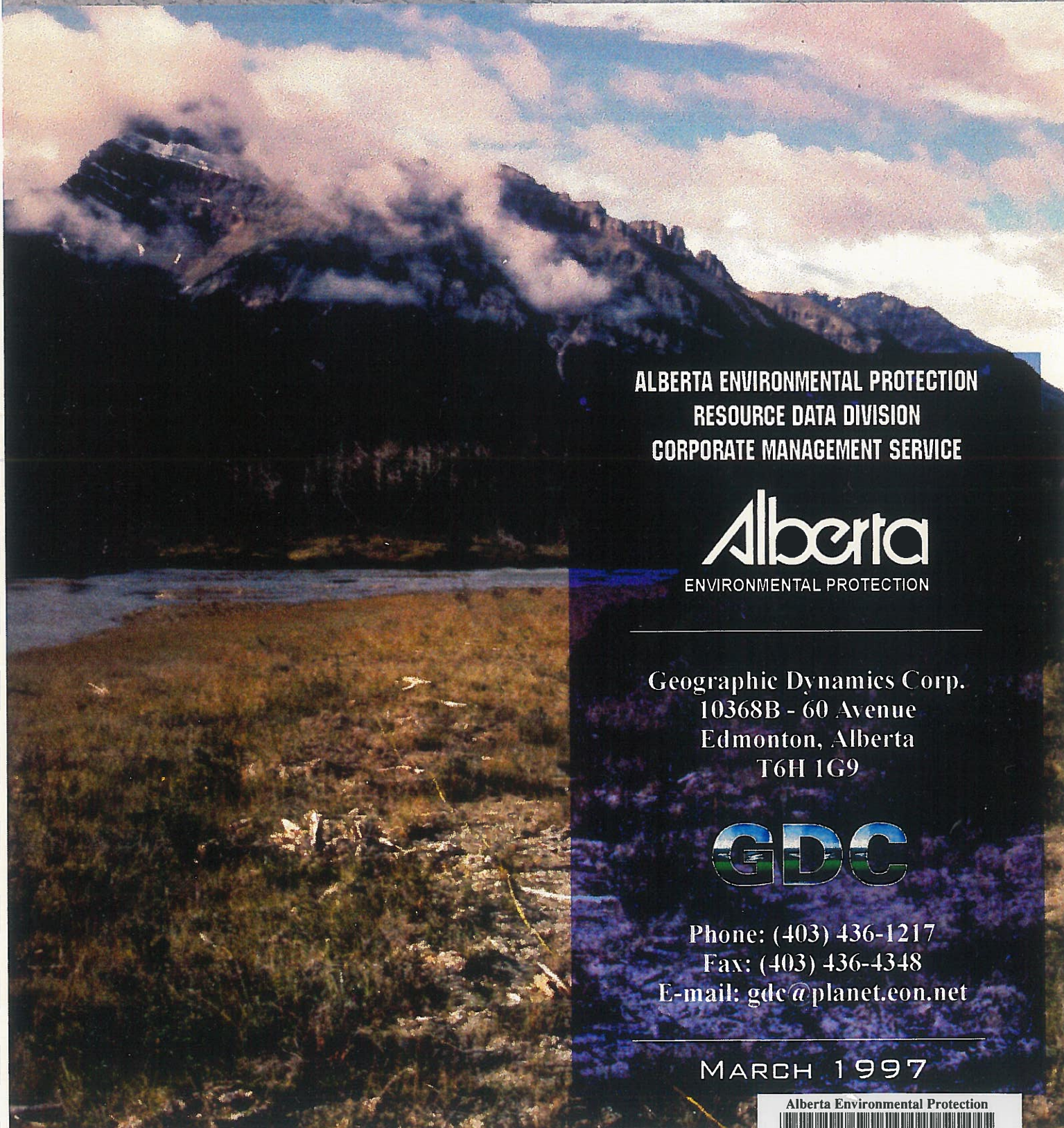


**FLORISTIC AND RARE PLANT SURVEY
OF THE KOOTENAY PLAINS
ECOLOGICAL RESERVE (1996-1997)**



**ALBERTA ENVIRONMENTAL PROTECTION
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1.0 INTRODUCTION

In 1995, the Kootenay Plains Ecological Reserve was expanded to include areas to the south of Whirlpool Point, to the southwest of the Siffleur Falls area and to the east of the mouth of Abraham Lake. It now encloses a larger number of significant features, such as calcareous cliffs, marshes, fens, dunes and grassland meadows. Due to this expansion, there is a need for an accurate biophysical inventory of these newly added areas. Of particular importance is the need for a survey of vascular and non-vascular plant species that are considered to be rare or endangered.

1.1 Project Purpose

The purpose of this project was to:

- (1) conduct a floristic survey in order to identify and document the location of rare vascular and non-vascular native plants; describe the site conditions where observed rare plants occur and provide this information for the management of the natural resources of the Kootenay Plains Ecological Reserve; and
- (2) to produce a report and a floristic survey site and rare native plant location map for selected, naturally vegetated areas of the Kootenay Plains Ecological Reserve.

1.2 Objectives

- To confirm rare native plant species identified in previous rare plant surveys (Kondla 1979, Wallis and Wershler 1981) and to document the characteristics and exact location of the surveyed populations;
- To conduct floristic surveys in landscape positions with the greatest potential for containing rare vascular and non-vascular native plants within the naturally vegetated areas in the Kootenay Plains Ecological Reserve;
- To identify and confirm rare native plant populations from the floristic surveys and document the species exact location on the ground, on maps and on air photos;
- To provide a thematic map depicting the location of all floristic survey sites and all observed rare native plants; and
- To provide a summary report and map according project specifications outlined in the terms of reference.

1.3 Study Area

The Kootenay Plains Ecological Reserve is located in the Montane Subregion roughly 50 km southwest of Nordegg, Alberta along the North Saskatchewan River. Its approximate geographic centre is at 52° 03' N and 116° 25' W (Figure 1). Access to the ecological reserve is via the David Thompson Highway (Hwy. 11), while back areas can be reached via various trails on foot or on non-motorized vehicles. The ecological reserve has a range in elevation between 1230 and 1700 m. The approximate elevation for the North Saskatchewan River in this area is 1300 m.

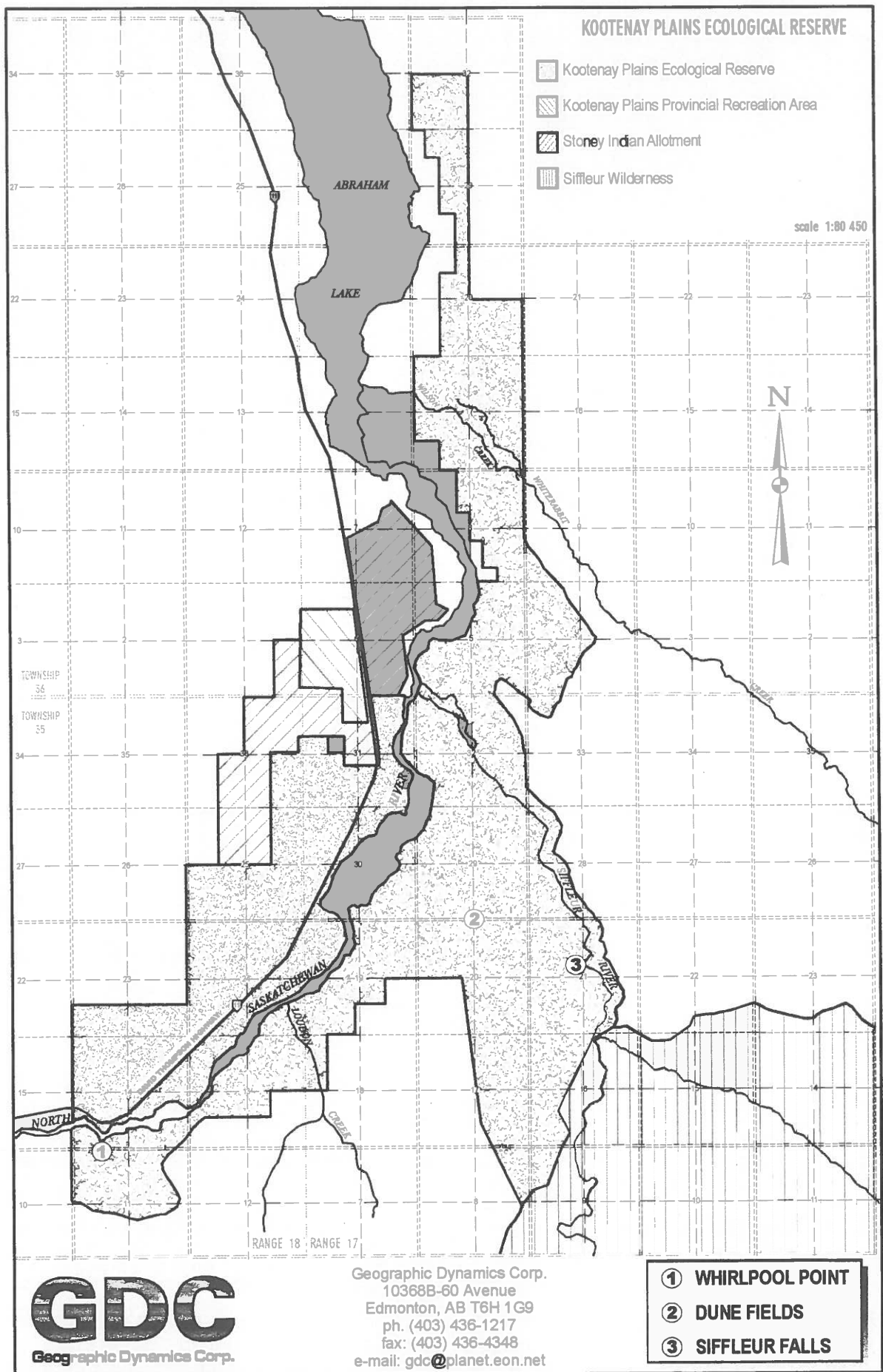


Figure 1. Map of the Kootenay Plains Ecological Reserve.

The Kootenay Plains Ecological Reserve is in the Montane Subregion (Alberta Environmental Protection 1994b). This region receives an annual range of precipitation from 308 to 1279 mm, with a median value of 515 mm (Strong 1992). The ecological reserve is in the rainshadow of the surrounding mountains which, when combined with high transpiration rates, results in a drier habitat than surrounding subalpine regions (Bruhjell et al. 1996). Mean summer temperatures for this region are from 10 to 11 °C, Mean winter temperatures are greater than other montane ecoregions in Alberta (Bruhjell et al. 1996). Chinook activity reduces the influence of the incoming arctic air, and raises the winter temperatures (Strong 1992). Freezing temperatures can occur in any month, but are infrequent in July.

Brunisolic soils are dominant in the area. Luvisolic, Gleysolic, and Organic soils are rare or have not been completely sampled (Bruhjell et al. 1996). The grassland soils in the area are strongly calcareous with dark brown to black surface horizons, typically well drained, and have a poorly developed organic mineral association (Wallis and Wershler 1981). Soils belonging to the Regosolic Order are common and have been described as young, and generally lacking well developed profiles probably due to factors like instability of the material, the nature of the material and the cold, dry environment (Bruhjell et al. 1996). The soils in the river valley are dominated by a complex system of alluvial fans and active floodplains (Bruhjell et al. 1996). These riparian areas are often the site of rare plants, and are significant to the study. Surficial deposits of silty eolian material (loess) are common in the ecological reserve (Wallis and Wershler 1981, Bruhjell et al. 1996).

Grasslands and other drought tolerant communities are dominant in the Montane Subregion relative to the forests because of generally higher evapotranspiration created by Chinooks and a rain-shadow (Bruhjell et al. 1996). This grassland dominance was perpetuated by both the active fire history of the area, and the overgrazing by both wild and domestic ungulates. These factors began to be restricted by the establishment of the ecological reserve in 1979 (Bruhjell et al. 1996).

The Kootenay Plains Ecological Reserve is host to a wide array of plant life. This region is vegetatively distinct because of the presence of *Pinus flexilis* (Strong 1992). The ecological reserve also contains lodgepole pine (*Pinus contorta*) forests in the uplands, and white spruce (*Picea glauca*) forests on fluvial terraces and along watercourses. Deciduous forests are less widespread than the coniferous forests, and are localized in the ecological reserve (Wallis and Wershler 1981). Grassland plant communities typically have *Agropyron dasystachyum*, *Koeleria macrantha*, and various species of forbs as important components (Bruhjell et al. 1996). Additional herbaceous plant communities have been previously found in the riparian and lowland areas associated with the North Saskatchewan river edge (Kondla 1979; Wallis and Wershler 1981).

Both the North Saskatchewan and Siffleur rivers run through the Kootenay Plains Ecological Reserve. Other large water bodies include the Loudon, White Rabbit and Wilson creeks. Large marshes and fens can be found southeast of Whirlpool Point and southwest of Siffleur Falls (Figure 1). Because of the presence of these water bodies, there is a high diversity of riparian and wetland plant communities, resulting in a relatively high species richness in the area.

1.4 Previous Studies

An initial vegetation inventory of the Kootenay Plains was carried out in 1978 and 1979 by Kondla (1979) who found several areas with a high diversity of rare and endangered plants. In 1979 and 1981, Wallis and Wershler (1981) sampled a number of sites within and near the Kootenay Plains Ecological Reserve. They used two methods in their investigation. At certain sites, they recorded plant species cover estimates and a presence-absence list (sample sites) while at other sites they compiled a presence-absence list only (collection sites).

Wallis and Wershler (1981), did not find either the diversity of species or the abundance of individuals reported by Kondla (1979) in his earlier study. For example, Kondla (1979) reported abundant *Primula mistassinica* on the calcareous flats of the North Saskatchewan River; however, he may have found *P. mistassinica* only in areas north of the ecological reserve. Although Wallis and Wershler did locate *P. mistassinica*, the populations were small and relatively few. They attributed the differences to a very late spring in 1981.

Bruhjell et al. (1996) conducted a biophysical inventory of the Kootenay Plains Ecological Reserve in 1995, with an emphasis on significant ecological features. Bruhjell et al. (1996) found relatively few rare plant species and attributed this to species phenology, climatic factors, and low sampling intensity.

2.0 METHODS

Plots were chosen in one of two ways. The first method was to revisit the plots that Wallis and Wershler (1981) established in order to relocate potential rare and endangered plants found in the earlier study. Because permanent plot markers were not established after the 1981 study, the revisited plots were approximated from both old site descriptions and rough positions delineated on their report map. Generally, the new survey plots were within 100 metres of the plots from the previous study. A comparison of the plots between this survey and the one performed by Wallis and Wershler (1981) is provided below (Table 1). Also, additional areas which had been sampled by Wallis and Wershler (1981) were investigated but were not sampled in this study because the plant communities present were already included in a number of representative plots, or there were no rare or endangered plants present.

Table 1. Concordance between this GDC's plots and those of Wallis and Wershler (1981)

GDC (1996)	W&W (1981)
01	oc16
*02	cc 24-28, oc23
03	t J
09	cc 4-5
*10	cc 10
11	cc 9
*12	cc 25, oc 23
16	cc 11-13, oc 15
*17	cc 11-13, oc 15
18	cc 11-13, oc 15
19	cc 11-13, oc 15
23	cc 14
24	cc 33-34
26	cc 36
27	cc 17-19, oc 1
29	oc 2
30	cc 19, oc 1
33	t M
34	t M
*35	oc 9
*37	oc 9
*40	t I
42	oc 20
47	t C
48	cc 20
*51	t H
*52	t F

- * plots with rare and endangered plant(s) in this survey
- cc closed circle; plot numbers; July 28-Aug 2, 1981
- oc open circle; collection sites; July 28-Aug 2, 1981
- t triangle; collection sites; June 8, 1981

The second method of site selection was to investigate significant ecological features as defined by Wallis and Wershler (1981). This was done because of the increased likelihood of finding rare or endangered plant species in these areas. Wallis and Wershler (1981)

selectively sampled significant ecological features such as calcareous rock outcrops, wetlands, grasslands (which showed diversity or richness apparent in certain color patterns evident on the false color aerial photographs), and river channel edges. Examples of significant ecological features from the current study include the fen located southwest of the Siffleur Falls area, and the calcareous cliffs south of Whirlpool Point.

In this survey, a total of 54 plots were sampled. One-half of these plots were established in the same or approximate location as the plots of Wallis and Wershler (1981), while half consisted of new sites encompassing a variety of habitat types (Appendix 1). While most sites were located in grasslands, wetlands, seepage areas, and riparian habitats, some were placed in forested areas as well. It should be noted that some plots were sampled outside of current ecological reserve boundaries in attempt to match Wallis and Wershler's sites.

A description of each site was recorded following the guidelines described in the *Ecological Land Survey Site Description Manual* (Alberta Environmental Protection 1994a). Both site description (LISD 15B (Rev. 3/93)) and vegetation (LISD 14B (Rev. 3/93)) forms were used for the field plots. Site forms were completed with the exception of the fields designated for aerial photography, regeneration, soil drainage, perviousness, ecological moisture regime and nutrient regime. Vegetation forms were filled out completely.

At each site a rectangular 100 m² plot was established and plant relative abundance was recorded by visual estimates of the percent of ground covered by each species. Typically the vegetation plot dimensions measured 10 by 10 m. However, in order to maintain specific community sampling, plots located in narrow areas (i.e. along river margins) were measured in 20 by 5 m plots. All strata of vegetation present were recorded within the vegetation plot as per the methods outlined by Alberta Environmental Protection (1994a). Data collected on the native species were restricted to their presence in the plots, but significant plant species that were found outside of the plot were also noted. Plants were either keyed out in the field or brought back to the office for identification. The final authority for the taxonomy of vascular plants was *Flora of Alberta* (Moss 1983). The following checklists were used to assess whether a plant was rare or endangered:

- *A checklist of the rare vascular plants of Alberta* (Packer and Bradley 1984);
- *Provincial tracking list of vascular plant species of concern in Alberta* (Alberta Parks 1996); and
- *Alberta natural heritage information centre tracking list: mosses of special concern* (Alberta Parks 1995).

The latter two lists were updated and revised in November 1996. As a result, four plant species found in this survey (*Carex franklinii*, *Erysimum asperum*, *Haplopappus lyallii*, and *Hieracium cynoglossoides*) were added to the updated list that were not known to be species of concern during the course of field sampling. These plants are included in this report as rare plant observations, however, some data are incomplete and will need to be collected in the spring of 1997.

Photographs were taken of site and ground cover for all plots. If a known rare or endangered plant population was found, an associated rare native plant survey form was completed (Appendix 2). The site in which the plant population was found was also clearly marked for later relocation. A piece of rebar (75 cm length) was placed within 10 m of the population, and capped with a surveyor's cap. This cap had the element code for the rare plant species tooled into it using a steel die. An aluminum marker, with the same code for the rare plant tooled into

it, was placed on a witness feature within 100 m of the population. Bearing and distance were recorded on the rare native plant survey forms. This witness feature was either a tree or an additional piece of rebar. Witness features were selected in highly visible areas (from trails or roads) marked with horizontal bars of yellow and blue tree paint. All the pieces of rebar used to mark plots were sprayed with corresponding yellow spray paint. Paths to sites which had rare or endangered plant species that were not easily located along a trail were flagged with day-glo orange flagging tape.

Witness features for plots with known rare and endangered plants were located using a global positioning system (GPS). The GeoExplorer GPS receiver by Trimble was selected since its specifications of accuracy fell within acceptable limits for this project (i.e. witness features located within 30 metres). At least 40 positions were attempted and recorded for each plot. These positions were then output into ASCII format from PFINDER software and summary statistics were calculated using SAS software (Appendix 3). A mean position was then recorded for each of these plots.

All plots were located on 1:50,000 scale resource access maps (Alberta Environmental Protection 1994c,d) from aerial photographs. Plot locations were pin pricked and marked in black ink on both sides of 1:15 000 and 1:20 000 scale aerial photographs. If a rare or endangered plant species occurred on that plot, the rare plant element code was also marked on the aerial photograph in green ink on both sides.

In addition, an area outside of the current Kootenay Plains Ecological Reserve near White Goat Lake described by Kondla (1979) was informally investigated for the presence of rare and endangered species. Detailed data forms were not completed since this site was located outside of the immediate study area.

3.0 OBSERVATIONS

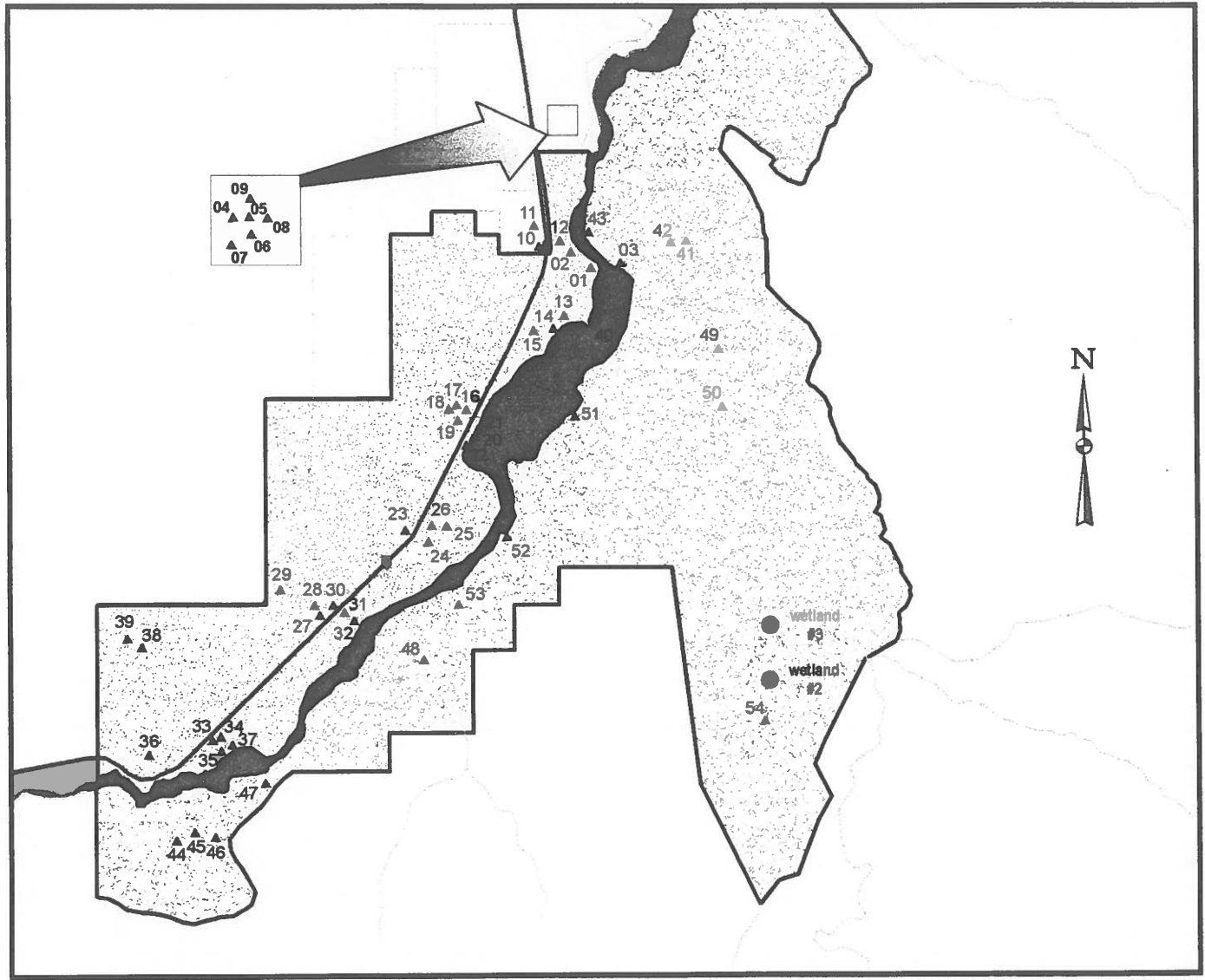
Sites were selected throughout the Kootenay Plains Ecological Reserve across several ecological features and plant community types (Appendix 1). Most plots were located in the valley floor macro-position with a level meso-position and straight site surface shape. The successional status was most often pioneer or young seral. Physiognomy varied from open grasslands to forested stands. Several areas are notable for distinctive plants and abundance of species; however, the riparian mud flats of the North Saskatchewan River valley support the greatest richness of species of all the areas sampled. Locations of the floristic survey sites for this study are plotted (Figure 2) and listed according to latitude, longitude, and legal land description (Appendix 4). A complete list of all vascular and non-vascular species found in the study are located in Appendix 5. Color photo-plates are provided in Appendixes 6 through 11 to further illustrate the habitat and diagnostic features of all rare plants observed.

3.1 Rare and Endangered Plant Species Observations

A total of 8 rare and endangered plant species were found in this study (Table 2); however, two of these (*Primula mistassinica* and *Salix lanata* var. *calcicola*) were reported outside of the immediate study area. Five of the rare and endangered plant species (*Brachythecium albicans*, *Erysimum asperum*, *Haplopappus lyallii*, *Hieracium cynoglossoides*, and *S. lanata* var. *calcicola*) found in this study were not recorded by either Kondla (1979), Wallis and Wershler (1981), or Bruhjell et al. 1996). However, the first species (*B. albicans*) is a moss (non-vascular) species, which is of a growth form that was not the focus in any of the previous studies. *Rare Native Plant Survey Forms* (Appendix 2) were only completed for populations of *Haplopappus uniflorus* (S3) in our survey during the summer of 1996. *Rare Native Plant Survey Forms* were not completed for *Brachythecium albicans* (S2?), since it was not identified until after the field season, and *Carex franklinii* (S2), *Erysimum asperum* (S3), *Haplopappus lyallii* (S2), and *Hieracium cynoglossoides* (S2) were not added to the provincial tracking list until November 1996.

Four species of concern (*Hippuris montana*, *Ledum glandulosum*, *Pellaea glabella*, and *Senecio cymbalarioides*) reported by both Kondla (1979) and Wallis and Wershler (1981) were not located in this study. Wallis and Wershler (1981) also reported four potential species of concern (*Botrychium dusenii*, *Carex rostrata*, *Castilleja pallida*, and *Salix alaxensis*) that were not recorded by Kondla (1979) or in this study. However, it is uncertain whether the varieties of *C. rostrata* and *S. alaxensis* identified in Wallis and Wershler's study were the actual varieties ranked as S2 in the Alberta provincial tracking list. *Haplopappus uniflorus* and *Primula mistassinica* were the only known rare and endangered species confirmed in all three studies.

The rare and endangered plant species' populations had low cover values (<1%) in all plots; however, the plots were fairly well distributed across the study area (Figure 3). The occurrences and habitats of each rare or endangered species encountered in this study are documented in the following subsections.



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- David Thompson Highway (11)
- ▨ Kootenay Plains Ecological Reserve
- North Saskatchewan River
- ▲ Floristic Survey Sites
- Wetlands—informal descriptions

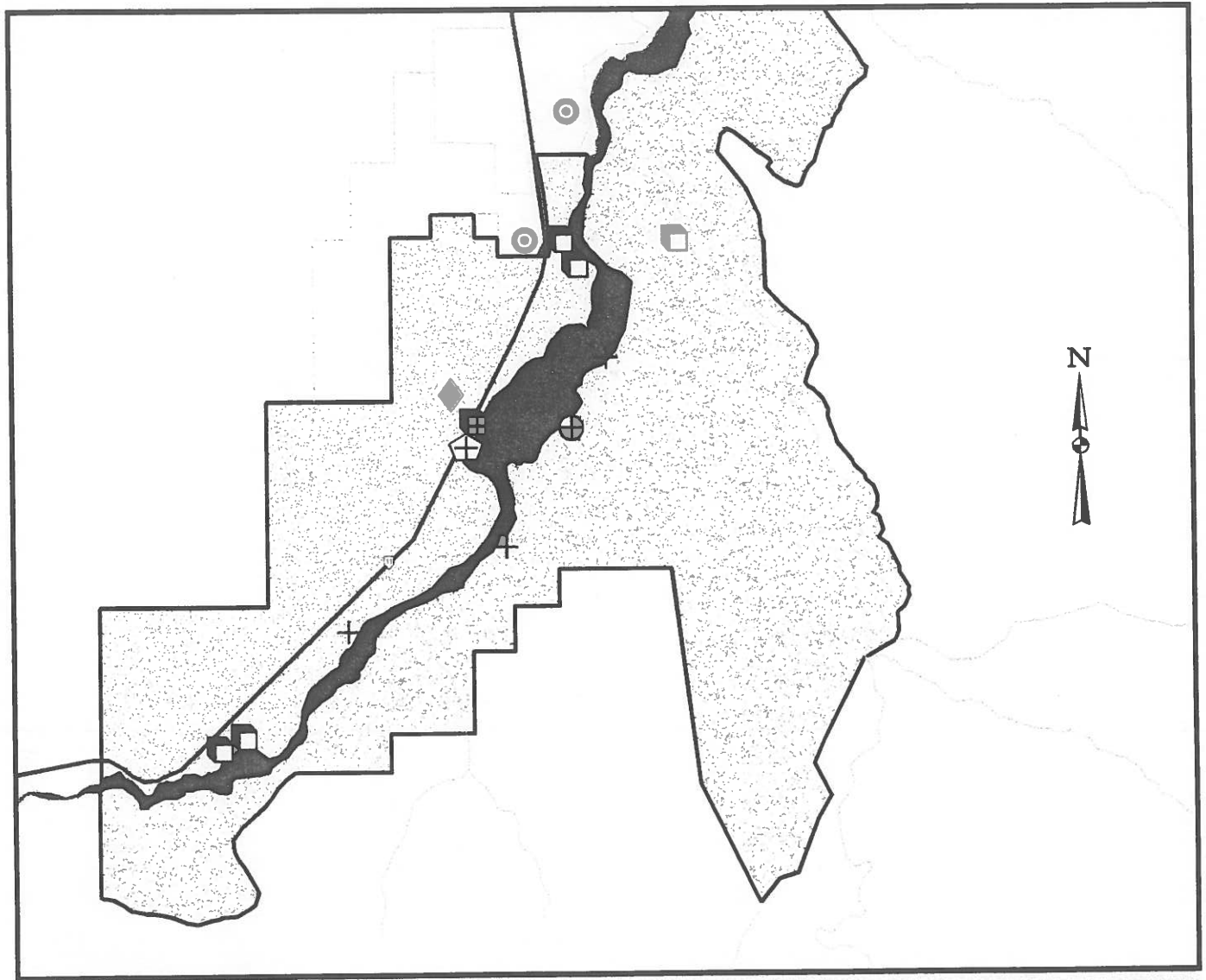
Figure 2. Location of floristic survey sites and wetlands.

Table 2. A summary of rare and endangered plant species found in three separate studies of the Kootenay Plains Ecological Reserve

Species	Rank	Kondla (1979)	Wallis and Wershler (1981)	This Survey (1996)
<i>Botrychium dusenii</i>	SU	not reported	reported	not reported
<i>Brachythecium albicans</i> ¹	S2?	N/A	N/A	reported
<i>Carex franklinii</i> ²	S2	not reported	reported	reported
<i>Carex rostrata</i> var. <i>sensu strictu</i>	S2	not reported	reported ^{5?}	not reported
<i>Castilleja pallida</i>	SR	not reported	reported	not reported
<i>Erysimum asperum</i> ²	S3	not reported	not reported	reported
<i>Haplopappus lyallii</i> ²	S2	not reported	not reported	reported
<i>Haplopappus uniflorus</i> ³	S3	reported	reported	reported
<i>Hieracium cynoglossoides</i> ²	S2	not reported	not reported	reported
<i>Hippuris montana</i> ³	S2	reported	reported	not reported
<i>Ledum glandulosum</i> ³	S3?	reported	reported	not reported
<i>Pellaea glabella</i>	S2	reported	reported	not reported
<i>Primula mistassinica</i>	S2	reported	reported	reported ⁴
<i>Salix alaxensis</i> ³ var. <i>alaxensis</i>	S2	not reported	reported ^{5?}	not reported
<i>Salix lanata</i> var. <i>calcicola</i> ³	S1	not reported	not reported	reported ⁴
<i>Senecio cymbalarioides</i> ³	S1	reported	reported	not reported

- ¹ Non-vascular species, which were not surveyed for (N/A) in the first two studies.
- ² Species on the newly updated provincial checklist (Nov. 1996) which was not available at the time of survey.
- ³ Species also considered rare by Packer and Bradley (1984).
- ⁴ Reported outside of the immediate study area, therefore, a detailed rare and endangered plant survey form was not completed.
- ^{5?} Species reported by Wallis and Wershler (1981); however, they did not identify specimen to variety, thus, status is uncertain.

Rank is based on the Alberta Natural Heritage Information Centre tracking list updated November 1996 (S1—critically imperiled; S2—imperiled; S3—rare-uncommon; SR—reported for Alberta but lacking sufficient documentation; SU—status uncertain).



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- *Brachythecium albicans* (S2?)
- + *Carex franklinii* (S2)
- ⊙ *Erysimum asperum* (S3)
- ◡ *Haplopappus lyallii* (S2)
- ◣ *Haplopappus uniflorus* (S3)
- ◆ *Hieracium cynoglossoides* (S2)

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- David Thompson Highway (11)
- ◻ Kootenay Plains Ecological Reserve
- North Saskatchewan River

Figure 3. Location of floristic survey sites with rare plant occurrences.

3.1.1 *Brachytecium albicans* (S2?)

Brachytecium albicans was the only non-vascular species of concern identified in this survey. This species was found with low cover in one plot (51) located on the east shore of the North Saskatchewan River (Table 3, Figure 3). The associated riparian plant community had a well-developed low shrub layer dominated by *Salix brachycarpa*, *Potentilla fruticosa*, and *Betula glandulosa*, but a very sparse tree layer of *Picea glauca*. The site was fairly rich in forb species, with several species indicative of a high pH conditions (e.g., *Tofieldia glutinosa*, *Pedicularis groenlandica*, and *Triglochin palustris*).

Table 3. Summary of occurrences of *Brachytecium albicans* (S2?)

Plot #	Location	Elevation (ft)	Habitat	Plot Size (ha)	Cover	Vigor	# of individuals
51	52° 02' 06" N 116° 24' 31" W	4300	River flat	0.01	< 1%	*	*

* needs to be determined

Ireland (1982) indicated that *B. albicans* ranges from Greenland to Alaska and may be found on grassy ground and on the trunks of trees.

3.1.2 *Carex franklinii* (S2)

Carex franklinii was one of the most frequently encountered rare and endangered plant species in the sampled floristic survey sites. This sedge was recorded in six different plots (Table 4) along or near the edge of the North Saskatchewan River (Figure 3). All of these plots were located in level sites with straight site surface shapes and were at a pioneer or young seral stage. This species was associated with riparian plant communities possessing a low shrub layer dominated by *Betula glandulosa*, *Potentilla fruticosa*, or *Salix* spp., and sometimes with a tree stratum of *Picea glauca*. These communities tended to be rich in herb species but with low cover values. Both forbs and graminoids were present, but no single species seemed to dominate the herb stratum. A large number of these species were calciophiles, indicating a highly calcareous environment. Similarly, Wallis and Wershler (1981) found *C. franklinii* on calcareous alluvial terraces.

Table 4. Summary of occurrences of *Carex franklinii* (S2)

Plot #	Location	Elevation (ft)	Habitat	Plot Size (ha)	Cover	Vigor	# of individuals
20	52° 01' 54" N 116° 25' 29" W	4400	Floodplain	0.01	< 1%	*	*
21	52° 01' 56" N 116° 25' 26" W	4400	River edge	0.01	< 1%	*	**
32	52° 00' 58" N 116° 26' 23" W	4400	River edge	0.01	< 1%	*	*
40	52° 02' 29" N 116° 24' 08" W	4400	River flat	0.01	< 1%	fair (2)	*
51	52° 02' 06" N 116° 24' 31" W	4300	River flat	0.01	< 1%	good (3)	*
52	52° 02' 29" N 116° 25' 08" W	4300	Mud flat	0.01	< 1%	good (3)	*

* needs to be determined

Generally, *C. franklinii* can be found in dry to moist open areas up to alpine elevations and seems to be confined in the province to west-central Alberta within the Rocky Mountain Natural Region (Moss 1983).

3.1.3 *Erysimum asperum* (S3)

Erysimum asperum is a member of the mustard family (Cruciferae). This species was found in two floristic survey sites (08 and 10) located just outside of the Kootenay Plains Ecological Reserve Boundary (Table 5, Figure 3). These sites may represent a north-western range extension of *E. asperum* in Alberta when their location is compared with the distribution maps of Moss (1983). Both of these plots were on Stoney Indian Allotment land situated to the west of the Ecological Reserve near areas that were previously surveyed by Wallis and Wershler (1981). Both occurrences of this species were in fairly dry, open areas with a pioneer seral successional status. Plot 08 was located in a level topographic position with a straight site surface shape, while plot 10 was located in an upper slope position with a convex site surface shape, a gentle slope (6%), and a southerly aspect. Plot 08 was in an *Agropyron dasystachyum*-*Koeleria macrantha* grassland community while plot 10 was in a *Juniperus horizontalis*-*Arctostaphylos uva-ursi*/*Antennaria parviflora*/lichen community in association with an open *Picea glauca* forest.

Table 5. Summary of occurrences of *Erysimum asperum* (S3)

Plot #	Location	Elevation (ft)	Habitat	Plot Size (ha)	Cover	Vigor	# of individuals
08	52° 03' 41" N 116° 24' 31" W	4400	Meadow	0.01	< 1%	fair (2)	*
10	52° 03' 02" N 116° 24' 50" W	4400	Open canopy forest	0.01	< 1%	dead (0)	*

* needs to be determined

Moss (1983) states that *E. asperum* occurs on dry sandy prairies from southern British Columbia to Minnesota while Looman and Best (1979) suggest that it is common in the prairies but rare in the parklands.

3.1.4 *Haplopappus lyallii* (S2)

One of two rare species from the genus *Haplopappus* identified in this survey, *H. lyallii* was only found at one site (Table 6). This plant was located on a floodplain at the west side of the North Saskatchewan River in a level topographic position (Figure 3). The riparian plant community had a sparse low shrub layer of *Potentilla fruticosa*, *Betula glandulosa*, *Salix glauca*, and *Arctostaphylos uva-ursi*. There were several herbaceous species present; however, all had low cover values. The sparse graminoid stratum was dominated by several species of *Carex* (*C. franklinii*, *C. gynocrates*, *C. aquatilis*, and *C. deweyana*) and *Agropyron* (*A. violaceum*, *A. dasystachyum*, and *A. trachycaulum*).

Table 6. Summary of occurrences of *Haplopappus lyallii* (S2)

Plot #	Location	Elevation (ft)	Habitat	Plot Size (ha)	Cover	Vigor	# of individuals
20	52° 01' 54" N 116° 25' 29" W	4400	Floodplain	0.01	< 1%	*	*

* needs to be determined

This record of *H. lyallii* from the montane represents a different habitat type than the typical one according to Looman and Best (1979) and Moss (1983). Both of these studies state that this species is typically found on dry alpine slopes and ridges in the southern rocky mountains. This record should be investigated as a possible northern range extension of *H. lyallii* in Alberta.

3.1.5 *Haplopappus uniflorus* (S3)

Haplopappus uniflorus was one of the most frequently found species of concern in this study and was identified in six plots (Table 7). This was the only species for which detailed *Rare Native Plant Survey Forms* were completed during the 1996 field season. *H. uniflorus* was most commonly found along the riparian mud flats of the North Saskatchewan River valley, but was also encountered in similar habitat along the Siffleur River (Figure 3). All plots in which this species was found were located in level areas with a straight site surface shape. The successional status of the associated riparian plant communities ranged from pioneer seral to mature seral. The physiognomy varied from open grasslands and shrub lands to open *Picea glauca* stands. Dominant graminoids were commonly *Agropyron dasystachyum* and *Carex* spp., while *Juniperus horizontalis* and *Potentilla fruticosa* were common shrubs associated with *Haplopappus uniflorus*.

Table 7. Summary of occurrences of *Haplopappus uniflorus* (S3)

Plot #	Location	Elevation (ft)	Habitat	Plot Size (ha)	Cover	Vigor	# of individuals
02	52° 02' 54" N 116° 24' 33" W	4400	Meadow	0.01	< 1%	fair (2)	12
12	52° 02' 58" N 116° 24' 36" W	4400	Meadow	0.01	< 1%	fair (2)	3
21	52° 01' 56" N 116° 25' 26" W	4400	River edge	0.01	< 1%	fair (2)	2
35	52° 00' 20" N 116° 27' 29" W	4400	River edge	0.01	< 1%	fair (2)	6
37	52° 00' 20" N 116° 27' 21" W	4300	Meadow	0.01	< 1%	fair (2)	8
41	52° 02' 57" N 116° 23' 28" W	4400	River edge	0.01	< 1%	fair (2)	3

Wallis and Wershler (1981) found *H. uniflorus* to be locally abundant in the Whirlpool Point area in open woodland, fen margins, and meadows. In Alberta, this species is most commonly found on dry to moist open slopes, banks and roadsides, and seems to be confined to the west-central part of the province (Moss 1983).

3.1.6 *Hieracium cynoglossoides* (S2)

Hieracium cynoglossoides, like the previous two species, is a member of the Compositae or sunflower family. This species was only found in one plot (Table 8, Figure 3) during the course of this study. Situated west of Hwy. 11 in a lower slope topographic position, plot 17 was at the highest elevation (4500 ft.) of all plots containing rare or endangered species in this study. *H. cynoglossoides* was found in an area with a strong slope, concave site surface shape, and a young seral successional status. The plant community was dominated by low shrubs (*Arctostaphylos uva-ursi* and *Juniperus horizontalis*) but a sparse tall shrub layer of *Pinus contorta* and *Picea glauca* was also present.

Table 8. Summary of occurrences of *Hieracium cynoglossoides* (S2)

Plot #	Location	Elevation (ft)	Habitat	Plot Size (ha)	Cover	Vigor	# of individuals
17	52° 02' 06" N 116° 25' 34" W	4500	Open canopy forest	0.01	< 1%	*	*

* needs to be determined

In Alberta, *H. cynoglossoides* is generally distributed in the southern rocky mountains and Cypress Hills in open woods and montane slopes (Moss 1983). This report of the species should be further investigated as a possible northern range extension.

3.2 Special Interest Areas

Several areas of ecological interest and significance were noted during this study and are briefly described below.

3.2.1 River Valleys

The riparian mud flats of the North Saskatchewan River valley support the highest richness of species of all the areas sampled. They contain an abundance of sedges and several orchid species, primarily on the edge of the mud flats among the willows. *Haplopappus uniflorus* was abundant in these areas and along hiking trails. These riparian zones are also where *Brachythecium albicans*, *Carex franklinii*, *Primula mistassinica*, and *Salix lanata* var. *calcicola* may be found. *Pinguicula vulgaris* was abundant together with *Selaginella densa* and several species of bog orchids, along the Loudon Creek bed and the eastern flats of the North Saskatchewan River.

3.2.2 Whirlpool Point

The area around Whirlpool Point (Figure 1) is geologically diverse, ranging from riparian mud flats to the lower borders of the subalpine treeline. Wetlands and grasslands contain a great diversity of plant species. Calcareous outcrops support *Cheilanthes feei* in this area. At higher elevations, hybridization appears to have occurred between *Pinus contorta* and *P. flexilis* evident by pine cones which are morphologically intermediate between these two species.

3.2.3 Dune Fields

The dune fields area south of the Siffleur Falls trail and between the North Saskatchewan River valley and the Siffleur River valley is an old burn area (Figure 1). It is dominated by *Pinus contorta* with a thick understorey consisting of *Shepherdia canadensis* and other common boreal forest species on a calcareous mineral substrate. The terrain contained ridges separated by drainage areas with a prominent component of *Salix* species. The orchid *Goodyera repens* was found in two sites in this area of interest.

3.2.4 Wetlands

Several large wetlands in the far south-east area of the Ecological Reserve were also investigated (Figure 2). These wetland sites are extremely important to animal populations in the area. Tracks were numerous and signs of browsing and wallowing were evident. These areas were fairly productive, but diversity was relatively low. Only one (Wetland 1, plot 54) out of three wetlands was formally described with site and vegetation forms. The other two wetlands (wetlands 2 and 3) were visually inspected and their descriptions are in the following subsections. It was felt that these areas were important to describe but no unusual species were found. *Carex buxbaumii* (S3), *C. lasiocarpa* (S3), *C. livida* (S3) and *C. viridula* (S3), found in these wetland areas, are notably rare but are currently not being tracked on the rare or endangered checklists for Alberta (as of November 1996).

3.2.4.1 Wetland 2 (52° 00' 50" N, 116° 22' 55" W)

This wetland of very dry marl substrate was colonized by clumps of *Juncus alpinoarticulatus* and *Carex viridula* with some *Potamogeton* species left stranded. Enclosing the marl area is an extensive sedge meadow (fen) consisting largely of *Carex utriculata* with bands of *C. lasiocarpa* and *C. aquatilis* intermingled. *C. livida* also occurred sparsely across the marl. A band of *Calmagrostis montanensis* was found at the north end. Shrub species surrounding the sedge meadow area included *Betula glandulosa*, *Potentilla* spp., *Salix glauca*, *S. maccalliana*, *S.*

myrtilifolia, and *S. candida*. Also, *Deschampsia cespitosa*, *Scirpus acutus*, *Polygonum amphibium*, *Carex capillaris*, and *Juncus balticus* were abundant in the edge vegetation which graded out toward a lodgepole pine forest.

3.2.4.2 Wetland 3 (52° 01' 00" N, 116° 22' 55" W)

This area was slightly wetter than the previous wetland and consisted of an open, shallow marl pond surrounded by a lodgepole pine forest. The pond had a band of *Carex viridula* around its edges, occasionally occurring with *C. aquatilis*. *C. viridula* was also abundant on the upper shore along with *C. aurea*, while *C. capillaris* was found locally on round mounds. Waterfowl were present in the open water of the pond with *Potamogeton filiformis* occurring abundantly. *Juncus alpinoarticulatus* again colonized the drier marl toward the edges. *Potentilla anserina*, *Habenaria hyperborea*, *Pedicularis groenlandica*, *Calamagrostis montanensis*, *Carex concinna*, *Carex buxbaumii* and *Erigeron* spp. also were present.

4.0 CONCLUSION

4.1 Comparison of Studies

In this survey, a late and cold spring compounded by a dry summer may have contributed to the absence of species reported in both earlier studies. Similarly, Wallis and Wershler (1981) did not find either the diversity of species or the abundance of individuals reported by Kondla (1979) in his earlier study. Most plants in this study were either not flowering, or had flowered earlier, making identification and location difficult. Bruhjell et al. (1996) cited similar problems in detecting rare plants in the study area.

Several species found in the previous two studies (e.g., *Botrychium dusenii*, *Castilleja pallida*, *Hippuris montana*, *Ledum glandulosum*, *Pellaea glabella*, and *Senecio cymbalarioides*) were not recorded in this study. However, several new species of concern (e.g., *Brachytheceium albicans*, *Erysimum asperum*, *Haplopappus lyallii*, *Hieracium cynoglossoides*, and *Salix lanata*) not reported in the previous studies were found in this survey. Future surveys may relocate populations reported by the previous two studies as well as additional populations of rare and endangered plants.

Hippuris montana, which was reported to be present in the Whirlpool Point Fen by Wallis and Wershler (1981), was not found in this study. The only *Hippuris* found in that area was the common *H. vulgaris*; however, this does not mean that *H. montana* is no longer present in the area. A survey performed in a different year or at a different period of the year may yet detect this species where it was originally reported.

Wallis and Wershler (1981) found some taxonomic confusion with *Agropyron smithii* and concluded that it may hybridize within the study area. This report confirms their finding. *A. smithii* warrants an in depth taxonomic study to determine its taxonomic status in Alberta.

Both Kondla (1979) and Wallis and Wershler (1981) found *Primula mistassinica* on the mud flats. *P. mistassinica* was not found in any of the plots of this survey; however, it was found in an area outside of the ecological reserve.

4.2 Recommendations

Some rare and endangered species were previously found in the area, but were not found in this study, either because the number of individuals were too few or the late spring and dry summer made identification impossible. Future floristic surveys of the area will probably locate rare and endangered plant populations not found in this survey. Site visits throughout the growing season and across several years will probably result in additional populations of species of concern. The significant areas identified within this region are important for both plant species abundance and support of animals which depend on them.

The riparian zones, particularly along the North Saskatchewan River, seem to support the greatest diversity of plant species. These habitats also have the greatest potential for rare and endangered species, as evidenced in this and other surveys. These areas should be managed carefully within the ecological reserve in order to maintain viable plant populations and sustaining ecosystems. Managers of the reserve may want to consider limiting access to these sensitive areas.

An area of interest outside of the Kootenay Plains Ecological Reserve is White Goat Lake, north of the David Thompson Resort. This area consists of a rich fen area fed by a shallow stream. The entire area is highly calcareous including the stream. Both *Salix lanata* var. *calcicola* and *Primula mistassinica* (S1 and S2 respectively) were found supporting the contention that both species may be abundant north of the ecological reserve as noted by Kondla (1979). Therefore, it is recommended that this area be protected due to the presence of both these plants. In the eastern section of the fen tire tracks were found.

Wallis and Wershler (1981) considered the Kootenay Plains ecosystem to be the result of a unique combination of physiography, climate, fire, grazing and groundwater which interact to form conditions that favour the development and persistence of grassland communities. It is likely that two of these factors—fire and grazing have changed considerably since the arrival of Europeans.

Wallis and Wershler note that the presence of seral lodgepole pine stands throughout the North Saskatchewan Valley suggests that fire is (or was) a regular occurrence in the area. White, Paquet and Purves (1994) suggest that warm montane sites in the eastern slopes of the Rockies may have had about a 40 year fire interval prior to the arrival of Europeans. Fire frequency in the valley is has been greatly reduced and it is possible that the extent and severity of fires have changed considerably as well.

Historically, there is much evidence to suggest that the North Saskatchewan Valley has been a favoured wildlife habitat area. There are several historical references to large populations of ungulates using the area (Wallis and Wershler 1981). Palliser (1863 in Wallace & Wershler, 1981) noted the presence of large populations of sheep, wapiti, deer and moose using the area at a time when game was generally scarce in the Rockies. Given the historically high usage of the area, it is likely that heavy grazing contributed to some extent to the persistence of grassland communities.

More recently, the area has been subject to heavy feral and domestic horse grazing up until 1979 or 1980. Wallace & Wershler (1981) suggest that recent horse grazing may have been severe relative to historical levels of use by wildlife. This may have led to a reduction in species diversity and increased soil exposure, which may tend to make the sites somewhat drier. The vegetation in the Kootenay Plains bear a strong resemblance to a *Koeleria*—*Calamagrostis montanensis* community identified by Stringer (1973), which he considers to be a community that is maintained in part by grazing. Wallis and Wershler conducted a survey of aerial photographs taken of the Kootenay Plains in 1951 and 1981. There was little apparent change in the extent of the grassland communities. Presumably the relatively recent horse grazing has served the same role as the historic wildlife populations in maintaining the grassland communities.

One can thus conclude that fire and grazing have played an important role in maintaining the unique vegetation communities of the Kootenay Plains. Given that the fire frequency has been greatly reduced, if not eliminated and that the grazing pressure by domestic horses has been reduced, it is not unreasonable to expect that successional changes may occur in the grassland communities. These two factors are not the sole determinants of community structure, climate and surficial geology also play an important part.

It is recommended that a monitoring program be established to determine what, if any successional changes are occurring in the ecological reserve. A good first step would be to use current and historical aerial photography as a means of assessing any forest community change as well as any invasion of grassland communities. Thorough vegetation sampling throughout the area should be undertaken to establish a baseline description of the present-day vegetation. Such data could then be compared with previously collected vegetation data. If the data indicates that successional change is occurring and such change could potentially affect any rare species or communities, reintroduction of controlled burns and grazing should be considered.

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APPENDIX 1
Distribution of plots over several ecological features and plant community types

Plot #	Elevation	Aspect	Slope	Macro-position	Meso-position	Site shape	Successional status	Plant community type
01	4400	138	15	valley floor	lower to upper slope	straight	pioneer seral	JUNIHOR/ARTIFRIG-ASTEALP
02	4400	.	0	valley floor	level	straight	pioneer seral	JUNIHOR/AGRODAS
03	4400	223	12	valley floor	middle slope	straight	pioneer seral	KOELMAC/ARTIFRIG
04	4400	140	5	valley floor	level	straight	young seral	AGRODAS-KOELMAC/ARTEFRI
05	4400	.	0	valley floor	level	straight	young seral	Sw/JUNIHOR/OXYTSPL
06	4400	.	0	valley floor	level	straight	young seral	Sw/AGRODAS/OXYTSPP
07	4400	40	12	plain	lower slope	straight	young seral	Sw(P)/JUNIHOR/feather moss
08	4400	130	1	valley floor	level	straight	pioneer seral	AGRODAS-KOELMAC
09	4400	.	0	valley floor	level	straight	pioneer seral	KOELMAC-AGRODAS/GENTAMA
10	4400	170	6	valley floor	upper slope	convex	pioneer seral	ARCTUVA/ANTEPAR
11	4400	100	8	valley floor	level	straight	young seral	Sw/ARCTUVA-JUNIHOR/ANTEPAR
12	4400	.	0	valley floor	level	straight	pioneer seral	AGRODAS/forbs
13	4400	250	20	valley floor	middle slope	convex	pioneer seral	JUNIHOR/AGRODAS-KOELMAC
14	4400	302	6	valley floor	level	straight	pioneer seral	AGROSMI-AGRODAS
15	4400	.	0	valley floor	level	straight	pioneer seral	KOELMAC-AGROSMI
16	4400	125	25	valley floor	toe	straight	young seral	ARCTUVA-ELAECOM/forbs
17	4500	290	20	lower slope	lower slope	concave	young seral	ARCTUVA-JUNIHOR-ELAECOM
18	4500	289	8	lower slope	lower slope	straight	young seral	ELAECOM-ARCTUVA/ANTEPAR
19	4400	.	0	valley floor	level	straight	pioneer seral	ARCTUVA/ANTEPAR-SMILSTE
20	4400	120	2	valley floor	level	straight	pioneer seral	BETUGLA-POTEFRU/CARESPP
21	4400	.	0	valley floor	level	straight	pioneer seral	BETUGLA/CARESPP
22	4400	140	2	valley floor	level	straight	pioneer seral	BETUGLA-POTEFRU/CARESPP
23	4500	182	14	valley floor	level	straight	pioneer seral	ARCTUVA/AGROSMI/forbs
24	4400	130	7	valley floor	level	straight	pioneer seral	JUNIHOR/AGROSMI/forbs
25	4400	.	0	valley floor	level	straight	young seral	Pb/JUNIHOR/KOELMAC
26	4400	100	2	valley floor	level	straight	pioneer seral	AGRODAS-KOELMAC
27	4400	.	0	valley floor	level	straight	mature seral	PI/JUNIHOR/SHEPCAN
28	4500	144	4	lower slope	lower slope	straight	mature seral, young edaphic climax	PI/SHEPCAN/ELYMINN
29	4600	148	6	lower slope	crest	convex	mature seral, young edaphic climax	PI/ARCTUVA
30	4500	150	5	valley floor	level	straight	mature seral	PI/ARCTUVA/SHEPCAN/ELYMINN
31	4400	.	0	valley floor	level	straight	young seral	Sw/ARCTUVA/grasses/ANTEPAR
32	4400	.	0	valley floor	level	straight	young seral	Sw/BETUGLA/forbs
33	4400	.	0	valley floor	level	straight	mature seral	GARECON-CALAMON
34	4400	209	21	valley floor	upper slope	straight	mature seral	PI/ARCTUVA
35	4400	.	0	valley floor	level	straight	mature seral	Sw/BETUGLA-ARCTUVA/forbs
36	4700	302	31	middle slope	middle slope	straight	mature seral	PI/JUNIHOR-JUNICOM
37	4300	.	0	valley floor	level	straight	mature seral	Sw/POTEFRU/forbs
38	5800	183	22	apex	crest	convex	young seral	ARCTUVA-JUNICOM/forbs
39	6000	272	42	apex	upper slope	straight	mature seral	PINUFLE-JUNICOM-ARCTUVA/DRYAOCT
40	4400	.	0	valley floor	level	straight	young seral	BETUGLA-POTEFRU
41	4400	.	0	valley floor	level	convex	young seral	ELAECOM/grasses
42	4400	.	0	valley floor	level	straight	mature seral	Sw/SALUSPP-ARCTUVA/ELYMINN
43	4400	.	0	valley floor	level	straight	mature seral	POTEFRU/CARESCO
44	4400	58	74	upper slope	middle slope	concave	young seral	POPUTRE-JUNICOM/ELYMINN
45	4400	.	0	valley floor	level	straight	young seral	JUNIHOR/CARESCI/THUABI
46	4400	.	0	valley floor	depression	straight	mature seral	Sw-PI/SHEPCAN/graminoids
47	4400	.	0	valley floor	level	straight	mature seral	ARCTUVA/grasses
48	4400	.	0	valley floor	level	concave	young seral	BETUGLA-ELAECOM/graminoids/forbs
49	4875	334	32	middle slope	upper slope	convex	mature seral	PI/SHEPCAN/ELYMINN
50	4830	60	30	middle slope	middle slope	straight	mature seral	PI/SHEPCAN/ELYMINN
51	4300	.	0	valley floor	level	straight	young seral	Sw/SALUBRA-POTEFRU/forbs/JUNCBAL
52	4300	.	0	valley floor	level	straight	young seral	POTERU/CARESPP
53	4300	.	0	valley floor	level	straight	young seral	POTERU/CARESPP/EQUIPAL
54	4900	.	0	valley floor	depression	straight	young seral, young edaphic climax	BETUGLA-SALICAN/LEQUUI/PEDIGRO

APPENDIX 2

Rare native plant survey forms

Rare Native Plant Survey Form

Please enter all information available to you. Use the back for comments if necessary. Please attach or draw a map on the back.
Return To: Heritage Protection and Education Branch, Alberta Parks, 8th Flr, 10405 Jasper Ave, Edmonton T5J 3N4.

Scientific Name: Haplopappus uniflorus Code: PDASTDTOK0

Common Name: One-flowered Ironplant

Reporter: E. Gordon Address: 15216-74 St, Edm. Phone: 475-2565

Observation Date: Aug 1, 1996 Collected, if Yes # Herb. Acc.#

Municipality: Kootenay Plains

Mapsheet: 83C1

Legal Twp: 35 Rge: 17 W 5 M: Section: 31 LSD: 8

Twp: Rge: W M: Section: LSD:

Lat.: 52°02'54" Long.: 116°24'33" Elevation: 4400 (ft/m)

Location: N. Saskatchewan River valley near trail to Siffleur Falls
on west side of river

Aspect: Slope: Moisture: 8

Habitat: Meadow

Plant Community: Grassland community

Landowner:

of Individuals: 12 Is this a subsequent visit: no yes

Compared to last visit: n/a more; same; fewer.

Phenology: # vegetative; # adults; # juveniles; # others; 2 # flowering; 10 # fruiting

Current Land Use / Possible Threats:

Should / could this site be protected? : How?

Determination:

 keyed at site; give reference used:

 compared with specimen housed at:

 compared with photo/drawing in:

by another person (name): Patsy Cotterill

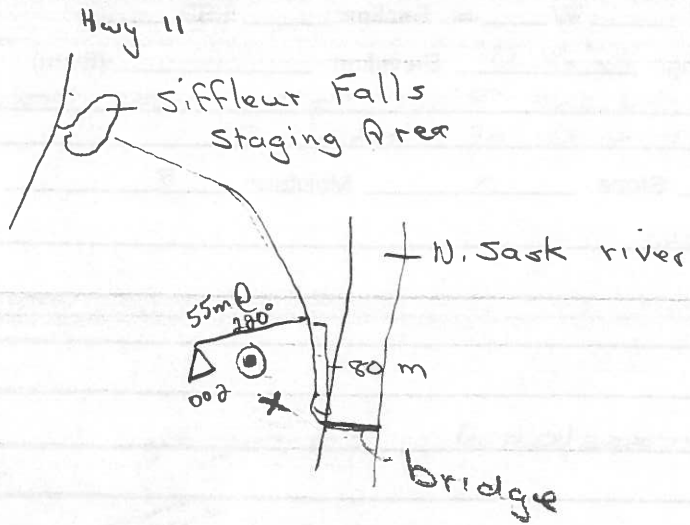
 other:

Photographs:

Habitat Slide

 Diagnostic Feature Print

Date Received	Date Entered



x bearing 328° \approx 30m to rebar \odot

Rare Native Plant Survey Form

Please enter all information available to you. Use the back for comments if necessary. Please attach or draw a map on the back.
Return To: Heritage Protection and Education Branch, Alberta Parks, 8th Flr, 10405 Jasper Ave, Edmonton T5J 3N4.

Scientific Name: Haplopappus uniflorus Code: PDASTDT ØKØ

Common Name: One-Flowered Ironplant

Reporter: E. Gordon Address: 15216-74 St., Edm Phone: 475-2565

Observation Date: Aug 3, 1996 Collected, if Yes # Herb. Acc.#

Municipality: Kootenay Plains

Mapsheet: 83C1

Legal Twp: 35 Rge: 17 W 5 M: Section: 31 LSD: 8

Twp: Rge: W M: Section: LSD:

Lat.: 52°02'58" Long.: 116°24'36" Elevation: 4400 (ft/m)

Location: Near Populus tremuloides stand on west side of
D. sask River near trail to Siffleur Falls

Aspect: 0 Slope: 0 Moisture:

Habitat: Meadow

Plant Community: Grassland / Forb

Landowner:

of Individuals: 3 Is this a subsequent visit: no yes

Compared to last visit: more; same; fewer.

Phenology: # vegetative; # adults; # juveniles; # others; # flowering; 3 # fruiting

Current Land Use / Possible Threats: Some trampling and mountain bike threat
may be possible if people leave trail

Should / could this site be protected? : How?

Determination:

 keyed at site; give reference used:

compared with specimen housed at: U of A herbarium

 compared with photo/drawing in:

by another person (name): Patsy Cotterill

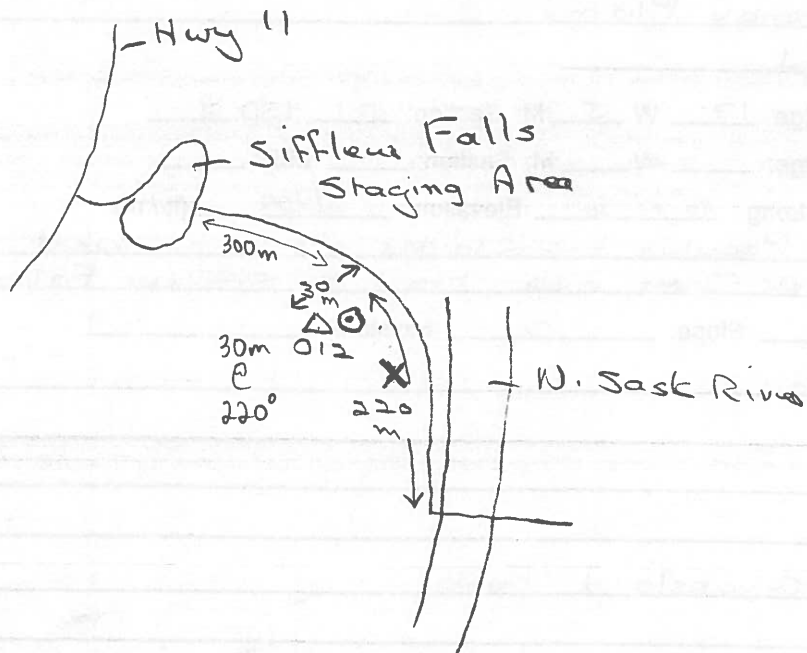
 other:

Photographs:

Habitat Slide

 Diagnostic Feature Print

Date Received	Date Entered



X bearing tree
 333° ~ 50m to rebar ⊙

Rare Native Plant Survey Form

Please enter all information available to you. Use the back for comments if necessary. Please attach or draw a map on the back. Return To: Heritage Protection and Education Branch, Alberta Parks, 8th Flr, 10405 Jasper Ave, Edmonton T5J 3N4.

Scientific Name: Haplopappus uniflorus Code: PDA5TDTØKØ

Common Name: One flowered Ironplant

Reporter: E. Gordon Address: 15216-74 St, Edm. Phone: 475-2565

Observation Date: Aug 5, 1996 Collected, if Yes # Herb. Acc.#

Municipality: Kootenay Plains

Mapsheet: 83C1

Legal Twp: 35 Rge: 17 W 5 M: Section: 30 LSD: 6

Twp: Rge: W M: Section: LSD:

Lat.: 52° 01' 56" Long.: 116° 25' 26" Elevation: 4400 (ft/m)

Location: On west side of N. Sask. River on mudflats
approximately 110 m from Highway 11

Aspect: 0 Slope: 0 Moisture:

Habitat: Riverine mudflats

Plant Community: Sedge Community

Landowner:

of Individuals: 2 Is this a subsequent visit: no yes

Compared to last visit: more; same; fewer.

Phenology: # vegetative; # adults; # juveniles; # others; # flowering; 2 # fruiting

Current Land Use / Possible Threats: Flooding

Should / could this site be protected? : How?

Determination: keyed at site; give reference used:

compared with specimen housed at: U of A herbarium

 compared with photo/drawing in:

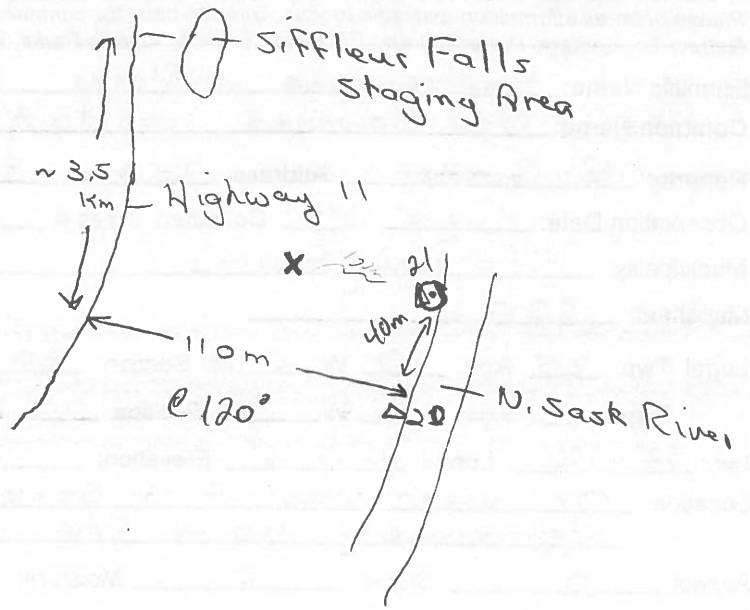
by another person (name): Patsy Cotterill

 other:

Photographs: Habitat Slide

 Diagnostic Feature Print

Date Received	Date Entered



x bearing tree
 114° to rebar @
 ~100m

Rare Native Plant Survey Form

Please enter all information available to you. Use the back for comments if necessary. Please attach or draw a map on the back. Return To: Heritage Protection and Education Branch, Alberta Parks, 8th Flr, 10405 Jasper Ave, Edmonton T5J 3N4.

Scientific Name: Happlopappus uniflorus Code: PDASTDTØKØ

Common Name: One flowered Ironplant

Reporter: E. Gordon Address: 15316-74 St, Edm. Phone: 475-2565

Observation Date: Aug 6, 1996 Collected, if Yes # Herb. Acc.#

Municipality: Kootenay Plains

Mapsheet: 83C1

Legal Twp: 35 Rge: 18 W 5 M: Section: 14 LSD: 8

Twp: Rge: W M: Section: LSD:

Lat.: 52° 00' 20" Long.: 116° 27' 29" Elevation: 4400 (ft/m)

Location: 2.6 km NE of Whirlpool Point on Riverbank

Aspect: 0 Slope: 0 Moisture:

Habitat: Shrub ~~with~~

Plant Community: Salice. Betula Habenaria Community

Landowner:

of Individuals: 6 Is this a subsequent visit: (no) yes

Compared to last visit: more; same; fewer.

Phenology: # vegetative; # adults; # juveniles; # others; # flowering; 6 # fruiting

Current Land Use / Possible Threats: None

Should / could this site be protected? : How?

Determination:

 keyed at site; give reference used:

X compared with specimen housed at: U of A herbarium

 compared with photo/drawing in:

X by another person (name): Patsy Cotterill

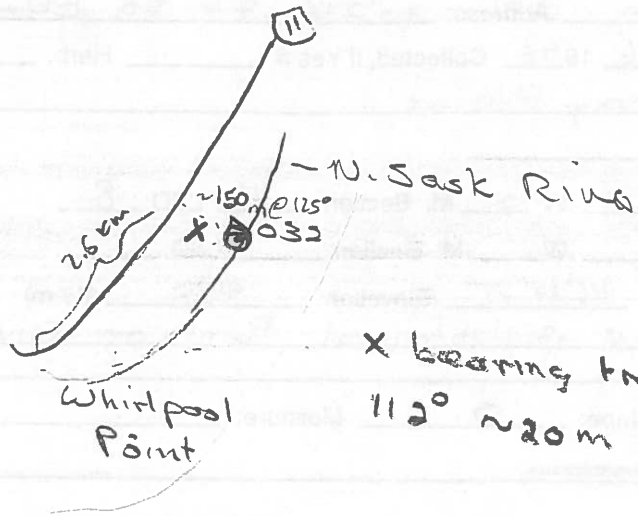
 other:

Photographs:

X Habitat X Slide

 Diagnostic Feature Print

Date Received	Date Entered



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Rare Native Plant Survey Form

Please enter all information available to you. Use the back for comments if necessary. Please attach or draw a map on the back.
Return To: Heritage Protection and Education Branch, Alberta Parks, 8th Flr, 10405 Jasper Ave, Edmonton T5J 3N4.

Scientific Name: Haplopappus uniflorus Code: PDASTDTOKØ

Common Name: One flowered Ironplant

Reporter: E. Gordon Address: 15216-74 St. Edm. Phone: 475-2565

Observation Date: Aug 16, 1996 Collected, if Yes # _____ Herb. _____ Acc.# _____

Municipality: Kootenay Plains

Mapsheet: 83C1

Legal Twp: 35 Rge: 18 W 5 M: Section: 14 LSD: 8

Twp: _____ Rge: _____ W _____ M: Section: _____ LSD: _____

Lat.: 52° 00' 20" Long.: 116° 27' 21" Elevation: 4300 (ft/m)

Location: Approximately 500 m NE of Whirlpool Point Sign in
river valley

Aspect: 0 Slope: 0 Moisture: _____

Habitat: Orchid rich drainage channel

Plant Community: Sedge / Orchid

Landowner: _____

of Individuals: 8 Is this a subsequent visit: no yes

Compared to last visit: _____ more; _____ same; _____ fewer.

Phenology: 2 # vegetative; _____ # adults; _____ # juveniles; _____ # others; _____ # flowering; 0 # fruiting

Current Land Use / Possible Threats: None

Should / could this site be protected? : _____ How? _____

Determination: _____

_____ keyed at site; give reference used: _____

_____ compared with specimen housed at: _____

_____ compared with photo/drawing in: _____

by another person (name): Patsy Cotterill

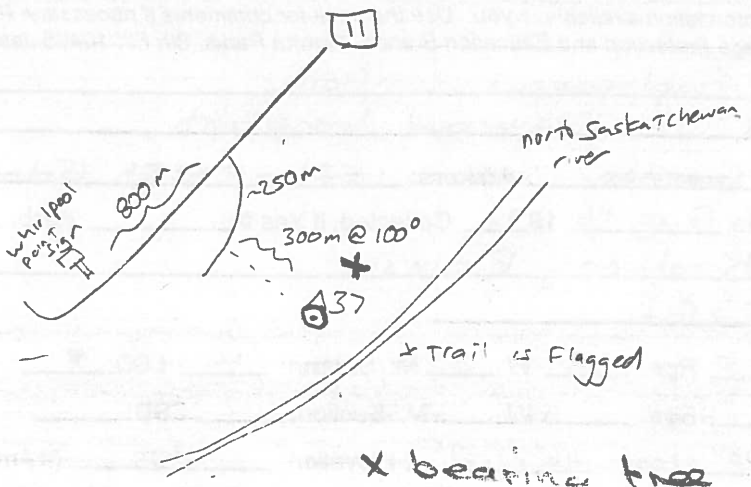
_____ other: _____

Photographs:

Habitat Slide

Diagnostic Feature Print

Date Received	Date Entered



x bearing tree
 147° ~ 10m to
 rebar ⊙

Rare Native Plant Survey Form

Please enter all information available to you. Use the back for comments if necessary. Please attach or draw a map on the back.
Return To: Heritage Protection and Education Branch, Alberta Parks, 8th Flr, 10405 Jasper Ave, Edmonton T5J 3N4.

Scientific Name: Haplopappus uniflorus Code: PDASTDT0140

Common Name: One flowered transplant

Reporter: E. Gordon Address: 15216-74 St. Edm Phone: 475-2565

Observation Date: Aug 17, 1996 Collected, if Yes # _____ Herb. _____ Acc.# _____

Municipality: Kootenay Plains

Mapsheet: 83C1

Legal Twp: 35 Rge: 17 W 5 M: Section: 32 LSD: 7

Twp: _____ Rge: _____ W _____ M: Section: _____ LSD: _____

Lat.: 52°02'57" Long.: 116°23'28" Elevation: 4400 (ft/m)

Location: Approximately 40 m North of Siffleur Falls trail footbridge on west bank of Siffleur River

Aspect: 0 Slope: 0 Moisture: _____

Habitat: Grassland on River bank

Plant Community: Grasses/Forbs

Landowner: _____

of Individuals: 3 Is this a subsequent visit: no yes

Compared to last visit: _____ more; _____ same; _____ fewer.

Phenology: 2 # vegetative; _____ # adults; _____ # juveniles; _____ # others; _____ # flowering; 1 # fruiting

Current Land Use / Possible Threats: Human disturbance (fire) in area

Should / could this site be protected? : _____ How? _____

Determination:

_____ keyed at site; give reference used: _____

_____ compared with specimen housed at: _____

_____ compared with photo/drawing in: _____

by another person (name): Patsy Cotterill

_____ other: _____

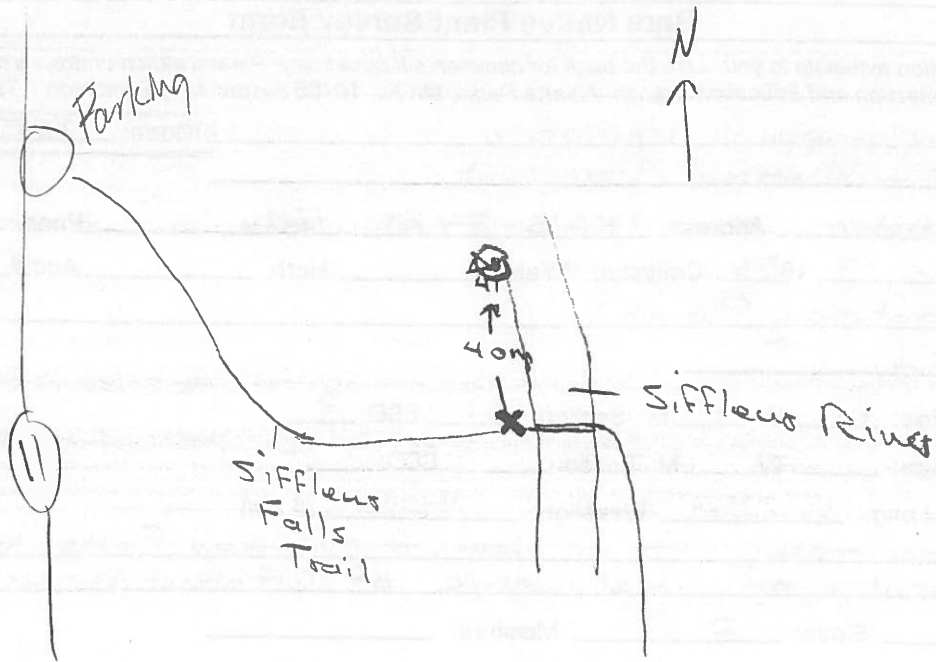
Photographs:

Habitat Slide

Diagnostic Feature Print

Date Received

Date Entered



X bearing tree
~ 30 m to rebar

APPENDIX 3

Summary statistics for GPS readings at sites with *Haplopappus uniflorus* (S3)

SAS Summary

	F	P	F	M	M	S	S	M	M	M	M	R	R
	I	L	R	E	A	T	T	I	A	A	X	N	N
	L	O	E	N	N	D	L	N	L	X	L	G	L
	E	T	Q	T	G	T	O	A	L	A	O	A	O
							N	N	T	T	N	N	N
							G	G	G	G	G	G	G
K091416B	02	53	54.0028	33.1482	0.06082	0.44996	53.930	32.229	54.138	33.841	0.208	1.612	
K091416A	12	63	57.8931	36.0903	0.43363	0.25565	57.182	35.530	58.574	36.451	1.392	0.921	
K091516A	21	54	55.9274	25.7266	0.08983	0.06532	55.687	25.660	56.004	25.889	0.317	0.229	
K091515B	35	58	20.0975	29.3676	0.36992	0.25653	19.455	28.802	20.636	29.628	1.181	0.826	
K091515C	37	56	20.4312	20.7848	0.09930	0.33412	20.206	20.112	20.587	21.239	0.381	1.127	
K091417A	41	52	56.8333	27.9018	0.20538	0.26470	56.440	27.614	57.074	28.419	0.634	0.805	

STD = standard deviation RNG = range
 MIN = minimum MAX = maximum

note: Latitude (LAT) and longitude (LONG) variables represented here are for seconds only. Degrees and minutes were excluded from these summaries.

PFINDER Summary

GPS file	Plot number	Number of points collected	Largest range of points collected (measured in metres using PFINDER)
K091416B	02	53	31.3
K091416A	12	63	43.1
K091516A	21	54	10.7
K091515B	35	58	39.3
K091515C	37	56	24.5
K091417A	41	52	24.9
	Mean	56.0	28.97

APPENDIX 4

Plot locations for all detailed floristic survey sites

Plot	Map Sheet	Latitude				Longitude				Legal Land Description				
		Deg.	Min.	Sec.	N	Deg.	Min.	Sec.	W	LSD	SEC	TWP	RNG	MER
01	83 C/1	52	02	50	N	116	24	22	W	8	31	35	17	5
02	83 C/1	52	02	54	N	116	24	33	W	8	31	35	17	5
03	83 C/1	52	02	50	N	116	24	05	W	5	32	35	17	5
04	83 C/1	52	03	41	N	116	24	39	W	1	6	36	17	5
05	83 C/1	52	03	41	N	116	24	37	W	1	6	36	17	5
06	83 C/1	52	03	39	N	116	24	33	W	1	6	36	17	5
07	83 C/1	52	03	36	N	116	24	39	W	1	6	36	17	5
08	83 C/1	52	03	41	N	116	24	31	W	8	6	36	17	5
09	83 C/1	52	03	44	N	116	24	37	W	8	6	36	17	5
10	83 C/1	52	03	02	N	116	24	50	W	7	31	35	17	5
11	83 C/1	52	03	05	N	116	24	53	W	10	31	35	17	5
12	83 C/1	52	02	58	N	116	24	36	W	8	31	35	17	5
13	83 C/1	52	02	33	N	116	24	39	W	1	31	35	17	5
14	83 C/1	52	02	32	N	116	24	43	W	15	30	35	17	5
15	83 C/1	52	02	30	N	116	24	50	W	15	30	35	17	5
16	83 C/1	52	02	04	N	116	25	26	W	5	30	35	17	5
17	83 C/1	52	02	06	N	116	25	34	W	5	30	35	17	5
18	83 C/1	52	02	02	N	116	25	34	W	5	30	35	17	5
19	83 C/1	52	02	00	N	116	25	33	W	5	30	35	17	5
20	83 C/1	52	01	54	N	116	25	29	W	5	30	35	17	5
21	83 C/1	52	01	56	N	116	25	26	W	6	30	35	17	5
22	83 C/1	52	01	53	N	116	25	30	W	4	30	35	17	5
23	83 C/1	52	01	29	N	116	26	00	W	9	24	35	18	5
24	83 C/1	52	01	29	N	116	25	39	W	12	19	35	17	5
25	83 C/1	52	01	35	N	116	25	33	W	13	19	35	17	5
26	83 C/1	52	01	35	N	116	25	38	W	13	19	35	17	5
27	83 C/1	52	01	00	N	116	26	44	W	3	24	35	18	5
28	83 C/1	52	01	03	N	116	26	50	W	4	24	35	18	5
29	83 C/1	52	01	11	N	116	27	04	W	5	24	35	18	5
30	83 C/1	52	01	02	N	116	28	39	W	3	24	35	18	5
31	83 C/1	52	01	00	N	116	26	30	W	2	24	35	18	5
32	83 C/1	52	00	58	N	116	26	23	W	2	24	35	18	5
33	83 C/1	52	00	22	N	116	27	46	W	7	14	35	18	5
34	83 C/1	52	00	22	N	116	27	30	W	7	14	35	18	5
35	83 C/1	52	00	20	N	116	27	29	W	8	14	35	18	5
36	83 C/1	52	00	19	N	116	28	05	W	6	14	35	18	5
37	83 C/1	52	00	20	N	116	27	21	W	8	14	35	18	5
38	83 C/1	52	00	51	N	116	28	12	W	14	14	35	18	5
39	83 C/1	52	00	53	N	116	28	14	W	13	14	35	18	5
40	83 C/1	52	02	29	N	116	24	08	W	13	29	35	17	5
41	83 C/1	52	02	57	N	116	23	28	W	7	32	35	17	5
42	83 C/1	52	02	55	N	116	23	46	W	6	32	35	17	5
43	83 C/1	52	02	58	N	116	24	25	W	8	31	35	17	5
44	82 N/16	51	59	20	N	116	27	42	W	15	11	35	18	5
45	82 N/16	51	59	21	N	116	27	30	W	15	11	35	18	5
46	82 N/16	51	59	20	N	116	27	26	W	16	11	35	18	5
47	83 C/1	52	00	01	N	116	27	18	W	1	14	35	18	5
48	83 C/1	52	00	53	N	116	25	55	W	16	13	35	18	5
49	83 C/1	52	02	30	N	116	23	33	W	15	29	35	17	5
50	83 C/1	52	02	11	N	116	23	33	W	10	29	35	17	5
51	83 C/1	52	02	06	N	116	24	31	W	8	30	35	17	5
52	83 C/1	52	02	29	N	116	25	08	W	11	19	35	17	5
53	83 C/1	52	01	09	N	116	25	29	W	5	19	35	17	5
54	83 C/1	52	00	32	N	116	23	00	W	9	17	35	17	5

APPENDIX 5

Complete plant species list from detailed plot descriptions

ACHIMIL	<i>Achillea millefolium</i>
AGOSGLA	<i>Agoseris glauca</i>
AGRODAS	<i>Agropyron dasystachyum</i>
AGROSMI	<i>Agropyron smithii</i>
AGROSPI	<i>Agropyron spicatum</i>
AGROTRA	<i>Agropyron trachycaulum</i>
AGROVIO	<i>Agropyron violaceum</i>
ALLICER	<i>Allium cernuum</i>
AMBLVAR	<i>Amblystegium varium</i>
ANDRCHA	<i>Androsace chamaejasme</i>
ANDRSEP	<i>Androsace septentrionalis</i>
ANEMMUL	<i>Anemone multifida</i>
ANEMPAR	<i>Anemone parviflora</i>
ANTEPAR	<i>Antennaria parvifolia</i>
ANTEPUL	<i>Antennaria pulcherrima</i>
ANTEROS	<i>Antennaria rosea</i>
ARABHOL	<i>Arabis holboellii</i>
ARCTRUB	<i>Arctostaphylos rubra</i>
ARCTUVA	<i>Arctostaphylos uva-ursi</i>
ARTECAM	<i>Artemisia campestris</i>
ARTEFRI	<i>Artemisia frigida</i>
ASTEALP	<i>Aster alpinus</i>
ASTECIL	<i>Aster ciliolatus</i>
ASTECON	<i>Aster conspicuus</i>
ASTEERI	<i>Aster ericoides</i>
ASTELAE	<i>Aster laevis</i>
ASTESIB	<i>Aster sibiricus</i>
ASTRPEC	<i>Astragalus pectinatus</i>
ASTRSPP	<i>Astragalus</i> spp.
ASTRSTR	<i>Astragalus striatus</i>
BETUGLA	<i>Betula glandulosa</i>
BRACALB	<i>Brachytheceium albicans</i>
BRACGRO	<i>Brachytheceium groenlandicum</i>
BROMCIL	<i>Bromus ciliatus</i>
BROMINE	<i>Bromus inermis</i>
CALAMON	<i>Calamagrostis montanensis</i>
CALASTR	<i>Calamagrostis stricta</i>
CAMPHIS	<i>Campylium hispidulum</i>
CAMPROT	<i>Campanula rotundifolia</i>
CAMPSTE	<i>Campylium stellatum</i>
CAREAQU	<i>Carex aquatilis</i>
CAREAUR	<i>Carex aurea</i>
CARECON	<i>Carex concinna</i>
CAREDEW	<i>Carex deweyana</i>
CAREFRA	<i>Carex franklinii</i>
CAREGYN	<i>Carex gynocrates</i>
CAREMIC	<i>Carex microglochin</i>
CARESAX	<i>Carex saxatilis</i>
CARESCI	<i>Carex scirpoidea</i>
CARESCO	<i>Carex scoparia</i>
CARESTE	<i>Carex stenophylla</i>
CASTMIN	<i>Castilleja miniata</i>
CATALAC	<i>Catapyrenium lachneum</i>

CERAPUR *Ceratodon purpureus*
CHEIFEE *Cheilanthes feei*
CHENALB *Chenopodium album*
CLADCAR *Cladonia cariosa*
CLADCER *Cladonia cervicornis*
CLADCHL *Cladonia chlorophaea*
CLADFIM *Cladonia fimbriata*
CLADGRA *Cladonia gracilis*
CLADPOC *Cladonia pocillum*
CLADPYX *Cladonia pyxidata*
CLADSPP *Cladina* spp.
CLADSUB *Cladonia subulata*
CLADSUL *Cladonia sulphurina*
COELACU *Coelocaulon aculeatum*
COMAUMB *Comandra umbellata*
CREPRUN *Crepis runcinata*
CREPTEC *Crepis tectorum*
CYPRPAS *Cypripedium passerinum*

DANTPAR *Danthonia parryi*
DESCCES *Deschampsia cespitosa*
DICRPOL *Dicranum polysetum*
DICRSCO *Dicranum scoparium*
DICRUND *Dicranum undulatum*
DISTCAP *Distichium capillaceum*
DITRFLE *Ditrichum flexicaule*
DODEPUL *Dodecatheon pulchellum*
DREPUNC *Drepanocladus uncinatus*
DRYADRU *Dryas drummondii*
DRYAINT *Dryas integrifolia*
DRYAOCT *Dryas octopetala*

ELAECOM *Elaeagnus commutata*
ELEOQUI *Eleocharis quinqueflora*
ELYMINN *Elymus innovatus*
EPILLAT *Epilobium latifolium*
EPILPAL *Epilobium palustre*
EQUIHYE *Equisetum hyemale*
EQUIPAL *Equisetum palustre*
EQUIPRA *Equisetum pratense*
EQUISCI *Equisetum scirpoides*
EQUIVAR *Equisetum variegatum*
ERIGCAE *Erigeron caespitosus*
ERIGCOM *Erigeron compositus*
ERIGGLA *Erigeron glabellus*
ERIGPHI *Erigeron philadelphicus*
ERYSASP *Erysimum asperum*
ERYSINC *Erysimum inconspicuum*
FESTSAX *Festuca saximontana*
FLAVCUC *Flavocetraria cucullata*
FRAGVIR *Fragaria virginiana*
FULGBRA *Fulgensia bracteata*

GAILARI *Gaillardia aristata*
GALIBOR *Galium boreale*
GENTAMA *Gentianella amarella*
GENTPRO *Gentiana prostrata*
GEOCLIV *Geocaulon lividum*
GEUMTRI *Geum triflorum*
GOODREP *Goodyera repens*

HABEHYP	<i>Habenaria hyperborea</i>
HABEOBT	<i>Habenaria obtusata</i>
HABEVIR	<i>Habenaria viridis</i>
HAPLLAN	<i>Haplopappus lanceolatus</i>
HAPLLYA	<i>Haplopappus lyallii</i>
HAPLUNI	<i>Haplopappus uniflorus</i>
HEDYALP	<i>Hedysarum alpinum</i>
HEDYBOR	<i>Hedysarum boreale</i>
HETEVIL	<i>Heterotheca villosa</i>
HIERCYN	<i>Hieracium cynoglossoides</i>
HYLOSPL	<i>Hylocomium splendens</i>
HYPNCUP	<i>Hypnum cupressiforme</i>
HYPNREV	<i>Hypnum revolutum</i>
HYPOAUS	<i>Hypogymnia austerodes</i>
HYPOPHY	<i>Hypogymnia physodes</i>
ISOPELE	<i>Isopterygium elegans</i>
JUNCALP	<i>Juncus alpinoarticulatus</i>
JUNCBAL	<i>Juncus balticus</i>
JUNICOM	<i>Juniperus communis</i>
JUNIHOR	<i>Juniperus horizontalis</i>
KOBRSIM	<i>Kobresia simpliciuscula</i>
KOELMAC	<i>Koeleria macrantha</i>
LESQALP	<i>Lesquerella alpina</i>
LILIPHI	<i>Lilium philadelphicum</i>
LINNBOR	<i>Linnaea borealis</i>
LINULEW	<i>Linum lewisii</i>
MEESULI	<i>Meesia uliginosa</i>
MUHLRIC	<i>Muhlenbergia richardsonis</i>
ORTHLUT	<i>Orthocarpus luteus</i>
ORTHSEC	<i>Orthilia secunda</i>
ORTHSP	<i>Orthotrichum</i> spp.
OXYTMON	<i>Oxytropis monticola</i>
OXYTSER	<i>Oxytropis sericea</i>
OXYTSPL	<i>Oxytropis splendens</i>
PARNPAL	<i>Parnassia palustris</i>
PEDIGRO	<i>Pedicularis groenlandica</i>
PELTAPH	<i>Peltigera aphthosa</i>
PELTCAN	<i>Peltigera canina</i>
PELTEL	<i>Peltigera elisabethae</i>
PELTNEC	<i>Peltigera neckeri</i>
PELTNEO	<i>Peltigera neopolydactyla</i>
PELTPRA	<i>Peltigera praetextata</i>
PELTRUF	<i>Peltigera rufescens</i>
PHYSMUS	<i>Physconia muscigena</i>
PICEENG	<i>Picea engelmannii</i>
PICEGLA	<i>Picea glauca</i>
PINGVUL	<i>Pinguicula vulgaris</i>
PINUCON	<i>Pinus contorta</i>
PINUFLE	<i>Pinus flexilis</i>
PLANMAJ	<i>Plantago major</i>
PLEUSCH	<i>Pleurozium schreberi</i>
POAAPAL	<i>Poa palustris</i>
POAAPRA	<i>Poa pratensis</i>
POHLNUT	<i>Pohlia nutans</i>

POHLSPP	<i>Pohlia</i> spp.
POPUBAL	<i>Populus balsamifera</i>
POPUTRE	<i>Populus tremuloides</i>
POTECON	<i>Potentilla concinna</i>
POTEFRU	<i>Potentilla fruticosa</i>
POTEGRA	<i>Potentilla gracilis</i>
PSORCER	<i>Psora cerebriformis</i>
PSORDEC	<i>Psora decipiens</i>
PSORRUB	<i>Psora rubiformis</i>
PTILCRI	<i>Ptilium crista-castrensis</i>
PYROASA	<i>Pyrola asarifolia</i>
ROSAACI	<i>Rosa acicularis</i>
RUBUARC	<i>Rubus arcticus</i>
SALIATH	<i>Salix athabascensis</i>
SALIBRA	<i>Salix brachycarpa</i>
SALICAN	<i>Salix candida</i>
SALIGLA	<i>Salix glauca</i>
SALIMYR	<i>Salix myrtilifolia</i>
SALIVES	<i>Salix vestita</i>
SAXIAIZ	<i>Saxifraga aizoides</i>
SELADEN	<i>Selaginella densa</i>
SENECAN	<i>Senecio canus</i>
SHEPCAN	<i>Shepherdia canadensis</i>
SISYMON	<i>Sisyrinchium montanum</i>
SMILSTE	<i>Smilacina stellata</i>
SOLICAN	<i>Solidago canadensis</i>
SOLIMUL	<i>Solidago multiradiata</i>
SONCOLE	<i>Sonchus oleraceus</i>
SPIRBET	<i>Spiraea betulifolia</i>
SQUALEN	<i>Squammarina lentigera</i>
STIPCOM	<i>Stipa comata</i>
TARAOFF	<i>Taraxacum officinale</i>
THALVEN	<i>Thalictrum venulosum</i>
THUIABI	<i>Thuidium abietinum</i>
TOFIGLU	<i>Tofieldia glutinosa</i>
TORTFRA	<i>Tortella fragilis</i>
TORTRUR	<i>Tortula ruralis</i>
TRIGMAR	<i>Triglochin maritima</i>
TRIGPAL	<i>Triglochin palustris</i>
VIOLADU	<i>Viola adunca</i>
VIOLNEP	<i>Viola nephrophylla</i>
VIOLREN	<i>Viola renifolia</i>
XANTCHL	<i>Xanthoparmelia chlorochroa</i>
XANTWYO	<i>Xanthoparmelia wyomingica</i>
ZIGAELE	<i>Zigadenus elegans</i>
ZIZIAPT	<i>Zizia aptera</i>

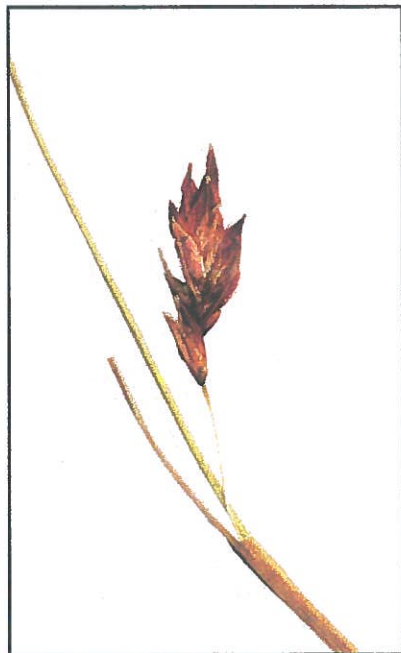
APPENDIX 6

Habitat and diagnostic features of *Brachytecium albicans* (S2?)



APPENDIX 7

Habitat and diagnostic features of *Carex franklinii* (S2)



APPENDIX 8

Habitat and diagnostic features of *Erysimum asperum* (S3)



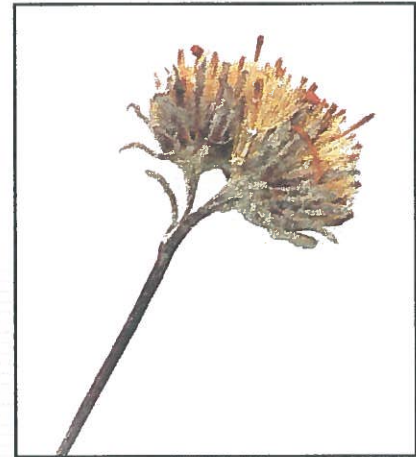
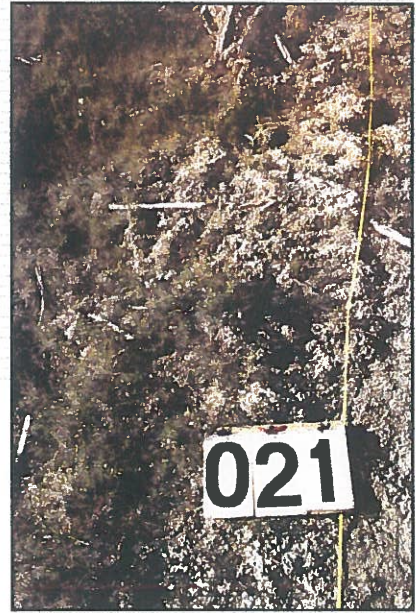
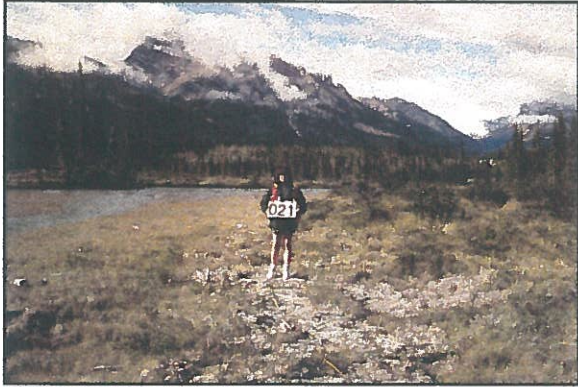
APPENDIX 9

Habitat and diagnostic features of *Haplopappus lyallii* (S2)



APPENDIX 10

Habitat and diagnostic features of *Haplopappus uniflorus* (S3)



APPENDIX 11

Habitat and diagnostic features of *Hieracium cynoglossoides* (S2)

