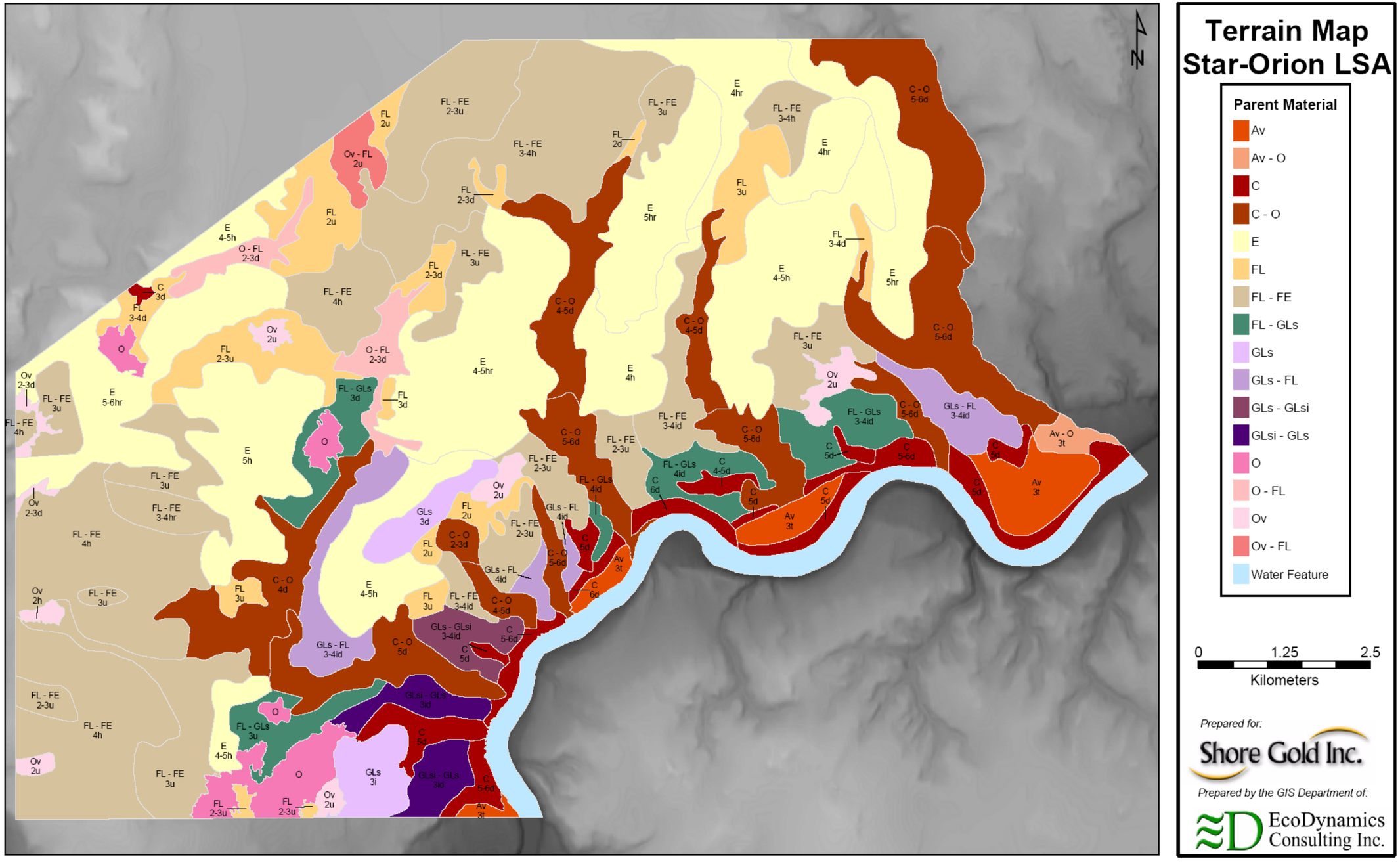


Figure 2-2. Terrain map covering the Star-Orion LSA.



2.4 Baseline Soil Resources

2.4.1 Introduction

The study area lies along a transition zone between the dark gray and gray soil zones, reflecting the regional transition from a prairie-parkland to boreal forest biome (Anderson and Ellis, 1976; Acton et al., 1998). As climate fluctuated during the 10,000 years since the end of the Pleistocene, the boreal-parkland transition repeatedly shifted northward and southward, each biome leaving its indelible mark on soil profile. Warmer drier periods favoured grasslands, whose dense, fine roots of grasses encourage the development of thick, humus-rich surface mineral horizons (i.e., *Ah* horizon). In stark contrast, the leaf and needle litter from deciduous and conifer trees tend to accumulate on top of the mineral surface as 'duff', and remain largely unmixed with the underlying mineral soil. As a result the soil of the region often have features attributable to a combination of boreal and grassland biomes. Many forest surface organic (or duff) layers are underlain by leached A horizons with some degree of organic enrichment ranging from minor (Aehj horizon) to significant (Ahe horizon).

Additionally, variations in surficial geology, vegetation, topography and drainage, result in local changes in soil characteristics across the landscape. These variations are reflected in the different soil associations and map units discussed below.

2.4.2 Soils and Soil Map Units

This section describes the various soil association and complexes and their constituent map units, occurring within the FalCPF and/or within the Star-Orion LSA. Table 2-3 provides a description of the major characteristics of each soil and component map units occurring on the regional and local soil maps (Figures 2-3 and 2-4). Tables 2-4 through 2-9 provides summaries of soil occurrence and distribution within the two study areas.

Eutric Brunisolic soils of the Pine Association are predominant, both regionally across the FalCPF (83,021 ha; 62.65%) and locally within the LSA (7,887 ha; 64.83%) Eutric Bruniols of the gravelly Kewanoke Association also occur regionally as a minor component (89 ha; 0.07%), but were not observed within the LSA. Luvisolic soils of the La Corne and Porcupine Plain Associations cover approximately 25,031 ha (18.90%) within the FalCPF, but only 856 ha (6.95%) within the LSA. Organic soils (i.e., peat >40cm thick) as a group cover approximately 13,609 ha (10.27%) regionally, and 1,088 ha (8.95%) within the LSA. Regosolic-dominated Hillwash and Alluvium Complex soils, cover only approximately 2,791 ha (2.11%) regionally, but are more prominent within the LSA, covering 1,727 ha or 14.19% of the area. Gleysolic soils of the Arbow, Meadow and Marsh Complexes cover approximately 4,004 ha (3.02%) within the FalCPF, and 207 ha (1.70%) within the LSA. Dark Gray Chernozems of the Nisbet and Carrot River Associations cover approximately 2,951 ha (2.23%) within the FalCPF. However, Dark Gray Chernozems of the Weirdale and Nisbet Associations occur in the LSA only as unmapped, inclusions within polygons of other soils; therefore, their areas are indeterminate, but are assumed to cover <1% of the total LSA. Water covers approximately 1,010 ha (0.76%) within the FalCPF, and 410 ha (3.37%) within the LSA.

Figure 2-3. Soil map covering the FalCPF.

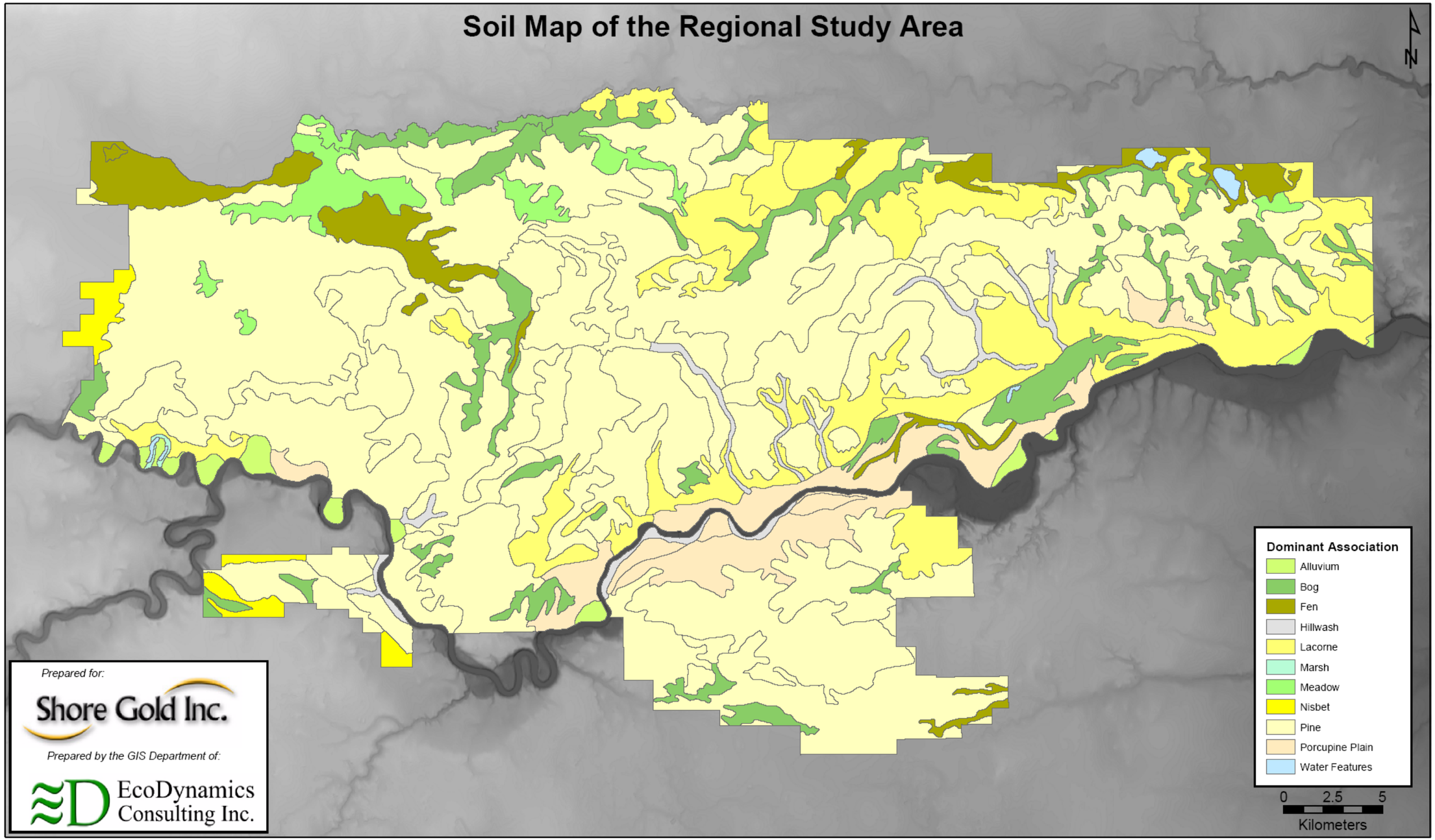


Figure 2-4. Soil map covering the Star-Orion LSA.

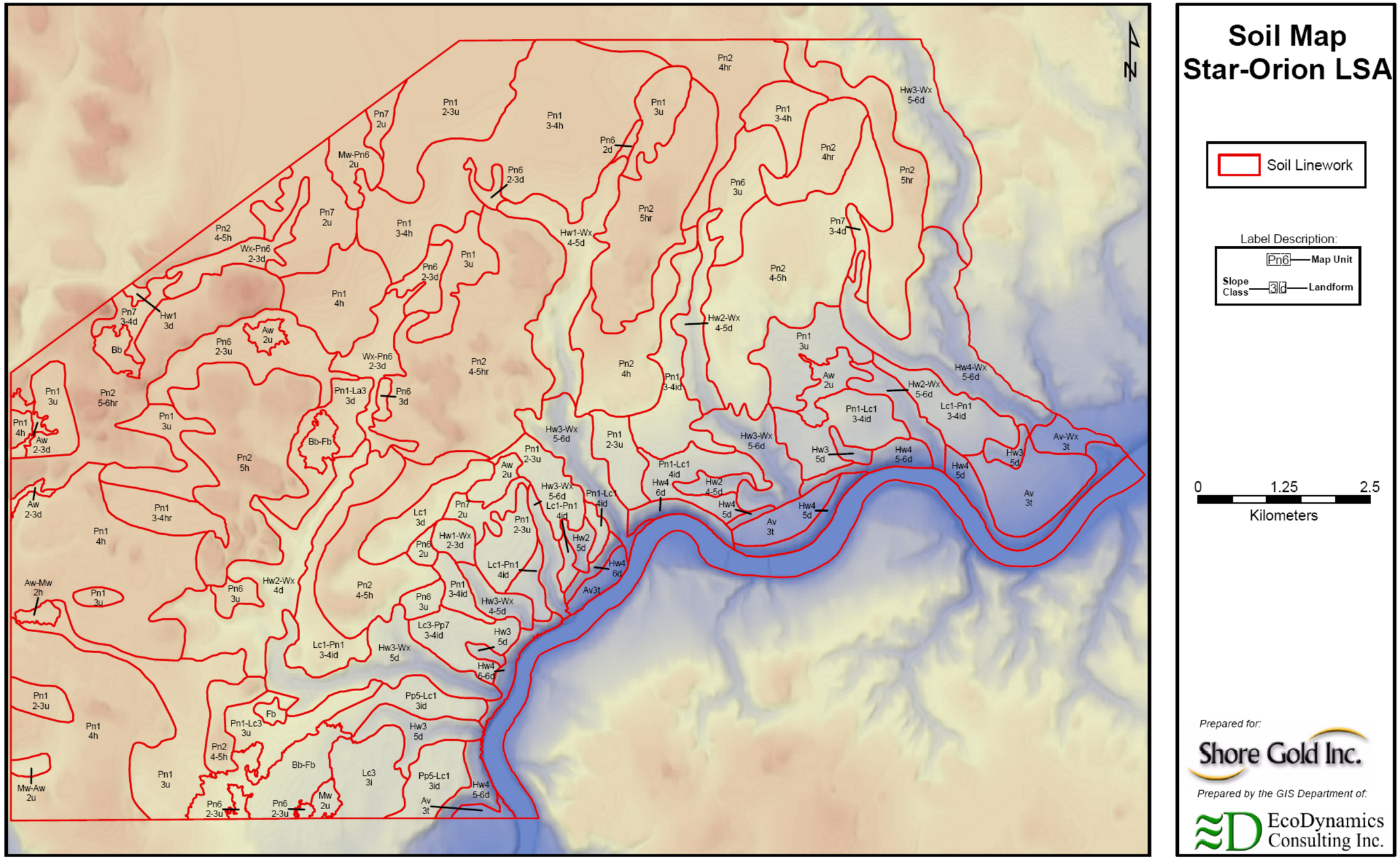


Table 2-3. Description of soil map units covering the FalCPF and the Star-Orion LSA.

SOIL NAME	MAP UNITS	DOMINANT SOILS	SIGNIFICANT SOILS	PARENT MATERIAL	DOMINANT LANDFORM
Pine	Pn1	Eluviated Eutric Brunisol		Coarse textured, non- to weakly calcareous, sandy glaciofluvial and glaciolacustrine deposits, some of which have been modified by wind to form eolian and fluvio-eolian deposits.	Gently undulating to gently rolling, fluvial-lacustrine and fluvio-eolian plains.
	Pn2	Eluviated Eutric Brunisol Orthic Regosol			Gently undulating to moderately rolling, hummocky-ridged eolian dunes.
	Pn4	Orthic Regosol	Eluviated Eutric Brunisol Gleysolic, Peaty Phase		Very gently undulating to gently rolling fluvial-lacustrine plain.
	Pn6	Gleyed Eluviated Eutric Brunisol Gleyed Regosol	Gleysolic, Peaty Phase		Very gently to gently undulating fluvial-lacustrine plain.
	Pn7	Eluviated Eutric Brunisol Orthic Regosol	Gleyed Eluviated Eutric Brunisol Gleyed Regosol		Gently undulating to gently rolling fluvial-lacustrine plain.
	Pn9	Eluviated Eutric Brunisol Orthic Regosol	Gleyed Eluviated Eutric Brunisol Gleyed Regosol Gleysolic, Peaty Phase		Very gently to gently undulating fluvial-lacustrine plain.
La Corne	Lc1	Orthic Gray Luvisol		Moderately coarse to medium textured, weakly to moderately calcareous sandy glaciolacustrine materials containing greater than 15% clay	Gently undulating to moderately rolling, often inclined and dissected, glaciolacustrine plain.
	Lc3	Orthic Gray Luvisol	Gleysolic, Peaty Phase		Very gently to roughly undulating glaciolacustrine plain.
Porcupine	Pp5	Orthic Gray Luvisol		Medium to moderately fine textured, moderately to strongly calcareous silty glaciolacustrine deposits.	Gently to steeply sloping, often inclined and dissected, glaciolacustrine plain and terraces.
	Pp7	Orthic Gray Luvisol Gleyed Gray Luvisol	Gleysolic, Peaty Phase		
Carrot River	Cr8	Gleyed Rego and Calcareous Dark Gray Chernozems	Gleyed Dark Gray Chernozem Gleysolic, Peaty Phase	Moderately to very strongly calcareous, coarse to medium textured, sandy fluvial-lacustrine deposits.	Very gently to gently undulating fluvial-lacustrine plain.
Kewanoke	Kk3	Eluviated Eutric Brunisol		Coarse to moderately coarse textured, weakly to non-calcareous, gravelly glaciofluvial deposits.	Gently undulating to gently rolling, often ridged, glaciofluvial plain.
Nisbet	Nt1	Orthic Dark Gray Chernozem		Coarse to moderately-coarse textured, weakly to moderately calcareous sandy fluvial-lacustrine deposits.	Gently to roughly undulating fluvial-lacustrine plain.
	Nt3	Orthic Dark Gray Chernozem	Rego Dark Gray Chernozem Gleysolic, Peaty Phase		Very gently to roughly undulating fluvial-lacustrine plain.
Hillwash	Hw	Complex of Regosolic, Brunisolic and Luvisolic soils		Colluvium and eroded materials of various origins.	Moderately to very steeply sloping ravines and valleys.
	Hw1	Complex of Regosolic and Brunisolic soils		Colluvium derived from sandy Pine parent material.	Gently to moderately sloping, with relatively shallow dissections due to erosion.
	Hw2	Complex of Brunisolic and Luvisolic soils		Colluvium derived from sandy Pine and loamy La Corne parent materials.	Moderately to strongly sloping, with moderately-deep dissections.
	Hw3	Mainly Luvisolic soils		Colluvium derived from loamy La Corne and silty Porcupine Plain parent materials.	Strongly to steeply sloping, with moderately-deep dissections.

Table 2-3. Continued.

SOIL NAME	MAP UNITS	DOMINANT SOILS	SIGNIFICANT SOILS	PARENT MATERIAL	DOMINANT LANDFORM
Hillwash	Hw4	Complex of Luvisolic and Regosolic soils		Colluvium derived from silty Porcupine Plain parent materials, along with exposures of actively eroding till.	Deeply dissected, steeply to very steeply sloping areas, mostly along the Saskatchewan River valley.
Alluvium	Av	Complex of Regosols, Cumulic Regosols and Gleysols		Variable textured recent alluvial sediments.	Very gently to gently undulating active alluvial flooplain.
Arbow	Aw	Gleysolic, Peaty Phase		Variable textured materials of various origins from sandy to clayey in texture.	Poorly drained, level to depressional areas.
Meadow	Mw	Gleysolic, Peaty Phase		Variable textured materials of various origins from sandy to clayey in texture.	Poorly drained, level to depressional areas.
Marsh	Mh	Gleysols (undifferentiated)		Flooded mineral materials with thin (<15cm), saturated organic layer.	Very poorly drained, level to depressional areas along near ponds, streams and beaver floods.
Bog	Bf	Terric Fibric Mesisol Mesic Fibrisol		Fibric to mesic peat derived from a combination of mosses, sedges and woody materials.	Extensive, level to depressional areas.
	Bb	Terric Mesisol Terric Fibric Mesisol			Shallow, bowl-shaped depressions.
	Bs	Terric Mesisol			Level areas along streams.
Fen	Fh	Terric Mesisol Typic Mesisol		Mesic to humic, occasionally calcareous, peat derived primarily from sedges.	Extensive, level to depressional areas.
	Fp	Typic Mesisol Fibric Mesisol			Level to depressional; ridged micro-topography.
	Fs	Typic Mesisol Cumulo Mesisol			Level areas along streams; frequent minerotrophic springs.
	Ff	Hydric Mesisol			Floating peat adjacent shallow ponds and lakes.
Wetland Complex	Wx	Complex of Gleysolic (Peaty Phase) and Organic soils		Fibric to humic peat of variable thickness (15 cm to >1m thick) overlying a variety of mineral materials.	Depressional areas along ravines.

Slope Class and Topography

Class	Slope %	Simple Topography (1)	Complex Topography (2)
1	0 - 0.5	Depressional to level	Depressional to nearly level
2	0.5 - 2	Very gently sloping	Very gently undulating
3	2 - 5	Gently sloping	Gently and roughly undulating (3)
4	6 - 9	Moderately Sloping	Gently rolling
5	10 - 15	Strongly sloping	Moderately rolling
6	16 - 30	Steeply sloping	Strongly rolling
7	30 - 60	Very steeply sloping	Hilly

Texture Group and Texture Class

Texture Group	Texture Class
Coarse	sand, loamy sand
Moderately Coarse	sandy loam, fine sandy loam
Medium	very fine sandy loam, loam, silt loam
Moderately Fine	sandy clay loam, clay loam, silty clay loam
Fine	sandy clay, silty clay, clay

Landform Symbols

Symbol	Description
u	undulating
h	hummocky
r	ridged
i	inclined
d	dissected
t	terraced

* Dominant soils cover >40% of the map unit; Significant (if present) soils comprise between >15% and <40%.
(1) Simple Topography - has single slopes giving a regular surface.
(2) Complex Topography- has multiple slopes giving an irregular surface and frequency pattern
(3) Roughly undulating has a higher frequency than gently undulating.

Table 2-4. Soil map unit distribution within FalCPF.

Soil Name	Map Unit	Area (ha)	% of Area
Pine	**Pn1**	27,176	20.51%
	Pn2	40,267	30.39%
	Pn4	11,313	8.54%
	Pn6	1,658	1.25%
	Pn9	2,607	1.97%
La Corne	**Lc1**	10,385	7.84%
	Lc3	5,019	3.79%
Porcupine Plain	**Pp5**	9,627	7.27%
Nisbet	**Nt1**	837	0.63%
	Nt3	438	0.33%
Kewanoke	**Kk3**	89	0.07%
Carrot River	**Cr8**	1,676	1.26%
Hillwash	**Hw**	1,647	1.24%
Alluvium	**Av**	1,144	0.86%
Arbow	**Aw**	571	0.43%
Meadow	**Mw**	3,269	2.47%
Marsh	**Mh**	165	0.12%
Bowl Bog	**Bb**	2,584	1.95%
Flat Bog	**Bf**	5,053	3.81%
Stream Bog	**Bs**	974	0.74%
Horizontal Fen	**Fh**	2,875	2.17%
Patterned Fen	**Fp**	1,071	0.81%
Stream Fen	**Fs**	958	0.72%
Floating Fen	**Ff**	94	0.07%
Water		1,010	0.76%
	Totals	**132,507**	**100.00%**

Table 2-5. Soil distribution summary within the FalCPF.

Soil	Dominant Soil	Area (ha)	% of Area
Pine	Eutric Brunisol	83,021	62.65%
La Corne	Gray Luvisol	15,404	11.63%
Porcupine Plain	Gray Luvisol	9,627	7.27%
Nisbet	Dark Gray Chernozem	1,275	0.96%
Kewanoke	Eutric Brunisol	89	0.07%
Carrot River	Gleyed Dark Gray Chernozem	1,676	1.26%
Hillwash	Orthic Regosol	1,647	1.24%
Alluvium	Cumulic Regosol	1,144	0.86%
Arbow	Gleysol	571	0.43%
Meadow	Gleysol	3,269	2.47%
Marsh	Gleysol	165	0.12%
Organic	Mesisol	13,609	10.27%
Water		1,010	0.76%
	Totals	**132,507**	**100.00%**

Table 2-6. Soil map unit distribution within the Star-Orion LSA.

Soil Name	Map Unit	Area (ha)	% of Area
Pine	**Pn1**	3,741	30.75%
	Pn2	3,310	27.21%
	Pn6	542	4.46%
	Pn7	294	2.42%
La Corne	**Lc1**	445	3.66%
	Lc3	264	2.17%
Porcupine Plain	**Pp5**	98	0.80%
	Pp7	38	0.32%
Hillwash	**Hw1**	149	1.22%
	Hw2	284	2.33%
	Hw3	594	4.89%
	Hw4	477	3.92%
Alluvium	**Av**	282	2.32%
Arbow	**Aw**	136	1.11%
Meadow	**Mw**	71	0.59%
Bowl Bog	**Bb**	142	1.16%
Bowl Fen	**Fb**	86	0.71%
Wetland Complex	**Wx**	801	6.59%
Water		410	3.37%
	Totals	**12,164**	**100.00%**

Table 2-7. Soil distribution summary within the Star-Orion LSA.

Soil	Dominant Soil	Area (ha)	% of Area
Pine	Eutric Brunisol	7,887	64.83%
La Corne	Gray Luvisol	710	5.83%
Porcupine Plain	Gray Luvisol	136	1.12%
Hillwash	Orthic Regosol	1,504	12.36%
Alluvium	Cumulic Regosol	282	2.32%
Arbow	Gleysol	136	1.11%
Meadow	Gleysol	71	0.59%
Organic	Mesisol	1,029	8.46%
Water		410	3.37%
	Totals	**12,164**	**100.00%**

Table 2-8. Soil area summary within FalCPF.

Soil Group	Area (ha)	% of Area
Eutric Brunisols	83,110	62.72%
Gray Luvisols	25,031	18.89%
Dark Gray Chernozems	2,951	2.23%
Regosols	2,791	2.11%
Gleysols	4,004	3.02%
Organic	13,609	10.27%
Water	1,010	0.76%
	132,507	100.00%

Table 2-9. Soil area summary within the Star-Orion LSA.

Soil Group	Area (ha)	% of Area
Eutric Brunisols	7,887	64.83%
Gray Luvisols	846	6.96%
Regosols	1,786	14.68%
Gleysols	207	1.70%
Organic	1,029	8.46%
Water	410	3.37%
	12,164	100.00%

Pine Association

The Pine Association consists of a group of Eutric Brunisolic and Regosolic soils that have developed from coarse textured, weakly to non-calcareous, sandy glaciofluvial and glaciolacustrine deposits, some of which have been modified by wind (eolian). This stone free parent material is typically light yellowish brown, with fine or medium sand textures predominating, although minor amounts of loamy fine sand do occur in areas of gentle topography. The material itself is composed mostly of resistant quartz and feldspar minerals, with only minor clay, resulting in low fertility and low moisture holding capacity.

Pine soils occupy a wide range of landscapes both regionally and locally, ranging from very gently to gently undulating (0.05-5%) fluvio-eolian and fluvial-lacustrine plains, to roughly undulating (2-5%) to strongly rolling (16-30%) hummocky (duned) and ridged eolian landscapes.

The most common Pine soils are rapidly to well drained, weakly to moderately developed Eluviated Eutric Brunisols, supporting dry jack pine (*Pinus banksiana*) forest. Orthic Regosols are usually limited to very dry, rapidly drained southerly aspects and knoll positions of steep eolian dunes, typically supporting open jack pine, with a ground cover dominated by grasses and lichen. Imperfectly drained Gleyed Eluviated Eutric Brunisols, supporting moist jack pine and trembling aspen (*Populus tremuloides*) forest, predominate in lower slope positions, minor upland depressions, and level areas adjacent poorly drained areas. Some map units include significant Peaty Phase Gleysolic soils, which occupy poorly drained depressions mainly supporting black spruce (*Picea mariana*).

Map Units

Pn1 – Dominantly Eluviated Eutric Brunisols. This unit is most common on gently undulating (2-5%) to gently rolling (6-9%) fluvio-eolian and fluvial-lacustrine landscapes.

Pn2 – Dominantly a combination of Eluviated Eutric Brunisols and Orthic Regosols. This map unit is most common in gently undulating to moderately rolling, hummocky and ridged eolian terrain. These soils are mostly rapidly drained and are the most arid of the Pine map units.

Pn4 – Dominant Orthic Regosol, with significant Eluviated Eutric Brunisol and Peaty Phase Gleysolic soils. This map unit occurs in western portions of the Fort a la Corne Provincial Forest on very gently undulating to gently rolling topography.

Pn6 – Dominantly a combination of Gleyed Eluviated Eutric Brunisols and Gleyed Orthic Regosol, with significant Gleysolic soils (peaty phase). This map unit occupies very gently to gently undulating fluvial-lacustrine plain.

Pn7 – Dominantly a combination of Eluviated Eutric Brunisol and Orthic Regosol, with a significant combination of Gleyed Eluviated Eutric Brunisol and Gleyed Regosol. This map unit occurs primarily on gently undulating to gently rolling fluvial-lacustrine plains.

Pn9 – Dominantly a combination of Eluviated Eutric Brunisol and Orthic Regosol, together with a significant combination of Gleyed Eluviated Brunisol and Gleyed Orthic Regosol and significant Peaty Phase Gleysolic soils. This unit occupies mostly very gently to gently undulating fluvial-lacustrine plains.

La Corne Association

The La Corne Association consists mostly of Gray Luvisolic soils developed from moderately coarse to medium textured, weakly to moderately calcareous sandy glaciolacustrine materials containing greater than 15% clay. The parent material is stone free and considerably variable, ranging from a weakly calcareous, light yellowish brown, loamy fine sand to a moderately calcareous, light olive brown, very fine sandy loam. Surface texture varies from loamy fine sand to very fine sandy loam.

La Corne soils occur mainly along weakly dissected slopes and terraces of the Saskatchewan River valley and its tributary ravines. They frequently occur in complex with soils of the Pine and the Porcupine Plain Associations.

The La Corne Association includes the following soils: Orthic Gray Luvisol, Brunisolic Gray Luvisol, Gleyed Gray Luvisol and Peaty Phase Gleysolic soils. The Orthic Gray Luvisol Brunisolic Gray Luvisol series occur on well and moderately well drained areas beneath mixed stands of trembling aspen, white spruce (Picea glauca) and jack pine. The Gleyed Gray Luvisols occur in imperfectly drained lower slope positions and along low ridges adjacent wet areas supporting mixtures of balsam poplar (*Populus balsamifera*), spruce and trembling aspen. Poorly drained Rego Gleysols (peaty phase) occur in lower slope and depressional areas supporting black spruce, speckled alder and willows.

Map Units

Lcl – Dominantly Orthic Gray Luvisol. This unit is most common within the Saskatchewan River valley and its tributary stream valleys, occurring mainly on weakly dissected topography that ranges from gently undulating (2-5%) to moderately rolling (10-15%).

Lc3 – Dominantly Orthic Gray Luvisol, with significant Gleysolic (peaty phase) soils. This map unit occurs primarily on very gently (0.05-2%) to roughly undulating (2-5%) topography.

Porcupine Plain Association

The Porcupine Plain Association consists mainly of Gray Luvisolic soils developed from medium to moderately fine textured, moderately to strongly calcareous silty glaciolacustrine deposits. The parent material is stone free, grayish brown to light olive brown in colour and ranges in texture from silt loam to silty clay loam. Surface textures include very fine sandy loam, silt loam and loam.

Most Porcupine Plain soils occur along the Saskatchewan River valley and tributary ravines, either on exumed and dissected silty glaciolacustrine sediments, once buried beneath deltaic materials, or on former silty glaciolacustrine terraces upslope of the recent alluvial sediments. Due to parent material complexities within these areas, Porcupine Plain soils are frequently mapped in complex with soils of the La Corne Association.

The Porcupine Plain Association includes the following soils: Orthic Gray Luvisol, Gleyed Gray Luvisol, and Peaty Phase Gleysolic soils. The Orthic Gray Luvisol soils are typically found on well to moderately well drained areas, supporting mixtures of trembling aspen, white spruce and white birch. Imperfectly drained Gleyed Gray Luvisols are common on lower slopes and in nearly level areas, typically hosting mixtures of balsam poplar, trembling aspen and white spruce. Some map units include a significant poorly drained component consisting of Peaty Phase Gleysolic soils supporting dense black spruce stands.

Map Units

Pp5 – Dominantly Orthic Gray Luvisol. This map unit occurs in the Saskatchewan River valley, often in complex with La Corne soils on gently (2-5%) to steeply (16-30%) sloping topography.

Pp7 – Dominantly a combination of Orthic Gray Luvisol a Gleyed Gray Luvisol, with significant Gleysolic (Peaty Phase) soils. Usually in complex with La Corne soils on gently (2-5%) to moderately sloping (6-9%) topography.

Carrot River Association

The Carrot River Association consists mostly of Dark Gray Chernozemic soils developed from moderately to very strongly calcareous, coarse to medium textured, sandy glaciolacustrine or glaciofluvial sediments. The parent material is yellowish brown to light olive brown in colour. However, much of the profile is marked by distinct to prominent, reddish brown mottles and streaks, and drab, splotches of gleying, indicative of imperfect to poor drainage. The parent materials range in texture from loamy fine sand to very fine sandy loam. The most common surface texture within the map area is very fine sandy loam.

The Carrot River Association in this region consist mainly of Gleyed Rego Dark Gray Chernozems and Gleyed Calcareous Dark Gray Chernozems. These soils occur in the imperfectly drained lower slope positions, in combination with Pine soils which occupy the rapid to well drained ridges. The forest cover consists mainly of a complex mixture of trembling aspen, white spruce, balsam poplar and willows. Peaty Phase Gleysolic also occur in adjacent poorly drained depressional areas, which typically support black spruce or willow.

Carrot River soils do not occur as a pure association in FalCPF, but only as a minor component in a mapping complex with Pine soils south of the Saskatchewan River. However, in the LSA, some imperfectly to poorly drained Pine soils under moist trembling aspen cover exhibited the intense mottling, characteristic of most Carrot River soils, but they lacked the thick Ahe horizon and strong calcareousness of the Carrot River Association. These profiles also have a complex,

unpredictable distribution that appears related to a strongly fluctuating water table. Therefore they were considered as a variant of the Pine Association and mapped as part of the Pn6 unit.

Map Units

Cr8 – Dominantly a combination of Gleyed Rego Dark Gray Chernozem and Gleyed Calcareous Dark Gray Chernozem, with significant combination of Gleyed Dark Gray and Peaty Phase Gleysolic soils.

Kewanoke Association

The Kewanoke Association consists mainly of Eutric Brunisolic soils developed from coarse to moderately coarse textured, weakly to non-calcareous, gravelly glaciofluvial deposits. The parent material is pale brown to grayish brown in colour, with a coarse sand to gravelly sand texture, and similar textures through to the surface. Gravel, cobbles and some stones occur throughout the soil. Most Kewanoke soils are Eluviated Eutric Brunisols occupying well to rapidly drained positions, with a cover of dry jack pine forest.

Kewanoke soils only occur within the FalCPF as a minor component of map complexes, and were not observed within the LSA. The only gravel noted in the LSA, was observed at depth in an exposure in a borrow pit immediately north of the Star main gate. This fine gravel was mixed with very coarse sands and lay below approximately one metre of fine sand typical of Pine soils in the area. Minor (<5%) gravel content was also observed on the surface of some Pine soils fringing the East Ravine.

Map Units

Kk3 – Dominantly Eluviated Eutric Brunisol.

Nisbet Association

The Nisbet Association consists primarily of Dark Gray Chernozemic soils developed from coarse to moderately-coarse textured, weakly to moderately calcareous sandy fluvial-lacustrine sediments. Nisbet soils mainly occur in southern portions of FalCPF, which is nearer to boreal forest-aspen parkland boundary. Nisbet parent material is typically light brown to dark brown in colour, with a loamy sand to sandy loam texture containing less than 15% clay. This parent material is somewhat similar to the parent material of the Pine Association, although slightly loamier in texture. As a result, Nisbet soils occur in mapping complexes with the Pine Association. The most common surface textures are loamy sand and sandy loam. Nisbet soils are stone free.

The Nisbet Association includes the following soils: Orthic Dark Gray Chernozem, Rego Dark Gray Chernozem and Peaty Phase Gleysolic soils. Orthic Dark Gray Chernozems are the most extensive, occupying most dry, rapidly to well drained positions with a cover of grasses, or grass and trembling aspen. The Rego Dark Gray, which lack B-horizons, occupy moderately-well or

imperfectly drained areas covered by trembling aspen forest. Peaty Phase Gleysolic soils occur in poorly drained depressional areas covered by sedge or sedge and willow vegetation.

Soils of the Nisbet Association occurs regionally within FalCPF, and as inclusions in some areas of Pine soils within the Star-Orion LSA.

Map Units

Nt1 – Dominantly Orthic Dark Gray Chernozems. This map unit is predominant in gently to roughly undulating (2-5%) topography.

Nt3 – Dominantly Orthic Dark Gray Chernozems, with a significant combination of Rego Dark Gray Chernozem and Peaty Phase Gleysolic soils. This map unit occurs on very gently (0.05-2%) to roughly undulating (2-5%) topography.

Weirdale Association

During the recent soil survey, soils of the Weirdale Association were observed to occur as *unmapped inclusions* in some tributary ravines draining into the Saskatchewan River valley. Weirdale soils consist of Dark Gray Chernozemic soils developed from very strongly calcareous, medium to moderately fine textured, silty glaciolacustrine deposits. The parent material is light yellowish brown to olive yellow in colour, and typically has a silty clay loam to silty clay texture. Surface texture is usually silty clay loam.

Most Weirdale soils observed in the LSA were Gleyed Calcareous Dark Gray Chernozems or Rego Gleysol-Peaty Phase soils located at base of ravine slopes. Forest cover consists mainly of white and black spruce, along with balsam poplar and trembling aspen.

Hillwash Complex

The Hillwash Complex consists of mixture of Regosolic, Brunisolic and Luvisolic soils developed in colluvial deposits. This colluvium results from the combined effects of water erosion and gravity on pre-existing materials occupying steep portions of the Saskatchewan River valley and its tributary ravines. As such, textures vary considerably from sand to loam to silty clay loam, depending on the nature of the material from which the colluvium is derived. Most Hillwash soils are rapidly to well drained, due to their occurrence on mostly steep slopes.

Forest cover is also highly variable, ranging from jackpine on dry, sandy, southern aspects to mixture of trembling aspen, white spruce and jack pine on loamier sites. Some of the steepest slopes are often deeply dissected and actively eroding, resulting in little or no vegetative cover.

Map Units

On the regional map of Anderson and Ellis (1976), only one hillwash unit is indicated:

Hw – A complex of Regosolic, Brunisolic and Luvisolic soils. This map unit generally occupies moderately (6-9%) to very steeply sloping (30-60%) topography.

For the more detailed soil map covering the Star-Orion LSA, four project-specific Hillwash map units were created to differentiate differences in parent material characteristics, as follow:

Hw1 – A complex of Regosolic and Brunisolic soils developed in colluvium derived from the erosion of sandy Pine parent material. The topography is typically gently (2-5%) to moderately sloping (6-9%), with relatively shallow dissections due to erosion.

Hw2 – A complex of Brunisolic and Luvisolic soils developed in colluvium derived from the erosion of sandy Pine and loamy La Corne parent materials. The topography ranges from moderately (6-9%) to strongly sloping (10-15%), with moderately-deep dissections.

Hw3 – A complex of Luvisolic soils developed in colluvium derived from the erosion of loamy La Corne and silty to clayey Porcupine Plain parent materials. The topography is typically strongly (10-15%) to steeply (16-30%) sloping, with moderately-deep dissections.

Hw4 – A complex of Regosolic and Luvisolic soils developed in colluvium derived from the erosion of silty to clayey Porcupine Plain parent materials, along with exposures of actively eroding, strongly calcareous, loamy till. This unit occurs mainly on deeply dissected, steeply (16-30%) to very steeply (30-60%) sloping portions along the Saskatchewan River valley.

Alluvium Complex

The Alluvium Complex consists mainly of Orthic and Cumulic Regosolic soils developed from variable textured alluvial sediments of recent age. This complex is most common on the active flood plain of the Saskatchewan River. The parent material is variable in texture and in carbonate content. However, very fine sandy loam and silt loam textures predominate, and most deposits are calcareous. Except in armoured portions of the river channel underlain by eroded till, Alluvium Complex soils are generally stone-free. Soil drainage ranges from well to very poor depending upon slope and topographic position, but is typically imperfect to poor. These sites are subject to severe flooding. Adjacent the river, vegetation cover is highly variable, ranging from very little to no cover on recently exposed or stony surfaces, to a complex mixture of willow (*Salix spp.*) and moisture-loving forbs and graminoids on the more stabilized and loamier soils. On stabilized and less flood-prone areas may support mixed stands of balsam poplar and trembling aspen.

The soils of the Alluvium Complex consist of a complex mixture of Orthic Regosols, Gleyed Regosols, Cumulic Regosols, Gleyed Cumulic Regosols and Rego Gleysols. The most recently deposited Regosols have little or no profile development. Buried LH and Ah horizons are characteristic of the Cumulic Regosols, resulting in rich nutrient regimes.

Map Units

Av – A complex mixture of Regosols, Cumulic Regosols and Gleysols.

Arbow Complex

The Arbow Complex consists of a group of poorly drained Gleysolic soils developed in a variety of parent materials, ranging from sandy to clayey in texture, but are usually stone free. The mineral soil is usually prominently mottled and/or gleyed and overlain by 15 to 60 cm of mixed fibric, mesic and humic peat. They usually occur along the margins or in complex with deeper Organic soils, and are covered by dense stands of black spruce, with an understory dominated by Labrador tea (*Ledum groenlandicum*), horsetails (*Equisetum spp.*) and feather mosses. The surface often exhibits hummocky microtopography.

Map Units

Aw – A complex of Peaty Phase Gleysolic soils.

Meadow Complex

The Meadow Complex consists of a mixture of Gleysolic soils occupying poorly drained nearly level and depressional areas covered by a combination of sedges (*Carex spp.*), reed grasses (*Calamagrostis spp.*), a variety of succulent forbs and willows. Most Meadow soils are Peaty Phase Rego Gleysols with 15 to 40 cm of moderately decomposed (mesic) sedge peat overlying a thin, black Ah horizon and a strongly gleyed, loamy sand to sandy loam C horizon. However, significant amounts of Humic Gleysols and Terric Mesisols also occur in this unit. Meadow soils usually occur in complex with other soil units. Meadow soils tend to be flooded in spring, with watertables dropping to below 1m by the end of the growing season. This fluctuating water regime gives these areas a swamp-like to wet-meadow character.

Map Units

Mw – Dominantly mixed Gleysolic soils.

Marsh Complex

The Marsh Complex consists of very poorly drained Gleysolic soils occurring along the margins of ponds and streams, as well as areas flooded by beavers. The strongly gleyed mineral material is often covered by a thin (<15 cm,) peaty organic layer. Some Marsh soils occupying tributary stream valleys are frequently calcareous. Vegetation cover is variable, with variable combinations of cattail (*Typha latifolia),* bulrushes (*Scirpus spp.*), sedges, reed grasses, horsetails and willows.

Map Units

Mh – Dominantly very poorly drained Gleysolic soils.

Bog Organic Soils

Areas mapped as bogs in the map area are typically underlain by fibric and mesic peat, with a water table near the surface, with only occasional pools of standing water. Typical vegetation cover consists of black spruce, with occasional tamarack, and an understory of Labrador tea, other ericacious shrubs and peat moss. The near surface, moss-derived, fibric peat is typically acidic, but are often underlain by less acidic peat derived from sedges within the upper metre. Peat thickness varies from 40cm to greater than 2 metres. The surface of bogs occasionally exhibit a hummocky micro-topography.

Based on recent surveys, many areas mapped as *Bog* in the existing regional soil survey frequently exhibit swamp-like characteristics, including: tall (>10m), closed stands of black spruce and tamarack; more strongly-expressed hummocky micro-topography with frequent pools of clear water; and ground-surfaces dominated by feathermosses rather than sphagnum mosses. In some cases, marl-like, calcareous peat is encountered between 50 cm and 1m depths. The *Treed Swamp* unit used during vegetation mapping incorporates these bog-swamp intergrades, since the latest forest inventory upon which the mapping was based, distinguishes these areas from 'true' bogs. However, in order to facilitate direct comparison between regional and local soils, these swamp-like areas remain included in the *Bog* units on the current soil survey. It is expected that the *Stream Bog* unit contains most of these swamp-bog intergrades.

Map Units

Flat Bog (Bf) – This type occurs in nearly level, low-lying areas. Soils consist mostly of Terric Fibric Mesisols and Mesic Fibrisols.

Bowl Bog (Bb) – This type occupies bowl-shaped depressions, with peat thicknesses generally less than one meter. Terric and Terric Fibric Mesisols are the most common soils.

Stream Bog (Bs) – This type occurs in elongate, very poorly drained depressions along drainage courses. The fibric to mesic peat material consists of a mixture of forest and moss peat. These areas typically host taller black spruce, with occasional tamarack and white spruce, and a ground cover consisting of mixtures of feather mosses and Sphagnum. Terric Mesisols are the dominant soils.

Fen Organic Soils

Both open and treed varieties of fen occur in the mapped areas. The relatively open fens are usually dominated by sedges, with a few shrubs including swamp birch (*Betula pumila*) and scattered, often stunted tamarack. Treed fens typically support open stands of tamarack with an understory consisting mainly of swamp birch, speckled alder, horsetails and sedges. The water table is at the surface most of the year and often near neutral to alkaline. The peat varies in thickness from 40 cm to 2 meters or more, and is composed primarily of mesic peat derived from sedges.

As with some bog areas, the recent soil survey indicated areas of rich fen-rich swamp intergrades often associated with minerotrophic groundwater discharge along the base of ravine slopes. Natural springs and seeps have been observed ed previously along the Saskatchewan River valley (Pipe et al., 1982). These areas typically host tall (often >20m) mixtures of tamarack, white spruce, black spruce and balsam poplar, along with a richer understory than most fens. Most of these fen-swamp intergrades appear to be captured by the *Stream Fen* unit.

Map Units

Horizontal Fen (Fh) – These fens occupy extensive, flat, low-lying areas. The water table is usually at or near the surface. The vegetation consists dominantly of sedge, swamp birch and, scattered tamarack. The most common soils are Terric Mesisols and Typic Mesisols, varying from 40 to 180 cm or more in thickness.

Patterned Fen (Fp) – These fens occur mainly on very gently sloping areas, with a characteristic pattern of ridges (or *flarks*) and hollows. The ridges typically support stunted black spruce and tamarack, swamp birch and mosses. The hollows are usually water-saturated to the surface and sedge-dominated. These fend often occur as elongated 'string fens' along indistinct drainage courses. Peat thicknesses are often greater than 180 cm, with Typic and Fibric Mesisols the most common soils.

Stream Fen (Fs) – These fens are similar to the *Horizontal Fen* except that they occur along distinct free-flowing streams and is associated with nutrient-charged (minerotrophic) spring and stream discharges, particularly along ravines. Peat materials are often <1m thick and water tables are usually at the surface. Typic and Cumulo Mesisols are the most common soils.

Floating Fen (Ff) – These fens are the least common fens, occurring only in close association with shallow water bodies, which are relatively rare in FalCPF. The peat material, derived mostly from sedges and reeds, forms a floating fibric to mesic mat over a water layer of variable depth. These areas are dangerous to traverse and should generally be avoided. The soil in these areas consists mostly of Hydric Fibrisols.

Wetland Complex

During mapping of the Star-Orion LSA, a new unit – *Wetland Complex* – was developed for mapping of poorly to very poorly drained soils occupying the tributary stream valleys (ravines), which drain into the Saskatchewan River valley. This complex consists of highly variable combinations of Peaty Phase Gleysolic soils, together with Organic soils where the peat is greater than 40cm thick. The peat varies in thickness from 15cm to more than 1m. This unit represents a complex of Arbow, Meadow, Marsh and Stream Fen units, which are not individually mappable at the current scale.

Map Units

Wx – A complex mixture of Peaty Phase Gleysolic soils and Organic soils. The most common Organic soils are Terric Mesisols, Terric Limnic Mesisols and Terric Humisols.

2.5 Land Capability Assessment

2.5.1 Land Capability for Agriculture

The agricultural capability ratings provided below are based on a variation of the Canada Land Inventory (CLI) rating system developed for Saskatchewan by Shields et al. (1968), and as applied during regional mapping of the FalCPF by Anderson and Ellis (1976). These agricultural capability ratings were also applied to soils illustrated on the more detailed soil map covering the Star-Orion LSA.

Agricultural capability considers a range of climatic, soil and landscape characteristics on the potential for a given areas to sustain typical dryland agriculture (Anderson and Ellis, 1976). The limiting effects of climate on common crops is considered first, followed by consideration of the limitations imposed by characteristics of the soils themselves, and landscape factors such as slope and susceptibility to flooding. Soils are then placed within one of seven capability classes and the major soil and landscape limitations listed as a subscript letter symbol.

The FalCPF is located within the Class 1 climate region, with a frost-free period greater than 90 days and sufficiently high growing season temperatures to allow common field crops to reach maturity (Anderson and Ellis, 1976). Common soil limitations include: low moisture holding capacity (m), poor soil structure (d), and low fertility (f). There are also landscape limitations in the areas due to adverse topography (t), excessive wetness or poor drainage (w), erosion susceptibility (e) and susceptibility to flooding or inundation (i).

These variations in agricultural capability are illustrated regionally and locally in Figure 2-5 and Figure 2-6. Tables 2-10 and 2-11 provide area summaries for agricultural capability within the FalCPF and the Star-Orion LSA. The following agricultural capability classes are found within FalCPF and the Star-Orion LSA:

Class 2. These areas have only moderate limitations for agriculture and provide good arable land suited to a wide range of crops. Class 2 lands are restricted to small areas of Alluvium (Av) along the Saskatchewan River, covering only 992 ha (0.75%) of FalCPF. These Class 2 lands also occur in the LSA, covering approximately 259 ha (2.13%).

Class 3. These lands have moderately severe limitations for agriculture, but provide fair arable land suited to the production of a moderate range of crops. The best Porcupine Plain soils in the areas are rated 3d, due to poor soil structure (d) related to a dense, clayey B-horizon. The best La Corne Association soils in the areas are rated 3m, with minor restrictions due to low moisture holding capacity (m). Class 3 lands cover approximately 19,180 ha (14.47%) of FalCPF, and 750 ha (6.17%) of the LSA.

Class 4. These areas have severe limitations to the growth of field crops and are considered poor arable land. Most Class 4 lands consist of Porcupine Plain and La Corne soils rated 4m, but areas of slopes steeper than 9% are rated 4t. Class 4 lands cover only 4,468 ha (3.37%) of FalCPF, and 38 ha (0.32%) of the LSA.

Table 2-10. Agricultural capability within the FalCPF.

Class	Limitations	Area (ha)	% of Area
2	*i*	992	0.75%
3	*m, d*	19,180	14.47%
4	*m, w, t*	4,468	3.37%
5	*m, f, w*	1,248	0.94%
6	*m, f, w, t, e*	90,799	68.52%
7	*w*	63	0.05%
Organic		14,747	11.13%
Water		1,010	0.76%
	Totals	**132,507**	**100.00%**

Table 2-11. Agricultural capability within the Star-Orion LSA.

Class	Limitations	Area (ha)	% of Area
2	*i*	259	2.13%
3	*m, d*	750	6.17%
4	*t*	38	0.32%
5	*w*	39	0.32%
6	*m, t, e, w*	9,809	80.64%
7	*w*	118	0.97%
Organic		741	6.09%
Water		410	3.37%
	Totals	**12,164**	**100.00%**

Class 5. These lands have serious soil or landscape limitations, making them unsuitable for the production of annual crops. They are only suitable for production of forage crops. Less droughty soils of the Pine Association and the sand-textured Nisbet soils are rated 5m due to low moisture holding capacity. The poorly drained Meadow soils are rated 5w, due to excessive wetness. Class 5 lands cover only 1,248 ha (0.94%) of FalCPF, and 39 ha (0.32%) of the LSA.

Class 6. These areas have very serious soil or landscape limitations which normally restrict their agricultural use to native grazing at best. However, grazing is generally restricted due to the extensive forest cover. Some Pine soils are rated 6m due to severe moisture limitations. Subclass 6w is assigned to poorly drained soils of many different associations and complexes, including the Pine and La Corne Associations and to the Arbow Complex. Soils occupying steeply sloping areas of the Saskatchewan River valley and some ravine areas are rated 6e. A rating of 6m is applied to Pine soils of sand dune areas. Class 6 lands are the most extensive in FalCPF covering approximately 90,799 ha (68.52%) of FalCPF, and 9,809 ha (80.64%) of the LSA.

Class 7. These soils are unsuitable for agricultural use. This class applies only to areas of Marsh Complex, which was mapped on a mere 63 ha (0.05 %) of the FalCPF, and 118 ha (0.97%) of the LSA.

Organic Soils (O). Organic soils were not included in the capability classification for agriculture. Organic soils occupy approximately 14,747 ha (11.13%) of the FalCPF, and 741 ha (6.09%) of the LSA.

In summary, Class 6 soils are predominant both regionally (68.52% of FalCPF) and locally (80.64% of the LSA). Only 24,640 ha (18.60%) of FalCPF, and 1,047 ha (8.61%) of the LSA may be considered as potential arable land (i.e., Classes 2, 3 and 4).

2.5.2 Land Capability for Forestry

The forest land capability ratings discussed below are based on the Canada Land Inventory system as applied in Saskatchewan (Kabzems et al., 1972), and specifically to the FalCPF (Anderson and Ellis, 1976). These forest capability ratings were also similarly applied to the more detailed soil map covering the Star-Orion LSA.

In addition to the use of soil survey information for assessing the agricultural capability of specific lands, this information can also be used to assess the potential or inherent ability of specific areas to grow timber (Anderson and Ellis, 1976). The forest land capability classification utilizes a seven class system similar to that used for agricultural capability, and is based on the natural, unimproved state of the land. Each capability class is characterized by a range of forest productivity based on the mean annual increment (MAI), measured as the m3 of wood volume produced per hectare per year (m3/ha/year), by the most suitable species or group of species adapted to the site. Subclasses are also listed to indicate the dominant factors limiting tree growth in a given area. The most common soil and landscape subclass limitations indicated in the FalCPF and LSA are: soil moisture deficiency during the growing season (m); excess soil moisture (w); low soil fertility (f); and actively eroding soils (e).

These variations in forest capability are illustrated regionally and locally in Figure 2-7 and Figure 2-8. Tables 2-12 and 2-13 provide area summaries for forest capability within the FalCPF and the Star-Orion LSA. The following forest capability classes are found within FalCPF and the Star-Orion LSA:

Class 4. These lands having moderately severe limitations to the growth of commercial forests. Productivity (MAI - Mean Annual Increment) typically ranges from 3.6 - 4.9 cubic metres per hectare per year. White spruce is the usual rating species. Most Class 4 forest lands are underlain by soils of the La Corne and Porcupine Plain Associations., with moisture (m) being the major limitation. Some minor areas of Alluvium complex are also rated Class 4, but are subject to excessive wetness (w). Class 4 lands occupy approximately 16,036 ha (12.10%) of the FalCPF, and 817 ha (6.72%) of the LSA.

Class 5. These lands having severe limitations to commercial forest production. Class 5 lands range in productivity from 2.2 - 3.5 cubic metres per hectare per year. Jack pine are the rating species applied to these lands, which are underlain mostly by some slightly moister Pine soils and some of the poorer La Corne soils. The major limitations are moisture (m), with some La Corne soils having multiple limitations (x). Class 5 lands cover approximately 43,781 ha (33.04%) within the FalCPF, and 4,169 ha (34.27%) in the LSA.

Table 2-12. Forest capability within the FalCPF.

Class	Limitations	Area (ha)	% of Area
4	*m, w*	16,036	12.10%
5	*m, x*	43,781	33.04%
6	*m, w, x*	56,711	42.80%
7	*w*	14,969	11.30%
Water		1,010	0.76%
	Totals	**132,507**	**100.00%**

Table 2-13. Forest capability within the Star-Orion LSA.

Class	Limitations	Area (ha)	% of Area
4	*m, w*	817	6.72%
5	*m*	4,169	34.27%
6	*m, x, w*	5,832	47.94%
7	*w*	937	7.70%
Water		410	3.37%
	Totals	**12,164**	**100.00%**

Class 6. These lands have very severe limitations to the growth of commercial forests. Productivity of these lands is 0.8 - 2.1 cubic metres per hectare.. The more droughty Pine soils (e.g., Pn2 map unit) are rated Class 6m, with jack pine the rating species. Black spruce is the rating species for Class 6w forest lands, covered by the Arbow Complex. Class 6 lands cover approximately 56,711 ha (42.80%) within the FalCPF, and 5,832 ha (47.94%) in the LSA.

Class 7. These lands having limitations severe enough to preclude commercial forest production. Productivity of these lands is usually usually less than 0.7 cubic metres per hectare per year. These lands consist of very poorly drained Fens and Bogs, and the Meadow and Marsh complexes. Class 7 lands cover approximately 14,969 ha (11.30%) within the FalCPF, and 937 ha (7.70%) in the LSA.

In summary, forest capability Classes 5 and 6 lands are predominant both regionally (75.84% of FalCPF) and locally (82.21% of the LSA). Therefore, most of FalCPF and the LSA are rated as having ‘severe’ to ‘very severe’ limitations to commercial forestry. Additionally, most of the LSA is covered by young (<20 years old), regenerating forest and will not be ready for harvest for more than 50 years.

Figure 2-5. Agricultural capability within the FalCPF.

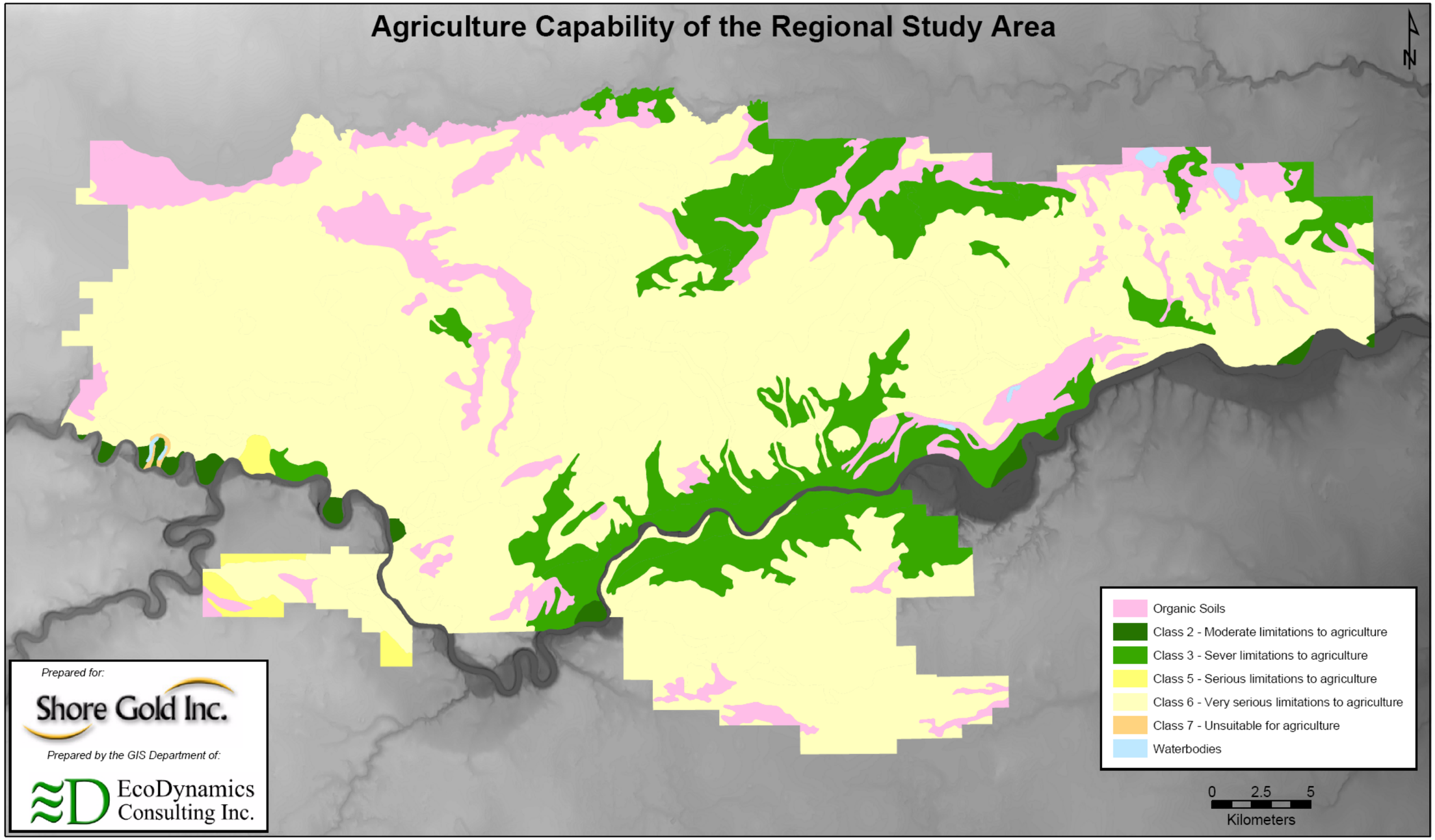


Figure 2-6. Agricultural capability within the Star-Orion LSA.

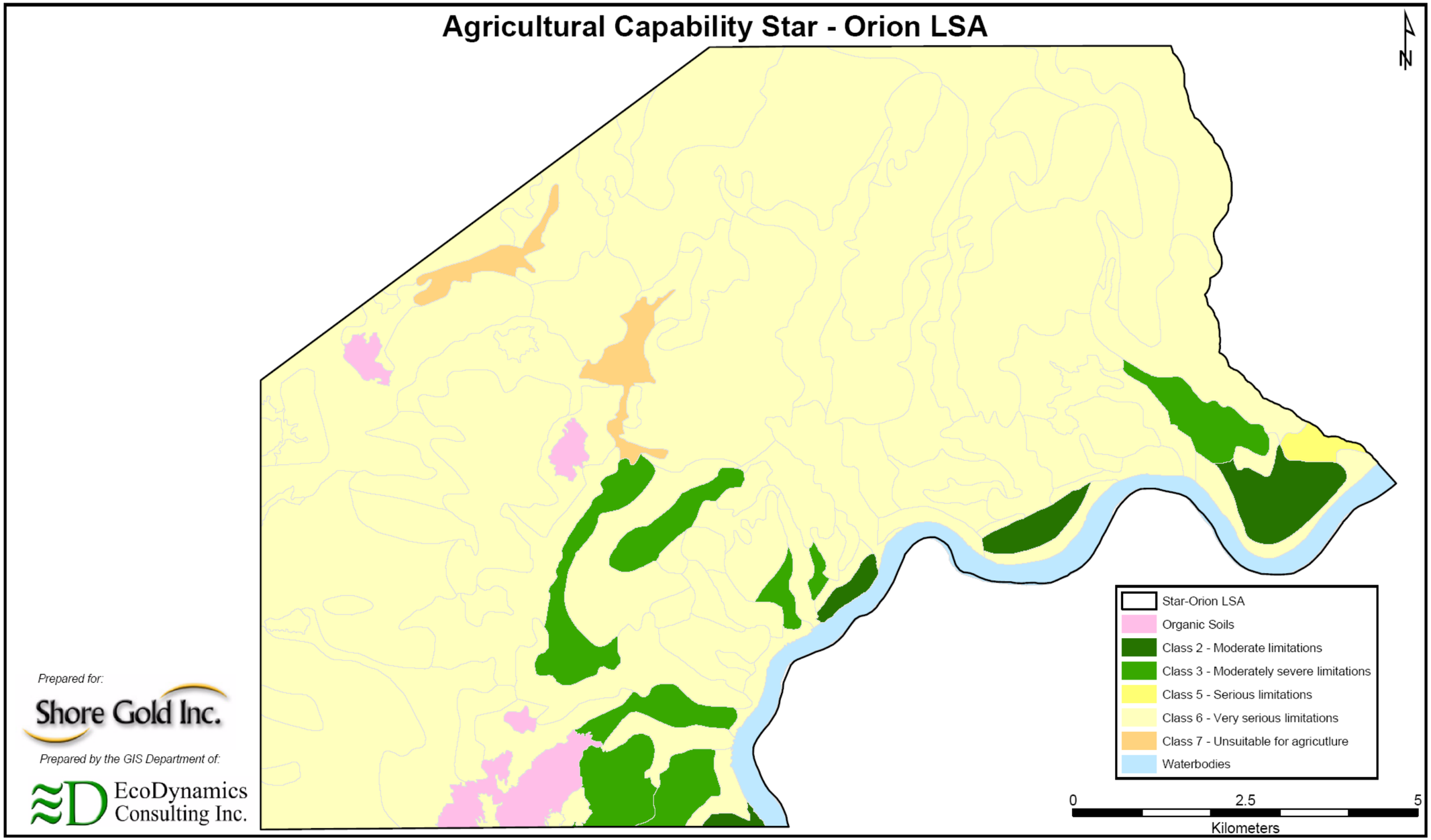


Figure 2-7. Forest capability within the FalCPF.

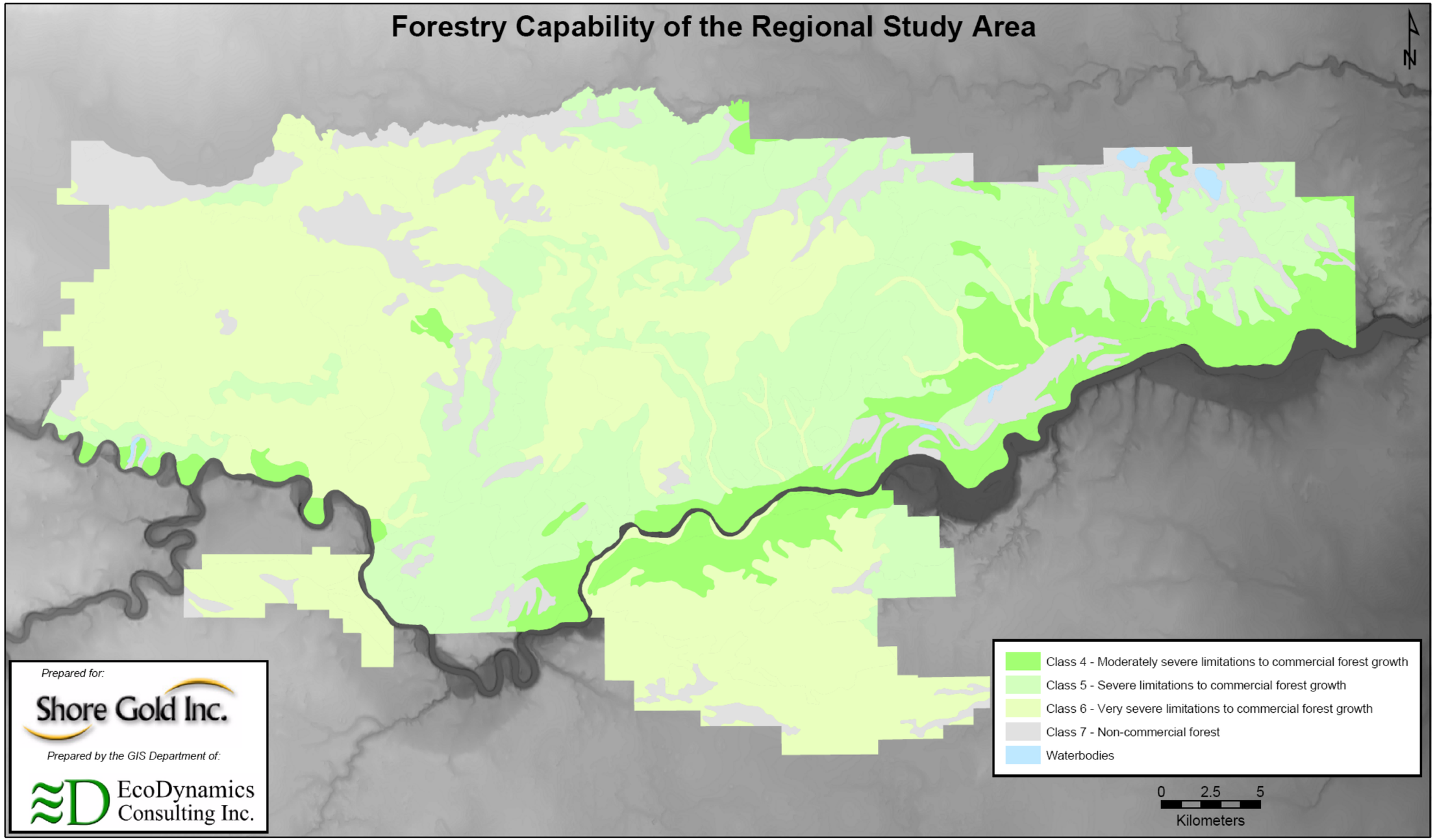
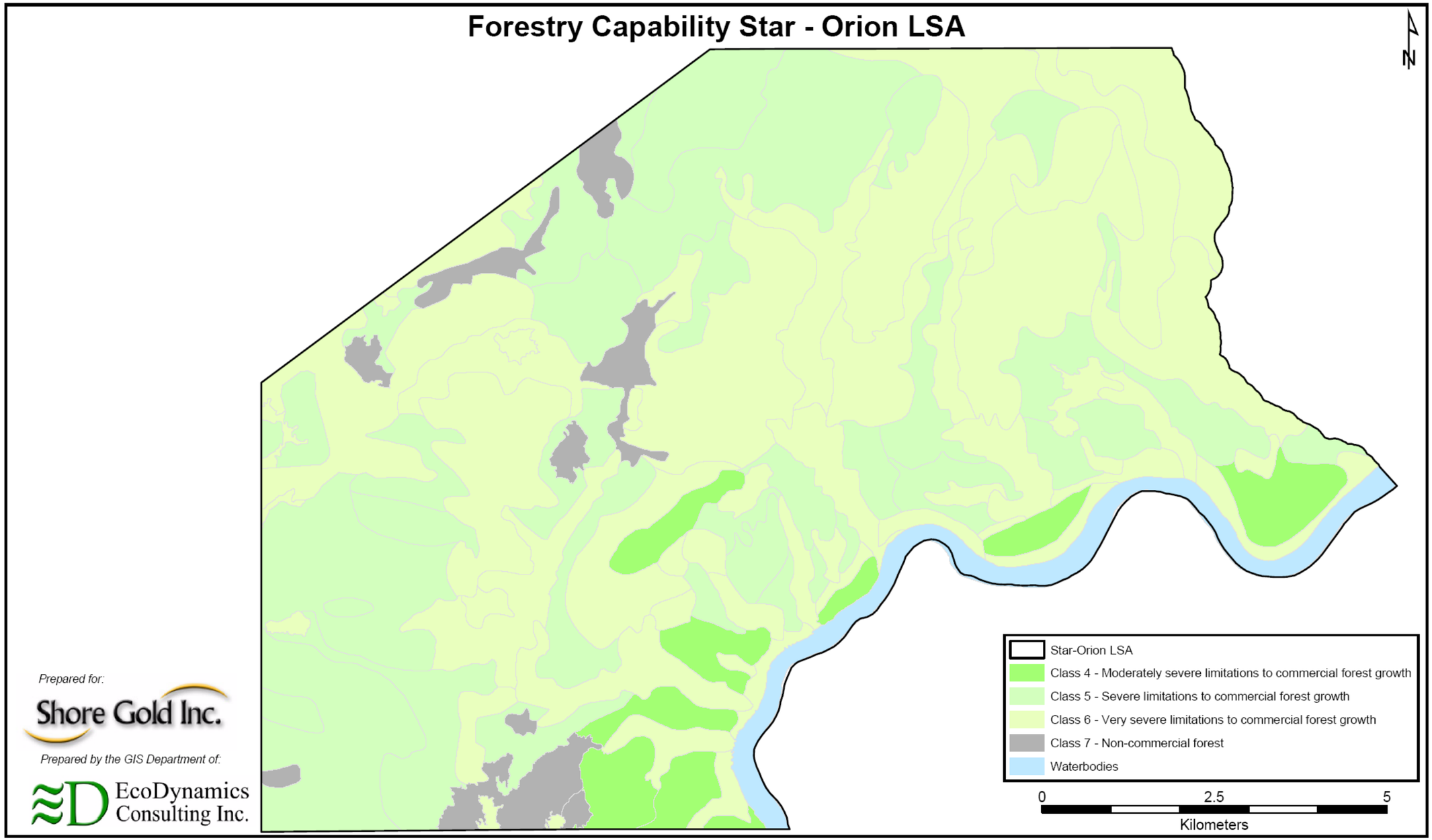


Figure 2-8. Forest capability within the Star-Orion LSA.



3.0 VEGETATION RESOURCES

3.1 Introduction

This section of the terrestrial baseline report describes the existing (baseline) state of vegetation resources within the vicinity of the Star-Orion Diamond Project. The general objectives of this portion of the terrestrial baseline program were to:

- map and describe the vegetation communities regionally within the FalCPF and locally within the Star-Orion LSA using an ecological land classification approach;
- establish a network of ecological plots across the LSA and selected areas of FalCPF to support vegetation mapping and to describe major upland and wetland vegetation communities;
- conduct early (June) and late season (August) rare plant surveys within the Star-Orion LSA to locate major occurrences of rare and endangered plant species.

3.2 Methodology

3.2.1 Existing Information

The general vegetation characteristics of the Fort-a-la-Corne region have been described by Acton et al. (1998). More detailed vegetation information for the region comes from baseline surveys conducted for the Nipawin (Willard et al., 1977; Blood et al., 1977) and Forks (Pipe, 1982) hydroelectric projects. In general, the current study includes more upland areas than these earlier studies, which were focused on the Saskatchewan River valley and immediately adjacent uplands.

Since the early 1950's, the Saskatchewan Government has conducted forest inventories in the Fort-a-la-Corne area for forestry purposes, the latest being completed in 2008 (based on 2004 orthophotography). This most recent forest inventory is completely digital and ready for direct import into ESRI™ ArcGIS systems, and not only contains traditional forest inventory information (i.e., species composition, height and density), but also includes wetland classification, soil moisture regime and a variety of other 'ecological' parameters. These characteristics make this latest forest inventory the logical choice as a base for mapping of vegetation, as well as wildlife habitat.

3.2.2 Field Surveys

Ecological Plot Survey

During August, 2007, a network of 51 detailed ecology plots (termed *Terrestrial Ecology Plots* or *TEPs* for the purposes of this project) were established across the PLSA in a variety of upland and wetland terrestrial ecosystems. In June, 2008, an additional 115 TEPs were established within the Star-Orion LSA, and in selected areas to the north and south along potential infrastructure corridors. These detailed ecological plots are the primary data source for the

assessment of vegetation resources, as well as contributing information to soil and wildlife habitat mapping. The TEP dataset not only provides a detailed 'snap-shot' of the baseline state of terrestrial ecosystems at the site/plot level, but also provides understanding of ecosystem variations across the sampled area. The ecological survey results together with the results of rare plant surveys, also enable the preparation of a comprehensive plant species list for the surveyed area.

The ecological survey was conducted by a field team consisting of a botanist, a soil specialist and a forest technician. Occasionally, the ecological survey team was accompanied by a wildlife biologist and/or a rare plant specialist in order to assess the wildlife and rare plant habitat potential of key ecosystems. Access to sampling locations was gained using a 4x4 truck along major roads and trails, while more inaccessible areas were traversed on foot. Selected areas of the potential north infrastructure corridor were sampled in June 2008 using a helicopter.

Ecological plot establishment and measurement was conducted in accordance with Saskatchewan's Forest Ecosystem Classification (FEC) protocols (Jiricka et al., 2002) and standard ecological sampling practice (Mueller-Dumbois and Ellenburg, 1974). Sample plot distribution was based on a stratified sampling approach utilizing the most current forest inventory. Plots were distributed to capture as much of the apparent moisture, nutrient and successional gradients as possible.

Representative sites were located within targeted polygons for plot establishment based on homogeneity of overstorey and general site conditions (i.e., representative of typical forest stand conditions). To minimize bias, a metal pigtail pin was randomly placed to mark the northwest corner. From this point, a 60m tape was used to establish a 10m x 10m plot along north-south and east-west axes (to minimize plot-specific bias), such that each side faced a cardinal direction. This overall approach was designed to be consistent with the ecological sampling method advocated by Mueller-Dumbois and Ellenburg (1974) – 'subjective without pre-conceived bias'.

At each plot species and cover abundance data was collected for all vegetation groups including trees, shrubs, forbs, graminoids, and common mosses and lichens. Species composition and abundance (% cover) was assessed for each overstorey and understorey vegetation layer in 2m x 2m vegetation subplots located in the NW and SE corners of the detailed plot. The presence and abundance of any understorey species present in the main plot, but not recorded in the subplots, was also recorded. Abundance of all trees and shrubs >2m were also rerecorded for the main plot. Heights and diameter at breast height (dbh) was measured for all trees within the plot >7.5 cm dbh, including dead trees. A prism sweep (BAF 2) was conducted at plot centre for forest volume assessment. Stand structure, crown closure, and species composition was also described. Two representative codominant trees of each species were selected for aging.

A variety of soil profile and site characteristics were also recorded at most sites to aid ecological classification and to contribute to soil and terrain mapping. A soil pit was excavated to approximately 1m at a representative location for soil description and classification. The soil profile characterization included: descriptions of all major soil horizons (horizon type, thickness, texture, mottling, gleying, calcareousness, and coarse fragment content); parent material classification; humus form; seepage; drainage class; moisture and nutrient regimes; and depths to

mottling, gleying, water table, and root-restricting layer. Site characteristics, including topographic position, aspect, and slope angle, were also collected.

Representative digital photographs of the overstorey and understorey vegetation, and the soil profile, were taken at most plots for future reference. UTM coordinates were recorded using a handheld GPS.

The detailed plot data was supplemented by visual inspections of vegetation conditions (incidental observations) completed while on traverse between plots, or in conjunction with other surveys. These visual inspections were used to assist with vegetation mapping and ecological classification. Figure C-2 (Appendix C) illustrates the distribution of vegetation inspections.

Rare Plant Surveys

Rare vascular plant surveys were conducted in selected areas of LSA and adjacent areas from June 21st to 25th (for early-flowering species) and August 13th to 17th, 2008 (for late- flowering species), with a focus on the LSA.

Prior to commencement of field surveys, a list of rare plants previously recorded in the study area obtained from the SASK Herbarium at the University of Saskatchewan (2008). The database search area was roughly delineated by the following coordinates: 53.12˚N to 53.42˚N, 104.2˚W to 105.2˚W.

Given the large area of proposed disturbance and the size of the study area, not all areas could be searched. Therefore search effort was concentrated in localized habitats with higher potential for rare plants, particularly ravines and wetlands. Specific survey locations were selected with the aid of a draft forest cover map, in order to investigate habitat types with a greater likelihood to contain rare species as well as to obtain a satisfactory representation of the major habitat types. The primary focus of the June survey was on the East Ravine, immediately to the east of the Star site. A few selected sites were surveyed by helicopter to the north of the Star-Orion LSA, during June ecological and wildlife surveys; these locations generally corresponded with the locations of ecological plots. The August survey revisited areas along the East Ravine, as well as areas eastern and western portions of the LSA. During the August survey, rare plant survey locations corresponded mainly to existing ecological plot locations. Additionally, the areas between targeted sites were also surveyed while on traverse.

At each location, a ‘random meander’ floristic survey technique, with both common and rare vascular plant species recorded, as per recommended procedures posted at the SKCDC website (2008). Particular attention was paid to micro-habitats, wet areas, ecotones, seepage areas and disturbances, which typically have a greater probability of hosting rare species. Upon location of rare plants, representative photographs were taken of both the habitat and the specific rare plant(s). The rare plant location was then marked with a flagged metal pin and the geographic location recorded with a handheld GPS. Voucher specimens were taken where such collection did not endanger the local population.

3.2.3 Vegetation Classification and Mapping

An ecological land classification (ELC) approach was selected for mapping of vegetation communities. ELC provides an ecosystem-based system that integrates vegetation, soil, and terrain characteristics into holistic ecological units, which are presented on a single map. ELC is particularly well suited to environmental assessment, as impact predictions and proposed mitigation measures are placed within an ecological context (ECSTF, 1981). The ELC method relies on a combination of field survey (e.g., ecological plots) and mapping to characterize the terrestrial ecosystems of a given area.

The most recent Saskatchewan Forest Vegetation Inventory (SFVI) (SMOE, 2008a) was used to prepare a *Vegetation Cover Type* (VCT) map illustrating the distribution of major upland and wetland vegetation communities across the FalCPF. The VCT map is designed for presentation at scales between 1:20,000 and 1:50,000. These ecological cover types are based on generalization of vegetation cover and soil moisture information contained in the forest inventory database. This latest forest inventory coverage was originally mapped at 1:15,000 scale based on 2004 aerial photography. In addition to traditional forest inventory information (tree species, height, density and age), the SFVI also includes more detailed wetland classifications (bog, fen, swamp, etc.), as well as estimates of soil moisture regime (11 classes) and landform (4 classes). The wetland, soil moisture and landform information greatly increase the utility of the inventory for use in ecological mapping. However, the 'data-rich' and complex nature of the SFVI required a substantial amount of tabular sorting and polygon grouping for use in vegetation mapping. During this generalization process polygons were grouped together based on similarities in forest cover/wetland type, age, and soil moisture regime. Each upland vegetation class was then assigned a name corresponding to its dominant tree cover combined with generalized soil moisture regime (i.e., dry, fresh, moist, wet). Wetland classes were constructed through generalization of detailed wetland information contained in the SFVI database.

The vegetation mapping methodology was selected to provide a consistent classification scheme with the same level of detail across the FalCPF, irrespective of changes in the development plans.

Once the VCT map was prepared, the mapped classes were compared with the ecological plot sampling results in order to assist with the description of each ecological cover type. The original intention was to utilize a new Saskatchewan ecosite guide, originally to be released in 2008 (R. Wright, per. comm.), for both plot classification and mapping. However, this guide remains pending as of the date of this report. As such, the ecological cover types are based on the same two primary ecological factors as the new ecosite classification (i.e., vegetation cover and soil moisture regime), allowing ready conversion when the new guide is released. As an interim measure, each VCT unit has been correlated to with the *ecosite phases* of an existing ecological guide, designed for use in the Mid-Boreal Ecoregions to the north and east of the study area (Beckingham et al., 1996).

3.3 Baseline Vegetation Resources

3.3.1 Ecological Setting

The proposed Star-Orion Diamond Project is located within the Boreal Transition Ecoregion, an ecologically complex area where the great northern boreal forest slowly transitions into aspen parkland (Acton et al., 1998). This geographic position between the boreal and parkland biomes results in a blending of boreal and prairie plant species and the occurrence of remnant grasslands along dry, south-facing slopes (Acton et al., 1998); the net result is higher species richness than the cooler, moister Mid-Boreal Upland Ecoregion to the north.

3.3.2 Vegetation Cover Types

The following section describes the various vegetation cover types used on the *Vegetation Cover Type* (VCT) maps presented in regional (Figure 3-1) and local scales (Figure 3-2). Areas of each cover type in the Fort-a-la-Corne Provincial Forest and in the Star-Orion LSA are provided in Tables xx and xx, respectively.

These cover types are derived from the most current Saskatchewan Forest Vegetation Inventory (SFVI) map covering the study area. The description of understory species composition is based primarily on ecological plot data, supplemented by visual inspection data from various surveys. The descriptions are designed to be readily convertible to the new ecosite guide mentioned in section 3.2.3. In the interim, approximate correlations with the existing *Field Guide to the Ecosites of the Mid-Boreal Ecoregions of Saskatchewan* (Beckingham et al., 1996) are also provided. However, this guide is not designed for the boreal transition ecoregion in which the current study area is located. The boreal transition is warmer and drier, and includes many prairie species (e.g., prairie crocus) due to its proximity to the adjacent parkland ecoregion. There is also evidence from a previous study (Nielson and Beckingham, 1997), that the boreal transition *reference ecosite* (i.e., medium nutrient regime and mesic/fresh moisture regime) is frequently indicated by beaked hazelnut rather than low-bush cranberry. Observations from the current study concur with these earlier findings.

The *Jack Pine: Dry to Fresh, Jack Pine - Trembling Aspen: Dry to Fresh, and Trembling Aspen: Dry to Fresh* cover types comprise more than two-thirds of FalCPF (67.89%; 90,192 ha). These same three cover types cover approximately 83.23% (10,122 ha) of the Star-Orion LSA. Of all the upland cover types, the *Jack Pine: Dry to Fresh* type is predominant both regionally and locally, covering 40,734 ha (30.66%) within FalCPF and 6,199 ha (50.97%) of the LSA. Wetlands cover a total of 16.16% (21,468 ha) of FalCPF, and 5.40% (656 ha) of the LSA, with *Treed Swamp* and *Shrub Swamp* the predominant wetland cover types in both study areas.

Table 3-1. Vegetation cover type distribution within FalCPF.

Vegetation Cover Type (VCT)	Area (ha)	% of Area
Jack Pine : Dry to Fresh	40,734	30.66%
Jack Pine - Trembling Aspen : Dry to Fresh	10,975	8.26%
White Spruce : Fresh	5,098	3.84%
White Spruce : Moist	2,255	1.70%
Black Spruce : Moist	3,089	2.33%
Trembling Aspen : Dry to Fresh	38,483	28.97%
Trembling Aspen : Moist	1,305	0.98%
Trembling Aspen - Spruce : Fresh	2,435	1.83%
Balsam Poplar - Spruce : Moist	822	0.62%
Balsam Poplar - Trembling Aspen : Moist	2,010	1.51%
Treed Bog	958	0.72%
Treed and Open Fen	3,188	2.40%
Treed Swamp	8,819	6.64%
Shrub Swamp	7,089	5.34%
Marsh	1,278	0.96%
Unclassified Wetland - Non-Forested	137	0.10%
Brushland and Grassland Complex	2,517	1.90%
Agricultural Land	337	0.25%
Unclassified Human Disturbance	299	0.23%
Lakes Rivers and Flooded Land	1,010	0.76%
Totals	**132,837**	**100.00%**

Table 3-2. Vegetation cover type distribution within the Star-Orion LSA.

Vegetation Cover Type (VCT)	Area (ha)	% of Area
Jack Pine : Dry to Fresh	6,199	50.97%
Jack Pine - Trembling Aspen : Dry to Fresh	916	7.53%
White Spruce : Fresh	168	1.38%
White Spruce : Moist	56	0.46%
Black Spruce : Moist	30	0.25%
Trembling Aspen : Dry to Fresh	3,007	24.72%
Trembling Aspen : Moist	73	0.60%
Trembling Aspen - Spruce : Fresh	41	0.33%
Balsam Poplar - Spruce : Moist	82	0.67%
Balsam Poplar - Trembling Aspen : Moist	207	1.70%
Treed Bog	44	0.36%
Treed and Open Fen	45	0.37%
Treed Swamp	180	1.48%
Shrub Swamp	366	3.01%
Marsh	2	0.02%
Unclassified Wetland - Non-Forested	20	0.17%
Brushland and Grassland Complex	333	2.74%
Unclassified Human Disturbance	19	0.16%
Lakes Rivers and Flooded Land	375	3.09%
Totals	**12,162**	**100.00%**

Figure 3-1. Vegetation cover types of the FalCPF.

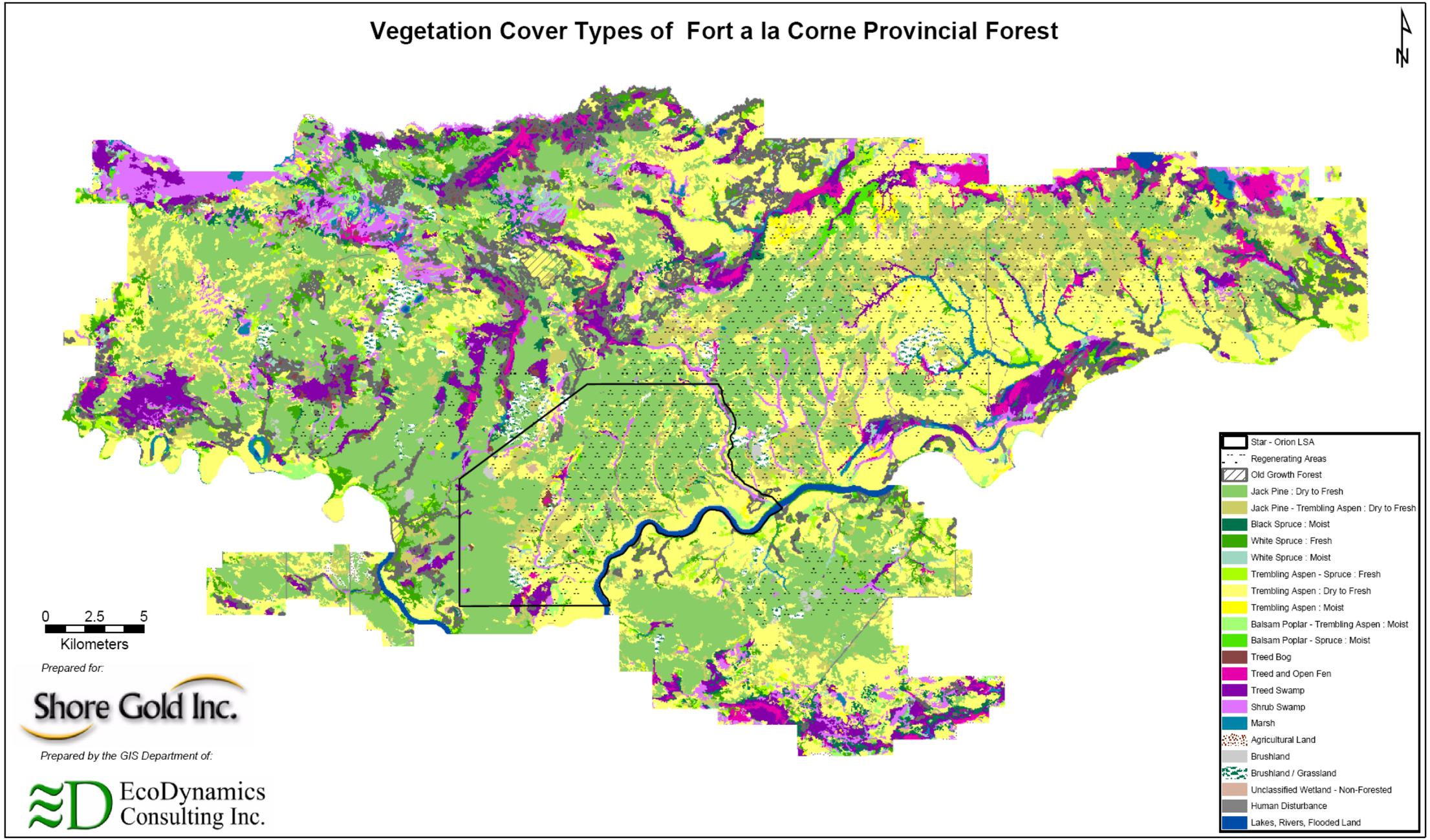
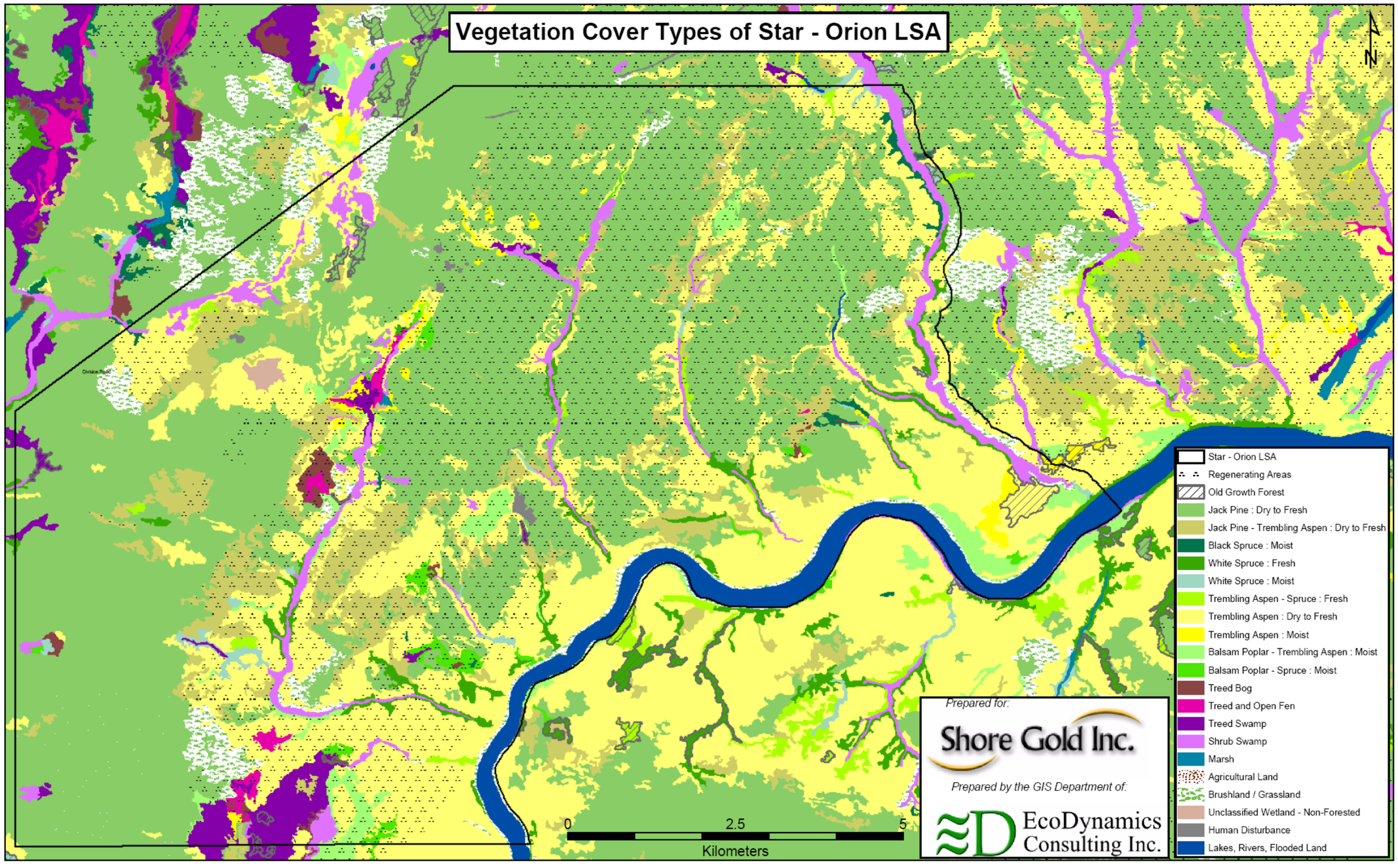


Figure 3-2. Vegetation cover types of the Star-Orion LSA.



Upland Cover Types

Jack Pine: Dry to Fresh

This cover type is the predominant cover type of both the LSA and the Fort-a-la-Corne Provincial Forest. The tree cover of these sites is predominantly jack pine (*Pinus banksiana*), but may include a minor (<10% cover) trembling aspen (*Populus tremuloides*) component, either as scattered individuals or small clumps within the dominant jack pine cover. The canopy height of immature to mature stands ranges from 10 to 20m tall, with a highly variable crown closure range from 10 to 80%. The lowest densities are usually associated with stands severely affected by dwarf mistletoe or 'witches broom' (*Arceuthobium americanum*) or sites with poor, post-fire or post-harvest regeneration.

The understory of this cover type is highly variable in response to variations in soil moisture regime and the density of tree cover. The understories of open, dry (rapidly-drained) sites tend to be dominated by bearberry, reindeer lichens (*Cladina spp.*) and cup lichens (*Cladonia spp.*), along with scattered shrubs (typically 1 to 5% cover each), mainly green alder (*Alnus viridis ssp. crispa*), rose (Rosa spp.), blueberry (*Vaccinium myrtilloides*), Saskatoon berry (*Amelanchier alnifolia*), choke cherry (*Prunus virginiana*), pin cherry (*Prunus pensylvanica*), and bog cranberry (*Vaccinium vitis-idaea*). Most choke cherry, pin cherry and Saskatoon occurs as a low shrub (i.e., <50 cm tall) due to heavy ungulate browsing. Forb and graminoid cover on these dry sites is also relatively low (i.e., <5% cover each), with sarsaparilla (*Aralia nudicualis*), two-leaved Solomon's seal (*Maianthemum canadense*), spreading dogbane (*Apocynum androsaemifolium*), asters (*Symphyotrichum spp.*), early blue violet (*Viola adunca*), cut-leaved anemone (*Anemone multifida*), goldenrod (Solidago spp.), white-grained mountain rice grass (*Oryzopsis asperifolia*) and northern rice grass (*Piptatherum pungens*) being the most common species. Prairie crocus (*Pulsatilla patens*) is also a frequent and notable species on dry sites, particularly on south-facing slopes.

As canopy cover increases on fresh (well drained) sites, the lichen cover is increasingly replaced by feathermosses, primarily Schreber's moss (*Pleurozium schreberi*) and stair-step moss (*Hylocomium splendens*). Green alder and blueberry also tend to increase in both cover and prominence. The forb content also increases, most notably northern bedstraw (*Galium boreale*), twinflower (*Linnea borealis*), bunchberry (*Cornus canadense*), northern star flower (*Trientalis borealis*), cream-coloured vetchling (*Lathryus ochroleucus*), stiff club-moss (*Lycopodium annotinum*), trailing club-moss (*Lycopodium complanatum*) and purple oat grass (*Schizachne purpurascens*) The saprophytic, large coralroot (*Corallorrhiza maculata*), was also observed in this moister phase.

This cover type generally correlates with the *a1 lichen jP*, inclusions of the *b1 blueberry jP-tA* ecosite phase (Beckingham et al., 1996), although the sites in the current study area often have a richer shrub composition, including choke cherry and Saskatoon, as well as include prairie crocus and other species not typical of boreal forest. This shrub diversity is uncharacteristic of a1 lichen jP sites. However, this guide is designed for the mid-boreal ecoregion, not the boreal transition ecoregion of the current study.

Jack Pine – Trembling Aspen: Dry to Fresh

This cover type consists of a mixture of jack pine and trembling aspen, with the latter generally distributed as small clumps in proportions up to 50% of stand composition. Occasionally, white or black spruce are sometimes present as codominants. The canopy height of immature to mature stands ranges from 10 to 25m tall, with crown closure ranging from 30 to 80%.

This type shares many of the species found on *Jack Pine: Dry to Fresh*. However, the larger aspen component and increased dominance of green alder (a nitrogen fixing species), likely improves the nutrient status of these sites favouring increased prominence by choke cherry and pin cherry, as well as bunchberry, sarsaparilla, two-leaved Solomon's seal, cream-coloured vetchling and northern starflower, early blue violet and purple oat grass. Beaked hazelnut (*Corylus cornuta*) is occasionally present as a co-dominant shrub. A diverse assortment of wintergreens, including: pink (*Pyrola asarifolia*), one-sided (*Orthilia secunda*), greenish-flowered (*Pyrola chlorantha*) may also be present. Lesser rattlesnake plantain (*Goodyera repens*), an orchid, and sweet grass (*Hierochloe odorata*) were also observed in this type. Feathermosses (Schreber's moss and stair-step moss) often dominate the moss-lichen layer under denser canopy, while reindeer and cup lichens predominate under less dense portions.

This cover type primarily correlates with the *b1 blueberry jP-tA* ecosite phase (Beckingham et al., 1996). Some areas of jack pine and aspen with a spruce component correlate with the *d1 low-bush cranberry jP-bS-tA* (Beckingham et al., 1996).

Trembling Aspen: Dry to Fresh

This cover type consists of nearly pure (typically >80%) trembling aspen forest cover, with the canopy height of immature to mature stands ranging from 10 to 25m, and a highly variable crown closure ranging from <10 to >80%.

Most sites are typically well-drained, with a fresh moisture regime, but a significant number of areas include a dry (rapidly drained) variant. This dry variant is most common in dune areas (eolian) and on the upper positions of some steep, south-facing slopes along the Saskatchewan River. These latter sites often have low-density aspen cover with frequent grass and shrub-dominated openings (see *Grassland* cover type description).

The shrub layer of fresh sites is dominated by a conspicuous, often dense layer of beaked hazelnut (*Corylus cornuta*), with lesser amounts (usually < 5% cover each) of choke cherry, pin cherry, Saskatoon, low-bush cranberry (*Viburnum edule*), wild honeysuckle (*Lonicera dioica*), and wild red raspberry (*Rubus idaeus*). Scattered red-osier dogwood (*Cornus sericea*; syn. *Cornus stolonifera*), high-bush cranberry (*Viburnum opulus*) and alder-leaved buckthorn (*Rhamnus alnfolia*) occur occasionally. The shrub layer also includes regenerating aspen and scattered white spruce (*Picea glauca*). While the forb and graminoid layer is fairly diverse, light penetration and corresponding cover levels are often substantially reduced (usually 1 to 5% cover per species) due to the dense tree and shrub cover. Dominant forbs include: bunchberry, sarsaparilla, two-leaved Solomon's seal, twinflower, cream-coloured vetchling, and pink wintergreen. Other frequent forbs include: smooth wild strawberry (*Fragaria virginiana*)

northern bedstraw, Canada goldenrod, northern starflower, dewberry, Lindley's aster, tall lungwort (*Mertensia paniculata*), wild peavine (*Lathyrus venosus*), veiny meadow rue (*Thalictrum venulosum*), fireweed (*Chamerion angustifolium ssp. angustifolium*; syn. *Epilobium angustifolium*), western Canada violet (*Viola Canadensis*). Palmate-leaved coltsfoot (*Petasites frigidus var. palmatus*), fairy bells (*Disporum trachycarpum*) and red baneberry (*Actaea rubra*) are also occasionally present. While graminoids are characteristically of low cover, there is a fairly diverse assortment, including: purple oat grass and northern rice grass, boreal wildrye (*Elymus innovatus*), and slender wheatgrass (*Elymus trachycaulus ssp. trachycaulu*s).

The shrub layer of the dry variant is dominated by green alder, snowberry, rose, and blueberry, with scattered Saskatoon berry, choke cherry, pin cherry, Canada buffaloberry (*Shepherdia canadensis*), and occasional beaked hazelnut. The forb layer of these drier sites consists mainly of bunchberry, sarsaparilla, cream-coloured vetchling, and two-leaved Solomon’s seal, with purple oat grass and white-grained mountain rice grass the most common graminoids. Some sites also host ground pine (*Lycopodium obscurum*) and running pine (*Lycopodium clavatum*). The moss and lichen layer is relatively sparse under this cover type due to extensive aspen leaf litter, but may include small patches of Shreber’s moss or reindeer lichen.

There is also a fresh variant with a substantial, and in some cases dominant, white birch cover. These sites have an understory quite similar to the trembling aspen sites, with beaked hazel, choke cherry, Saskatoon, low-bush cranberry, snowberry and wild honeysuckle the dominant shrubs. The forb and graminoid layer consists mainly of bunchberry, sarsaparilla, white-grained mountain rice grass, with lesser amounts of Lindley's aster, palmate-leaved colt's foot, dewberry, northern starflower, smooth wild strawberry, fairy bells, pink and one-sided wintergreen, and western Canada violet.

Fresh sites within this cover type roughly correlates with the *d2 low-bush cranberry tA* ecosite phase of Beckingham et al., (1996), but frequently is dominated by beaked hazelnut rather than low-bush cranberry. Dry sites generally correlate with the *b2 blueberry tA (wB)* ecosite phase of Beckingham et al. (1996).

Trembling Aspen: Moist

This cover type has a dominantly trembling aspen forest cover (typically >80%), with the canopy height of immature to mature stands ranging from 10 to 25m, and the crown closure typically between 55 and 80%. Mature sites of this type are usually taller and denser than the *Trembling Aspen: Fresh* cover type, due to its occurrence on moist, imperfectly drained soils. Balsam poplar (*Populus balsamifera*) is usually conspicuously absent or only present in small amounts (<10% of stand composition).

The density and composition of the understory is highly variable, but commonly includes willow (*Salix spp.*), both green and speckled alder (*Alnus incana*), red-osier dogwood, labrador tea (*Ledum groenlandicum*), rose and wild red currant (*Ribes triste*), with occasional shrubby cinquefoil (*Dasiphora floribunda*; syn. *Potentilla fruticosa*) and alder-leaved buckthorn. More nutrient rich sites, particularly in lower slope positions of ravines, often have a larger red osier dogwood component (in some cases up to 50% of the shrub cover), and may also include a minor

high-bush cranberry component. The forb and graminoid layer includes many of the same species found on the *Trembling Aspen: Fresh* cover type, including: bunchberry, sarsaparilla, twinflower, tall lungwort, northern starflower and dewberry. However, the additional moisture at these sites generally increases the prominence of palmate-leaved colt's foot, common horsetail (*Equisetum arvense*), woodland horsetail (*Equisetum pratense*), as well as the addition of bishop's cap (*Mitella nuda*), a characteristic moisture-loving forb. Red baneberry also occurs in greater frequency on these sites. The graminoid layer is often sparse due to the typically dense tree cover, with marsh reed grass (*Calamagrostis canadensis*), purple oat grass and white-grained mountain rice grass being the most frequent species. The moss and lichen layer is typically very sparse.

A white birch dominant variant also occurs, usually as an immature, early succession phase. The shrub layer is dominantly speckled alder and willow, with lesser amounts of wild red currant, wild red raspberry, and black gooseberry. The forb and graminoid layer includes: sedge (e.g., two-seeded sedge: *Carex disperma*), sweet-scented bedstraw, stinging nettle (*Urtica dioica*), tall lungwort, fringed loosestrife (*Lysimachia ciliata*), purple oat grass, small enchanter's nightshade (*Circaea alpina*), and bishop's Cap.

The sites with red-osier dogwood, roughly correlate with the *e1 dogwood bP-tA* ecosite phase of Beckingham et al. (1996). However, this cover type does not typically contain balsam poplar component and as such, does not correlate with this classification in this regard. Given the general absence of balsam poplar, also leads some sites to weakly correlate with the *d2 low-bush cranberry tA* ecosite phase of Beckingham et al., (1996).

Trembling Aspen – Spruce: Fresh

This type is characterized by a mixture of trembling aspen with black spruce (*Picea mariana*) and/or white spruce, and occasional white birch. The canopy height of immature to mature stands ranges from 10 to 25m, and crown closure is typically between 55 and 80%.

The shrub layer is often dominated by regenerating aspen and spruce, which frequently reduces the prominence of many shrubs. The remainder of the shrub layer consists of mixtures of green alder, low-bush cranberry, rose, snowberry, Saskatoon, and beaked hazelnut, with occasional speckled alder and alder-leaved buckthorn. The forb and graminoid layer is fairly diverse and is similar to that found under the *Trembling Aspen: Fresh* cover type. Typical forbs include bunchberry, twinflower, sarsaparilla, dewberry, common horsetail, palmate-leaved colt's foot, two-leaved Solomon's seal, northern starflower, smooth wild strawberry, tall lungwort, Canada goldenrod, Lindley's aster, pink and one-sided wintergreen, and red baneberry. Graminoid cover is generally sparse, with purple oat grass and white-grained mountain rice grass the most common species. Moss and lichen cover is relatively low (typically <5 % cover), with Schreber's moss and stair-step moss, being dominant.

This cover type generally corresponds to the *d3 low-bush cranberry tA-wS* ecosite phase of Beckingham et al., (1996).

White Spruce: Fresh

This cover type has a fresh moisture regime (well to moderately-well drained) and has a tree layer dominated by white spruce, with occasional scattered white birch and trembling aspen. Canopy heights of these mostly mature stands typically ranges from 15 to 25m, with crown closures commonly between 55 and 80%.

The shrub layer consists predominantly of beaked hazelnut, snowberry, rose, low-bush cranberry and wild honeysuckle, with Canada buffaloberry, Saskatoon, northern gooseberry and wild red currant as less frequent or prominent species. Ground juniper is a prominent member of the shrub layers on drier, south-facing white spruce stands, particularly along the Saskatchewan River valley. The forb and graminoid layer consists mainly of bunchberry, sarsaparilla, white-grained mountain rice grass, sweet-scented bedstraw and northern bedstraw, twinflower, smooth wild strawberry and pink wintergreen. Other frequent, but lower cover forbs and graminoids include cream-coloured vetchling, tall lungwort, Lindley's aster, one-sided wintergreen, greenish-flowered wintergreen, western Canada violet, dewberry, fairy bells, and purple oat grass. The forest floor frequently includes a significant feathermoss component consisting mainly of Schreber’s moss and stair-step moss.

This cover type generally corresponds to the *d4 low-bush cranberry wS* ecosite phase of Beckingham et al., (1996).

White Spruce: Moist

The tree layer of this moist (imperfectly drained to poorly drained) cover type is dominated by white spruce, frequently with a lesser black spruce component. Scattered balsam poplar and tamarack (*Larix laricina*) may also be present, particularly when occurring in the toe-slopes of ravines. The canopy height of these primarily mature stands ranges from 15 to 25m, with crown closures typically between 55 and 80%.

This type is often found in nutrient rich areas, particularly in minerotrophic seepage zones at the base of ravine slopes. As such, the shrub layer is often diverse, but cover is typically low, often with <5% total shrub cover. Of those shrubs present, the most common include: Labrador tea, low-bush cranberry, red-osier dogwood, red raspberry, northern gooseberry (Ribes oxyacanthoides), northern black current, and wild red current, with lesser amounts of alder-leaved buckthorn, snowberry, blueberry, rose, and bog cranberry. Occasionally, Labrador tea may be dominant with cover exceeding 5%. Balsam poplar or trembling aspen regeneration dominates the shrub layer is some areas. Common horsetail, meadow horsetails and sedges (including: beautiful sedge: *Carex concinna*) are typical dominant forbs. A diverse assortment of other forbs and graminoids also occur, though at relatively low cover levels (i.e., each at <5% cover), including: palmate-leaved colt's foot, bunchberry, Lindley's aster, northern bedstraw, twinflower, and smooth wild strawberry, kidney-shaped violet, dewberry, northern rice grass, marsh reed grass, and purple oat grass. Feathermosses are typically extensive across the forest floor, consisting mainly of Schreber’s moss and stair-step moss, with lesser amounts of knight’s plume moss.

This cover type includes both the *e3 dogwood wS* and *h3 horsetail wS-bS* ecosite phases of Beckingham et al. (1996).

Black Spruce: Moist

The tree layer of this moist (imperfectly drained to poorly drained) cover type is dominated by black spruce, sometimes with a secondary jack pine component. The canopy height of these mostly mature stands ranges from 10 to 20m, with crown closures typically between 55 and 80%.

The forest floor is covered by a carpet of feathermosses, mostly Schreber's moss and stair-step moss, with lesser amounts of knight's plume moss (*Ptilium christa-castrensis*). The shrub layer is usually sparse or dominated by regenerating black spruce. Labrador tea, blueberry and bog cranberry are the most frequent shrubs, but usually at <5% cover. Forb diversity and cover is much lower than that of the *White Spruce: Moist* cover type, and usually limited to scattered common and meadow horsetails, dwarf-scouring rush (*Equisetum scirpoides*), kidney-shaped violet (*Viola renifolia*), palmate-leaved colt's foot and sedges.

This cover type generally correlates with the *g1 Labrador tea-hygric bS-jP* ecosite phase of Beckingham et al. (1996).

Balsam Poplar – Spruce: Moist

The tree layer of this moist (imperfectly drained) cover type consists mainly of a mixture of balsam poplar, white spruce and black spruce, with an occasional white birch component. These mainly mature stands are typically between 20 and 25m in height, with crown closures typically between 55 and 80%.

The shrub layer consists primarily of alder-leaved buckthorn, rose, and wild honeysuckle, with lesser amounts of willow, wild red raspberry, northern gooseberry, skunk currant and snowberry. The shrub layer may also include regenerating balsam poplar and white spruce. The remainder of the understory consists of a mixture of forbs and graminoids including: tall lungwort, red baneberry, dewberry, veiny meadow-rue, sarsaparilla, bishop's cap, palmate-leaved colt's foot, star-flowered false Solomon's seal (*Maianthemum stellatum*), common horsetail, sedges and occasional marsh reed grass. The forest floor contains small amounts of feathermosses (mainly Schreber's and stair-step moss), generally associated with the spruce cover.

This cover type includes both the *e2 dogwood bP-wS* and *h2 horsetail bP-wS* ecosite phases of Beckingham et al. (1996).

Balsam Poplar – Trembling Aspen: Moist

The tree layer of this moist (imperfectly drained) cover type consists mainly of a mixture of balsam poplar and trembling aspen, with occasional scattered white birch, Manitoba maple (*Acer negundo*) and white spruce. Immature stands are typically 10 to 15m in height, while mature stands often attain heights of 25m, particularly in moist-rich soils along the lower slopes of

ravines and the Saskatchewan River valley. These stands are typically closed and dense, with crown closures typically between 55 and 80%.

These moist and rich sites host a complex and rich assortment of tall and low shrubs including: red-osier dogwood, speckled alder, choke cherry, Saskatoon, willow, alder-leaved buckthorn, high-bush cranberry, low-bush cranberry, snowberry, rose, wild red raspberry, northern gooseberry, northern black current and wild honeysuckle. Regenerating trembling aspen, balsam polar, white birch and Manitoba maple are also common members of the shrub layer. The forb layer is typically dominated by sarsaparilla, common horsetail, meadow horsetail, palmate-leaved colt's foot, and tall lungwort, smooth wild strawberry and dewberry. Other common species include: bunchberry, sedge, red baneberry, purple oat grass, Lindley's aster, fireweed, American vetch (*Vicia Americana*), veiny meadow-rue, sweet-scented bedstraw, northern bedstraw, woodland horsetail, northern starflower, star-flowered false Solomon's seal, and two-leaved Solomon's seal. In some areas on richer soils along the Saskatchewan River valley, ostrich fern (*Matteuccia strupthiopteris*) may also be present as a dominant forb. Additionally, some areas of this cover type, associated with hill-side seepage zones, host a distinct *speckled alder-ostrich fern* community similar to that reported by Pipe (1982).

This cover type generally includes both the *e1 dogwood bP-tA* and *h1 horsetail bP-tA* ecosite phases of Beckingham et al. (1996). Some inclusions of *f1 ostrich fern bP-tA* and *i1 river alder gully* ecosite phase are also present in rich, seepage areas at the base of ravine and valley slopes.

Grassland and Brushland

Larger shrub- and graminoid-dominated areas are indicated on the cover map, and appear to be the result of poor jack pine regeneration associated with high frequency forest fire, forest harvesting and forest clearing. As such, the understory is somewhat similar to that found under the *Jack Pine: Dry to Fresh* and *Jack Pine – Trembling Aspen: Dry to Fresh* cover types, but more complex, with graminoids predominating. Shrubs on these sites consist mainly of a mixture of narrow-leaved meadowsweet, rose, Saskatoon, choke cherry, snowberry and bearberry. However, green alder dominates some sites. Hay sedge (*Carex foenea var. foenea*), fescue (*Festuca sp.*), and northern rice grass often dominate the graminoid layer on dry sites, while marsh reed grass is often dominant on moist sites.

There are also isolated pockets of natural or ‘true’ grasslands on steep, south-facing slopes along the Saskatchewan River valley (Pipe, 1982). One such site south of the Star site consisted of a mixture of little bluestem (*Schizachyrium scoparium*), purple oat grass, slender wheat grass (*Elymus trachycaulus ssp. trachycaulus*), wormwood (*Artemesia spp.*) and wild bergamot (*Monarda fistulosa*), along with low-growing Saskatoon, rose and snowberry (buckbrush) (*Symphoricarpos occidentalis*). Other forbs included: wild licorice (*Glycyrrhiza lepidota*), wild buckwheat (*Polygonum convolvulus*), lewis wild flax (*Linum lewisii*), ox-eye daisy (*Leucanthemum vulgare*), cut-leaved anemone, northern bedstraw, northern comandra, and early blue violet.

Some these sites correlate with the *a1 lichen jP* and *b1 blueberry jP-tA* ecosite phases of Beckingham et al. (1996). However, the ‘true’ grassland sites are not described by this guide.

Wetland Cover Types

Many wetlands observed during the course of the current study contain concentrations of calcium and/or magnesium carbonates either at the surface or within 30 to 50cm of the surface. In some treed swamp and fen areas, these carbonates have accumulated to such a level that a violent effervescence reaction occurs immediately upon contact with a weak hydrochloric acid solution. These 'extremely calcareous' materials appear to be 'marl peats', and may have originated in the same manner as the marl deposits of the Sturgeon Lake region (Department of Mineral Resources, 1956) to the northwest of Prince Albert. Given the predominance of alkaline conditions, most wetlands fall within the fen or swamp category, with bogs being the least prevalent. There are also frequent difficulties differentiating between some variants of treed swamps and treed fens, particularly in ravines, where they appear to share some species such as marsh marigold. The ravines in particular, have very complex nutrient and moisture regimes due to spatial and seasonal fluxes in groundwater discharge, as well as the effects of frequent beaver damming activity. Wetland complexity also tends to increase downstream as tributary streams cut into richer glaciolacustrine and till sediments, which underlie the predominant sandy surface materials. These tributary streams also host marshes along flowing streams and beaver floods.

Treed Bog

Treed Bogs have a black spruce dominant cover, typically <15m in height with a variable crown closure between 10 and 80%, often with a multi-layered or *complex* stand structure. The shrub layer often contains regenerating black spruce and tamarack, along with Labrador tea, bog cranberry, small bog cranberry, and occasional bog rosemary (*Andromeda polifolia*) and dwarf birch (*Betula pumila*). Forb and graminoid cover is often sparse, but commonly include sedges, three-leaved Solomon's seal (*Maianthemum trifolium*), round leaved sundew (*Drosera rotundifolia*), northern comandra (*Geocaulon lividum*) and blunt-leaved bog orchid (*Platanthera obtusata*). The ground surface is covered by a nearly continuous carpet of feathermosses, with lesser amounts of peat or sphagnum mosses (*Sphagnum spp.*).

Notably, leatherleaf (*Chamaedaphne calyculata*), a typical dominant of most boreal bogs, was not observed during the course of recent surveys. Additionally, sphagnum mosses were not dominant, another typical characteristic of most bogs. Overall bog-like character is weakly expressed. The wide-spread occurrence of calcium-charged peats and minerotrophic groundwater influence appears to limit bog occurrence to areas of raised, deeper fibric, moss-derived peat, where the root zone is lifted well above richer mesic and humic peat zones. As such, treed bogs are often difficult to differentiate from treed swamps, which also share a predominantly black spruce cover. As a result, differentiation of treed bogs from treed (black spruce) swamps is often based on a shorter tree height, more complex (multi-layered) stand structure, and the absence of standing pools of clear, minerotrophic water. Open bogs are rare and usually the result of recent forest fire.

This cover type roughly correlates with the *j1 treed bog* ecosite phase (Beckingham et al., 1996)

Treed Fen and Open Fen

Treed Fen and *Open Fen* usually occur as a complex and are thus mapped and described as such. Treed fens are typically covered by open to closed tamarack, with occasional scattered black spruce, white spruce or white birch. Tree heights typically range from 10 to 15m, with some old growth stands being in excess of 20m tall. Crown closure is highly variable, ranging from 10 to 80%. Open fens, while usually sedge and forb dominant, may also host tamarack, but they are sparse or scattered (<10% crown closure) and usually of variable height (1 to 5m tall).

The shrub layer of *Treed Fen* usually includes regenerating tamarack and black spruce, along with various mixtures of dwarf birch, bog birch (*Betula nana*), white birch, willow, marsh cinquefoil (*Comarum palustre*), bog rosemary, bog bilberry or wortleberry (*Vaccinium uliginosum*) and small amounts of Labrador tea. Sedges (e.g., beautiful sedge, water sedge: *Carex aquatilis*, northern bog sedge: *Carex gynocrates* and hairy-fruited sedge: *Carex lasiocarpa*), marsh reed grass and a variety of horsetails (common, woodland and swamp horsetail: *Equisetum palustre*) often dominate the forb and graminoid layer. Other common forbs and graminoids include: buck bean (*Menyanthes trifoliate*), seaside arrow grass (*Triglochin maritime*), needle-spike rush (*Eleocharis acicularis*), tall cotton grass (Eriophorum *angustifolium*), pitcher plant (*Sarracenia purpurea*), small bog cranberry, dewberry, three-leaved Solomon's seal and dwarf-scouring rush (*Equisetum scirpoides*). Other species observed at some sites include: round-leaved orchid (*Amerorchis rotundifolia*), northern green bog orchid (*Platanthera hyperborea var. hyperborean*), round-leaved sundew, northern bog violet (*Viola nephrophylla*) and marsh violet (*Viola palustris*). *Open Fens* include many of the same species as *Treed Fen*, but with a greater dominance by graminoids and shrubs such as bog birch and dwarf birch.

This cover type correlates mainly with the *k1 treed poor fen* and *l1 treed rich fen*, ecosite phases, with lesser amounts of *l3 graminoid rich fen* and *l2 shrubby rich fen* ecosite phases (Beckingham et al., 1996).

Treed Swamp

This cover type is commonly found at the interface between fens and moist upland cover types. Treed swamps have a wet moisture regime, and frequently exhibit a hummocky microtopography with numerous small pools of clear standing water originating from influx of minerotrophic ground water and run-off. The tall, dense tree cover and frequent pools of clear standing water are the primary characteristics differentiating most treed swamps from treed bogs and treed fens, as they share many similar vegetation characteristics with these other wetland types. While most treed swamps support a cover of black spruce and tamarack similar to that of bogs, the trees tend to be taller (often between 10 and 15m tall) due to the regular influx of minerotrophic waters, which usually produces a medium nutrient regime, though it may range from poor to rich.

On most sites, the trees are usually even-aged and lack the complex, multi-layered structure that is more characteristic of bogs. On sites with a dense crown closure, much of the ground surface is covered by feathermosses (Schreber’s, stair-step and knight’s plume), with sphagnum mosses

conspicuously absent or of low cover. The associated shrub layer is typically sparse, consisting mainly of regenerating black spruce and Labrador tea. However, some treed swamps host a rich nutrient regime due to intense minerotrophic conditions, particularly prevalent in ravines. These rich treed swamps consist of a mixture of black spruce, tamarack, white spruce, white birch and balsam poplar, often exceeding 20m in height; tamarack are occasionally dominant. The richer nutrient regime supports a more diverse shrub layer that includes regenerating balsam poplar, speckled alder, alder-leaved buckthorn, northern gooseberry, wild red currant and skunk currant. Treed swamps typically support a variety of forbs and graminoids, including: sedges, bishop's cap, three-leaved Solomon's seal, palmate-leaved colt's foot, common and woodland horsetails, dewberry, northern starflower, bunchberry and kidney-shaped violet. Some rich swamps appear to overlap with rich fens and may share some species such as marsh marigold and marsh cinquefoil. However, rich swamps have higher shrub diversity and cover than fens and often contain additional forb species including: bunchberry, dwarf raspberry (*Rubus arcticus ssp. acaulis*), yellow avens (*Geum aleppicum*), lady fern (*Athyrium filix-femina*), ostrich fern and small enchanter's nightshade.

The Treed Swamp cover type does not correlate with any ecosite phases in Beckingham et al. (1996). The *k1 treed poor fen* and *l1 treed rich fen* ecosite phases are its closest analogs.

Shrub Swamp

Shrub swamps frequently experience spring flooding followed by draw-down of the water table over the course of the growing season, resulting in a moisture regime that varies from moist to wet. As a result, these sites host some species common to both wetlands and moist uplands. The vegetation cover consists mainly of a variable mixture of willow, sedges and marsh reed grass. Other shrubs include northern and black gooseberry, wild red raspberry, rose, sweet gale (*Myrica gale*), red-osier dogwood, and shrubby cinquefoil. Frequent dominant forbs include marsh hemp-nettle (*Stachys palustris*), arrow-leaved colt's foot (*Petasites sagittatus*), stinging nettle, and wild mint (*Mentha arvensis*). A rich assortment of other graminoid and forb species also occur, including: northern reed grass (*Calamagrostis stricta ssp. inexpansa*), fowl blue grass (*Poa palustris*), awned wheatgrass (*Elymus trachycaulus ssp. subsecundus*), slender wheatgrass, tufted loosestrife (*Lysimachia thyrsiflora*), marsh skullcap (*Scutellaria galericulata*), dewberry, dwarf raspberry, smooth wild strawberry, sweet-scented bedstraw, tall lungwort, fireweed, pitseed goosefoot (*Chenopodium berlandieri*), yellow avens, large-leaved avens and three-flowered avens (*Geum triflorum*).

The *Shrub Swamp* cover type correlates with the *willow/marsh reed grass* plant community type (l2.3) of the *l2 shrubby rich fen* ecosite phases in Beckingham et al. (1996).

Marsh

Marsh areas have high water tables and frequent ponds of standing or flowing water. Vegetation cover consists mostly of sedges, marsh reed grass, canary reed grass (*Phalaris arundinacea*), cattail (*Typha latifolia*), arrow-leaved colt’s foot and wild mint, along with willow and speckled alder. Some of the wettest sites include water calla (*Calla palustris*) Most occur in ravines in association with flowing streams and beaver floods.

This cover type correlates well with the *m1 marsh* ecosite phase of Beckingham et al. (1996).

Regenerating Uplands and Wetlands

Regenerating forests and wetlands form a significant portion of Fort-a-la-Corne Provincial Forest, as well as the predominant cover of LSA. The vegetation cover of these areas is highly variable reflecting their early successionary status, but are essentially *variants* of the more mature upland and wetland cover types previously discussed. In many dry upland areas of the LSA, repeated, high frequency forest fires over the past 20 years have substantially reduced jack pine stocking levels, often resulting in < 10% crown closures. As a result, these areas exhibit a substantially denser and richer assemblage of shrubs, forbs and graminoids, which in turn appear to further inhibit the return of substantial jack pine cover. These young, regenerating areas are indicated on the vegetation cover map using dots in a repeating triangular pattern.

3.3.3 Vascular Plant Species Richness

The 2007/2008 baseline vegetation surveys identified a total of 412 species of vascular plants Table A-1 (Appendix A), including:

- 8 species of trees;
- 62 species of shrubs (including at least 14 species of willow or *Salix spp.*);
- 246 species of forbs;
- 89 species of graminoids (including 31 identified species of sedge or *Carex spp.*); and
- 7 species of ferns and fern allies.

Of the 412 vascular plants identified during the recent ecological and rare plant surveys, 11 species were provincially rare, and 26 are listed as ‘invasive’ or ‘noxious’ species by the Saskatchewan Conservation Data Centre (SKCDC, 2009a and 2009b) (Table A-2, Appendix A).

Pipe et al. (1982) recorded a total of 347 vascular plant species during vegetation surveys for the proposed Forks hydroelectric project. These included 9 species of trees, 26 shrubs, 218 forbs, 82 species of graminoids and 2 ferns. Willard et al. (1977) reported 239 species of vascular plants during surveys for the Nipawin hydroelectric project.

Differences in total species numbers between the recent and historical surveys, is largely attributed to: study area differences; the number and locations of sites surveyed, the effects of subsequent forest fires; and the number of plants identified to the species level, particularly willows and sedges.

3.3.4 Rare Plant Occurence

A search of the SASK Herbarium at the University of Saskatchewan (2008), showed occurrences of 40 rare plant species at 97 locations within the Fort a la Corne Provincial Forest and immediately surrounding area (Table 3-3). A total of 201 and 322 vascular plant species were recorded during the June and August surveys, respectively. Eleven of these observed species are

currently tracked by the SKCDC as rare species (Table 3-4). Table 3-5 provides rarity rank information. *Lilium philadelphicum* var. *andinum* and *Carex pseudocyperus* were the only rare plant species found in more than one location. Most species were locally abundant or with more than one plant present. Figure 3-3 illustrates the distribution of rare species observed during the 2008 surveys.

Historical vegetation surveys conducted for the proposed Forks hydroelectric project identified only two vascular plant species considered provincially rare at the time: adder's mouth (*Malaxis monophyllos*) and whorled water milfoil (*Myriophyllum verticillatum var. pectinatum*). Both adder's mouth and whorled water milfoil are still considered rare and currently listed as S1 (extremely rare), but were not observed during the most recent surveys. Willard et al. (1977) did not report the occurrence of any rare species during vegetation surveys for the Nipawin hydroelectric project. However, *Parnassia glauca* (S2) was reported by Blood et al. (1977) in another study for the same project.

An earlier baseline report prepared by Golder Associates (2006) for the *Fort a la Corne Joint Venture Advanced Exploration Program 2004-2005*, summarized the findings of a earlier rare plant surveys conducted in support of diamond exploration by De Beers Canada Inc. The authors reported the occurrence of three provincially listed species:

- Broad Leaf (Leathery) Grape Fern (*Botrychium multifidum*) (S3) – "a number of individuals" were observed in a meadow, both on and adjacent to 'kimberlite body 147';
- Pink fringed milkwort (*Polygala paucifolia*) (S2S3) – observed at two locations near 'kimberlite body 116' in open, moist to wet, trembling aspen and balsam poplar regeneration. The plants were observed to occur in 'clumps', ranging in number from 20 to more than 500 individuals; and
- Heart leaved twayblade (*Listera cordata*) (S2) – 34 individuals were observed at four sites within a wet black spruce habitat on the west side of Caution Creek.

The Golder Associates (2006) report concluded that most of the Fort a la Corne Joint Venture property had 'low to moderate rare plant potential', with wetlands and riparian areas having the highest potential (moderate). Recent surveys appear to support this earlier conclusion. Additionally, results of both past and recent surveys highlight the importance of moist forests, which should also be designated as having moderate potential for rare plant occurrence, particularly when occurring along the fringes of wetlands and riparian areas.

Table 3-3. Rare plant species previously recorded in Fort a la Corne, Saskatchewan and surrounding area. (Source: SASK Herbarium rare plant database, 2008).

Latin Name	**Habitat**	**SCDC Status**
Adoxa moschatellina	Wet bog forests.	S3
Alisma gramineum	River shores.	S3
Arnica lonchophylla	Sunny exposed, sandy areas.	S2S3
Astragalus aboriginum	Eroded slopes.	S2
Bidens frondosa	Moist beaches.	S2S3
Botrychium lunaria	Mossy woods.	S1
Botrychium multifidum	Wet clay.	S3
Calypso bulbosa var. *americana*	In feather mosses in mature spruce stands.	S3
Campanula aparinoides	Wet woods and new clearings.	S2S3
Carex eburnean	Dry banks.	S2
Chenopodium leptophyllum	Eroded slopes.	S4
Cypripedium passerinum	Peaty bogs.	S2
Diervilla lonicera	Sandy pinelands.	S3
Dryopteris cristata	Swampy places.	S3
Eleocharis elliptica	Bogs.	SNR
Erigeron strigosus	Shores.	S2S3
Gentianopsis procera ssp. *procera*	Fens.	S2
Impatiens noli-tangere	In creek beds.	S3S4
Leucophysalis grandiflora	Sandy soils.	S2
Lilium philadelphicum var. *andinum*	Moist to dry woods and moist prairies.	S3S4
Lonicera oblongifolia	Along rivers.	S2
Luzula acuminata	Moist peaty soil, valley bottoms.	S1S2
Malaxis monophyllos var. *brachypoda*	Hummocky bogs.	S1
Myriophyllum verticillatum var. *pectinatum*	Oxbow aquatic.	S1
Parnassia glauca	Bogs.	S2
Pinguicula vulgaris	Mossy hummocks in bogs.	S2S3
Platanthera dilatata	Fens.	S2
Platanthera orbiculata	Bogs.	S2S3
Polygala paucifolia	Rich woods and margins of bogs.	S2S3
Potentilla paradoxa	River shores.	S2S3
Primula mistassinica	Marl bogs.	S3
Rhynchospora alba	Bogs.	S2S3
Rhynchospora capillacea	River valleys.	S2
Rorippa truncate	River shores.	S1
Rosa blanda	Open riparian mixed woods.	S1S2
Salix planifolia ssp. *tyrrellii*	Clearings.	S2
Selaginella selaginoides	In mossy bogs.	S2
Senecio plattensis (near to)	Burned over woods.	S3S4
Sorbus scopulina	In woods.	S2
Utricularia minor	Bogs.	S2S3

Figure 3-3. Rare species occurrence within the Star-Orion LSA.

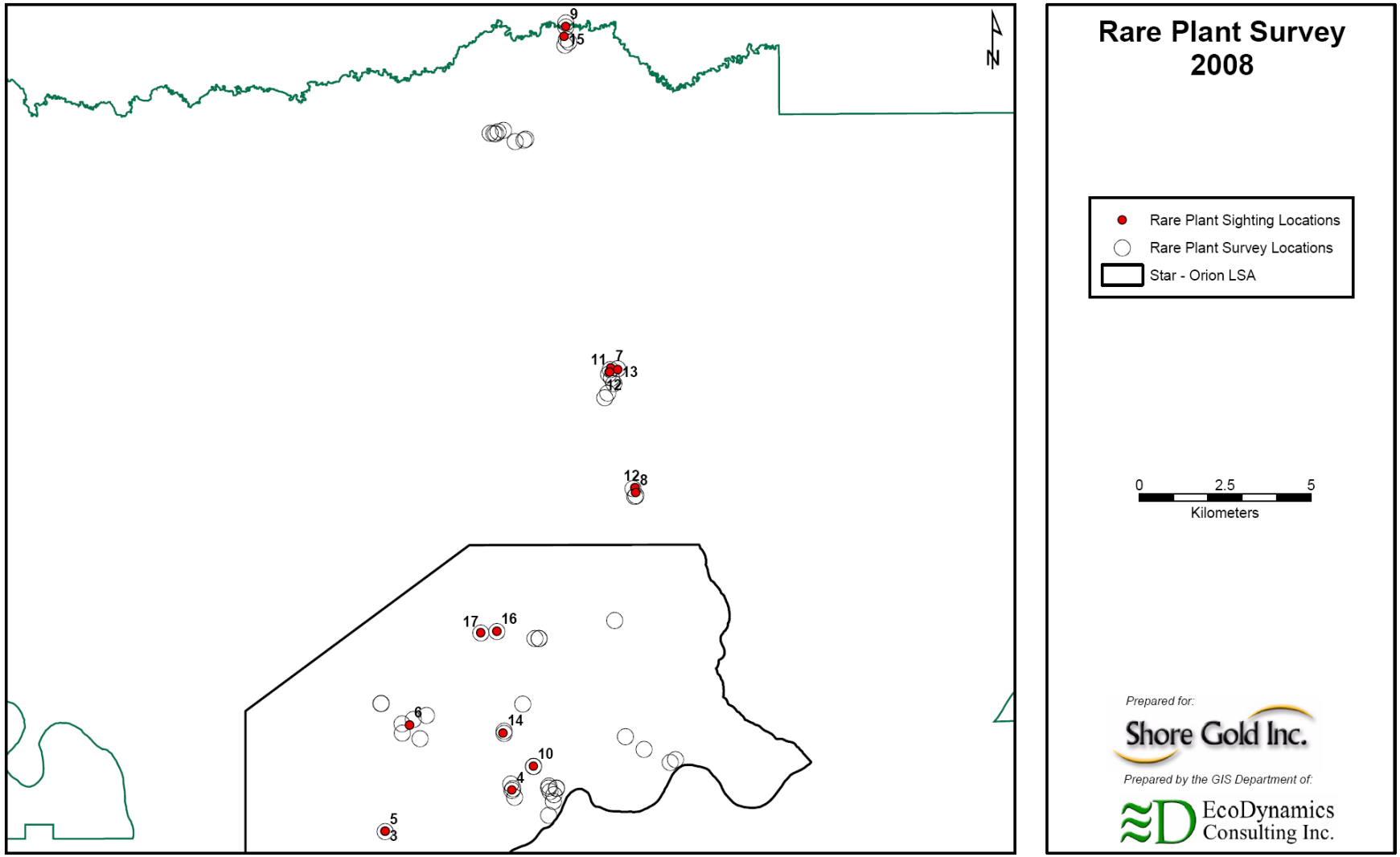


Table 3-4. Rare plant occurrences within the Star-Orion LSA.

Site ID	UTM Easting	UTM Northing	Scientific Name	Common Name	Rank (SKCDC)	Abundance	Habitat	Survey
1	518467	5905334	*Campanula aparinoides*	Marsh Bellflower	S2S3	Locally abundant in a small area.	Moist, riparian area.	August
2	518467	5905334	*Canadanthus modestus*	Large Northern Aster	S2	Few scattered plants.	Moist, riparian area.	August
3	511196	5895316	*Carex hystericina*	Porcupine Sedge	S2	Locally abundant.	Creek,dammed by beavers.	August
4	514882	5896518	*Carex pseudocyperus*	Cyperus-like Sedge	S2S3	Locally abundant.	Creek,dammed by beavers.	August
5	511196	5895316	*Carex pseudocyperus*	Cyperus-like Sedge	S2S3	Locally abundant.	Creek,dammed by beavers.	August
6	511905	5898417	*Coeloglossum viride* ssp. *virescens*	Long-Bracted Bog Orchid	S3S4	Few.	Moist woods.	August
7	517767	5908833	*Lactuca biennis*	Tall Blue Lettuce	S2	Single plant.	Willow meadow.	August
8	518482	5905194	*Leucophysalis grandiflora*	Sand Cherry	S2	Few.	Beaver lodge in a riparian area.	August
9	516451	5918790	*Lilium philadelphicum* var. *andinum*	Western Red Lily	S3S4	Few scattered plants.	Deciduous or coniferous woodland.	June
10	515511	5897210	*Lilium philadelphicum* var. *andinum*	Western Red Lily	S3S4	Few scattered plants.	Deciduous or coniferous woodland.	June
11	517718	5908709	*Lilium philadelphicum* var. *andinum*	Western Red Lily	S3S4	Few scattered plants.	Deciduous or coniferous woodland.	June
12	517734	5908708	*Lilium philadelphicum* var. *andinum*	Western Red Lily	S3S4	Few scattered plants.	Deciduous or coniferous woodland.	June
13	517970	5908787	*Lilium philadelphicum* var. *andinum*	Western Red Lily	S3S4	Few scattered plants.	Deciduous or coniferous woodland.	June
14	514626	5898180	*Listera cordata*	Northern Twayblade	S1	Few scattered plants.	Moist black spruce forest.	June
15	516406	5918504	*Pedicularis macrodonta*	Swamp Lousewort	S2	Several plants in small cluster.	Bog.	June
16	514442	5901151	*Polygala pauciflora*	Fringed Milkwort	S2S3	Three plants in mossy soil.	Moist coniferous woods.	June
17	513977	5901108	*Polygala pauciflora*	Fringed Milkwort	S2S3	Three plants in mossy soil.	Moist coniferous woods.	June

Table 3-5. Definitions of Saskatchewan Conservation Data Centre ranking system
(Source: SKCDC website: http://www.biodiversity.sk.ca/Docs/ranking.pdf).

S Rank (Provincial)	Status
S1	Extremely Rare
S2	Rare
S3	Rare-Uncommon
S4	Common
S5	Very Common

4.0 WILDLIFE RESOURCES

4.1 Introduction

This section of the terrestrial baseline report describes the existing (baseline) wildlife and wildlife habitat conditions in the vicinity of the proposed Star-Orion Diamond Project. The purpose of this component is to provide wildlife baseline data for assessment of potential development impacts on wildlife species and their habitats. The general objectives of this component were to:

- Determine wildlife species occurrence, distribution, relative abundance, population trends and use of various habitats based on existing information sources and the results of specific field surveys;
- Identify species of concern (rare, threatened or endangered); and
- Identify areas of potentially sensitive wildlife habitat.

4.3 Methododology

4.3.1 Existing Information

There is a considerable volume of existing wildlife information for FalCPF resulting from studies conducted by provincial wildlife management agencies (Froc, 1988; Saskatchewan Environment, 2007) and from previous baseline studies associated with hydroelectric developments (Blood et al., 1977; Pipe, 1982). Some preliminary wildlife baseline work was also conducted during previous stages of diamond exploration in the FalCPF (Golder Associates, 2006). Collectively, this existing baseline provides both historical context for the current baseline survey results, as well as indicates possible temporal trends. Pertinent portions of this existing information were integrated with new baseline survey results to provide an updated wildlife baseline for the current environmental assessment. Provincial trapping records, covering the period 2002 to 2008, were also reviewed.

4.3.2 Field Surveys

Wildlife surveys completed during the 2007/08 baseline program included: a fall small mammal survey (September and November, 2007); winter ungulate aerial surveys (December 2007; January and March, 2008) and ungulate food habit surveys (December, 2007; March, 2008), winter track count surveys (March, 2008), spring amphibian and owl reconnaissance surveys (May, 2008), spring waterfowl aerial and ground surveys (May, 2008) and an upland breeding bird survey (June, 2008).

The recent field surveys were designed to supplement existing historical information and confirm the presence, abundance and distribution of various wildlife species within the study area. These surveys were timed to coincide with specific periods of wildlife activity (e.g., amphibian mating season, song bird breeding season and spring waterfowl migration and nesting) or the winter season, which improves mammal tracking (e.g., winter tracking and food habit surveys) and

sightability (e.g., aerial ungulate surveys). The results of these specific wildlife surveys were supplemented by incidental observations made during the course of other baseline surveys and by Shore Gold staff and contractors.

Ungulate Aerial Surveys

Three ungulate aerial surveys were flown over the PLSA during the winter of 2007/08 (December, 2007; January 2008; March, 2008) to provide estimates of elk, moose and deer density and population levels within the PLSA. Survey lines were flown in an east-west orientation at ½ mile (800m) intervals (Figure C-3, Appendix C) at an altitude of approximately 100-125m. Surveys were conducted using a Cessna 182 fixed wing aircraft with two trained observers seated in the rear of the plane, and a navigator/recorder seated in the front next to the pilot. Observations included ungulate sightings, tracks and feeding crater occurrences, as well as sightings and signs of furbearers (e.g., wolves and coyotes) and stick nests (potential raptor nests). Ungulates observed within ¼ mile of the side of the aircraft were considered "on transect", while other animals were noted, but recorded as "off transect". Sex and the presence of ungulate calves and fawns were recorded whenever possible, however a specific recruitment survey was not undertaken. Ungulate population estimates are based only on "on transect" data. Coverage was assumed to be 50%, necessitating the use of a 2x correction factor (*i.e.*, double the observations). Assumed errors due to observer bias, weather, forest density and species behaviour, likely caused some "on-transect" animals to be missed. Such errors may be countered by additional species-specific "miss" correction factors. However, given that previsous surveys in the region did not utilize such corrections, miss factors were not applied to the data presented, allowing for more direct comparison with historical data.

The navigator/recorder used a tablet PC equipped with a Garmin 60CSX GPS and OziExplorer™ mapping software for navigation and to digitally record observation points. This real-time moving-map system reduced navigator/recorder workload and also aided the pilot in maintaining position on transect. The locations of all observations were recorded on a moving map display, while detailed records were kept on paper data sheets.

Additionally, during the late-winter survey (March), a reconnaissance-level 25% coverage survey (i.e., 1 mile transect interval) was flown for those portions of Fort-a-la-Corne Provincial Forest outside the PLSA (Figure C-4, Appendix C).

Ungulate Food Habit Surveys

An ungulate winter food habit tracking survey program was initiated concurrent with the early winter aerial ungulate survey in early December, 2007. The purpose of the food habit surveys was to determine winter food preference by ungulates in a variety of habitats. The procedure was developed by the Saskatchewan Research Council, and used on several environmental baseline surveys in Saskatchewan, including in the Fort-a-la Corne area for SaskPower's proposed Forks hydroelectric project (Pipe, 1982).

In areas of recent ungulate tracks, selected tracks were followed for a representative distance (Figure C-5, Appendix C). The procedure consists of locating and following fresh tracks of

moose, elk and deer for several hundred metres from the edge of roads and trails, with stops wherever the animal has browsed. At each stop the browsed species were identified and the number of twigs consumed recorded. Habitat descriptions were also made at the beginning of the transect and wherever there was an apparent change in habitat (tree species, height and density; shrub species % cover). Each transect start and end point, as well as each browse or habitat description locations was recorded with a handheld GPS. The type and position of incidental observations, such as tracks of furbearers and upland gamebirds were also recorded.

At each browse stop the animal made along the track, the plant species browsed and the number of stems eaten were recorded. Relative abundance of each browse species was also estimated for each habitat. Fresh elk and deer tracks were more easily located than moose, and this resulted in a general difficulty finding moose tracks to follow. Both the number of stops and stems browsed per habitat were converted to a standard distance unit (100m) for comparative purposes.

Winter Track Counts

Linear transects were established in a variety of accessible habitats across the PLSA during the first week of March, 2008 to provide evidence of winter habitat use by ungulates, furbearers (including snow-show hare), small mammals and winter resident birds. The location of these transects is indicated in Figure C-6, Appendix C. Transects were established using a stratified random sampling technique. The number and locations of both fresh and old tracks were recorded (separately) along each measured transect using a hand-held GPS; however, only fresh tracks were used directly in calculations. Fresh tracks were defined as those made since the last noticeable snowfall. Intensity of animal use of each habitat was established by dividing the number of days since the last snowfall by the number of tracks of each species observed in each transect segment. Results were standardized to tracks/day/100m for each major cover type. Animal sightings, bedding sites, fresh pellet groups and other incidental observations were also recorded.

Small Mammal Survey

Small mammals (i.e., mice, voles, moles, shrews, squirrels, ground squirrels, chipmunks, hares, and porcupines) represent an important prey source for a variety of predatory mammals and birds. Understanding small mammal population variance among different habitats, is important for assessing the relative importance of each habitat for dependent predator species.

A small mammal survey was conducted in fall, 2007 (late August, early September and early November), timed to coincide with the general fall microtine and shrew population peak. During the surveys, a series of 21 traplines were established in a variety of upland and wetland habitats across the PLSA (Figure C-7, Appendix C). The location of each trapline was chosen to be representative of the habitat, while having a random orientation to minimize bias. Along each trapline, 50 Victor snap traps were set at approximately 2m intervals and baited with peanut butter. Traplines were checked daily to reduce the likelihood of disturbance of the traps by scavenging birds such as gray jays or ravens. Each transect was sampled on four consecutive nights as per Pipe (1982). Analysis was based on 4,200 trap-nights (21 traplines x 4 nights x 50 traps/trapline).

Preliminary identification of most species (except shrews; Sorex spp.) was conducted in the field. All shrews were frozen for subsequent laboratory analysis.

A general estimate of the relative abundance (%) of each species in the study area was calculated by dividing the total of each captured species by the total number of microtines and shrews captured. Similarly, relative species abundance figures were calculated for each habitat type by dividing the number of captures of a given species by the total number of microtines and shrews in a given habitat. This latter calculation allowed the estimate of microtine and shrew productivity across major habitat types. All calculations were standardized to 100 trap nights.
The microtine and shrew trapping program was not designed to capture larger small mammals such as chipmunks and squirrels. Non-microtine small mammal occurrence was recorded based on incidental observations made by terrestrial survey crews and exploration personnel, and from historical reports (Golder Associates, 2006; Pipe, 1982; and Blood et al., 1977).

Upland Breeding Bird Survey

An upland breeding bird survey was conducted in June, 2008 in the Star-Orion LSA and selected portions of the proposed infrastructure corridors, to obtain data on breeding avifauna and to detect occurrences of species at risk (SAR). The survey utilized a standard point count method (Ralph et al., 1993).

Sampling was stratified by forest cover type, and consists of 118 point counts (PCs) distributed among the Star-Orion LSA (58), the proposed northern road/rail access corridor (39) and the proposed southeast transmission line corridor (21) (Figure C-8, Appendix C). Sampling points were set a minimum of 250 m apart to avoid double sampling of birds, and a minimum of 50 m from edge of a given habitat type to ensure that birds inhabiting other adjacent types were not inadvertently counted.

Surveying was restricted to the period between 0.5 hour before sunrise to approximately 10:00 am, and under low wind conditions with no significant precipitation. Once at the survey point, a 2-minute quiet down period was followed by a 5-minute listening and observation period. All birds observed or heard within a 50 m radius, were recorded separately from those observed or heard outside the 50 m radius, as well as those flying overhead or merely passing through the plot. Double counting was avoided by keeping track of individual birds as they moved around the station. Data collected at each PC station included: surveyor name; date; start/end times of observation; weather conditions (temperature, Beaufort scale wind, % overcast, precipitation); site number; number of each species observed or heard; GPS coordinates; and a description of general forest cover and vegetation to allow correlation with ecological mapping.

Observations results from within each 50 m point sample radius (0.785 ha), were compiled by habitat type to calculate relative abundance and species richness for each habitat. Observations of birds outside the radius, including those passing overhead, were used to enhance the general species list.

Waterfowl Aerial and Ground Surveys

Information on waterfowl and related migratory species (ducks, geese, swans, loons, grebes, bitterns and cranes) was obtained from a spring aerial survey, incidental observations from other surveys and historical information. The May 14th, 2008 aerial survey covered the sloughs, tributary streams, and beaver ponds located within the PLSA, as well as the section of the Saskatchewan River valley lying within the PLSA (Figure C-9, Appendix C). A sweep of the waterbodies along the proposed north and south infrastructure corridors was also conducted during this survey. Given the paucity of waterbodies and the low numbers observed, a fall waterfowl survey was not undertaken. Waterfowl data was also collected during spring 2008 amphibian survey including East Ravine, English Creek and a pond located in the Orion area. Incidental waterfowl observations were also collected during the course of other field work and contributed additional species to the bird list.

During the aerial waterfowl survey low-altitude passes were made using a single-engine fixed-wing Cessna 182 aircraft, with a pilot, navigator/recorder and two observers. The number and species of observed waterfowl were recorded along with their geographic coordinates derived from a handheld GPS. In some cases repeated passes were made to ensure adequate habitat coverage, particularly along complex shoreline habitats. Double counting was avoided by careful tracking of waterfowl movements and relocation. General habitat information was also recorded. Where accurate identification was not possible birds were identified to the most accurate level possible (i.e. diver species, dabbler species, duck species, and shorebird).

Owl Survey

An owl call playback survey was originally proposed based on the guidelines of Takats *et al.* (2001). However, due concerns for potentially disturbing owl territorial and mating behaviour, a 'listening-only' survey was conducted, which is also outlined by Takats *et al.* (2001). Listening surveys are currently used for the annual *Saskatchewan Owl Monitoring Survey* (per. comm. Carman Dodge).

Listening sites were selected to reflect the range of potential owl habitats in the PLSA (Figure C-10, Appendix C). Sites were set at least 1.6 km apart to reduce the risk of double-sampling of the same individuals (Takats et al., 2001). Surveys time was restricted to the period from 0.5 hour after sunset until approximately 3 hours after sunset, when the majority of detections would be expected. Each calling owl was identified to the species level and its location estimated using a compass bearing and a subjective assessment of its distance from the survey site. In addition to owl species data, weather conditions (temperature, wind speed and direction, and percentage cloud cover) and general habitat descriptions were also recorded.

The late and unseasonably cold spring of 2008 severely reduced the amount of owl calling heard by the survey crew, and the owl survey should be considered as reconnaissance information.

Amphibian Survey

An amphibian call survey was conducted in May, 2008 during the breeding season for frogs and

toads. The survey protocol followed that used for the *North American Amphibian Monitoring Program (NAAMP)* (USGS, 2008b) as applied in Saskatchewan by the Saskatchewan Amphibian Monitoring Program (SAMP). Normally, each species calls for approximately 3 weeks, with the exception of the boreal chorus frog, which may continue calling up to 5 or 6 weeks. It should be noted, however, that the late and unseasonably cold spring of 2008, caused substantial shifting and overlapping of calling periods, affecting survey timing and results.

Amphibian survey stations were established at ground accessible areas across the PLSA in areas expected to contain amphibian habitat, with a focus on ravines and wetlands (Figure C-11, Appendix C). Sites were surveyed during evenings when air temperatures was above 5^{o} C. Survey times began at 0.5 hours after sunset and continued no later than midnight. At each survey site a 1 minute "quiet down", was followed by a 2 minute listening period. Calls were identified to species, with a qualitative assessment of relative abundance made using the Amphibian Calling Index (USGS, 2008b). Weather conditions, including temperature, wind (Beaufort scale), and percentage cloud cover, were also recorded.

Reptile Reconnaissance Survey

During the course of the fall 2007 small mammal trapping and spring 2008 amphibian survey, sand covered roads and trails were surveyed for sign of red-sided garter snake, the only reptile expected in the region.

Incidental Observations

Incidental observations of wildlife were recorded on an ongoing basis by the various biophysical field teams, as well as Shore Gold staff. This incidental information was used to supplement species data derived from formal surveys and also provides additional insights regarding general distribution of some animals.

4.3.3 Habitat Classification and Mapping

The wildlife survey results and related analysis for the current wildlife baseline were placed, wherever possible, within the context of habitat availability and relative quality. Similarly, whenever available, historical information was also reported by habitat type.

The Vegetation Cover Type (VCT) map (Figures 3-1 and 3-2, in section 3.3.2) provides a visualization of the variety of terrestrial ecosystems distributed across the Fort-a-la-Corne Provincial Forest, including the Star-Orion LSA; thus, the ECT map was chosen for habitat presentation. This habitat map is based on the most current forest inventory mapping by the Forest Service of Saskatchewan Environment, supplemented by air and ground observations compiled from various baseline surveys. The forest inventory data were reorganized into ecologically-based land cover classes with wildlife habitat significance. Each of these habitat units are based primarily on variations in forest cover type, height, density, and age class/seral stage and soil moisture regime. The attached geodatabase includes a variety of detailed habitat data including ecosite classification (Beckingham et al., 1996). The ecosite information provides an indication of potential variations in understory species composition among the various

habitats, important for assessing ungulate browse quantity and quality. Additional information on the habitat classification and mapping process may be found in the Vegetation section (3.0) of the terrestrial baseline report.

4.4 Baseline Wildlife Resources

4.4.1 Mammals

Based on a review of the literature (Pipe, 1982; Blood *et al.*, 1977; Banfield, 1974; Maher, 1969; Beck, 1958), a total of 51 mammal species are potentially found in FalCPF and adjacent farmlands (Table B-1, Appendix B). Of these potential species, 33 species of mammals were recorded during the current study, including 4 ungulates, 13 carnivores and 16 other mammals, including microtines, shrews and bats.

Ungulates

Four species of ungulates were observed within the FalCPF: elk (*Cervus elaphus*), moose (*Alces alces*), white-tailed deer (*Odocoileus virginianus*) and mule deer (*Odocoileus hemionus*). Mule deer in FalCPF are at the northern edge of their range and are found only in relatively low numbers, and are thus grouped with white-tailed deer for reporting. Figures C-12 through C-21 in Appendix C illustrate the survey observations made during the course of the three winter aerial surveys of the Preliminary LSA.

Ungulate Densities

Estimated ungulate densities and populations for the recent aerial surveys, as well as historical surveys conducted in FalCPF, are provided in Table 4-1. It should be noted that results from recent surveys have *not* been corrected for possible missed animals (i.e., 'miss factor') due to poor sightability. Sightability is affected by variations in forest type and density, light, weather conditions, or amount of bare ground, and is usually better in low-density and deciduous (leaf-off) forest or open areas, with continuous snow cover. As far as can be presently determined, historical survey results also appear to be uncorrected for sightability.

Overall, density results in the PLSA are within the range of variation from previous surveys of the FALC area. While the elk and moose density results of the current survey are slightly lower than the overall average from the 2006 Saskatchewan Environment survey (SE, 2007), which yielded 0.28 elk/km2 and 0.23 moose/km2. However, a more direct comparison, using only those SE survey blocks contained within the current PLSA indicates more comparable results.

Ungulate Population Estimates in the PLSA and Star-Orion LSA

Using actual highest counts of the three recent surveys, the population estimates for the current Preliminary LSA (575 km^2) are:

Elk:	134 animals
Moose:	110 animals

Deer: 180 animals

Using density values (animal/km2) from the PLSA survey coverage (Table 4-1), the current population estimates for the Star-Orion LSA (122 km^2) are:

Elk: 28 animals
Moose: 23 animals
Deer: 38 animals

The lowest ungulate counts were from the March 2008 survey, which is expected. Ungulates are at their weakest state at this time of year and more susceptible to mortality and predation. Also, in March, there was a significant snow crust over the deep snow making travel difficult for ungulates, particularly deer. As a result, most deer were likely to have been in denser jack pine and spruce forests, potentially reducing sightability and reducing aerial counts. March snow track surveys appear to support this hypothesis. For similar reasons, elk also appeared to have been avoiding open areas and low-density forest. Lower moose counts in March were at least partly the result of reduced sightability, due to partial melting and exposure of dark surface areas, as well as winter predation by wolves.

Table 4-1. Ungulate densities from various surveys within FalCPF

Study Area	Source	Time Period	Ungulate Density (animals/km2)		
			Elk	Moose	Deer
PLSA (575km2 portion of FALC)	Current study	Dec. 2007	0.14	0.19	0.31
		Jan. 2008	0.23	0.16	0.19
		Mar. 2008	0.11	0.11	0.09
SE survey blocks within the PLSA	SE, 2007	February 14-18, 2006	0.19	0.20	-
FALC + farmland (2,113 km2)	SE, 2007	February 14-18, 2006	0.28	0.23	-
FALC (entire)	Froc, 1985 (reported in SE, 2007; Froc, 1988)	Winter, 1983	0.50	0.30	-
FALC (entire)	Pipe, 1982	Dec 17-19, 1979	0.23	0.21	0.24
		Jan 29-31, 1980	0.27	0.14	0.18
		Feb 19-21, 1980	0.22	0.18	0.10
		Mar 31-April 1, 1980	0.05	0.03	0.01
FALC (entire)	DTRR (reported in Blood et al., 1977; Froc, 1988)	76/77 winter average	0.25	0.21	-
FALC (entire)	DTRR (reported in Blood et al., 1977; Froc, 1988)	10 yr. Ave. (1965-1975)	0.23	0.13	0.24

Comparisons among the various surveys conducted over the last 40 years must be tempered by the fact that survey coverage, methodology and habitat distribution have varied over this time period. The 2007/08 surveys covered only the central portion of FALC, not its entirety. Previous surveys usually covered FALC in its entirety, and in some cases adjacent farmland (e.g., SE,

2007), thereby including a greater range of habitat types and qualities. The area east of Highway 6 is known historically to yield the highest population numbers for elk, partly due to the more favourable habitat mix (Blood et al, 1977; Froc, 1988). Based on the 2006 survey (SE, 2007), this trend appears to be continuing, in spite of significant habitat changes over the last 40 years due to fire and other disturbances. The 2006 survey yielded density numbers as high as 2.23 elk/km2 in eastern FALC, nearly eight times their FALC average of 0.28 elk/km2 (SE, 2007).

Results of the March 2008 reconnaissance survey of those portions of the FalCPF outside the PLSA (Figure C-22 and C-23, Appendix C) did not indicate any clear late-winter movement trends other than an apparent concentration of moose observations along the Saskatchewan River in East FalCPF. Most deer and elk were usually spotted at the base of trees adjacent large openings, where the remnants of the previous years understory vegetation were now exposed. Some of the warmer exposed areas exhibited green shoots from early spring growth. Traditionally, late winter is a period when elk and deer are at their lowest body weight and would be expected to target such areas of accessible and concentrated food value.

Chronic Wasting Disease

Chronic wasting disease (CWD) is a fatal neurological disease that can affect all members of the deer family (cervids), including white-tailed and mule deer, elk and moose. A total of 34 cases of CWD in white-tailed deer have been reported to date within Wildlife Management Units 43 and 50, which each contain portions of Fort-a-la-Corne Provincial Forest (SMOE, 2008b). However, only 2 of the white-tailed deer were from animals taken in the forest itself (eastern edge). Most cases were concentrated on farmland east and north east of the Fort-a-la-Corne Provincial Forest, with one case in the Smeaton area to the north of the forest and one case along Highway 6 on the southeast edge of the forest (SE, 2008). In early April, 2008, two cases of CWD in elk were reported in the area between east Fort-a-la-Corne and the town of Nipawin (SMOE, 2008b).

Ungulate Food Habit Transects

Food habit survey data provides an indication of what plant species are utilized by ungulates as a winter food source, as well as what species are preferred (or 'candy') species. The results of the surveys indicate the ungulate utilization of a variety of shrubs, as well as some specific forbs.

At total of at least 18 species of trees, shrubs and forbs were utilized as browse and forage by ungulates (Table B-2, Appendix B). Wormwood (*Artemesia spp.*) was reported eaten by all three groups of ungulates. One species, pincherry was included in feeding data for all three groups. The most concentrated feeding noted for elk was in mature trembling aspen and balsam poplar stands and willow swamps. The most active feeding of moose noted in the study was in the willow swamp habitat. Deer feed most heavily on low forbs and shrubs in regenerating jack pine stands. Elk and deer had the most similarities in their choice of browse species of plants. Deer and elk are both browsers and grazers of herbs and forbs, while moose rely almost exclusively in the winter on woody browse and will forage on aquatic plants when available in the summer period.

A variety of browse plants were taken by the three species, however, elk and deer tended to be

closer in their food habits, relying more heavily on a mixture of forbs and shrubs and showing a preference for Saskatoon$_s$ choke cherry, pincherry, and red-osier dogwood. Moose showed preferences for willow, trembling aspen, red-osier dogwood and beaked hazelnut. Moose were also the only species to consume balsam poplar regularly.

While the predominant young (regenerating) jack pine forest had a relatively low browse production, most available browse was heavily utilized; perhaps a reflection of the extensive distribution of this habitat in the FalCPF.

The predominance of early succession, regenerating jack pine forests of varying density, along with soil disturbances from exploration activities, has increased the abundance of weedy, early-successionary plant species (e.g., sweet clover, aster, and wormwood), which attract both elk and deer. These upland habitat characteristics do not attract moose, which instead are drawn to shrub-rich wetlands and aspen forests.

Closed conifer forests tended to have substantially lower species richness and biomass, and were generally less utilized by ungulates for food supply. However, closed conifer forests provide important winter thermal cover and protection from predators, given the tendency for lower snow depths and less surface crust development, which make escape easier.

All ungulate species were observed to be consuming wormwood (*Artemesia spp.*) during browsing activity. Wormwood is known to have anti-parasitic compounds, which may be the reason for its consumption by ungulates. Several species of this forb are widespread in the FalCPF, particularly in dry, open areas of regenerating jack pine.

Ungulate Habitat Use

The FalCPF location in the boreal transition ecoregion, where boreal and prairie plant species are blended together, increases the variety of forbs and grasses available to wildlife than would typically be found further north in the Mid-Boreal Ecoregions. Additionally, past forest fires and forest clearing have created enhanced opportunities for increased abundance of early successional plant species, including weedy species such as sweet clover and other favoured food sources for elk and deer. As a result elk and deer appear to have increased tolerance to human disturbance in the area.

Elk and deer tracks and feeding craters were evident across the entire PLSA, including in active exploration areas. Based on aerial and ground surveys, elk and deer make extensive fall and early winter use of the low density regenerating jack pine and aspen in burnovers and cutovers, likely due to the relative diversity of understory grasses and forbs and the predominance of this habitat type. They typically retreat to feed in denser cover during later winter when deep snows and heavy crusting limit the use of the more open areas.

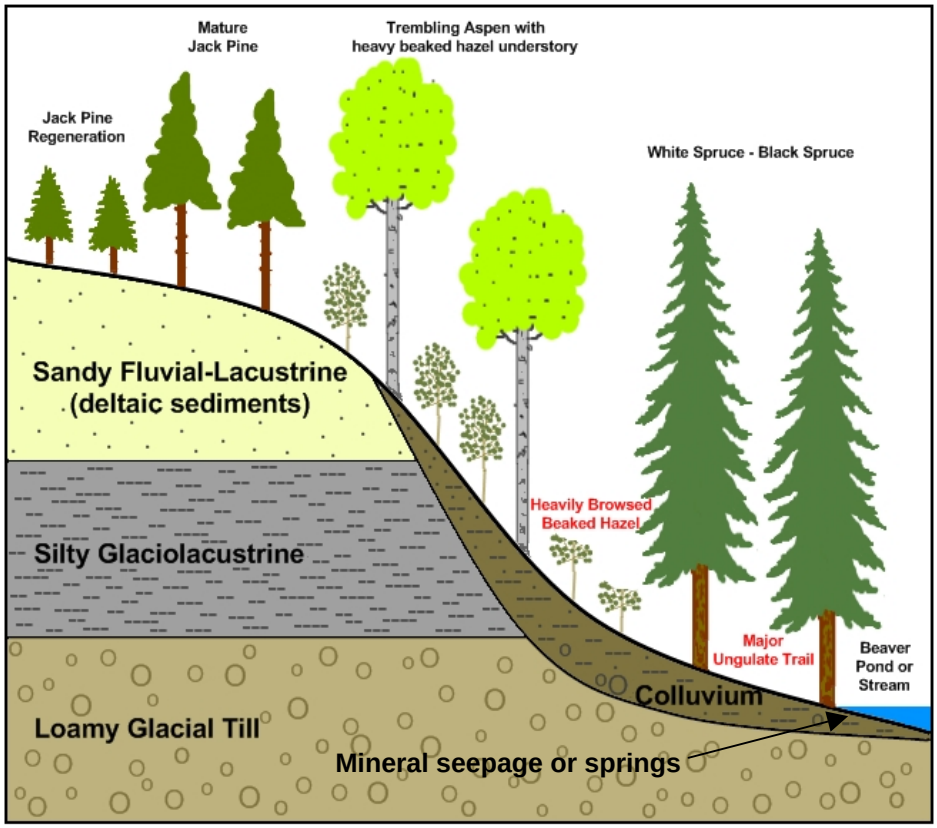
Notably, concentrations of elk and deer were observed along English Creek during aerial surveys, only a few kilometers from exploration activities. The English Creek ravine complex provides a diversity of habitats and may act as an important terrain buffer to exploration activity, as well as an important travel lane. In general, air and ground observations indicate that most

ravines in FalCPF appear to be wildlife travel lanes. These ravines frequently host mineral licks, a variety of browsing and grazing areas, and also provide escape terrain and thermal cover. Figure 4-1 illustrates a common habitat complex found in many ravines of FalCPF.

While moose tend to be more sensitive to human activity and development than elk and deer, most moose habitat lies well outside the Star-Orion LSA. It should be noted, however, that a significant concentration of moose were observed in a habitat complex occurring in the southwest corner of the Star-Orion LSA, adjacent the Saskatchewan River. This habitat complex consists of various upland and wetland cover types in various stages of post-fire succession, combined with complex terrain including several tributary drainages and river floodplain. This area should, therefore, be considered the most sensitive moose habitat in the Star-Orion LSA.

The principal population regulators of deer and elk within Fort a la Corne are periodic severe winters and predation by packs of wolves and coyotes. During times of higher deer numbers, there may be reduced predation pressure on elk and moose. Many wolf sightings during fall and early winter fieldwork were of single animals or pairs. Packing appeared to be more common in late winter, which would indicate that wolves might rely more heavily on smaller prey earlier in the year, particularly deer.

Figure 4-1. Typical crossection of ravine slope and associated habitat structure.



Carnivores

A total of 13 species of carnivores are known to occur within FalCPF and are each discussed below:

Black Bear *(Ursus americanus).* The black bear is a common and widely distributed resident of the area, and both spring and fall bear hunting is permitted. Frequent bear sign was noted throughout the area during the course of various field investigations, particularly along the Saskatchewan River valley and tributary stream ravines. During course of baseline surveys, several sightings were made of bears including a sow with two cubs during the spring waterfowl survey, as well as a sow with a single cub during the spring amphibian survey

The ravines hosted intense black bear foraging activity, and is a likely primary hunting area given the plant and animal diversity. Bear activity also appeared to be relatively high in areas of concentrated dead-fall (e.g., regenerating jack pine burnover), which would be expected to host larger ant and grub populations.

Gray Wolf *(Canis lupus).* Wolf tracks were encountered on a regular basis both in the summer and winter. Sightings of single wolves and packs of up to seven individuals were observed during the winter aerial ungulate surveys. Several wolf kill sites were observed during the March aerial ungulate survey. Based on these observations, it is estimated that three to four packs exist in FalCPF, with at least one pack occupying the Star-Orion LSA. Based on these observations, the total estimated population of wolves in the FalCPF in the range of 15 to 20 animals. Given the relatively high deer numbers of recent years, the wolf population in FalCPF is likely close to its peak.

Recently reported wolf predation problems outside the FalCPF suggest that there is some movement into the surrounding farmland. During the winter of 2008-09 the MOE issued special trapping permits to several trappers in the James Smith Reserve in order to counteract complaints of wolf predation on domestic livestock in area surrounding the FalCPF. The results of these trapping efforts remain unknown at this time.

Coyote *(Canis latrans).* Coyote tracks were frequently encountered across FalCPF, both in the summer and winter period. Survey crews also reported several sightings, including a single coyote that frequented the Shore Gold camp area.

Red Fox *(Vulpes vulpes).* Limited evidence of red fox was noted in FalCPF during the recent surveys, perhaps due to relatively high numbers of coyotes and wolves. Fox tracks were observed mainly along roads or along frozen creeks.

Cougar *(Puma concolor).* The current population of cougar in the Fort a la Corne Provincial Forest currently remains unknown. Signs and sightings of cougars have been reported from previous investigations (Pipe, 1982), but the secretive nature of this large cat makes it difficult to determine its abundance. While the cougar is likely resident throughout the FalCPF and surrounding farmland, it is likely most attracted to the river valley where there are numerous suitable perches along steep river escarpments from which deer are more easily hunted while they use they utilize the river valley resources. The only cougar signs noted in FalCPF during

the period of the current baseline, were a series of large and small cougar tracks (female with 2 kittens) on a sandy stretch of road approximately 3 kilometres north of the Saskatchewan River and west of the Star-Orion LSA. Also, during 2008, a single cougar (sex undetermined) was observed in a tree by bear hunters in FalCPF south of the Saskatchewan River (per comm., Sharla Picton).

Lynx *(Lynx lynx).* The population status of lynx in FalCPF remains unclear. However, Shore Gold camp and environmental personnel reported frequent observations of lynx, including a female with two kittens just outside the main gate of the Star site in 2007. An adult lynx was also photographed in the fall of 2008 by Chad Wilkinson of Shore Gold, at the intersection of the Division Road with the Shipman Trail. An active den was also reported west of the Star facilities during the summer of 2008. However, the exact location of this den remains uncertain.

Historically lynx were thought to come down from further north in winter (i.e., winter resident only) (Pipe, 1982). The results of the current study confirm that lynx occupy FalCPF as permanent breeding resident.

Wolverine *(Gulo gulo).* Previous surveys (Pipe, 1982; Blood et al., 1977) did not report any wolverine, but they may have been a resident of FalCPF historically.

Marten *(Mustela Americana).* The marten likely occurs in small numbers across FalCPF, particularly in areas of with larger red squirrel population, the marten's primary food source. No tracks were recorded, but a single martin was observed in the fall of 2008 in riparian mixedwood forest south of the Star-Orion LSA (E518556 N5895764, NAD83).

Fisher *(Martes pennanti).* Fisher tracks were relatively uncommon, but observed in both hardwood and softwood forest and riparian shrubby areas within the Star-Orion LSA. A single inciental fisher sighting was made during late fall fieldwork in 2008 (E519153 N5916888, NAD83), north of the Star-Orion LSA. The fisher is less specific in its preferred habitat than the marten, and will likely occur throughout the FalCPF.

Mink *(Mustela vison).* Based on previous records (Pipe, 1982; Blood et al., 1977), mink tracks would be expected along the Saskatchewan River, tributary creeks or the edge of beaver ponds. However, mink tracks were not encountered during the course of recent surveys.

River Otter *(Lontra canadensis).* Previous studies in the FalCPF (Pipe, 1982; Blood et al., 1977) encountered otter tracks infrequently along the edge of the Saskatchewan River and along various creeks and beaver ponds. Otter tracks were also observed twice during the winter track count surveys and a single otter was observed incidentally.

Short-tailed Weasel *(Mustela erminea).* Weasel tracks were common throughout the area. It is presumed that most of the weasel tracks in the forest were made by the short-tailed weasel or ermine. While not observed in the current study area, the long-tailed weasel *(Mustela longicauda)* would be expected to occur at the edge of the forest in adjacent farmland. The small least weasel *(Mustela nivalis)* is uncommon in Saskatchewan, but may occur in small numbers.

Striped Skunk *(Mephitis mephitis).* This species will likely occur in the FalCPF in limited numbers and outside the forest in the farmland in much higher numbers. They often frequent edges of wetlands and areas with an abundance of amphibians and small microtine mammals. No tracks or sightings were noted in the FalCPF during the current study.

Raccoon *(Procyon lotor).* No raccoons were observed during the current study, but tracks were noted along the Saskatchewan River and along English Creek. This species is a relatively new invader from the south and is not expected to be very common within the FalCPF, but may be common in surrounding farmland.

Other Mammals

Snowshoe Hare *(Lepus americanus).* Tracks of this species were encountered in a variety of habitats, but most abundant in shrubby riparian areas and young jack pine dominated forests.

Red Squirrel *(Tamiasciurus hudsonicus).* Red squirrels inhabit a wide range of cover types including all of the forest types that contained jack pine or spruce species. Red squirrel were frequently observed and heard during the course of various terrestrial surveys, particularly in trembling aspen forests with a dense hazel understory and in mature coniferous forests.

Beaver *(Castor canadensis).* Beaver are one of the most important mammals within the study area, as they exert significant influence over a wide variety of animal and plant species with the creation of beaver ponds, new marsh habitat, as well as their habit of clearing adjacent forest for food and dam construction materials. Observed beaver-induced habitat changes in the study area include: expansion of shrub and grass communities along the slopes of tributary stream valleys (creating additional ungulate, song-bird and small mammal habitat); snag creation (habitat for cavity nesting birds including: king-fisher, bufflehead and gold eye); and the creation of additional ravine crossing points (i.e., dams) for traveling ungulates and hunting carnivores.

Historically, the beaver is a common species along the creeks, in most of the larger ponds and along the Saskatchewan River (Pipe, 1982; Blood et al., 1977). While no specific census of beaver was undertaken, evidence of recent beaver activity was observed in all tributary ravines, as well as the Saskatchewan River valley during the course of various air and ground surveys. Evidence of intense beaver activity was observed in both the East and West Ravines flanking the Star site, as recently as the summer and fall of 2008. This evidence included recent cutting activity, presence of food caches, bank lodges and fresh mud packing on the numerous dams established at various points along the lengths of both ravines. A food cache was also incidentally observed along the Saskatchewan River southeast of the Star site in the fall of 2007. Observed lodges were a combination of both traditional lodges and bank lodges, with the latter more common and difficult to detect.

Muskrat *(Ondatra zibethicus).* While muskrat is known to occur in the region, its distribution is limited to larger ponds with sufficient water depth and sufficient emergent marsh vegetation (e.g., *Scirpus sp., Juncus sp.* and *Carex spp.*). Muskrat push-ups and houses were observed in several ravines and ponds across the study area, but the population is considered relatively small. A few individual muskrats were observed during fall and winter surveys traveling overland,

presumably in search of more suitable water-bodies.

Northern Flying Squirrel *(Glaucomys sabrinus).* The northern flying squirrel was only observed on a single occasion during the course of the current work. This species is nocturnal and seldom observed during the day. The northern flying squirrel generally requires mature to old growth forests with abundant decaying trees, suitable for cavity nesting. Suitable mature and old growth forests are not abundant in the study area; however there are selected areas where snags from past fire are mixed with remnant mature forest. These areas would be the most likely locations for flying squirrel nests in the current study areas. As such, this species is likely somewhat more abundant than our single observation suggests, but is not expected to be a common resident.

Woodchuck *(Marmota monax).* Two sightings of woodchuck were recorded as incidental observations by Shore Gold environment staff. This mammal is normally restricted to the Saskatchewan River Valley and surrounding farmland.

Porcupine *(Erethizon doreatum).* There were several observations of feeding evidence by porcupines, including one in dense willow cover. This species did not appear to be common within the FalCPF.

Northern Pocket Gopher *(Thomomys talpoides).* Evidence of the pocket gopher was noted on several occasions including the picnic area on the west side of the English Creek crossing on Division Road. A single pocket gopher was observed near an ecological plot south of the Star-Orion LSA in the proposed powerline corridor (N525164 E5888231, NAD83). This mammal would not be common within the boundaries of the FalCPF, but would be relatively common in the surrounding farmland.

Least Chipmunk (*Eutamias minimus*). Least chipmunk is a common boreal forest resident and was observed across the surveyed areas, including in forb- and graminoid-rich, early succession habitats including exploration disturbances and regenerating burnovers, although at lower levels than red squirrels.

Ground Squirrels. Three species of ground squirrels were observed by Pipe (1982) in FalCPF and/or surrounding farmlands. These species were: Richardson's ground squirrel (*Spermophilus richardsonii*), thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*), and Franklin's ground squirrel (*Spermophilus franklinii*). Of these three species, only the Franklin’s ground squirrel is likely to reside in FalCPF, possibly along edges of moist, grassy openings.

Microtines and Shrews. According to Maher (1969) and Beck (1958) six microtine species and six shrew species should occur in the FalCPF region, as follows (in expected order of abundance): deer mouse *(Peromyscus maniculatus)*, Gapper’s red-backed vole *(Clethrionomys gapperi)*, the meadow vole *(Microtus pennsylvanicus)*, western jumping mouse (*Zapus princeps*), heather vole *(Phenacomys intermedius)*, northern bog lemming *(Synaptomys borealis)*, masked shrew *(Sorex cinereus)*, vagrant shrew *(Sorex vagrans)*, arctic shrew *(Sorex arcticus)*, short-tailed shrew *(Blarina brevicauda*), pigmy shrew *(Microsorex hoyi)* and American water shrew *(Sorex palustris)*. While the northern bog lemming was not observed

during historical or current surveys, it might be expected to occur in some of the more remote wetland complexes in the northern portions of FalCPF.

Blood et al. (1977) confirmed the presence of deer mouse, Gapper's red-backed vole, meadow vole, heather vole, western jumping mouse, masked shrew, and short-tailed shrew. Pipe (1982) recorded the presence of deer mouse, Gapper's red-backed vole, meadow vole, masked shrew, arctic shrew, pigmy shrew and short-tailed shrew.

Table B-3 (Appendix B) provides a listing of expected and observed microtines. Table B-4 (Appendix B) indicates overall relative abundance of each trapped species in the study area as a whole. Relative abundance and diversity of microtines and shrews is shown by habitat in Table B-5 (Appendix B).

A total of 119 individuals were trapped during sampling, for an overall trap success of 2.8%, and an average of 0.03 captures per 100 trap-nights. A total of four species of mice (deer mouse, Gapper's red-backed vole, meadow vole, and western jumping mouse) and three species of shrews (masked shrew, American water shrew and vagrant shrew) were taken during the fall 2007 small mammal trapping. The deer mouse was the most commonly taken species, comprising almost 64% of the small mammals trapped. Next in abundance was Gapper's red-backed vole, a species that comprised 46% of the small mammals trapped. The masked shrew was the most abundant shrew and was third in abundance (27.3%) of small mammals trapped. The western jumping mouse was encountered 13.6% of the time and three other species, the American water shrew, the vagrant shrew and the meadow vole, each accounted for 9% of the animals trapped. Of these species trapped in the recent survey, vagrant and water shrew had not been previously recorded. Previous studies in the FalCPF region (Pipe, 1982; Blood et al., 1977) also found deer mouse and Gapper's red-backed vole to be the most abundant small mammals.

The most widely distributed species by cover type was the deer mouse occurring in 14 of the 22 trap lines or 64% of the trap lines. This species was found resident in both open (grassy) and closed regenerating forest, as well as both dry and moist phases of hardwood and softwood forests. The red-backed vole occurred in most cover types which had well-developed understory vegetation, and was found at 45.5% of the trap lines.

Several species taken in the current study were very habitat-specific. The American water shrew was only found on the edge of creeks or ponds. The meadow vole was only found on moist sites dominated with dense sedge or grass cover. The western jumping mouse was encountered along the moist sedge-dominated edges of creeks and ponds. The vagrant shrew was only taken on two occasions both in willow/grass/sedge complexes.

Some of the differences in small mammal findings among the various studies, may be attributed to differences in study areas, habitats trapped and fire-based successional changes over the periods between surveys. Species such as the water shrew are restricted to the waters edge along creeks and ponds, habitats not trapped in either the study conducted by Blood et al. (1977) or Pipe (1982).

Bats. Pipe (1982) indicated that the breeding ranges of six species of bats may overlap the study area.These bat species include: Brown Bat (*Myotis lucifugus*), Keen's Bat (*Myotis keenii*), Silver-

haired Bat (*Lasionycteris noctivagans*), Big Brown Bat (*Eptesicus fuscus*), Red Bat (*Lasiurus borealis*) and the Hoary Bat (*Lasiurus cinereus*). No bats were observed during the current survey.

Winter Track Counts

Table B-6 (Appendix B) presents a summary of the results of all track counts. A total of 71 transect segments totaling 14.74 kilometres were walked through eight general cover types. The total distance walked per habitat type are included in the table.

The highest number of species, as determined by fresh tracks encountered during the surveys, was in the willow swamp cover type. A total of ten species of mammals including deer, moose and elk were encountered in willow swamps. This cover type also yielded the third highest snow shoe hare *(Lepus americanus)* activity, but did not show any evidence of red squirrel *(Tamiasciurus hudsonicus)* activity.

Transects run in the riparian complex habitats (ravines and river valley) recorded a total of 9 species of animal tracks. The cover type represented the second highest activity for both snow-shoe hares and red squirrels. All other cover types were well represented by mammal activity with the exception of the openings and clearings, where no mammal tracks were recorded.
The highest snowshoe hare activity was noted in the regenerating forest transects (1.07 tracks/100m) with the second highest activity in the riparian complex areas (0.99 tracks/100m). No snowshoe hare tracks were observed in transects that crossed the open clearings and few tracks were noted in either the softwood forest (0.12 tracks/100m) or mixed wood forest type (0.12 tracks/100m).

The highest squirrel activity was found in the regenerating forest (0.58 tracks/100 m) with the next highest squirrel activity recorded in the regenerating complex (0.43 tracks/100m). No squirrel tracks were encountered in the open clearings or the white spruce forest. Few squirrel tracks were recorded in the hardwood stands (0.02 tracks/100m) or the mixed woods (0.04 tracks/100m).

The most commonly encountered predator tracks were those of weasels *(Mustela erminea)* and they occurred in all cover types with the exception of the open clearings. The highest density of weasel tracks was in the regenerating forest type (0.59 tracks/100 m) and white spruce (0.23 tracks/100m). Six other types of fresh predator tracks were encountered during the winter track study. These included the lynx *(Lynx lynx)* (present in 3 cover types), the fisher *(Martes pennanti)* (present in 2 cover types), coyote *(Canis latrans)* (present in 2 cover types). Tracks of the river otter *(Lontra canadensis)* and red fox *(Vulpes vulpes)* were only noted in one cover type each. The occurrence of the river otter in the riparian complex type is not surprising as this species is known to travel and forage extensively through terrestrial cover types, often foraging for grouse bedded under the snow. No wolf *(Canis lupus)* tracks were encountered on any of the track survey lines. Wolf tracks were, however, regularly noted during other ground survey work, often associated with areas of noticeable deer activity, such as the relatively dense stands of jack pine.

Fresh deer tracks were noted in all of the cover types tested, but were most abundant in the

forested wetlands (0.77 tracks/100m), open clearings (0.66 tracks/100m) and softwood forest (0.63 tracks/100m). The use of the open clearings by deer was likely simply as travel lanes between other cover types, given their potential vulnerability to wolves in open areas. While the food supply is rather limited under most dense conifer cover, snow depths and snow crusting are reduced, providing the deer with easier access to underlying forbs and shrubs. Elk tracks were noted in three cover types and moose in only one. These latter findings likely reflect the more spotty distribution of these species.

Recent Trapping Data

The project area is located in fur block P-85. The production and cash value of furs taken for the years 2002 - 2008 are presented in Table 4-2. Only nine species of a possible fourteen commercial furbearer species were harvested since 2002 from trapping activity. Economic returns from the trapping of furbearers in P-85 during this period was quite low (total fur value of $8,076.54). During the 2002-08 period, beaver, coyote and otter brought a total value of $6,541.79, representing 81% of the total fur value. At best, these figures provide supplementary indications of furbearer presence rather than any measure of animal abundance.

Table 4.2. Trapping summary statistics for P-85 - Fort-a-la-Corne Fur Block (2002-2008).

	2002-03		2003-04		2004-05		2005-06		2006-07		2007-08		Total Revenue
Species	**Pelts**	**Value**	**Pelts**	**Value**	**Pelts**	**Value**	**Pelts**	**Value**	**Pelts**	**Value**	**Pelts**	**Value**	
Beaver	58	$1,137.38	12	$263.64	0	$0.00	54	$1,614.06	5	$111.85	0	$0.00	$3,126.93
Coyote	24	$1,397.75	0	$0.00	0	$0.00	5	$217.45	6	$337.98	0	$0.00	$1,953.18
Red Fox	11	$397.32	1	$23.37	0	$0.00	2	$48.18	3	$68.85	0	$0.00	$537.72
Squirrel	36	$31.68	53	$57.77	0	$0.00	3	$4.23	0	$0.00	0	$0.00	$93.68
Fisher	0	$0.00	1	$43.38	0	$0.00	1	$96.95	0	$0.00	0	$0.00	$140.33
Otter	0	$0.00	1	$167.10	0	$0.00	7	$1,294.58	0	$0.00	0	$0.00	$1,461.68
Weasel	0	$0.00	3	$8.58	0	$0.00	0	$0.00	4	$33.32	0	$0.00	$41.90
Lynx	0	$0.00	0	$0.00	0	$0.00	1	$180.83	0	$0.00	0	$0.00	$180.83
Muskrat	0	$0.00	0	$0.00	0	$0.00	29	$218.66	71	$321.63	0	$0.00	$540.29
Totals	**129**	**$2,964.13**	**71**	**$563.84**	**0**	**$0.00**	**102**	**$3,674.94**	**89**	**$873.63**	**0**	**$0.00**	**$8,076.54**

4.4.2 Birds

Based on the results of previous surveys (Blood et al., 1977; Pipe, 1982; and Golder Associates, 2006) and the Saskatchewan Bird Atlas (Smith, 1996), a total of 251 birds are thought to occur in the FalCPF and adjacent areas (Table B-7, Appendix B). A total of 132 of these potential species were observed during the current study. Baseline surveys by Golder Associates (2006), which were conducted in a portion of the current study area, reported observations of 83 bird species, with 66 of these occurring in both surveys.

The two most significant differences between the current study and previous studies were differences in warbler numbers and species observed, and differences in the number of species of water-based birds. A number of the water-based species reported by Blood et al. (1977) and Pipe (1982) may not occur in the current study area, as these studies focused on the Saskatchewan

River valley. Surveys by Blood et al. (1977) also included the upper reaches of Tobin Lake. Wetland species were therefore much better represented in these two earlier studies.

Upland Breeding Birds

Table B-8 (Appendix B) provides a list of the 142 bird species encountered specifically during the breeding bird survey, and their overall frequency of occurence. The list includes a single sighting of a hoary redpoll *(Carduelis hornemanni)* in a large flock of common redpolls *Carduelis flammea)*; numerous sightings of pileated woodpeckers *(Dryocopus pileatus)*; and a single sighting of a northern shrike *(Lanius excubitor).*

The late, cold spring period during the spring of 2007 appeared to either inhibit warbler calling or may have actually prevented individuals from reaching territories. The current study noted only 10 species of warblers, while Blood et al. (1977) recorded 17 species and Pipe, (1982) found 22 species.

The most broadly encountered species of songbird in the study area was the red-eyed vireo *(Vireo olivaceus)*, which occurred in 53 of the 118 plots (44.9%) of plots sampled. Although this species in generally attributed to hardwood forest it appeared to be present wherever some hardwood vegetation occurred. The white-throated sparrow *(Zonotrichia albicollis)* (33.1% of the plots) was also widely distributed throughout the area as was the Chipping sparrow *(Spizella passerina)* (23.7% of plots) and the dark-eyed junco (*Junco hyemalis*) (21.2%). The most broadly distributed warbler observed was the common yellowthroat *(Geothlypis trichas)* (16.9%). The least flycatcher *(Empidonax minimus)* was encountered in 14.4 percent of the plots sampled.

A major difference noted in the current study compared to studies conducted by Blood et al. (1977) and Pipe (1982), was the limited species of warbler encountered during the current study. This maybe in part due to habitat differences but the most obvious difference between the three studies was the very cold and late spring and the fact that incidental observations appeared to support the idea that may of the resident warbler likely did not appear.

Upland Breeding Bird Results by Habitat

The following discussion of bird occurrence by habitat is based on the results presented in Table B-9 (Appendix B).

O*pen regenerating jack pine* was sampled by 20 plots. This habitat exhibited the largest number of species found in any one cover type, with a total of 21 species recorded. The dark-eyed junco *(Junco hyemalis),* chipping sparrow, red-eyed vireo were the most common species, each occurring in 6 or 30% of the plots. Densities ranged from 0 to 8.91 singing males/ha, with an average of 3.82 singing males/ha. Only two species of warblers were recorded in plots in this habitat type in comparison to the six warbler species noted in the closed (mature) jack pine forest type.

C*losed regenerating jack pine* was sampled by 7 plots. The chipping sparrow and red-eyed vireo were equally common, occurring in 4 of the 7 plots or 57 %. A total of 7 breeding bird species

were noted during the surveys of this cover type. Densities ranged from 0 to 6.36 singing males/ha, with an average of 3.45 singing males/ha.

Open (mature) jack pine forest was sampled by 4 plots. The chipping sparrow occurred in 50% of the plots, while nine other species occurred in only a single plot each, for a total of 10 species observed in this cover type. Singing male densities ranged from 2.55 to 6.36 singing males/ha, with an average of 4.14 singing males/ha.

Closed (mature) jack pine forest was sampled with 12 plots. Of the twelve plots eight or 67% of these plots supported red-eyed vireos. This species was the most commonly observed species across all of the plots, but would typically be more common in hardwood or deciduous forest types. Quite a broad contingent of warblers were found in this habitat including the common yellowthroat, black & white warbler (*Mniotilta varia*), and magnolia warblers (*Dendroica magnolia*) as well as the American redstart (*Setophaga ruticilla*), yellow warbler (*Dendroica petechia*) and ovenbird (*Seiurus aurocapillus*). This cover type supported a range of 1.27 to 6.36 singing males/ha for an average of 3.39 singing males/ha.

Closed black spruce habitat was sampled by 5 plots. The white-throated sparrow was the most commonly encountered species, found in 3 of the 5 plots or 60% of plots. The second most common species was the ruby-crowned kinglet that occurred in 33% or 2 of the 5 plots. Singing male densities ranged from 1.27 to 6.36 singing males/ha, and averaged 3.05 singing males/ha.

Closed white spruce habitats are not extensive and were sampled by only 2 plots. Only 2 species were recorded in one plot, while 6 species were recorded in the second, with no species similarities between the plots. Singing male densities ranged from 2.55 to 5.09 singing males/ha, with an average of 3.82 singing males/ha.

Open mature hardwood forest was sampled by 4 plots. The red-eyed vireo was the most commonly recorded species, present in 3 of the 4 plots (75%). Singing male densities ranged from 3.82 to 8.91 singing males/ha, with an average density of 6.05 singing males/ha.

C*losed mature hardwood* forest was sampled by 23 sample plots. The red-eyed vireo was again the most commonly encountered species, occurring in 70% of the plots. This cover type supported the highest diversity of songbirds with a total of 29 species. This was significantly higher than the diversity noted in the open hardwood stands where only 10 species were recorded. Singing male densities ranged from 1.27 to 15.27 singing males/ha, with an average of 5.09 singing males/ha.

C*losed regenerating hardwood* was sampled by 8 plots. The red-eyed vireo was noted in 6 of the 8 plots or 75%. A total of 12 species of singing males were recorded. Singing male densities ranged from 1.27 to 8.91 singing males/ha, with an average of 4.30 singing males/ha.

T*rembling aspen-white spruce* was sampled by 6 plots. Thirteen species of songbirds were recorded in total among the plots. The chipping sparrow and white-throated sparrow shared the highest occurrence, each observed in 50% of the plots. Singing male densities ranged from 3.82 to 8.91 singing males/ha, with an average of 6.05 singing males/ha.

Treed fen was sampled by three plots. A total of only 5 species were recorded within this type. Wilson's or common snipe (*Capella gallinago*) was recorded at all three plots; treed fens are one of this species' key nesting habitats. Singing male densities ranged from 3.82 to 6.36 singing males/ha, with an average of 5.52 singing males/ha.

Shrubby fen was sampled with two plots. A total of only 4 species were observed. The white-throated sparrow was the only species common to both plots. Singing male densities ranged from 2.55 to 3.82 singing males/ha, with an average of 3.18 singing males/ha.

Treed (conifer) swamp was sampled by 6 plots, which recorded a total of only 7 species. Ruby-crowned kinglet (*Regulus calendula*) was the dominant, occurring in 4 of the 6 plots (67%). Singing male densities ranged from 1.27 to 6.36 singing males/ha, with an average of 3.39 singing males/ha.

Shrub swamp was sampled by 7 plots. These willow and graminoid-rich areas are rich breeding bird habitat. A total of 15 species were recorded in this habitat. Red-eyed vireos and common yellowthroat were the most common species observed (57% of the plots). Singing male densities ranged from 2.55 to 12.73 singing males/ha, with an average of 6.52 singing males/ha.

Additionally, two habitat complexes were sampled. The *beaver pond complex* was sampled with 6 plots and was found to support 14 species. The white-throated sparrow was the dominant, occurring in 83% of the plots. Singing male densities ranged from 2.55 to 19.09 singing males/ha, with an average of 8.48 singing males/ha.

Two *river shoreline* plots were sampled with a total of 9 species recorded. Six species were recorded at one plot and 11 species at the second. The most common species were the American goldfinch (*Carduelis tristis*) and the song sparrow (*Melospiza melodia*), which were observed in both plots. Singing male densities ranged from 7.64 to 14.00 singing males/ha, with an average of 10.82 singing males/ha.

Waterfowl and Other Wetland-dependent Species

A total of 39 water-dependent species (ducks, geese, grebes, mergansers, cranes, pelicans and herons) were recorded during the current study (Table B-8, Appendix B). Nineteen of these species were observed during the aerial survey and the rest during ground surveys.

As mentioned previously, higher numbers of both wetland species and individuals were noted during earlier studies in the FalCPF (Blood et al, 1977; Pipe, 1982). These studies were conducted specifically for proposed hydro projects and both concentrated on wetland habitat along the river. The 1977 study also included the upper reaches of Tobin Lake.

Waterfowl habitat in the current study is restricted to a short stretch of the South Saskatchewan River, tributary creeks and several ponds or small lakes. Overall waterfowl productivity is limited primarily by the paucity of water bodies in the area, as well as a limited amount of suitable nesting habitat. The primary waterfowl habitat in the Star-Orion LSA is restricted to beaver impoundments along the tributary drainages feeding into the Saskatchewan River.

The only colonial nesting bird in the FalCPF is the Great Blue Heron *(Ardea herodias).* During the fall of 2007, a single heron was observed in the marsh adjacent English Creek Bridge, and a second heron was observed flying across the Division Road approximately 4 km east of English Creek. A single heron was again observed at the English Creek Bridge during the spring amphibian survey. Based on these limited observations and known habitat preferences, it appears that the marshes associated with major tributary drainages such as English Creek and the Saskatchewan River are likely utilized in a limited manner by foraging great blue herons. No heronries were observed during the recent studies, but one heronry was found in the Saskatchewan River valley during the wildlife study for the Nipawin dam (Blood et al., 1977).

A breeding pair of sandhill cranes *(Grus Canadensis)* with a single juvenile was observed a few hundred metres northeast of the Shipman Bridge on the northern edge of FalCPF. This species utilizes wetland complexes for nesting and summer feeding. Effort should be made to avoid this species when suspected nesting pairs are encountered.

Raptors

Raptors are an important link in many food chains involving small mammals, birds, amphibians, reptiles, and fish. Raptor species including eagles, hawks, falcons and owls are recorded in the study area from all baseline surveys and historical sources, are also listed in Table B-8 (Appendix B). Stick nests locations were noted during the ungulate aerial surveys (Figure C-24, Appendix C). Most of these nests were subsequently surveyed during the spring waterfowl survey for raptor occupancy. During the spring waterfowl survey, a bald eagle *(Haliaeetus leucocephalus)* was observed with young in a stick nest overlooking the Saskatchewan River along the eastern flank of the Star-Orion LSA. The other stick nests were smaller and likely used by crows, red-tailed hawks and great horned owls, though no apparent activity was detected during the waterfowl survey. None of these nests were readily accessible from the ground.

Great grey owls *(Strix nebulosa)* were noted on several occasions across the PLSA during winter wildlife fieldwork, as well asin the East Ravine during the spring owl survey. However, this species likely nests only in small numbers within the Star-Orion LSA, and most nesting activity is likely concentrated in the more northerly reaches of the FalCPF, where an abundance of suitable habitat may be found. In Alberta, Great Gray Owl nest sites are generally in *"undisturbed woodlands, particularly forests with a mixture of coniferous muskegs, deciduous forest and natural small clearings"* (Salt & Salt, 1976); therefore, their nesting is most likely restricted to areas north of the Star-Orion LSA, which has a more favourable habitat mix.

Upland Game Birds

No formal census techniques were utilized to assess upland game populations during the current baseline program. The majority of observations come from incidental observations made during the course of other surveys.

Three upland game birds were frequently observed during the conduct of the 2007/08 terrestrial baseline program: ruffed grouse *(Bonasa umbellus),* spruce grouse *(Canachites canadensis),* and sharp-tailed grouse *(Pedioecetes phasianellus).* Ruffed grouse were most often observed in

trembling aspen forests of all ages, while spruce grouse were observed in dense upland black spruce and white spruce forests. Sharp-tailed grouse were most frequently observed in areas of sparse and low density regenerating jack pine forest, which often has a grass and shrub-rich understory.

Notably, two willow ptarmigan *(Lagopus lagopus)* were reported in riparian willow habitat near the Shipman Trail bridge in early December, 2008, by a crew establishing forest mensuration plots for Saskatchewan Environment. A small flock of ptarmigan had been observed along the Saskatchewan River during winter fieldwork by Pipe (1982). In general, this species is expected as a winter resident in selected years.

4.4.3 Amphibians and Reptiles

The spring 2008 amphibian survey (Tables B-10 and B-11, Appendix B), along with numerous incidental observations, indicated the widespread occurrence of boreal chorus frog, wood frog and Canada toad across the study area. However, no signs of leopard frog (a listed species of concern) were observed during any of the surveys. Although the Tiger salamander was only encountered on one occasion along English Creek, it likely occurs in many of the more permanent wetlands.

While garter snakes are known to occur regionally (Pipe, 1982; Blood et al., 1977), no tracks or sightings were observed during the recent surveys. If this species does occur in the current study areas, it would most likely be found in selected areas along the Saskatchewan River valley and the farmlands surrounding the Fort-a-la-Corne Provincial Forest.

4.4.4 Species at Risk

A total of 8 wildlife species at risk potentially overlap the study area (Table B-12, Appendix B) (SKCDC, 2009c). The *threatened* bird species: common nighthawk (*Chordeiles minor*), olive-sided flycatcher (*Contopus borealis*), Canada warbler (*Wilsonia canadensis*), whip-poor-will (*Caprimulgus vociferous*) and chimney swift (*Chaetura pelagicaare*), have been historically reported in the FalCPF region. However, only the first three were observed during the recent survey. The Short-eared Owl (Asio flammeus), a species of *special concern*, may potentially occur in the region, but was not reported in available previous surveys nor observed during recent surveys. The wolverine, another threatened species, was not observed during the course of recent surveys, but may have occurred historically in FalCPF. The leopard frog, a species of *special concern* is a historical resident of FalCPF, but was not observed during the current study.

4.4.5 Wildlife Habitat

Habitat Overview

The Vegetation Cover Type (VCT) map (Figures 3-1 and 3-2, in section 3.3.2) illustrates the distribution of terrestrial ecosystems distributed across the FalCPF and provides suitable context for discussion of wildlife habitat. The VCT map in combination with the various wildlife survey results highlights the potential importance of certain habitat areas for specific wildlife groups or

species. The VCT mapping is based on the most current forest inventory mapping by the Forest Service of the Ministry of Environment, supplemented by air and ground observations compiled from various baseline surveys. The forest inventory data were reorganized into ecologically-based land cover classes with wildlife habitat significance. Each of these habitat units are based primarily on variations in forest cover type, height, density, and age class/seral stage. Additional information on the habitat classification and mapping process may be found in the Vegetation section.

The current FalCPF landscape is the result of both natural and human forces. Over the last 40 years of wildlife surveys, numerous forest fires (1967, 1989, 1995, 1998, and 2000), extensive dwarf mistletoe infection of jack pine, forest harvesting and road and trail development, have significantly altered habitat distribution and characteristics. Such disturbances reduce the proportion of old growth forest, while increasing the area covered by early to mid-seral stages. These disturbance-induced changes have significantly changed the habitat proportions in FalCPF since earlier studies such by Pipe (1982) and Blood et al. (1977). This has likely affected the distribution of many animal species, including ungulates. Habitat distribution changes will continue to occur as the burned areas undergo succession.

Over many decades, repeated burning, timber harvesting and other anthropogenic disturbances, have produced a complex mosaic of open and closed jack pine-dominated forest in various stages of succession, providing a wide variety of habitats. Extensive areas of jack pine regeneration exhibit a complex understory of pioneer and late succession plant species, likely important for elk, deer, upland game birds, song birds and small mammals. Adding to the habitat mix are the tall aspen and mixedwood forests of the adjacent Saskatchewan River valley and the many steep sided ravines draining into it. These riparian areas appear to be important wildlife travel corridors and typically have higher species richness than adjacent uplands, with extensive use by moose, elk, small mammals, songbirds, and amphibians. In turn these areas would be expected to receive concentrated hunting activity by carnivores. Willow swamps, which are the dominate wetland type throughout the FalCPF, is an important winter feeding habitat for moose.

Vegetation mapping indicated a predominance of early succession jack pine regeneration in much of the Star-Orion LSA and surrounding areas. A significant portion of this regeneration is very open (low density) with a higher diversity and abundance of shrubs, forbs and grasses than might be expected in a boreal setting. Early succession plant communities are known to provide elk with forage of both high quality and quantity (Blood et al, 1977; Hunt, 1977a; Hunt and Phillips, 1978). Therefore, these areas represent an important food source for deer and elk, when away from wetlands and riparian areas.

The remnant grassland pockets found on the steep south-facing slopes of the Saskatchewan River valley and sedge-rich fens (‘wet meadows’) in the northern portion of the FalCPF are known to provide good elk habitat (Canada Land Inventory, undated). The agricultural fringe, immediately north of the provincial forest, has historically also been an important forage area for elk (Canada Land Inventory, undated).

The higher than expected ungulate numbers observed in recent surveys may be partly the result of the current high proportion of regenerating forest, as well as proximity to the Saskatchewan

River Valley and the numerous tributary stream ravines which cut across much of the southern half of the FalCPF. Over the course of the three winter aerial ungulate surveys, it was noted that there was a concentration of moose observations in the southwest corner of the Star-Orion LSA. Based on analysis of the vegetation cover type map, these observations appear to be related to the habitat complexity in the area. The habitat in this area consists of a complex mixture of forest and wetland cover types in various stages of succession along with a high degree of terrain variability, including several tributary drainages into the Saskatchewan River valley.

Based on moose aerial observations and ground survey data, the widely distributed shrub (willow) swamp areas were important focal points for winter browse activity. Moose were also common in regenerating aspen forest and mature deciduous and mixedwood forests with a high shrub diversity and density.

The complex riparian areas (Saskatchewan River valley and tributary stream ravines), act as important travel corridors, as well as provide escape terrain and additional sources of food and water. The numerous springs at the bases of many ravine slopes provide important sources of minerals in the diet of ungulates (‘mineral licks’).

Both deer and elk appear to have adapted to recent human activity in the LSA. These activities disturb the existing vegetation layer and create an environment favourable for the invasion of weedy and or grassland related species, which based on food habits survey results, both elk and deer appear to favour and seek out.

The predominance of rapidly drained sandy soils has prevented an abundance of sloughs and ponds, resulting in a paucity of suitable waterfowl nesting habitat (Canada Land Inventory, undated). The adjacent Saskatchewan River system also has poor capability for waterfowl production due to unsuitable shorelines and currents, but may be used during staging and migration (Canada Land Inventory, undated). However, beaver ponds associated with ravines, may offer suitable nesting habitat for some waterfowl species.

Habitat Use Among Vegetation Cover Types

Jack Pine: Dry to Fresh

This cover type is the most extensive in the Star-Orion LSA and is locally important for winter survival of ungulates, particularly deer. Forest age, height and densities vary considerably across this type due to a complex fire and forest harvesting history.

The understory of very open, low density, (<30% cover) regenerating forests exhibit a greater abundance of graminoid and forb cover, which favours spring, summer and grazing by deer and elk. In winter these open areas are less favourable food sources for deer due to overall deeper snow cover and greater tendency for snow crusting. Due to their greater size and strength, elk continue to utilize these areas throughout the year, with the exception of later winter when the snow is typically deepest (due to drifting) and crusting more severe. The severe crusting of late winter in these open areas also creates conditions most favourable to predation by wolf and

coyote packs. Denser regenerating forests have somewhat lower understory vegetation diversity, than more open regenerating areas, reducing its potential as an ungulate food source.

Denser variants of this cover type provide limited grass, forb and shrub production and therefore of limited suitability as a food source for ungulates, but may be somewhat more important in early spring. However, food habit transects indicate that, what little shrub growth is available (i.e., Saskatoon, pincherry and choke cherry), is used as a winter food source. Dense mature jack pine forests provide important winter thermal cover and protection from predators for all ungulates, particularly deer since they are smaller and more sensitive to cold. These areas also do not experience the same degree of snow crusting as more open cover types (e.g., regenerating areas). Snow crusting, which is most common in late winter, makes winter travel and foraging more difficult for many ungulates, particularly deer. Thicker crusts enable wolves and coyotes to travel readily on the snow surface, while the sharp hooves of ungulates tend to break through, thereby increasing predation.

The more open regenerating jack pine areas, with a more diverse understory, are also important for small mammal production, mainly consisting of deer mouse and Gapper's red-backed vole in average to above average numbers. The relatively abundant small mammal population in these areas would tend to support increased hunting by species such as red-tailed hawks and kestrels, which were frequently observed hunting these areas; the latter cavity nesting in snags which are common to this cover type. Denser jack pine forests also hosted deer mouse and Gapper's red-backed vole, but in lower numbers than most other habitats. These low density areas exhibited some use be snowshoe hare and red squirrels, but these species were more abundant in dense jack pine regeneration. The winter track counts did not detect much use by other fur-bearers. The most graminoid-rich, open regeneration areas, also provide the most suitable nesting habitat for sharp-tail grouse, which were frequently observed in these areas.

Most variants of the jack pine cover type provide limited song bird habitat, with the exception of some low-density jack pine areas with shrub-rich pockets in close proximity to open grassy areas. These localized habitat complexes provide additional habitat structure and more insect diversity and availability. Typical song bird species observed in open jack pine forest include chipping sparrow, brown creeper and ruby-crowned kinglet. Typical song birds observed in closed jack pine areas include Swainson’s thrush and white-throated sparrow. Red-eyed vireo was also frequently observed in jack pine cover, which is atypical, as this species is usually specific to hardwood forests.

White Spruce – Fresh to Moist

These areas have a limited understory dominated by feathermosses, limiting its potential for most wildlife species. Denser stands may provide thermal protection for ungulates. Winter use by ungulates was indicated by various winter surveys, likely for thermal cover. Songbird typical of this habitat include Swainson’s thrush and white-throated sparrow. High red squirrel densities were noted in the fresh (drier) white spruce stands.

Dry to fresh variants consisting of mixed white spruce and jack pine also occur within this cover type. These mixed conifer areas would likely support a high red squirrel population, which may

attract predators such as fisher and martin. This variant would also be expected to provide suitable thermal cover for ungulates in winter. While not specifically sampled, expected song bird species would likely include gray jay and white-throated sparrow.

Jack Pine – Trembling Aspen: Dry to Fresh

This cover type would be expected to host higher microtine and shrew diversity and abundance compared to pure jack pine cover, due to the presence of aspen and slightly higher understory diversity. Track count data indicates higher snowshoe hare numbers than pure jack pine, and therefore greater potential use by predators such as fisher and lynx. Aerial survey and track count data also indicated some evidence of moderate winter use by deer, elk and moose. Song bird species diversity was very low in this type, with only dark-eyed junco and ovenbird observed common in the mature variant, and white-throated sparrow and red-eyed vireo common in the young variant.

Some fresh sites host mixtures of jack pine, black spruce and trembling aspen, but are of limited distribution and were thus mapped as a variant of the *Jack Pine – Trembling Aspen: Dry to Fresh* cover type. As a result this variant was not targeted during wildlife surveys. It would be expected to provide winter thermal cover for ungulates due to the conifer dominance, but hosting limited foraging potential due to an understory often dominated by feathermosses. The inclusion of black spruce would be expected to support moderate to high levels of red squirrel, which may attract fisher, martin and other predators. This type would be expected to host many of the same song bird species as closed jack pine and black spruce forests.

Black Spruce: Moist

The diversity of the understory is very limited and dominated by feathermosses; as such, overall use by wildlife is limited, with the exception of spruce grouse, which favour these areas. In winter, the dense conifer cover provides excellent thermal protection for ungulates. Ungulate aerial, track count and food habit surveys indicated moderate winter use by ungulates, particularly deer, probably for thermal cover and protection from predators. The most common song birds were ruby-crowned kinglet and white-throated sparrow.

Trembling Aspen –Spruce: Fresh

The mixedwood nature of this cover type provides moderate levels of ungulate browse availability and low to moderate thermal cover, each varying with tree species proportions (ie., aspen vs. white spruce dominant) and density (open vs. closed). More open, aspen dominant variants have a more significant shrub component, improving support for small mammals, grouse and ungulates. The additional shrub layer complexity of the more open variants, improves song-bird potential, but song bird densities remain relatively moderate compared to aspen forest. Chipping sparrow, white-throated sparrow, were the two dominant song bird species found in this type. Ungulate aerial, track count and food habit surveys indicated moderate winter use by ungulates.

Trembling Aspen: Dry to Fresh

The relative importance of this cover type for wildlife varies depending on density and the understory composition. Overall, the most dominant understory shrub in this cover type is beaked hazel, which favours a high red squirrel population. Widespread evidence of intensively winter browsing of hazel by elk and moose was apparent from both food habit and other biophysical surveys; not surprising given its predominance under most aspen cover. Variants dominated by a green alder understory have relatively low suitability for both small mammals and ungulates; however, there is some evidence of use by feeding ruffed and sharp-tail grouse, particularly in winter. Variants with increased amounts of Saskatoon berry, pincherry and choke cherry improve the suitability for small mammals, grouse and ungulates, thereby attracting more attention from predators. The additional shrub layer complexity of this type makes for somewhat more favourable song-bird habitat than the jack pine cover type, but song bird densities remain relatively moderate compared to moister aspen forest. The most common song birds were red-eyed vireo and ovenbird, both typical of hardwood forests.

Ungulate aerial, track count and food habit surveys indicated moderate to high winter use by all ungulates for browse. A significant proportion of elk and moose sightings were recorded in this type, particularly along the Saskatchewan River valley and its tributary streams (ravines).

Trembling Aspen: Moist and Balsam Poplar – Trembling Aspen: Moist

Trembling aspen and balsam poplar forest with moist soils, typically have more willow and graminoid cover in their understories than the dry to fresh aspen cover type, and also exhibits a higher red-osier dogwood content, though still typically less than 15% cover. As such, this cover type provides slightly better elk and moose habitat, but with lower use by snowshoe hare and squirrel. Moist aspen cover supports average to above average small mammal density and diversity, including a variety of shrews, as well as the ubiquitous deer mouse, Gapper's red-backed vole. Use by snowshoe hare and red squirrel is relatively low. The higher understory diversity and complexity of this type, favours a higher diversity and population of song birds. Red-eyed vireo and ovenbird, both typical of hardwood forests, were the most common species.

Ungulate aerial, track count and food habit surveys indicated high winter use by all ungulates, as a source of winter browse. Most elk and moose sightings were recorded in this type, particularly along the Saskatchewan River valley and its tributary streams (ravines).

Treed Bogs and Fens

These areas provide potential habitat for unique small mammal species such as the heather vole and the northern bog lemming. Notably, a single occurrence of the regionally uncommon heather vole was reported in bog habitat by Blood et al. (1977). While northern bog lemming was not reported during recent or previous surveys (Blood et al., 1977; Pipe et al., 1982), if this species does occur in the area, it would most likely be found in this habitat. Bogs are typically important foraging areas for great gray owls, which are known to nest and remain as winter residents in FalCPF (Pipe et al., 1982). Some specific passerines, such as ruby-crowned kinglet, dark-eyed junco and Wilson’s snipe may also select this habitat for foraging and nesting. Open, graminoid-

rich areas may be utilized by sharp-tailed grouse during the nesting season. Ungulate aerial, track count and food habit surveys indicated some winter use of treed bogs and fens by moose, likely for thermal cover and protection from predators.

Treed Swamp

While having similar wildlife habitat potential to that of treed bogs and fens, the seasonal fluctuations in the water table, which characterize swamp areas, appears to reduce small mammal diversity and abundance. The black spruce and tamarack cover provides similar thermal cover for ungulates as with other treed wetlands. Areas of old-growth treed swamp, with very complex forest structure are common in the northern half of FalCPF. The most commonly observed song birds in treed swamp were ruby-crowned kinglet, dark-eyed junco and chipping sparrow.

Open Fens

The predominance of sedges and low shrubs, support relatively high microtine and shrew density and diversity, including meadow vole, Gapper's red-backed vole and western jumping mouse and masked shrew. These small mammal characteristics are favourable for a variety of predators including weasel, fox, coyote, and great gray owls. Graminoid-rich areas may be utilized by sharp-tailed grouse during the nesting season. The dominant species observed was the white-throated sparrow. Winter use by ungulates appears limited.

Shrub Swamp

Aerial ungulate, winter track and food habit surveys indicated that shrub-rich swamps, particularly willow-rich variants are very important winter food sources for moose. In summer, songbird diversity is among the highest of all habitats surveyed. Microtine densities vary with sedge and grass cover, and are somewhat limited, likely due to the seasonal water fluctuations characteristic of swamps. Graminoid pockets among the shrubs are utilized by ungulates throughout the year for bedding sites. Red-eyed vireo and common yellowthroat were the dominant song birds observed in this habitat.

Marsh

These constantly wet, often spring-fed, graminoid- and shrub-rich areas are mostly associated with the fringes of small sloughs and in the tributary stream valleys feeding into the Saskatchewan River Valley. Marshes are particularly important waterfowl habitat, known to host nesting Canada geese, mallards, and teal. The frequent pools of open water and predominance of cattails, reeds and sedges also support a unique assemblage of songbirds. The dominant song birds were the white-throated sparrow, least flycatcher, song sparrow and red-eyed vireo. Red-winged blackbird and tree swallow, both typical of marsh habitat, were also present, though in lower numbers. Great blue heron and belted king-fisher were also frequently observed at beaver ponds and other small water bodies which are commonly associated with these marsh areas.

Wildlife and Habitat Sensitivities

With regard to future mine development, the proposed project is located within one of the least complex portions of the FalCPF and all habitats observed within the Star-Orion LSA are well-represented in other portions of the FalCPF. Therefore, the overall impact is expected to be small on a regional basis. Some bird species such as the barn swallow and eastern phoebe may actually respond in a positive manner to development, taking advantage of building structures during nest construction.

However, there are some specific habitat areas that have more sensitivity to development. Of all the habitats in the Star-Orion LSA, the most sensitive habitats appears to be the numerous ravines which extend into the Saskatchewan River valley, and the valley itself. The ravines were host to signs of intensive use by all ungulates, which is not surprising given that the ravines host a complex assortment of habitats including beaver ponds, marsh, fen, dense conifer (thermal cover) and mixedwoods forests in various stages of succession and pockets of grassy, south-facing slopes. This complex habitat mixture provides a wide variety of food and water sources, and the numerous mineral springs are often visited by ungulates as a source of minerals. Of particular note is an area of concentrated winter moose activity in the southwest corner of in the Star-Orion LSA. This area contains a spatially complex mixture of ravine, wetland and upland habitats and should be avoided by development activity. Also of special note is English Creek along the east side of the Star-Orion LSA, which appears to be the most important north-south travel lane in the study area. The English Creek valley is host to a variety of species of wildlife and appears to act as a ‘spatial buffer’ from adjacent exploration activities, due to its position in the landscape and its physical characteristics.

The development of the proposed northern transportation corridor should be considered in the anticipated EIA, due to the risk of wildlife vehicle collisions, particularly with large carnivores and ungulates.

5.0 SUMMARY

Based on the ubiquitous and dominant occurrence of jack pine across the FalCPF, one might initially assume that the area and the Star-Orion LSA in particular is relatively simple ecologically. However, the various terrestrial field surveys indicated a deeper level of ecological complexity, reflecting three primary biogeographic factors:

- Location of the study area in the Boreal Transition Ecoregion (i.e., where the prairie parkland transitions into boreal forest);
- Inclusion of the Saskatchewan River valley and numerous tributary streams (ravines);
- Multiple stages of succession caused by numerous forest fires and other historical disturbances

Glaciation and subsequent eolian processes have been the major geomorphic agents responsible for the current landscape in Fort-a-la-Corne Provincial Forest. However, along the Saskatchewan River valley and its tributary ravines, many steep slopes have been reworked by post-glacial land slides and gully erosion; these processes remain active. The regional surficial geology is characterized by extensive deposits of fluvial-lacustrine (deltaic) sands and silts overlying silt and clay-rich glaciolacustrine deposits, which in turn overlie clay-rich glacial till. In many areas the deltaic sands and silts have been reworked by wind producing a complex arrangement of stabilized eolian landforms including dunes, dune track ridges and blow out depressions. Gravel deposits appear to be very rare.

Eutric Brunisolic soils of the Pine Association are predominant, both regionally across the FalCPF (62.65%) and locally within the LSA (64.83%). Gravelly Kewanoke soils comprise a minor portion of the regional Brunisolic soils (0.07%), but were not observed within the LSA. Luvisolic soils of the La Corne and Porcupine Plain Associations cover approximately 18.89% of the FalCPF, but only 6.96% of the LSA. Organic soils (i.e., peat >40cm thick) as a group cover approximately 10.27% of the land base regionally, and 8.95% within the LSA. Regosolic-dominated Hillwash and Alluvium Complex soils, cover a mere 2.11% regionally, but are more prominent within the LSA, covering 14.68%. Gleysolic soils of the Arbow, Meadow and Marsh Complexes cover approximately 3.02% of the FalCPF, and 1.70% of the LSA. Dark Gray Chernozems of the Nisbet and Carrot River Associations cover approximately 2.23% regionally within the FalCPF, with Dark Gray Chernozems of the Weirdale and Nisbet Associations occupying a minor portion of the LSA (assumed to be <1%) as unmapped inclusions. Water covers a mere 0.76% of the FalCPF, with a slightly higher proportion of water cover (3.37%) within the LSA.

Agricultural capability Class 6 lands are predominant both regionally (68.52% of FalCPF) and locally (80.64% of the LSA). Potentially arable land (i.e., Classes 2, 3 and 4) is restricted to a mere 24,640 ha (18.60%) of FalCPF, and 1,047 ha (8.61%) of the LSA. Forest capability Classes 5 and 6 lands are predominant both regionally (75.84% of FalCPF) and locally (82.21% of the LSA). These lands have severe to very severe limitations to commercial forestry. These inherent soil and landscape limitations, along with the fact that much of the LSA is covered by young

(<20 years old) regenerating forest, results in limited forest harvesting potential in the LSA for at least 50 years.

FalCPF is located in the Boreal Transition Ecoregion, which features vegetation characteristics intermediate between the Mid-Boreal Ecoregion to the north and the Aspen Parkland Ecoregion to the south. Frequent forest fires and a long history of forest harvesting have produced a successionally complex mosaic of vegetation communities. The *Jack Pine: Dry to Fresh, Jack Pine - Trembling Aspen: Dry to Fresh, and Trembling Aspen: Dry to Fresh* cover types extend across more than two-thirds of FalCPF (67.89%; 90,192 ha). These same three cover types cover approximately 83.23% (10,122 ha) of the Star-Orion LSA. Of all the upland cover types, the *Jack Pine: Dry to Fresh* type is predominant both regionally and locally, covering 40,734 ha (30.66%) within FalCPF and 6,199 ha (50.97%) of the LSA. Wetlands cover a total of 16.16% (21,468 ha) of FalCPF, and 5.40% (656 ha) of the LSA, with *Treed Swamp* and *Shrub Swamp* the predominant wetland cover types in both study areas. Vegetation surveys identified a total of 418 vascular plant species, of which 11 species were provincially rare, and 26 are listed as invasive or noxious species by the Saskatchewan Conservation Data Centre.

The general botanical species richness of the area, and the age and structural complexity of each terrestrial habitat, in turn drives much of the habitat use by wildlife. One surprising outcome of these factors, was the unanticipated understory species diversity of regenerating jack pine forest, which dominate much of the Star-Orion LSA; this has lead to higher than expected use by ungulates, small mammals and song birds in this cover type. Nonetheless, the complex habitat found in the ravines and along the Saskatchewan River valley, as well as the willow swamp habitats, remain the richest and most important wildlife habitat in both the Star-Orion LSA and surrounding areas. Fortunately these important habitats are well-represented outside the Star-Orion LSA. Additionally, the vegetation cover mapping indicates that the Star-Orion LSA exhibits the least diverse habitat within FalCPF.

As expected, the current study confirmed the presence of elk, white-tailed deer, moose and mule deer. All ungulate populations appear to be robust and consistent with historical trends. Mule deer were confirmed as being present in low numbers, which is consistent with historical records. The most important habitat for elk appeared to be the regenerating jack pine areas, ravine complex and south-facing valley slopes, the latter two habitat areas being the most important due to the greater diversity and volume of food sources. The regenerating jack pine areas are both extensive in areas and also host a complex mixture of open areas with jack pine of varying densities, underlain by a highly variable and unexpectedly diverse assortment of grasses, herbs and shrubs; these factors favour its use by elk in both summer and winter. The steep terrain found in these areas are also important for elk breeding activity in fall, particularly bugling. Deer made use of a broad variety of habitats, with both dense regenerating and mature jack pine forests being of critical importance in late winter due to the lower snow depths and limited crusting and provision of thermal cover provided by these conifer areas. Moose also made extensive use of the ravines, the Saskatchewan River valley and the upland willow swamp habitats. In these areas, moose targeted willow and regenerating aspen as primary winter food sources. The ravines also host numerous beaver ponds, streams, mineral springs and ‘mineral licks’, as well as a diverse assortment of foods for ungulates.

During our current study we estimated the wolf population to consist of approximately 15-18 animals grouped into at least three packs and possibly four. The largest packs observed were 5 and 6 animals. However, wolves were regularly noted in singles and pairs, perhaps due to the high deer population and the ease of bringing down this relatively small ungulate. During the study there was some evidence to suggest that wolves were moving out of the FalCPF and into the farmland. The Ministry of the Environment did issue some special trapping permits during the winter of 2008-09 to several trappers in the James Smith Reserve in an effort to reduce the resident wolf population

Historically lynx were thought to be periodic winter resident. However, the current study confirmed the presence of a summer breeding population of lynx. The current study also indicates both a fairly robust snowshoe hare population, the primary prey of lynx. While reported as present in previous surveys, the current study also confirmed the presence of a breeding cougar population in FalCPF.

Small mammal results from the current study are consistent with historical surveys, with populations at expected levels. The only notable exception being the recent observation of water shrew, unrecorded in previous surveys.

The only COSEWIC-listed wildlife species observed in the area were the common nighthawk (*Chordeiles minor*), olive-sided flycatcher (*Contopus borealis*), and Canada warbler (*Wilsonia canadensis*), all listed as *threatened*. The leopard frog, a COSEWIC species of *special concern*, was historically recorded, but was not observed during the current study.

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APPENDIX A – Vegetation Data Tables

Table A-1. Vascular plant species list derived from 2007/2008 baseline surveys.

Scientific Name	Common Name	*Synonyms*	Growth Form
Acer negundo	Manitoba Maple		T
Achillea millefolium	Common Yarrow		F
Achillea sibirica	Siberian Yarrow		F
Actaea rubra	Red Baneberry		F
Agastache foeniculum	Giant Hyssop		F
Agoseris glauca	Prairie Agoseris		F
Agrimonia striata	Woodland Agrimony		F
Agrostis scabra	Rough Hair Grass		G
Alisma plantago-aquatica	European Water Plantain		F
Alnus incana ssp. *rugosa*	River Alder	*Alnus rugosa*	S
Alnus viridis ssp. *crispa*	Green Alder	*Alnus crispa*	S
Amelanchier alnifolia	Saskatoon		S
Amerorchis rotundifolia	Round-Leaved Orchid	*Orchis rotundifolia*	F
Andromeda polifolia	Bog Rosemary		S
Androsace septentrionalis	Pygmyflower		F
Anemone canadensis	Canada Anemone		F
Anemone cylindrica	Long-Fruited Anemone		F
Anemone multifida	Cut-Leaved Anemone		F
Anemone riparia	Riverbank Anemone		F
Antennaria neglecta	Broad-Leaved Pussytoes		F
Antennaria parvifolia	Small-Leaved Pussytoes	*Antennaria microphylla*	F
Apocynum androsaemifolium	Spreading Dogbane		S
Apocynum cannabinum	Indian Hemp or Hemp Dogbane		S
Aquilegia brevistyla	Small-Flowered Columbine		F
Aquilegia canadensis	Canadian Columbine		F
Arabis divaricarpa	Spreadingpod Rockcress		F
Arabis hirsuta	Hirsute Rock Cress		F
Arabis lyrata	Lyre-Leaved Rock Cress		F
Aralia nudicaulis	Wild Sarsaparilla		F

Arctostaphylos uva-ursi	Bearberry		S
Arenaria lateriflora	Blunt-leaved Sandwort		F
Argentina anserina	Silverweed Cinquefoil	*Potentilla anserina*	F
Artemisia biennis	Biennial Wormwood		F
Artemisia campestris	Sagewort Wormwood		F
Artemisia frigida	Pasture Sage		F
Asclepias ovalifolia	Oval-leaf Milkweed		F
Astragalus americanus	American Milk Vetch		F
Astragalus canadensis	Canadian Milk-Vetch		F
Astragalus eucosmus	Pretty Milk Vetch		F
Athyrium filix-femina	Lady Fern		FF
Barbarea orthoceras	American Winter Cress	*Barbarea americana*	F
Beckmannia syzigachne	Sloughgrass		G
Betula nana	Bog Birch		S
Betula occidentalis	Water Birch or River Birch		S
Betula papyrifera	White Birch		T
Betula pumila	Dwarf Birch	*B. glandulifera; B. glandulosa; B. nana*	S
Bidens cernua	Nodding Beggartick		F
Botrychium virginianum	Virginia Grape Fern		F
Bromus ciliatus	Fringed Brome		G
Bromus inermis	Smooth Brome		G
Calamagrostis canadensis	Marsh Reed Grass		G
Calamagrostis montanensis	Plains Reed Grass		G
Calamagrostis stricta ssp. *inexpansa*	Northern Reed Grass	*C. stricta or C.inexpansa*	G
Calamovilfa longifolia	Sand Grass		G
Calla palustris	Water Calla		F
Caltha palustris	Yellow Marsh Marigold		F
Calystegia sepium	Wild Morning Glory	*Convolvulus sepium*	F
Campanula aparinoides	Marsh Bellflower		F
Campanula rotundifolia	Common Harebell		F
Canadanthus modestus	Large Northern Aster	*Aster modestus*	F
Carex aenea	Hay Sedge	*C. siccata*	G
Carex aquatilis	Water Sedge		G
Carex atherodes	Awned or Slough Sedge		G

Carex aurea	Golden Sedge		G
Carex bebbii	Bebb's sedge		G
Carex capillaris	Hair-Like Sedge		G
Carex concinna	Beautiful Sedge		G
Carex diandra	Lesser Panicled Sedge		G
Carex disperma	Two-Seeded Sedge		G
Carex duriuscula var. eleocharis	Needleleaf Sedge		G
Carex foenea var. foenea	Hay or Dry-spike Sedge		G
Carex gynocrates	Northern Bog Sedge		G
Carex houghtoniana	Houghton's Sedge		G
Carex hystericina	Bottlebrush or Porcupine Sedge		G
Carex inops ssp. *heliophila*	Sun Sedge		G
Carex interior	Inland Sedge		G
Carex lasiocarpa	Hairy-Fruited Sedge or Wiregrass		G
Carex leptalea	Bristle-stalked Sedge		G
Carex limosa	Mud Sedge		G
Carex magellanica ssp. irrigua	Boreal Bog Sedge		G
Carex pellita	Wooly Sedge		G
Carex pseudocyperus	Cyperus Sedge		G
Carex retrorsa	Retrorse Sedge		G
Carex richardsonii	Richardson's Sedge		G
Carex rostrata	Beaked Sedge		G
Carex scirpoidea	Northern Singlespike Sedge		G
Carex simulata	Analogue Sedge		G
Carex sprengellii	Longbeak Sedge		G
Carex tenuiflora	Sparse-flowered Sedge		G
Carex utriculata	Bear Sedge		G
Carex vaginata	Sheathed Sedge		G
Castilleja miniata	Red Indian Paintbrush		F
Ceratophyllum demersum	Common Hornwort		F
Chamerion angustifolium ssp. angustifolium	Fireweed	*Epilobium angustifolium*	F
Chenopodium album	Lamb's-Quarters		F
Chenopodium berlandieri	Pitseed Goosefoot or Pigweed		F
Chenopodium pratericola	Narrowleaf Goosefoot		F

Cicuta bulbifera	Bulb-bearing Water Hemlock		F
Cicuta maculata	Spotted Water Hemlock		F
Cinna latifolia	Slender Wood Grass		G
Circaea alpina	Small Enchanter's Nightshade		F
Cirsium arvense	Canada Thistle		F
Cirsium flodmanii	Prairie Thistle		F
Coeloglossum viride* var. *viriscens	Long-Bracted Green Bog Orchid	*Haben virdidis var. bracteata*	F
Comandra umbellata	Bastard Toadflax		F
Comarum palustre	Marsh Cinquefoil	*Potentialla palustris*	F
Conyza canadensis var. *canadensis*	Horseweed	*Erigeron canadensis*	F
Coptis trifolia	Goldthread		F
Corallorrhiza maculata	Large Coralroot		F
Corallorrhiza trifida	Early Coralroot		F
Corispermum pallasii	Bugseed		F
Cornus canadensis	Bunchberry		F
Cornus sericea ssp. *sericea*	Red-Osier Dogwood	*C. stolonifera*	S
Corydalis aurea	Golden Corydalis		F
Corylus cornuta	Beaked Hazelnut		S
Crepis tectorum	Narrowleaf Hawksbeard		F
Cypripedium parviflorum	Small Yellow Lady's Slipper		F
Dasiphora floribunda	Shrubby Cinquefoil	*Pentaphylloides floribunda; Potentilla fruticosa*	S
Disporum trachycarpum	Fairybells		F
Draba nemorosa	Yellow Whitlow-Grass		F
Dracocephalum parviflorum	American Dragonhead		F
Drosera rotundifolia	Round-Leaved Sundew		F
Dryopteris carthusiana	Spinulose Woodfern		FF
Elaeagnus commutata	Silverberry		S
Eleocharis acicularis	Needle Spike Rush		G
Eleocharis palustris	Common Spike Rush		G
Elymus canadensis	Canada Wild Rye	*Elymus philadelphicus*	G
Elymus innovatus	Boreal Wildrye	*Leymus innovatus*	G
Elymus lanceolatus ssp. *lanceolatus*	Thickspike Wheatgrass	*Agropyron dasystachyum*	G
Elymus lanceolatus ssp. *psammophilus*	Sand Dune Wheatgrass	*Agropyron dasystachyum ssp. psammophilus*	G
Elymus repens	Quackgrass		G

Elymus trachycaulus ssp. subsecundus	Awned Wheat Grass	*Agropyron trachycaulum var. unilaterale*	G
Elymus trachycaulus ssp. trachycaulus	Slender Wheat Grass	*Agropyron trachycaulum*	G
Epilobium ciliatum ssp. *ciliatum*	Northern Willowherb		F
Equisetum arvense	Common Horsetail		F
Equisetum fluviatile	Swamp Horsetail		F
Equisetum hyemale	Common Scouring Rush		F
Equisetum laevigatum	Smooth Scouring Rush		F
Equisetum palustre	Marsh Horsetail		F
Equisetum pratense	Meadow Horsetail		F
Equisetum scirpoides	Dwarf Scouring Rush		F
Equisetum sylvaticum	Woodland Horsetail		F
Equisetum variegatum	Variegated Scouring Rush		F
Erigeron glabellus	Smooth Fleabane		F
Erigeron philadelphicus	Philadelphia Fleabane		F
Eriophorum angustifolium	Tall Cottongrass		G
Eriophorum vaginatum	Tussock Cottongrass		G
Erysimum cheiranthoides	Wormseed Mustard		F
Eurybia conspicua	Showy Aster	*Aster conspicuus*	F
Euthamia graminifolia var. *graminifolia*	Narrow-leaf Goldentop		F
Festuca ovina	Sheep Fescue		G
Festuca saximontana	Northern Rough Fescue		G
Fragaria vesca	Woodland Strawberry		F
Fragaria virginiana	Smooth Wild Strawberry		F
Galeopsis tetrahit	Common Hempnettle		F
Galium boreale	Northern Bedstraw		F
Galium labradoricum	Labrador Bedstraw		F
Galium trifidum	Small Bedstraw		F
Galium triflorum	Sweet-Scented Bedstraw		F
Gentianella amarella	Autumn Dwarf Gentian		F
Gentianopsis crinita	Greater Fringed Gentian		F
Geocaulon lividum	Northern Comandra		F
Geum aleppicum	Yellow Avens		F
Geum macrophyllum	Large-Leaved Avens		F
Geum rivale	Purple or Water Avens		F

Geum triflorum	Three-Flowered Avens		F
Glyceria borealis	Boreal Mannagrass		G
Glyceria grandis	Tall Manna Grass		G
Glyceria striata	Fowl Meadow Grass		G
Glycyrrhiza lepidota	Wild Licorice		F
Gnaphalium uliginosum	Marsh Cudweed	*Filaginella uliginosa*	F
Goodyera repens	Lesser Rattlesnake Plantain		F
Halenia defelexa	Spurred Gentian		F
Hedysarum alpinum	Licorice Root		F
Hedysarum boreale	Northern Sweetvetch		F
Helenium autumnale	Common Sneezeweed		F
Helianthus couplandii	Prairie Sunflower		F
Helianthus pauciflorus ssp. subrhomboideus	Rhombic-Leaved Sunflower	*Helianthus laetiflorus var. rigidus*	F
Helictotrichon hookeri	Hooker's oat grass		G
Heracleum maximum	Cow Parsnip	*Heracleum lanatum*	F
Hesperostipa comata	Needle and Thread Grass	*Stipa comata*	G
Hesperostipa spartea	Western Porcupine Grass	*H. curtiseta*	G
Heuchera richardsonii	Alumroot		F
Hieracium umbellatum	Narrowleaf Hawkweed		F
Hierochloe odorata	Sweet Grass		G
Hippuris vulgaris	Common Mare's Tail		F
Hordeum jubatum	Foxtail or Wild Barley		G
Houstonia longifolia	Slenderleaf Bluet		F
Hudsonia tomentosa	Sand-Heather		S
Juncus balticus	Baltic Rush	*Juncus arcticus var. balticus*	G
Juncus bufonius	Toad Rush		G
Juncus nodosus	Knotted or Jointed Rush		G
Juncus tenuis	Western Rush	*Juncus occidentalis*	G
Juncus vaseyi	Vasey's Rush		G
Juniperus communis	Ground Juniper		S
Juniperus horizontalis	Creeping Juniper		S
Kochia scoparia	Kochia or Burning Bush	*Bassia scoparia*	F
Koeleria macrantha	June Grass	*K. cristata*	G
Lactuca biennis	Blue Wood Lettuce		F

Lactuca tatarica var. *pulchella*	Russian Blue Lettuce		F
Larix laricina	Tamarack Larch		T
Lathryus ochroleucus	Cream-Coloured Vetchling		F
Lathyrus palustris	Marsh Vetchling		F
Lathyrus venosus	Wild Peavine		F
Ledum groenlandicum	Common Labrador Tea		S
Lemna minor	Lesser Duckweed		F
Lepidium densiflorum	Common Pepper-Grass		F
Leucanthemum vulgare	Ox-Eye Daisy	*Chrysanthemum leucanthemun var. boeche*	F
Leucophysalis grandiflora	White Groundcherry		S
Liatris ligustylis	Meadow Blazing-Star		F
Lilium philadelphicum* var. *andinum	Wood Lily		F
Linnaea borealis	Twinflower		S
Linum lewisii	Lewis Wild Flax		F
Listera cordata	Heartleaf Twayblade		F
Lonicera dioica	Wild or Twining Honeysuckle		S
Lonicera villosa	Mountain Fly Honeysuckle		S
Luzula parviflora	Smallflowered Woodrush		G
Lycopodium annotinum	Stiff Club-Moss		FF
Lycopodium clavatum	Running Pine		FF
Lycopodium complanatum	Trailing Club Moss		FF
Lycopodium obscurum	Ground-Pine		FF
Lycopus asper	Western Waterhorehound		F
Lysimachia ciliata	Fringed Loosestrife		F
Lysimachia thyrsiflora	Tufted Loosestrife		F
Machaeranthera canescens	Hoary Tansy-Aster	*Aster canescens*	F
Maianthemum canadense	Wild Lily-of-the-valley		F
Maianthemum stellatum	Star-Flowered False Solomon's-Seal	*Smilacina stellata var. sessilifolia*	F
Maianthemum trifolium	Three-leaved Solomon's seal	*Smilacina trifolia*	F
Matricaria discoidea	Pineapple Weed		F
Matteuccia struthiopteris	Ostrich Fern		FF
Medicago lupulina	Black Medic		F
Medicago sativa	Alfalfa		F
Melampyrum lineare	Cow-Wheat		F

Melilotus alba	White Sweet-clover		F
Melilotus officinalis	Yellow Sweet-clover		F
Mentha arvensis	Wild Mint		F
Menyanthes trifoliata	Buck-Bean		F
Mertensia paniculata	Tall Lungwort		F
Mitella nuda	Bishop's-Cap		F
Moehringia lateriflora	Bluntleaf Sandwort		F
Monarda fistulosa	Wild Bergamot		F
Moneses uniflora	One-Flowered Wintergreen		F
Monotropa uniflora	Ghost Pipe		F
Muhlenbergia glomerata	Bog Muhly		G
Myrica gale	Sweet Gale		S
Myriophyllum sibiricum	Common Water Milfoil		F
Oenothera biennis	Yellow Evening Primrose		F
Orthilia secunda	One-Sided Wintergreen	*Pyrola secunda*	F
Oryzopsis asperifolia	White-grained Mountain Rice Grass		G
Oxytropis sericea	Locoweed		F
Oxytropis splendens	Showy Locoweed		F
Packera cana	Silvery Ragwort	*Senecio canus*	F
Packera paupercula	Balsam Ragwort	*Senecio pauperculus*	F
Parnassia palustris	Northern Grass-of-Parnassus		F
Pascopyrum smithii	Western Wheatgrass		G
Pedicularis macrodonta	Swamp Lousewort		F
Petasites frigidus var. palmatus	Palmate-leaved Colt's Foot		F
Petasites sagittatus	Arrow-Leaved Colt's Foot		F
Phacelia franklinii	Franklin's Scorpionweed		F
Phalaris arundinacea	Reed Canary Grass		G
Phleum pratense	Timothy		G
Picea glauca	White Spruce		T
Picea mariana	Black Spruce		T
Pinus banksiana	Jackpine		T
Piptatherum pungens	Northern Rice Grass	*Oryzopsis pungens*	G
Plantago major	Common Plantain		F
Platanthera hyperborea var. hyperborea	Northern Green Bog Orchid	*Habenaria hyperborea*	F

Platanthera obtusata	Blunt-leaved Bog Orchid	*Habenaria obtusata*	F
Poa palustris	Fowl Blue Grass		G
Poa pratensis	Kentucky Blue Grass		G
Polygala pauciflora	Fringed Milkwort		F
Polygala senega	Seneca Snakeroot		F
Polygonum amphibium	Water Smartweed		F
Polygonum amphibium var. emersum	Water Smartweed		F
Polygonum arenastrum	Northern Knotweed	*Polygonum aviculare* subsp. *boreale*	F
Polygonum convolvulus	Wild Buckwheat		F
Polygonum persicaria	Lady's-Thumb		F
Populus balsamifera	Balsam Poplar		T
Populus tremuloides	Trembling Aspen		T
Potamogeton filiformis	Slender Pondweed		F
Potamogeton gramineus	Grassy Pondweed		F
Potamogeton natans	Floating Pondweed		F
Potentilla bipinnatifida	Plains Cinquefoil		F
Potentilla norvegica	Norwegian Cinquefoil		F
Potentilla pensylvanica	Pennsylvanian Cinquefoil		F
Potentilla pulcherrima	Western Cinquefoil	*Potentilla gracilis* var. *gracilis*	F
Prunus pensylvanica	Pin Cherry		S
Prunus virginiana	Choke Cherry		S
Pulsatilla patens	Prairie Crocus	*Anemone patens* var. *multifida*	F
Pyrola asarifolia	Pink Wintergreen		F
Pyrola chlorantha	Greenish-Flowered Wintergreen	*Pyrola virens var. convoluta*	F
Pyrola minor	Lesser Wintergreen		F
Ranunculus aquatilis	White Watercrowfoot		F
Ranunculus cymbalaria	Alkali Buttercup		F
Ranunculus gmelinii	Gmelin's Buttercup		F
Ranunculus lapponicus	Lapland Buttercup		F
Ranunculus macounii	Macoun's Buttercup		F
Ranunculus sceleratus	Blister Buttercup		F
Rhamnus alnfolia	Alder-Leaved Buckthorn		S
Ribes americanum	Wild Black Currant		S
Ribes glandulosum	Skunk Currant		S

Ribes hudsonianum	Northern Black Currant		S
Ribes lacustre	Black Gooseberry		S
Ribes oxyacanthoides	Northern Gooseberry		S
Ribes triste	Wild Red Currant		S
Rorippa palustris	Bog Yellow Cress		F
Rorippa sinuata	Spreading Yellowcress		F
Rosa acicularis	Prickly Rose		S
Rosa woodsii	Wood's Rose		S
Rubus arcticus ssp. *acaulis*	Dwarf Raspberry	*Rubus acaulis*	F
Rubus chamaemorus	Cloudberry		F
Rubus idaeus	Wild Red Raspberry		S
Rubus pubescens	Dewberry		S
Rudbeckia hirta	Black-eyed Susan		F
Rumex aquaticus var. *fenestratus*	Western Dock	*Rumex occidentalis*	F
Rumex crispus	Yellow Dock		F
Rumex salicifolius	Narrow-leaved Dock		F
Rhynchospora alba	White Beaked Rush		G
Sagittaria cuneata	Arum-leaved Arrowhead		F
Salix bebbiana	Bebb's Willow		S
Salix candida	Hoary or Sage Willow		S
Salix cf. glauca	Northern Willow		S
Salix cf. lucida	Glossy Willow		S
Salix discolor	Pussy Willow		S
Salix exigua	Sandbar Willow		S
Salix lucida ssp. *lasiandra*	Pacific Willow		S
Salix lutea	Yellow Willow		S
Salix maccalliana	McCalla's Willow		S
Salix myrtillifolia	Blueberry Willow		S
Salix petiolaris	Meadow Willow		S
Salix planifolia	Diamondleaf Willow		S
Salix pseudomyrsinites	Tall Blueberry Willow		S
Salix serissima	Autumn Willow		S
Sanicula marilandica	Black Snakeroot		F
Sarracenia purpurea	Pitcherplant		F

Schizachne purpurascens	Purple Oat Grass		G
Schizachyrium scoparium	Little Bluestem		G
Schoenoplectus acutus var. *acutus*	Hard Stem Club Rush		G
Schoenoplectus fluviatilis	River Bulrush		G
Scirpus cyperinus	Marsh Bulrush		G
Scirpus microcarpus	Panicled Bulrush		G
Scutellaria galericulata	Marsh Skullcap		F
Selaginella densa	Prairie or Lesser Spikemoss		F
Senecio eremophilus	Cut-Leaved Ragwort		F
Senecio vulgaris	Common Groundsel		F
Setaria viridis	Green Foxtail		G
Shepherdia canadensis	Canada Buffaloberry		S
Sibbaldiopsis tridentata	Three-Toothed Cinquefoil		F
Sisyrinchium montanum	Common Blue-Eyed Grass		F
Sium suave	Water Hemlock		F
Solidago altissima var. gilvocane	Late or Tall Goldenrod		F
Solidago canadensis	Canada Goldenrod		F
Solidago hispidula var. *hispidula*	Goldenrod		F
Solidago missouriensis	Prairie Goldenrod		F
Solidago simplex var. *spathulata*	Flat-Topped Goldenrod	*Solidago spathulata*	F
Sonchus arvensis	Perennial Sow Thistle		F
Sonchus asper	Spiny-Leaved Sow Thistle		F
Sparganium angustifolium	Narrowleaf Bur-reed		F
Sparganium eurycarpum	Giant Bur-reed		F
Spartina gracilis	Alkali Cordgrass		G
Sphenopholis obtusata	Prairie Wedgegrass		G
Spiraea alba	Narrow-Leaved Meadowsweet		S
Spiranthes romanzoffiana	Hooded Lady's-Tresses		F
Sporobolus cryptandrus	Sand Dropseed		G
Stachys palustris	Marsh Hemp-Nettle		F
Stellaria calycantha	Northern Stitchwort		F
Stellaria longifolia	Long-Leaved Stitchwort		F
Stellaria longipes	Longstalk Starwort		F
Stuckenia vaginata	Sheathed Pondweed		F

Symphoricarpos albus	Snowberry		S
Symphoricarpos occidentalis	Snowberry (Buckbrush)		S
Symphyotrichum boreale	Northern Aster	*Aster borealis*	F
Symphyotrichum ciliolatum	Lindley's Aster	*Aster ciliolatus*	F
Symphyotrichum ericoides var. *ericoides*	White Heath Aster		F
Symphyotrichum laeve var. *laeve*	Smooth Aster	*Aster laevis*	F
Symphyotrichum lanceolatum var. *hesperium*	Western Panicled Aster		F
Symphyotrichum puniceum	Purple-Stemmed Aster	*Aster puniceus*	F
Tanacetum vulgare	Tansy		F
Taraxacum officinale	Dandelion	*Tarxacum croceum*	F
Thalictrum dasycarpum	Tall or Purple Meadow Rue		F
Thalictrum occidentale	Western Meadow Rue		F
Thalictrum sparsiflorum	Few-flower Meadow-Rue		F
Thalictrum venulosum	Veiny Meadow-Rue		F
Toxicodendron radicans ssp. radicans	Eastern Poison Ivy		S
Tragopogon dubius	Yellow Goat' Beard		F
Trientalis borealis	Northern Starflower		F
Trifolium hybridum	Alsike Clover		F
Trifolium pratense	Red Clover		F
Triglochin maritima	Seaside Arrow-grass		G
Tripleurospermum perforata	Scentless Chamomille	*Matricaria perforata*	F
Typha latifolia	Cattail		G
Urtica dioica	Stinging Nettle		F
Utricularia intermedia	Flatleaf Bladderwort		F
Utricularia macrorhiza	Common Bladderwort		F
Vaccinium caespitosum	Dwarf Blueberry		S
Vaccinium myrtilloides	Blueberry		S
Vaccinium oxycoccos	Small Bog Cranberry	*Oxycoccus microcarpus*	S
Vaccinium uliginosum	Bog Billberry or Bog Whortleberry		S
Vaccinium vitis-idaeus	Bog Cranberry		S
Veronica catenata	Water Speedwell		F
Viburnum edule	Low Bush-Cranberry		S
Viburnum opulus	High-Bush Cranberry	*Viburnum trilobum*	S
Vicia americana	American Vetch		F

Vicia cracca	Tufted or Bird Vetch	*Vicia tenuifolia*	F
Viola adunca	Early Blue Violet		F
Viola canadensis	Western Canada Violet		F
Viola nephrophylla	Northern Bog Violet		F
Viola palustris	Marsh Violet		F
Viola renifolia	Kidney-Shaped Violet		F
Xanthium strumarium	Common Cocklebur		F
Zigadenus elegans	White or Death Camas		F
Zizia aptera	Meadow Zizia		F

Code	Growth Form
T	Trees
S	Shrubs
F	Forbs and herbs
FF	Ferns and fern allies
G	Graminoid (grasses, sedges and rushs)

Rare species are indicated by **bold** type.

Table A-2. Noxious and invasive plant species observed during vegetation surveys. (Based on SKCDC, 2009a and 2009b).

Scientific Name	Common Name	Growth Form	Noxious Weeds	Invasive
Bromus inermis	Smooth Brome	G		X
Chenopodium album	Lamb's-Quarters	F		X
Cirsium arvense	Canada Thistle	F	X	
Crepis tectorum	Narrowleaf Hawksbeard	F		X
Galeopsis tetrahit	Common Hempnettle	F		X
Hordeum jubatum	Foxtail or Wild Barley	G		X
Kochia scoparia	Kochia or Burning Bush	F		X
Leucanthemum vulgare	Ox-Eye Daisy	F		X
Medicago lupulina	Black Medic	F		X
Melilotus alba	White Sweet-clover	F		X
Melilotus officinalis	Yellow Sweet-clover	F		X
Phleum pratense	Timothy	G	X	X
Plantago major	Common Plantain	F		X
Poa pratensis	Kentucky Blue Grass	G		X
Polygonum convolvulus	Wild Buckwheat	F		X
Polygonum persicaria	Lady's-Thumb	F		X
Senecio vulgaris	Common Groundsel	F		X
Setaria viridis	Green Foxtail	G	X	X
Sonchus arvensis	Perennial Sow Thistle	F	X	X
Sonchus asper	Spiny-Leaved Sow Thistle	F		X
Tanacetum vulgare	Tansy	F		X
Taraxacum officinale ssp. Officinale	Dandelion	F	X	X
Tragopogon dubius	Yellow Goat' Beard	F		X
Trifolium hybridum	Alsike Clover	F		X
Trifolium pratense	Red Clover	F		X
Vicia cracca	Tufted or Bird Vetch	F		X

Table A-3. Results of 2008 rare plant surveys.

Site ID	UTM Easting	UTM Northing	Scientific Name	Common Name	Rank (SKCDC)	Abundance	Habitat	Survey
1	518467	5905334	*Campanula aparinoides*	Marsh Bellflower	S2S3	Locally abundant in a small area.	Moist, riparian area.	August
2	518467	5905334	*Canadanthus modestus*	Large Northern Aster	S2	Few scattered plants.	Moist, riparian area.	August
3	511196	5895316	*Carex hystericina*	Porcupine Sedge	S2	Locally abundant.	Creek,dammed by beavers.	August
4	514882	5896518	*Carex pseudocyperus*	Cyperus-like Sedge	S2S3	Locally abundant.	Creek,dammed by beavers.	August
5	511196	5895316	*Carex pseudocyperus*	Cyperus-like Sedge	S2S3	Locally abundant.	Creek,dammed by beavers.	August
6	511905	5898417	*Coeloglossum viride* ssp. *virescens*	Long-Bracted Bog Orchid	S3S4	Few.	Moist woods.	August
7	517767	5908833	*Lactuca biennis*	Tall Blue Lettuce		Single plant.	Willow meadow.	August
8	518482	5905194	*Leucophysalis grandiflora*	Sand Cherry		Few.	Beaver lodge in a riparian area.	August
9	516451	5918790	*Lilium philadelphicum* var. *andinum*	Western Red Lily	S3S4	Few scattered plants.	Deciduous or coniferous woodland.	June
10	515511	5897210	*Lilium philadelphicum* var. *andinum*	Western Red Lily	S3S4	Few scattered plants.	Deciduous or coniferous woodland.	June
11	517718	5908709	*Lilium philadelphicum* var. *andinum*	Western Red Lily	S3S4	Few scattered plants.	Deciduous or coniferous woodland.	June
12	517734	5908708	*Lilium philadelphicum* var. *andinum*	Western Red Lily	S3S4	Few scattered plants.	Deciduous or coniferous woodland.	June
13	517970	5908787	*Lilium philadelphicum* var. *andinum*	Western Red Lily	S3S4	Few scattered plants.	Deciduous or coniferous woodland.	June
14	514626	5898180	*Listera cordata*	Northern Twayblade	S1	Few scattered plants.	Moist black spruce forest.	June
15	516406	5918504	*Pedicularis macrodonta*	Swamp Lousewort	S2	Several plants in small cluster.	Bog.	June
16	514442	5901151	*Polygala pauciflora*	Fringed Milkwort	S2S3	Three plants in mossy soil.	Moist coniferous woods.	June
17	513977	5901108	*Polygala pauciflora*	Fringed Milkwort	S2S3	Three plants in mossy soil.	Moist coniferous woods.	June

UTM coordinates are NAD83

APPENDIX B – Wildlife Data Tables

Table B-1. List of expected and confirmed mammal species.

Mammal Group	Species Common Name	Species Scientific Name	Expected	Presence Confirmed		
				Blood et al., 1977	Pipe, 1982	Current Survey
Ungulates	Elk	*Cervus elaphus*	X	X	X	X
	Moose	*Alces alces*	X	X	X	X
	White-tailed Deer	*Odocoileus virginianus*	X	X	X	X
	Mule Deer	*Odocoileus hemionus*	X	X	X	X
Carnivores	Black Bear	*Ursus americanus*	X	X	X	X
	Gray Wolf	*Canis lupus*	X	X	X	X
	Coyote	*Canis latrans*	X	X	X	X
	Red Fox	*Vulpes vulpes*	X	X	X	X
	Cougar	*Felis concolor*	X	X	X	X
	Lynx	*Lynx lynx*	X	X	X	X
	Wolverine	*Gulo gulo*	X			
	Martin	*Martes americana*	X		X	X
	Fisher	*Martes pennanti*	X	X	X	X
	Mink	*Mustela vison*	X	X	X	X
	River Otter	*Lontra canadensis*	X	X	X	X
	Short-tailed Weasel (Ermine)	*Mustela erminea*	X	X	X	X
	Long-tailed Weasel	*Mustela frenata*	X	X	X	
	Least Weasel	*Mustela nivalis*	X			
	Badger	*Taxidea taxus*	X	X		
	Striped Skunk	*Mephitis mephitis*	X	X	X	X
	Raccoon	*Procyon lotor*	X	X	X	X
Other Mammals	Muskrat	*Ondatra zibethicus*	X	X	X	X
	Beaver	*Castor canadensis*	X	X	X	X
	Red Squirrel	*Tamiasciurus hudsonicus*	X	X	X	X
	Northern Flying Squirrel	*Glaucomys sabrinus*	X	X	X	X
	Least Chipmunk	*Ewtomias minimus*	X	X	X	X
	Snow-shoe Hare	*Lepus americanus*	X	X	X	X
	White-tailed Jackrabbit	*Lepus townsendii*	X		X	

Table B-1. List of expected and confirmed mammal species (concluded).

Mammal Group	Species Common Name	Species Scientific Name	Expected	Presence Confirmed		
				Blood et al., 1977	Pipe, 1982	Current Survey
Other Mammals	Porcupine	*Erethizon dorsatum*	X	X	X	X
	Woodchuck	*Marmota monax*	X	X	X	X
	Richardson's Ground Squirrel	*Spermophilus richardsonii*	X		X	
	Thirteen-lined Ground Squirrel	*Spermophilus tridecemlineatus*	X		X	
	Franklin's Ground Squirrel	*Spermophilus franklinii*	X		X	
	Northern Pocket Gopher	*Thomomys talpoides*	X	X	X	X
Microtines & Shrews	Deer Mouse	*Pepomyscus maniculatus*	X	X	X	X
	Gapper's Red-backed Vole	*Clethrionomys gapperi*	X	X	X	X
	Meadow Vole	*Microtus pennsylvanicus*	X	X	X	X
	Western Jumping Mouse	*Zapus princeps*	X	X		X
	Heather vole	*Phenacomys intermedius*	X	X		
	American Water Shrew	*Sorex palustris*	X			X
	Arctic Shrew	*Sorex arcticus*	X		X	
	Short-tailed Shrew	*Blarina brevicauda*	X	X	X	
	Vagrant Shrew	*Sorex vagrans*	X			X
	Masked Shrew	*Sorex cinereus*	X	X	X	X
	Pigmy Shrew	*Microsorex hoyi*	X		X	
	Northern Bog Lemming	*Synaptomys borealis*	X			
Bats	Brown Bat	*Myotis lucifugus*	X	X		
	Keen's Bat	*Myotis keenii*	X	X		
	Silver-haired Bat	*Lasionycteris noctivagans*	X	X		
	Big Brown Bat	*Eptesicus fuscus*	X	X		
	Red Bat	*Lasiurus borealis*	X	X		
	Hoary Bat	*Lasiurus cinereus*	X	X		

X - presence confirmed by surveys; others listed as potentially present regionally, but not necessarily in FalCPF.

Table B-2. Summary of food habit survey results.

Species	General Cover Type	Number of Transect Segments	Average Segment Length (m)	Stops per 100m	Stems Browsed per 100m	**Species Consumed** (Order of Preference)
Elk	***jP (regen)***	10	131	11.8	65.0	***Forbs:*** *Artemesia spp., Aster spp., Melilotis spp., graminoids;* ***Shrubs:*** *Amelanchier alnifolia; Prunus virginiana, P. pensylvanica, Populus tremuloides, Salix spp., Rosa spp., Alnus viridus*
	tA (regen)	2	93	14.7	92.4	***Forbs:*** *variety including Aster spp.;* ***Shrubs:*** *Prunus virginiana, Amelanchier alnifolia, Populus tremuloides*
	tA & bP (mature)	3	133	12.1	181.0	***Shrubs:*** *Cornus sericea,Corylus cornuta, Amelanchier alnifolia, Prunus virginiana, Populus tremuloides, Salix spp.*
	Willow Swamps	2	201	11.1	137.9	***Forbs:*** *variety including Aster spp.;* ***Shrubs:*** *Salix spp., Populus balsamifera, Rubus sp.*
	Treed Wetland (bStL)	1	37	3.0	3.0	***Shrubs:*** *Populus balsamifera (regen)*
Moose	***jP (regen)***	1	43	12.0	12.0	***Forbs:*** *Artemesia spp.*
	tA (regen)	1	170	5.3	33.5	***Shrubs:*** *Prunus virginiana, Populus tremuloides*
	tA & bP (mature)	5	98	0.0	0.0	*No browsing observed.**
	wS (mature)	1	22	0.0	0.0	*No browsing observed.*
	Willow Swamps	2	92	6.1	147.9	***Forbs:*** *variety including Aster spp.;* ***Shrubs:*** *Salix spp., Populus balsamifera, Rubus sp.*
	Treed Wetland (bStL)	5	65	0.0	0.0	*No browsing observed.*
Deer	***jP (regen)***	4	110	8.0	45.6	***Shrubs:*** *Prunus virginiana, Amelanchier alnifolia, Prunus pensylvanica, Rosa spp., Betula pumila;* ***Forbs:*** *Artemesia spp., Aster spp., Melilotis spp.*
	jP (mature)	4	84	4.8	19.1	***Shrubs:*** *Amelanchier alnifolia, Prunus virginiana, Rosa spp., Populus tremuloides, Salix spp., Betula papyrifera*
	tA (regen)	2	206	2.0	12.0	***Shrubs:*** *Cornus sericea,Corylus cornuta, Viburnum edule, Prunus virginiana, P. pensylvanica, Amelanchier alnifloia, Alnus viridis*
	tA mixedwood (mature)	3	116	5.6	16.9	***Shrubs:*** *Cornus sericea, Amelanchier alnifloia, Viburnum edule, Rosa spp., Populus tremuloides, Populus balsamifera, Salix spp.*
	Willow Swamps	*NS*	*NS*	*NS*	*NS*	*NS*
	Treed Wetland (bStL)	4	72	0.0	0.0	*No browsing observed.*

*** Note:** extensive hazel browsing by moose in riparian areas near the Saskatchewan River noted during summer surveys
NS - not sampled

Table B-3. Potential and confirmed microtine and shrew species.

Common Name	Scientific Name	Expected*	Blood et al., 1977	Pipe et al., 1982	Current Survey
Deer Mouse	*Pepomyscus maniculatus*	X	X	X	X
Gapper's Red-backed Vole	*Clethrionomys gapperi*	X	X	X	X
Meadow Vole	*Microtus pennsylvanicus*	X	X	X	X
Western Jumping Mouse	*Zapus princeps*	X	X		X
Heather vole	*Phenacomys intermedius*	X	X		
American Water Shrew	*Sorex palustris*	X			X
Arctic Shrew	*Sorex arcticus*	X		X	
Short-tailed Shrew	*Blarina brevicauda*	X	X	X	
Vagrant Shrew	*Sorex vagrans*	X			X
Masked Shrew	*Sorex cinereus*	X	X	X	X
Pigmy Shrew	*Microsorex hoyi*	X		X	
Northern Bog Lemming	*Synaptomys borealis*	X			

* Based on Maher (1969) and Beck (1958)

Table B-4. Total occurrence by species.

Species	No. Traplines Species Found (Total Traplines = 22)	Percent Occurrence
Deer Mouse *(Peromyscus maniculatus)*	14	63.6
Gapper's Red-backed Vole *(Clethrionomys gapperi)*	10	45.5
Meadow Vole *(Microtus pennsylvanicus)*	2	9.1
American Water Shrew *(Sorex palustris)*	2	9.1
Masked Shrew *(Sorex cincereus)*	6	27.3
Vagrant Shrew *(Sorex vagrans)*	2	9.1
Western Jumping Mouse *(Zapus princeps)*	3	13.6

Table B-5. Microtine and shrew trapping results by habitat.

Ecological Cover Type	DM	GRBV	MV	AWS	MS	VS	WJM	Microtines & Shrews per 100 Trap-nights
Trembling Aspen: dry to fresh (regen)	5	1	0	0	0.5	0	0	6.5
Trembling Aspen: dry to fresh (regen)	6	0	0	0	0	0	0	6
Shrub Swamp (willow)	0.5	0	5	0	0	0	0	5.5
Jack Pine: dry to fresh (regen)	4	0	0	0	0.5	0	0.5	5
Jack Pine: dry to fresh	1	3	0	0	0.5	0	0	4.5
Jack Pine: dry to fresh (regen)	1.5	2	0	0	0.5	0	0	4
Trembling Aspen: moist	2.5	1.5	0	0	0	0	0	4
Open Fen - Marsh Complex	1.5	0	0.5	1	0	0	0.5	3.5
Trembling Aspen - White Spruce: fresh	2.5	0.5	0	0	0	0	0	3
Trembling Aspen: moist	0	2.5	0	0	0.5	0	0	3
Jack Pine: dry to fresh (regen)	2.5	0	0	0	0	0	0	2.5
Jack Pine: dry to fresh (regen)	2.5	0	0	0	0	0	0	2.5
Jack Pine: dry to fresh	1	1	0	0	0	0	0	2
Trembling Aspen: moist	0	1.5	0	0	0.5	0	0	2
Shrub Swamp (willow)	0	1	0	0	0	0.5	0	1.5
Black Spruce: moist	0.5	1	0	0	0	0	0	1.5
Shrub Swamp (willow) - Marsh Complex	0	0	0	0.5	0	0.5	0	1
White Spruce: fresh	0	0	0.5	0	0	0	0.5	1
Jack Pine: dry to fresh (regen)	0.5	0	0	0	0	0	0	0.5
Shrub Swamp (willow) - Marsh Complex	0	0	0	0	0	0	0	0
Jack Pine: dry to fresh (regen)	0	0	0	0	0	0	0	0

Symbols

DM	Deer Mouse
GRBV	Gapper's Red-backed Vole
MV	Meadow Vole
AWS	American Water Shrew
MS	Masked Shrew
VS	Vagrant Shrew
WJM	Western Jumping Mouse

Table B-6. Winter track count summary.

General Habitat Type	Metres Surveyed	Sample Size*	Average Tracks/100m/day														No. Animal Types
			E	M	D	W	C	F	L	O	Fr	Wl	SH	Sk	G	Mi	Mu	
RC	3801	22	0.00	0.00	0.16	0.00	0.02	0.02	0.00	0.07	0.00	0.01	0.99	0.43	0.01	0.05	0.00	9
SW	3481	14	0.00	0.00	0.63	0.00	0.00	0.00	0.02	0.00	0.00	0.02	0.12	0.16	0.01	0.01	0.00	7
MW	809	5	0.10	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.12	0.04	0.03	0.15	0.00	7
HW	1393	8	0.00	0.00	0.08	0.00	0.00	0.00	0.01	0.00	0.00	0.12	0.40	0.02	0.05	0.06	0.00	7
Regen	1997	7	0.00	0.00	0.13	0.00	0.01	0.00	0.00	0.00	0.00	0.59	1.07	0.58	0.26	0.00	0.00	6
Open	128	3	0.22	0.00	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2
FW	1368	2	0.00	0.00	0.77	0.00	0.00	0.00	0.00	0.00	0.03	0.10	0.19	0.20	0.00	0.02	0.00	6
WS	1759	7	0.01	0.14	0.03	0.00	0.00	0.00	0.01	0.00	0.04	0.23	0.55	0.00	0.02	0.01	0.03	10

Symbol	Animal
E	Elk
M	Moose
D	Deer
W	Wolf
C	Coyote
F	Fox
L	Lynx
O	Otter

General Habitat Type Description		Habitat Description
Symbol	**General Habitat Type**	
RC	*Riparian complex*	Complex mixture of various upland and wetland cover types along tributary drainages & Saskatchewan River
SW	*Softwood*	Intermediate to mature jack pine forests, with some areas of black spruce and/or white spruce
MW	*Mixedwood*	Intermediate to mature mixtures of aspen and jack pine, and some aspen-white spruce stands
HW	*Hardwood*	Intermediate to mature trembling aspen, with occasional mixtures of aspen - balsam poplar
Regen	*Regenerating forest*	Mixtures of aspen and jack pine regeneration
Open	*Openings and clearings*	Openings and clearings areas with sparse tree regeneration
FW	*Forested wetlands*	Forested bogs, fens and swamps
WS	*Willow swamps*	Mixtures of sedges, grasses and willows

Table B-7. List of expected and confirmed bird species.

Common Name	***Latin Name***	**Observed Current Study**	**Observed Golder (2006)**	**Observed Blood et al. (1977)**	**Observed Pipe (1982)**	**Reported Other Studies***
Common loon	*Gavia immer*	X	X	X	X	X
Arctic loon	*Gavia arctica*					X
Red-necked grebe	*Podiceps grisegena*	X		X	X	X
Horned grebe	*Podiceps auritus*	X	X	X	X	X
Eared grebe	*Podiceps nigricollis*	X			X	X
Western grebe	*Aechmophorus occidentialis*	X		X	X	X
Pied-billed grebe	*Podilymbus podiceps*	X	X	X	X	X
White pelican	*Peecanus erythrorhynchos*	X		X	X	X
Double-crested cormorant	*Phalacrocorax auritus*	X		X	X	X
Great blue heron	*ardea herodias*	X		X	X	X
American bittern	*Botaurus lentiginosus*	X		X	X	X
Whistling swan	*Olor columbianus*	X		X	X	X
Canada goose	*Branta canadensis*	X	X	X	X	X
White-fronted goose	*Anser albifrons*			X	X	X
Snow goose	*Chen caerulescens*	X		X	X	X
Ross' goose	*Chen rossii*				X	X
Mallard	*Anas platyrhynchos*	X	X	X	X	X
Black duck	*Anas rubripes*			X	X	X
Gadwall	*Anas strepera*	X		X	X	X
Pintail	*Anas acuta*	X		X	X	X
Green-winged teal	*Anas crecca*	X	X	X	X	X
Blue-winged teal	*Anas discors*	X	X	X	X	X
Cinnamon teal	*Anas cyanoptera*			X		
American widgeon	*Anas americana*	X	X	X	X	X
Northern shoveler	*Anas clypeata*	X		X	X	X
Wood duck	*Aix sponsa*			X		X
Redhead	*Aythya americana*	X		X	X	X
Ring-necked duck	*Aythya collaris*	X	X	X	X	X
Canvasback	*Aythya valisineria*	X		X	X	X
Lesser scaup	*Aythya affinis*	X		X	X	X
Common Goldeneye	*Bucephala clangula*	X		X	X	X

Table B-7. List of expected and confirmed bird species (continued).

Common Name	***Latin Name***	**Observed Current Study**	**Observed Golder (2006)**	**Observed Blood et al. (1977)**	**Observed Pipe (1982)**	**Reported Other Studies***
Bufflehead	*Bucephala albeola*	X	X		X	X
Old squaw	*Clangula hyemalis*			X		X
White-winged scoter	*Melanitta deglandi*			X	X	X
Surf scoter	*Melanilla perspicillata*				X	X
Ruddy duck	*Oxyura jamicensis*	X		X	X	X
Hooded merganser	*Lophodytes cucullatus*			X	X	X
Common merganser	*Mergus merganser*	X	X	X	X	X
Red-breasted merganser	*Mergus serrator*	X			X	X
Turkey vulture	*Cathartes aura*	X		X	X	X
Goshawk	*Accipiter gentilis*	X		X	X	X
Sharp-shinned hawk	*Accipiter striatus*	X		X	X	X
Cooper's hawk	*Accipiter cooperii*			X	X	X
Broad-winged hawk	*Buteo platypterus*		X	X	X	
Red-tailed hawk	*Buteo jamaicensis*	X	X	X	X	X
Swainson's hawk	*Buteo swainsoni*			X	X	X
Rough-legged hawk	*Buteo lagopus*			X	X	X
Ferruginous hawk	*Buteo regalis*					X
Golden eagle	*Aquila chrysaetos*			X	X	X
Bald eagle	*Haliaeatus leucocephalus*	X		X	X	X
Northern harrier	*Circus circus*	X		X	X	X
Osprey	*Pandion haliaetus*	X		X	X	X
Prairie falcon	*Falco mexicanus*				X	
Peregrine falcon	*Falco peregrinus*			X	X	X
Merlin	*Falco columbarius*	X		X	X	X
Kestral	*Falco sparverius*	X	X	X	X	X
Spruce grouse	*Canichites canadensis*	X	X	X	X	
Ruffed grouse	*Bonasa umbellus*	X	X	X	X	X
Willow ptarmigan	*Logopus lagopus*			X		X
Sharp-tailed grouse	*Pedioecetes phasianellus*	X	X	X	X	X
Ring-necked pheasant	*Phasianus colchicus*				X	X
Gray partridge	*Perdix perdix*			X	X	X

Table B-7. List of expected and confirmed bird species (continued).

Common Name	***Latin Name***	**Observed Current Study**	**Observed Golder (2006)**	**Observed Blood et al. (1977)**	**Observed Pipe (1982)**	**Reported Other Studies***
Whooping crane	*Grus americanus*					X
Sandhill crane	*Grus canadensis*	X	X	X	X	X
Virginia rail	*Rallus limicola*			X		X
Sora	*Porzana carolina*	X	X	X	X	X
American coot	*Fulica americana*	X	X	X	X	X
Semipalmated plover	*Charadrius semipalmatus*			X	X	X
Piping plover	*Chardrius melodus*			X		X
Killdeer	*Charadrius vociferus*	X	X	X	X	X
American golden plover	*Pluvialis dominica*			X	X	X
Black-bellied plover	*Pluvialis squatarola*			X	X	X
Ruddy turnstone	*Arenaria interpres*			X		X
Common (or Wilson's) snipe	*Capella gallinago*	X	X	X	X	X
Wimbrel	*Numenius phaeopus*			X		X
Upland sandpiper	*Bartramia longicauda*					X
Spotted sandpiper	*Actitis macularia*	X		X	X	X
Solitary sandpiper	*Tringa solitaria*					X
Willet	*Catoptrophorus semipalmatus*				X	X
Greater yellowlegs	*Tringa melanoleuca*	X		X	X	X
Lesser yellowlegs	*Tgringa flavipes*	X	X	X	X	X
Pectoral sandpiper	*Calidris melanotos*					X
White-rumped sandpiper	*Calidris fuscicollis*					X
Baird's sandpiper	*Calidris bairdii*					X
Least sandpiper	*Calidris fuscicollis*			X	X	X
Dunlin	*Calidris aplina*			X		X
Dowitcher	*Limodromus sp.*			X		X
Stilt sandpiper	*Micropalama himantopus*			X		X
Semipalmated sandpiper	*Calidris pusilla*			X		X
Buff-breated sandpiper	*Tryngites subruficollis*					X
Marbled godwit	*Limosa fedoa*			X	X	X

Table B-7. List of expected and confirmed bird species (continued).

Common Name	***Latin Name***	**Observed Current Study**	**Observed Golder (2006)**	**Observed Blood et al. (1977)**	**Observed Pipe (1982)**	**Reported Other Studies***
Hudsonian godwit	*Limosa haemaotica*					X
Sanderling	*Calidris alba*			X		X
American avocet	*Receuvirostra americana*			X		X
Wilson's phalarope	*Steganopus tricolor*			X	X	X
Northern phalarope	*Lobipes lobatus*					X
Parasitic jaeger	*Stercorarius parasiticus*			X		X
Herring gull	*Larus argentatus*	X		X	X	X
California gull	*Larus californicus*	X		X	X	X
Ring-billed gull	*Larusdelawarensis*	X		X	X	X
Franklin's gull	*Larus pipixcan*			X	X	X
Bonaparte's gull	*Larus philadelphia*			X	X	X
Forester's tern	*Sterna forsteri*			X	X	X
Common tern	*Sterna hirundo*					
Caspian tern	*Sterna caspia*			X	X	X
Black tern	*Chilidonian niger*	X		X	X	X
Rock dove	*Columba livia*			X		X
Mourning dove	*Zenaida macroura*	X	X	X	X	X
Black-billed Cuckoo	*Coccyzus erythropthalmus*				X	X
Great horned owl	*Bubo virginianus*	X		X	X	X
Snowy owl	*Nyctea scandiaca*	X		X		X
Northern hawk owl	*Surnia ulula*				X	X
Burrowing owl	*Speotylo cunicularia*					X
Barred owl	*Athene cunicularia*					X
Great grey owl	*Strix nebulosa*	X	X	X	X	X
Long-eared owl	*Asio otus*			X		X
Short-eared owl	*Asio flammeus*				X	X
Boreal owl	*Aegolius funereus*					X
Saw-whet owl	*Aegolius acadicus*			X	X	X
Whip-poor-will	*Caprimulgus vociferus*				X	X
Common nighthawk	*Chordeiles minor*	X	X	X	X	X
Chimney swift	*Chaetura pelagica*					X

Table B-7. List of expected and confirmed bird species (continued).

Common Name	***Latin Name***	**Observed Current Study**	**Observed Golder (2006)**	**Observed Blood et al. (1977)**	**Observed Pipe (1982)**	**Reported Other Studies***
Ruby-throated hummingbird	*Archilochus colubris*			X	X	X
Belted kingfisher	*Ceryle alcyon*	X		X	X	X
Yellow-bellied sapsucker	*Sphyrapicus varius*	X		X	X	X
Downy woodpecker	*Picoides pubescens*	X		X	X	X
Hairy woodpecker	*Picoides villosus*	X	X	X	X	X
Three-toed woodpecker	*Picoides tridactylus*		X	X	X	X
Black-backed three-toed woodpecker	*Picoides arcticus*		X	X	X	X
Northern flicker	*Colaptes auratus*	X	X	X	X	X
Pileated woodpecker	*Dryocopus pileatus*	X	X	X	X	X
Olive-sided flycatcher	*Contopus borealis*		X	X	X	X
Western wood-pewee	*Contopus sordidulus*			X	X	X
Yellow-bellied flycatcher	*Empidonax flaviventris*		X			X
Alder flycatcher	*Empidonax alnorum*		X	X	X	X
Least flycatcher	*Empidonax minimus*	X	X	X	X	X
Eastern phoebe	*Sayornis phoebe*	X		X	X	X
Great-crested flycatcher	*Myiarchus crinitus*			X	X	X
Western kingbird	*Tyrannus verticalis*	X		X	X	X
Eastern kingbird	*Tyrannus tyrannus*	X	X	X	X	X
Horned lark	*Eremophila alpestris*	X		X	X	X
Purple martin	*Progne subis*			X	X	X
Tree swallow	*Tachycineta bicolor*	X	X	X	X	X
Violet-green swallow	*Tachycineta thalassina*			X	X	X
Bank swallow	*Riparia riparia*			X	X	X
Cliff swallow	*Hirundo pyrrhonota*			X	X	X
Barn swallow	*Hirundo rustica*	X	X	X	X	X
Gray jay	*Perisoreus canadensis*	X		X	X	X
Blue jay	*Cyanocitta cristata*	X	X	X	X	X
Black-billed magpie	*Pica pica*	X	X	X	X	X
American crow	*Corvus brachyrhynchos*	X		X	X	X
Common Raven	*Corvus corax*	X	X	X	X	X
Black-capped chickadee	*Parus atricapillus*	X	X	X	X	X

Table B-7. List of expected and confirmed bird species (continued).

Common Name	***Latin Name***	**Observed Current Study**	**Observed Golder (2006)**	**Observed Blood et al. (1977)**	**Observed Pipe (1982)**	**Reported Other Studies***
Boreal chickadee	*Parus hudsonicus*	X	X	X	X	X
Red-breasted nuthatch	*Silla canadensis*	X	X	X	X	X
White-breasted nuthatch	*Sitta carolinensis*	X		X	X	X
Brown creeper	*Certhia americana*	X	X	X	X	X
House wren	*Troglodytes aedon*	X		X	X	X
Winter wren	*Troglodytes troglodytes*	X	X	X	X	X
Sedge wren	*Cistothorus platensis*					X
Marsh wren	*Cistothorus palustris*		X	X	X	X
Golden-crowned kinglet	*Regulus satrapa*		X	X		X
Ruby-crowned kinglet	*Regulus calendula*	X	X	X	X	X
Eastern bluebird	*Sialia sialis*					X
Mountain bluebird	*Sialia currucoides*	X	X	X	X	X
Townsend's solitaire	*Myadestes townsendi*					X
Veery	*Catharus fuscescens*	X		X	X	X
Gray-cheeked thrush	*Catharus minimus*			X	X	X
Swainson's thrush	*Catharus ustulatus*	X	X	X	X	X
Hermit thrush	*Catharus guttatus*		X	X	X	X
American robin	*Turdus migratorius*	X		X	X	X
Gray catbird	*Dumetella carolinensis*	X	X	X	X	X
Northern mockingbird	*Mimus polyglottos*				X	
Brown thrasher	*Toxostoma rufum*			X		X
American pipit	*Anthus rubescens*					X
Sprague's pipit	*Anthus spragueii*			X	X	X
Bohemium waxwing	*Bombycilla garrulus*	X		X	X	X
Cedar waxwing	*Bombycilla cedrorum*	X	X	X	X	X
Northern shrike	*Lanius excubitor*					X
Loggerhead shrike	*Lanius ludovicianus*			X		X
Europeon starling	*Sturnus vulgaris*			X	X	X
Solitary vireo	*Vireo solitarius*			X		X
Yellow-throated vireo	*Vireo flavifrons*					X
Warbling vireo	*Vireo gilvus*			X	X	X

Table B-7. List of expected and confirmed bird species (continued).

Common Name	***Latin Name***	**Observed Current Study**	**Observed Golder (2006)**	**Observed Blood et al. (1977)**	**Observed Pipe (1982)**	**Reported Other Studies***
Philadelphia vireo	*Vireo philadelphicus*	X		X	X	X
Red-eyed vireo	*Vireo olivaceus*	X	X	X	X	X
Tennessee warbler	*Vermivora peregrina*	X	X	X	X	X
Orange-crowned warbler	*Vermivora warbler*		X	X	X	X
Nashville warbler	*Vermivora ruficapilla*		X	X	X	X
Yellow warbler	*Dendroica petechia*	X		X	X	X
Chest-nut sided warbler	*Dendroica pensylvanica*	X	X	X	X	X
Magnolia warbler	*Dendroica magnolia*	X	X	X	X	X
Cape may warbler	*Dendroica tigrina*		X	X	X	X
Yellow-rumped warbler	*Dendroica coronata*	X	X	X	X	X
Black-throated green warbler	*Dendroica virens*		X	X	X	X
Blackburnian warbler	*Dendroica fusca*		X	X	X	X
Palm warbler	*Dendrioca palmarum*		X	X		X
Bay-breasted warbler	*Dendrioca castanea*			X		X
Blackpoll warbler	*Dendrioca striata*			X		X
Black & white warbler	*Mniotilta varia*	X		X	X	X
American redstart	*Setophaga ruticilla*	X	X	X	X	X
Ovenbird	*Seiurus aurocapillus*	X	X	X	X	X
Northern waterthrush	*Seiurus noveboracensis*			X	X	X
Conneticut warbler	*Oporornis agilis*		X	X	X	X
Mourning warbler	*Oporornis philadelphia*		X	X	X	X
MacGillvrays's warbler	*Oporornis tolmiei*			X	X	X
Common yellowthroat	*Geothlypis trichas*	X	X	X	X	X
Wilson's warbler	*Wilsonia pusilla*	X		X	X	X
Canada warbler	*Wilsonia canadensis*			X	X	X
Scarlot tanager	*Pirango olivacea*			X		X
Western tanager	*Piranga tudoviciana*	X		X	X	X
Red-breasted grosbeak	*Pheucticus ludovicianus*	X	X	X	X	X
Rufous-sided towhee	*Pipilo erythrophthalmus*			X		X
American tree sparrow	*Spizella arborea*					X
Chipping sparrow	*Spizella passerina*	X	X	X	X	X

Table B-7. List of expected and confirmed bird species (continued).

Common Name	***Latin Name***	**Observed Current Study**	**Observed Golder (2006)**	**Observed Blood et al. (1977)**	**Observed Pipe (1982)**	**Reported Other Studies***
Clay-colored sparrow	*Spizella pallida*	X	X	X	X	X
Vesper sparrow	*Pooecetes gramineus*	X	X	X	X	X
Lark sparrow	*Chondestes grammacus*					X
Lark bunting	*Calamospiza melanocorys*					X
Savannah sparrow	*Passerculus sandwichensis*	X		X	X	X
Baird's sparrow	*Ammodramus bairdii*					X
Le Conte's sparrow	*Ammodramus leconteii*		X		X	X
Sharp-tailed sparrow	*Ammodramus caudacutus*				X	X
Fox sparrow	*Passerella iliaca*			X		X
Song sparrow	*Melospiza melodia*	X	X	X	X	X
Lincoln's sparrow	*Melospiza lincolnii*	X	X	X	X	X
Swamp sparrow	*Melospiza georgiana*			X		X
White-throated sparrow	*Zonotrichia albicollis*	X	X	X	X	X
White-crowned sparrow	*Zonotrichia leucophrys*	X		X	X	X
Harris' sparrow	*Zonotrichia querula*				X	X
Dark-eyed junco	*Junco hyemalis*	X	X	X	X	X
Lapland longspur	*Calcarius lapponicus*				X	X
Snow bunting	*Plectrophenax nivalis*	X		X	X	X
Red-winged blackbird	*Agelaius phoeniceus*	X	X	X	X	X
Western meadowlark	*Sturnella neglecta*	X		X	X	X
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*	X		X	X	X
Rusty blackbird	*Euphagus carolinus*					X
Brewer's blackbird	*Euphagus cyanocephalus*	X		X	X	X
Common Grackle	*Quiscalus quiscula*	X		X	X	X
Brown-headed cowbird	*Molothrus ater*	X		X	X	X
Baltimore oriole	*Icterus galbula`*	X		X	X	X
Pine grosbeak	*Pinicola enucleator*	X		X	X	X
Purple finch	*Carpodacus purpureus*	X	X	X	X	X
Red crossbill	*Loxia curvirostra*	X		X	X	X
White-winged crossbill	*Loxia luecoptera*	X	X			X
Common redpoll	*Carduelis flammea*	X		X	X	X

Table B-7. List of expected and confirmed bird species (concluded).

Common Name	***Latin Name***	**Observed Current Study**	**Observed Golder (2006)**	**Observed Blood et al. (1977)**	**Observed Pipe (1982)**	**Reported Other Studies***
Hoary redpoll	*Carduelis hornemanni*	X				X
Pine siskin	*Carduelis pinus*	X	X	X	X	X
American goldfinch	*Carduelis tristis*	X	X	X	X	X
Evening grosbeak	*Coccothraustes vespertinus*	X		X	X	X
House sparrow	*Passer domesticus*	X		X	X	X

* *Observed other studies:* Smith (1996) and references reported in Blood et al. (1977) and Pipe et al. (1982), including accounts by local naturalists. Some of these species may occur only regionally (e.g., Nipawin area), but not specifically in Fort-a-la-Corne Provinvial Forest, or may be migrants only passing through during spring and fall migration. Blood et al (1977) included the TobinLake Area and a focus on the Saskatchewan River valley.

Table B-8. Species occurrence during breeding bird survey.

Species	Occurrence (% of Plots)
Red-eyed vireo	44.92
White-throated sparrow	33.05
Chipping sparrow	23.73
Dark-eyed junco	21.19
Common yellowthroat	16.95
Least flycatcher	14.41
Swainson's thrush	11.02
Ovenbird	11.02
Song sparrow	10.17
Yellow warbler	10.17
Ruby-crowned kinglet	9.32
American goldfinch	6.78
Clay-colour sparrow	5.93
Blue jay	5.93
Pine siskin	3.39
Wison's snipe	3.39
American redstart	3.39
Black-capped chickadee	2.54
Mourning dove	2.54
Tree swallow	2.54
Magnolia warbler	2.54
Chestnut-sided warbler	1.69
Yellow-bellied sapsucker	1.69
Northern flicker	1.69
Red-tailed hawk	1.69
Spotted sandpiper	1.69
Philedelphia vireo	1.69
Black & White warbler	1.69
Sedge wren	1.69
White-breasted nuthatch	1.69
Wilson's warbler	1.69
Cedar waxwing	0.85
Rose-breasted grosbeak	0.85
Cliff swallow	0.85
Barn swallow	0.85
Turkey vulture	0.85
Red-breasted nuthatch	0.85
Marsh wren	0.85
White-crowned sparrow	0.85
Brown creeper	0.85
Mallard	0.85
Common merganser	0.85
Red-winged blackbird	0.85

Table B-8. Species occurrence during breeding bird survey (concluded).

Species	Occurrence (% of Plots)
Olive-sided flycatcher	0.85
Cooper's hawk	0.85
American crow	0.85
Tennesse warbler	0.85
Evening grosbeak	0.85
Grey jay	0.85
Boreal chickadee	0.85

Table B-9. Breeding bird species richness by habitat.

General Cover Class	# Plots Sampled	Total Species Observed	Average # Species Per Plot	Average # of Singing Males Per Plot	Average # of Singing Males Per Hectare
jP Regen (open)	20	21	2.62	3.00	3.82
jP Regen (closed)	7	7	2.43	2.71	3.45
jP (open)	4	10	2.50	3.25	4.14
jP (closed)	12	14	2.42	2.67	3.39
bS (closed)	6	8	2.17	3.00	3.82
wS (closed)	2	8	3.00	3.00	3.82
tA-wS (closed)	6	13	3.50	4.50	5.73
Hardwood (open)	4	11	4.25	4.75	6.05
Hardwood (closed)	23	29	3.61	4.00	5.09
Aspen Regen (closed)	8	13	2.88	3.38	4.30
Treed Fen	3	5	3.33	4.33	5.52
Shrubby Fen	2	4	2.50	2.50	3.18
Treed Conifer Swamp	6	7	2.33	2.67	3.39
Willow Swamp	7	15	3.50	5.13	6.52
Beaver Pond Complex	6	14	4.67	6.67	8.48
River Shoreline	2	9	5.50	8.50	10.82

Table B-10. May 8th, 2008 amphibian survey results.

Per Stop Information							
Stop #	**A016**	**A007**	**A007**	**A009**	**A005**	**A006**	**A015**
Date: (May 2008)	**8**	**8**	**8**	**8**	**8**	**8**	**8**
Start Time(optional)	16:54	17:09	17:15	18:14	18:43	19:12	19:32
Air Temperature (Celsius)	10.9	10.9	10.9	10.5	10.5	8.9	8.9
Noise Factor	No	No	No	No	No	No	No
Timeout	No	No	No	No	No	No	No
Species							
Wood Frog	4	3	4	4	4	4	4
Boreal Chorus Frog	4	4	4	4	4	4	4
Northern Leopard Frog	4	4	4	4	4	4	4
Canadian Toad	4	4	4	4	4	4	4
Environment Information							
Water Temperature (Celsius)	N/R	N/R	N/R	N/R	N/R	N/R	N/R
Sky	N/R	N/R	N/R	N/R	N/R	N/R	N/R
Windspeed	5	3	5	5	5	5	5

Table B-11. May 22nd to 23rd, 2008 amphibian survey results.

Per Stop Information																				
Stop #	**A001**	**A002**	**A003**	**A004**	**A005**	**A006**	**A007**	**A008**	**A009**	**A010**	**A011**	**A012**	**A013**	**A014**	**A015**	**A016**	**A017**	**A018**	**A019**	**A020**
Start Time(optional)	16:45	N/R	18:37	N/R	19:24	N/R	3:00	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R
Air Temperature (Celsius)	22	22	22	22	22	22	24	N/R	24	24	24	24	24	N/R	24	24	N/R	N/R	22	N/R
Noise Factor	No	No	No	No	No	No	2	N/R	No	No	No	No	No	N/R	N/R	N/R	N/R	N/R	No	N/R
Timeout	No	No	No	No	No	No	No	N/R	No	No	No	No	No	N/R	N/R	N/R	N/R	N/R	No	N/R
Species																				
Wood Frog	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Boreal Chorus Frog	4	4	4	3	4	3	4	4	1	2	3	3	3	4	4	4	4	4	4	4
Northern Leopard Frog	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Canadian Toad	4	4	4	4	4	4	3	4	3	4	4	4	4	4	4	4	4	4	4	4
Environment Information																				
Water Temperature (Celsius)	13.2	13.2	13.2	19.6	17.7	14.0	19.2	N/R	19.6	20.3	20.2	20.3	10.1	N/R	N/R	N/R	N/R	N/R	19.6	N/R
Sky	0	0	0	0	0	0	0	N/R	0	0	0	0	0	N/R	N/R	N/R	N/R	N/R	0	N/R
Windspeed	2	3	3	3	3	4	3	N/R	3	3	3	3	3	N/R	N/R	N/R	N/R	N/R	3	N/R

Amphibian Survey Codes

Amphibian Calling Index	
1	Individuals can be counted; there is a space between calls
2	Calls of individuals can be distinguished but there is some overlapping of calls
3	Full chorus, calls are constant, continuous and overlapping
4	No calling; observed
Sky Codes	
0	Few clouds
1	Partly cloudy (scattered) or variable sky
2	Cloudy or overcast
4	Fog or smoke
5	Drizzle or light rain (not affecting hearing ability)
7	Snow
8	Showers (is affecting hearing ability) do not conduct survey
Beaufort Wind Codes	
0	Calm (<1mph) smoke rises vertically
1	Light air (1-3mph) smoke drifts, weather vain inactive
2	Light Breeze (4-7mph) leaves rustle, can feel wind on face
3	Gentle Breeze (8-12mph) leaves and twigs move around, small flag extends
4*	Moderate Breeze (13-18mph) moves thin branches, raises loose papers
5**	Fresh Breeze (19mph or greater) small trees begin to sway
Noise Index	
0	No appreciable effect (e.g. owl calling)
1	Slightly affecting sampling (e.g. distant traffic, dog barking, 1 car passing)
2	Moderately affecting sampling (e.g. nearby traffic, 2-5 cars passing)
3	Seriously affecting sampling (e.g. continuous traffic nearby, 6-10 cars passing)
4	Profoundly affecting sampling (e.g. continous traffic passing, construction noise)
*****	do not conduct survey at level 4, unless in Great Plains region
******	do not conduct survey at level 5, all regions
	stop location; no amphibian data recorded (N/R) due to no frogs

Table B-12. Wildlife species at risk.

Common Name	Latin Name	SARA Status	COSEWIC Status	SKCDC Rank	Last COSEWIC Assessment	Schedule	Expected	Confirmed Previous Studies	Confirmed Current Study
Wolverine	*Gulo gulo*	No Status	Special Concern	S3S4	May 2003	No Schedule	Yes	No	No
Short-eared Owl	*Asio flammeus*	Special Concern	Special Concern	S3B, S2N	April 2008	Schedule 3	Possible	No	No
Whip-poor-will	*Caprimulgus vociferus*	No Status	Threatened	S3B	April 2009	No Schedule1	Yes	Yes	No
Chimney swift	*Chaetura pelagica*	Threatened	Threatened	S3B	April2007	Schedule 1	Yes	Yes	No
Common Nighthawk	*Chordeiles minor*	No Status	Threatened	S4S5B, S4S5M	April 2007	No Schedule	Yes	Yes	Yes
Olive-sided Flycatcher	*Contopus cooperi*	No Status	Threatened	S4	November 2007	No Schedule	Yes	Yes	Yes
Canada Warbler	*Wilsonia canadensis*	No Status	Threatened	S5B	April 2008	No Schedule1	Yes	Yes	Yes
Northern Leopard Frog	*Rana pipiens*	Special Concern	Special Concern	S3	April 2009	Schedule 1	Yes	Yes	No

Source: SKCDC May, 2009

Threatened (T): A wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.
Special Concern (SC): A wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats.

For more detailed information see:

Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and its recommendations for listing, go to: http://www.cosewic.gc.ca
Species at Risk Act (SARA) and its registry of protected species go to: http://www.sararegistry.gc.ca
Saskatchewan Conservation Data Centre (SKCDC) go to: http://www.biodiversity.sk.ca

APPENDIX C – Additional Maps

- separate PDF file