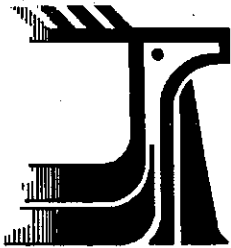


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COMMITTEE ON THE
STATUS OF ENDANGERED
WILDLIFE IN CANADA

OTTAWA, ONT. K1A 0H3
(819) 997-4991

COMITÉ SUR LE STATUT
DES ESPÈCES MENACÉES
DE DISPARITION AU
CANADA

OTTAWA (ONT.) K1A 0H3
(819) 997-4991

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**STATUS REPORT ON THE RUSH PINK
*STEPHANOMERIA RUNCINATA***

IN CANADA

BY

BONNIE SMITH



STATUS ASSIGNED IN 1996
NOT AT RISK

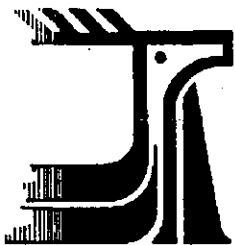
REASON: **WIDELY DISPERSED STABLE POPULATIONS OF
RESTRICTED HABITATS AT NORTHERN EDGE OF
RANGE.**

OCCURRENCE: **BRITISH COLUMBIA**

NOTE: **EDITORIAL CHANGES MADE TO REPORT DECEMBER
1996**

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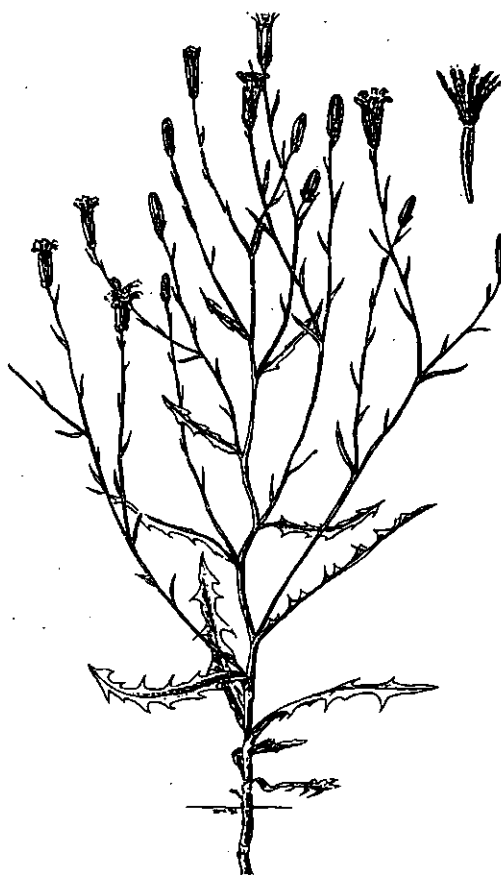
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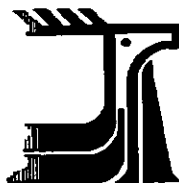
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STATUS REPORT ON PLANTS AT RISK IN CANADA



Rush Pink
Stephanomeria runcinata

COSEWIC
COMMITTEE ON THE STATUS
OF ENDANGERED WILDLIFE
IN CANADA



CSEMDC
COMITÉ SUR LE STATUT
DES ESPÈCES MENACÉES
DE DISPARITION AU CANADA

STATUS REPORT ON THE RUSH PINK
STEPHANOMERIA RUNCINATA

IN CANADA

BY

BONNIE SMITH
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STATUS ASSIGNED IN 1996
NOT AT RISK

EXECUTIVE SUMMARY

Description

Stephanomeria runcinata Nutt., or rush pink, is a member of the Asteraceae or Sunflower Family. *S. runcinata* is a perennial, with stems 1-2 dm tall, usually several, generally branched from a stout taproot. Leaves are alternate, 1-7 cm long, 4-15 mm wide, linear to linear-lanceolate, runcinate-pinnatifid, with upper leaves reduced to linear or scalelike. When broken, stems and leaves exude a white, milky sap. Heads terminating the branches. Heads are all ligulate, mostly 5-flowered, pink or white. Involucres are 9-12 mm high, with mostly 5 principal bracts. Achenes are about 5 mm long, more or less rugose-tuberculate and pitted, and longitudinally grooved rather than ribbed. The pappus is bright white, plumose to the base or very nearly so.

Only two other species of *Stephanomeria* occur in Canada. Both are geographically restricted to the dry interior of southern British Columbia. Species of *Lygodesmia* may resemble rush pink but rush pink has a plumose pappus as well as distinctive leaves.

Distribution

Stephanomeria runcinata is restricted to North America and distributed from southern Alberta (Brocket, Dinosaur Provincial Park, Suffield, and south to the American border in eastern Alberta) to southcentral Saskatchewan (along the South Saskatchewan River from the Alberta border to Diefenbaker Lake and Grassland National Park west along the Frenchman River to Eastend) in Canada and extends southward in the United States to south and central Montana, Wyoming, northwestern Utah, northern Colorado and northwestern Nebraska and North Dakota. rush pink is recognized as endangered in North Dakota and rare in Colorado.

Population Size and Trends

The species is very infrequent within its restricted range in Alberta and Saskatchewan with the exception of the Grasslands National Park site where it can be quite common. The total Alberta population is estimated to be less than 2000 specimens. The total Saskatchewan population is estimated to be approximately 10,000 specimens with 80% of the total population found in Grasslands National Park. There are few sites in Saskatchewan and Alberta with good local populations, the best of which are the sites at Grasslands National Park and Diefenbaker Lake in Saskatchewan and Dinosaur Provincial Park and the Manyberries Badlands in Alberta. Populations appear to be stable but the species apparently remains restricted to site specific locations along waterways.

Habitat

Stephanomeria runcinata is found infrequently on marginal lands within the Grassland Natural Region, occurring mainly on eroded shale sites from Bearpaw and Oldman Formations. Rush pink habitat is differentiated from the other habitats by being undisturbed, having a high percentage of bare ground primarily from wind and water erosion, and having slopes normally

greater than 5%. The eroded communities support a great diversity of species that are sparsely distributed. Species commonly associated with rush pink include the following: *Eriogonum pauciflorum*, *Thermopsis rhombifolia*, *Commandra umbellata*, *Iva axillaris*, *Solidago missouriensis*, *Hymenoxys richardsonii*, *Phlox hoodii*, *Eriogonum flavum*, *Eurotia lanata*, *Opuntia polyacantha*, *Stipa comata*, *Calamovilfa longifolia*, *Agropyron trachycaulum*, *Koeleria cristata*. Shrub cover often includes the following species: *Chrysothamnus nauseosus*, *Rosa arkansana*, *Artemisia cana* and *Juniperus horizontalis*.

General Biology

Stephanomeria runcinata is a perennial species. It reproduces sexually by pollen production. The species is actively producing fruit and setting seed at most sites. Little is known about the role the species plays in the ecosystem.

Limiting Factors

Developments requiring the modification of waterways is the primary threat to the continued survival of rush pink within Canada. Dam construction has eradicated one location on the Oldman River north of Pincher Creek in Alberta. Threats to habitat from developments associated with tourism and oil and gas extraction should also be closely monitored. The inaccessibility of most sites remains their greatest protection but any increase in resource extraction - oil, gas, mining - might eradicate a particular site. One site in Alberta is situated very close to a road.

Protection

There are no regulatory or other measures to protect this species. While the populations are stable at most locations, *Stephanomeria runcinata* is restricted to a very limited range in Canada. Therefore, it is important to protect all sites within this range.

Conclusions

Stephanomeria runcinata is recommended for listing as a **vulnerable** species in Canada in consideration of the restricted range of the species in Canada and the United States and its tendency to occur very infrequently within suitable habitat. The prognosis for the species survival is very good if the existing habitat is not compromised. Development should be restricted, especially in the Dinosaur Provincial and Grasslands National Parks. Development of resources should be monitored at all locations, especially those which may alter the waterways along which rush pink is located.

NOTE

COSEWIC has determined that the best designation for this species, at present, is **Not at Risk**. Two recent, additional sites are now known for Saskatchewan. The new locations are at Snipe Lake and at Saskatchewan Landing Provincial Park. At the latter, the local population numbers roughly 600 plants. [Erich Haber, Chairman, Subcommittee for Vascular Plants, Mosses and Lichens, November, 1996]

TABLE OF CONTENTS

I Species Information

1. Classification and Nomenclature	1
2. Description	1
3. Biological and Economic Significance	2
4. Distribution	2
4.1 Alberta	2
4.2 Saskatchewan	3
5. General Environmental and Habitat Characteristics	3
5.1 Climate	4
5.2 Physiography, Hydrology and Edaphic Factors	4
5.3 Biological Characteristics	6
6. Population Biology and Ecology	6
6.1 Reproductive Ecology	9
6.2 Population Ecology	10
7. Land Ownership and Management Responsibility	10
8. Management Practices and Experience	11
8.1 Habitat Management	11
8.2 Cultivation	11
8.3 Current Management Policies	11
9. Evidence of Threats to Survival	13
9.1 Tourism and Recreation	13
9.2 Resource Extraction	13
9.3 Construction of Dams, Water Diversions	13
9.4 Roadside Development	14
9.5 Grazing	14
9.6 Conversion to Tame Pasture and Cropland	14
10. Present Legal or Other Formal Status	15

II Assessment of Status

11. General Assessment	15
12. Status Recommendation	16
13. Recommended Critical Habitat	16
14. Conservation Recommendation	17

III Information Sources

15. References Cited in Report	17
16. Collections Consulted	20
17. Fieldwork	20
18. Knowledgeable Individuals	21

IV Authorship

19. Initial Authorship of Status Report	22
20. Maintenance of Status Report	22

Appendices

Appendix 1: Detailed Locality Citations	23
Appendix 2: Habitat Site Descriptions	28
Appendix 3: Recommended Critical Habitat	38

LIST OF MAPS AND FIGURES

- Map 1:** Distribution of *Stephanomeria runcinata* Nutt.
- Map 2:** Distribution of *Stephanomeria runcinata* Nutt. in Canada.
- Map 3:** Distribution of *Stephanomeria runcinata* Nutt. within Dinosaur Provincial Park, Alberta. (Site 1)
- Map 4:** Distribution of *Stephanomeria runcinata* Nutt. within the West Block of Grasslands National Park, Saskatchewan. (Site 2)
- Map 5:** Critical habitat of *Stephanomeria runcinata* Nutt., Grasslands National Park, Saskatchewan. (Site 2)
- Map 6:** Critical habitat of *Stephanomeria runcinata* Nutt., Diefenbaker Lake, Saskatchewan. (Site 3)
- Map 7:** Critical habitat of *Stephanomeria runcinata* Nutt., Dinosaur Provincial Park, Alberta. (Site 1)
-
- Figure 1:** *Stephanomeria runcinata* Nutt.
- Figure 2:** Steep slopes, river breaks. Semi-barren *Stephanomeria runcinata* Nutt. habitat. Site 2. Suffield National Wildlife Area, Alberta.
- Figure 3:** *Stephanomeria runcinata* Nutt. growing on steep semi-barren slopes. Site 2. Suffield National Wildlife Area, Alberta.
- Figure 4:** *Stephanomeria runcinata* Nutt. habitat. Steep, semi-barren slopes near South Saskatchewan River. Site 4. Lemsford Ferry, Saskatchewan.
- Figure 5:** Low hills along Diefenbaker Lake. Near Prairie Bluff Regional Park, Saskatchewan.
- Figure 6:** *Stephanomeria runcinata* Nutt. habitat. Site 3.1. Jahnke Ranch, southwest of Riverhurst, Diefenbaker Lake, Saskatchewan.
- Figure 7:** Eroded shale *Stephanomeria runcinata* Nutt. habitat. Site 2. Timmons Coulee, West Block, Grasslands National Park, Saskatchewan.
- Figure 8:** Rocky, semi-barren, eroded shale habitat. Site 2. Timmons Coulee, West Block, Grasslands National Park, Saskatchewan.
- Figure 9:** Semi-barren, rocky *Stephanomeria runcinata* Nutt. habitat. Site 2. Timmons Coulee, West Block, Grasslands National Park, Saskatchewan.
- Figure 10:** *Stephanomeria runcinata* Nutt. and habitat. Site 2. Timmons Coulee, West Block, Grasslands National Park, Saskatchewan.
- Figure 11:** *Stephanomeria runcinata* Nutt. Note runcinate basal leaves. Site 2. Timmons Coulee, West Block, Grasslands National Park, Saskatchewan.

I. Species Information

1. Classification and Nomenclature

Stephanomeria runcinata Nutt. is commonly referred to as rush pink, runcinate-leaved skeleton-weed or desert wirelettuce. Rush pink is a member of the family Asteraceae (also known as Compositae) in the order Asterales. The Asteraceae is organized into about 13 tribes. *Stephanomeria* is a member of the tribe Lactuceae (Cronquist 1981).

There are only 3 species of *Stephanomeria* in Canada; namely, *S. runcinata* Nutt., *S. tenuifolia* (Torr.) Hall, and *S. lactucina* Gray. The latter two species are restricted in range to the dry interior of British Columbia (Scoggan 1978).

Rush pink was first described by Nuttall, a well known botanist. (Gray's Herbarium Index (1968) recognizes two varieties; namely, var. *myrioclada* Jepson, Jepson, Man. Pl. Calif. 998. 1925; var. *Parishii* Jepson, Man. Fl. Pl. Calif. 998 1925. California.) Hitchcock *et al.* (1964) lists the following synonyms for *Stephanomeria runcinata* Nutt.: *Ptiloria runcinata* Davidson & Moxley, *Ptiloria ramosa* Rydb., and *Stephanomeria heterophylla* Nutt. Another synonym sometimes used is *Ptiloria pauciflora* (Torr.) Raf. The first edition of the Flora of Alberta (Moss, 1952) listed rush pink under the name *Stephanomeria tenuifolia* (Torr.) Hall. This name more properly refers to the species found in southern B.C. (Hitchcock *et al.* 1964). Scoggan (1978) lists *S. minor* sensu Macoun not (Hook.) Nutt. as a synonym. No subspecies or varieties of rush pink have been recognized in Canada.

2. Description

Stephanomeria runcinata is a perennial with stems 1-2 dm tall, usually several, generally branched from a stout, vertical rhizome that is elongate and often branched and arises from a stout taproot. Leaves are alternate, 1-7 cm long, 4-15 mm wide, linear to linear-lanceolate, runcinate-pinnatifid, with upper leaves reduced to linear or scalelike. When broken, stems and leaves exude a white, milky sap. Heads terminating the branches. Heads are all ligulate, mostly 5-flowered, pink or white. Involucres are 9-12 mm high, with mostly 5 principal bracts. Achenes are about 5 mm long, more or less rugose-tuberculate and pitted, and longitudinally grooved rather than ribbed. The pappus is bright white, plumose to the base or very nearly so, $2n=16$ (Hitchcock *et al.* 1969). See Figures 1, 5, 11.

There is only one other species of rush pink in Canada with which *Stephanomeria runcinata* might be confused. This is *Stephanomeria tenuifolia*, a plant of southern British Columbia. The geographic separation leaves little possibility for confusion between the two. However, *S. tenuifolia* is also much taller (2-7 dm), has linear or filiform leaves and smooth achenes (Hitchcock *et al.* 1964).

There are many other genera in the family Asteraceae. The genus *Stephanomeria* is distinctive as it has only ligulate flowers, milky juice, pink flowers, a diffusely branched stem with few cauline, mostly linear or reduced, leaves, and plumose pappus-bristles. *Stephanomeria* inhabit dry sites. There are no other species of *Stephanomeria* in Alberta (Moss 1982).

Rush pink superficially resembles skeletonweed (*Lygodesmia juncea*), which also has reduced leaves, milky sap and is a member of the Lactuceae. The diagnostic characteristic for rush pink is its plumose pappus, as opposed to a pappus of simple capillary bristles. It is also different in having well-developed stem leaves and an altogether narrower shape with very little branching from the base. Rush pink does not occur in the same habitats as skeletonweed. Skeletonweed occurs in much more harsh and unstable habitats (North Dakota Natural Heritage Inventory 1990).

3. Biological and Economic Significance

The family Asteraceae is of great importance economically. The genus *Stephanomeria*, however, has very few horticultural uses. *S. runcinata* is not useful as a horticultural species due to its preference for rather extreme climatic and habitat conditions (Everett 1981).

4. Distribution

In Canada, *Stephanomeria runcinata* is found in southern Alberta (Argus and White 1978, Packer and Bradley 1984) mainly along the South Saskatchewan River and in the Extreme SE corner of the province. It extends eastward along the South Saskatchewan River in southcentral Saskatchewan (Maher *et al.* 1979) to the east end of Diefenbaker Lake. It also is present in Grassland National Park and near Eastend in the southwestern corner of Saskatchewan. The species extends southward in the United States (Map 1) to south and central Montana, Wyoming, northwestern Utah, northern Colorado and northwestern Nebraska and North Dakota.

Precise locality data and land ownership, if known, are on file with COSEWIC and the appropriate provincial - territorial jurisdictions. This information is generally available unless the localities are considered to be publicity-sensitive.

4.1 Alberta

The distribution of rush pink in Alberta (Map 2, 3) is very spotty and always associated with waterways. Specimens have been collected from Dinosaur Provincial Park along the Red Deer River, Suffield National Wildlife Area along the South Saskatchewan

River, one site along the Oldman River north of Brocket, Chin Coulee, Sage Creek and the Manyberries Badlands along Manyberries Creek in southeastern Alberta. There are extensive areas of cultivated lands separating most sites.

4.2 Saskatchewan

The Saskatchewan (Map 2, 4) population of rush pink is mostly restricted to two separate areas. One extends from the Alberta border to Diefenbaker Lake along the South Saskatchewan River. The other extends from Grasslands National Park west along the Frenchman River to just west of Eastend. As in Alberta, all sites are associated with waterways.

During the summer of 1994 many other potential sites were examined in southwestern Saskatchewan and Alberta but no other populations were located (Smith 1994).

5. General Environment and Habitat Characteristics

Populations occur in the mixed grassland (prairie) natural region in Alberta and Saskatchewan, on dry hills and plains but, particularly, on outcrops of the Bearpaw Formation in Saskatchewan (Argus and White 1978, Maher *et al.* 1979). In Alberta, the Dinosaur Provincial Park badlands are typified by a complex topography. Stabilized areas are interspersed with actively eroding sites, natural drainage channels, mesas and irrigation fed valley (Romuld 1993). Within Grasslands National Park in Saskatchewan, the presence of dry, rolling uplands, eroded slopes, badlands and riparian areas, and numerous coulees as well as the Frenchman River Valley and the Rock Creek Badlands create a highly diverse landscape. As a result of this landscape diversity, the vegetation mosaic of Grasslands National Park is generally more complex than that found in other mixed-grass prairie areas (Michalsky & Ellis 1994).

Species commonly associated with rush pink include the following: *Eriogonum pauciflorum*, *Thermopsis rhombifolia*, *Comandra umbellata*, *Iva axillaris*, *Solidago missouriensis*, *Hymenoxys richardsonii*, *Phlox hoodii*, *Eriogonum flavum*, *Eurotia lanata*, *Opuntia polyacantha*, *Stipa comata*, *Calamovilfa longifolia*, *Agropyron trachycaulum*, *Koeleria cristata*. Shrub cover often includes the following species: *Chrysothamnus nauseosus*, *Rosa arkansana*, *Artemisia cana* and *Juniperus horizontalis*.

Detailed habitat information was provided to the chairman of the Plants Subcommittee for inclusion in the COSEWIC file for this species.

5.1 Climate

The Prairies Climatic Region, encompassing both the Alberta and Saskatchewan populations, lies in the northern cool-temperate zone characterized by low annual precipitation, high evaporation rates and fast runoff. These factors lead to chronic water deficits with severe shortages in the short-grass prairie area. Soil moisture is not always restored to capacity in an average year and water surplus averages only 7 mm. Southern Alberta and Saskatchewan have a very high average annual water deficiency - among the highest in Canada (Stamp 1988).

The climate of the mixed grassland natural region is continental, characterized by extremes in temperatures with warm summers and cold winters. The mean temperature ranges from 6°C in the hotter parts to 0°C in the cooler areas. The growing season is relatively short, with an average of 105 to 130 frost-free days. The growing average frost-free period around Diefenbaker Lake is about 100 days. There is comparatively low annual precipitation, ranging from about 30 cm in extreme southeastern Alberta and southwestern Saskatchewan to 40 cm along the western and northern fringes. Dry summers and winters are typical. Spring is the wettest season with about two-thirds of the annual precipitation falling as rain, the peak occurring in June. Because of the warm temperatures and high average wind speed, the rate of evaporation is high through the summer months (Wallis 1987). Around Diefenbaker Lake, snowfall averages about 100 cm but depths are usually less due to compaction and drifting, as well as melting and sublimation (Saskatchewan Parks, Recreation and Culture, n.d.).

In Dinosaur Provincial Park, precipitation falls mostly as rain during summer thunderstorms. The park is dry with 30 to 40 cm of precipitation falling each year. Most of the year it is extremely dry in badland areas, the preferred habitat of rush pink, so that only a few drought-tolerant plants can survive. Summers are generally short and hot with summer daily high temperatures often exceeding 40°C. Winters are typically cold with January mean temperatures of -19°C (Findlay and Findlay 1987). Because these few plants cannot hold back much water, runoff is high. During a heavy rainstorm about 75% of the rain runs off without sinking into the ground. As the water runs down the hillsides it erodes the rocks into the intricate shapes of the badlands. Precipitation averages 35 mm a year in Drumheller and falls mostly as rain during summer thunderstorms. Moisture deficits are severe (Digby & Digby 1991).

5.2 Physiography, Hydrology, and Edaphic Factors

The Alberta and Saskatchewan populations occur in the Interior Plains physiographic region (Brookes 1988). Sites 3,4,5 in Saskatchewan occur in the South Saskatchewan River Plain, Central Saskatchewan Plains physiographic subregion of the Saskatchewan Plains physiographic region.

Adjacent to the South Saskatchewan River the average elevation of the plain is 580 metres. It is underlain by lake deposits or water-washed glacial till. The main features of the Saskatchewan River Plain are its deep, terraced river valleys, dune areas and hummocky moraine (Saskatchewan Parks, Recreation and Culture, n.d.). Site 1 and 2 occur in the Great Plains physiographic region. Site 1 occurs in the Cypress Hills Uplands as does the western area of Site 2. The eastern area of Site 2 lies in the Wood Mountain Uplands (Richards 1969).

All Alberta and Saskatchewan sites occur on Upper Cretaceous bedrock, non-marine in origin, composed of sandstone, shale and coal (Beaty 1975). In Saskatchewan, sites mostly occur on Bearpaw Formation except for Sites 4 and 5 on the South Saskatchewan River which occur on Oldman Formations. In Alberta, sites are found mainly on Oldman Formations of late Cretaceous age. This bedrock unit consists of alternating layers of non-marine sandstones and shales, with coal seams and scattered dinosaur fossils in its upper part (Richards 1969). Rush pink is rigidly confined to powder-shale beds (Figures 7-9), that is beds of loose, flaky non-swelling clays which in the outcrop break down to a powder and lie at the angle of repose for loose sand. It does not grow on bentonite (i.e., gumbo-like) beds (Hudson 1965).

Saskatchewan and Alberta sites occur in one of three drainage basins: the Red Deer, South Saskatchewan and Milk basins. Rush-pink is always associated with erosion caused by waterways. The Dinosaur Provincial Park site (Site 1) is in the Red Deer drainage basin. The Suffield National Wildlife Area, the Chin Coulee and Brocket sites (Sites 2,5 and 6, respectively, Alberta) and the Diefenbaker, Lemsford Ferry and Empress sites (Sites 3,4,5, respectively, Saskatchewan) are in the South Saskatchewan River drainage basin. The Sage Creek and Manyberries sites (Sites 3,4, Alberta) are in the Milk Drainage basin as are the Eastend and Grasslands National Park sites (Sites 1, 2, Saskatchewan) (Richards 1969).

Rush pink is found in badlands both in Alberta and Saskatchewan, for example, Dinosaur Provincial Park, areas around Diefenbaker Lake, and areas within Grasslands National Park and the Manyberries Badlands. Badlands are restricted mainly to areas of arid to semi-arid climate in which relatively weak bedrock is horizontally layered and the vegetation cover extremely sparse or completely absent. A typical tract of badlands consists of rough, intricate, narrowly and steeply gullied topography in which a continuous soil cover and plant life are all but missing. Bedrock structure, in the form of horizontal bands of different colors and textures, is usually very apparent (Beaty 1975).

All Alberta and Saskatchewan sites occur in brown soil zones except the Chin Coulee and Brocket sites in Alberta (Sites 5, 6) and the Diefenbaker (Riverhurst) site (Site 3.1) in Saskatchewan which occur in the dark brown soil zone (Richards 1969). Soils within the area of Diefenbaker Lake and Grasslands National Park are mostly true grassland soils known as Chernozemic Dark Brown soils, characterized by dark brown topsoil and

brownish upper subsoils over lighter colored lower subsoils that have concentrations of lime (Saskatchewan Parks, Recreation and Culture, n.d.).

5.3 Biological Characteristics

Rush pink is a perennial species. Reproduction may be primarily sexual. [There may also be considerable vegetative propagation as a result of the elongate, branching rhizomes. Dr. Vernon Harms, Saskatchewan, pers. comm.]

6. Population Biology and Ecology

Rush pink is almost always distributed in a localized pattern in habitats of limited accessibility. Most populations have characteristically low densities, with a few plants at any given spot. The species is similarly distributed in southwestern North Dakota (North Dakota Natural Heritage Inventory 1990). Spot checks in apparently similar habitat in Alberta in various areas have failed to detect the presence of rush pink - even in the "heart" of its Alberta range. The species is inexplicably rare (Provincial Museum of Alberta 1986 fact sheet).

Alberta

Site 1 - Dinosaur Provincial Park

Romould (1990) found rush pink at three sites (Map 3) within Dinosaur Provincial Park. Populations were low at all sites.

Site 1.1: 48 plants counted, summer 1990.

Site 1.2: 2 plants counted, summer 1990.

Site 1.3: 63 plants counted, summer 1990.

Cornish (1989) found rush pink at eight sites (Map 3) within the park. Again, populations were low at all sites.

Site 1.4: 18 plants covering an area of 20 sq. m., scattered, 10% in flower, June 30, 1989.

Site 1.5: 50 plants covering an area of 12 sq. m., scattered, 30% in flower, June 30, 1989.

Site 1.6: 115 plants covering an area of 40 sq. m., scattered, 40% in flower, July 4, 1989.

Site 1.7: 29 plants covering an area of 30 sq. m., scattered, 30% in flower, July 4, 1989.

Site 1.8: 3 plants covering an area of 4 sq. m., scattered, 50% in flower, July 17, 1989.

Site 1.9: 19 and 3 plants in two nearby sites covering an area of 12 sq. m., scattered, 30% in flower, July 17, 1989.

Site 1.10: 17 plants covering an area of 2 sq. m., clumped, 10% in flower, July 17, 1989.

Site 1.11: 6 plants covering an area of 6 sq. m., scattered, 15% in flower, July 19, 1989.

No population information exists for Site 1.12. Original site collected 1971.

Site 2 - Suffield National Wildlife Area

Rush pink is always infrequent or sparse within this area. Only 15 plants were found at the site in the river breaks on steep slopes (Macdonald, pers comm. 1994).

Site 3 - Sage Creek

No specimens were found during the 1994 field season but substantial suitable habitat was noted by the author (Smith 1994).

Site 4 - Manyberries Badlands

Wayne Smith (1993) states that populations of rush pink observed in this area represent the largest known in Alberta and possibly in Canada.

Site 5 - Chin Coulee

Local population of 100 plants scattered in a 10 m x 15 m area. (Wallis 1986 field information) Similar areas were checked to west and east along Chin Coulee but no plants were found. Smith (1994) visited this area but did not find any plants. The exact location of the limited population probably was not pinpointed with sufficient accuracy. Access was also limited by oilfield development in the immediate area.

Site 6 - Oldman River - Brocket

In 1986, 30 plants were counted scattered over 100 m by 15 m area. An extensive similar area east of this location was examined but no plants were found (Wallis 1986 field information).

Historical Collection - Oldman River - Pincher Creek - Extirpated

Extirpated by flooding from the Three Rivers Dam on the Oldman River, early 1990's. In 1986, this site was relocated in the same area as the original Moss collection. In 1986, 13 plants were counted, 8 in loose aggregation and the rest scattered on a south-facing highly erodible bank with little other vegetation, (Wallis 1986, field information).

Saskatchewan

Site 1 - Eastend and Environs

No data from this site but substantial potential habitat was noted by the author (Smith 1994).

Site 2 - Grassland National Park

There are 17 reported locations of rush pink within the deeded boundary of the park, primarily in the West Block. Although it can occur fairly frequently, rush pink is never dominant in any of the three plant communities in which it occurs within the park. Rush pink is most frequent in the juniper/golden bean community followed by the moss phlox/rubberweed and rose/winter fat communities, in that order. The authors of the vegetation report do not provide an estimate of the total population but the species is stated to be fairly common within the park and is assigned only a Category 3 ranking. Scale from 1 to 4, with 1 referring to species most urgently requiring protection (Michalsky & Ellis 1994).

Number of plots examined for the three communities:

Table 1

Rose/Winter Fat			Juniper/Golden Bean			Moss Phlox/Rubberweed		
E	W	Total	E	W	Total	E	W	Total
0	9	9	2	28	30	11	12	23

(E = East Block, W = West Block)

Most of the specific surveys for rare plants within the park were conducted in May and June, therefore, rush pink would not have been as obvious as it would be when it flowered in July and August (Michalsky & Ellis 1994).

Timmons Coulee (Map 4, Figures 7-11): Widespread down length of coulee on the south-facing slopes. Rush pink is one of the dominant colonizers of the semi-barren slopes. The population is restricted to the steep coulee slopes. Four to five hundred were counted in a 12 m x 4.5 m area. Mid- to upper-thousands of specimens are estimated for this coulee. Rush-pink was also noted to be common in the Laovenan Coulee on the opposite side of the park access road (west) from Timmons Coulee. Probably there are 10,000+ specimens in the Park (Smith 1994).

Site 3 - Diefenbaker Lake

Site 3.1: Riverhurst

Infrequent (Jahnke) (Hudson, 1992, label data [about 50 plants, pers. comm.]), eastern location. See Figure 6. Locally frequent (Gerbrandt) (Hudson 1993, label data [about 100 plants, pers. comm.]), western location.

Site 3.2: Beechy

Occasional colonies noted during two collections (Hudson 1964, label data [about 50 plants, pers. comm.]).

Site 3.3: Beechy to Matador

Noted to be rare at this site by Hudson (1964).

Site 3.4: Matador Research Station

Upper slopes and crest of coulee banks (Skoglund 1969, label data). [Additional data from Dr. Vernon Harms, Saskatchewan, based on a study by Diana Bizecki, indicates that there are about 100 plants in two patches.]

Glen Sutter, from the Matador Research Station, (1994, pers. comm.) reports finding 10-15 scattered in the badlands closer to Diefenbaker Lake during fishing trips.

Site 4 - Lemsford Ferry

Hudson (1991) found a few plants only. Smith (1994) did not find any plants but, undoubtedly, the lower slopes of the steep slopes are proper habitat for the species. See Figure 4.

Site 5 - South Saskatchewan River - Empress

Infrequent (Hudson 1983, label data); [about 50 plants spaced at about 25-50 m, pers. comm. from Dr. Vernon Harms, Saskatchewan]

6.1 Reproductive Ecology

Stephanomeria runcinata is a perennial with a stout rhizome and taproot. As of July 6, 1986 all plants were flowering profusely at the Chin Coulee (Site 5, Alberta) location. On July 15, 1986 all plants were flowering or seeding profusely at the site north of Brocket, Alberta (Site 6).

At Site 1 (Alberta) in Dinosaur Provincial Park (Cornish 1989), rush pink was found to flower somewhat erratically throughout July. On June 30, 1989 - 10-30% in flower (2 sites). On July 4, 1989 - 30-40% in flower (2 sites). On July 17, 1989 - 10-50% in flower (3 sites). On July 19 - 15% in flower (1 site).

On July 13, 1994, 75% of the specimens of rush pink were in fruit in Timmons Coulee, west block, Grasslands National Park (Site 2) (Smith 1994). Michalsky & Ellis (1994) have reported that rush pink flowers from July to August within Grasslands National Park.

In North Dakota, rush pink flowers beginning in late June and its flowering extends through at least mid-July, depending on rainfall (North Dakota Natural Heritage Inventory 1990).

6.2 Population Ecology

No information on *Stephanomeria runcinata* population ecology was found.

7. Land Ownership and Management Responsibility

A. Alberta

Site 1 - Dinosaur Provincial Park (Map 2). Site 2 - Suffield National Wildlife Area - the buffer zone between the Suffield Military Reserve and farmland. Site 3 - Sage Creek probably lies on a grazing lease. Site 4 - Manyberries Badlands and Site 5 - Chin Coulee lie close to oilfield developments. Site 6 - Oldman River at Brocket lies on a roadside allowance.

B. Saskatchewan

Site 1 (Map 2) probably occurs on a grazing lease. Site 2 - Grasslands National Park. Site 3.1 - The eastern Riverhurst location occurs on private property. The western Riverhurst location also occurs on private property. Site 3.4 - Matador Field Station is on the IBP Grasslands Study Site managed by the University of Regina as a research station. Other sites along Diefenbaker Lake occur on various grazing leases or private rangeland. Sites 4 and 5 probably occur on a grazing leases or private property.

8. Management Practices and Experience

Mixed prairie is the most extensive grassland region found in North America. The majority of short-grass and mixed-grass prairie has been lost or converted in Alberta (Wallis and Wershler 1988). Much of the remaining rangeland exists in areas unsuitable for cultivation. Rush pink prefers these marginal areas including badlands and very steep, inaccessible semi-barren slopes. At the same time, greatly increased grazing pressure on the remaining rangeland has changed the plant composition in all types of habitats. About 24% of the original mixed prairie remains in its native state. One national park, Grasslands National Park in southwestern Saskatchewan, several provincial parks and natural areas exist within the mixed prairie zone, but further protection is necessary. Loss of primary habitat as well as destruction of specific habitats is a serious concern regarding survival of endangered species (World Wildlife Fund 1988).

8.1 Habitat Management

The extreme conditions existing within badland habitats protects these areas, to a degree, from many kinds of exploitation but damage to habitat may still result from certain uses such as tourism, oil and gas exploration and other site specific types of disturbances such as the construction of dams and flooding along the waterways with which this species is always associated.

8.2 Cultivation

No information was found regarding cultivation potential or practices for rush pink.

8.3 Current Management Policies

A. Alberta

Suffield National Wildlife Area is managed as a protected wildlife area and a buffer zone between the Suffield Military Reserve and farmland. A permit from the military is required for entrance to the reserve as the lands could be potentially dangerous due to possible presence of unexploded shells. The Manyberries Badlands and Chin Coulee sites lie within active oilfields. Many roads are located near the sites. Pumpjacks dot the areas. The tiny site near the Oldman River north of Brocket is located on a roadside allowance. The Oldman River site at Pincher Creek has been extirpated by construction of the Oldman Dam. The Sage Creek site is managed as a grazing leasehold.

In 1979 Dinosaur Provincial Park was designated a UNESCO World Heritage Site based on its wealth of dinosaurian fossils, its unique badland landscape and its significant riparian habitat. No particular protection exists for plants found within the park although collection is discouraged. The park has a variety of facilities as well as the field station of the Royal Tyrell Museum of Palaeontology. Over the next few years existing

campgrounds, picnic areas, hiking trails and visitor services will be upgraded (Romuld 1993).

B. Saskatchewan

The southern Saskatchewan areas surrounding Lake Diefenbaker are managed by the Saskatchewan Water Corporation as part of an irrigation block, South Saskatchewan River Project. By the end of 1985, about 33,000 hectares of farmland were under irrigation from Lake Diefenbaker. As of 1986, various areas surrounding the lake were listed as potential areas for future development for irrigation (Agriculture Canada/Saskatchewan Water Corporation, 1986). The Riverhurst areas (Site 3.1 and 3.2) are managed by the landowners as rangeland (Jahnke and Gerbrandt ranches). The areas on which rush pink occurs is marginal land which is unused by cattle due to the extreme conditions associated with badlands. The Matador Field Station (Site 3, 4) is managed as a research station by the University of Regina. The Lemsford Ferry site (Site 4) is held under grazing leasehold.

Most of the land around Diefenbaker Lake is agricultural. Since this is its best use, it has been designated to remain in that use. The wide variety of slopes, soils and foundation conditions limit the amount of potentially usable waterfront at Lake Diefenbaker. In 1962 the lands around the lake were designated as a Reservoir Development Area and regulations were established to assure proper use of the shoreline. Areas with favourable slopes and soil conditions have been designated for recreational development. Under the regulations administered by Saskatchewan Environment, development permits must be obtained before land use changes can take place. Development plans are reviewed by Saskatchewan Environment to assure environmental quality is maintained or enhanced. The regulations assure safe and orderly development and prevent damage from flooding, erosion or land slides. They also ensure that development which might interfere with the efficient operation of the reservoir is avoided (Agriculture Canada/Saskatchewan Water Board, 1986).

Only one location within Grasslands National Park, 70 Mile Butte, seems to have a concentration of rare species associated with it. Rush-pink has been collected at three locations near 70 Mile Butte. The West Block has been more intensively searched than the East Block. Management concerns regarding this area include the following: burning, grazing and foot traffic around areas with rare species. Limitation of these practices is advised for the area around 70 Mile Butte. It is unknown how these practices will affect other, more scattered, rare species locations. Further inventory of rare species is suggested. Also, concentrations of rare species populations should be monitored (Michalsky & Ellis 1994). The sites within Grasslands National Park (Site 2) are protected from collection and are managed by the National Parks system.

The Eastend (Site 1) and Empress (Site 5) sites are managed under grazing leaseholds.

9. Evidence of Threats to Survival

The Grasslands Natural Region is one of the most threatened natural regions in Alberta. Over two-thirds of the Mixed Grassland has been lost to cultivation or other development (Wallis 1987). Critical habitat is defined by Wallis (1987) as "most crucial to the survival of population, species, races or form. When these critical habitats are disturbed there will be major effects on the plants and animals that depend upon them." The government of Alberta has prioritized the threatened grassland region for representation and protection in the form of ecological reserves but overall representation of ecological reserves in this region of Alberta is very poor to date.

9.1 Tourism and Recreation

Some area around Lake Diefenbaker has been designated for potential recreational development. A long term strategy for both private and public sector involvement in that development is now in place and is resulting in improved facilities and greater utilization of the resource. Diefenbaker Lake is bordered by three provincial parks; namely, Douglas Park, Danielson Park, and Saskatchewan Landing Park. In addition, four regional parks have been developed on the lake by local municipalities (Agriculture Canada/Saskatchewan Water Board, 1986). Grasslands National Park site in southern Saskatchewan lies within the confines of a national park. The Dinosaur Provincial Park site in Alberta lies in a provincial park. Both have undergone recreational pressure. Effects of recreational use and tourism on the sites have yet to be assessed. Effects of future development of tourism facilities on rush pink populations within provincial and national parks is unknown but should be closely monitored, especially developments which may destroy specific sites within the parks.

9.2 Resource Extraction

The Chin Coulee (Site 5) and Manyberries Badlands (Site 4) sites are located within existing oilfield developments. Further development of roadways and oil wells should be situated away from populations of rush pink since the very local nature of the population lends it to easy eradication. All other sites should be monitored for future development of oil or gas fields on or near the rush pink sites. As well, any mining or other resource extraction which takes place in rush pink habitat should be monitored.

9.3 Construction of Dams, Water Diversions

Since rush pink is always associated with waterways any developments resulting in flooding or water diversion could eradicate or seriously impair the future survival of the species. One population at Pincher Creek (Oldman River) has been lost through construction of the Oldman Dam. Since rush pink exists sporadically at few sites within Canada, loss of any site is a direct threat to the survival of the species within Canada.

When the dams on the South Saskatchewan River, Saskatchewan were completed in 1967 considerable habitat was flooded along the original river site. Although no known sites were destroyed during the flooding of the lake, it will never be known if rush pink sites were actually lost but it is very possible.

9.4 Roadside Development

Rush pink exists at the roadside at the Brocket site (Site 6) in Alberta. Any site specific operation such as dumping, road widening, etc. would eradicate this very small population of rush pink.

9.5 Grazing

The large tracts of uncultivated grassland east of the mountains, mostly community pasture or crown land leased by ranchers, are grazed by domesticated livestock (Bird 1988). Some of the sites on which rush pink occurs are fenced for grazing or are under grazing lease including all or part of the following: Sage Creek, Eastend, and the South Saskatchewan River sites in Alberta and Saskatchewan. There is no indication that grazing adversely affects the growth and survival of rush pink. Overgrazing is indicated by the presence of *Artemisia frigida* and *Mamillaria vivipara*. *Opuntia polyacantha* Haw. Further data is required for a full understanding of the affects of the absence of grazing vs. grazing vs. overgrazing cycle on the growth and frequency of rush pink.

9.6 Conversion to Tame Pasture and Cropland

More than two-thirds of the Mixed Prairie Grassland region has been destroyed by cultivation. Some clearing continues but it is not as pervasive a problem as in the Parkland Region (Wallis 1987).

The proportion of farmland occupied by rangeland declined from 53% to 41% between 1956 and 1981 in Alberta (Mixed Prairie Census Districts). About one-third of the disappearing rangeland has been converted to seeded pasture in the Mixed Prairie Region of Alberta. The area of uncultivated grassland in Saskatchewan and Alberta is declining at a rapid rate. The surviving untilled area contains a smaller proportion of typical grassland and a large proportion of azonal types (saline flats, sloughs, sandhills, badlands) as time goes by, because the typical upland situations are being converted to cropland (Coupland 1987). Areas surrounding Lake Diefenbaker are slated for development for irrigation as part of the South Saskatchewan River Project. It is not known how this development might affect the rush pink sites (Agriculture Canada/Saskatchewan River Project, 1986).

10. Present Legal or Other Formal Status

No specific legal status is accorded *Stephanomeria runcinata* in any part of Canada. Alberta and Saskatchewan have no legislation which covers plants or endangered species.

In Canada, rush pink occurs naturally only in southern Alberta and southwestern Saskatchewan, mostly along the Frenchman and South Saskatchewan River (Map 1, 2). As a result of this limited distribution the species is considered rare from a national perspective. Argus and White (1978) and Packer and Bradley (1984) identified rush pink as rare in Alberta. Maher *et al.* (1979) identified rush pink as rare in Saskatchewan. Argus & White (1978) note that rush pink is endangered in North Dakota and rare in Colorado.

The Nature Conservancy rank is Global G5, Canada N2, Alberta S1, Saskatchewan S1. The United States rank is North Dakota SU, Nebraska S?. The Nature Conservancy assigns the species a Canadian Priority of 3.

All the lists of rare species for the prairie provinces are relatively long. The most recent Alberta list (Packer and Bradley 1984) contains 360 species, representing 24% of the native flora.

Kershaw (1987) acknowledges three major groups of distribution patterns of rare species in the prairie provinces. Over 80% of the "rare" species in the prairie provinces appear to belong to a group composed of species extending into the provinces from nearby (non-disjunct) widespread populations. Such populations add considerably to the species diversity of the provinces, probably accounting for more than 20% of the total floras. The Canadian populations of *Stephanomeria runcinata* probably fall into this category. A second group is composed of species extending into the province as small disjunct populations and is composed of less than 10% of the number of total rare species in the prairie provinces. A third group, composed of endemic species, is limited to a local area and is restricted geographically (Kershaw 1987).

Harms *et al.* (1992) consider this species as vulnerable in Saskatchewan.

II. Assessment of Status

11. General Assessment

The following criteria have been used to assess the status of *Stephanomeria runcinata* in Canada:

abundance (although rush pink has been found at several locations along various waterways in southern Alberta and Saskatchewan, it is never common (except at the Grasslands National Park site) and usually occurs in small numbers.)

distribution (restricted in Canada to southern Alberta (sporadic sites along the Oldman, South Saskatchewan, Red Deer Rivers, Chin Coulee, Manyberries Creek, and Sage Creek) and to southwestern Saskatchewan, mostly around Diefenbaker Lake and along the Frenchman River.)

habitat distribution (restricted in Canada, Alberta and Saskatchewan.)

habitat stability (fairly stable but loss of habitat to oil and gas developments, tourism, or other development is ongoing or threatened.)

population trend (only a few locations in Alberta and Saskatchewan, very common at only one site, sparse at other sites.)

reproductive potential (insufficient data to provide an analysis.)

international standing (ranked as G5 globally, stable.)

protective status (low, no formal designation, uncertainty about future landowners, management of grazing leases, and potential development on sites)

All preceding criteria are items of concern in assessing the status of this species. In Canada, *Stephanomeria runcinata* is known only from scattered sites. Continuity of populations may be affected by many factors including changes in land use, ongoing habitat destruction, and possible development in the remaining known and potential habitat placing the future survival of the species in question. The lack of formal protection for most sites with a viable management plan is a critical problem for the species' survival in Canada.

12. Status Recommendation

Rush pink (*Stephanomeria runcinata* Nutt.) is proposed for listing as a **vulnerable** species in Canada.

13. Recommended Critical Habitat

Primary critical habitat - West Block, Grasslands National Park, Saskatchewan.
Secondary critical habitat - Diefenbaker Lake, Riverhurst to Matador, Saskatchewan.
Tertiary critical habitat - Dinosaur Provincial Park, south of Red Deer River, Alberta.

Detailed information was provided to the chairman of the Plants Subcommittee for inclusion in the COSEWIC file for this species.

14. Conservation Recommendations

Detailed recovery and monitoring plans should be prepared for *Stephanomeria runcinata* in an attempt to reverse the trend towards loss of habitat. There must be a clear recognition of the value of mixed-grass prairie for rare plants and animals. Changes in land use and development should be considered as necessary in order to assure continuation of populations of rush pink in Canada. Conservation recommendations are dependent on rediscovery of populations. It would appear that the habitat of rush pink likely protects the species from grazing. Further studies should be undertaken to determine any possible effects of grazing.

An assessment of recreational and tourism impacts should be undertaken for all sites. Oil, gas and mining developments should be monitored and situated away from populations of rush pink. Any changes to the waterways should be closely examined and monitored as rush pink is dependant on the erosional effects of the rivers and streams along which it is found. As well, road development near sites should be monitored.

Landowners should be informed regarding the presence of the species on their property. Two landowners, Jahnke and Gerbrandt (Site 3.1, Riverhurst, Diefenbaker Lake), have expressed a willingness to the author to monitor the species if they are provided with plant descriptions and habitat information. Also, it is very likely that cooperation could be enlisted from students or staff at the Matador Research Station, Diefenbaker Lake (Site 3.4) (Smith 1994).

III. Information Sources

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16. Collections Consulted

The following botanical collections have been consulted:

University of Calgary (UAC), Calgary, AB
University of Lethbridge (LEA), Lethbridge, AB
University of Alberta (ALTA), Edmonton, AB
Provincial Museum of Alberta (PMAE), Edmonton, AB
University of Regina (USAS), Regina, SK
University of Saskatchewan (SASK), Saskatoon, SK
Canadian Museum of Nature (CAN) and Agriculture Canada (DAO), Ottawa, ON

17. Fieldwork

John H. Hudson conducted fieldwork in the areas along the South Saskatchewan River and Grasslands National Park (East Block) during the years 1964-1965 and 1991-1993 in Saskatchewan. The author revisited most known sites in 1994. Susan J. Michalsky and Robert A. Ellis of D.A. Westworth & Associates Ltd. of Calgary conducted an extensive vegetation survey of Grasslands National Park during the summer of 1993.

As well, the author visited most Alberta sites during the summer of 1994. Ian Macdonald and Clifford Wallis visited the Suffield National Wildlife Area site in the summers of 1994 and 1986, respectively. Margaret Romuld conducted fieldwork during the summer of 1990 in Dinosaur Provincial Park as did Beth Cornish during the summer of 1989. The sites at Chin Coulee and Brocket sites were originally discovered and described by the Provincial Museum of Alberta in 1986. The Sage Creek site was originally discovered and described by Clifford Wallis in 1979. Wayne Smith discovered and described the Manyberries Badlands site in 1993.

A considerable amount of fieldwork by a variety of botanists and ecologists has been conducted throughout the years leading to the discovery and description of rush pink sites within Alberta and Saskatchewan. In addition to those mentioned above, many other collectors have added information leading to a better understanding of the status of rush pink in Canada.

18. Knowledgeable Individuals

1. John H. Hudson, 103 Richmond Crescent, Saskatoon, SK, S7N 0W0
 - original discovery of most modern collection locations in Saskatchewan, especially those collections along the South Saskatchewan River. Has collected as recently as 1993 from one location in Saskatchewan. [a more recent collection was made at Snipe Lake, 1994, pers. comm., Vernon Harms, SK]
2. Magaret A. Romuld, Department of Geography, University of Calgary, Calgary, AB T2N 1N4.
 - conducted fieldwork on rush pink sites within Dinosaur Provincial Park in 1990. Author of M.Sc. thesis on the ecology of badland landscapes of Dinosaur Provincial Park (1993) as well as an article on rare plants found in that park (1991).
3. Beth Cornish, address unknown.
 - conducted fieldwork on rush pink sites within Dinosaur Provincial Park in 1989.
 - Discovered the majority of the known sites within that park (8 of the 12 sites) and described the sites and populations found at the sites.
4. Ian Macdonald, 105-19th St. N.W., Calgary, AB. Telephone: 283-3104.
 - conducted fieldwork within the Suffield National Wildlife Area during the summer of 1994 (for the Provincial Museum of Alberta and the Canadian Wildlife Service).
 - Described the rush pink site found along the South Saskatchewan River within this Wildlife Area.
5. Susan J. Michalsky and Robert A. Ellis, D.A. Westworth & Associates Ltd., 240-3015-12 St. NE, Calgary, AB Telephone: 250-2210.
 - conducted fieldwork within Grasslands National Park during the summer of 1993. Produced a vegetation survey for that park.
6. Wayne Smith, Alberta Fish and Wildlife, Lethbridge, AB.
 - conducted fieldwork within the Manyberries Badlands for a report on short-horned lizards written in 1993.
7. Clifford Wallis, Cottonwood Consultants Ltd., 615 Deercroft Way SE, Calgary, AB Telephone: 271-1408.
 - discovered and described the Sage Creek site. Very knowledgeable regarding rare

plant distribution within Alberta. Involved in the discovery of the Bocket, Chin Coulee and rediscovery of the Pincher Creek site (prior to the construction of the Oldman Dam which eradicated the site). Also, discovered the site within the Suffield National Wildlife Area in 1986.

[8. Diana Bizecki-Robson, Dept. of Crop Science and Plant Ecology, University of Saskatchewan, Saskatoon, SK.

- conducted field work during 1995 in the "Palliser Triangle" where rush pink was documented at Beechy, Saskatchewan Landing Park and Matador Field Research Station. pers. comm., Vernon Harms, SK]

IV. Authorship

19. Initial Authorship of Status Report

The initial author of this report was:

Bonnie Smith, 6808 Silver Ridge Way N.W., Calgary, AB T3B 4R4. Phone: (403) 288-4724.

20. Maintenance of Status Report

Bonnie Smith, 6808 Silver Ridge Way N.W., Calgary, AB T3B 4R4. Phone: (403) 288-4724, will be responsible for receiving new information and making revisions and corrections to this status report and passing information on to COSEWIC.

APPENDIX 1

Detailed Locality Citations

The known Alberta collections include:

Site 1 - Dinosaur Provincial Park

1. Dinosaur Provincial Park, below viewpoint, SE 1-21-12-W4; near site 7, southeast slope, dry prairie escarpment, 48 plants in population; July 11, 1990; Maggie Romuld; UAC 49473.
2. Dinosaur Provincial Park, SW 2-21-11-W4, Site 47; west slope, dry; August 2, 1990; Maggie Romuld; UAC 49474.
3. Dinosaur Provincial Park, Waterfall Coulee, Site 22, SW 32-20-11-W4; south slope, dry, 63 plants in population; August 22, 1990; Maggie Romuld; UAC 49472.
4. Dinosaur Provincial Park; NW1/4 Sec. 36 T20 R12 W4M, Sites SR-1, SR-2; along north slope of Little Sandhill Creek valley; 2 sites - one 18, second 50 plants; June 30, 1989; Beth Cornish, field survey.
5. Dinosaur Provincial Park; NE1/4 Sec. 36 T20 R12 W4M, Sites SR-3, SR-4; on north side of Little Sandhill Creek; 2 sites - one 115, second 29 plants; July 4, 1989; Beth Cornish, field survey.
6. Dinosaur Provincial Park; NE1/4 Sec. 31 T20 R11 W4M, Sites SR-5, SR-6, SR-7, near south end of bus road extension between Lp-11 and Lp-12; 3 sites - one 3, second 22, third 17 plants; July 17, 1989; Beth Cornish, field survey.
7. Dinosaur Provincial Park; NE1/4 Sec. 6 T21 R11 W4M, Site SR-8, along Badlands Trail, south of interpretive post #12; 1 site - 6 plants; July 19, 1989; Beth Cornish, field survey.
8. Dinosaur Provincial Park, south side of Red Deer River, east end of park; edge of large mesa, bare exposed shale slope; June 23, 1971; N. Kondla & H. Crawford, #49; UAC 29145.
9. Dinosaur Provincial Park; SW exposure, very bare habitat, in shale; August 6, 1971; N. Kondla; determined by J. Kuijt; UAC 29146.

Site 2 - Suffield National Wildlife Area

10. Suffield National Wildlife Area, 47 km north of Medicine Hat, 50°27'10"N 110°28'20"W, 5 km northwest of Murphy's Horn (bend in South Saskatchewan River); river breaks, very dry barren steep banks; with *Artemisia cana*, *Artemisia frigida*, *Agropyron trachycaulum* and *Orobanche leucophyllum*; 15 plants; July 7, 1994; I.D. Macdonald, Alberta Provincial Museum and Canadian Wildlife Service joint venture.

11. Bull Springs Coulee, SW6 T17 R4 W4; eroding gravel slopes, edge of coulee, river break; 1987 report; Cliff Wallis; from "The Proposed Middle Sand Hills Ecological Reserve: a Biophysical Overview" 1987. Cottonwood Consultants Ltd., Calgary for Alberta Recreation and Parks." (Site is 6 miles southeast of Macdonald's Suffield National Wildlife Area site listed above.)

Site 3 - Sage Creek

12. Sage Creek, facing east, 36-2-3-W4; eroding badland slope, elev. 3000 ft.; July 4, 1979; C. Wallis; ALTA 84608.

Site 4 - Manyberries Badlands

13. Manyberries Badlands, LSD 13, Sec 34 T4 R4; Sites L1, L2, L3; steep badland slopes; July - August, 1993; Wayne Smith; from report "An Assessment of Short-Horned Lizard Habitat and Use, Manyberries Badlands, Alberta".

Site 5 - Chin Coulee

14. Chin Coulee, NW 29-8-16-W4, 49°35'N 112°08'W; elev. 901 m, *Koeleria macrantha*/*Poa secunda* grassland and partially disturbed *Agropyron cristatum*, very loose soil, bare ground, stony and silty clay, at edge of Chin Coulee, almost level terrain with slight north and east aspect; July 6, 1986; Alberta Provincial Museum.

Site 6 - Oldman River - Brocket

15. North of Brocket, NW 13-7-29-W4, 49°34'N 113°49'W; south-facing eroding slope, along valley of Oldman River, general cover of *Rhus trilobata* but little vegetation where *Stephanomeria* plants are growing; 30 plants in population; July 15, 1986; Alberta Provincial Museum.

Historical Collection - Oldman River - Pincher Creek

16. Oldman River, north of Pincher; steep rocky slope, flowers pinkish, determined as *S. tenuifolia* (Torr.) Hall (= *Ptiloria ramosa* Rydb.) by Moss; sp. name revised to *S.*

runcinata Nutt. by J.G. Packer, 1977; August 2, 1939; Survey 253; ALTA 18971.

The known Saskatchewan collections include:

Site 1 - Eastend and Environs

1. Frenchman River, W of Eastend, 49o31'N 108o49'W; dry S-facing clay bank of Frenchman River, associated with *Mentzelia decapetala*; 07 08 1959; G.F. Ledingham (International Grasslands Tour), #2787; USAS 16026.

Site 2 - Grasslands National Park

West Block

2. 2 miles W of Bluff C, Potential Grasslands Park, 14 miles east and 3 miles S of Rosefield, 49o01'N 107o13'W; dry eroding slopes; 28 07 1989; E.R. Hooper, #11091; USAS 1697.
3. West block of Grasslands Park, 49o02'N 107o15'W, Sec 15 T01 R10 W3; shale outcrop - eroded slope; 13 07 1989; Jim Romo and Perry Grilz; SASK 89496.
4. 7 miles SE of Val Marie, 49o13'N 107o34'W, SW1/4 Sec 16 T03 R12 W3; eroding clay banks in badlands; 27 06 1985; G.F. Ledingham and Don Blood, #9129; USAS 1696.
5. 9 miles SE of Val Marie, along Frenchman, 49o10'N 107o36'W, Sec 31 T02 R12 W3; sterile marine deposits, lower slopes of hill; 28 06 1964; G.F. Ledingham and R. Taylor *et al.*, #3818; USAS 16029, DAO s.n.
6. SE Val Marie, ca 49o12'N 107o40'W; dry prairie; 27 06 1970; B. de Vries, #9478.70; USAS(FQH) 06039.
7. Frenchman River valley, SE Val Marie, Kornfeld Ranch, ca 49o12'N 107o40'W; dry open prairie; 19 06 1986; B. de Vries, #6031.86; USAS(FQH) s.n.
8. Grasslands National Park, east of Timmons Coulee; eroded shale outcrops, with *Artemisia cana*, *Koeleria cristata*, *Eriogonum pauciflorum*, *Rosa arkansana*, s-facing slope, outwash, semi-barren; July 13, 1994; B.M. Smith; UAC s.n.

East Block

9. Southview, E side Wetherall Creek valley, 49o02'N 906o44'W, LSD 15 in Sec 15 T01 R06 W3; powder shale bank, with *Thermopsis rhombifolia*, *Rosa* sp., only local but

frequent here; 21 07 1965; J.H. Hudson, #2242; SASK 29168, DAO s.n.

Historical Collection

10. Wood Mountain, N.W.T., 49°22'N 106°23'W; open prairie; 29 06 1874; G.M. Dawson, #10089 1/2; DAO 5407. (Actually from Morgan Creek Badlands, Eastern Block, Grasslands National Park.)

Site 3 - Diefenbaker Lake

Site 3.1

11. Riverhurst, 50°46'N 106°58'W, LSD 2 in Sec 12 T21 R08 W3; powder shale badlands of Bearpaw formations 50 ft. above lake level, with *Solidago missouriensis*, *Artemisia longifolia*, infrequent; 04 07 1992; J.H. Hudson, #5058; SASK 107642.

12. Riverhurst, 50°44'N 107°02'W, LSD 08 Sec 34 T20 R08 W3; powder shale slope of Bearpaw formation, 100-125 ft. above lake, with *Artemisia longifolia*, *Rosa* sp., ligules purplish pink, latex white, locally frequent; 12 07 1993; J.H. Hudson, #5121; SASK 124731.

Site 3.2

13. 12 miles SE of Beechy, banks of South Saskatchewan River, 50°47'N 107°12'W; sterile clay layers well down on eroding banks of river; 07 06 1964; G.F. Ledingham and J.H. Hudson *et al.*, #3702; USAS 16025, DAO s.n.

14. Beechy, 50°46'N 107°14'W, NW1/4 Sec 8 T21 R09 W3; bare soft loose powder shale slope, Bearpaw outcrop, with *Iva axillaris*, *Rosa arkansana*, occasional colonies; 07 06 1964; G.F. Ledingham and J.H. Hudson, #2202; SASK 9664.

15. Beechy, 50°46'N 107°15'W, SE1/4 Sec 7 T21 R09 W3; Bearpaw shale badlands of South Saskatchewan River breaks, rigidly confined to non-bentonitic powder shale, with *Artemisia longifolia*, occasional colonies; 16 08 1964; J.H. Hudson, #2211; SASK 24855, DAO s.n.

Site 3.3

16. Beechy, 50°40'N 107°31'W, NW1/4 Sec 6 T20 R11 W3; Steep loose S-facing slope of dune-weathering flaky shale-"powder shale"-of Bearpaw formation, rigidly confined to powder shale, with *Rosa arkansana*, rare; 06 06 1964; J.H. Hudson, #2198; DAO s.n.

Site 3.4

17. Matador Field Station, 35 km SE of Kyle, around old Indian "Lookout Point", 50°42'N 107°45'W, Sec 9-11, 14-16 (SW sub 1-4 of SW 1-4 Sec 11) T20 R13 W3; upper slope and crest of coulee bank; 15 07 1969; N.A Skoglund, #165; SASK 41924, USAS 16027, USAS(FQH) 07924, DA0 608274, CAN 344698.

Site 4 - South Saskatchewan River - Lemsford Ferry

18. Lemsford Ferry, 51°01'N 109°07'W, LSD 5 in Sec 2 T24 R23 W3; on steep bare slope of proglacial silts, with *Iva axillaris*, *Artemisia dracunculus*, a few plants; 15 08 1991; J.H. Hudson, #5026; SASK 97202.

Site 5 - South Saskatchewan River - Empress

19. Empress, 50°51'N 109°58'W, W part LSD 12 in Sec 9 T22 R29 W3; steep silty S-facing slope of weathered Oldman formation 100 ft. above river, with *Salsola kali*, *Distichlis stricta*, *Gutierrezia*, infrequent; 19 08 1983; J.H. Hudson, #4416; SASK 78821, USAS 16028.

ADDENDUM

Two additional, recent collections of rush pink are now known from Saskatchewan. The records have been provided by Dr. Vernon Harms, The W. P. Fraser Herbarium, University of Saskatchewan, Saskatoon, SK [E. Haber, Chairman, Subcommittee for Vascular Plants, Mosses and Lichens, November, 1996].

Site 6. "Snipe Lake" (actually S and W of Lancer Ferry); 51°00'30" N, LSD 13, Sec 33, T 23, R 21, W3. Gravelly and cobbly till slope, shoulder of butte in South Saskatchewan River breaks. Locally common. 23 06 1994. John H. Hudson # 5145 (SASK # 132474) This site is about 14 km east of the Lemsford Ferry Site.

Site 7. Saskatchewan Landing Provincial Park, on S side of Lake Diefenbaker (=South Saskatchewan River); Sec 28, T 19, R 15, W 3; 50°38'09" N, 108°00'18.7" (precise GPS reading). Eroded S-facing bluff slopes, along & above old trail. About 600 plants in overall local population. Collector & Recorder: Diana Bizecki 33-#10, Aug. 3, 1995 (collection and data still to be processed at SASK).

APPENDIX 2

Habitat Site Descriptions

Alberta and Saskatchewan are located in the Western Grassland vegetation region in Canada. The southern Alberta and Saskatchewan populations occur in the mixed grassland natural region populated by relatively drought resistant grasses such as blue grama and spear grass (Bird 1988). Plants are perennials on prairies being composed mostly of grasses associated with sedges, forbs, and a few dwarf shrubs. Before European settlement, this vegetation occupied valleys of southern interior British Columbia and much of southern Manitoba, Saskatchewan and Alberta. The nature of grassland vegetation depends on climate and soil.

Rush pink requires very steep, mostly badland locations areas, with exposures of shales and clays. Vegetation of badlands occupies habitats of variable relief with a substrate that is frequently poor in nutrients and which contains water soluble salts. Growth under such harsh ecological conditions is possible mainly for perennial xerophytes with deeply bedded and rapidly growing roots and plants that are adapted to exposure of the upper part of their root systems. Sagebrush, greasewood and several species of salt sage are the most frequent and hardy species (Romuld 1993).

Vegetation is described in detail for the Dinosaur Provincial Park and Grasslands National Park sites (Site 1, Alberta and Site 2, Saskatchewan, Map 2). These descriptions should be taken as representative of the vegetation associations in which rush pink occurs.

Alberta

Site 1 - Dinosaur Provincial Park

There are over 220 species of flowering plants found within the park. Habitats range from dry, hot and exposed to moist, cool and sheltered sites (Digby & Digby 1987, Romuld 1993). Rush pink habitats within the park ranged from dry prairie escarpment at edge of large mesa to bare exposed shale slope on west, south and north-facing slopes. Romuld (1990) collected the species from three sites within the park on dry southern and western slopes and escarpments. (Sites 1.1 - 1.3) Cornish (1989) collected rush pink from 8 locations within the park (Sites 1.4 - 1.11). See Appendix: Field Survey Forms and corresponding maps for detailed notes on the field locations. The most easterly site within the park was collected from an exposed shale slope. (Site 1.12) All sites Map 2, 3.

The Cornish sites are summarized as follows:

Site 1.4 : dry, sandy wash, moderate south-facing slope. Associated species (in order

of frequency): *Bouteloua gracilis*, *Agropyron sp.*, *Oryzopsis hymenoides*, *Stipa comata*, *Artemisia cana*, *Comandra umbellata*, *Hymenoxys richardsonii*.

Site 1.5 : dry, sandy, eroded, south-facing, steep slope. With *Iva axillaris* (most common) and *Eriogonum flavum*.

Site 1.6 : dry, sandy, eroding moderate slope. Associated species (in order of frequency): *Stipa comata*, *Calamovilfa longifolia*, *Artemisia frigida*, *Penstemon nitidus*, *Erigeron caespitosus*.

Site 1.7 : dry sand slump, steep south-facing slope. Associated species (in order of frequency): *Stipa comata*, *Oryzopsis hymenoides*, *Iva axillaris*.

Site 1.8 : dry sandy wash, moderate southwest-facing slope. Associated species (in order of frequency): *Stipa comata*, *Bouteloua gracilis*, *Agropyron sp.*, *Artemisia cana*, *Comandra umbellata*, *Thermopsis rhombifolia*.

Site 1.9 : gravelly shale, moderate to steep, southwest-facing slope. Associated species (in order of frequency): *Agropyron sp.*, *Muhlenbergia cuspidata*, *Thermopsis rhombifolia*, *Artemisia frigida*.

Site 1.10 : dry, shaley gravel, flat to slight south-facing slope. Associated species (in order of frequency): *Agropyron sp.*, *Muhlenbergia cuspidata*, *Bouteloua gracilis*, *Erigeron caespitosus*, *Hymenoxys richardsonii*.

Site 1.11 : dry, eroding sands, moderate north-northeast-facing slope. Associated species (in order of frequency): *Atriplex nuttallii*, *Artemisia cana*, *Artemisia frigida*, *Penstemon nitidus*.

Romuld (1993) found rush pink in the badlands ecosection of Dinosaur Provincial Park in the *Artemisia* - *Rosa* association. This association is very similar to the *Artemisia* - *Stipa* association although there is a greater variety and total number of species found in these sites. There are no tree, tall shrub or moss layers. Bare ground covers an average of 50% of the ground surface. The low shrub layer is dominated by sagebrush and common wild rose. Buckbrush and greasewood regularly occur. There is a great variety of occasional species between plots. Regularly occurring grasses include green needle grass, spear grass, plains muhly and wheatgrass. Regularly occurring forbs include sunflower, prickly pear cactus, pasture sage, long leaved sage, prairie sagewort, tufted white prairie aster, scarlet butterfly weed, smooth bluebeard tongue, white prairie clover, purple prairie clover, broomweed, scarlet mallow and moss phlox. Frequently occurring species include yellow umbrella plant, Colorado rubber plant, wavy leaved thistle, goats-beard and collomia.

Site 2 - Suffield National Wildlife Area

Rush pink is found in river breaks on very dry barren steep eroding slopes and edges of coulees with *Artemisia cana*, *Artemisia frigida*, *Agropyron trachycaulum* and *Orobancha leucophyllum*. *Mentzelia decapetala*, *Ratibida columnifera* and *Artemisia campestris* were found nearby. Plants were found on open brown clay soils. Several other rare species were also found in this area during this study. The Wildlife Area (Map 2, Figures 2, 3) is located in a 4-6 mile wide buffer zone between the military training grounds to the east and farmland to the west (Macdonald 1994).

Site 3 - Sage Creek

Rush pink is found on eroding badland slopes, elev. 3000 ft., at this site (Map 2). Smith (1994) noted that the habitat in this area was similar to that found in the west block of Grasslands National Park. Suitable areas of eroded cobbly shale was noted. Species found growing on these areas included the following: *Eurotia lanata*, *Sarcobatus vermiculatus*, *Gutierrezia sarothrae*, *Heterotheca villosa*, *Opuntia polyacantha*, *Oxytropis sericea*, and *Artemisia cana* (1-6" height).

Site 4 - Manyberries Badlands

Wayne Smith (1993) reports on the status of rush pink at this site (Map 2). He state that the species occupy a variety of open badland and juniper pediment habitats but are most abundant in the latter.

The steep badland slopes habitat extends from the valley edge to the mid-slope areas. The vegetation is sparse and bare ground predominates. Smith described three habitat divisions within this habitat type. The first is dominated by rush pink and *Atriplex suckleyi*. The other two habitat divisions is characterized by *Artemisia longifolia* and *Chrysothamnus nauseosus* communities. The first of these two communities has 90% bare ground with scattered *Artemisia cana*, *Artemisia longifolia*, *Chrysothamnus nauseosus*, *Thermopsis rhombifolia*, *Hymenoxys richardsonii*, *Gutierrezia sarothrae*, *Gaura coccinea*, *Koeleria macrantha*, and some *Eriogonum flavum*. The second of these two communities has 75-80% bare ground and grades into slightly more vegetated areas. Species present are *Artemisia longifolia*, some *Rosa* sp., *Chrysothamnus nauseosus*, *Thermopsis rhombifolia*, *Gaura coccinea*, *Eriogonum flavum*, *Calamagrostis montanensis* (locally important) and *Koeleria macrantha*.

The juniper pediment habitat is dominated by *Juniperus horizontalis* and *Koeleria macrantha*. This habitat occurs from the bottom of the badland slopes to the edges of the sagebrush flats or grasslands along the valley bottoms. The juniper makes up 80% of the plant cover present. *Calamagrostis montanensis* also occurs.

Site 5 - Chin Coulee

The site (Map 2) is situated at an elevation of 901 m in a *Koeleria macrantha*/*Poa secunda* grassland with partially disturbed *Agropyron cristatum* on very loose soil, mostly bare ground, on stony and silty clay, at edge of Chin Coulee on almost level terrain with slight north and east aspect (Wallis 1986 field information).

Site 6 - Oldman River - Brocket

This site (Map 2) is situated on a south-facing eroding slope, along valley of Oldman River with a general cover of *Rhus trilobata* but little vegetation where *Stephanomeria* plants are growing (Wallis 1986 field information).

Historical Collection - Oldman River - Pincher Creek - Extirpated

Originally found by Moss on a steep rocky slope. Relocated in 1986 on a south-facing highly erodible bank with very little other vegetation. Eradicated by the construction of the Three Rivers Dam on the Oldman River in the early 1990's (Wallis 1986, field information).

Saskatchewan

Site 1 - Eastend and Environs

Rush pink prefers dry, south-facing clay bank of Frenchman River (Map 2) associated with *Mentzelia decapetala* (Ledingham 1959, label data). Smith (1994) noted abundant suitable habitat consisting of areas of black shale and cobbly slopes in the Frontier to Eastend area. There is also appropriate habitat around the Eastend area and in the Ravenscrag to Eastend area.

Site 2 - Grassland National Park

Description is based on Michalsky & Ellis (1994). See Map 2, 4 and Figures 7-11.

There are 7 plant communities recognized as occurring within the park; namely, disturbed, treed, shrub, eroded, slopes (grassland), upland and valley. Rush pink occurs in the Eroded Communities vegetation unit within the park and covers 5418.1 ha of the study area (totalling 42,288 ha; 26,754 in the West Block and 15,534 in the East Block) and accounts for 12.7% of the mapped land base.

The eroded land range type occurs primarily in strongly dissected sites where erosion has prevented soil development or where surficial deposits have been eroded leaving exposed bedrock. Total vascular plant cover averaged 25% and lichen, litter and bare ground

averaged 75%. Bare ground constituted a significant portion of this value, averaging 66% cover.

Graminoid cover averaged 5% with sand grass (*Calamovilfa longifolia*) and various wheatgrass species as the most common species. Forb cover averaged 10% and common species included branched eriogonum (*Eriogonum pauciflorum*), buffalo bean (*Thermopsis rhombifolia*), bastard toadflax (*Comandra umbellata*), poverty - weed (*Iva axillaris*) and low goldenrod (*Solidago missouriensis*). Shrub cover also averaged 10% and common species included rabbit brush (*Chrysothamnus nauseosus*), low prairie rose (*Rosa arkansana*) and creeping juniper (*Juniperus horizontalis*).

It is differentiated from the other vegetation units by being undisturbed, having a high percentage of bare ground primarily from wind and water erosion, and having slopes normally greater than 5%. Rush pink is found in the following three eroded community types: rose/winter fat, juniper/golden bean, and moss phlox/rubberweed. 41, 86 and 104 species, respectively, were found in the preceding eroded plant communities. The eroded communities support a great diversity of species that are sparsely distributed. The moss phlox/rubberweed community is one of the most diverse within the park.

Community 1: Rose / Winter Fat Vegetation Type
(*Rosa* sp. / *Eurotia lanata*)

The rose/winter fat community is found only in the West Block of the Park. It is common on sites that are very rapidly drained and have ecological moisture regimes that are very xeric. The average slope for these sites is 30% but slopes range between 25 and 40%. This community may be somewhat aspect controlled as the primary aspects are north and west. The surface soil material is often shale and percent bare ground is extremely high, most commonly 90%.

Hoary sagebrush is occasionally present, however rose, including prickly rose and low prairie rose are most common. Creeping juniper is also very common in this plant community. Grasses are not abundant in this type. Common forb species include winter fat, branched eriogonum, golden - bean and prickly pear cactus. Lichen (mainly *Xanthoparmelia* sp.) is common in this community as in all communities with substantial bare ground. Table 1 lists the common species present in this community.

Table 2. Species commonly present in the Rose / Winter Fat Community.

Scientific Name	Common Name
<i>Juniperus horizontalis</i>	creeping juniper
<i>Eurotia lanata</i>	winter fat

<i>Eriogonum pauciflorum</i>	branched eriogonum
<i>Rosa</i> sp.	rose
<i>Thermopsis rhombifolia</i>	golden bean
<i>Opuntia polycantha</i>	prickly pear cactus
Lichen (mainly <i>Xanthoparmelia</i> sp.)	lichen
<i>Comandra umbellata</i>	bastard toadflax
<i>Agropyron trachycaulum</i>	slender wheatgrass
<i>Artemesia cana</i>	hoary sagebrush
<i>Poa sandbergii</i>	Sandberg's blue grass
<i>Koeleria cristata</i>	June grass
<i>Solidago missouriensis</i>	low goldenrod

Community 2: Juniper - Golden Bean Vegetation Type
(*Juniperus* sp. - *Thermopsis rhombifolia*)

The juniper/golden bean community is very common in the Eroded Communities vegetation unit. It is found primarily at the base of eroded slopes on shaley or stoney soil. The site is typically rapidly drained with sites on flatter slopes ranging to moderately drained and sites on steeper slopes ranging to very rapidly drained. The ecological moisture regime is normally xeric to subxeric but ranges from very xeric on steeper slopes and to submesic on flatter slopes. Slopes average 15% but range between 2 and 60%. There is no apparent aspect control for this community. Bare ground is very high. It averages about 50%, but ranges from 10 to 80%.

Creeping juniper is commonly the dominant species in this community. It is sometimes replaced by common juniper in the East Block or in eastern portions of the West Block. Rose also accounts for a significant portion of the vegetative cover on these sites. Grass cover is relatively sparse but common species include june grass, western wheatgrass and sand grass. Common forbs include golden bean, low prairie goldenrod, and bastard toadflax. Terricolous lichens (primarily *Xanthoparmelia* sp.) are also common on this site. Table 2 lists the common species present in this community.

Table 3. Species commonly present in the Juniper - Golden Bean Community.

Scientific Name	Common Name
<i>Juniperus</i> sp. (mainly <i>horizontalis</i>)	juniper
Lichen (mainly <i>Xanthoparmelia</i> sp.)	lichen
<i>Rosa</i> sp.	rose
<i>Thermopsis rhombifolia</i>	golden bean
<i>Koeleria cristata</i>	June grass

Agropyron smithii
Solidago missouriensis
Comandra umbellata
Calamovilfa longifolia
Poa sandbergii
Chrysothamnus nauseosus
Aster laevis
Gutierrezia sarothrae

western wheatgrass
 low prairie goldenrod
 bastard toadflax
 sand grass
 Sandberg's blue grass
 rabbit brush
 smooth aster
 common broomweed

Community 3: Moss Phlox - Rubberweed Vegetation Type
 (*Phlox hoodii* - *Hymenoxys richardsonii*)

The moss phlox/rubberweed community is common in the Eroded Communities vegetation unit. It occurs on the crests of eroded hills on very rapidly to rapidly drained sites. Slopes average about 24% but range from 0% at the top of crests to 50% below the crest. The ecological moisture regime ranges from very xeric to xeric. Bare ground averages about 55% and soils are represented primarily by undeveloped shales.

Hoary sagebrush and creeping juniper are occasional shrub species present in this community. Grasses are sparse but regularly occurring species include June grass and blue grama - grass. Common forb species include moss phlox, common broomweed, Colorado rubberweed, pasture sage and bastard toadflax. Lichens (primarily *Xanthoparmelia* sp.) are also common in this community. Table 3 lists the common species present in this community.

Table 4. Species commonly present in the Moss Phlox - Rubberweed Community.

Scientific Name	Common Name
Lichen (mainly <i>Xanthoparmelia</i> sp.)	lichen
<i>Koeleria cristata</i>	June grass
<i>Phlox hoodii</i>	moss phlox
<i>Artemesia cana</i>	hoary sagebrush
<i>Bouteloua gracilis</i>	blue grama-grass
<i>Gutierrezia sarothrae</i>	common broomweed
<i>Hymenoxys richardsonii</i>	Colorado rubberweed
<i>Artemesia frigida</i>	pasture sage
<i>Comandra umbellata</i>	bastard toadflax
<i>Chrysothamnus nauseosus</i>	rabbit brush
<i>Stipa comata</i>	speargrass
<i>Opuntia polyacantha</i>	prickly pear cactus

Eriogonum flavum
Muhlenbergia cuspidata
Agropyron smithii
Happlopappus nuttallii

yellow eriogonum
prairie muhly
western wheatgrass
toothed ironplant

The author collected field data on the West Block Timmons Coulee site (Map 4) and described it as follows: Eroded grey shale outcrops, with *Artemisia cana*, *Koeleria cristata*, *Eriogonum pauciflorum*, *Rosa arkansana*, s-facing slope, slopes above outwash, semi-barren (50-60% barren), very cobbly in places. Rush pink was fairly common at this site. No specimens were found on north-facing slopes of the coulee (Smith 1994). This site best fits under the Rose/Winter Fat Vegetation Type described by Michalsky and Ellis (1994). Rush-pink occurs most frequently in this vegetation type. Sites across the road (west) in the Laovenan Coulee (Map 4) are similar.

West Block habitat: dry, eroding slopes, shale outcrops, eroding clay bank in badlands, sterile marine deposits, lower slopes of hill, dry open prairie

East Block habitat: powder shale bank with *Thermopsis rhombifolia*, *Rosa* sp. The Morgan Creek Badlands (Smith 1994) is likely good rush pink habitat.

Historical Collection - Wood Mountain

Rush pink was found by Dawson in 1874 on open prairie (label data). Hudson (1965) says this site location refers more correctly to the Morgan Creek Badlands (now in the east block of Grasslands National Park). Hudson states, in this article, that he and G. Ledingham saw rush pink in this area. Hudson notes that on May 29, 1955 while he and Ledingham were visiting the Morgan Creek Badland he noticed odd-looking basal rosettes with milky juice but at the time dismissed them as young Blue Lettuce (*Lygodesmia*). He states that he is sure that they were actually rush pink.

Site 3 - Diefenbaker Lake

The most common grasses associated with the mixed grassland surrounding Diefenbaker Lake are June grass, spear grass, northern wheat grass, sand reed grass and blue grama grass. Common herbs are prairie sage and lesser club moss (prairie selaginella). Wildflowers to be found in the grasslands include field chickweed, small-flowered prairie rocket, early yellow locoweed, golden bean, silver-leaved psoralea, prairie cinquefoil, purple milk-vetch, narrow-leaved vetch, hairy golden aster, long-headed coneflower and white prairie aster. Three different kinds of cacti may be found in this area; namely, the prickly pear, brittle prickly pear, and the ball cacti. The grassland is also characterized by clumps and patches of shrubs including western snowberry, Wood's rose, wolf-willow, and thorny buffaloberry (Saskatchewan Parks, Recreation and Culture, n.d.).

Rush pink is usually found on the steep banks above Diefenbaker Lake (Figure 5) or on steep river breaks of the South Saskatchewan River. Areas are usually semi-barren, exposed outcrops of the Bearpaw Formation on powder-shale badlands or proglacial silts. Other areas around Diefenbaker Lake were examined by the author for rush pink but in most cases the habitat was not suitable. The low, rolling hills at these other locations did not have exposures of the Bearpaw Formation visible.

Site 3.1: Riverhurst area

At the eastern location (Map 2, Figure 6) rush pink was found on powder shale badlands of Bearpaw formations 50 ft. above lake level, with *Solidago missouriensis*, *Artemisia longifolia* (Hudson 1992, label data). This site is located on Mr. Jahnke's property.

At the western location (Map 2) rush pink was found on powder shale slope of Bearpaw formation, 100-125 ft. above lake, with *Artemisia longifolia*, *Rosa* sp. (Hudson 1993, label data). This site is located on Mr. Gerbrandt's property.

Site 3.2: Beechy area

At one location (Map 2) rush pink was found on sterile clay layers well down on eroding banks of river. At another nearby location on bare soft loose powder shale slope, Bearpaw outcrop, with *Iva axillaris*, *Rosa arkansana*. During a third collection rush pink was found on Bearpaw shale badlands of South Saskatchewan River breaks, rigidly confined to non-bentonitic powder shale, with *Artemisia longifolia*. All specimens were collected in 1964 by Hudson.

Site 3.3: Beechy to Matador

At this site (Map 2), rush pink was found growing on steep loose S-facing slope of dune-weathering flaky shale-"powder shale"-of Bearpaw formation, rigidly confined to powder shale, with *Rosa arkansana* (Hudson 1964).

Site 3.4: Matador Field Station

At this site (Map 2), rush pink was found on upper slopes and crests of coulee banks (Skoglund 1969).

Associated species on steep up to 50%+ barren slopes: *Hymenopappus filifolius*, *Eriogonum flavum*, *Artemisia frigida*, *Artemisia cana*, *Astragalus gilviflorus*, *Koeleria macrantha*, *Haplopappus spinulosus*, *Opuntia polyacantha*, *Phlox hoodii*, *Psoralea esculenta*, *Psoralea argophylla*. *Artemisia cana* grows only to a height of six inches and is scattered on the steep slopes. Snowberries and roses grow in grassier areas. Cottonwoods dominant in the coulee bottoms (Smith 1994).

Site 4 - South Saskatchewan River - Lemsford Ferry

Rush pink occurs on steep bare slope of proglacial silts, with *Iva axillaris*, *Artemisia dracunculus* (Hudson 1991, label data).

Smith (1994) found the site as described by Hudson (1991 label data) with steep slopes and abundant *Iva axillaris*. Site is fenced for grazing but is probably far too steep for cattle. Lower slopes is probably the preferred location for rush pink. Site is very similar to the Suffield National Wildlife Area, Site 2, Alberta. On Map 2, compare Figure 4 to Figure 2, habitat at the Suffield site.

Site 5 - South Saskatchewan River - Empress

At this site (Map 2), rush pink was found growing on steep silty S-facing slope of weathered Oldman formation 100 ft. above river, with *Salsola kali*, *Distichlis stricta*, *Gutierrezia* (Hudson 1983, label data).

APPENDIX 3

Recommended Critical Habitat

In Saskatchewan the most substantial populations exist within the West Block of Grasslands National Park. This location has the protection of the National Park system. It is recommended as primary critical habitat (Map 4, 5). The area along the shores of Diefenbaker Lake (Riverhurst to Matador) is recommended as secondary critical habitat (Map 6). There is significant areas of fairly isolated habitat available to the species within this area.

Although there are actually no sites in Alberta with sufficient population base to recommend them as critical habitat, populations at sites within Dinosaur Provincial Park (Map 3, 7), south of the Red Deer River, are recommended for protection as tertiary critical habitat. Although low at specific sites, populations are sufficiently widespread to ensure the species a good chance of survival at this site. Wayne Smith (1993) states that the Manyberries Badlands site (Map 2) contains significant populations. The site, itself, is fairly small and is located within an active oilfield. If, upon further examination, this site is determined to be viable for the long term this area should also be recognized as containing critical habitat. The species occurs only sporadically at Suffield, Chin Coulee, Sage Creek and along the Oldman River within Alberta.

[With the finding of a site in 1995 at Saskatchewan Landing Provincial Park, the area of critical habitat along Diefenbaker Lake should extend from Riverhurst to Saskatchewan Landing. E. Haber, November, 1996]

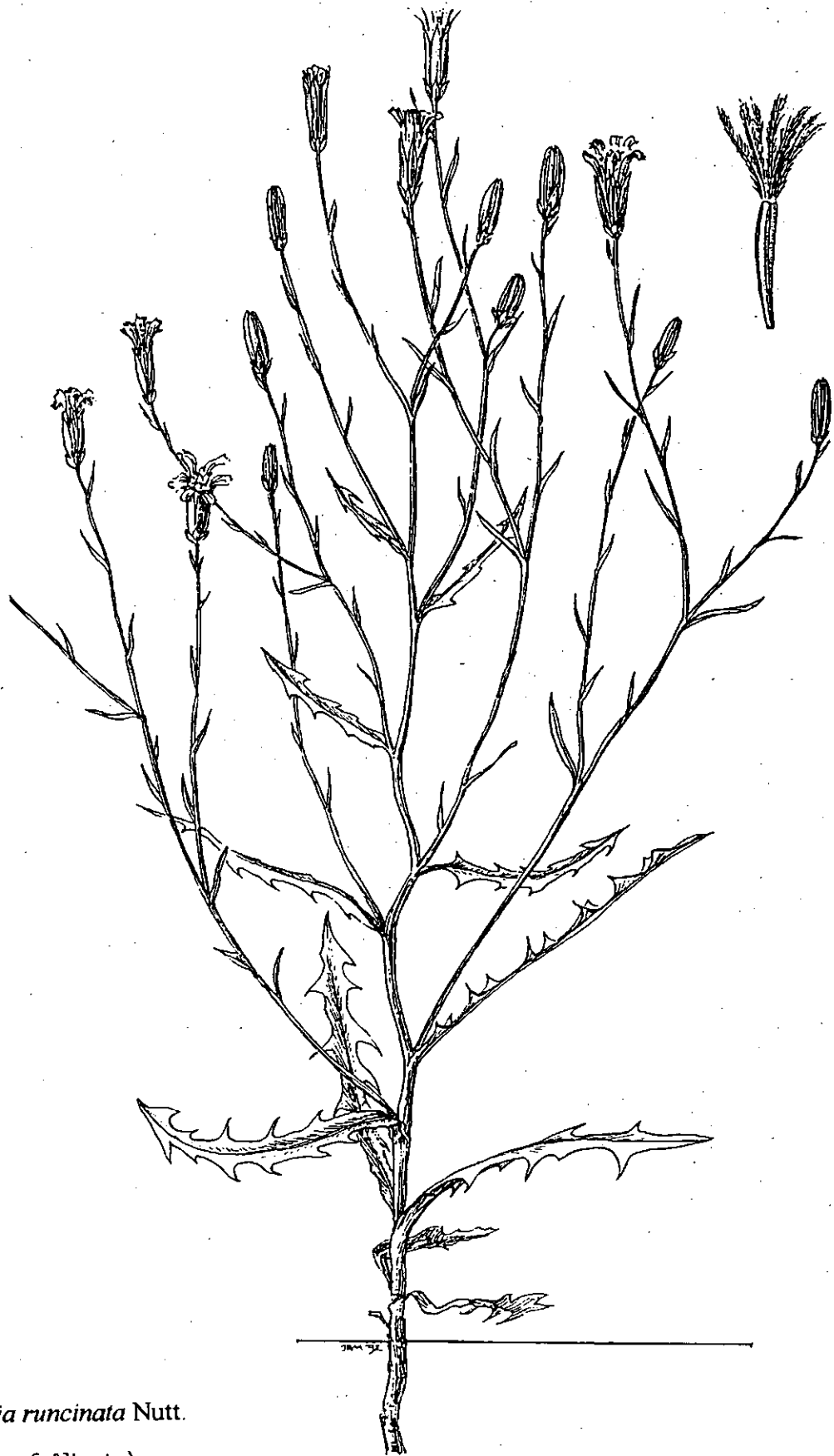


Figure 1: *Stephanomeria runcinata* Nutt.
(from Provincial Museum of Alberta)

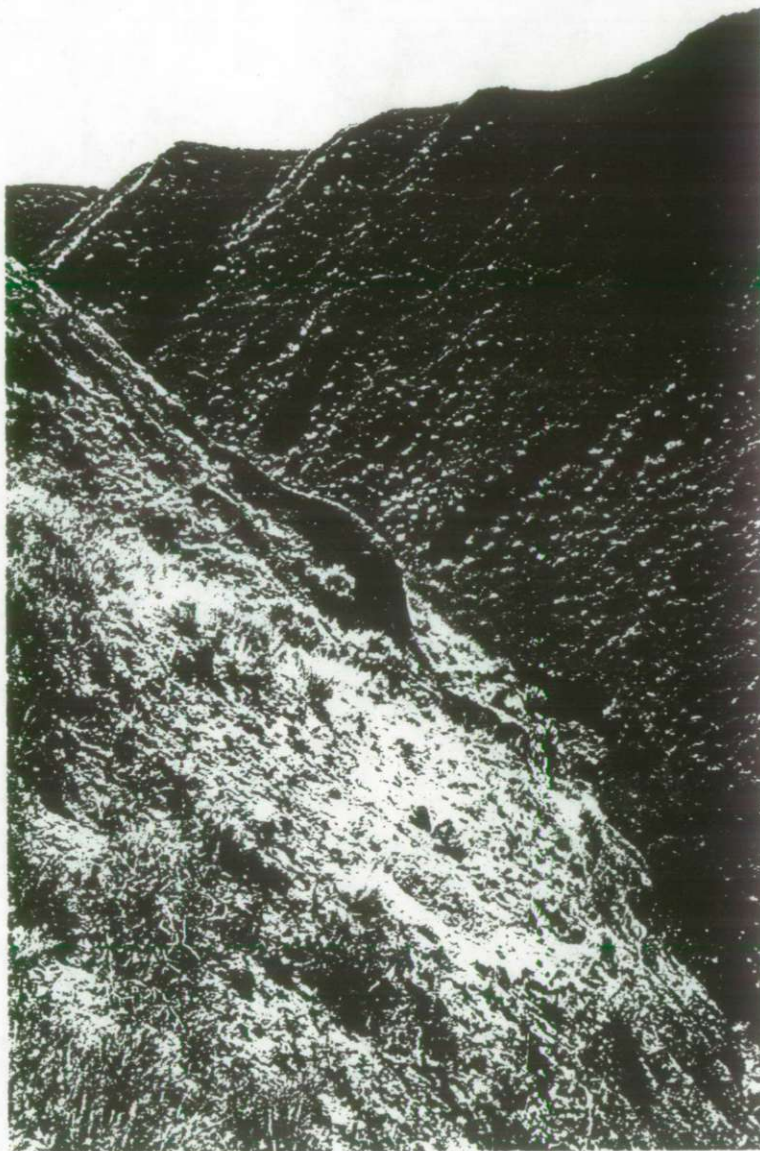


Figure 2: Steep slopes, river breaks. Semi-barren *Stephanomeria runcinata* Nutt. habitat. Site 2. Suffield National Wildlife Area, Alberta

(photo credit: Ian D. Macdonald,
Alberta Provincial Museum and Canadian Wildlife Service)

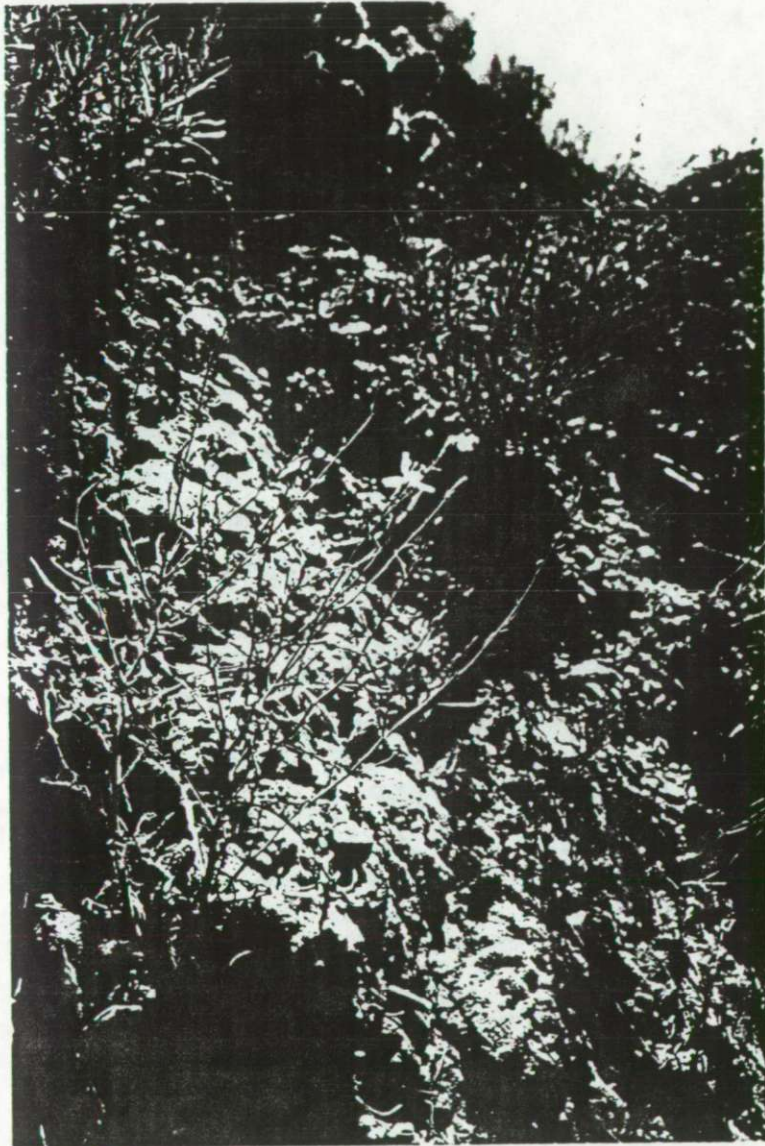


Figure 3. *Stephanomeria runcinata* Nutt. growing on steep semi-barren slopes.
Site 2. Suffield National Wildlife Area, Alberta.

(photo credit: Ian D. Macdonald,
Alberta Provincial Museum and Canadian Wildlife Service)



Figure 4 *Stephanomeria runcinata* Nutt. habitat. Steep, semi-barren slopes near South Saskatchewan River. Site 4. Lemsford Ferry, Saskatchewan.

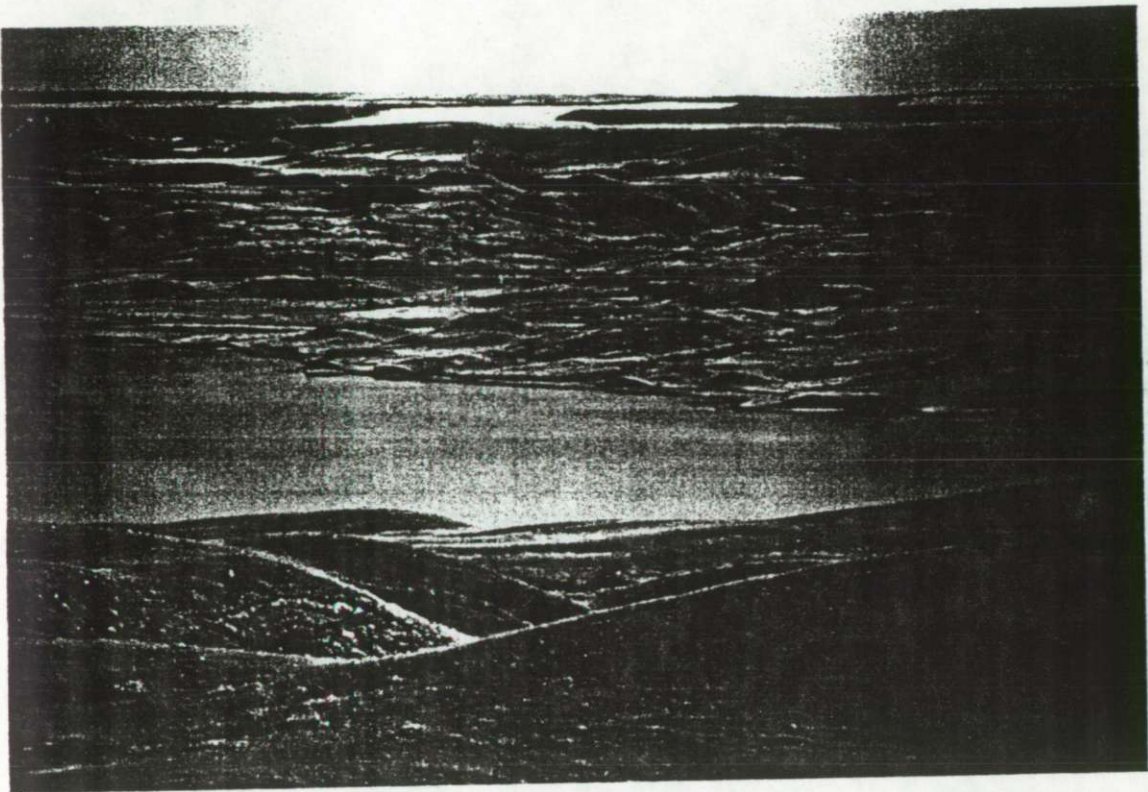


Figure 5: Low hills along Diefenbaker Lake. Near Prairie Bluff Regional Park, Saskatchewan.

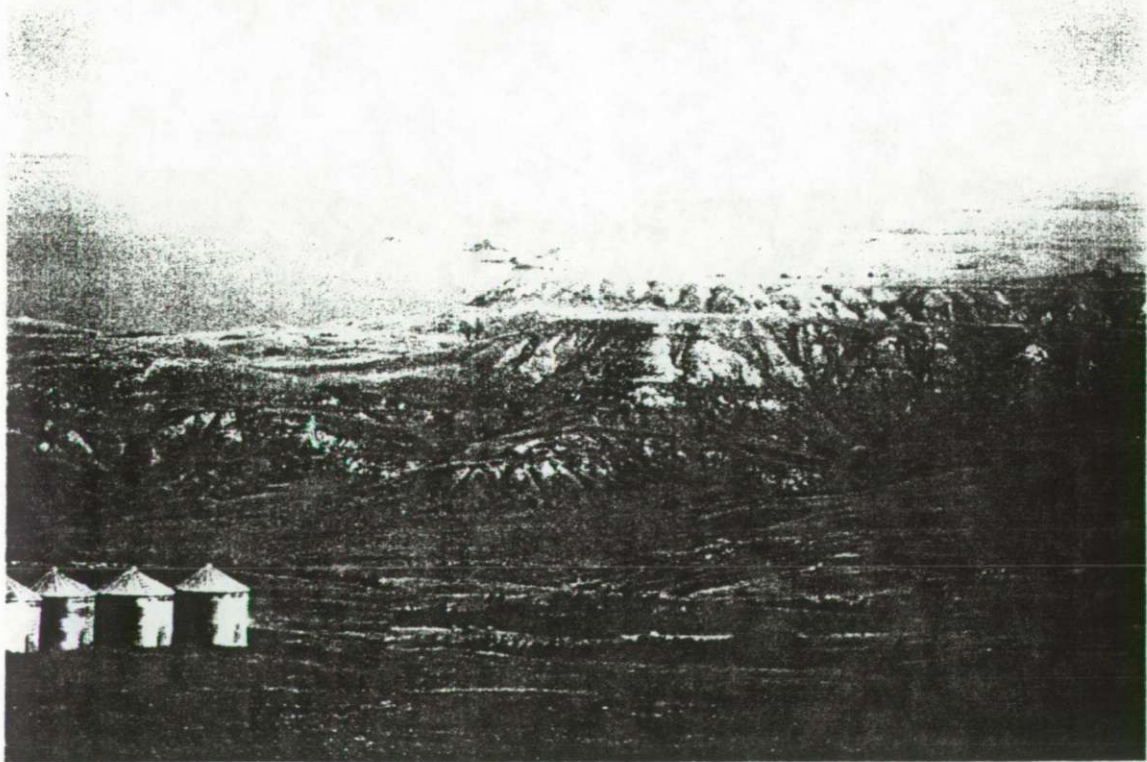


Figure 6: *Stephanomeria runcinata* Nutt. habitat. Site 3.1. Jahnke Ranch, southwest of Riverhurst, Diefenbaker Lake, Saskatchewan.



Figure 7: Eroded shale *Stephanomeria runcinata* Nutt. habitat. Site 2.
Timmons Coulee, West Block, Grasslands National Park, Saskatchewan.



Figure 8: Rocky, semi-barren, eroded shale habitat. Site 2. Timmons Coulee,
West Block, Grasslands National Park, Saskatchewan.

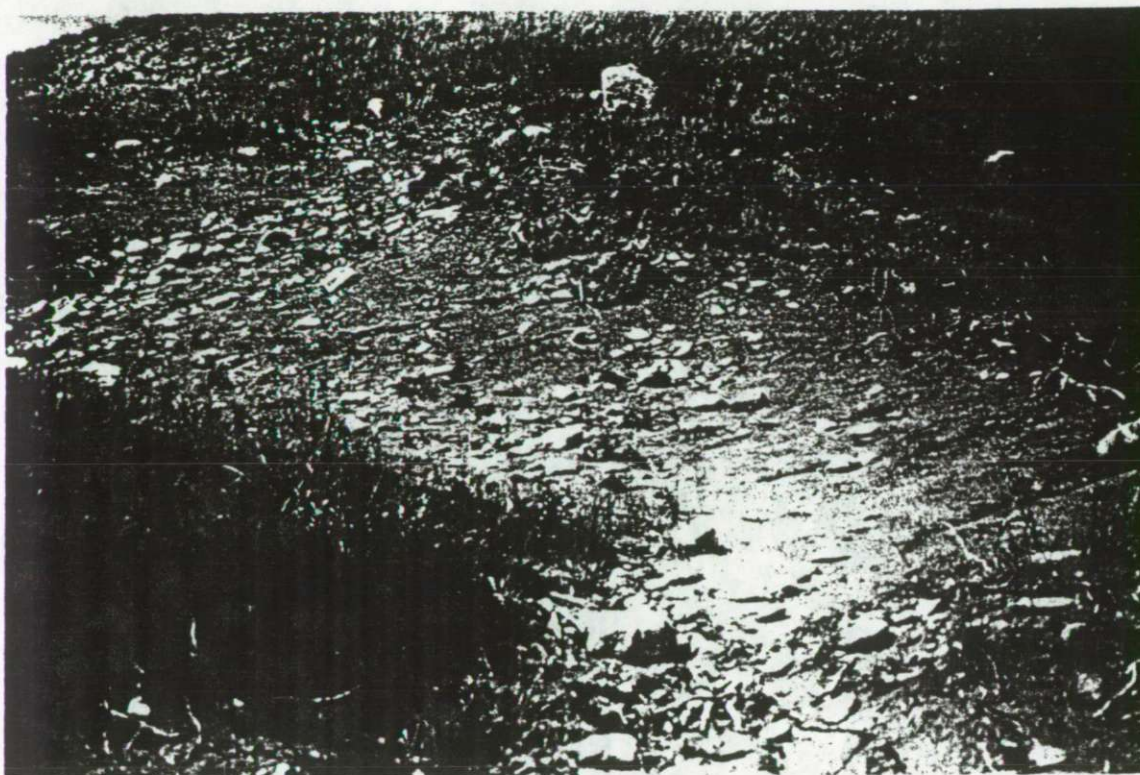


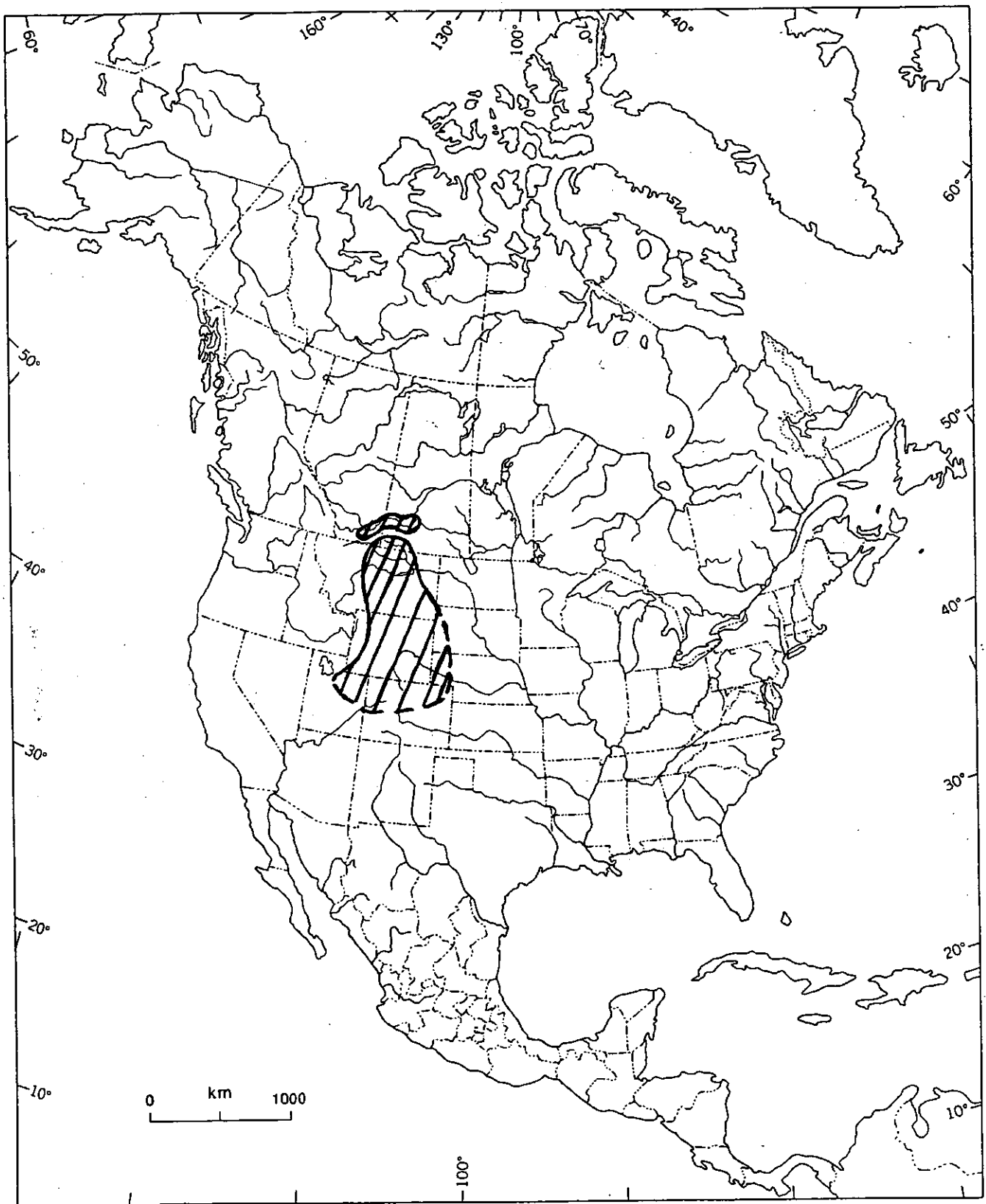
Figure 9: Semi-barren, rocky *Stephanomeria runcinata* Nutt. habitat. Site 2. Timmons Coulee, West Block, Grasslands National Park, Saskatchewan.



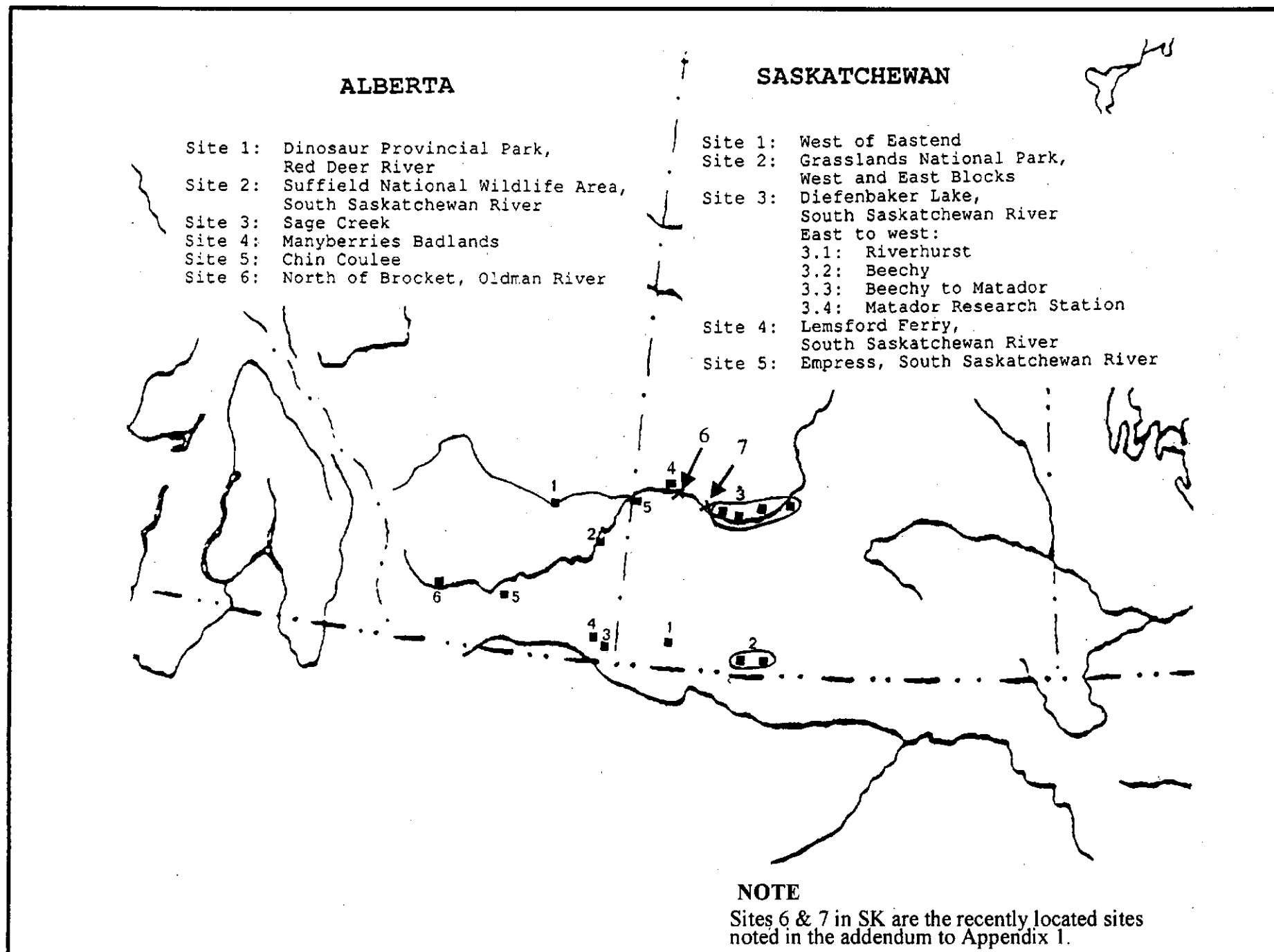
Figure 10: *Stephanomeria runcinata* Nutt. and habitat. Site 2. Timmons Coulee, West Block, Grasslands National Park, Saskatchewan.



Figure 11: *Stephanomeria runcinata* Nutt. Note runcinate basal leaves. Site 2.
Timmons Coulee, West Block, Grasslands National Park, Saskatchewan.

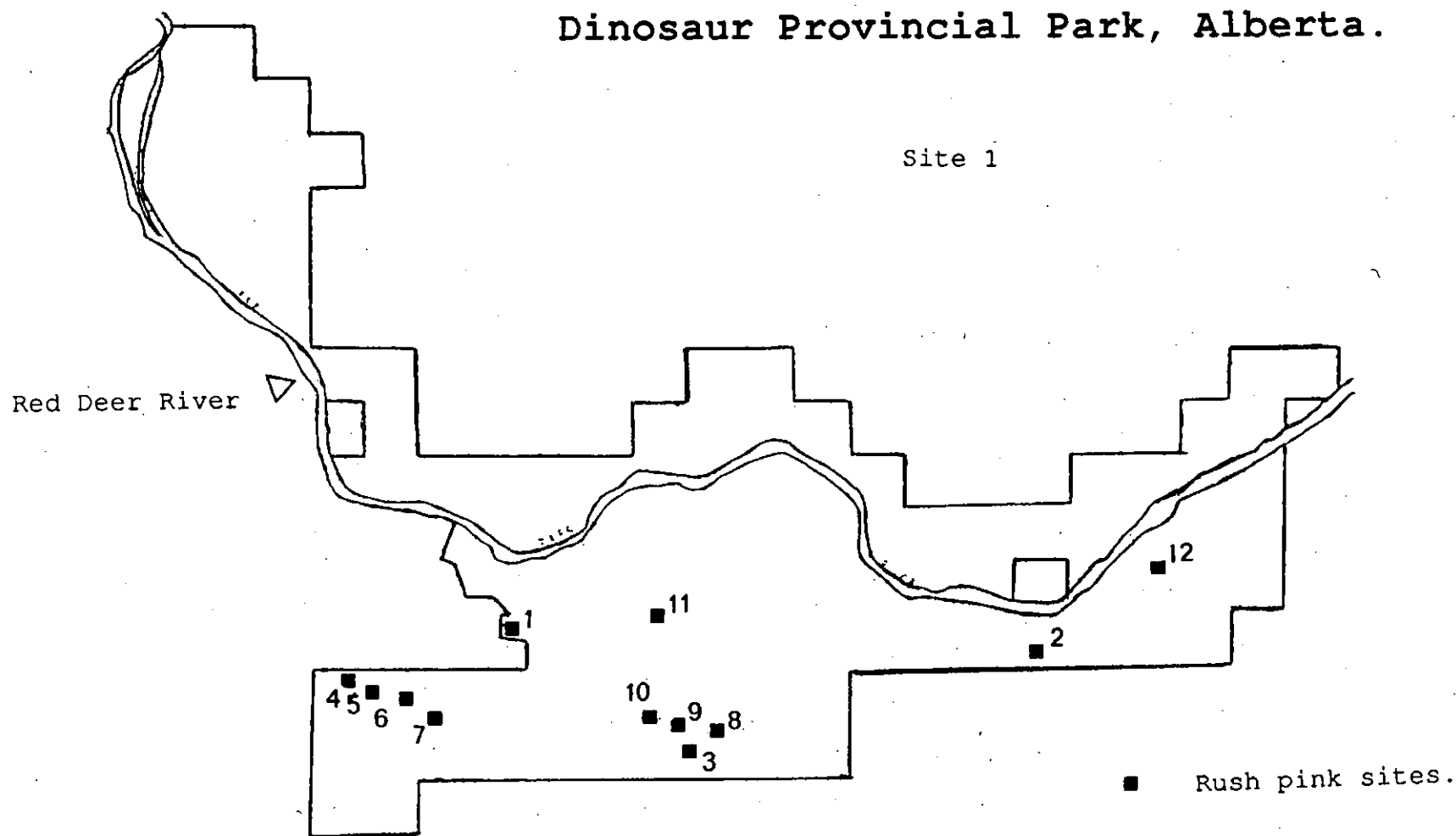


Map 1: Distribution of *Stephanomeria runcinata* Nutt.



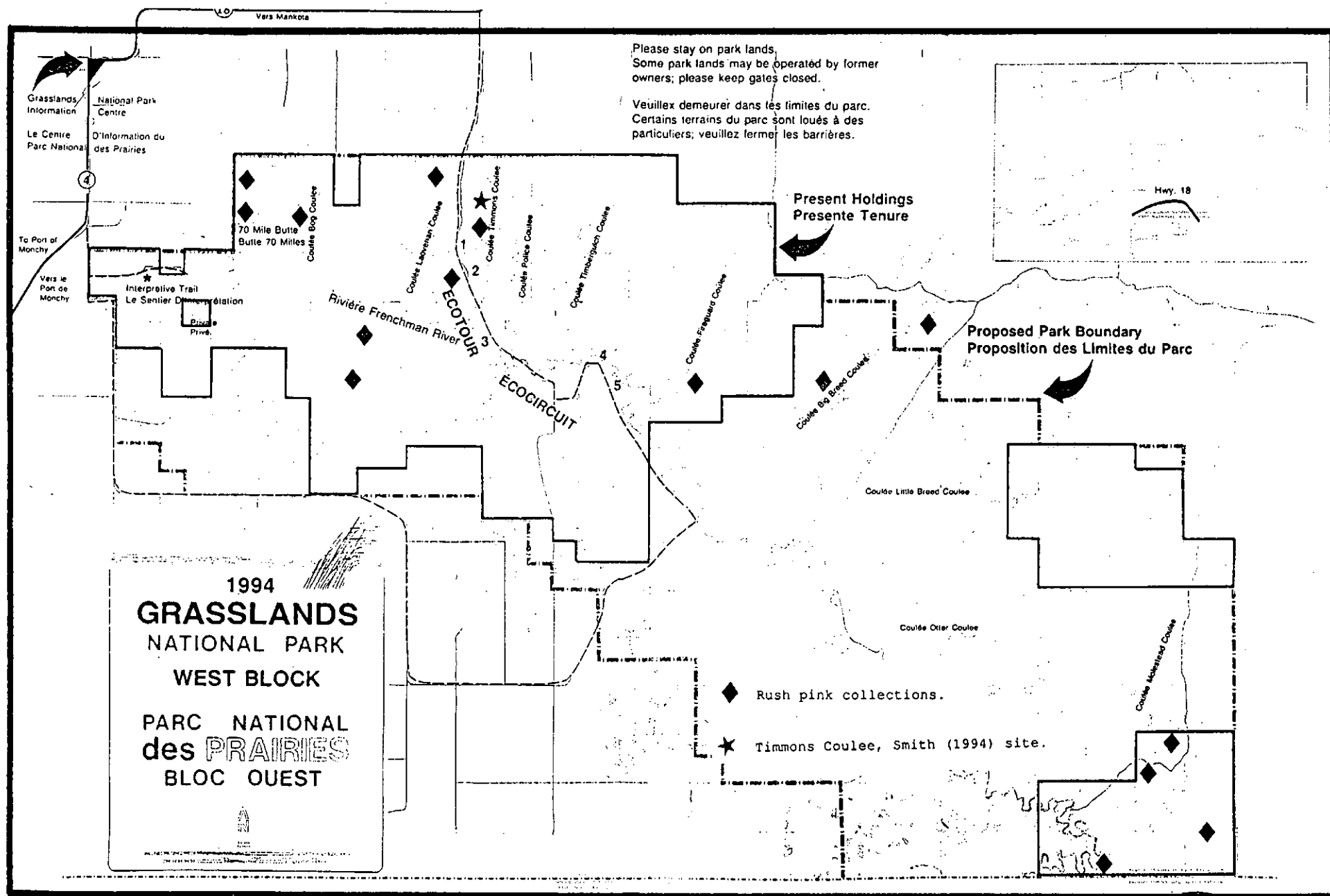
Map 2: Distribution of *Sanomeria runcinata* Nutt. in Canada

Dinosaur Provincial Park, Alberta.

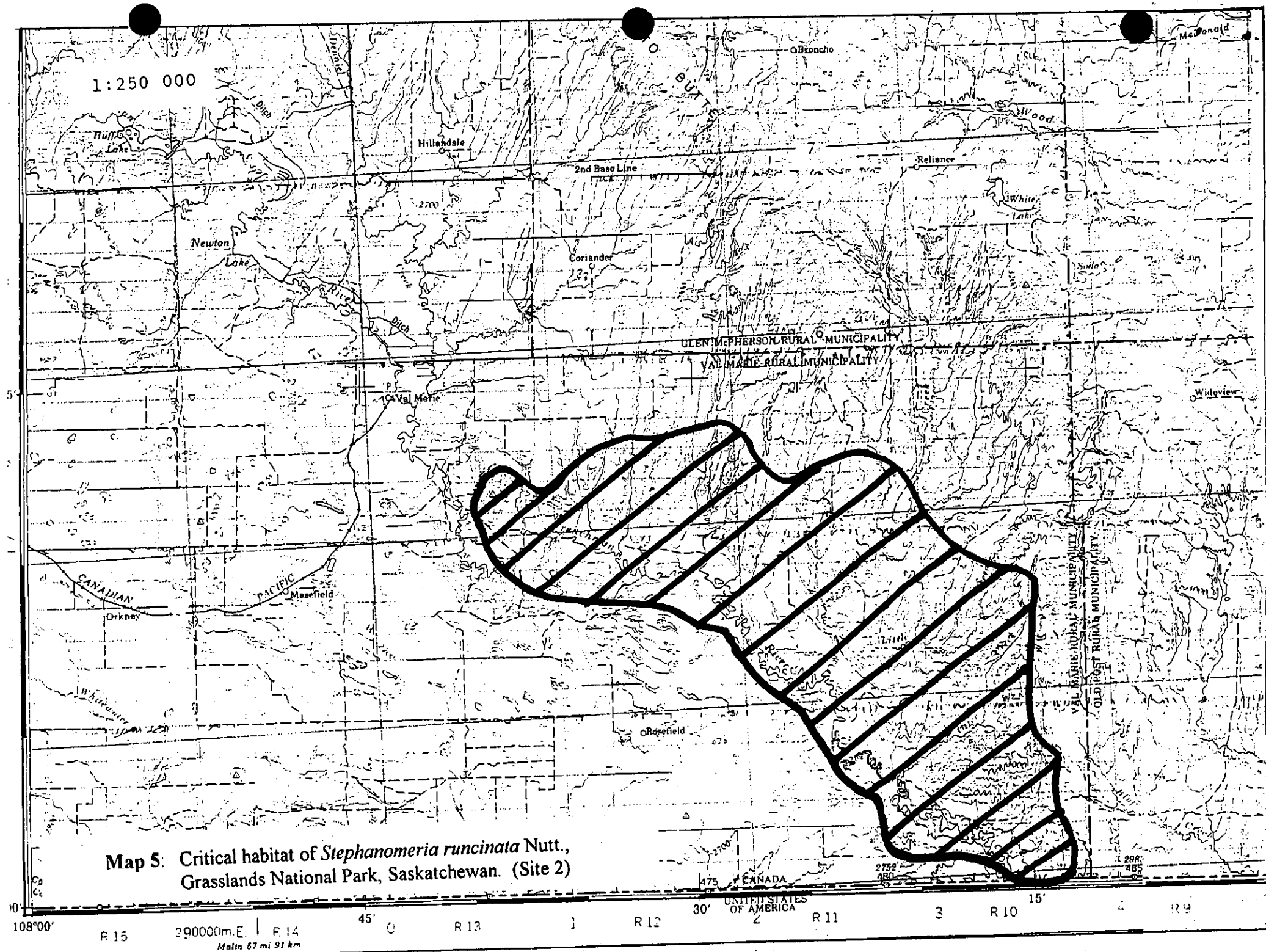


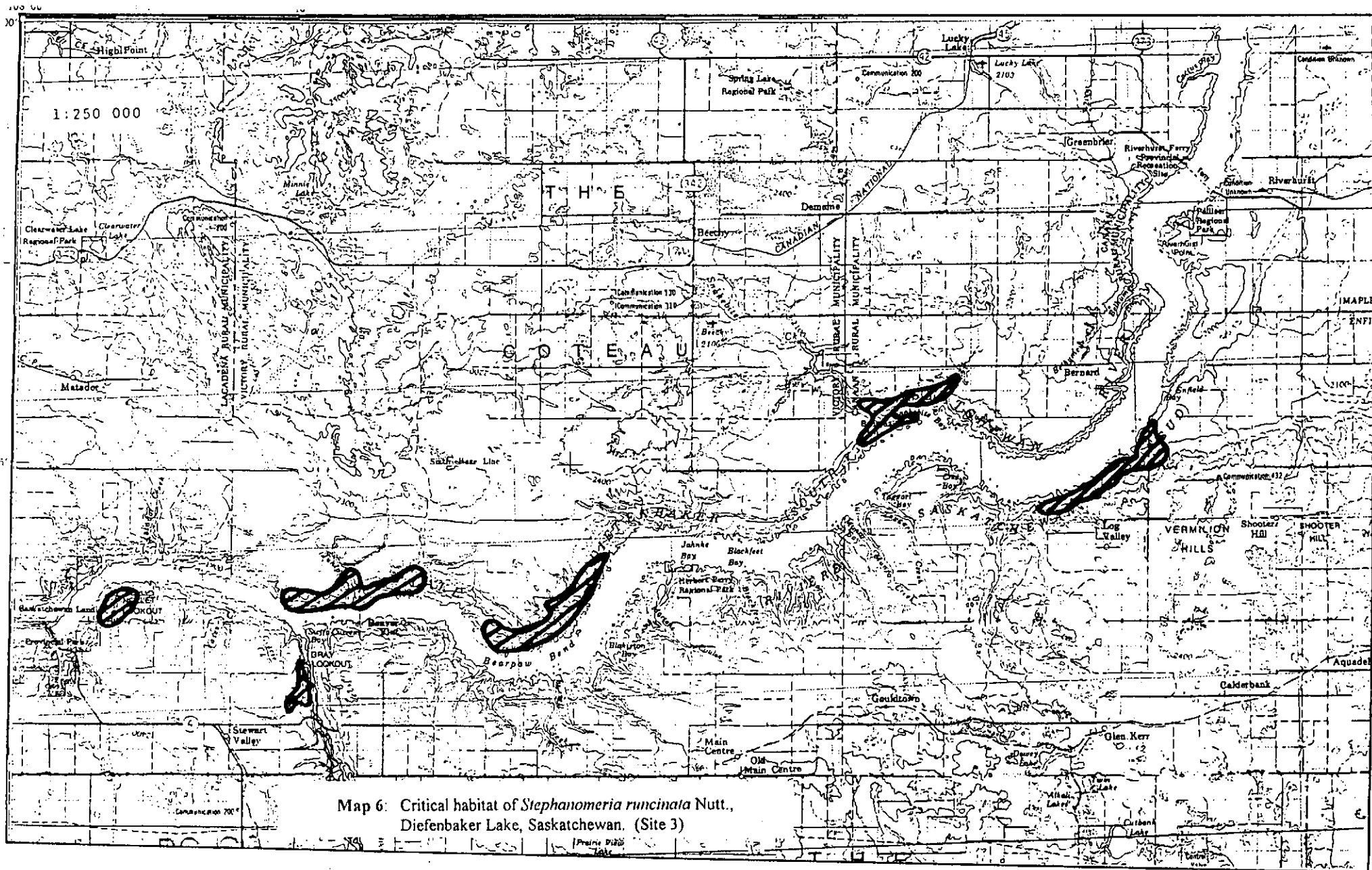
Sites 1-3: Romuld collections.
Sites 4-11: Cornish collections.
Site 12: Kondla and Crawford collection.

Map 3: Distribution of *Stephanomeria runcinata* Nutt. within Dinosaur Provincial Park, Alberta. (Site 1)

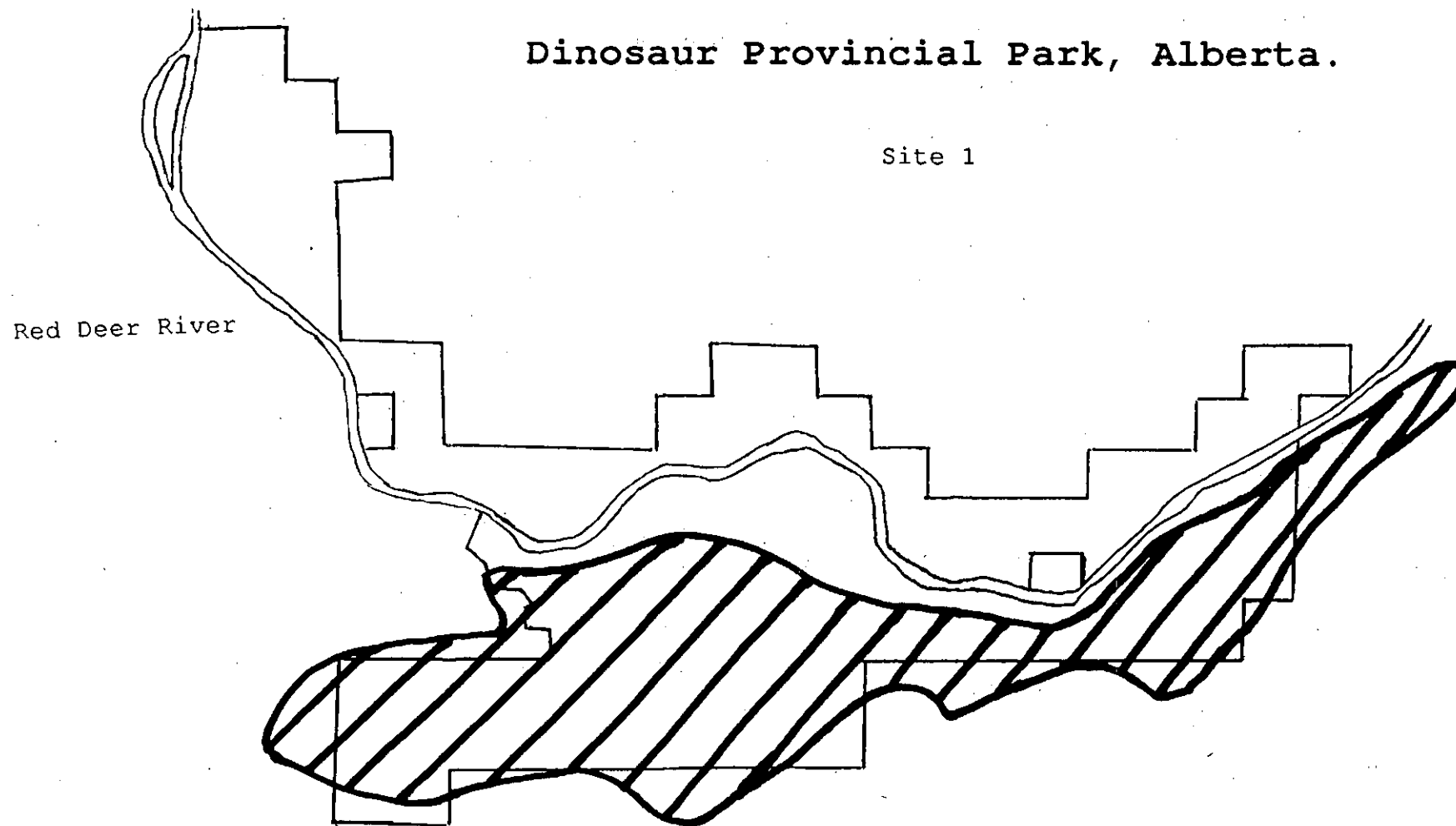


Map 4: Distribution of *Stephanomeria runcinata* Nutt. within the West Block of Grasslands National Park, Saskatchewan. (Site 2)





Dinosaur Provincial Park, Alberta.



Map 7: Critical habitat of *Stephanomeria runcinata* Nutt.,
Dinosaur Provincial Park, Alberta (Site 1)