SPECIES AT RISK SURVEY

Spy Hill Lands

Prepared for

Alberta Transportation
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by

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TABLE OF CONTENTS

FIGURES

TABLES

EXECUTIVE SUMMARY

URSUS Ecosystem Management Ltd. (URSUS) was previously retained by Brown and Associates to conduct a wildlife and vegetation baseline study (Kansas and Collister 2002) in conjunction with the preliminary evaluation of development options for the Spy Hill Lands gravel reserves. URSUS was subsequently requested by Brown and Associates to complete a "species-at-risk survey" of the Spy Hill Lands in support of further public consultation and engineering assessments of the site. The objective of this additional study was to verify the presence/absence and abundance of potential wildlife and plant species at risk on the Spy Hill lands.

Fifteen vertebrate species at risk with high suitability habitat on the Spy Hill lands and 11 rare plants were the focus of field surveys during 2003. A songbird call survey on 6 and 9 June detected one bird species at risk: Swainson's Hawk. A transect survey on 7 August documented the presence of Badger in the study area. A nocturnal amphibian survey on 23 May and 2 June did not detect any species at risk.

Rare plant surveys during June and July detected one rare plant: stiff yellow paintbrush (*Castilleja lutescens*) at 11 sites. A rare plant community, in excellent condition, *Festuca scabrella* (*campestris*)-*Danthonia parryi* native grassland was identified in the southwestern portion of the study area outside the limits of extraction.

Overall, there is a scarcity of plant species at risk and their habitats within the study area. This relates primarily to a paucity of calcareous or alkaline seepages and sandy grassland types. Although one provincially rare species has been identified, no COSEWIC (2003) listed species have been found in the study area.

The stiff yellow paintbrush (*Castilleja lutescens*) populations can largely be avoided by confining activities to the non-native grassland habitats. Plants could also be transplanted to the southern portion of the study area outside the limits of extraction and subsequently returned to reclaimed areas as appropriate. The rare high quality fescue grassland community in the southwest portion of the study area beyond the limits of extraction can be protected by leaving the area ungrazed and not removing the native prairie cover.

No COSEWIC listed vertebrates were found. Two provincial vertebrate species at risk were detected during field surveys: Swainson's Hawk and Badger. A local resident reliably reported Red-sided Garter Snakes, a provincially listed species, in the study area. Long-tailed Weasel, another provincially listed species, although not detected likely occurs. Badger and Swainson's Hawk populations can be maintained post development if grassland habitat and ground squirrel populations persist. Swainson's Hawk also requires trees or tall shrubs as nesting substrate. Long-tailed Weasels and garter snakes may still occur on the property after reclamation if sufficient habitat with a mixture of hiding cover and moist grasslands are fostered. Garter snake hibernacula (over-wintering sites) are at risk during excavation and should be watched for.

1.0 INTRODUCTION

1.1 Background

The Spy Hill Lands in NW Calgary are comprised of two square miles of land owned by the Province of Alberta containing significant non-renewable aggregate deposits. The Spy Hill Lands Development project was undertaken on behalf of Alberta Infrastructure and Alberta Transportation by a consulting team headed by Brown and Associates Planning Group (land use planning) and Russ Gerrish Consulting (gravel mining engineering).

Initial phases of this project determined and evaluated development options and identified ways of utilizing the Spy Hill gravel reserves to their optimum levels. The scope of work included identifying all relevant issues, identifying and reviewing all utilities/easements, and adjacent land uses and providing recommendations. A report was prepared documenting issues, stakeholders, aggregate extraction scenarios and the affect of such scenarios on the identified issues (Brown and Associates 2003).

URSUS Ecosystem Management Ltd. (URSUS) was previously retained by Brown and Associates to conduct a wildlife and vegetation baseline study (Kansas and Collister 2002) in conjunction with the preliminary evaluation of development options for the Spy Hill Lands gravel reserves. That report identified wildlife habitats on the Spy Hill Lands that were regionally significant including a major ravine and contiguous block of aspen groveland. Kansas and Collister (2002) also identified the potential occurrence of 54 species at risk (SAR) including 5 mammals, 17 birds, 4 amphibians and reptiles, and 28 vascular plants. Potential occurrence was based on known distribution and habitat affiliations but it was beyond the scope of the initial project to comprehensively investigate the occurrence and/or abundance of these species on the site.

URSUS was subsequently requested by Brown and Associates to complete a "species-at-risk survey" of the Spy Hill Lands in support of further public consultation and engineering assessments of the site. Although the project terms of reference focused on federal species at risk we took a broader approach and considered species listed provincially as well.

1.2 Objective

1. To verify the presence/absence and abundance of potential wildlife and plant species at risk on the Spy Hill lands.
2. To establish a baseline for future monitoring of reclamation success.
3. To recommend reclamation measures that would provide optimum habitat for species at risk currently resident on the site.

1.3 Species at Risk

Vertebrates

Vertebrate species at risk with potential to occur on the Spy Hill Lands were identified in Kansas and Collister (2002) and are presented in Table 1. At risk definitions are presented in Table 2. Status and abundance definitions are presented below.

Status

S	summer resident, migrates out of study area for the winter
W	winter resident, present only during late fall, winter and early spring
R	permanent resident, present year-round although not necessarily active during winter
M	migrant, passes through area during spring and/or fall, not normally resident at any time of the year
T	transient, expected to occur only in passing, not normally resident at any time of the year

Abundance

C	common, detected whenever suitable habitat is investigated during an appropriate season
U	uncommon, detected often, but not always, whenever suitable habitat is investigated during an appropriate season
S	scarce, detected occasionally, but not usually, even when suitable habitat is investigated during an appropriate season
R	rare, unexpected but could occur in any given year, would not generally be considered a regular component of the study area fauna

Of the 26 species at risk with potential to occur on or in the vicinity of the Spy Hill Lands 15 were assessed, for purposes of this study, as being most likely based on the identification of highly suitable habitat within Kansas and Collister (2002).

- Northern Goshawk
- Swainson's Hawk
- Prairie Falcon
- Sharp-tailed Grouse
- Upland Sandpiper
- Short-eared Owl
- Pileated Woodpecker
- Sprague's Pipit

- Baird's Sparrow
- Long-tailed Weasel
- American Badger
- Northern Leopard Frog
- Wandering Garter Snake
- Red-sided Garter Snake

Vascular Plants

Although all of the plants identified in Kansas and Collister (2002) have potential to occur in the vicinity of the Spy Hill Lands the following are considered most likely and were specifically targeted in the field surveys.

- *Carex parryana* (Parry's sedge) - moist calcareous or alkaline seeps, S1S2
- *Gentiana fremontii (marsh gentian) - calcareous springs/seepage areas, S2S3*
- *Gratiola neglecta (clammy hedge-hyssop), wet muddy places, S2S3*
- *Potentilla finitima (sandhills cinquefoil) - disturbances in native grassland, especially sandier sites, S1*
- *Ranunculus glaberrimus (early buttercup) - grassland, S2*
- *Rorippa tenerrima (slender yellow-cress) - moist open areas, generally on recently exposed mud, S1*
- *Sisyrinchium septentrionale (pale blue-eyed grass) - moist meadows, S2S3*
- *Sphenopholis obtusata (prairie wedge grass), moist meadows, especially at edges of flowing springs, S2*
- *Townsendia exscapa (low townsendia), dry hillsides and prairies, especially exposed valley slopes or ridge, S2*
- *Veronica catenata (water speedwell) - ponds, slow-moving creeks, S2*
- *Viola pedatifida (crowfoot violet) - grassland, especially sandy types, S2*

The Alberta Natural Heritage Information Centre Tracking List criteria used to rank species for tracking is presented below.

S1 ≤5 occurrences in the province or only a few remaining individuals or may be imperiled because some factor of its biology makes it especially vulnerable to extirpation.

S2: 6-20 occurrences or with many individuals in fewer occurrences; or may be susceptible to extirpation because of some factor of its biology.

S3: 21-100 occurrences, may be rare and local throughout its provincial range, or in a restricted provincial range (may be abundant in some locations or may be vulnerable to extirpation because of some factor of its biology).

S4: apparently secure under present conditions, typically >100 occurrences but may be fewer with many large populations; may be rare in parts of its provincial range, especially peripherally.

S5: demonstrably secure under present conditions, >100 occurrences, may be rare in parts of its provincial range, especially peripherally.

SU: status uncertain often because of low search effort or cryptic nature of the element; possibly in peril, unrankable, more information needed.

2.0 SURVEYS AND ASSESSMENT

2.1 Vertebrates

Birds

A songbird call survey was undertaken on 6 and 9 June from 0515-0900 hrs and 0500-0830 hrs respectively. The entire study area was surveyed systematically to detect species primarily by song but also visually in the case of hawks, grouse and owls. Table 3 presents the species detected and their habitat affiliations. The only species at risk detected was Swainson's Hawk although no active nests were located. Five active Red-tailed Hawk nests were identified (Figure 1). It is unlikely but possible that an active Swainson's Hawk nest was present on the Spy Hill Lands during 2003. However this species certainly could be expected to nest on the study area in any given year.

Northern Goshawk is most likely to use the Spy Hill Lands during the non-breeding season and its presence would be occasional and unpredictable. No suitable nest sites for Prairie Falcon occur in the study area but the presence of ground squirrels in the grassland habitats provides high suitability foraging habitat. This species will travel many kilometers between nesting and foraging sites. The Spy Hill Lands provide good Sharp-tailed Grouse habitat except for the high level of human-use nearby. It is likely that this species has been extirpated in the immediate area. Upland Sandpiper requires extensive areas of native grassland. Although the native grassland on the Spy Hill Lands rates highly suitable for this species it is likely not extensive enough to support breeding. Short-eared owl was searched for at dawn at the beginning of songbird surveys and at dusk at the beginning of amphibian surveys. This species is crepuscular and is best detected foraging over grassland habitat at these times. No Short-eared Owls were observed. However it is an irruptive species and absence in one year does not preclude its presence in the future. The highly suitable habitat for Pileated Woodpecker on the Spy Hill Lands is likely not extensive enough to support breeding. Sprague's Pipit and Baird's Sparrow are both species of relatively ungrazed native grassland. The limited supply of this type of habitat in the study area coupled with being located near the western limit of their ranges likely explains their absence.

Mammals

Kansas and Collister (2002) noted in their baseline ecological assessment of the Spy Hill Lands that the Badger was an uncommon resident on the property. We conducted transect sampling for sign of Badgers and their main prey (ground squirrels and pocket gophers) in order to further ascertain the status, abundance and habitat affiliations of this species. Sixteen (16) transects were completed on 7 August 2003. Transects ranged in length from 250- to 1600- m and were located within mapped habitat types (Figure 1). The number of fresh burrows/diggings of Richardson's Ground Squirrel and Northern Pocket Gopher that occurred within 1-m of either side of the transect were counted at 50-m intervals. Badger

diggings observed within sight (approximately 5-m) of transects were recorded. Habitat in the vicinity of each badger digging was described and a GPS location recorded.

Table 4 summarizes the data collected on transects. Disturbed grasslands with heavy and severe livestock grazing generally supported the highest frequency of ground squirrel burrows. Ground squirrel activity was sporadic and located in isolated pockets of heavily grazed and well-drained domestic grassland. Pocket gopher activity was more widespread and consistent with highest activity occurring within lightly to moderately grazed low shrub and willow groveland. Badger sign was observed at 10 locations with five of these occurring on transects. Table 5 describes habitat conditions at each Badger sign location. Eight of the 10 digging sites observed were in disturbed grassland – most of these heavily or severely grazed by livestock.

Field investigations confirm that Badgers are resident on the Spy Hill Lands. The number of Badgers that use the Spy Hill lands is unknown. Published literature reports densities of from one to 6 adult badgers per km^2 (Scobie 2002). This information suggests that from 5 to 30 badgers could occur on the Spy Hill lands. Our observations including levels and age of digging sign would indicate that the lower end of this population density spectrum is more likely.

Inventory of Long-tailed Weasel requires winter conditions with snow tracking the technique of choice. Our study period did not include winter conditions and as such no inventory could be conducted. Based on past inventory experience with this species and the existing habitat conditions, we are confident that it is a resident on the Spy Hill Lands. A review of seven North American studies by Fagerstone (1987) reported that population densities of Long-tailed Weasels range from 0.4 to 38 animals per km^2 (mean = 12.0/km^2). This suggests that from 2 to 190 weasels could occur on the Spy Hill lands. Based on the fact that approximately half of the property is heavily grazed and low quality weasel habitat we believe that weasel densities are likely in the lower to middle of this range of values.

Reptiles and Amphibians

A nocturnal call survey for amphibian species at risk was undertaken on the evenings of 23 May (2200-1200 hrs) and 2 June 2003 (2200-0030 hrs). On 23 May observers listened along Rocky Ridge Road and 85th Street at sites 400-m, 1200-m, 2000-m and 2800-m N of 112th Ave. On 2 June observers listened continuously while walking N along a transect 800-m east of Rocky ridge Road between 112th Ave and 144th Ave and then returning via Rocky Ridge Road and 85th Street.

Boreal Chorus Frogs were abundant while Wood Frogs were much less so. No Northern Leopard Frogs or Western Toads were detected. The study area is at the eastern range limit for Western Toads and this is probably the reason that none were encountered. Northern Leopard Frogs occurred with some regularity in the Calgary region historically (20+ years

ago) but there are no recent records. Nevertheless there is always the chance of encountering an isolated relic population.

No focused surveys were undertaken for garter snakes and none were detected during field surveys. Their occurrence is dictated primarily by the presence of suitable hibernacula (over-wintering sites). Given the geological character of the study area and environs it is likely that hibernacula do exist nearby and that one or both of Wandering Garter Snake and Red-sided Garter Snake occur in small numbers on the Spy Hill Lands. A local resident (Garry Willison) and his son observed Red-sided Garter Snakes near the ponds in the southwest portion of the study area around the end of July 2003.

2.2 Vascular Plants

Detailed plant species at risk surveys were undertaken in late June and early July 2003 in the full range of habitats--native grasslands, disturbed fields, modified grasslands, shallow marshes, low shrubbery, Bebb willow shrubbery, aspen woodland, and silverberry shrubbery; however, there was a concentration of effort on native habitats.

Surveys included both "directed" and intensive "hands and knees" ground surveys in high potential native microhabitats. This allowed a detailed assessment of representative habitats throughout the proposed development area as well as a detailed inspection of the potentially more productive plant species at risk microhabitats. Directed surveys consisted of a series of meandering transects in native plant communities ensuring complete coverage of each area. Hands and knees ground surveys were used along directed survey routes to investigate high potential microhabitats. This involved a close examination of the ground cover on hands and knees and parting of the vegetation to inspect the full range of species, including smaller, less conspicuous types.

In addition to the plant species at risk surveys, some assessment was made of native grasslands due to their scarcity in the Calgary region.

A large portion of the study area is crop or hayland that has been seeded with non-native species. Much of the remaining native grassland in the study area has been compromised by overgrazing and invasion by non-native species. Native grasslands exist largely as tiny patches with low species diversity surrounded by areas dominated by non-native species. Some excellent condition native grassland persists at the southwestern corner (Figure 3). It is a *Festuca scabrella* (*campestris*)-*Danthonia parryi* type that is listed on the tracking list of rare plant communities in Alberta (ANHIC 2003). It is of high conservation value given the lack of recent grazing, presence of some rare plant populations (stiff yellow paintbrush) and the scarcity of high quality native grassland habitats in the vicinity of Calgary.

No nationally listed plant species at risk were found in this survey. One provincially rare plant, stiff yellow paintbrush (*Castilleja lutescens*) (Figure 2), was found in scattered locations across the study area (Figure 3), although a preponderance of the records are in the southern

2/3 of the study. This species classified as S2S3 in Alberta, was found at the following locations (all NAD27 datum):

UTME	UTMN	Number of Plants*	Notes
694820	5673076	2	east-facing slope, 3%, in *Poa pratensis with Rosa, Hedysarum alpinum, Thermopsis rhombifolia, Smilacina stellata, Geum triflorum, Lithospermum ruderale, Heuchera richardsonii, Cirsium arvense, Helictotrichon hookeri, Erysimum inconspicuum, Galium boreale, Aster alpinus*
694387	5672163	1	northwest facing slope, 2%, in *Poa pratensis-Bromus inermis* with *Hedysarum alpinum, Thermopsis rhombifolia, Potentilla fruticosa, Festuca scabrella*
694517 -694487	5672115 -5672080	19	top of knoll in *Festuca scabrella* with *Bromus inermis, Hedysarum alpinum, Poa pratensis, Potentilla gracilis, Thermopsis rhombifolia, Vicia americana, Galium boreale;* on both sides of fence
694656	5671800 -5671829	4	top of knoll in *Poa pratensis* with *Achillea millefolium, Hedysarum alpinum, Potentilla gracilis, Artemisia ludoviciana, Gaillardia aristata, Rosa, Galium boreale;* on both sides of fence
694975	5671622	9	top of knoll in *Poa pratensis-Festuca scabrella-Agropyron dasystachum* with *Hedysarum alpinum, Symphoricarpos occidentalis, Anemone multifida, Potentilla hippiana, Artemisia frigida, Geum triflorum, Rosa, Galium boreale, Aster alpinus*
694933-694944	5672228-5672267	2	level terrain in *Festuca scabrella-Poa pratensis* with *Hedysarum alpinum, Potentilla gracilis, Salix bebbiana, Artemisia ludoviciana, Geum triflorum, Agoseris glauca, Achillea millefolium*
695000	5671746	8	top of knoll in *Festuca scabrella-Symphoricarpos occidentalis* with *Hedysarum alpinum, Anemone patens, Geranium viscosissimum, Geum triflorum, Rosa, Galium boreale, Artemisia ludoviciana, Poa interior*
693722	5670821	7	west-facing, 3% slope at base of hill at edge of native grassland and mid-slope in native grassland; in *Poa pratensis-Festuca scabrella* with *Thermopsis rhombifolia, Anemone patens, Fragaria virginiana, Galium boreale, Danthonia parryi*
693833-693904	5670757-5670725	8	plateau, with slight southerly aspect; in native grassland and modified native grassland; in *Festuca scabrella* with *Hedysarum alpinum, Thermopsis rhombifolia, Galium boreale, Lupinus sericeus*
693532	5670656	4	depression at end of wet meadow, in *Poa pratensis* with *Heuchera richardsonii, Fragaria virginiana, Achillea millefolium, Antennaria, Galium boreale, Potentilla gracilis*
694186-694153	5670583-5670611	34	south-facing 4% slope, *Festuca scabrella-Danthonia parryi* with *Symphoricarpos occidentalis, Rosa, Galium boreale, Thermopsis rhombifolia*

*An individual plant may consist of multiple stems

3.0 CONCLUSIONS, RECOMMENDATIONS AND MITIGATION

- Overall, there is a scarcity of plant species at risk and their habitats within the study area. This relates primarily to a paucity of calcareous or alkaline seepages and sandy grassland types. Although one provincially rare species (stiff yellow paintbrush) has been identified, no COSEWIC (2003) listed species have been found in the study area.

- The stiff yellow paintbrush (*Castilleja lutescens*) populations can largely be avoided by confining activities to the non-native grassland habitats. Plants could also be transplanted to the southern portion of the study area outside the limits of extraction (Figure 3) and subsequently returned to reclaimed areas as appropriate.

- The rare high quality fescue grassland community (Figure 3) that occurs in the southern portion of the study area outside the limits of extraction (Figure 3) can be protected by leaving it ungrazed and not removing the native prairie cover.

- No COSEWIC listed vertebrates were found. Two provincial vertebrate species at risk were detected during field surveys: Swainson's Hawk and Badger. Red-sided Garter Snakes, another provincially listed species, were reliably reported by a local resident. Long-tailed Weasel, also provincially listed, although not detected, likely occurs.

- Badger and Swainson's Hawk presence can be maintained post development if grassland habitat and ground squirrel populations persist. Swainson's Hawk also requires trees or tall shrubs as nesting substrate.

- Long-tailed Weasels and garter snakes may still occur on the property after reclamation if sufficient habitat with a mixture of hiding cover and moist grasslands are fostered. Garter snake hibernacula are at risk during excavation and should be watched for.

4.0 LITERATURE CITED

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FIGURES

Figure 1

Red-tailed Hawk nest and Badger transect locations in the Spyhill Lands Developement Project

Badger Transect

Red-tailed Hawk Nest

Scale 1 : 1,100

0 250 500 m.

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Produced by Richard Ashton - Oct, 2003.

Figure 2

Stiff yellow paintbrush (*Castilleja lutescens*)

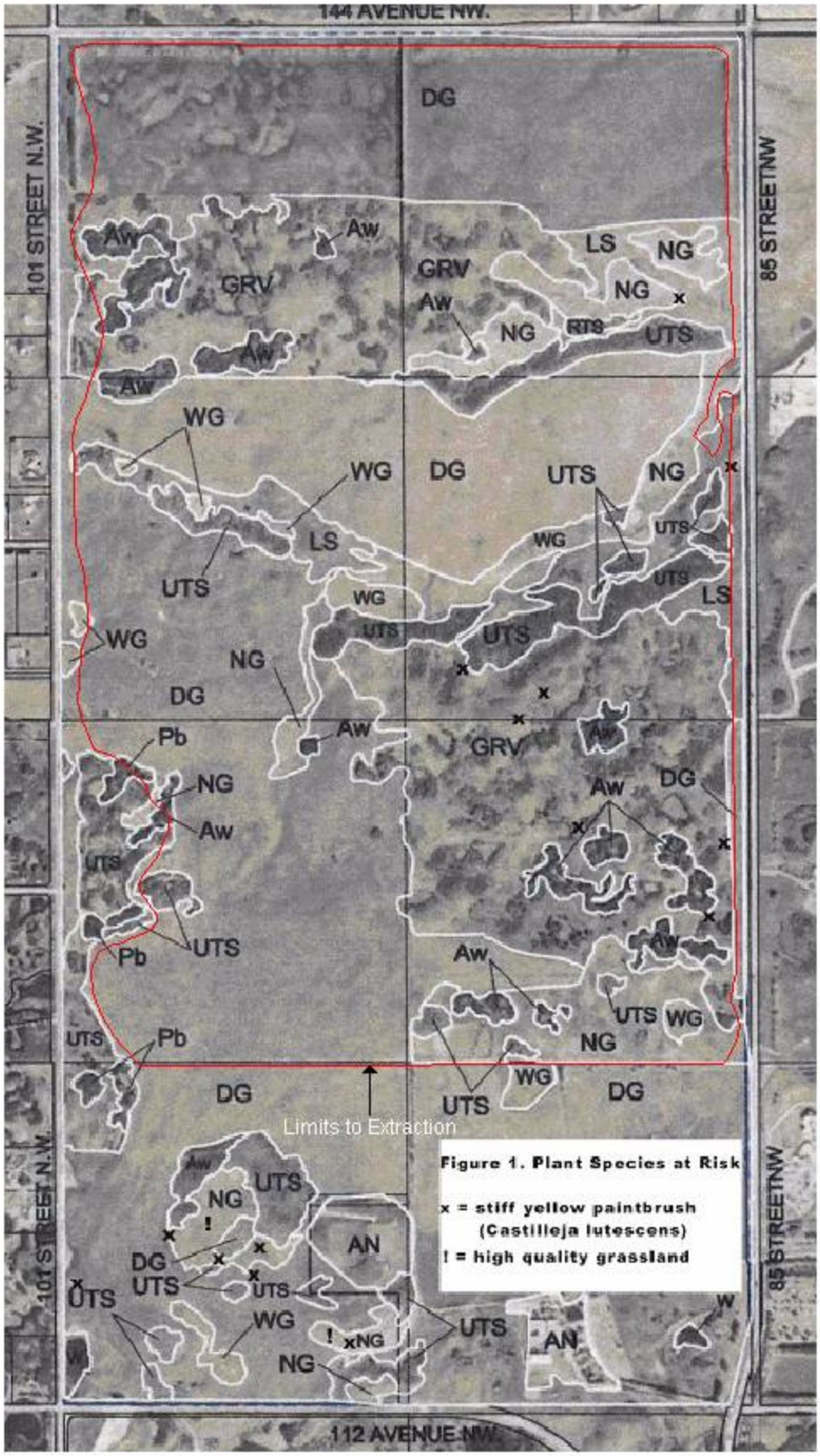

Figure 3. Location of vascular plant species at risk on Spy Hill Lands

TABLES

Table 1. Vertebrate species at risk with potential to occur on Spy Hill Lands

Common Name	Scientific Name	Status	Abund	At Risk Designation	
				Alberta	COSEWIC
Pied-billed Grebe	*Podilymbus podiceps*	S	S	Sensitive	
Horned Grebe	*Podiceps auritus*	S	S	Sensitive	
Great Blue Heron	*Ardea herodias*	S	S	Sensitive	
Black-crowned Night-Heron	*Nycticorax nycticorax*	S	S	Sensitive	
Bald Eagle	*Haliaeetus leucocephalus*	W	S	Sensitive	Not at Risk
Northern Goshawk	*Accipiter gentilis*	R	S	Sensitive	Not at Risk
Swainson's Hawk	*Buteo swainsoni*	S	U	Sensitive	
Golden Eagle	*Aquila chrysaetos*	W	S	Sensitive	Not at Risk
Prairie Falcon	*Falco mexicanus*	S	S	Sensitive	Not at Risk
Sharp-tailed Grouse	*Tympanuchus phasianellus*	R	S	Sensitive	
Upland Sandpiper	*Bartramia longicauda*	S	S	Sensitive	
Short-eared Owl	*Asio flammeus*	S	S	May Be At Risk	Special Concern
Common Nighthawk	*Chordeiles minor*	S	U	Sensitive	
Pileated Woodpecker	*Dryocopus pileatus*	R	S	Sensitive	
Sprague's Pipit	*Anthus spragueii*	S	U	Sensitive	Threatened
Western Tanager	*Piranga ludoviciana*	S	S	Sensitive	
Baird's Sparrow	*Ammodramus bairdii*	S	S	Sensitive	Not at Risk

Table 1. Vertebrate species at risk with potential to occur on Spy Hill Lands

Common Name	Scientific Name	Status	Abund	At Risk Designation	
				Alberta	COSEWIC
Long-tailed Weasel	*Mustela frenata*	R	U	May Be At Risk	Not at Risk
American Badger	*Taxidea taxus*	R	U	Sensitive	Not at Risk
Lynx	*Felis concolor*	T	R	Sensitive	
Cougar	*Lynx canadensis*	T	R	Sensitive	
Bobcat	*Lynx rufus*	R	S	Sensitive	
Western Toad	*Bufo boreas*	R	S	Sensitive	
Northern Leopard Frog	*Rana pipiens*	R	R	At Risk Threatened	Special Concern
Wandering Garter Snake	*Thamnophis elegans*	R	U	Sensitive	
Red-sided Garter Snake	*Thamnophis sirtalis*	R	U	Sensitive	

Table 2. At Risk Definitions (AEP 2000: 2001; COSEWIC 2003)

Alberta Environmental Protection (AEP)

At Risk – any species known to be "At Risk" after formal detailed status assessment and designation as "Endangered" or "Threatened" in Alberta
May Be At Risk – any species that "May Be At Risk" of extirpation or extinction, and is therefore a candidate for detailed risk assessment.
Sensitive – any species that is not at risk of extinction or extirpation but may require special attention or protection to prevent it from becoming at risk.

Endangered – a species facing imminent extirpation or extinction.
Threatened – a species likely to become endangered if limiting factors are not reversed.
Special Concern – a species of special concern because of characteristics that make it particularly sensitive to human activities or natural events.
Data Deficient – a species for which there is insufficient scientific information to support status designation.

Committee on the Status of Endangered Wildlife in Canada (COSEWIC)

Endangered - a species facing imminent extirpation or extinction.
Threatened - a species likely to become endangered if limiting factors are not reversed.
Special Concern - a species of special concern because of characteristics that make it particularly sensitive to human activities or natural events.
Not at Risk - a species that has been evaluated and found to be not at risk.
Indeterminate - a species for which there is insufficient scientific information to support status designation.

Table 3. Birds detected by habitat type on Spy Hill Lands 6-9 June 2003

Species	AN*	Aw	DG	GRV	LS	NG	Pb	UTS	W	WG
Alder Flycatcher				x				x		
American Crow		x		x			x			
Gadwall									x	
American Wigeon									x	
Blue-winged Teal									x	
Northern Shoveler									x	
Green-winged Teal									x	
Lesser Scaup									x	
Swainson's Hawk		x				x				
Red-tailed Hawk		x		x			x			
Killdeer									x	
Wilson's Snipe									x	x
Western Wood-Pewee		x								
Least Flycatcher		x					x			
Eastern Kingbird		x								
Warbling Vireo							x			
Black-billed Magpie			x	x				x		
Tree Swallow			x							
Black-capped Chickadee		x		x			x	x		
House Wren		x		x			x	x		
American Robin				x			x			
European Starling							x			
Yellow Warbler		x		x			x			
Chipping Sparrow		x								
Clay-colored Sparrow				x	x			x		
Vesper Sparrow						x				
Savannah Sparrow			x	x		x				x
Le Conte's Sparrow			x							x
Lincoln's Sparrow				x				x		
Red-winged Blackbird									x	
Western Meadowlark			x	x		x				
Brown-headed Cowbird		x		x			x	x		
Baltimore Oriole		x					x			
American Goldfinch		x					x			

*AN Anthropogenic
Aw Aspen Forest
DG Disturbed Grassland
GRV Willow Groveland
LS Low Shrub
NG Native Grassland
Pb Balsam Poplar
UTS Upland Tall Shrub
W Water
WG Wet Graminoid

Table 4. Badger survey transects and sign on Spy Hill Lands 7 August 2003

Transect	Length (m)	Habitat Type	Grazing Level	Sign Frequency/50-Meter		
				Pocket Gopher	Ground Squirrel	Badger
1	1400	Disturbed Grassland	Moderate	4.1	0.1	0.0
2	1600	Willow Groveland	Moderate	5.5	0.2	0.0
3	100	Low Shrub	Light	3.5	0.0	0.0
4	100	Native Grassland	Light	2.0	0.0	0.0
5	1200	Disturbed Grassland	Heavy	2.5	0.1	0.0
6	300	Low Shrub	Light	2.2	0.0	0.0
7	700	Native Grassland	Very Light	3.0	0.0	0.0
8	250	Low Shrub	Very Light	3.6	0.0	0.0
9	500	Native Grassland	None	2.1	0.0	0.0
10	650	Disturbed Grassland	Heavy	0.4	0.5	3.0
11	450	Disturbed Grassland	Severe	0.0	4.4	1.0
12	300	Disturbed Grassland	Moderate	0.0	7.7	0.0
13	450	Disturbed Grassland	Severe	0.4	7.8	1.0
14	250	Native Grassland	None	3.0	0.8	1.0
15	800	Willow Groveland	None	3.2	0.0	0.0
16	650	Disturbed Grassland	Very Light	0.2	1.2	0.0
17	250	Native Grassland	None	0.0	0.0	0.0
18	250	Disturbed Grassland	None	2.4	0.4	0.0

Sign	Type	Habitat Description	Grazing Level	Age
1	Digging	Disturbed Grassland	Heavy	Recent
2	Digging	Disturbed Grassland	Heavy	Recent
3	Digging	Disturbed Grassland	Heavy	Old
4	Digging	Disturbed Grassland	Heavy	Old
5	Digging	Disturbed Grassland	Heavy	Recent
6	Digging	Disturbed Grassland	Heavy	Recent
7	Digging	Native Grassland	Severe	Recent
8	Digging	Native Grassland	Light	Recent
9	Digging	Disturbed Grassland	Very Light	Recent
10	Digging	Disturbed Grassland	None	Old