BIRDS HILL PROVINCIAL PARK

Birds Hill Provincial Park lies about 24 km northeast of downtown Winnipeg. It is an area of primarily Aspen Parkland on sandy and gravelly beach and outwash deposits. Unfortunately, the large grassland areas are regularly cut very short and some have been planted with introduced species. However, remnants of prairie vegetation still exist here and there in the park.

One typical pocket of prairie vegetation occurs in a small clearing in the aspen and oak wood near the beginning of the White-tailed Deer Trail. Big and Litle Bluestem (Andropogon gerardi Vitman and A. scoparius Michx.) are present along with Porcupine Grass (Stipa spartea Trin.) and the Sand Dropseed (Sporobolus cryptandrus (Torr.) Gray). The Leadplant (Amorpha canescens Pursh) is present in the low shrubby layer. Among the forbs are Three-flowered Avens (Geum triflorum Pursh) which is abundant, and the Silver Aster (Aster sericeus Vent.) which is listed as a rare plant in The Rare Vascular Plants of Manitoba (White and Johnson 1980).

A larger area of about 1.6 hectares of Andropogon-Stipa grassland has survived the mowing along South Drive. Andropogon gerardi Vitman, and Kentucky Bluegrass (Poa pratensis L.) are the dominant grasses. Porcupine Grass (Stipa spartea Trin.) is frequent and there is some Spike Oat (Helictotrichon hookeri (Scribn.) Henr.). This grassland is adjacent to a Bouteloua-Stipa grassland which has also escaped the mowers. Interesting forbs found in the Andropogon-Stipa grassland are the Four-o'clock (Mirabilis hirsuta (Pursh) MacM.), the Siver Aster (Aster sericeus Vent.), the Ground Cherry (Physalis virginiana Mill.) and

Bluets (Houstonia longifolia Gaertn.) all indicative of dry prairie.

Further along South Drive, just before it turns north, there is an extensive carpet (4 to 6 hectares) of Three-flowered Avens (Geum triflorum Pursh). This area would be an excellent seed source for this species.

The IBP Preliminary Report on Prairie (1968) suggested that an area should be set aside in the Park and left undisturbed.

BIRDS HILL PARK SPECIES LIST August 21 1968

ANDROPOGON-STIPA GRASSLAND

WOODY SPECIES

Juniperus horizontalis Moench o

Rosa sp. o

Symphoricarpos occidentalis Hook. o

GRASSES, SEDGES AND RUSHES

Agropyron trachycaulum (Link)Malte var. glaucum (Pease & Moore)Malte o

Andropogon gerardi Vitman a

Bouteloua gracilis (HBK.) Lag. o (outer edge)

Festuca rubra L. o

Helictotrichon hookeri (Scribn.) Henr. o

Koeleria cristata (L.) Pers. o

Poa pratensis L. a

Stipa spartea Trin. f

FORBS

Agastache foeniculum (Pursh) Ktze. r

Anemone cylindrica Gray o

Antennaria sp. o

Apocynum cannabinum L. var. hypericifolium (Ait.) Gray o

Artemisia frigida Willd. f

Artemisia ludoviciana Nutt. var. gnaphalodes (Nutt.) T.&G. f

Asclepias ovalifolia Dene. o

Aster laevis L. o

Aster sericeus Vent. o

Erigeron strigosus Muchl. o

Geum triflorum Pursh o

Helianthus laetiflorus Pers. var. rigidus (Cass.) Fern. f

Houstonia longifolia Gaertn. r

Lathyrus venosus Muhl. var. intonsus Butt. & St.John o

Lithospermum canescens (Michx.) Lehm. o

Mirabilis hirsuta (Pursh) MacM. o
Monarda fistulosa L. o
Oenothera biennis L. o
Orthocarpus luteus Nutt. r
Penstemon gracilis Nutt. r
Petalostemum purpureum (Vent.) Rydb. o
Physalis virginiana Mill. o
Polygonatum canaliculatum (Muhl.) Pursh o
Potentilla pensylvanica L. var. bipinnatifida (Dougl.) T.&G. o
Psoralea esculenta Pursh r
Solidago nemoralis Ait. var. decemflora (DC.) Fern. o
Thalictrum venulosum Trel. o
Tragopogon dubius Scop. o

PRAIRIE POCKET

WOODY SPECIES

Amorpha canescens Pursh o
Arctostaphylos uva-ursi (L.) Spreng. f
Populus tremuloides Michx. o
Rosa sp. f

GRASSES, SEDGES AND RUSHES

Andropogon gerardi Vitman f
Andropogon scoparius Michx. f
Poa pratensis L. o
Sporobolus cryptandrus (Torr.) Gray o
Stipa spartea Trin. f

FORBS

Anemone cylindrica Gray o
Artemisia caudata Michx. o
Artemesia frigida Willd. o
Artemisia ludoviciana Nutt. var. gnaphalodes (Nutt.) T.&G. o

Aster laevis L. f
Aster pansus (Blake) Cronq. f
Aster ptarmicoides (Nees) T.&G. o
Aster sericeus Vent. r
Astragalus goniatus Nutt. o
Campanula rotundifolia L. f
Fragaria virginiana Duchesne f
Geum triflorum Pursh a
Heuchera richarsonii R.Br. o
Lithospermum canescens (Michx.) Lehm. o
Medicago lupulina L. o
Orthocarpus luteus Nutt. o
Petalostemum purpureum (Vent.) Rydb. f
Potentilla pensylvanica L. var. bipinnatifida (Dougl.) T.&G. o
Solidago hispida Muhl. o
Solidago nemoralis Ait. var. decemflora (DC.) Fern. a

BEAUDRY PROVINCIAL PARK

Beaudry Provincial Park is located about 15 km west of Winnipeg on the Assiniboine River. Along the loops of the river there is a very good example of bottomland forest through which there are hiking and skiing trails. Cultivated fields at present occupy much of the remaining area in the park, but plans are under way for restoration of over 240 hectares.

In 1967 and 1968, M. Levin and G. Keleher of the University of Manitoba investigated a prairie remnant on the south side of Provincial Road 241 in what is now Beaudry Provincial Park. It lay between the road and a Canadian National Railways line, regular use of which had been discontinued in 1965. The track has now been lifted. In 1967 it was noted that because the vegetation along the railway righ-of-way was no longer being burned for railroad maintenance the area was being invaded by woody species. Unfortunately today there has been much invasion by woody and non-prairie species.

The soil in the area of the road and abandoned track is mapped as a St.Norbert Clay, the wooded associate of the Red River Association, a Blackearth developed on lacustrine fine clay.

Of the two types of prairie recognized in 1967 - Andropogon gerardi type and the Stipa spartea-Andropogon gerardi type - only the latter is recognizable today and is confined to a strip about 0.15 km long and about 23 m wide. The invading shrubby trees are Oak (Quercus macrocarpa Michx.), Aspen (Populus tremuloides Michx.) and Balsam Poplar (Populus balsamifera L.). Porcupine Grass (Stipa spartea Trin.) is abundant and Big Bluestem (Andropogon gerardi Vitman) only occasional. There is a mixture of other grasses

present, including Smooth Brome (Bromus inermis Leyss.) and Kentucky Bluegrass (Poa pratensis L.). Among the forbs, Mugwort (Artemisia ludoviciana Nutt. var. gnaphalodes (Nutt.) T.&G.), Sunflowers (Helianthus spp.) and Wild Bergamot (Monarda fistulosa L.) are common.

Big Bluestem occurs here and there along both sides of Provincial Road 241 within the park boundary as well as in the site described. However, it no longer forms a stand such as that described by Levin and Keleher in 1968.

A sprinkling of Big Bluestem can also be found in a small clearing in the oak just to the west of the trail along the lake to the south of Provincial Road 241. Although the area has been invaded by weedy species there are a number of prairie species present. The grasses are mainly Smooth Brome (Bromus inermis Leyss.) and Slender Wheat Grass (Agropyron trachycaulum (Link) Matte), with lesser amounts of Green Needle Grass (Stipa viridula Trin.) and June Grass (Koeleria cristata (L.) Pers.). The prairie shrub, Dwarf False Indigo (Amorpha nana Nutt.), is present and also the prairie forbs Blazing-star (Liatris ligulistylis (Nels.) K. Schum.) and Prairie Clover (Petalostemum purpureum (Vent.) Rydb.

A clearing in the oak groves north of Provincial Road 241 also harbours a little Green Needle Grass. In the same area there is some Meadow Sweet (Spiraea alba Du Roi), Wild Onion (Allium stellatum Fraser) and Wild Bergamot (Monarda fistulosa L.).

BEAUDRY PARK SPECIES LISTS

ROADSIDE, July 22, 1986

WOODY SPECIES

Amelanchier alnifolia Nutt. f
Crataegus sp. r
Populus balsamifera L. o
Populus tremuloides Michx. o
Quercus macrocarpa Michx. f
Rosa sp. f
Spiraea alba Du Roi o
Symphoricarpos occidentalis Hook. f

GRASSES, SEDGES AND RUSHES

Agropyron trachycaulum (Link) Malte o
Agropyron trachycaulum (Link) Malte var. unilaterale (Cassidy) Malte o
Andropogon gerardi Vitman o
Bromus inermis Leyss. f
Calamagrostis inexpansa Gray var. brevior (Vasey) Stebbins r
Koeleria cristata (L.) Pers. o
Panicum leibergii (Vasey) Scribn. r
Phleum pratense L. o
Poa pratensis L. f
Stipa spartea Trin. a
Spartina pectinata Link f

FORBS

Anemone canadensis L. f
Anemone cylindrica Gray f
Artemisia ludoviciana Nutt. var. gnaphalodes (Nutt.) T.&G. f
Asclepias ovalifolia Dcne. o
Aster laevis L. f
Aster pansus (Blake) Cronq. f
Campanula rotundifolia L. o
Fragaria virginiana Duchesne o

Galium septentrionale R.&S. f
Glycyrrhiza lepidota (Nutt.) Pursh f
Helianthus laetiflorus Pers. var. rigidus (Cass.) Fern. f
Helianthus laetiflorus Pers. var. subrhomboideus (Rydb.) Fern. f
Helianthus maximilliani Shrad f
Heliopsis helianthoides (L.) Sweet var. scabra (Dunal) Fern. r
Heuchera richarsonii R.Br. r
Lactuca tatarica (L.) Meyer o
Lathyrus venosus Muhl. var. intonsus Butt. & St.John o
Liatris ligulistylis (Neis.) K.Schum. o
Lithospermum canescens (Michx.) Lehm. o
Monarda fistulosa L. f
Petalostemum purpureum (Vent.) Rydb. o
Silene cserei Baumg. o (along railbed)
Smilacina stellata (L.) Desf. o
Solidago canadensis L. var. gilvocanescens Rydb. a
Solidago rigida L. f
Steironema ciliatum (L.) Raf. r
Thalictrum venulosum Trel. f
Vicia cracca L. o
Vicia americana Muhl. var. truncata (Nutt.) Brewer o

LAKESIDE CLEARING, Aug.26, 1986

WOODY SPECIES

Amelanchier alnifolia Nutt. o
Amorpha nana Nutt. o
Rosa sp. o
Symphoricarpos occidentalis Hook. o

GRASSES, SEDGES AND RUSHES

Agropyron trachycaulum (Link) Malte a
Agropyron trachycaulum (Link) Malte var. unilaterale (Cassidy) Malte f
Andropogon gerardi Vitman o

Bromus inermis Leyss. a
Hordeum jubatum L. o
Koeleria cristata (L.) Pers. o
Poa pratensis L. f
Spartina pectinata Link o
Stipa viridula Trin. o

FORBS

Anemone canadensis L. o
Anemone cylindrica Gray r
Artemisia ludoviciana Nutt. var. gnaphalodes (Nutt.) T.&G. o
Aster laevis L. f
Aster pansus (Blake) Cronq. a
Galium septentrionale R.&S. f
Glycyrrhiza lepidota (Nutt.) Pursh la
Helianthus laetiflorus Pers. var. rigidus (Cass.) Fern. f
Helianthus laetiflorus Pers. var. subrhomboideus (Rydb.) Fern. f
Helianthus maximilliani Shrad f
Lactuca tatarica (L.) Meyer o
Liatris ligulistylis (Nels.) K.Schum. o
Medicago sativa L. o
Monarda fistulosa L. o
Petalostemum purpureum (Vent.) Rydb. o
Solidago canadensis L. a
Solidago gigantea Ait. var. serotina (Ait.) Cronq o
Solidago rigida L. f

COMMUNITY PASTURE NORTH OF POPLAR POINT

The pasture, which covers a large area, is characterized by groves of scrubby aspen and oak with grazed grassy clearings. The site examined is located on the east edge of section 24, township 13, range 5 west. Although it appears to be part of the pasture and is fenced, the land actually belongs to B.A.C.M. Ltd. The dominant soil of the area is a Rendzina belonging to the Isafold Association, but the particular site chosen for study is on a ridge the soil of which belongs to the Agassiz Association. The Agassiz soils are Blackearths developed on gravel and coarse sandy beach deposits.

This site, being on top of the ridge, is quite xeric. It was chosen for its great diversity of prairie species which on the July 20 visit gave the approximately two hectare clearing a colourful appearance which was readily visible from Provincial Road 430. This area is not as heavily grazed as the other clearings. About a dozen different species of grass are present, including Big and Little Bluestem (Andropgon gerardi Vitman and A. scoparius Michx.) and Porcupine Grass (Stipa spartea Trin.). There are low shrubs of Wild Rose (Rosa sp.) and Wolfberry (Symphoricarpos occidentalis Hook.) and Wolf Willow (Eleagnus commutata Bernh.) is invading around the edges of the clearing. The varied forbs include the Prairie Anemone (Anemone patens L. var. wolfgangiana (Bess.) Koch), Breadroot (Psoralea esculenta Pursh), Black-eyed Susan (Rudbeckia serotina Nutt.), Three-Flowered Avens (Geum triflorum Pursh) and four species of Goldenrod (Solidago spp.).

This area was included in an International Biological Program Preliminary Report on Prairie (July, 1968) but does not appear to have been given further consideration.

COMMUNITY PASTURE SPECIES LIST July 20 1986

WOODY SPECIES

Amorpha nana Nutt. r
Eleagnus commutata Bernh. f (edge of clearing)
Prunus pumila L. r
Rosa sp. f
Salix spp. o
Spiraea alba Du Roi o
Symphoricarpos occidentalis Hook. o

GRASSES, SEDGES AND RUSHES

Agropyron trachycaulum (Link)Malte var. novae-angliae (Scribn.)Fern. o
Agropyron trachycaulum (Link) Malte var. unilaterale (Cassidy) Malte f
Andropogon gerardi Vitman f
Andropogon scoparius Michx. o
Bromus inermis Leyss. o
Festuca elatior L. o
Hierochloe odorata (L.) Beauv. r
Hordeum jubatum L. r
Juncus torreyi Coville r
Koeleria cristata (L.) Pers. o
Panicum virgatum L. o
Poa pratensis L. a
Sporobolus heterolepis Gray o
Stipa sp. f

FORBS

Agoseris glauca (Nutt.) Greene o
Allium stellatum Nutt. o
Anemone canadensis L. o
Anemone cylindrica Gray o
Anemone patens L. var. wolfgangiana (Bess.) Koch o
Antennaria sp. o
Apocynum cannabinum L. var. hypericifolium (Ait.) Gray o

Asclepias ovalifolia Dcne. r
Aster laevis L. o
Aster pansus (Blake) Cronq. f
Aster ptarmicoides (Nees) T.&G. o
Campanula rotundifolia L. o
Cirsium arvense (L.) Scop. o
Cirsium flodmanii (Rydb.) Arthur o
Erigeron glabellus Nutt. r
Fragaria virginiana Duchesne f
Gaillardia aristata Pursh o
Galium septentrionale R.&S. f
Gentiana affinis Griseb. r
Geum triflorum Pursh o
Glycyrrhiza lepidota (Nutt.) Pursh o
Helianthus laetiflorus Pers. var. rigidus (Cass.) Fern. f
Helianthus maximilliani Shrad o
Heuchera richarsonii R.Br. o
Liatris ligulistylis (Nels.) K.Schum. o
Linum sulcatum Riddell o
Lithospermum canescens (Michx.) Lehm. o
Lobelia spicata Lam. var. hirtella Gray f
Medicago lupulina L. o
Melilotus alba Desr. r
Monarda fistulosa L. o
Potentilla millegrana Engelm. o
Potentilla pensylvanica L. o
Prunella vulgaris L. var. lanceolata (Barton) Fern. r
Psoralea esculenta Pursh o
Rudbeckia serotina Nutt. f
Solidago canadensis L. var. gilvocanescens Rydb. o
Solidago missouriensis Nutt. f
Solidago rigida L. a
Sonchus arvensis L. var. glabrescens Guenth., Grab., & Wimm. o

Thalictrum venulosum Trel. o
Zigadenus elegans Pursh o
Zizia aptera (Gray) Fern. F

THE FORMER McCABE RANCH

This area was suggested to the International Biological Program as an example of Tall-grass Prairie but, for some reason, was never examined. The site consists of three adjacent sections of land a few miles to the southwest of St.Ambroise. They are sections 8 and 5 in township 14, range 5 west, and section 32 in township 13, range 5 west and they were formerly known as the McCabe or Last Straw Ranch. The majority of this land is now owned by the St.Ambroise Cattlemen's Co-op Ltd., but the easterly three-quarters of the northwest quarter of section 32 is owned by Dalrymple Farms Ltd., and the most westerly 16 hectares of this quarter (the area most closely examined by the author) is owned by Montreal Trust Company.

The landscape is characterized by the ridge and swale topography typical of the general area. Apart from a few small areas of marsh the soil, referred to as a Rendzina in the Manitoba Soil Survey Report of 1957 but now called a Rego Black, belongs to the Isafold Association which is developed on highly calcareous boulder till. The surface textures vary from loam to clay loam. In the above-mentioned report the vegetation of the ridges is described as "tall prairie grasses, principally big and little bluestem, mixed with clumps of scrubby aspen poplar and oak". Because of the high calcium carbonate content of this soil and the stony nature of the ground, the soils are best used for pasturage.

Much of these three sections is used for pasture and forage. An area of about 16 hectares at the extreme north end of the north section is under cultivation. A crop of alfalfa had been harvested there by our August 3 visit. The rest of the section as far as the eye could see was being grazed. The middle section had been hayed so presumably it

supported a good grass stand. The southern half of the south section was fenced off and had cattle on it. It appeared to be quite heavily grazed. The north half did not appear to have been recently grazed and there was easy access to it through an open gate on the west side. The topography here is undulating with one small ridge that supports prairie vegetation. If the vegetation on this ridge is indicative of that of section 5 then that area could be worth an investigation before the beginning of the haying season next year.

The whole north half of section 32 is badly infested by Sow Thistle (Sonchus arvensis L. var. glabrescens Guenth., Grab. & Wimm.). Big Bluestem (Andropogon gerardi Vitman) is found on the ridge with a few other prairie grass species but does not form a thick stand. Prairie Anemone (Anemone patens L. var wolfgangiana (Bess.) Koch) is also present along with the two species of Psoralea (Psoralea argophylla Pursh and P. esculenta Pursh). In the less well-drained areas Northern Reed Grass (Calamagrostis inexpansa Gray var. brevior (Vasey) Stebbins), Spangletop (Scolochloa festucacea (Willd.) Link) and Fowl Bluegrass (Poa palustris L.) are found. Slender Wheat Grass (Agropyron trachycaulum (Link) Matte) is widespread. Sunflowers (Helianthus spp.) and Asters (Aster spp.) are common. One clump of Prairie Coneflower (Ratibida columnifera (Nutt.) Wooton & Standl.) was spotted.

The second site, 3.3 km to the east of the previous one, is in the southwest corner of section 4, township 15, range 4 west. This one is more extensive, and generally more level and drier than the previous site. Kentucky Bluegrass (Poa pratensis L.), Big Bluestem (Andropogon gerardi Vitman) and Porcupine Grass (Stipa spartea Trin.) are abundant. Among the forbs, Breadroot (Psoralea esculenta Pursh) and Silverleaf Psoralea (Psoralea argophylla Pursh) are frequent. As in the previous site, several species of Goldenrod (Solidago spp.) and Aster (Aster spp.) are also present. Sweet Clover (Melilotus alba Desr.) is frequent.

While there is a fair amount of Big Bluestem in this area, there are no relatively pure dense stands of it. The next site to be described, however, does have such a stand.

ST. AMBROISE SITE 1 SPECIES LIST July 20 & Aug. 3 1986

WOODY SPECIES

Rosa sp. o

GRASSES, SEDGES AND RUSHES

Agropyron trachycaulum (Link)Malte var. novae-angliae (Scribn.)Fern. o
Andropogon gerardi Vitman o
Andropogon scoparius Michx. la
Calamagrostis inexpansa Gray var. brevior (Vasey) Stebbins la
Helictotrichon hookeri (Scribn.) Henr. o
Hordeum jubatum L. o
Koeleria cristata (L.) Pers. o
Panicum virgatum L. o
Poa palustris L. lf
Poa pratensis L. a
Puccinellia nuttalliana (Schultes) Hitchc. o
Spartina gracilis Trin. o
Stipa spartea Trin. f

FORBS

Achillea millefolium L. o
Agoseris glauca (Nutt.) Greene o
Allium stellatum Nutt. f
Anemone canadensis L. o
Anemone cylindrica Gray o
Apocynum cannabinum L. var. hypericifolium (Ait.) Gray o
Aster pansus (Blake) Cronq. o
Aster ptarmicoides (Nees) T.&G. o
Campanula rotundifolia L. o
Cirsium arvense (L.) Scop. o
Cirsium flodmanii (Rydb.) Arthur o
Glycyrrhiza lepidota (Nutt.) Pursh o
Grindelia squarrosa (Pursh) Dunal o
Helianthus maximilliani Shrad o

ST. AMBROISE SITE 2 SPECIES LIST July 20 & Aug. 3 1986

WOODY SPECIES

Rosa sp. o

GRASSES, SEDGES AND RUSHES

Agropyron trachycaulum (Link)Malte var. novae-angliae (Scribn.)Fern. o
Andropogon gerardi Vitman a
Andropogon scoparius Michx. o
Calamagrostis inexpansa Gray var. brevior (Vasey) Stebbins o
Helictotrichon hookeri (Scribn.) Henr. o
Hierochloe odorata (L.) Beauv. o
Hordeum jubatum L. o
Koeleria cristata (L.) Pers. o
Poa pratensis L. a
Stipa spartea Trin. a
Stipa viridula Trin. o

FORBS

Achillea millefolium L. o
Agoseris glauca (Nutt.) Greene o
Allium stellatum Nutt. o
Anemone canadensis L. f
Anemone cylindrica Gray o
Artemisia ludoviciana Nutt. var. gnaphalodes (Nutt.) T.&G. f
Aster laevis L. o
Aster pansus (Blake) Cronq. o
Aster ptarmicoides (Nees) T.&G. o
Astragalus goniatus Nutt. o
Campanula rotundifolia L. o
Cirsium arvense (L.) Scop. r
Comandra umbellata (L.) Nutt. o
Erigeron glabellus Nutt. r
Gaillardia aristata Pursh r
Galium septentrionale R.&S. f

ST. AMBROISE SITE 2 SPECIES LIST July 20 & Aug. 3 1986

Gentiana amarella L. r
Glycyrrhiza lepidota (Nutt.) Pursh o
Helianthus maximilliani Shrad o
Lactuca ratarica (L.) Meyer o
Liatris ligulistylis (Nels.) K.Schum. o
Lilium philadephicum L. o
Linum lewisii Pursh o
Linum sulcatum Riddell r
Lobelia spicata Lam. var. hirtella Gray f
Melilotus alba Desr. f
Orthocarpus luteus Nutt. o
Petalostemum candidum (Willd.) Michx. o
Petalostemum purpureum (Vent.) Rydb. o
Psoralea argophylla Pursh f
Psoralea esculenta Pursh f
Smilacina stellata (L.) Desf. o
Solidago canadensis L. var. gilvocanescens Rydb. o
Solidago hispida Muhl. o
Solidago rigida L. o
Stachys palustris L. var. pilosa (Nutt.)Fern. r
Thalictrum venulosum Trel. o
Zigadenus elegans Pursh o
Zizia aptera (Gray) Fern. o

LAKE FRANCIS

This site is on the east side of Highway 6 a few kilometres north of Lake Francis. It lies just inside the northern boundary of the R.M. of Woodlands and immediately east of the Canadian National railway. It is situated in the north side of section 32, township 15, range 3 west. The land belongs to E.C.R. Ranches Limited.

The site is a grassy clearing of about one or two hectares in the aspen-oak groves which are typical of the general area. The topography is undulating with a narrow ridge running across the site from the gate on the west side. The soil is mapped as Lundar-Clarkleigh Complex, Gleyed Rego Black and Calcareous Meadow soils developed on strongly calcareous till. The ridge which shows up on the soils map belongs to the Agassiz Series, an Orthic Black developed on sand and gravel beach deposits. The ridge shows some disturbance with a growth of Smooth Brome (Bromus inermis Leys.) and Tall Wormwood (Artemisia caudata Michx.) on top. A tall, dense stand of Big Bluestem (Andropogon gerardi Vitman) covers the rest of the area. A noteworthy feature of this site is the occurrence of Indian Grass (Sorghastrum nutans (L.) Nash), an indicator of Tall-Grass Prairie and rarely found in Manitoba now. The latter grass tends to occur around the outer and possibly moister edges of the site. Other grasses are also found, such as Little Bluestem (Andropogon scoparius Michx.) and Tufted Hairgrass (Deschampsia cespitosa (L.) Beauv.). Around the edges of the clearing are various shrubby species such as Wolf Willow (Eleagnus commutata Bernh.), Willow (Salix sp.), Dwarf Birch (Betula glandulosa Michx. var. glandulifera (Regel) Gl.) and Soapberry (Shepherdia canadensis (L.) Nutt.). Among the forbs are several species of Goldenrod (Solidago spp.), Aster

recommended in a Preliminary Report on Prairie (1968) that it should be preserved.

Not far from the Stony Mountain site there is a prairie remnant along a 0.8 km strip of ditch bank in an area of cultivated fields. It is located on the south side of section 15, township 13, range 2 east. It was first spotted on July 1 also due to the many brightly coloured orange Lilies and the creamy coloured Camas plants. Also present are other assorted prairie species, including Silverleaf Psoralea (Psoralea argophylla Pursh), Blazing-star (Liatris ligulistylis (Nels.) K. Schum.) and Prairie Clover (Petalostemum purpureum (Vent.) Rydb.). On a later visit on July 20, the prairie grasses Big Bluestem (Andropogon gerardi Vitman) and Switchgrass (Panicum virgatum L.) were evident although not the dominant grasses. A more complete species list follows the one for the Stony Mountain Prairie. The soil is also a Blackearth as in the previous site.

(Aster spp.) and Gentian (Gentiana spp.). Also present but confined to the ridge are Prairie Anemone (Anemone patens L. var. wolfgangiana (Bess.) Koch) and Cut-leaved Anemone (Anemone multifida Poir.).

The excellent stand of Andropogon gerardi Vitman and the presence of Sorghastrum nutans (L.) Nash make this site a unique one and worthy of preservation.

LAKE FRANCIS SPECIES LIST Aug. 17 1986

WOODY SPECIES

Amelanchier alnifolia Nutt. o (edges)
Arctostaphylos uva-ursi (L.) Spreng. o (near trees)
Eleagnus commutata Bernh. o (edges)
Potentilla fruticosa L. o (near trees)
Rosa sp. f
Salix sp. o (edges)
Shepherdia canadensis (L.) Nutt. o (edges)
Symphoricarpos occidentalis Hook. o

GRASSES, SEDGES AND RUSHES

Agropyron trachycaulum (Link)Malte var. novae-angliae (Scribn.)Fern. o (edges)
Andropogon gerardi Vitman a
Andropogon scoparius Michx. f
Bouteloua gracilis (HBK.) Lag.
Bromus inermis Leyss. a (ridge)
Bromus purgans L. r
Deschampsia cespitosa (L.) Beauv. f
Juncus longistylis Torr. o
Poa pratensis L. f
Sorghastrum nutans (L.) Nash f
Sporobolus heterolepis Gray f

FORBS

Achillea millefolium L. o
Agoseris glauca (Nutt.) Greene o
Allium stellatum Nutt. o
Anemone cylindrica Gray o
Anemone multifida Poir. o (ridge)
Anemone patens L. var. wolfgangiana (Bess.) Koch o (ridge)
Artemisia ludoviciana Nutt. var. gnaphalodes (Nutt.) T.&G. o
Aster laevis L. f

Aster pansus (Blake) Cronq. f
Aster ptarmicoides (Nees) T.&G. o
Astragalus canadensis L. o
Campanula rotundifolia L. o
Cirsium arvense (L.) Scop. r
Cypripedium calceolus L. r
Galium septentrionale R.&S. a (ridge)
Gentiana affinis Griseb. o
Gentiana andrewsii Griseb. r
Gentiana crinita Froel. f
Glycyrrhiza lepidota (Nutt.) Pursh o (near trees)
Helianthus maximilliani Shrad o
Hieracium umbellatum L. r
Liatris ligulistylis (Nels.) K.Schum. o
Lilium philadephicum L. o
Lithospermum canescens (Michx.) Lehm. o
Monarda fistulosa L. o
Pedicularis canadensis L. o
Petalostemum candidum (Willd.) Michx. o
Petalostemum purpureum (Vent.) Rydb. o
Potentilla arguta Pursh r (ridge)
Potentilla pensylvanica L. var. bipinnatifida (Dougl.) T.&G. o (ridge)
Prenanthes racemosa Michx. o (near trees)
Rudbeckia serotina Nutt. o
Solidago canadensis L. la
Solidago hispida Muhl. o
Solidago missouriensis Nutt. o
Solidago rigida L. f
Thalictrum dasycarpum Fisch. & Lall. r
Zigadenus elegans Pursh o
Zizia aptera (Gray) Fern. o

STONY MOUNTAIN PRAIRIE

This wedge-shaped piece of land, bounded by the Canadian Pacific railway and a road, lies under the shadow of the Stony Mountain Penitentiary. It is included in Survey Plan 18282, the present owners being L.J. Houghey, W.O. and L.M. Gibson, and D.J. and P.F. Rendell. This site of about four hectares is all that remains of a much larger area that was known for its show of Prairie Anemone in the early spring. Although reduced in size, it still represents a good example of Tall-grass Prairie. On a July 1 visit, the orange of the Lilies and the creamy-white of the Camas readily identified the prairie. By July 20 there was a good stand of prairie grasses. In passing the site in early August, it was noticed that it had been harvested for hay.

The topography of the site is level and appears well drained. The soil, a Marquette Clay Loam, is a Blackearth developed on lacustrine clay over till or stratified drift. In the Manitoba Soil Survey Report of 1953, the native vegetation on the better-drained soils of the Marquette Association is described as "tall prairie grasses and herbs".

The low, shrubby vegetation layer consists of Wild Rose (Rosa sp.) and Wolfberry (Symphoricarpos occidentalis Hook.) with some Wolf Willow (Eleagnus commutata Bernh.). The stand of grasses includes both Big and Little Bluestem (Andropogon gerardi Vitman and A. scoparius Michx.) and Porcupine Grass (Stipa spartea Trin.). The varied forbs include the Prairie Anemone (Anemone patens L. var. wolfgangiana (Bess.) Koch), Three-flowered Avens (Geum triflorum Pursh) and species of Goldenrod (Solidago spp.), Aster (Aster spp.) and Sunflower (Helianthus spp.).

This area is part of a larger one that was examined by International Biological Program workers and it was

STONY MOUNTAIN SPECIES LIST July 1 & 20 1986

PRAIRIE

WOODY SPECIES

Eleagnus commutata Bernh. o
Rosa sp. f
Symphoricarpos occidentalis Hook. f

GRASSES, SEDGES AND RUSHES

Agropyron trachycaulum (Link) Malte var. unilaterale (Cassidy) Malte f
Andropogon gerardi Vitman f
Andropogon scoparius Michx. f
Distichlis stricta (Torr.) Rydb. o
Elymus canadensis L. o
Helictotrichon hookeri (Scribn.) Henr. o
Juncus balticus Willd. var. littoralis Engelm. o
Koeleria cristata (L.) Pers. f
Panicum virgatum L. o
Poa pratensis L. f
Stipa spartea Trin. f

FORBS

Allium stellatum Nutt. f
Anemone cylindrica Gray o
Anemone patens L. var. wolfgangiana (Bess.) Koch f
Artemesia absinthium L. f (along track)
Artemisia ludoviciana Nutt. var. gnaphalodes (Nutt.) T.&G. o
Asclepias ovalifolia Dcne. o
Asclepias verticillata L. o
Aster laevis L. o
Aster pansus (Blake) Cronq. f
Aster ptarmicoides (Nees) T.&G. a
Astragalus goniatus Nutt. o
Astragalus striatus Nutt. o
Cerastium arvense L. o

Erigeron asper Nutt. r
Fragaria virginiana Duchesne f
Galium septentrionale R.&S. f
Geum triflorum Pursh f
Glycyrrhiza lepidota (Nutt.) Pursh o
Helianthus laetiflorus Pers. var. rigidus (Cass.) Fern. f
Helianthus maximilliani Shrad a
Heuchera richarsonii R.Br. o
Liatris ligulistylis (Nels.) K.Schum. o
Lilium philadephicum L. f
Lobelia spicata Lam. var. hirtella Gray f
Orthocarpus luteus Nutt. o
Penstemon gracilis Nutt. o
Petalostemum candidum (Willd.) Michx. o
Petalostemum purpureum (Vent.) Rydb. o
Potentilla pensylvanica L. var. bipinnatifida (Dougl.) T.&G. o
Psoralea argophylla Pursh o
Psoralea esculenta Pursh r
Senecio pauperculus Michx. o
Sisyrinchium montanum Greene o
Solidago canadensis L. var. gilvocanescens Rydb. o
Solidago hispida Muhl. f
Solidago missouriensis Nutt. f
Solidago rigida L. f
Zigadenus elegans Pursh f
Zizia aptera (Gray) Fern. o

DITCH

(1 km strip near Stony Mountain)

<u>WOODY SPECIES</u>

Eleagnus commutata Bernh. o
Rosa sp. a
Spiraea alba Du Roi o

Lithospermum canescens (Michx.) Lehm. o
Monarda fistulosa L. o
Oxytropis sp. r (railway bed)
Petalostemum purpureum (Vent.) Rydb. f
Psoralea argophylla Pursh f
Smilacina stellata (L.) Desf. o
Solidago canadensis L. f
Solidago missouriensis Nutt. f
Solidago rigida L. f
Thalictrum venulosum Trel. f
Zigadenus elegans Pursh f
Zizia aptera (Gray) Fern. o

BROOKSIDE BOULEVARD

Another remnant of prairie within the Winnipeg Perimeter is located along the west side of Brookside Boulevard. Despite the fact that the soil surface in the general area is quite stony, land on either side of the site has been broken, and indeed it is surprising that this area has escaped the plow. The site is on an irregularly-shaped ridge of about 10 hectares in area. The soil is mapped as the Semple Association, a Grey-Black developed on a thin mantle of fine-textured sediments over till. The land belongs to the Canadian Pacific Railway and is in the east-central portion of the east half of section 22, township 11, range 2 east.

The site supports an interesting diversity of prairie species despite the fact that there has been some commercial development across the road. Only a small area of about 0.5 hectare close to the street was sampled because of the presence of prairie grasses there. The rarely-occurring Ground Plum (Astragallus carvocarpus Ker.) is here. On our August 26 visit the mature round pods were lying on the ground. While Kentucky Bluegrass (Poa pratensis L.) is the dominant grass, Little Bluestem (Andropogon scoparius Michx.) and Prairie Dropseed (Sporobolus heterolepis Gray) are frequent. Big Bluestem (Andropogon gerardi Vitman) and Switchgrass (Panicum virgatum L.) are also present but to a lesser degree. Wolf Willow (Eleagnus commutata Bernh.) and Dwarf False Indigo (Amorpha nana Nutt.) are found in the low shrubby layer along with the ever-present Wild Rose (Rosa sp.) and Wolfberry (Symphoricarpos occidentalis Hook.). Among the forbs there is Prairie Anemone (Anemone patens L. var. wolfgangiana (Bess.) Koch) and Blazing-star (Liatris ligulistylis (Nels.) K. Schum.).

BROOKSIDE BOULEVARD SPECIES LIST Aug. 26 1986

WOODY SPECIES

Amorpha nana Nutt. o
Eleagnus commutata Bernh. f
Rosa sp. f
Symphoricarpos occidentalis Hook. o

GRASSES, SEDGES AND RUSHES

Andropogon gerardi Vitman o
Andropogon scoparius Michx. f
Panicum virgatum L. o
Poa pratensis L. a
Sporobolus heterolepis Gray f

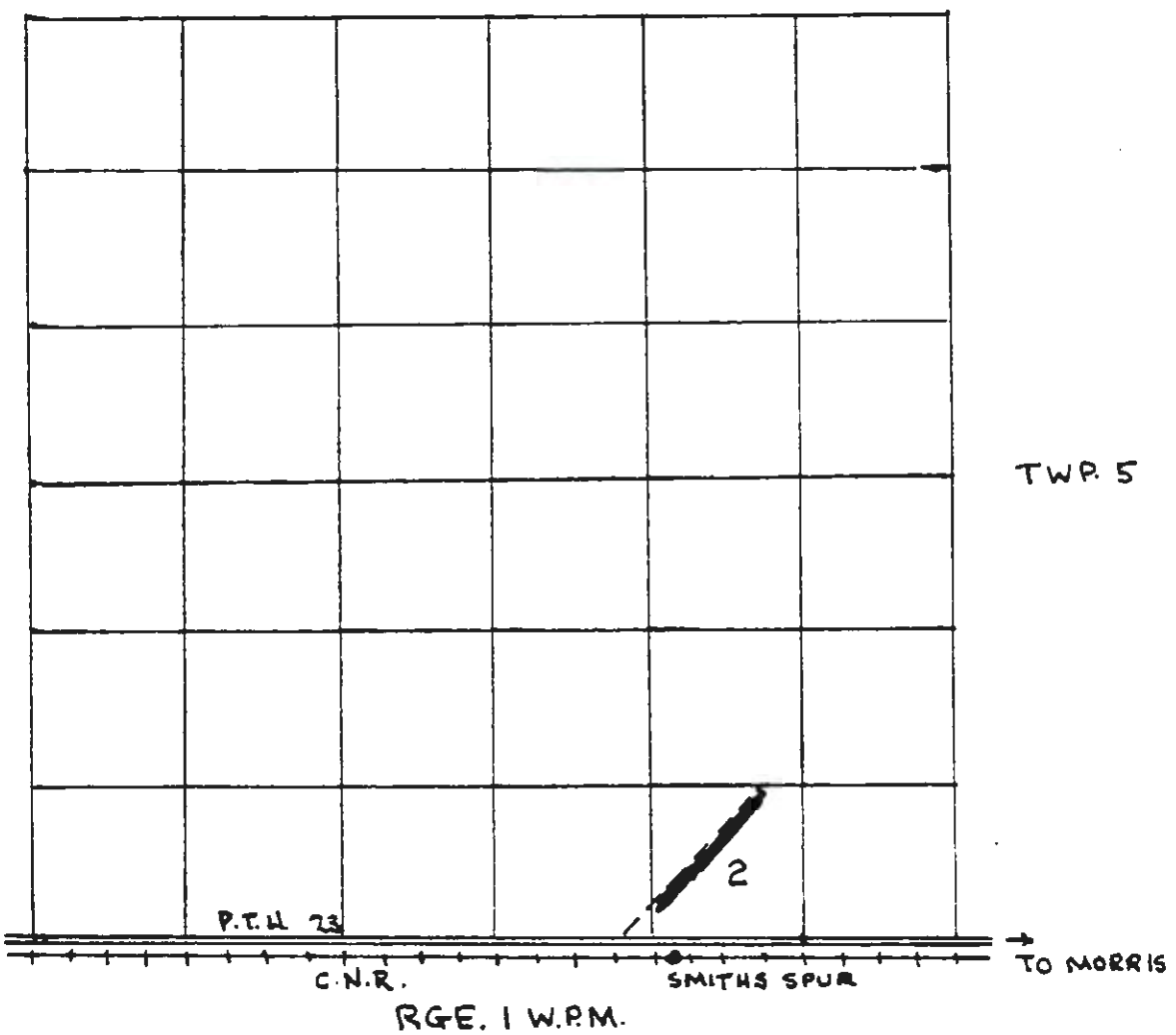
FORBS

Anemone multifida Poir. f
Anemone patens L. var. wolfgangiana (Bess.) Koch f
Asclepias ovalifolia Dcne. o
Aster laevis L. f
Aster pansus (Blake) Cronq. f
Aster ptarmicoides (Nees) T.&G. f
Astragalus caryocarpus Ker r
Campanula rotundifolia L. o
Cirsium flodmanii (Rydb.) Arthur o
Galium septentrionale R.&S. f
Gentiana affinis Griseb. r
Geum triflorum Pursh o
Helianthus laetiflorus Pers. var. rigidus (Cass.) Fern. f
Heuchera richarsonii R.Br. o
Liatris ligulistylis (Nels.) K.Schum. f
Monarda fistulosa L. o
Petalostemum purpureum (Vent.) Rydb. f
Potentilla arguta Pursh o
Psoralea argophylla Pursh o

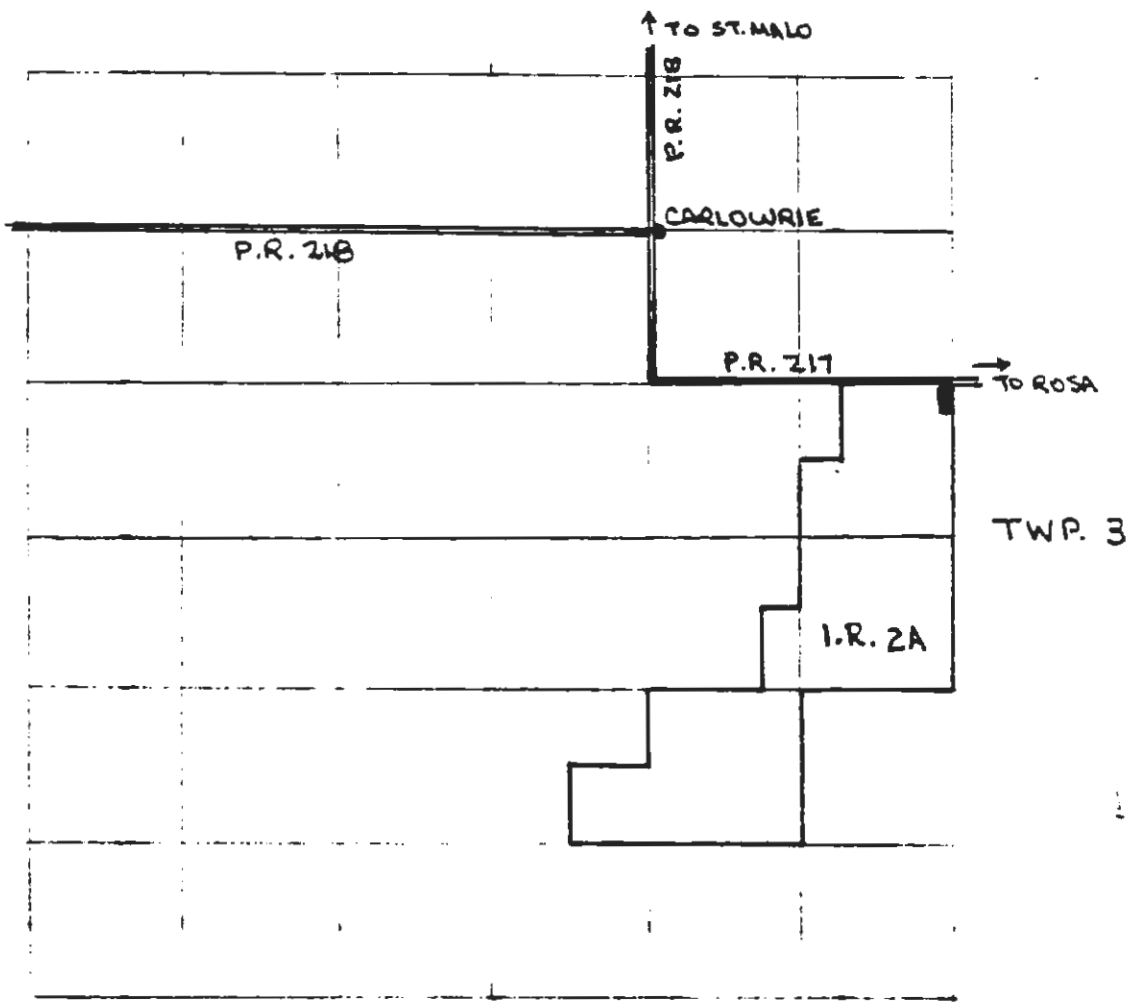
BROOKSIDE BOULEVARD SPECIES LIST Aug. 26 1986

Psoralea esculenta Pursh o
Solidago canadensis L. var. gilvocanescens Rydb. f
Solidago nemoralis Ait. var. decemflora (DC.) Fern. f
Solidago rigida L. f
Thalictrum venulosum Trel. f
Zigadenus elegans Pursh o
Zizia aptera (Gray) Fern. o

SMITHS SPUR

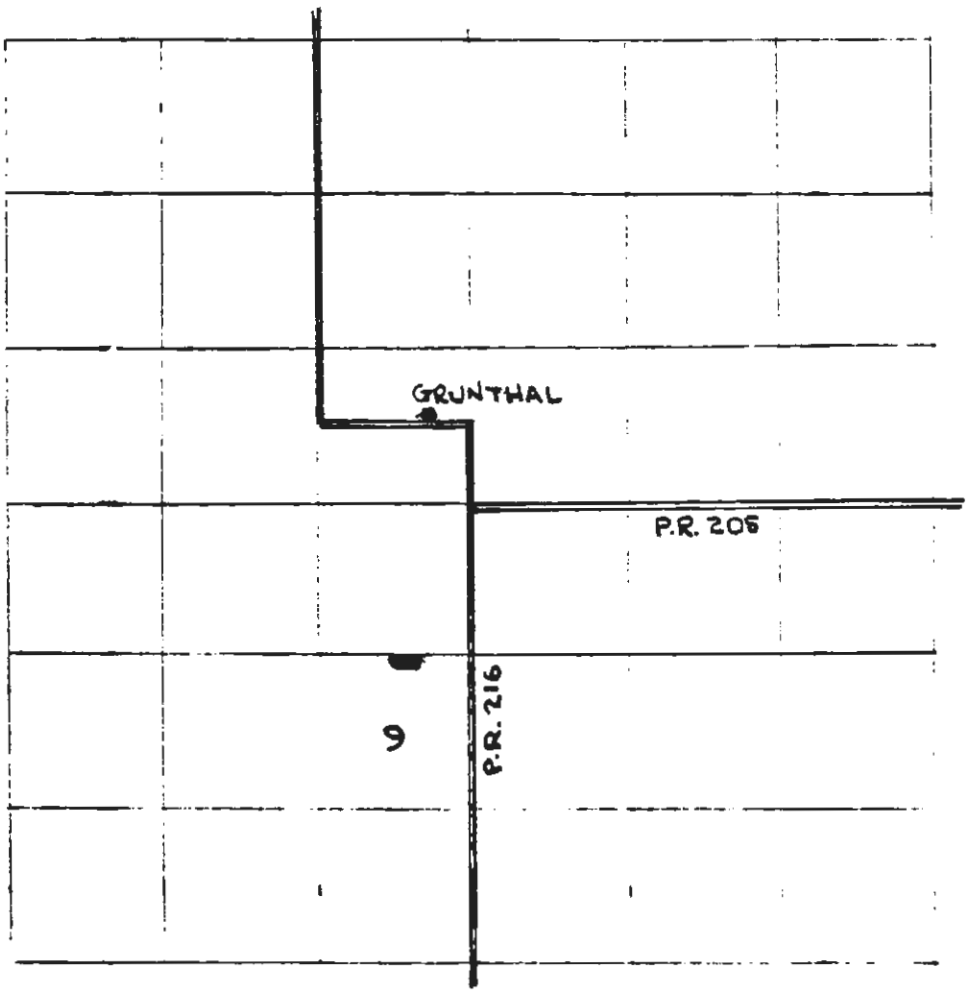


INDIAN RESERVATION 2A



RGE. 4 E.P.M.

GRUNTHAL



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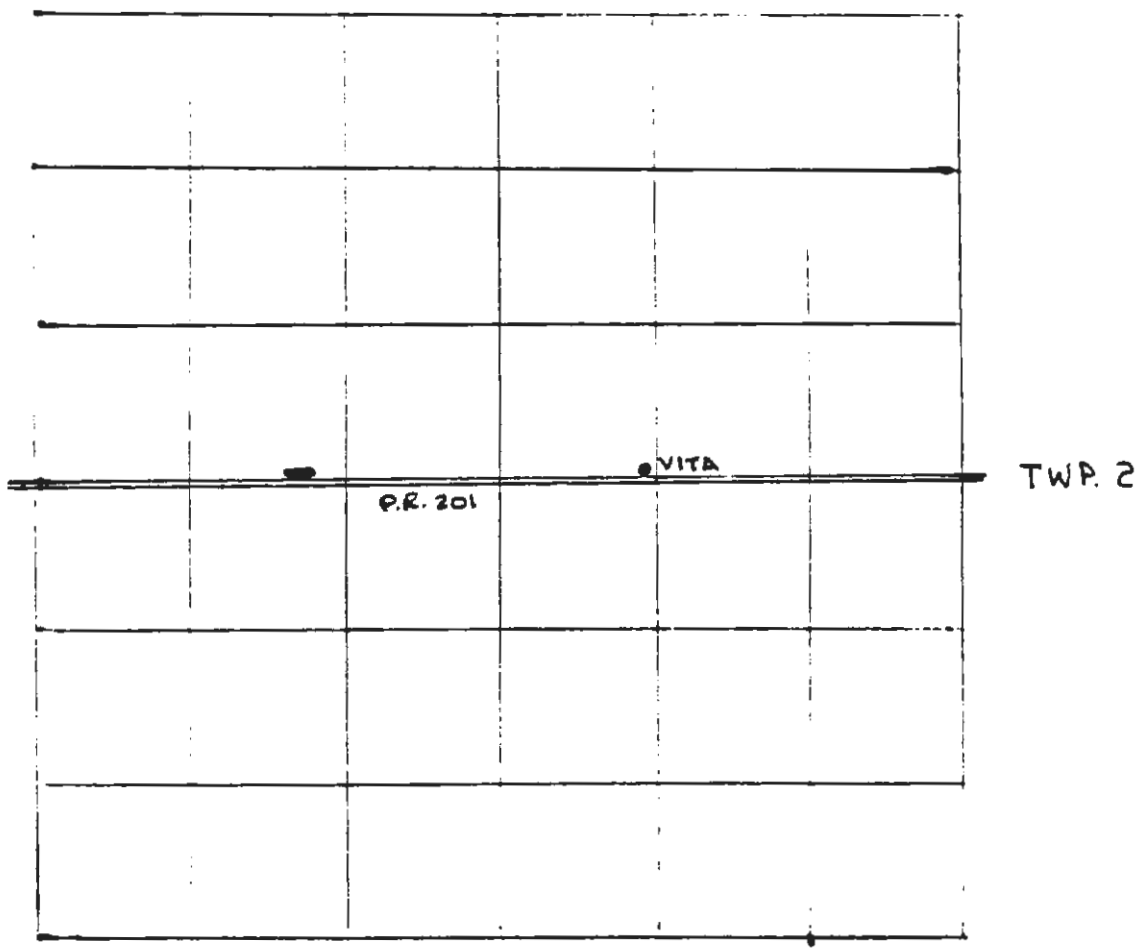
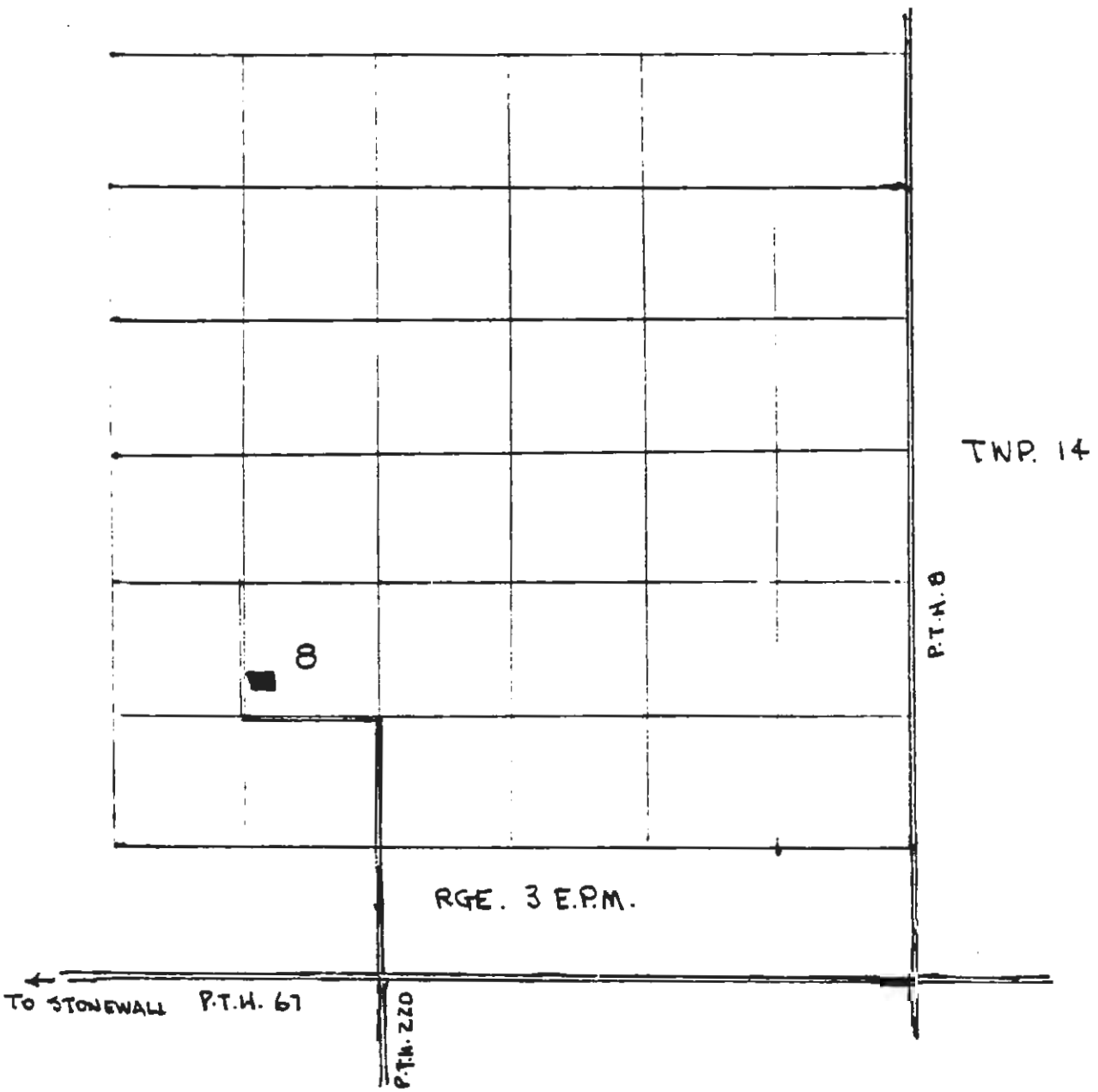
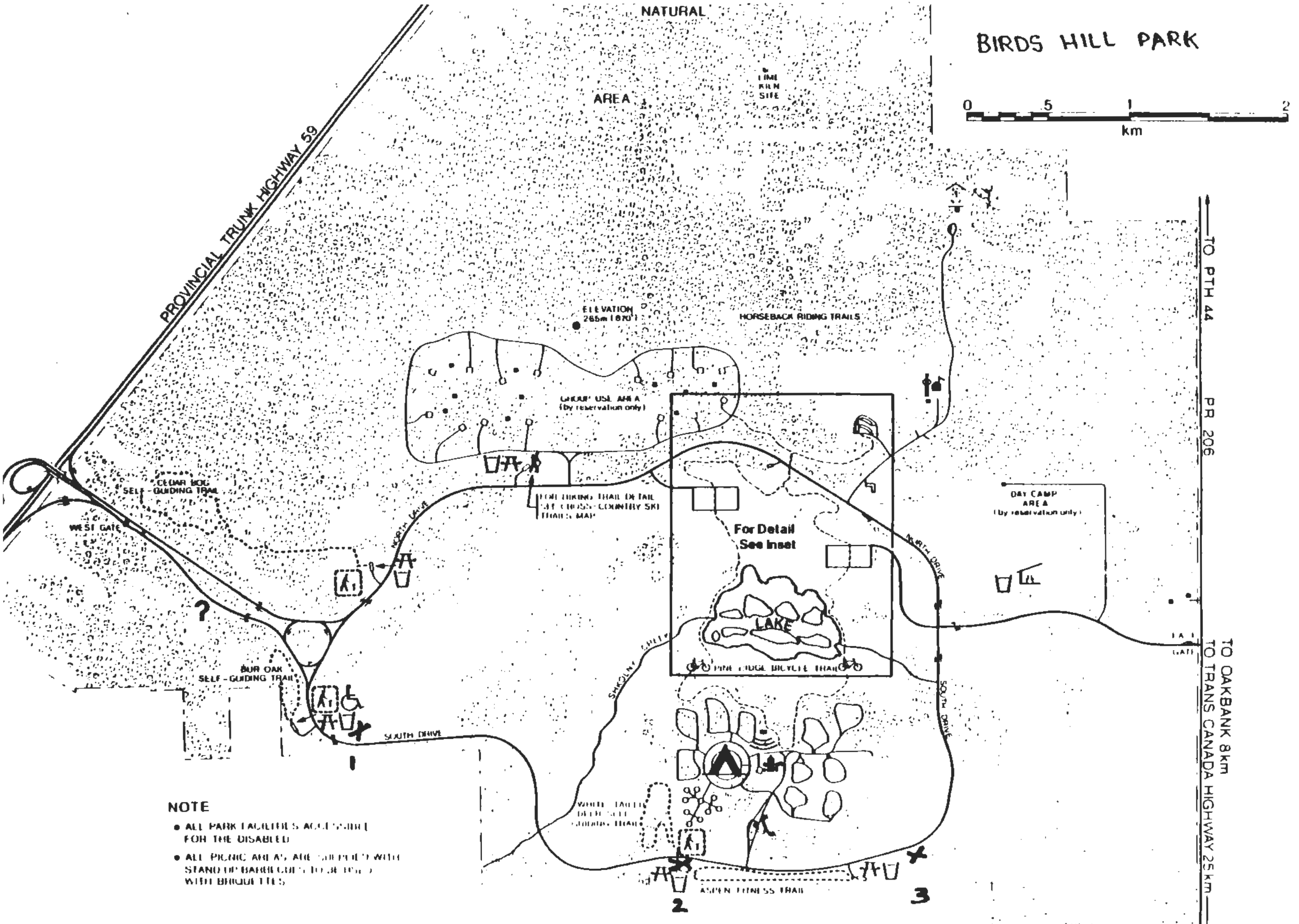


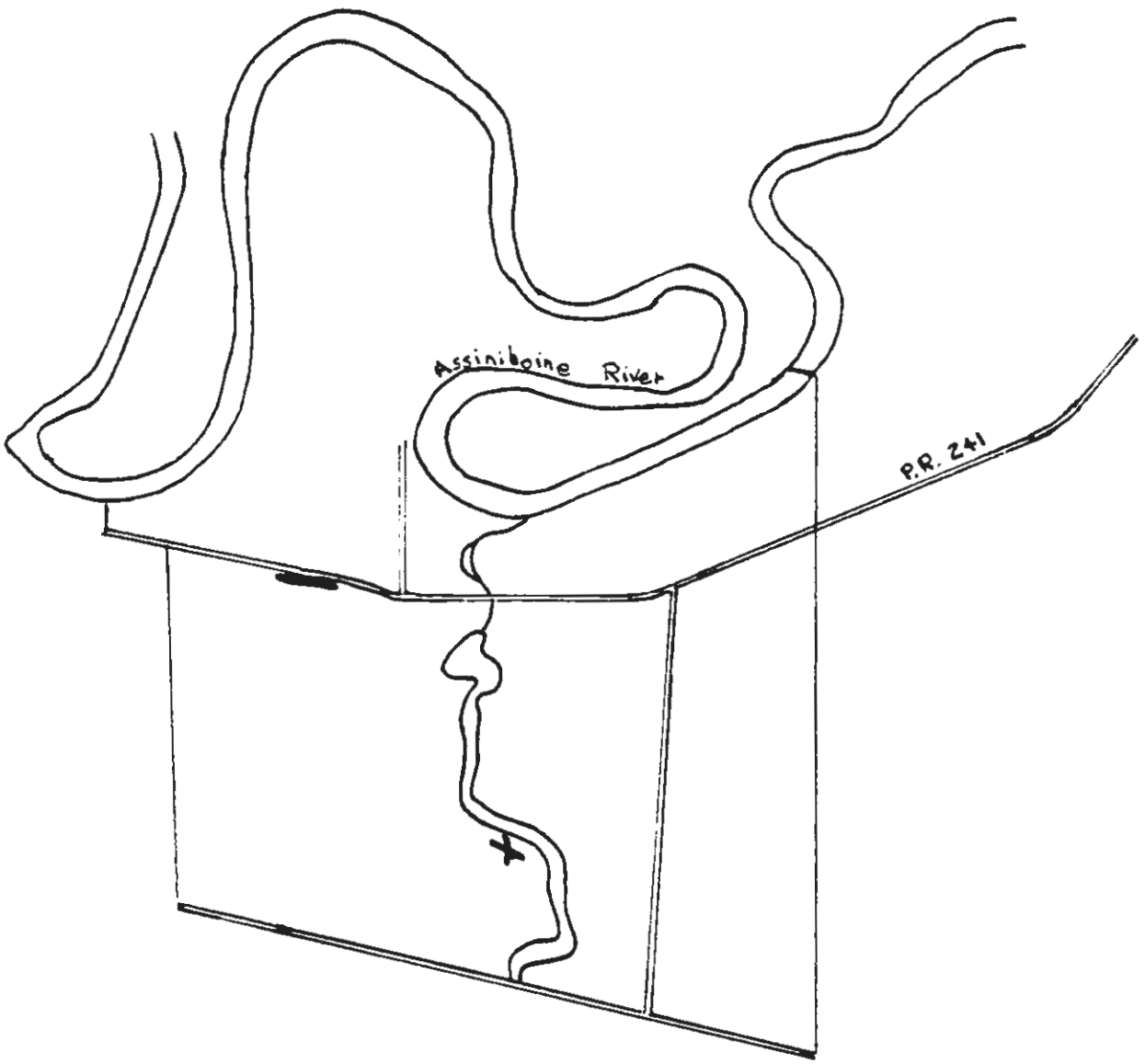
OAK HAMMOCK



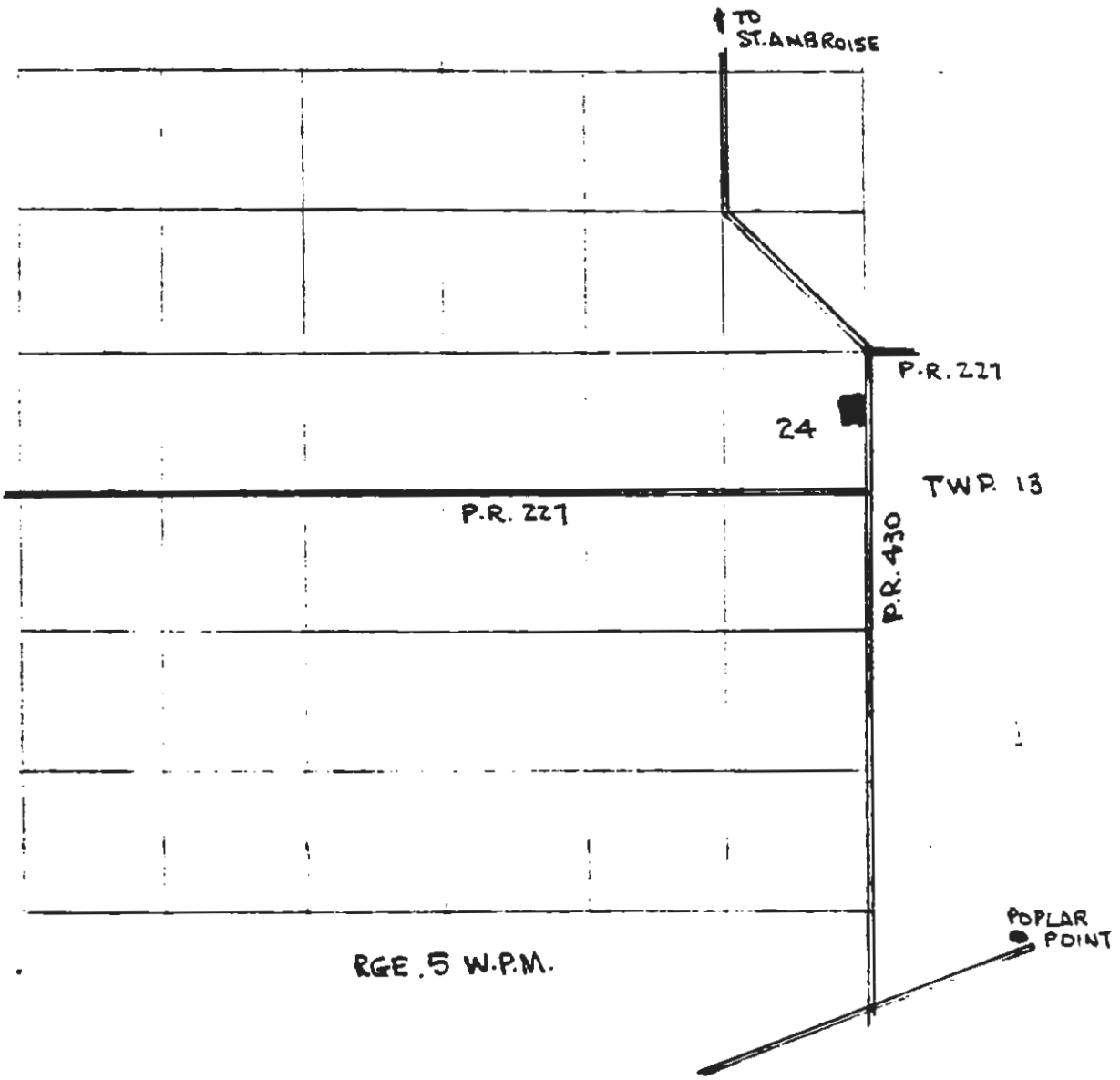


1 ANDROPOGON - STIPA SITE 2 PRAIRIE POCKET 3 GEUM TRIFLORUM MEADOW

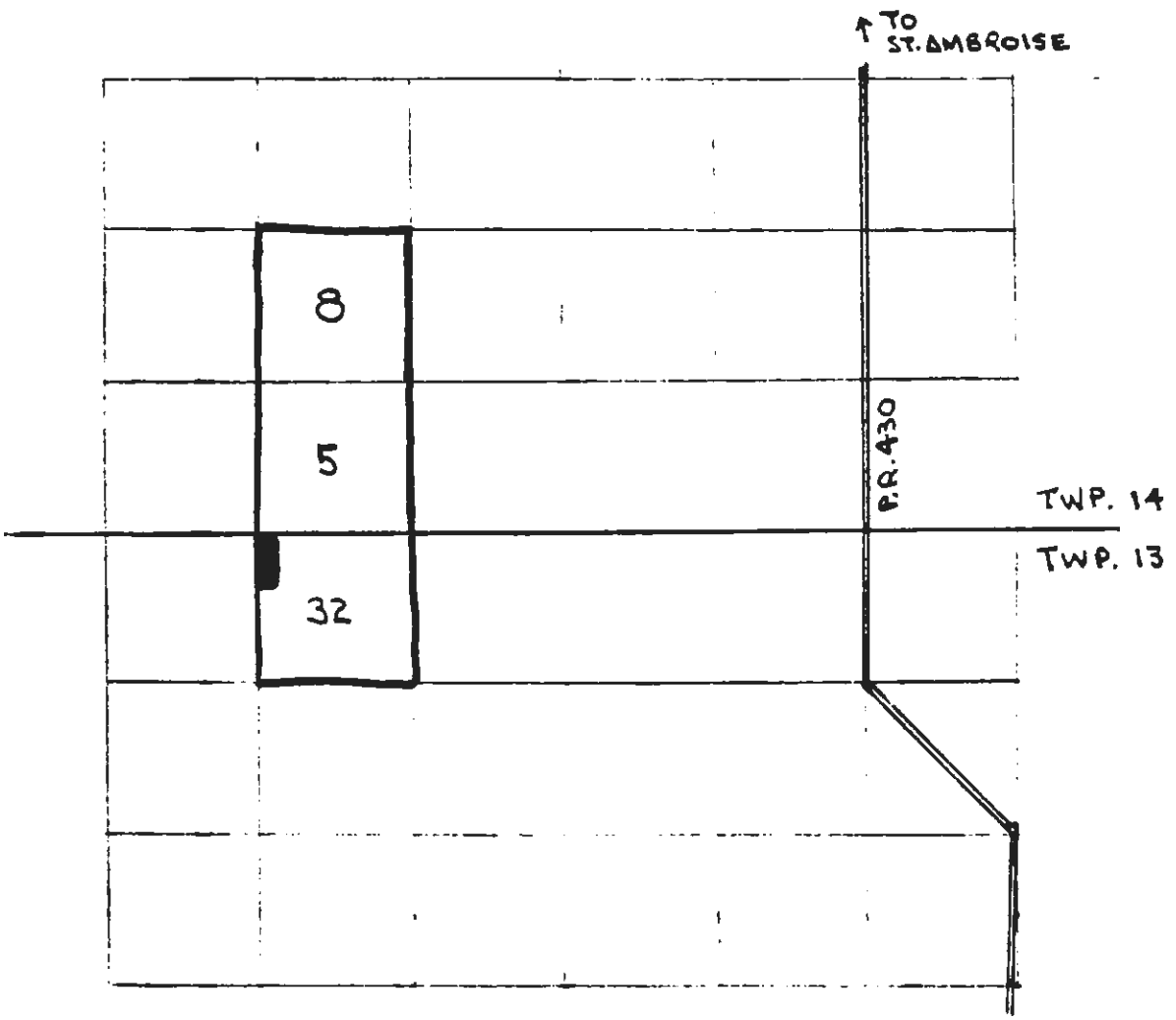
BEAUDRY PROVINCIAL PARK



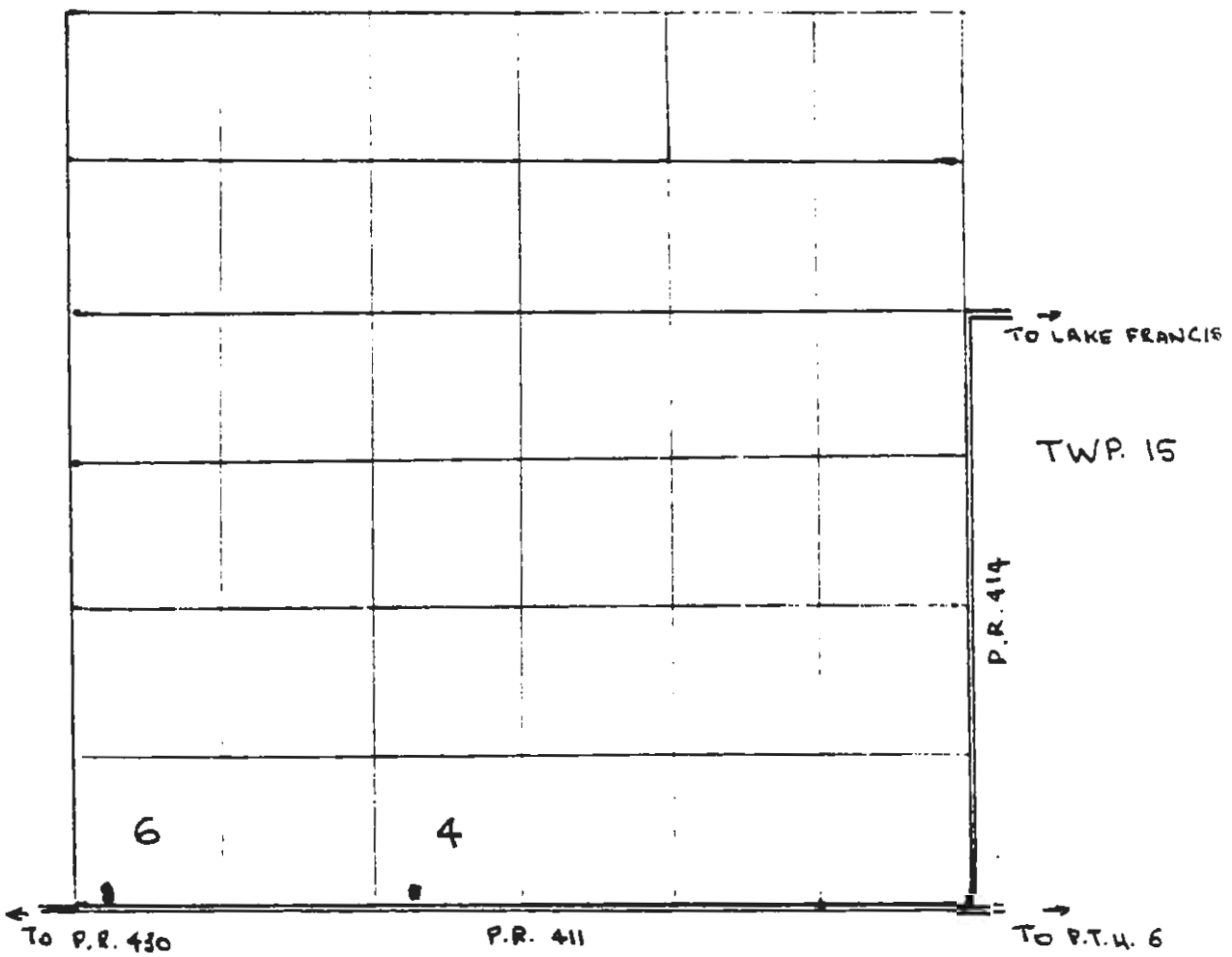
PASTURE NORTH OF POPLAR POINT



FORMER McCABE RANCH

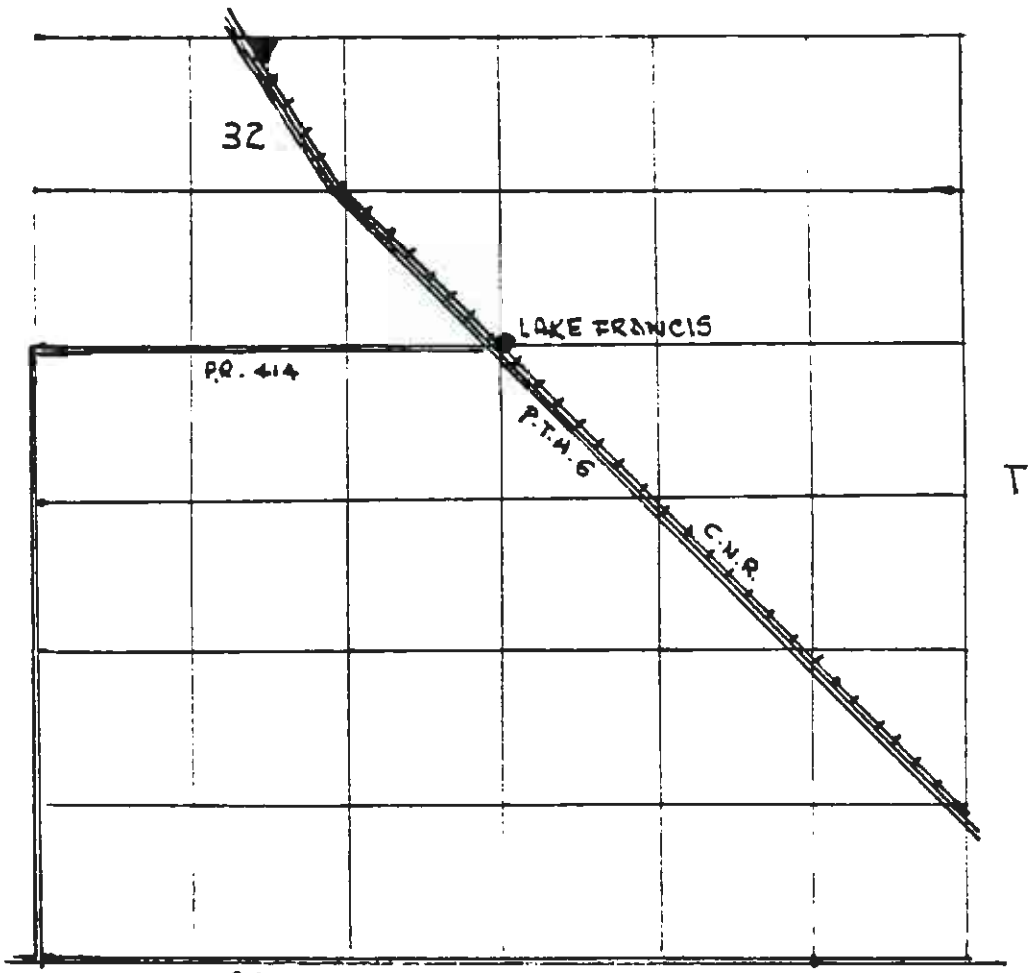


ST. AMBROISE



RGE. 4 W.P.M.

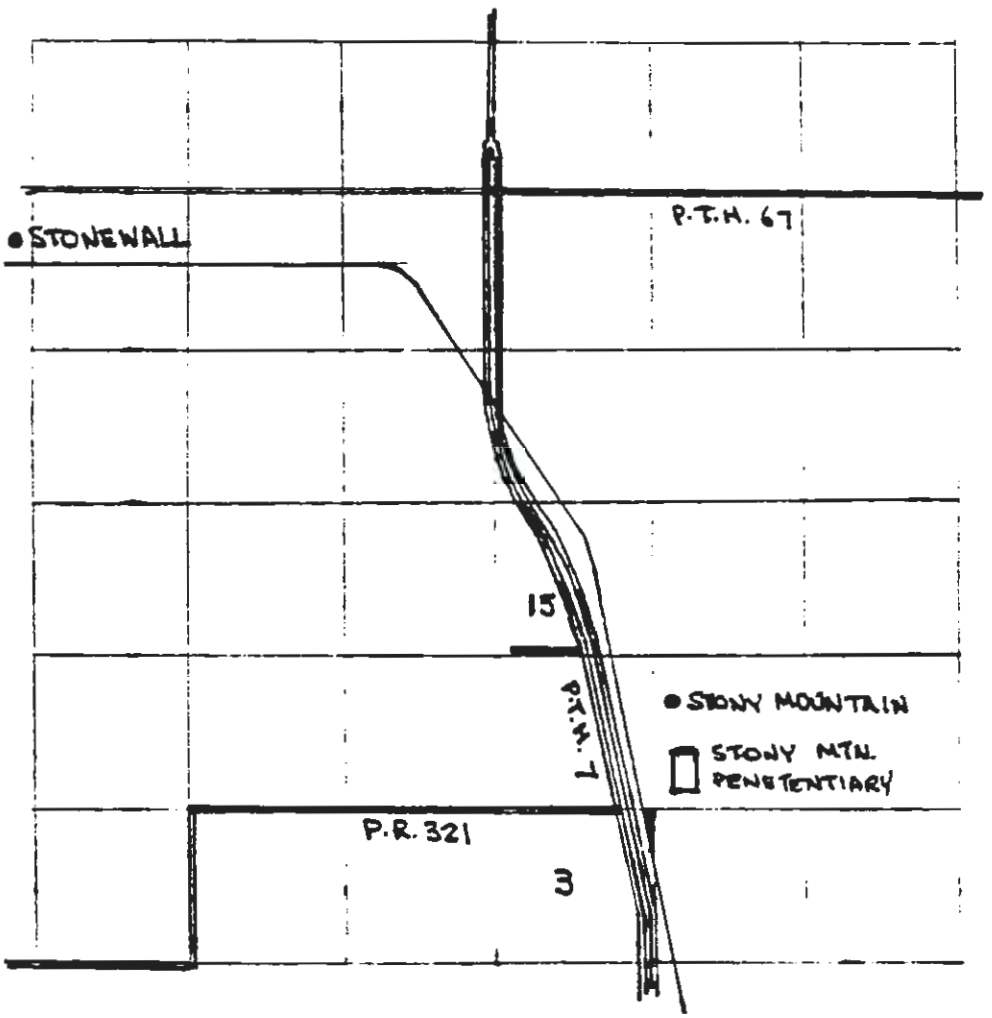
LAKE FRANCIS



TWP. 15

RGE. 3 W.P.M.

STONY MOUNTAIN

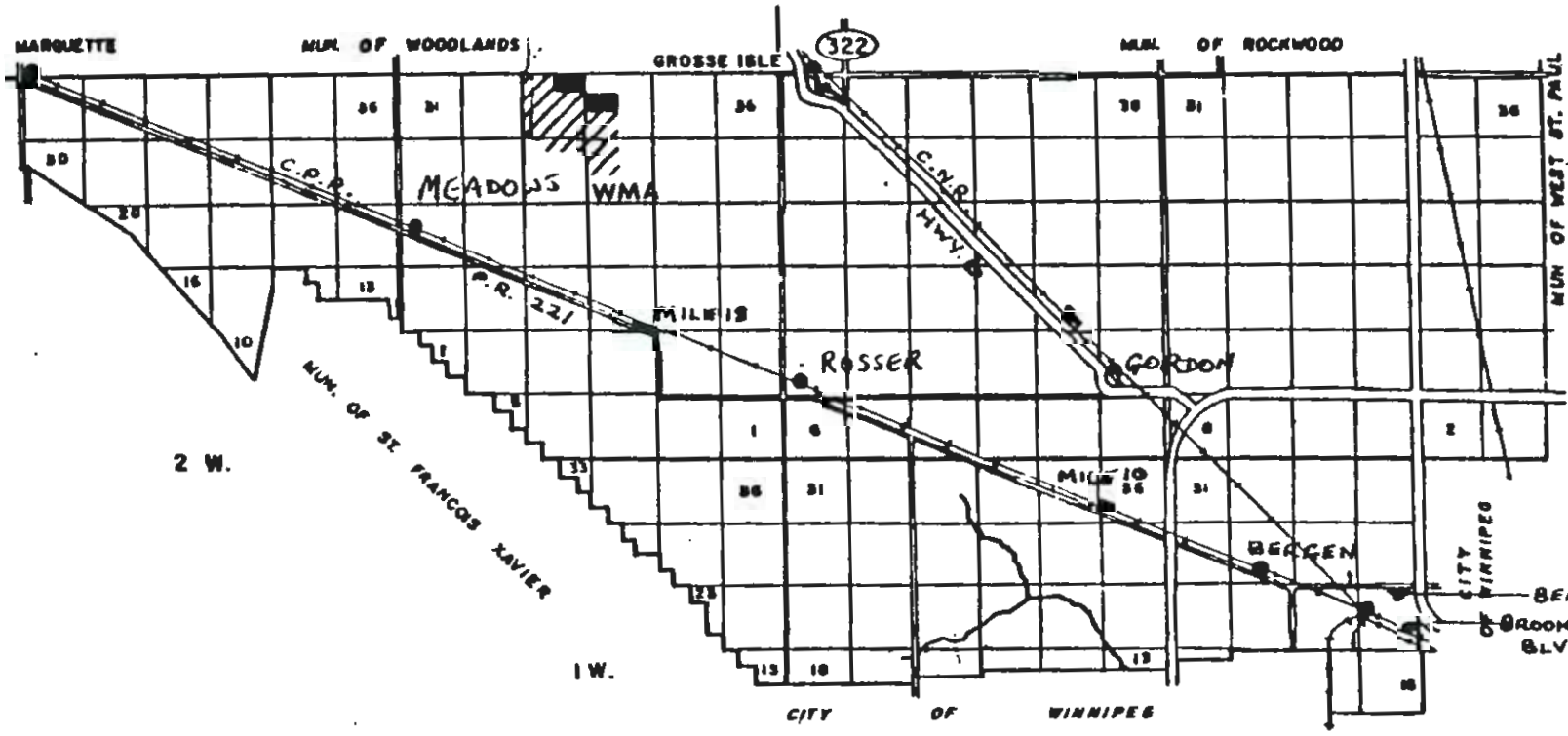


MUN. OF ROSSER

Last Revised: Dec. 31, 1983

Scale: 1 in. = 3 miles

REVISED SEPT. 1970



HWY 6 SITE

P.R. 221 SITES

BERGEN CUT-OFF SITE

BROOKSIDE BLVD. SITE

MASTER SPECIES LIST

WOODY SPECIES

Amelanchier alnifolia Nutt.
Amorpha canescens Pursh
Amorpha nana Nutt.
Arctostaphylos uva-ursi (L.) Spreng.
Betula glandulosa Michx. var. glandulifera (Regel) Gl.
Crataegus sp.
Eleagnus commutata Bernh.
Juniperus horizontalis Moench
Populus tremuloides Michx.
Potentilla fruticosa L.
Prunus pumila L.
Prunus virginiana L.
Quercus macrocarpa Michx.
Rhus radicans L. var. rydbergii (Small) Rehd.
Rosa sp.
Rosa arkansana Porter
Salix sp.
Shepherdia canadensis (L.) Nutt.
Spiraea alba Du Roi
Symphoricarpos occidentalis Hook.

GRASSES, SEDGES AND RUSHES

Agropyron repens (L.) Beauv.
Agropyron trachycaulum (Link) Malte
Agropyron trachycaulum (Link) Malte var. glaucum (Pease & Moore) Malte
Agropyron trachycaulum (Link) Malte var. novae-angliae (Scribn.) Fern.
Agropyron trachycaulum (Link) Malte var. unilaterale (Cassidy) Malte
Agrostis scabra Willd.
Agrostis stolonifera L. var. major (Gaud.) Farw.
Andropogon gerardi Vitman
Andropogon scoparius Michx.
Bouteloua gracilis (HBK.) Lag.
Bromus inermis Leyss.
Bromus purgans L.
Calamagrostis canadensis (Michx.) Nutt.
Calamagrostis inexpansa Gray var. brevior (Vasey) Stebbins
Carex aurea Nutt.
Carex scirpoidea Mchx.
Carex tetanica Schkuhr
Deschampsia cespitosa (L.) Beauv.
Distichlis stricta (Torr.) Rydb.
Elymus canadensis L.
Festuca elatior L.
Festuca rubra L.
Helictotrichon hookeri (Scribn.) Henr.
Hierochloe odorata (L.) Beauv.
Hordeum jubatum L.
Juncus balticus Willd. var. littoralis Engelm.
Juncus longistylis Torr.
Juncus torreyi Coville

MASTER SPECIES LIST - continued

Koeleria cristata (L.) Pers.
Muhlenbergia asperifolia (Nees & Mey.) Parodi
Muhlenbergia richardsonis (Trin.) Rydb.
Panicum leibergii (Vasey) Scribn.
Panicum virgatum L.
Phleum pratense L.
Poa palustris L.
Poa pratensis L.
Puccinellia nuttalliana (Schultes) Hitchc.
Scolochloa festucacea (Willd.) Link
Sorghastrum nutans (L.) Nash
Spartina gracilis Trin.
Spartina pectinata Link
Sphenopholis obtusata (Michx.) Scribn.
Sporobolus cryptandrus (Torr.) Gray
Sporobolus heterolepis Gray
Stipa comata Trin. & Rupr.
Stipa spartea Trin.
Stipa viridula Trin.

FORBS
Achillea millefolium L.
Agastache foeniculum (Pursh) Ktze.
Agoseris glauca (Nutt.) Greene
Allium stellatum Nutt.
Ambrosia psilostachya DC. var. coronopifolia (T.&G) Farw.
Anemone canadensis L.
Anemone cylindrica Gray
Anemone multifida Poir.
Anemone patens L. var. wolfgangiana (Bess.) Koch
Antennaria sp.
Antennaria neodioica Greene
Apocynum cannabinum L. var. hypericifolium (Ait.) Gray
Artemisia absinthium L.
Artemisia caudata Michx.
Artemesia frigida Willd.
Artemisia ludoviciana Nutt. var. gnaphalodes (Nutt.) T.&G.
Asclepias ovalifolia Dcne.
Asclepias speciosa Torr.
Asclepias verticillata L.
Aster laevis L.
Aster pansus (Blake) Cronq.
Aster ptarmicoides (Nees) T.&G.
Aster sericeus Vent.
Aster simplex Willd.
Astragalus canadensis L.
Astragalus caryocarpus Ker
Astragalus goniatus Nutt.
Astragalus striatus Nutt.
Campanula rotundifolia L.
Cerastium arvense L.
Chenopodium rubrum L.

MASTER SPECIES LIST - continued

Cirsium arvense (L.) Scop.
Cirsium flodmanii (Rydb.) Arthur
Comandra umbellata (L.) Nutt. var. umbellata
Convolvulus sepium L.
Cypripedium calceolus L.
Erigeron asper Nutt.
Erigeron canadensis L.
Erigeron glabellus Nutt.
Erigeron philadelphicus L.
Erigeron strigosus Muchl.
Erysimum inconspicuum (Wats.) MacM.
Fragaria virginiana Duchesne
Gaillardia aristata Pursh
Galium septentrionale R.&S.
Gentiana affinis Griseb.
Gentiana amarella L.
Gentiana andrewsii Griseb.
Gentiana crinita Froel.
Geum triflorum Pursh
Glycyrrhiza lepidota (Nutt.) Pursh
Grindelia squarrosa (Pursh) Dunal
Helianthus laetiflorus Pers. var. rigidus (Cass.) Fern.
Helianthus laetiflorus Pers. var. subrhomboideus (Rydb.) Fern.
Helianthus maximilliani Shrad
Heliopsis helianthoides (L.) Sweet var. scabra (Dunal) Fern.
Heuchera richarsonii R.Br.
Hieracium umbellatum L.
Houstonia longifolia Guertn.
Hypoxis hirsuta (L.) Colville
Lactuca tatarica (L.) Meyer
Lathyrus palustris L.
Lathyrus venosus Muhl. var. intonsus Butt. & St.John
Lepidium densiflorum Schrad.
Liatris ligulistylis (Nels.) K.Schum.
Lilium philadephicum L.
Linum lewisii Pursh
Linum sulcatum Riddell
Lithospermum canescens (Michx.) Lehm.
Lobelia spicata Lam. var. hirtella Gray
Medicago lupulina L.
Medicago sativa L.
Melilotus alba Desr.
Melilotus officinalis (L.) Lam.
Mirabilis hirsuta (Pursh) Macm.
Monarda fistulosa L.
Oenothera biennis L.
Orthocarpus luteus Nutt.
Oxytropis sp
Penstemon gracilis Nutt.
Pedicularis canadensis L.
Petalostemum candidum (Willd.) Michx.
Petalostemum purpureum (Vent.) Rydb.

MASTER SPECIES LIST - continued

Physalis virginiana Mill.
Plantago eriopoda Torr.
Polygala verticillata L. var. isocycla Fern.
Polygonatum biflorum (Walt.) Ell.
Polygonatum canaliculatum (Muhl.) Pursh
Polygonum convolvulus L.
Potentilla anserina L.
Potentilla arguta Pursh
Potentilla millegrana Engelm.
Potentilla pensylvanica L.
Potentilla pensylvanica L. var. bipinnatifida (Dougl.) T.&G.
Prenanthes racemosa Michx.
Prunella vulgaris L. var. lanceolata (Barton) Fern.
Psoralea argophylla Pursh
Psoralea esculenta Pursh
Ratibida columnifera (Nutt.) Wooton & Standl.
Rudbeckia serotina Nutt.
Sanicula marilandica L.
Senecio aureus L.
Senecio congestus (R. Br.) DC.
Senecio plattensis Nutt.
Senecio pauperculus Michx.
Silene cserei Baumg.
Sisyrinchium montanum Greene
Smilacina stellata (L.) Desf.
Solidago canadensis L.
Solidago canadensis L. var. gilvocanescens Rydb.
Solidago gigantea Ait. var. serotina (Ait.) Conq.
Solidago graminifolia (L.) Salisb. var. major (Michx.) Fern.
Solidago hispida Muhl.
Solidago missouriensis Nutt.
Solidago nemoralis Ait. var. decemflora (DC.) Fern.
Solidago rigida L.
Sonchus arvensis L. var. glabrescens Guenth., Grab., & Wimm.
Stachys palustris L. var. pilosa (Nutt.)Fern.
Steironema ciliatum (L.) Raf.
Thalictrum dasycarpum Fisch. & Lall.
Thalictrum venulosum Trel.
Tragopogon dubius Scop.
Triglochin maritima L.
Trifolium hybridum L.
Trillium cernuum L.
Vicia americana Muhl.
Vicia americana Muhl. var. angustifolia Nees
Vicia americana Muhl. var. truncata (Nutt.) Brewer
Vicia cracca L.
Viola pedatifida G. Don
Zigadenus elegans Pursh
Zizia aptera (Gray) Fern.

CONCLUSIONS

While much of the Tall-grass Prairie has disappeared, some remaining examples are now protected and many small remnants such as those described in this report still survive. Nearly all these remnants, however, are not located on the deep Black soils normally associated with Tall-grass Prairie and occur in the Aspen Parkland zone.

The best stand of Andropogon gerardi Vitman found this summer is located at the Lake Francis site. Although this site is only one or two hectares in area, the occurrence of Indian Grass (Sorghastrum nutans (L.) Nash) makes it rather unique.

A good example of a drier prairie is that at Stony Mountain. Unfortunately, there is a house and yard on it now, but an area of roughly four hectares remains. Andropogon gerardi Vitman, Andropogon scoparius Michx. and other prairie grasses are well represented in addition to a population of Anemone patens L. var. wolfgangiana (Bess.) Koch and a variety of other prairie species. By early August the grass had been cut for hay, but the site is otherwise undisturbed.

The middle section at the former McCabe Ranch (section 5, township 14, range 5 west) may be worth an investigation before haying season next year. A small ridge in an adjacent section supports a prairie vegetation. The rest of the property is heavily grazed.

In Birds Hill Provincial Park, because of the survival of many prairie remnants, it would be relatively easy to restore some Tall-grass Prairie by setting aside a grassland area (one not sown with introduced species) and leaving it undisturbed. In carrying out such a project it would be important to select an area where the soil and local drainage

conditions would be capable of sustaining a Tall-grass Prairie community as some drier areas within the park support only a Mixed-grass Prairie.

Several of the other remnants described could provide seed sources for the prairie restoration project at Beaudry Provincial Park. One of the best of these is the strip of prairie along Highway 6.

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H

Management of Burrowing Owls in Manitoba: Population Distribution and Plan for Recovery

By

Kenneth A. Thomson

For

Manitoba Department of Natural Resources
Wildlife Branch

July 1986

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LIST OF FIGURES

Chapter I

INTRODUCTION

1.1 BACKGROUND

The western subspecies of the burrowing owl (Athene cunicularia) breeds in western North America from interior British Columbia to southwestern Manitoba to western Louisiana and central Mexico.

The owl winters in the southern portion of its breeding range. The breeding range approximates the ranges of Richardson's ground squirrel (Spermophilus richardsonii) and the American badger (Taxidea taxus) (Figure1).

From about 1890 to the mid-20th century the owl was common in certain areas within its range . Since then there has been a substantial decline in population and now the bird is no longer found in many districts it formerly inhabited (Wedgwood,1978).

The burrowing owl is protected in Manitoba through regulations under the Manitoba Wildlife Act (1980 and amendments) which prohibit the killing of raptors. The owl is also protected in international trade by the Convention on International Trade in Endangered Species (CITES).

Figure 1: Breeding range of the burrowing owl
Adopted from: Karalus and Eckert, 1974.

Basic factors essential to good burrowing owl habitat are open grassland; short vegetation; and burrow availability. Most habitat is found in grazed pastures. Suitable pastures are found on ranches, community pastures and on stock and barnyard pastures.

There are several known and possible limiting factors causing a decline of the species across its range (Ratcliff, 1984, Dunbar, 1983, Wedgwood, 1978.):

1. The loss of open ,short grass to cultivation and urbanization.
2. The loss of nest burrows through eradication of burrowing mammals or the destruction of burrows for pasture improvements.
3. Chemical contaminants through pesticide spraying, especially for grasshoppers, and through rodent poisoning.
4. Roadkill loss of birds.
5. Shooting of owls intentionally or accidentally.
6. Predation by wild animals and by feral cats.

1.2 PROBLEM STATEMENT

In 1979, the burrowing owl was officially classified as a threatened species in Canada by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). The COSEWIC report estimated Manitoba's burrowing owl population at 110

pairs. Subsequently Ratcliff (1984) estimated population levels at 76 pairs in 1982; 60 pairs in 1983; and 35 pairs in 1984. Although there was no formal survey conducted in 1985, the same number of pairs were observed, by D.N.R. personnel, as in 1984 (35). This marked decline indicates the need to continue monitoring the status and distribution of burrowing owls in Manitoba and, in order to ensure a future population, to implement a recovery plan to enhance breeding opportunities for the burrowing owl in Manitoba.

1.3 RESEARCH OBJECTIVES

The objectives of this study are:

1. To continue monitoring the distribution of the burrowing owl and habitat availability in selected areas of Manitoba.
2. To assess possible causes of decline in Manitoba.
3. To prepare a provincial recovery plan for the burrowing owl in Manitoba which will include;
    i) locations for re-introduction,
    ii) sources of captive-raised burrowing owls,and re-introduction schedule
    iii) protection and education programs and,
    iv) long term management requirements.

1.4 METHODS

1. Undertake a literature review examining the historical records of burrowing owl nesting habitat in the northeast portion of its range (this would include southwest Manitoba and proximal areas of North Dakota and Saskatchewan); use of pest and rodent control chemicals; protection and education programs; and other relevant considerations.
2. Re-establish landowner contacts identified in Ratcliff (1984) in order to locate birds and burrows for continued monitoring of a minimum breeding population. This will be carried out in conjunction with banding operations and through personal visits and telephone communications.
3. Conduct interviews with contact landowners in order to determine owl status, use of pesticides and rodenticides, and possible land use changes to owl habitat. These interviews will also be used to determine the extent of roadkill and other deaths of owls and to determine other possible limiting factors.
4. Document availability of selected crown land areas and determine suitability for owl habitat.

1.5 CRITICAL PATH

1.	First Committee Meeting	June 1986
2.	Field Work	June/July/Aug. 1986
3.	Analyze Data	Sept./Oct. 1986
4.	Draft First Report	Nov./Dec.'86 Jan. 1987
5.	Second Committee Meeting	Jan. 1987
6.	Draft Final Report	Feb./March 1987
7.	Final Committee Meeting/Oral	March 1987

1.6 BUDGET

Salary	
Researcher	
@ $1200/month x 4 months	$4800
@ $300/month x 8 months	$2400
Board and room	$900
Vehicle mileage	$1300
Telephone and postage	$300
Cartography costs	$500
Computer Services	
- supplied by N.R.I.	$1000
Total	$11,200

1.7 POTENTIAL CLIENTS

1. Wildlife Branch - Manitoba Department of Natural Resources.
2. Manitoba Wildlife Federation
3. World Wildlife Fund of Canada - Wild West Program.
4. Manitoba Naturalists Society
5. Manitoba Habitat Heritage Inc.

Chapter II

REVIEW OF RELATED LITERATURE

2.1 INTRODUCTION

As the title of this practicum suggests there are two distinct components under study. First, a 'population distribution' component to continue to monitor the owls' status in Manitoba and second, a 'plan for recovery' component to ensure a viable future population level. Accordingly, the literature review concentrates on distribution information and conservation/management information. Each of the two component areas will be examined individually in this section in order to provide clarity.

2.2 POPULATION DISTRIBUTION

2.2.1 North American Population Distribution

As mentioned in the Background section of this practicum, the western burrowing owl breeds in North America from interior British Columbia to southwestern Manitoba to western Louisiana and central Mexico. The owl winters in the southern portion of its breeding range in the United States, south to Honduras and occasionally to Panama (Zarn

1974). Butts (1976) pointed out that burrowing owls as far south as the Oklahoma Panhandle migrate south during winter.

In the United States the burrowing owl population has experienced a decline throughout its range. Zarn (1974) wrote that the owl was declining in many areas of former abundance throughout the western states. Further evidence of this decline was recorded for burrowing owl populations in Utah (Hoffman 1977) and the middle Pacific region of the Western U.S. (Smith 1977).

From the late 1800's to the mid-20th Century, the owl was locally common on the Canadian prairies although it was relatively scarce overall.(Dunbar, 1983) Since then there has been a substantial decline in their populations. Wedgwood (1978) suggested that while the duration of the decline is uncertain, the owl is no longer found in many districts it formerly inhabited. He considered that the burrowing owl was an "accidental wanderer" in central Canada, a scarce breeder on the prairies and possibly an "accidental breeder" in the southern interior of British Columbia. Fyfe's (1976) earlier findings generally concurred with Wedgwood's as he found British Columbia's burrowing owl population to be in decline and their relative abundance low. The listing of burrowing owl pairs as "none confirmed" in Wedgwood's (1978) COSEWIC report just two years later revealed just how rapid this decline may be. The populations in Alberta and Saskatchewan were estimated

at 610 pairs and 1280 pairs respectively in the COSEWIC report (Wedgwood 1978). These numbers are substantially higher than the 110 pairs for Manitoba and the "none confirmed" pairs for British Columbia, and Fyfe (1976) considered the Alberta and Saskatchewan populations stable and abundant. However, the COSEWIC report found that from 1970 through 1977, based on the opinions of managers/operators of community pastures, a net decrease in owls of 7% in Saskatchewan and 9% in Alberta had occurred (Wedgwood 1978). Despite controversy over the absolute stability of the Alberta and Saskatchewan populations, those populations are generally stable relative to Manitoba's.

2.2.2 Manitoba Population Distribution

Fyfe (1976) reported the trend in population and relative abundance of the burrowing owl to be declining in Manitoba. These trends, as previously noted, were confirmed by COSEWIC's report of an estimated 110 pairs in 1978 and Ratcliff's (1984) subsequent figures of 76, 60, and 35 pairs for the years 1982 through 1984.

Historical record of the distribution of the burrowing owl are limited. A. G. Lawence's Winnipeg Free Press "Chickadee Notes" column did record, however, a map showing the owls distribution from 1922- 1955 (Figure2). Although the accuracy of sightings and the actual population levels they represent are somewhat lacking, the map does show the

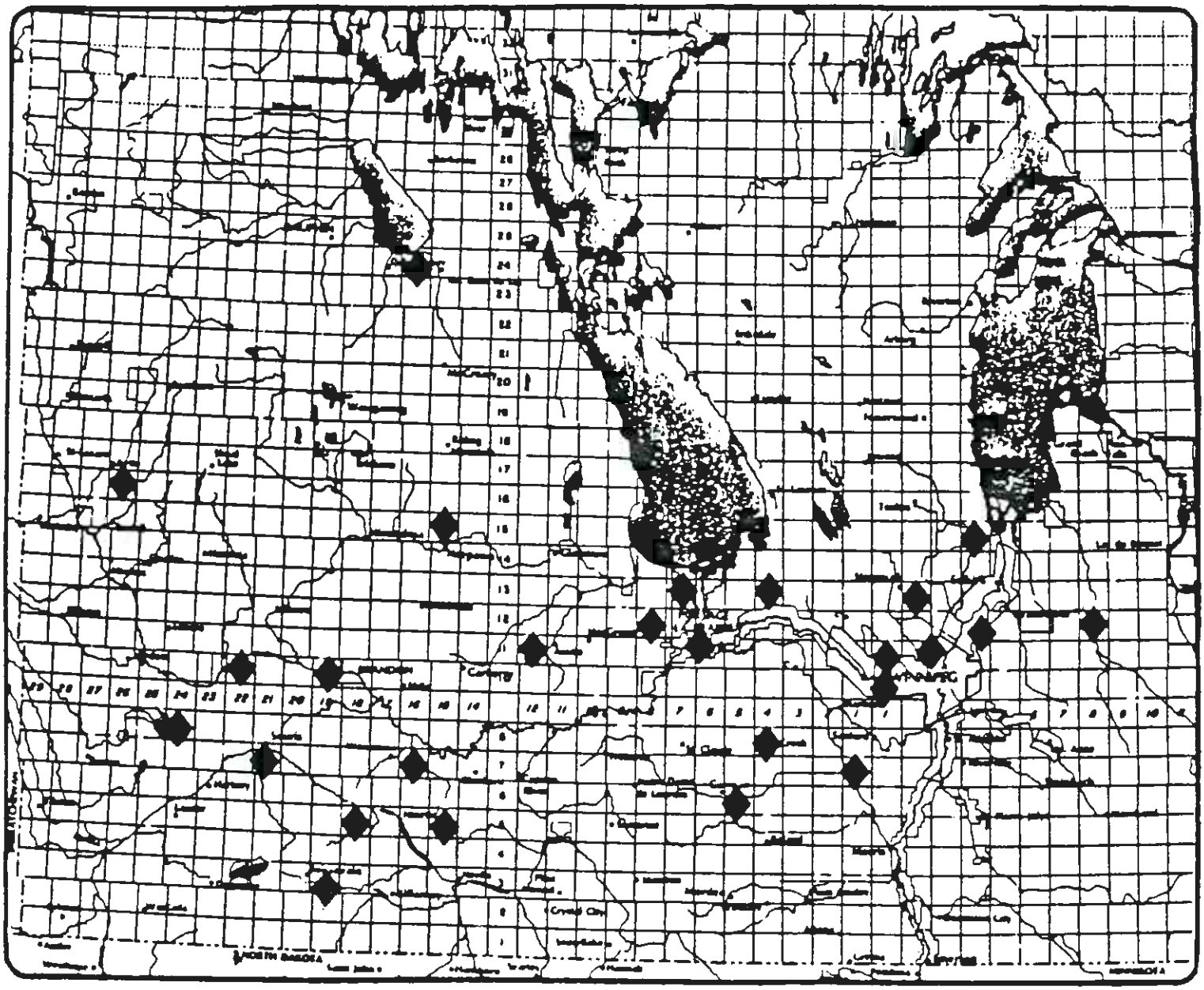
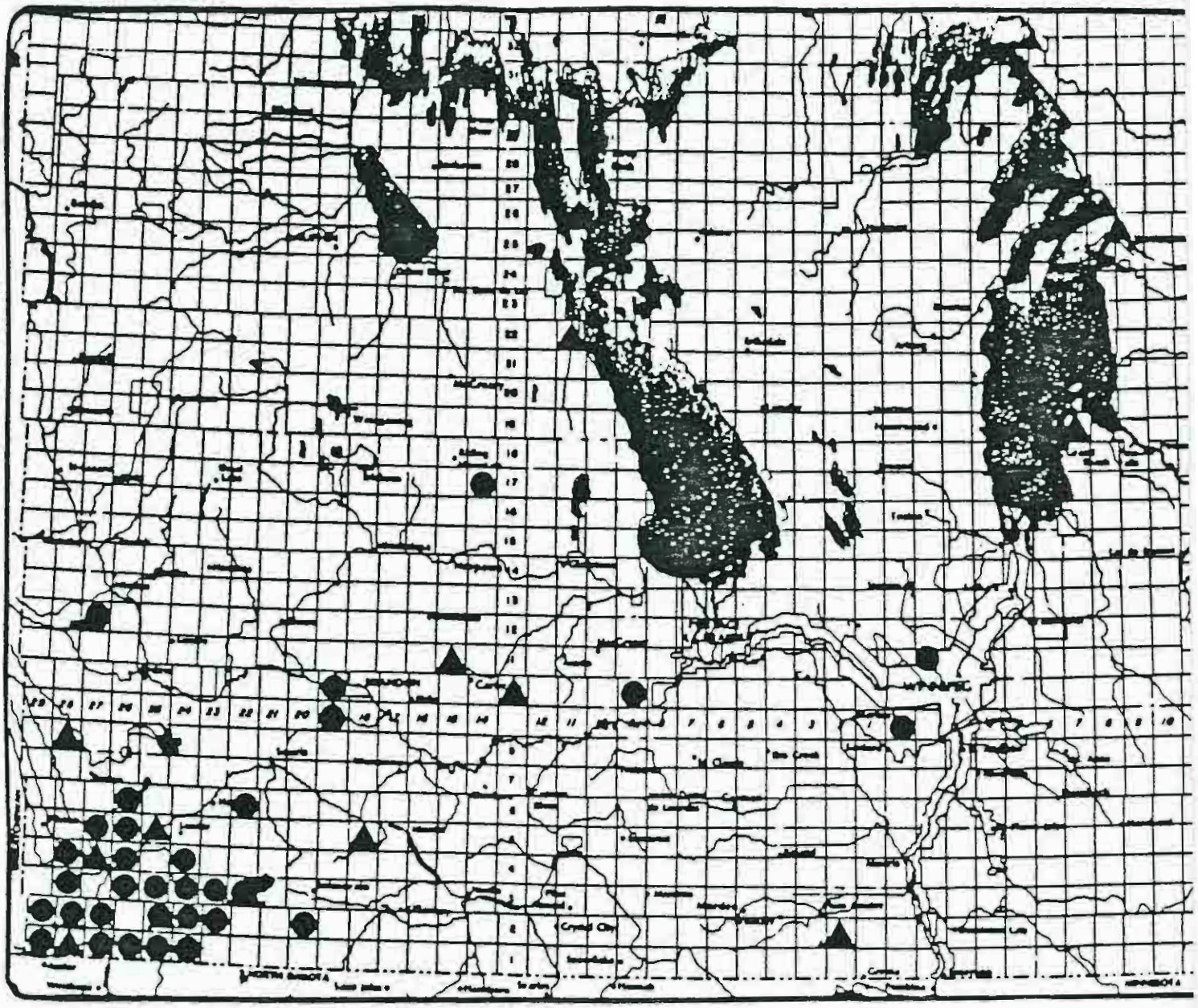


Figure 2: Historical record of burrowing owls
Lawrence,A.G. in Ratcliff (1984)

once greater extent eastward of the owl's distribution. Ratcliff (1984) found that landowners surveyed in his study of the burrowing owl in Manitoba indicated that the owls were fairly common from 1930 to 1960 across the same general area, supporting the distribution illustrated by Lawrence. Additionally, the landowners concurred with the trend of decline in Manitoba, especially since the 1960's. Ratcliff's "Burrowing Owl Site Distribution" maps from 1982 through 1984 indicate the declining population and distribution over this three year study. (Figures3,4,5)

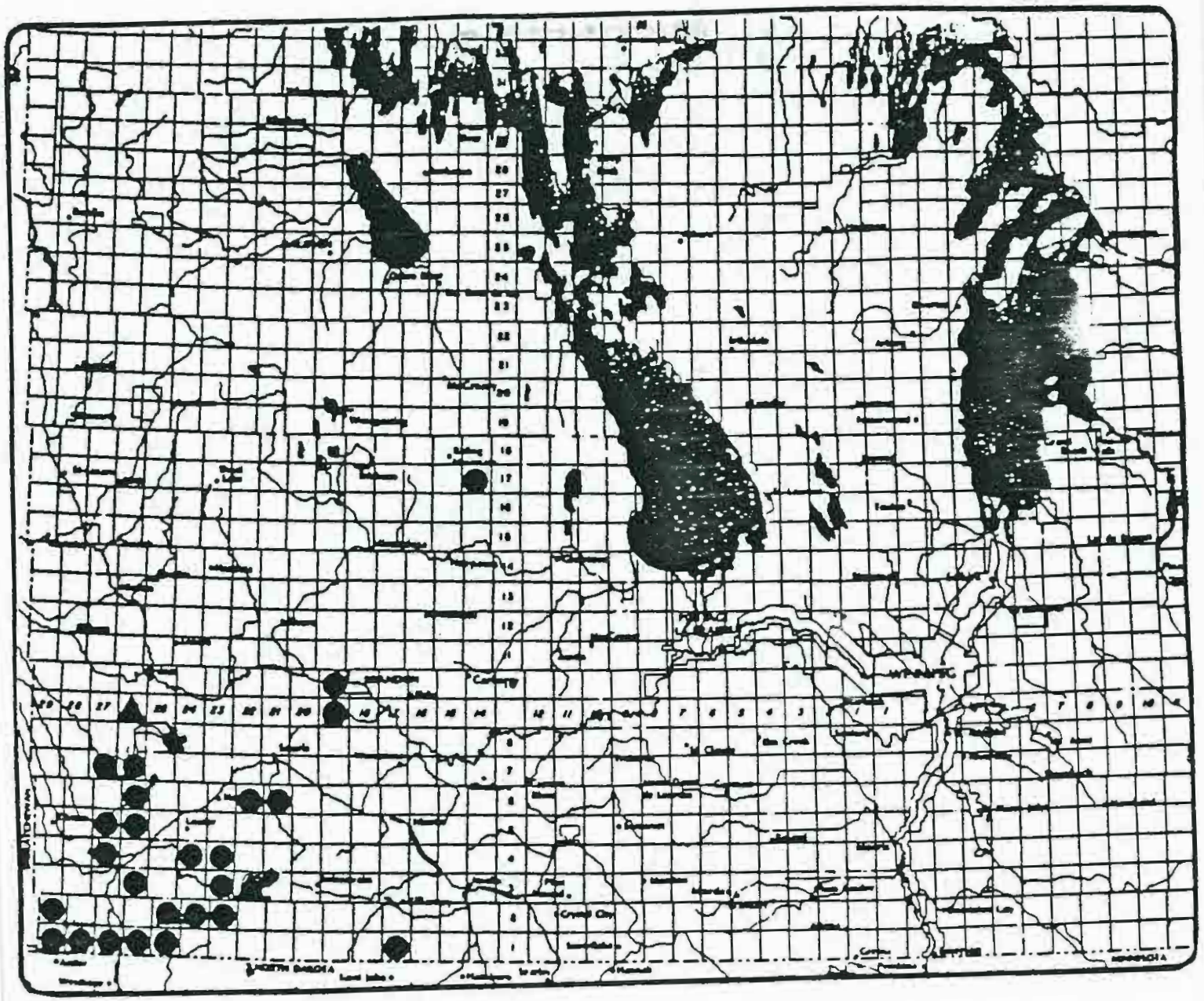
Manitoba represents the northeastern extent of the Burrowing Owl's range in North America. Ratcliff's (1984) 3 year study was the first in-depth study to examine and document the status and distribution of the burrowing owl at this edge of it's range. This is of special significance for two reasons. First, the study of any species of fauna at the edge of it's range requires special scrutiny because of various potential biological "edge effects" on the population, and second, as Wedgwood(1978) pointed out "American data are not necessarily applicable to the more northern population."



● Township with one or more pairs.

▲ Township with sighting of adult owl.

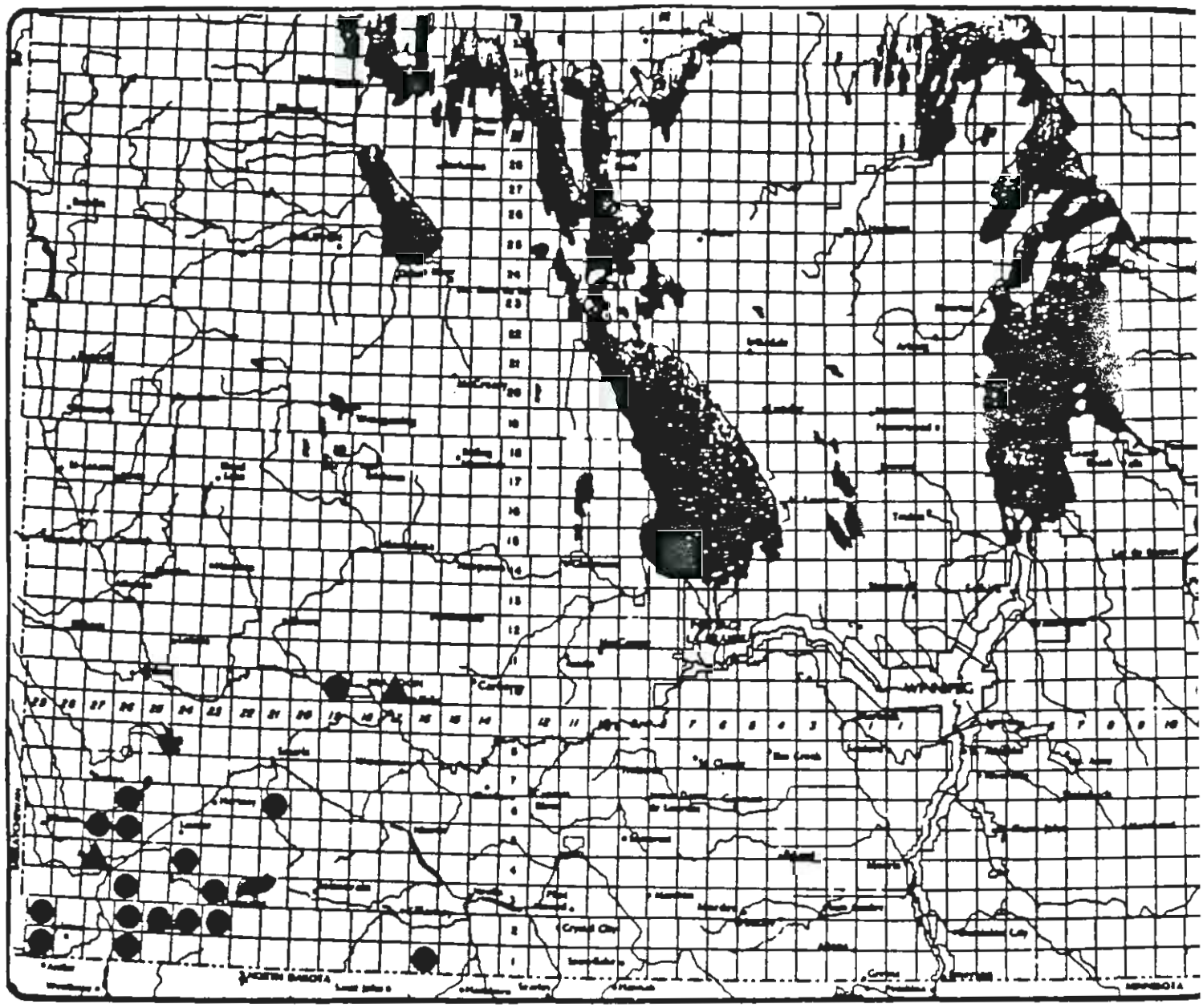
Figure 3: Burrowing Owl Site Distribution-1982
Ratcliff (1984)



● Township with one or more pairs.

▲ Township with sighting of adult owl.

Figure 4: Burrowing Owl Site Distribution-1983
Ratcliff (1984)



● Township with one or more pairs.

▲ Township with sighting of adult owl.

Figure 5: Burrowing Owl Site Distribution-1984
Ratcliff (1984)

2.2.3 Conclusions

Based on the literature reviewed it is evident that the burrowing owl across it's North American range is experiencing a marked decline in it's population distribution. Although a few parts of their range are more stable than others, the owls threatened species classification under COSEWIC is fully justified. The most recent literature available on Manitoba reported " A critically low regional Burrowing Owl population..."(Ratcliff,1984).

2.3 PLAN FOR RECOVERY

Literature related to recovery plans for burrowing owls is limited. Those related to other species of owls and raptors in general, are of limited use given the uniqueness of the burrowing owl. Management techniques employed in the conservation of burrowing owls both in the United States and Canada do, however, provide valuable insight. Examining the successes and failures of those techniques applicable, and even those less applicable, has provided a greater comprehension of the topic.

2.3.1 Habitat Considerations

Coulombe (1970) suggests that the occurrence of burrowing owls is governed more by the suitability of burrow sites

than by any other factor. Support for this argument is found in British Columbia where the lack of burrows, due to the near elimination of the badger, is considered the primary limiting factor (Dunbar,1983). Ratcliff (1984) points out, however, that while the loss of burrows is a factor in the species decline, Manitoba has pastures with suitable burrows that aren not being utilized.

Clearly there are regional differences as to the importance of suitable burrow availability as a limiting factor. Where it is important, the use of artificial nest burrows as a management tool could be considered. Collins and Landrey (1977), designed and implemented artificial nest burrows in California which were accepted readily in areas where natural burrows had not previously occurred. Implementation of this technique was recommended in British Columbia, by Dunbar, in order to re-introduce the owls as a viable breeding species in that province. In 1985 10 adults and 45 young were brought into B.C.'s Okanagon Valley from Washington, 38 of the young fledged and remained until September of that year. Very early indications from March of 1986 were promising with 3 of the owls having returned (Munro, personal communications, 1986). The importance of successful implementation of artificial nest burrows for the Manitoba recovery plan in protected crown land areas may become relevant if limiting factors on private land are determined to be prohibitive to corrective measures.

Potential implementation in Manitoba on a test basis, in this case, would be viewed favorably by the principal client with consideration to such observations: "Experience to date dealing with artificial nest boxes for burrowing owls have been extremely favourable." (Dunbar,1983).

Good burrowing owl habitat has three basic factors,the aforementioned burrow availability, in addition to openess, and short vegetation (Zarn,1974). Brown(1975) cited habitat preference in vegetation to include uncultivated prairie, sage brush, and open grassland. James and Seabloom(1968) found that burrows were located on well drained gentle slopes or on flat terrain and were normally associated with grazing pastures in their study in southwestern North Dakota. This terrain is usually associated with human settlement in the prairies, as supported by Wedgwood(1976), where in south-central Saskatchewan farmland pastures and range pastures constituted much of the burrowing owl's habitat. Farmyard or barnyard pastures average about 10 acres and are mostly found adjacent to the farmyard itself (Wedgwood,1978).

This proximity to human habitation necessarily leads to interaction between man and owl. Limiting factors either indirectly or directly associated with the decline of the bird across it's range because of this proximity include: cultivation and urbanization, pasture improvements, eradication of burrowing mammals, pesticide spraying, rodent

poisoning, shooting and roadkill loss of birds (Wedgwood 1978, Dunbar 1983, Ratcliff 1984).

Recommendations regarding urbanization were, for self-evident reasons, not dealt with in the literature. The cultivation of land that was owl habitat pasture land to grain crops over the past 30 years was noted in Ratcliff(1984) and Wedgwood(1978), however, both considered this to be a contributing problem locally, but not constraining on the population as a whole.

Pasture improvements usually involve either the plowing up of native pastures for reseeding of tame grasses or the filling in of badger holes for the safety of livestock (Wedgwood,1978). This again was considered contributory but not constraining on the population overall.

As mentioned earlier, eradication of burrowing mammals is of concern in British Columbia but not as pertinent a factor in Manitoba.

The spraying of pesticides may lead to secondary poisoning from feeding on contaminated insects; additionally, spraying results in the direct loss of food for the owls (Ratcliff,1984). Similarly the use of rodenticides to poison rodents can affect the bird directly through eating carrion. Wedgwood (1978) considers that this "...could be a contributory factor in Canada, but data for a definitive conclusion are lacking."

Burrowing owls may be shot by irresponsible individuals as 'sport' or out of ignorance where landowners believe the owl to be responsible for digging burrows in their pasture. Dunbar (1983) concludes: "Unfortunately, shooting has been and still remains an important factor contributing to population declines of burrowing owls."

Mortality from roadkills appears to be a significant limiting factor of burrowing owls. In his three year survey, Ratcliff (1984) cited reports of seven owls killed on highways: "Most of the dead were young owls which had recently fledged and were scavenging for dead insects on the road after dark."

2.3.2 Protection and Education

Ratcliff (1984) found Manitoba's burrowing owl habitat consistent with that noted earlier, i.e. open grassland etc., and further pointed out that all of the nests in his survey were located on private lands. For this reason protection of the owl necessarily involves landowner cooperation. A public protection and education program providing information on the status, the statutory protection, species susceptibilities and ways of safeguarding the burrowing owl was recommended in the COSEWIC report. "Aim the plan at environmental and burrow protection as well as the bird itself, with the objective of reducing shooting of owls, minimizing secondary poisoning

and reducing loss of burrows and agricultural destruction of birds." (Wedgwood,1978). Both Dunbar (1983) and Wedgwood (1978) recommended the posting of no shooting signs on the owls habitat areas.

Wedgwood (1978) and Ratcliff's (1984) studies demonstrated that people were interested in the owls and willing to assist the researchers. By informing these people about limiting factors which they may be able to prevent, a recovery plan will have a greater chance of success.

2.3.3 Conclusions

Based on the literature reviewed it is evident that the longer term decline of the burrowing owl has been documented somewhat sporadically. Additionally, given the relatively recent marked decline, documentation on conservation for the present and future recovery of the owl has only begun over the last 10 to 15 years. The COSEWIC report in 1978, for example, stated:"...the first known venture in estimating the Canadian population. Hopefully, the report will help us to understand the owl better and to arrive at sound decisions about its management." (Wedgwood,1978). Similarly Ratcliff's study in 1982 through 1984 was the first to examine Manitoba's burrowing owls in-depth.

Chapter III

METHODS

Literature continues to become available through new reference sources and through personal communication with those interested in this study. The review of related literature is therefore seen as an ongoing process over the length of the study. Information that is deemed relevant will be incorporated in the course of preparing the study.

In order to continue to monitor the population distribution of burrowing owls in Manitoba, the re-establishment of Ratcliff's (1984) landowner contacts will be undertaken. It should be noted that although Ratcliff's study was extensive geographically, there will have been owls unaccounted for. His study results, however, have shown the trend of decline and in order to make correct comparative measures, the parameters of his study will be followed. Any new sightings that may be reported outside the study area will be recorded and listed separately.

The study area extends from Winnipeg in the east, Swan River to the north and southwest to the Saskatchewan - North Dakota border (Figs.2 through 5). There are 30 local contact people throughout the study area, each to receive site location information from landowners in their

communities. These 30 contact people will be contacted in writing to inform them of the study and to ask for their continued cooperation.

Once actual burrowing owl sites have been established through the contact people, the landowners where the birds are located will be written and interview dates will be set up. Interviews will be scheduled in conjunction with banding operation dates to limit the inconvenience to landowners. Telephone contact will be used for re-scheduling or confirmation of interviews where necessary.

Prior to interview questionaire, it will need to be determined whether or not the landowner can recognize a burrowing owl. Confirmation of this will be carried out through verbal description and where necessary, an accompanying photograph.

The interview questions are open-ended as this is the most appropriate question type for personal interviews. Open-ended questions allow for more detailed responses and allows the landowners an opportunity for self-expression which may project their motivations and attitudes on the subjects. In addition, this allows for quotations in the final report. (see Appendix.A) Information derived from the interviews will provide:

1. The physical location of the burrowing owls (distribution) within the study area.

2. The estimated population of owls within the study area.
3. The extent and duration of pesticide and rodenticide use at existing owl sites.
4. Landowner plans for existing owl habitat.
5. The number of existing sites no longer in use that were previously.
6. Landowner perceptions of reasons for sites no longer being used.

This information can be of significance for reasons listed in sequence below:

1. Determining present distribution of owl sites will allow comparison to that found in Ratcliff's study.
2. Determining the estimated population of owls within the study area, again ,will allow comparison with Ratcliff's figures and show population trends.
3. Determining the use of pesticides/rodenticides will allow for more informed management decisions once the effects of pesticides on the burrowing owl are better understood.
4. Determining landowner plans for existing owl sites may lead to future protection of the site with landowner cooperation or proximal relocation into artificial nest burrows.
5. By looking at owl mortalities and their possible reasons, the types of limiting factors pertinent in Manitoba may be examined.

6. By determining which sites are no longer in use the changing population distribution can be analyzed.
7. Through determining landowner perceptions of why the sites are no longer used, insight into landowner knowledge/attitudes about the burrowing owl can be attained and further, this will allow examination of possible contributing limiting factors.

Documenting the availability of crown land which is suitable for owl habitat will be carried out through examining crown land maps and Canadian Land Inventory maps available at the Survey and Mapping Branch of Manitoba Department of Natural Resources. This will not be done for the entire study area; rather, it will be done for specific areas designated through consultation with local government authorities in combination with habitat suitability inspection of the sites. If artificial nest burrows are to be implemented in the future, this information will be utilized by the principal client.

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Appendix A

INTERVIEW QUESTIONNAIRE

1. Do you have any burrowing owls on your land this year? If so, how many? How many adult birds? How many young?

2. If no to No.1, when was the last year you saw burrowing owls on your land?

3. What possible reasons do you see for them not returning?

4. If yes to No.1, are you presently using pesticides/rodenticides on your land? How much do you use? When do you use it? What brand do you use? How long have you been using it?

5. Have you seen any dead burrowing owls this year ? If so, do you know the cause of death?

6. What are your plans for the land where the owl sites are located?

W10

MANITOBA MUSEUM OF MAN & NATURE

190 RUPERT AVENUE - WINNIPEG, MANITOBA CANADA R3B 0N2
TELEPHONE (204) 956 - 2830

May 30, 1989

Mr. Miles Scott-Brown
World Wildlife Fund
204 - 1422 Kensington Road N W
Calgary, Alberta
T2N 3P9

Dear Miles:

This is my report on Plains Spadefoot (Scaphiopus bombifrons) research in Manitoba in 1987 and 1988. In 1987, the year in which I received a World Wildlife Fund grant of $2000 under the Wild West Program, no spadefootbreeding occurred as there was insufficient rainfall in southwestern Manitoba.

In 1988 I launched a poster campaign, sending 50 posters (one enclosed) to eleven contact persons in southwestern Manitoba. Again, although there were seemingly sufficiently heavy rainfalls, .8 to .9 inches in the Melita area, no breeding occurred.

I conducted two trips to the Melita-Lyleton area of southwestern Manitoba, one in early July and another in mid July. On the first trip, arriving after a period of no rainfall, I drove the roads at night and found no spadefoot activity. However on the following two evenings, after and during heavy rain, I found 13 spadefoots on the roads but heard no calls. Two of these sightings extended the known range in that area to within 9.8 km of Melita. Previously, spadefoots had been known only in the vicinity of Lyleton in that part of Manitoba.

I noted that there were large gaps in the sightings of spadefoots and am now examining the distribution in respect to soil types as determined from detailed surface geology maps. I plan to pursue this aspect of the study this summer, using the remaining $700 of the World Wildlife Fund grant, supplemented with funds from a Manitoba Museum Foundation Fund grant I obtained this year.

On my second field trip in mid July, I found no spadefoots although there had been a rain sufficiently heavy to form pools. A search of the pools revealed no eggs or tadpoles.

I had checked another area near Rivers on being informed that a heavy rain had formed a large pool a month earlier, and "frogs" had been heard. The frogs were leopard frogs.

Even though what should have been sufficient rain to stimulate breeding had occurred, it is perhaps possible that the drought had so reduced the soil moisture content that the stimulus of rainfall was insufficient to induce breeding.

I have just returned from a field trip to the Melita-Lyleton area, and although there had been rain, the temperature was evidently too low (7.4 °C) and no spadefoots were seen on the ~~ponds.~~ roads.

It would seem that spadefoots are active on the surface if there has been sufficient recent rainfall and if the temperature is high enough. Also, the Plains Spadefoot appears to be more widespread in the Lyleton-Melita area than I was aware, based on earlier research. I am still attempting to determine the limiting factors.

I will send you any further information resulting from the study as well as reprints of any publications.

Yours sincerely,

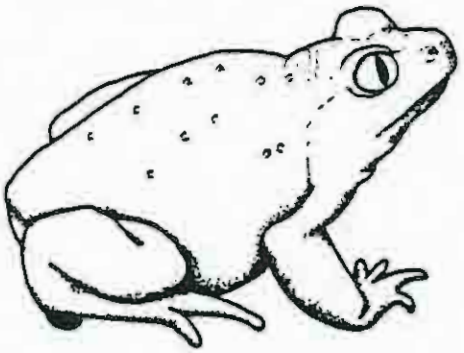
Bill Preston

William B. Preston
Curator of Reptiles, Amphibians and Fishes

WBP:cmc

Enclosure

HAVE YOU SEEN THIS TOAD?



NAME:	**PLAINS SPADEFOOT**
DESCRIPTION:	**About 2" long; gray.**
DISTINGUISHING FEATURES:	**Eye gold, pupil a vertical slit in bright light. A hard, black tubercle under the hind foot.**
VOICE:	**A coarse "WRRK" heard after heavy rain.**

If you see this toad or hear its voice please telephone (collect):

Dr. W. Preston

MANITOBA MUSEUM OF MAN & NATURE
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J

DISTRIBUTION AND STATUS OF PIPING PLOVERS IN MANITOBA-1986

Susan Haig, Department of Biology, University of North Dakota, Grand Forks ND 58202 and Delta Waterfowl and Wetlands Research Station, Portage la Prairie, Manitoba R1N 3A1.

Piping Plovers are an uncommon shorebird species that have recently been declared endangered in Canada (Haig 1985) and threatened in the United States (Sidle 1986). Currently, less than 4,000 Piping Plovers remain, with the vast majority of birds inhabiting prairie lakes and sloughs (Haig 1985, 1986b,c, Haig and Oring 1985a, 1986a). Since 1981, the distribution and status of Piping Plovers has been under investigation in Manitoba (Haig 1986a). Results prior to 1986 showed that 44 pairs of Piping Plovers bred at 7 sites in the province, and an additional 30-40 non-breeding birds (possibly migrants) were frequently observed. Observation of a significant number of "extra birds" and knowledge of the wide dispersal abilities of adults during the breeding season, as well as between years (Haig 1987), prompted the initiation of a provincial search for previously unknown breeding areas in 1986.

METHODS

The 1986 study was organized by a core group of 4 biologists from the Manitoba Dept. of Natural Resources, and the author (Table 1). A volunteer network of 25 individuals provided additional knowledge and man-power to carry out the study (Table 1). Notices were placed in local papers and in DNR publications to solicit

Table 1. 1986 participants in Manitoba Piping Plover survey.

1. Susan Haig, Coordinator	16. Kathy Johnston
2. Merlin Shoesmith	17. Rudy Koes
3. Bob Nero	18. John Morgan
4. Bill Koonz	19. Ted Muir
5. Ken DeSmet	20. Raymond O'Connor
6. John Christie	21. Paul Paquet
7. Pat Christie	22. V. Pelon
8. Norm Cleveland	23. Henry Pops
9. Clark Cluff	24. Pat Ratkowski
10. Herb Copland	25. Don Sexton
11. Cal Cuthbert	26. Tim Sopuck
12. Dave Clayton	27. Paul Taylor
13. Celas Davar	28. Bill Walley
14. T. Galloway	29. Doug Stephanson
15. Stewart Holohan	30. Carl Hendrickson

further information. Past and present breeding records were reviewed to determine potential areas for the survey. As a final step in determining possible breeding sites, over 60 hours were spent surveying the province by air and mapping beach sites.

RESULTS

Aerial surveys covered the majority of shoreline on: Lake Winnipeg, Lake Winnipegosis, Lake Manitoba, the Shoal Lakes, Cedar Lake, and Moose Lake (Figure 1). Results indicate at least 30 sites, not currently known to be inhabited by Piping Plovers, show potential for breeding activity (Table 2, Appendix 1). The majority of these sites occur on Lake Winnipeg where islands and northern beaches have been difficult to survey in the past.

Thirty-six sites were ground-surveyed at least once during 1986 (Table 3). Of these areas, 4 were primarily used by migrants: Beausejour, Grassmere, Proulx Point, and Oak Hammock Marsh (Figure 2). West [illegible] also an important migration site. Piping Plovers bred at 7 sites: Clandeboye Bay, Twin Lakes Beach, West Shoal Lake, Grand Marais Island, Grand Marais spit, Long Point, and possibly Whitewater Lake (Figure 2). A 1985 breeding record from Elk Island was also included because the site was not able to be checked in 1986. The only new breeding site found was Long Point on Lake Winnipeg. Discovery of Piping Plovers on Long Point extends their current northern breeding range in Manitoba by 130 km.

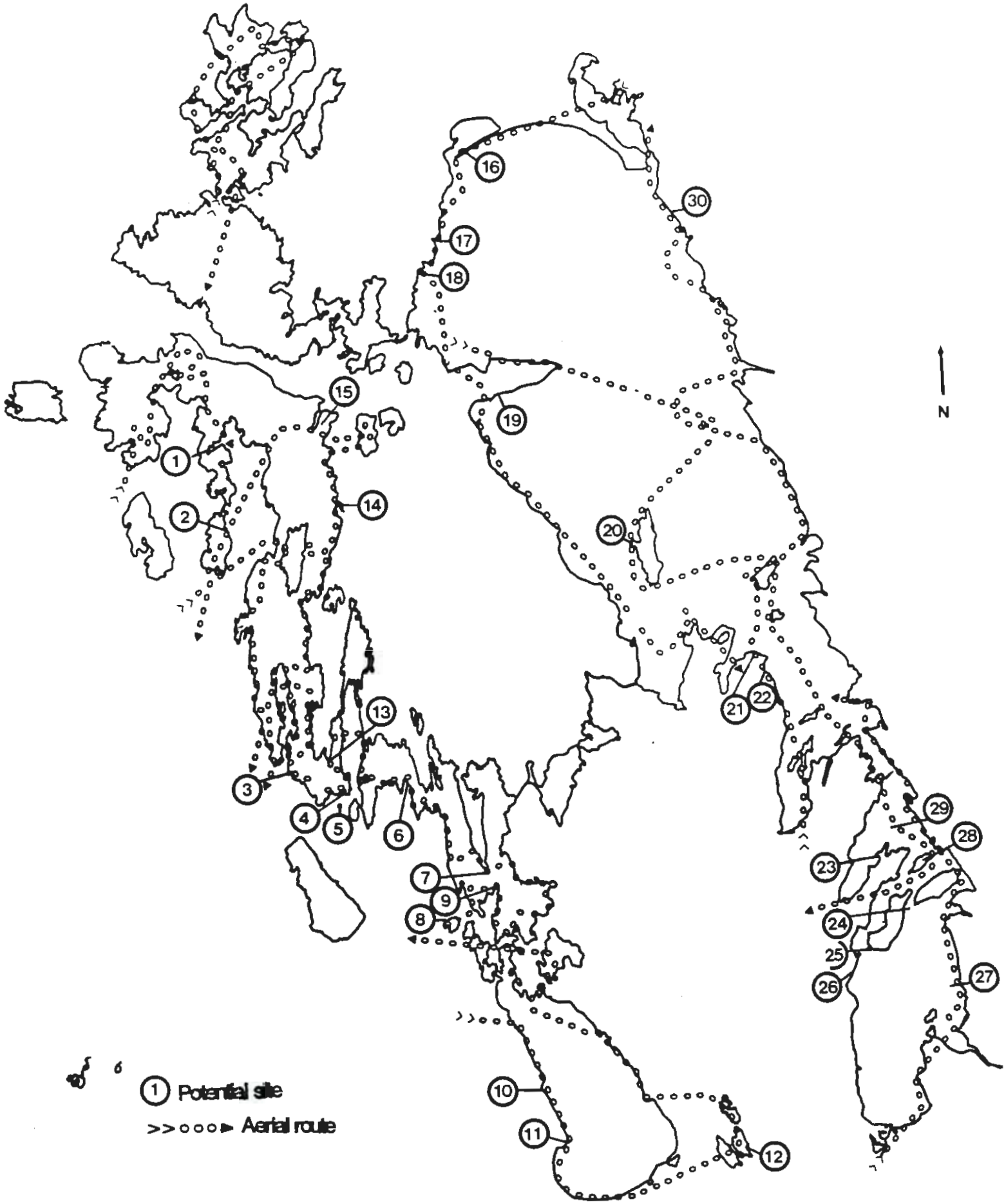

Figure 1. 1986 aerial routes and location of potential Piping Plover habitat.

Table 2. Potential Piping Plover habitat as seen from aerial surveys (sites that were ground-checked in 1986 are not included).*

LOCATION	MAP REFERENCE NUMBER**
East Shoal Lake	12
Lake Manitoba	
Big Point	11
Bluff Harbor	9
Little Sandy Point	6
Marius	10
Peonan Point	7
Lake Winnipeg	
Black River Delta	27
Buffalo Creek Bay	18
Deer Island	28
Egg Island	29
Grindstone Park	23
Gull Bay	19
Hecla Island	25
Limestone Point	16
Montreal Point	30
Punk Island	24
Reindeer Island	20
Riverton	26
Robinson's Point	17
Stony Point	22
Wicked Point	21
Lake Winnipegosis	
Farmer's Point	3
Goose Bay Area	15
Meadowlands	4
Moose Point	2
Pelican Bay	1
Point LaRonde	14
Salt Point	13
Lawrence Lake	5
Lonely Lake	8

*Appendix A has specific comments on locations.
**Map numbers refer to figure 1.

Table 3. Summary of areas surveyed for Piping Plover use in 1980.

Location*	#PPL	Date	Obs**	Comments
Beausejour (9)	1	7 June	27	Sewage lagoon-migrants
Diamond Lakes	0	18 June	6,7	High water, no disturbance
East Shoal Lake	0	18 July	5	Pasture poor habitat
Grassmere (6)	1	29 May	15	Sewage lagoon-migrants
Kawinaw Lake	0	16 June	6	NE corner, too many gulls
Lake Kiskitti	0	June	24	Little habitat
Lake Manitoba	*5-11 acults			*Total
Big Sandy Bay	0	4 July	5	Good habitat
Clandeboye (2)	4-6	1 June	1	2 nests, high disturb
Hollywood Beach	0	June	20	Nests in 82 & 83
Proulx Point (5)	3	15 Sept	26	Migrants on cobble shore
Sandy Bay north	0	4 July	5	Good habitat-north
Sandy Bay	0	late May	25	High water
Sandy Bay south	0	8 June	8	Good habitat
Stony Beach	0	1 June	1	Good habitat
Swan Creek Hatchery	0	2 July	26	Good habitat
Twin Lakes Beach (4)	2	2 June	1	1 nest, high disturb.
Lake Winnipeg	*18 adults + 24 chicks			*Total
Berens Island	0	10 June	5	Good habitat, no PPL
Elk Island (11)	2+	3 July	17	1 nest in 85
Grand Marais Is.(10)	6+10	17 July	5,10	3 pair, 10 chicks
Grand Marais Spit (10)	1	28 July	5,10	Non-territorial
Grand Rapids	0	16 June	6,7	High water, good
Long Point (8)	9+14	31 July	5,6,10	South bar-2 censuses
Lynx Point	0	11 June	5	Good habitat
Lake Winnipegosis	*0*			*Total
Denbeigh Point	0	16 June	6,7	High water, no habitat
Oscar Point	0	17 June	6,7	Better w/low water
Oscar-Denbeigh	0	17 June	6,7	Shoal under water
Overflowing River	0	17 June	6,7	Better w/low water
Salt Point	0	17 June	6,22	High water
Lawrence Lake	0	13 June	5	High water
Lizard Point I.R.	0	17 June	6,7	3 alkali lakes
Moose Lake	0	June	9	Too much disturbance
Oak Hammock Marsh (7)	3	June	6,15,17,19	Migrants-4 censuses
West Shoal Lake (3)	27+31	June	1,6,15	High water
West Shoal Lake Is.	0	18 July	5	Poor habitat
Whitewater Lake (1)	2-3	June	6,11,15	High water-3 censuses
Whitemouth Lake	0	June	9	No beach habitat
TOTAL	62-69 breeding adults + 55 chicks			

* Map reference number in () refers to figure 2.

** Obs=Observer number (see table 1)

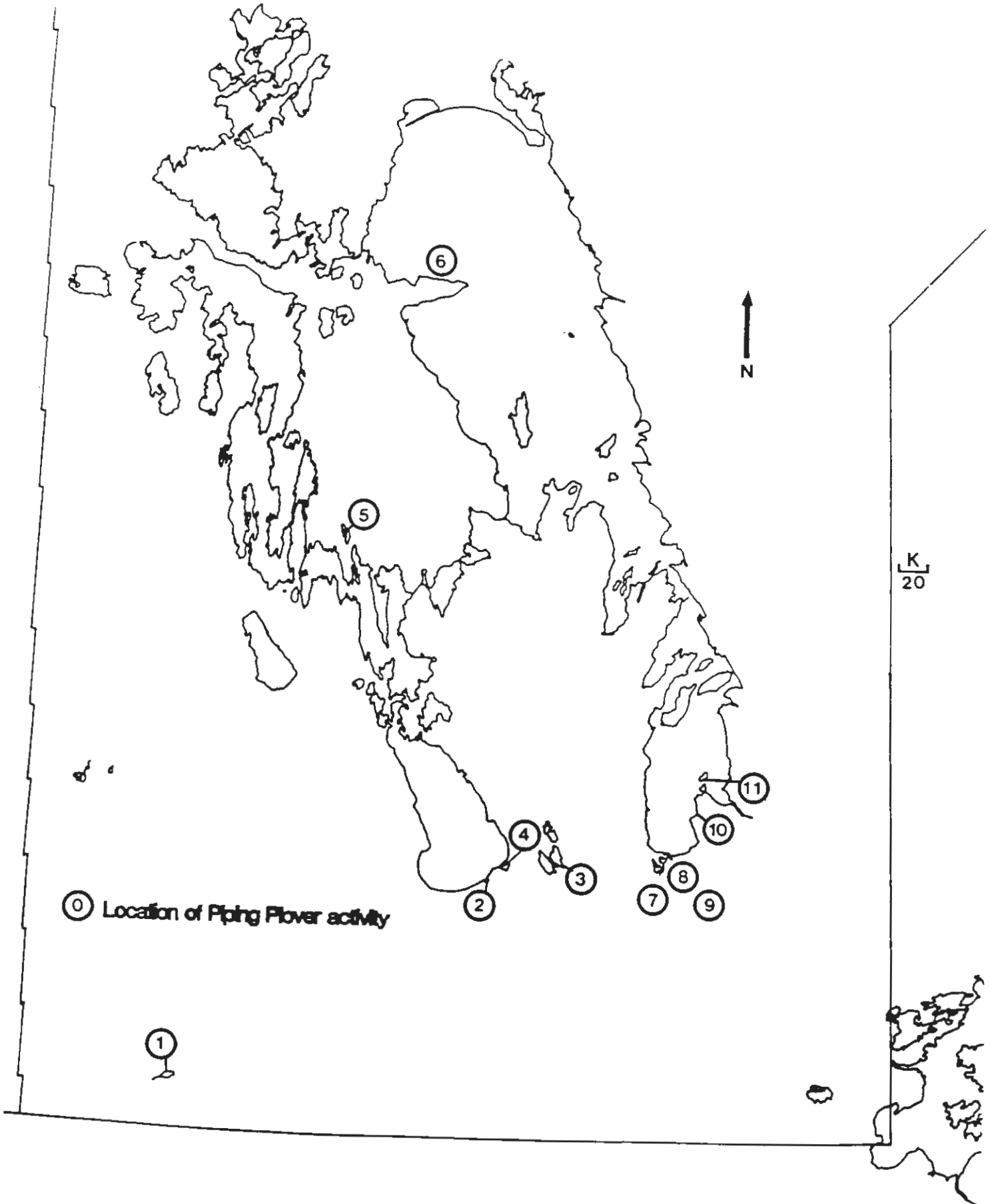

Figure 2. Location of Piping Plover nesting areas and migration sites in 1986.

Census totals indicate that 62-69 adults bred in the province and at least 55 chicks hatched (Table 3). Estimates for West Shoal Lake may be low due to incomplete censusing of the south shore. The total population estimate for known sites in 1986 ranges between 85-90 adults. The number of chicks fledged is most likely 55 or less.

Banded birds were observed at Clandeboye Bay, Twin Lakes Beach, Grand Marais, and Long Point. Marked individuals on Long Point had been banded at West Shoal Lake and at Lake of the Woods, MN. In addition, K. DeSmet and M. Copland banded 9 juveniles on Grand Marais Island (Appendix 1).

DISCUSSION

Status of Piping Plovers in Manitoba: Results from 1986 survey work indicates that the number of breeding Piping Plovers in the province is approximately the same as the 1985 estimate. High water levels found throughout the province may account for a decrease in the number of birds observed at previously-used sites such as Whitewater Lake, West Shoal Lake, Grand Marais Island, Lawrence Lake, and Salt Point. Variation in census techniques from past years may also account for discrepancies in the number of birds seen. It is significant to note that the number of birds on the southeast corner of Lake Manitoba (i.e. Twin Lakes Beach, Clandeboye Bay, and Stony Beach) continues to decline and reproductive success was negligible for the fourth year in a row.

Threats to Piping Plovers in Manitoba: Disturbance to nesting birds from recreational activity remains the most critical threat to Piping Plovers on Lake Manitoba, Grand Marais, Long Point, and possibly other sites. High water levels also pose a significant threat to the birds. If these high water levels are maintained for a number of consecutive years, permanent habitat destruction will occur and the tradition of using the sites will be broken. The impact of predators such as gulls, skunks, or raccoons has not been accurately assessed. Cattle grazing along Lake Manitoba, Lake Winnipegosis, and West Shoal Lake may become a problem in the future.

Conservation measures: Since 1962, nest sites at Clandeboye Bay have been designated a "Special Conservation Area" by the DNR. Signs have been posted, but have not been effective due to lack of enforcement. Human disturbance is quite intense at Long Point and has prompted DNR officials to initiate closing-off of nesting areas for the 1987 breeding season. Birds breeding on Grand Marais (spit and island) also suffer the consequences of human disturbance to nesting areas. These two areas are critical nest sites and are important to migrating birds. In addition, they serve as the link between birds breeding at Lake of the Woods, MN and breeding areas in Manitoba (Haig 1987). It is critical that these sites be protected in the immediate future. In reality, the best way vulnerable sites such as Clandeboye Bay, Long Point, West Shoal Lake, and Grand Marais may be preserved is through direct purchase by groups such as The Nature Conservancy

or Wildlife Habitat-Canada. Perhaps this private interest would insure better protection and eliminate future development of sites.

Future studies: Results from 1986 indicate there is significant indication of further use of Manitoba beaches by Piping Plovers. Aerial surveys from Lake Winnipeg are especially encouraging. A conversation with C. Hendrickson (July 1986) indicated that a number of Piping Plovers nested on Tamarack Island, Sandy Island, and the south side of Gull Bay during the 1960's (Appendix 1). None of these sites have been checked recently. Beaches on Hecla Island and Elk Island had birds 1-2 years ago but were never thoroughly investigated. Salt flats on Lake Winnipegosis also have potential if water levels subside.

To insure important sites are not overlooked, I propose an intensive search for Piping Plovers along Lake Winnipeg in 1987. Further aerial surveys could be incorporated with Colonial Bird Surveys. Most importantly, however, all potential sites will have to be ground-checked between late May and early July. Piping Plover breeding distribution is sporadic and nesting occurs in very localized areas (Haig 1985a,1985b,c, Haig and Oring 1985, 1986a). Unfortunately, this means that many kilometers of potential habitat may have to be surveyed before nest sites are found. While this is a tedious process, and it may appear that Manitoba has "had its share" of Piping Plover surveys, discovery of a number of significant sites on Lake Winnipeg seems quite probable.

The significance of Manitoba to Piping Plovers cannot be over-emphasized. In the past, Piping Plovers were distributed from Alberta to Newfoundland (Bell 1975, Haig 1985). Currently, the middle part of the species' range (i.e. the Great Lakes region) has less than 10 pairs of birds (Haig and Oring 1985, Haig 1986b). This gap creates a serious dilemma if genetic diversity is to be maintained for the species. It also decreases the number of dispersal sites available to birds on the fringes of prairie and Atlantic populations. The fact that birds from Minnesota are regularly seen moving into Manitoba (Haig 1987) strengthens the importance of identifying and protecting sites in the province.

Ideas concerning maintenance of population continuity are not new to geneticists, but are just coming of age for wildlife managers (Temple 1977, Frankel and Soule 1981, Schonewald-Cox et al 1983). If Piping Plovers in Manitoba are examined from an international perspective, and ideas of current endangered species management are put into practice, it is easy to realize that loss of any site in Manitoba significantly widens the gap (geographically and genetically) between inland and coastal birds. Knowledge of new areas in the province would ease the threat of population fragmentation. Loss of peripheral sites also decreases the buffer zone surrounding densely populated areas in Saskatchewan and North Dakota. As a final note: 1986 census results from Minnesota (Haig and Oring 1986b) and Saskatchewan (Hjertaas, pers. comm.) indicate that Piping Plovers in both

areas suffered a severe decline this year. Obviously, if birds in even the most stable areas are threatened, identification and protection of new sites is crucial.

Conclusions

In 1986, 7 breeding sites in Manitoba contained 62-69 adult Piping Plovers and produced 55 chicks. Aerial surveys indicated sites on Lake Winnipeg Harbor great potential for Piping Plover breeding activity. Threats to nest sites include intense human disturbance and high water levels. It is strongly recommended that human activity be prohibited on all known nesting areas in the province and that plans be made to carry out future surveys of potential nesting habitat on Lake Winnipeg.

Acknowledgements

This study was made possible through funding and other resources provided by the following groups: Manitoba Dept. of Natural Resources, World Wildlife Fund (Canada), Delta Waterfowl and Wetlands Research Station, and the University of North Dakota. The cooperation of volunteer surveyors is also greatly appreciated.

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K

DISTRIBUTION AND STATUS OF PROVINCIALLY RARE PLANTS IN THE SOURIS RIVER VALLEY, SOUTHEASTERN SASKATCHEWAN

by

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World Wildlife Fund, Canada
and also
Saskatchewan Natural History Society

National Museum of Natural Sciences, Botany Division: The Rare and Endangered Plants Project

Canadian Botanical Association: Conservation Committee

Canadian Wildlife Federation

Environment Canada: Office of Environmental Assessment and Review

Saskatchewan Department of Environment: Coordination and Assessment Branch

Fraser Herbarium Technical Report 89-1

April 1989

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I. Introduction

The Souris River valley of southeastern Saskatchewan represents one of the botanically most unique regions of the province, containing an unusually high concentration of provincially rare native plants. In this respect, it is comparable to the Cypress Hills, Lake Athabasca south shore, and Porcupine/Pasquia Hills regions of Saskatchewan. The Souris Valley riverine deciduous woods dominated by Boxelder (Acer negundo L.), Green Ash (Fraxinus pennsylvanica Marsh.), and American Elm (Ulmus americana L.), and locally near Oxbow also some Bur Oak (Quercus macrocarpa Michx.), and their shrubland borders, contain various provincially rare plant species belonging to the Eastern Deciduous Forest Phytogeographical Element, - i.e. plants more characteristic of the deciduous forests and riverine hardwoods found farther southeast and south of Saskatchewan (e.g. Creeping Bittersweet, Great Solomon's Seal, Wood Nettle, American Plum, Heavy-fruited Sedge, Blue Skullcap, Western False Gromwell, Nanny-berry, Blue Vervain, Thicket Creeper, Lance-leaved Heal-all, Assiniboia Sedge and Creeping Love-grass). Similarly, some local sites on largely south-facing, more mesic, lower or middle prairie slopes of river bluffs, otherwise covered by species of the

Mixed-grassland Association, reveal admixtures of some provincially rare species belonging to the True Prairie Phytogeographical Element, - i.e. plants more characteristic of the Tall-grass Association found in typical form farther east and southeast of Saskatchewan (e.g. Big Bluestem, Side-oats Grama, Switch Grass, Indian Grass, White Milkwort, Lambert's Locoweed, White-flowered Parsley and Prairie Bird's-foot Trefoil). Specialized habitats for some plant rarities are provided by certain local substrates such as shaly and more or less alkaline clay-flats and outwash slopes (e.g. Whorled Milkweed, Whorled Milkwort, and Buffalo Grass), alkaline wet meadows, marshes and shores (e.g. Rigid Sedge and Dark Green Bullrush), wet to drying sloughs and depressions (e.g. Flat-stemmed and Engelmann's Spike-rush), sand-hill grassland and sand-barrens (e.g. Wilcox's Panic-grass and Schweinitz's Umbrella-sedge), and limestone outcrops (e.g. Smooth Cliffbrake).

Interest in the rare plants of this floristically unique river valley in Saskatchewan is particularly focused at this time because of perceived serious threats to their survival resulting from the proposed construction of the Rafferty Dam west of Estevan and the Alameda Dam north of Oxbow.

Nearly a score of previous collectors over the last 80 years have contributed to our floristic knowledge of the Souris River valley, but the following two individuals, in particular, deserve special acknowledgements for their noteworthy discoveries of many of the regional plant rarities: (1) Bernard Boivin, who collected in this region during parts of four summers, from 1951 to 1960, and (2) John H. Hudson, who made numerous regional collections over a span of more than 30 years since 1955, including many new provincial records

and noteworthy range extensions that he often reported in the Blue Jay, a publication of the Saskatchewan Natural History Society. Several earlier survey studies with botanical components were conducted in particular areas within the Souris River valley of southeastern Saskatchewan. A study was conducted by the International Biological Program (IBP-CT) (1972) on a proposed "Pinto/Souris River Natural Area" northeast of Pinto, south-southwest of Hirsch. The botanical part of the I.B.P. natural area field reconaissance and report was limited to a listing of the dominant and some other characteristic plant species of the 28 vegetational community types described. Only 25 plant species were mentioned for their area, plus six identified only to the genus level, but no rare plants were reported except that American Elm (Ulmus americana) was listed in I.B.P.-C.T. report as a "unique species of exceptional interest". Despite this omission of rare plants in the I.B.P. report, the surprisingly high number of 15 provincially rare plants were recently recorded by Harms (1987) from within the boundaries of the proposed I.B.P. "Pinto-Souris Natural Area", as restricted by Adam (1985), including the new and only provincial record of Indian Grass (Sorghastrum nutans) and five other "especially rare" species. Thus this site would indeed appear an excellent choice for such a natural area.

In their grasslands range ecological investigation of the Coalfields P.F.R.A. Community Pasture, Abouguendia et al. (1982) recorded a total of 108 plant species, including several provincially rare native grasses of Tall-grass Prairie affinities (viz. Big Bluestem, Switch Grass, and Side-oats Grama). They also collected the

rare sandhill species, Wilcox's Panic-grass, as recently identified by us.

In a study focussing on wildlife habitats in the Midale SDA Community Pasture, Noble and Flory (1978) listed 63 plant species as occurring there plus 13 more identified only to the genus level, probably representing about one-third of the plants that could be found there. Included were the rare species, Sideoats Grama and (Lanceolate-leaved?) Healall.

Godwin and Abouguendia (1985) of the Saskatchewan Research Council, under a subcontract with Saskmont Engineering, for the Saskatchewan Power Corporation, conducted a survey of the natural vegetation of the proposed Rafferty Dam Reservoir and the immediate Shand Thermal Power Station site. They listed a total of 154 plant species in their study region (perhaps about one-half of these to be expected), and cited five "rare species", including Big Bluestem and Sideoats Grama found by them, plus Jerusalem Artichoke, Lambert's Purple Locoweed and Blue Skullcap that they referenced from Maher et al. (1979). They failed, however, to include three other rare plants indicated by Maher et al. for their actual Rafferty Reservoir study area, or to mention the 11 additional provincially rare plant species mapped by Maher et al. in the Estevan area along the few miles of the Souris Valley between their Rafferty Reservoir and Shand Power Station Study area.

The "Chapter 10 - Natural Vegetation" of the Environmental Impact Statement on the Rafferty-Alameda Project by the Souris Basin Development Authority (1987) covers only the same Rafferty Reservoir region itself and appears entirely based on, and mostly verbatimly

repeated from, the previous study by Godwin and Abouguendia (1985), although only the summarized report of the latter by Abouguendia (1986) was referenced. All included "information" concerning the vegetation and rare plants of the Alameda Reservoir represented an extrapolation with no field data obtained from the latter region.

Subsequently, during the 1987 summer, a study was carried out by Environmental Management Associates for the Souris Basin Development Authority, on the vegetational resources of the Alameda Reservoir. The study-report, to which the present author contributed some field identifications, was completed in Spring 1988 (although predated November 1987). While not containing an overall list of the flora, a total of 255 plant species plus 22 more identified only to genus level can be extracted from the text and appended vegetational analysis and range evaluation tables of this Alameda Reservoir report. These species numbers are probably more representative of the total flora. However, because an opportunity was not provided to either substitute the ultimate herbarium determinations for tentative or incomplete field identifications, or to botanically edit the final report, numerous taxonomic errors are apparent in it.

The information on the provincially rare plants from the actual Alameda Reservoir study area reported in the latter report was provided by the present author and included the following 10 species: Rigid Sedge, Prairie Bird's-foot Trefoil, Jerusalem Artichoke, Lance-leaved Healall, Lambert's Purple Locoweed, Switch Grass, Sideoats Grama, White Milkwort, Prairie Cinquefoil and Big Bluestem.

Previous to the present study, most provincially rare plant species in the Souris River valley had been recorded from only a

relatively few local collection sites. Knowledge of their overall distributions and frequencies within the region was often fragmentary, although it was realized that an unusually high number of botanical rarities were found here. The present study has been an attempt to compile more complete information, better detailing the overall regional distributions, local population sizes, phenology, precise habitats and regional frequencies, of these provincially rare native plants, plus indicating perceived threats to their survival. Based on the gathered information, a reassessment has been made of the rarity status of the provincially rare plant species in the Souris River valley. A further study objective has been to identify, if possible, particular sites containing notable concentrations of rare species that based on their floristic significance might be proposed as candidates for legal protected "natural areas".

The present study involved field expeditions during the 1986-88 summers, sampling an approximately 100-mile extent of the Souris River from the Goodwater/Halbrite area southeast of Weyburn, to the United States border south of Glen Ewen, searching for, recording the abundance and habitats of, and collecting voucher specimens of, the provincially rare and associated plants. The plant communities along an approximately 20-mile extent of the lower Moose Mountain Creek valley were also sampled at 17 local sites ranging from the Souris River confluence near Oxbow, northward to latitude 49°30'N, about 10 miles south of Carlyle.

Preliminary information on the provincially rare plants found specifically in the Roche Percee-Pinto area obtained during the

initial (1986) field season of the present study, was published earlier (Harms 1987).

A total of 36 provincially rare plant taxa are recorded in the Souris River valley, 14 of which have also been considered rare for Canada. Of the Souris Valley plant rarities, 12 are known only from here in the province, and four others only from here and the neighboring Antler River valley. Of these provincially rare plant taxa, 16 are here rated as "especially rare" and 6 others as borderline to "especially rare" for Saskatchewan based on their infrequent occurrence and limited geographical distribution and/or local scarcity. Of the botanical rarities in the Souris Valley, 13 are considered potentially endangered in Saskatchewan, and 2 others threatened to potentially endangered. The provincially rare plants recorded for the Souris River and lower Moose Mountain Creek valleys are alphabetically listed in Table 1 by their scientific names, followed by their common names, families and symbols indicating their rarity status. All recorded collection localities, both past and present, of the rare plants in the Souris River and lower Moose Mountain Creek valleys, are mapped in figures 1 & 2 at a roughly quarter-section accuracy-level permitted by the label data and the map scales. The superposed coordinants on the distribution maps are those of the Section-Township-Range-Meridian survey system. These are also the coordinants used in the textual locality references. Since the latter system is based on mile-square sections, for consistency, all distances in the text have been expressed in miles of the English system rather than in kilometers.

In the subsequent textual account, the provincially rare plant taxa recorded in the Souris River and Moose Mountain Creek valleys of southeastern Saskatchewan are presented in the alphabetical order of their scientific names under their respective families which are arranged in the traditional Englerian sequence. Common names follow the respective scientific names and important synonyms, if any, and then brief descriptions of the specific habitats of the plants in the Souris Valley study region are given. The general localities in the Souris River and lower Moose Mountain Creek valleys known for each rare plant taxon are then given, followed by the collection numbers, if any, from the present study. Because they are mapped in figures 1-4 at the accuracy level of less than a quarter-section the precise collection localities including grid coordinants are usually omitted for the present study collections. Then outlined are the known distributional records elsewhere in Saskatchewan of these provincially rare taxa. The earlier literature reports and previous herbarium records of the rare plants in the Souris Valley study region are summarized, with the locality and collection data given as precisely as allowed by the available information. The reevaluated rarity status of each species concludes the individual entries. The basic reference sources used for determining inclusion on the provincially rare plant list have been Maher et al. (1979) and the present author's own updated files on Saskatchewan rare plants. Species entries only recently described, recorded, or recognized as rare in the province, and thus not on previous rare lists, are individually explained in the text. The assignment of taxa to the various rarity status categories, as indicated in Table 1, has been

based on personal judgement. Sources for rarity status in Canada included Argus and Pryor (1986), the various Syllogeus publications on rare plants of the different provinces and territories by the National Museum of Natural Sciences, and the author's personal judgement based on field, herbarium and literature information.

The present study collection numbers cited in this paper not prefixed by a collector's name are those of the author (including numbers 35240-35478 with co-collectors Donald F. Hooper and Les Baker, and numbers 35855-36205 with Ramona M. Harms), with the voucher specimens filed in the W.P. Fraser Herbarium, University of Saskatchewan, Saskatoon, Saskatchewan (SASK).

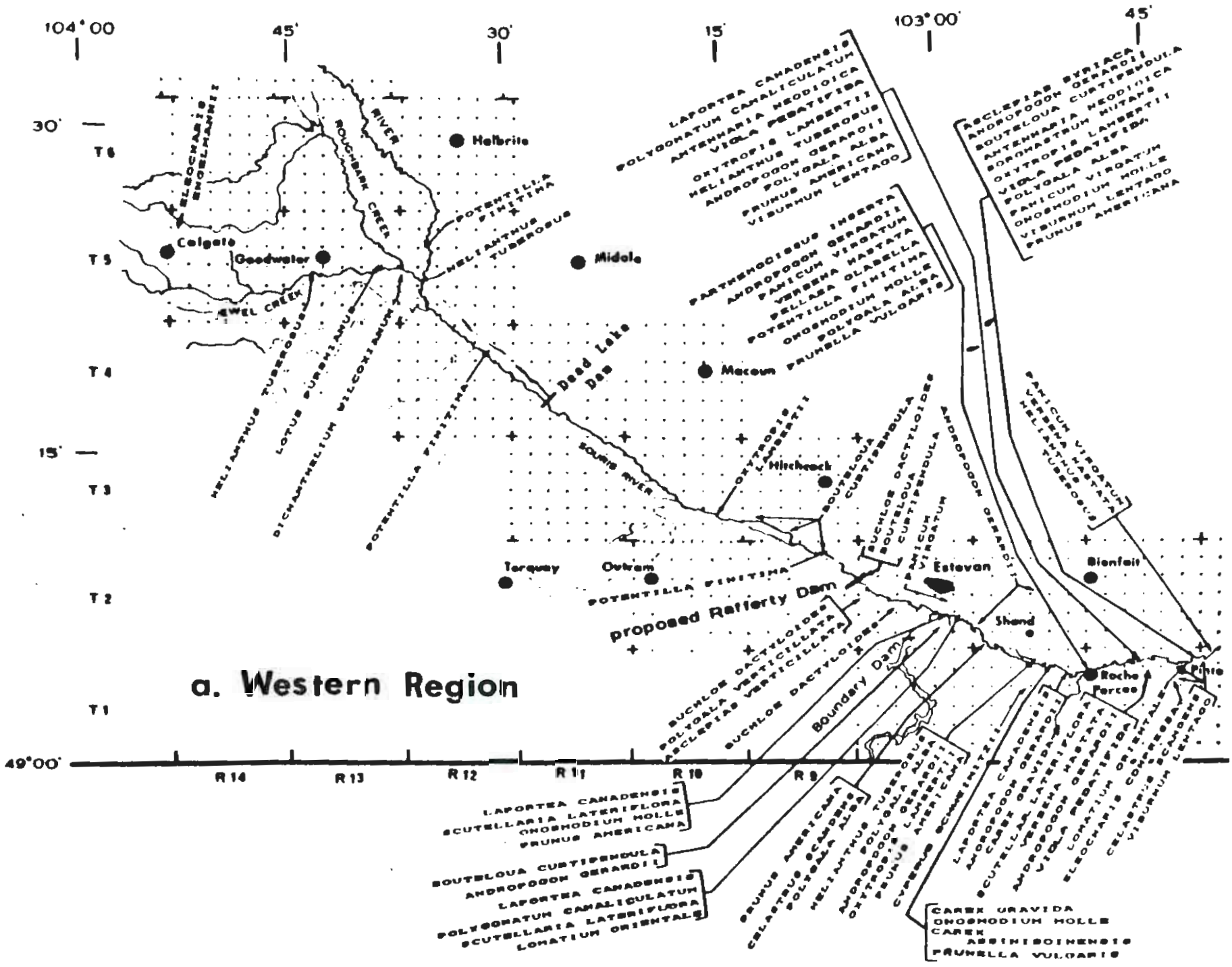

Fig. 1. Distribution Records of Provincially Rare Native Plants in the Souris River Valley

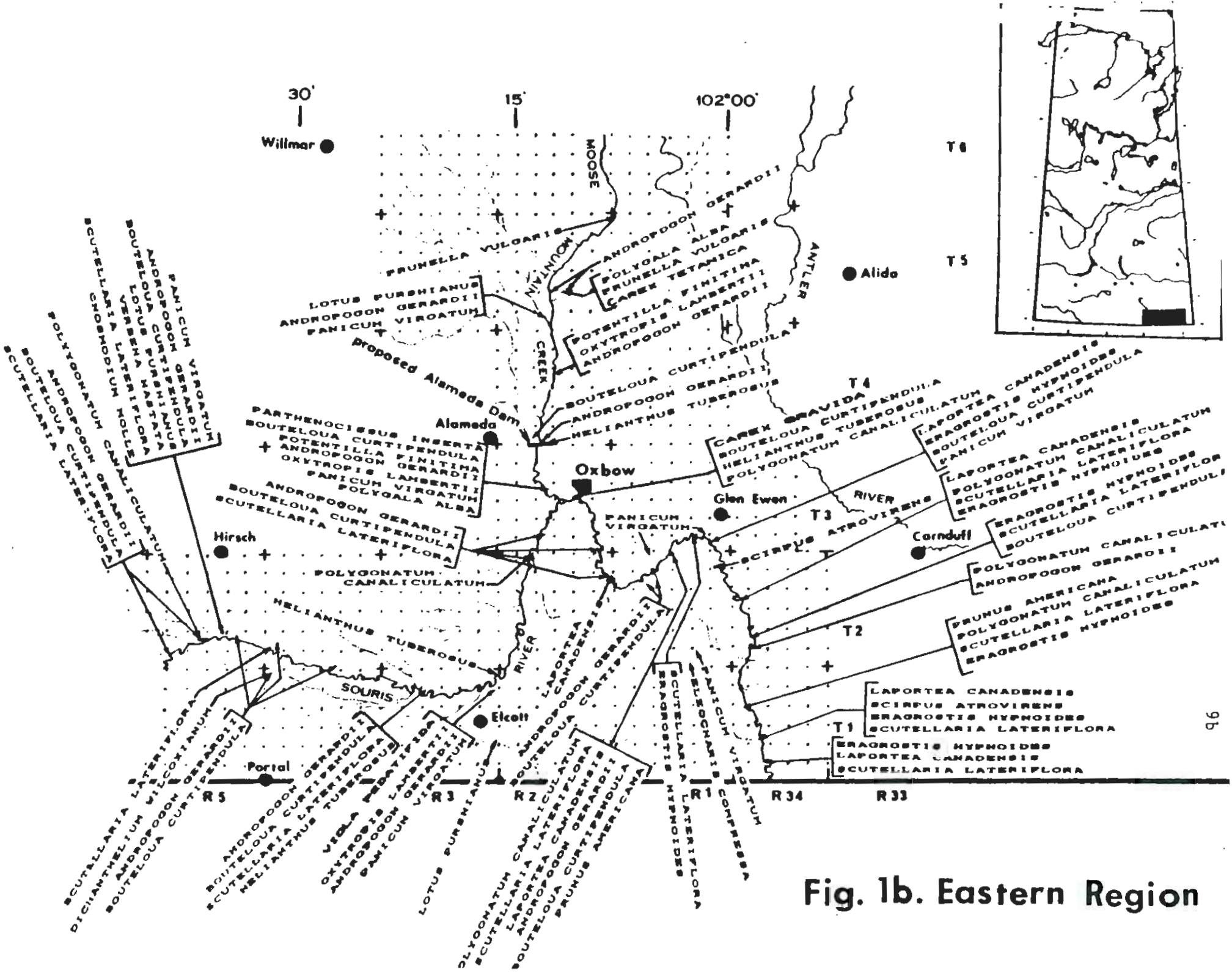

Fig. 1b. Eastern Region

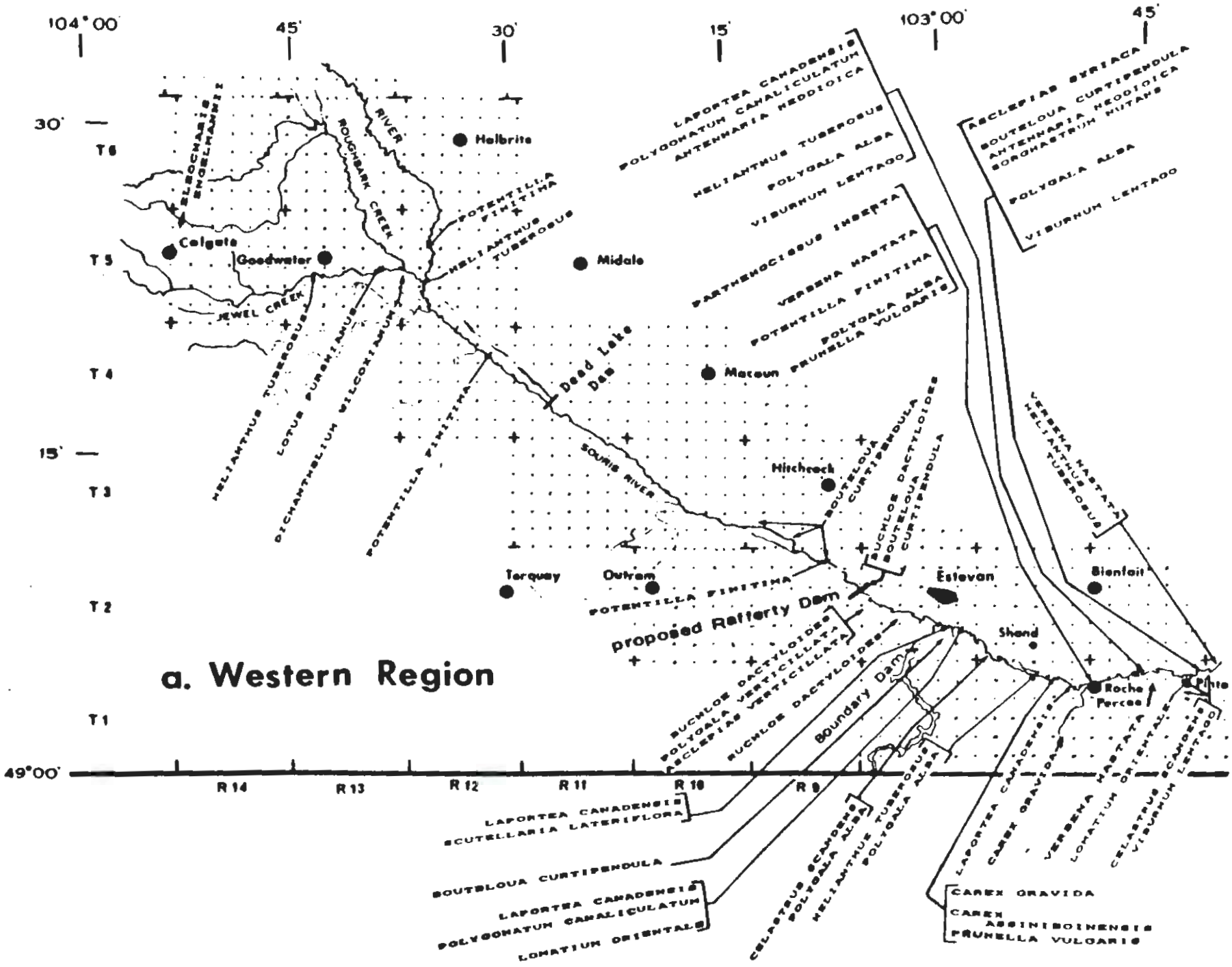

Fig. 2. Distribution Records in the Souris River Valley of Only the Provincially "Especially Rare" Native Plants and also Those Rare in Canada

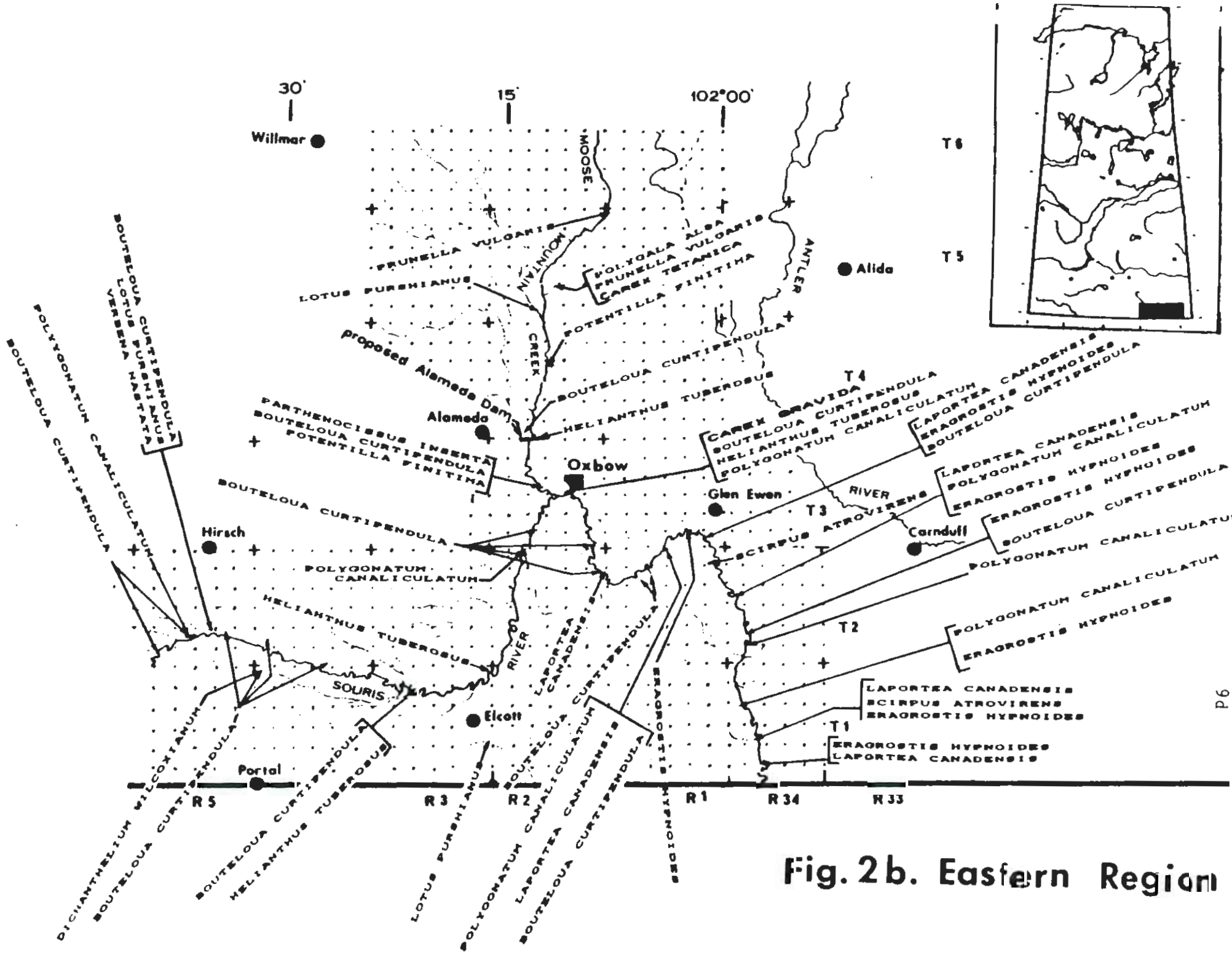

Fig. 2b. Eastern Region

II. An Annotated List of the Provincially Rare Plants in the Souris Valley

ADIANTACEAE - CLIFF-BRAKE FAMILY:

Pellaea glabella Mett. var. occidentalis (E.Nels) Butters - SMOOTH CLIFF-BRAKE.

Locally scarce in crevices on north-facing vertical surfaces and under ledges of large limestone outcrops. Roche Percee (37928). Elsewhere in Saskatchewan, this fern has been recorded at Lake Athabasca (north shore), Carswell Lake, Cluff Lake, Clearwater River, Deschambault Lake, Amisk Lake, and Big Muddy Lake. It was collected in the Souris Valley on 31 May 1958 from a "limestone cliff" at "Roche Percee" by B. Boivin & J.M. Perron (11820, DAO, SASK). The present collection from bluff slopes about 0.25 mi. north of the Souris River and the town of Roche Percee, in sw 31-1-6-W2, was probably from at or near the earlier collection site since only here were noted such large (i.e. 2-3 m high) limestone outcrops. This fern has a widely scattered distribution in Saskatchewan, requiring calcareous outcrops, although only sporadically occurring even on such, and is locally sparse. Despite the species' wide range across Saskatchewan, it appears deserving of its status as a provincially rare species.

POACEAE - GRASS FAMILY

Andropogon gerardii Vitman - BIG BLUESTEM.

Mesic grassland on lower south-facing bluff slopes often with spring-seepages, in depressions, and just above open marshy shores. Estevan (36764, 37875); Shand (37994); Roche Perce (36835. 36941, 37902, 37943, 38294); Pinto (36852, 36910); s of Hirsch

(37025-B, 38589, 38597, 38623, 38686); n of Portal (38638, 38958); Elcott (38021, 38951); e & ne of Alameda (38203, 38391, 38433); Moose Mtn. Creek w of Alida (38158-9, 38463); Oxbow (38080, 38584, 38937); Glen Ewen (38745, 38758, 38810, 38812, 38869); midway Glen Ewen to N. Dak. border (38924). Elsewhere in Saskatchewan, Big Bluestem has been recorded at various localities along the valleys of upper Moose Mtn. Creek near Carlyle, Antler River from Carnduff to s of Gainsborough, Pipestone Creek, Qu'Appelle River, Assiniboine River, and Red Deer River. There were quite frequent earlier collections of this species in the Souris River valley from Estevan to Oxbow by various collectors, most particularly J.H. Hudson and R.E. Redmann et al., prior to the fairly numerous collections of the present study.

This characteristic grass of the True (i.e. Tall-grass) Prairie Association is relatively widespread, although sporadically occurring, across eastern Saskatchewan northward to Hudson Bay Junction. The more northern local populations of this species in Saskatchewan are usually small, but those along the Souris and Antler Rivers in southeastern Saskatchewan are sometimes relatively large, occasionally even dominating lower bluff slopes. Since Big Bluestem does not have an overly restricted range in Saskatchewan nor particularly infrequent or sparse populations, it appears to no longer warrant the provincial rarity status accorded to it by Maher et al. (1979).

Bouteloua curtipendula (Michx.) Torr. - SIDE-OATS GRAMA.

Warm, mesic, stony, south-facing, prairie bluff slopes, usually associated with granitic rock erratics or sandstone outcrops. S of Macoun (37816); s of Hitchcock (37696; 37803); Estevan (36778, 36877);

Roche Percee, Pinto (36912, 36954); s of Hirsch (37022, 37046, 38590, 38598, 38622, 38690); n of Portal (38646, 38957); Elcott (38041, 38950); Alameda (38485); Moose Mtn. Creek w of Alida (38499); Oxbow (38054-B, 38093, 38556, 38716, 38735); Glen Ewen (38751, 38757, 38788, 38806, 38811); midway Glen Ewen to N. Dak. border (38923). Elsewhere in Saskatchewan, this species has been recorded only in the Qu'Appelle River Valley at Craven and Crooked Lake. Some earlier Souris Valley collections were those made on 28 June 1938 from s of Hitchcock by J.A. Campbell (s.n. SASK), and on 15 July 1938 from Oxbow by J.L. Bolton (s.n. SASK). Subsequently it was quite frequently collected throughout the region by B. Boivin, J.H. Hudson, and others. This species of True (i.e. Tall-grass) Prairie Association affinity appears to be highly infrequent and locally sparse in the Qu'Appelle River valley, but to be relatively frequent and sometimes locally fairly numerous on the immediate Souris River bluffs between Hitchcock and Oxbow. Although regionally quite restricted in Saskatchewan, within its limited provincial range the local populations are fairly frequent, occasionally consisting of quite numerous plants. Thus, Side-oats Grama may be borderline for retention of the provincially rare plant status accorded to it by Maher et al. (1979), but it probably still deserves, at least tentatively, to remain on the rare list because of its considerable regional restriction and mostly small local colonies. Argus and Pryor (1986) listed this species as also rare for Canada.

Buchloe dactyloides (Nutt.) Engelm. - BUFFALO GRASS.

Dry, ± alkaline, clayey, shaly, ± eroded, ravine bottoms and lower slopes. Estevan area (37835, 37861, 37862); - the only Saskatchewan locality. The only earlier records were by J.H. Hudson (1958 & 1970), from 2-3 mi, w-sw of Estevan in sw 17 & sw 30-2-8-W2, respectively (JHH1996 & 2632, SASK). Of the present collections, no. 37835 was from se 17-2-8-W2, near Hudson's original site where four patches occurred on valley bottom flats, and no. 37861 was from about 1.5 mi farther w-nw in nw 18-2-8-W2, the colony extending into ne 13-2-9 W2 (no. 37862) within the same shallow valley just parallel south of, and interconnected to, the main Souris River valley. The latter site contained Saskatchewan's largest known local population of Buffalo Grass, including over 20 clonal patches 0.5-3 m in diameter, on clayish and shaly valley bottom-flats and outwashing lower s-facing bluff slopes. The known Saskatchewan localities of this species all occur within a 3-mile distance. Buffalo Grass, a characteristic and dominant species of the short-grass phase of the Mixed Prairie Association on the Great Plains south of Saskatchewan, must be considered one of Saskatchewan's "especially rare" native species. With the three known local colonies occurring in grazed pastures, and two of them including the largest one in relatively close proximity to the proposed Rafferty Dam construction activities, this species may also be endangered. It was listed by Argus & Pryor (1986) as also rare in Canada.

Dicanthelium wilcoxianum (Vasey) Freckman [Panicum wilcoxianum Vasey] - WILCOX's PANIC-GRASS.

Bare sand patches and dry grassland on sandy bluffs. Goodwater; and N of Portal. Elsewhere in Saskatchewan, this species has been recorded at Welby, Rosthern and MacDowall. It was collected in the Souris region from near Goodwater in nw 18-5-12-W2 on 1 June 1961 by J.H. Hudson & E.Y. Carlson (2089 SASK, DAO), and subsequently in July 1981 from about 9 km N of North Portal in nw 31-1-4-W2 by Z. Abouguendia & B. Godwin (s.n. SASK) as only recently identified by us. While the known stations of this species in Saskatchewan are quite widely spaced, its highly infrequent occurrence and local sparsity support its status as an "especially rare" species in the province. It was listed by Argus & Pryor (1986) as also rare in Canada.

Eragostis hypnoides (Lam.) BSP. - CREEPING LOVEGRASS

Wet, sandy or silty, later-season exposed, river-shoreline beach-flats at north channel-edges of the main Souris River. Glen Ewen (38829, 38845-B); between Glen Ewen & N. Dak. border (38899, 38920); and near N. Dak. border (38882, 38886, 38906); - the only Saskatchewan records. This species was first collected in the region on 15 September 1957 and reported as new for Saskatchewan by Hudson (1958) from near the N. Dak. border 12 mi. south of Glen Even in se 16-1-34-W1 (JHH2017, SASK), and subsequently on 10 August 1971, from just s of Glen Ewen in ne 2-3-1-W2 (JHH2748, SASK). In the present study, it was found and collected at seven different local sites along the Souris River from 1.5 mi. sw of Glen Ewen to the North Dakota

border. This represents a regionally very restricted species in Saskatchewan, found only along a 16-mile stretch of the immediate Souris River channel from Glen Ewen to the U.S. border, but within this limited region, local populations are relatively frequent and often quite sizeable. Because of its seemingly precise habitat requirement of late-summer exposed, sand- or clay-flat beaches on north shorelines of the main Souris River, the survival of this provincially rare species may be endangered by the proposed major dam-constructions upstream depleting the water flows and the planned building of small irrigation weirs along the channel below, predictably producing unnatural water-level fluctuations, drying up of major river-channel segments, and an artificial "ponding" effect with unnatural shorelines of the numerous small reservoir ponds.

Panicum virgatum L. - SWITCH-GRASS

Warm, mesic-moist, grassy, mostly s-facing, lower bluff and ravine slopes, and moist meadow flats. Estevan; Roche Percee (37901, 38297); Pinto (36923, 36967); s of Hirsh (38685); Elcott (38022); Moose Mtn. Creek w of Alida (38427); Oxbow; and Glen Ewen. Elsewhere in Saskatchewan, Switch-grass has been recorded only from the upper Moose Mtn. Creek drainage near Kisbey, and the Antler River s of Carievale and Gainsborough. It was collected earlier in the Souris Valley study region on 17 July 1957 from Roche Percee by W.G. Dore & B. Boivin (13309, DAO), and subsequently by J.H. Hudson on 8 Aug. 1978 from just s of Estevan in ne 14-2-8-W2 (JHH3650, SASK), on 24 July 1955 by him from 1 mi. w of Oxbow in nw 21-3-2-W1 (JHH1704, SASK) and on 10 Aug. 1971 from 7 mi. s of Glen Ewen in nw 1-2-1-W2 (JHH2747,

SASK). This characteristic grass of the True (i.e. Tall-grass) Prairie Association, appears regionally restricted in the province to southeastern Saskatchewan, where it has been found only along the Souris River and its larger tributaries, - viz. Moose Mountain Creek and the Antler River. While fairly frequently encountered within this quite limited region, the local stands are mostly sparse, and it still appears to deserve a rare species status in Saskatchewan.

Sorghastrum nutans (L.) Nash - INDIAN GRASS.

Warm, mesic, s-facing, prairie bluff mid-slopes n of Souris River, below sandstone outcrops. Pinto (36953); - the only Saskatchewan record. This characteristic grass of the True (i.e. Tall Grass) Prairie Association found farther southeast of Saskatchewan, was only recently reported by Harms (1987) as new for the province on the basis of the above cited collection from about 1 mi. ne of Pinto in c 36-1-6-W2. Fewer than a dozen individual plants were observed at this only known Saskatchewan station for the species. Thus, Indian Grass deserves the status of an "especially rare" species in Saskatchewan, and with its occurrence in a cattle-grazed pasture it also represents an endangered one. It is also considered rare for Canada, occurring elsewhere only in the Tall Grass Prairie relicts in southern Manitoba.

CYPERACEAE - SEDGE FAMILY:

Carex assiniboiensis W. Boott - ASSINIBOIA SEDGE.

Moist, shady to open, riverine, deciduous woods mostly on alluvial flats, and shores. Shand. Elsewhere in Saskatchewan, this

species has been recorded from the Moose Jaw Creek drainage basin at Moose Jaw and Trossachs, in the Qu'Appelle River Valley at Lake Katepwa and Lumsden (Hudson 1977), and along the Red Deer River at Silica Sands and the Smoking Tent Creek confluence n and w of Armit respectively. It was collected in the Souris River valley on 12 June 1958 from about 2 mi. s-se of Shand in se 34-1-7-W2 by J.H. Hudson (2643, DAO), and subsequently on 8 Sept. 1960 by B. Boivin (DAO) from "between Estevan and Roche Percee", an imprecisely indicated locality that could even be in the same vicinity as the previous. Although the Red Deer River localities recently recorded by D.F. Hooper have now considerably widened the known overall Saskatchewan range of this sedge, its infrequent, highly sporadic occurrences and small local populations support its continued status as a rare species and borderline to being "especially rare" in the province. It is also considered rare for Canada.

Carex gravida Bailey - HEAVY-FRUITED SEDGE.

Moist, shady to open, mostly riverine, deciduous woods, shores and wooded ravine bottoms. Shand, Roche Percee & Oxbow. Elsewhere in Saskatchewan, this sedge has been recorded only at Willow Bunch (Hudson 1977). In the Souris River valley, it was collected from Oxbow on 15 July 1938 by J.L. Bolton (s.n., SCS), who misidentified it as C. stipata. It was collected on 4 Aug. 1958 and reported as new for Saskatchewan by Hudson (1958) from along Short Creek about 4 mi. sw of Roche Percee in nw 11-1-7-W2 (JHH1999, DAO), and subsequently on 18 July 1969 also from about 2 mi. s-se of Shand in se 34-1-7-W2 (JHH2628, SASK). This regionally restricted species with infrequent

and sparse local populations, deserves the status of an "especially rare" plant in Saskatchewan. It could be endangered in the Souris Valley by water deprivation of the floodplains below the proposed Rafferty and Alameda Dams. It was listed by Argus & Pryor (1986) as also rare in Canada.

Carex tetanica Schkuhr. - RIGID SEDGE

Moist, ± calcareous meadows and sloughs. Moose Mtn. Creek w of Alida (38446). Elsewhere in Saskatchewan this sedge has been recorded from along upper Moose Mountain Creek at Kisbey, from the Qu'Appelle River watershed at Redpath nw of Spyhill, Saltcoats, Strawberry Lakes and the File Hills, and recently by J.H. Hudson from along an Antler River tributary s of and between of Carnduff and Carievale (Hudson 1988). The present Moose Mountain Creek collection was from about 10 mi. n of Oxbow (about 18 mi. w of Alida) in wc 10-5-2-W2. Once thought probably to be extirpated in Saskatchewan (Maher et al. 1979), the more recent Strawberry Lakes, Saltcoats, Carnduff/Carievale, and the present Moose Mountain Creek collections reveal this sedge still to be present and rather more frequent in the province than once realized. The species appears restricted to the general southeastern region of Saskatchewan east of longitude 103°30′ and south of latitude 51°. With this regional limitation, infrequent known localities and the local populations small, it clearly deserves a rare status and is borderline to being "especially rare" in Saskatchewan. It was listed by Argus & Pryor (1986) as also rare in Canada.

Cyperus schweinitzii Torr. - SCHWEINITZ'S UMBRELLA-SEDGE; SAND NUT-GRASS.

Sand-barrens in sand grassland. Shand. Elsewhere in Saskatchewan, it has been recorded at Cutknife, Artland Siding, Elbow, Mortlach, Caron, and Welby. The only collection from the Souris Valley region was on 5 August 1956 from about 3 mi. s of Shand in nw 21-1-7-W2 by J.H. Hudson (1896, DAO). Although it has a rather widespread overall range in Saskatchewan, the recorded occurrences of this species are rather infrequent and sporadic. It is tentatively retained on the Saskatchewan rare plant list, but appears borderline for removal from a rare status.

Elechocharis compressa Sulliv. - FLAT-STEMMED SPIKE-RUSH.

Moist to drying, usually sandy depressions, sloughs and ditches, wet meadows and seepy lower slopes. Pinto; and Glen Ewen. Elsewhere in Saskatchewan this species has been recorded from Kisbey and Forget in the upper Moose Mountain Creek drainage, Bredenbury, Moose Jaw Creek and Pike Lake. Although B. Boivin & W.G. Dore collected it in 1951 from Kisbey on upper Moose Mountain Creek, it appears not to have been collected from the present Souris Valley study region until 10 August 1971 from about 8 mi. s of Glen Ewen in se 3-2-1-W2 by J.H. Hudson (2743, SASK), and also by him on 6 June 1978 from near Pinto in se 26-1-6-W2 (JHH3518, SASK). With especially the Pike Lake record, this species has quite a wide overall known range in the province, but its occurrences are infrequent and sporadic, and the known local populations are mostly small but sometimes larger. In the Souris Valley, region the plants were sparse

at the Pinto site but relatively numerous at Glen Ewen. It still appears to deserve the status of a provincially rare species.

Eleocharis engelmannii Steud. - ENGELMANN'S SPIKE RUSH

Wet sloughs and wet to drying depressions. Colgate. Elsewhere in Saskatchewan, this spike-rush has been recorded from near Regina, Govan and Saskatoon. The only known collection in the Souris Valley region was on 7 October 1978 from Roughbark Creek near Colgate in nw 30-5-14-W2 by J.H. Hudson (3759, SASK). With only four quite widely spaced known stations in Saskatchewan and indicated by label data as uncommon at all but the Colgate site, this species deserves to retain the status of a provincially rare plant and is at least borderline to being considered an "especially rare" species. It was locally numerous and dominant at the Colgate site, however, forming nearly solid stands. It was listed by Argus & Pryor (1986) as also rare for Canada.

Scirpus pallidus (Britt.) Fern. [S. atrovirens Willd. var. pallidus Britt.] - DARK-GREEN BULRUSH.

Low wet meadows, marshy depressions, and wet ditches. Glen Ewen; & near N. Dak. border. Elsewhere in Saskatchewan, this species has been recorded only from Lake Marguerite se of Indian Head, and Crooked Lake on the Qu'Appelle River. This taxon was first collected on 15 Sept. 1957 and reported in the Souris River region by Hudson (1958) from about 12 mi. s of Glen Ewen (3 mi. n of the North Dakota border) in sw 16-1-34-W1, JHH2021, DAO. Subsequently, on 3 August 1986, Hudson also collected it from about 3 mi. s of Glen Ewen in sw 36-2-1-W2 (JHH4664, SASK). This is an infrequently encountered and

locally sparse species, apparently restricted in Saskatchewan to a very few sites in the general southeastern region south of the Qu'Appelle River and east of longitude 104°. It appears to deserve the status of an "especially rare" species in Saskatchewan and is also considered rare in Canada.

LILIACEAE - LILY FAMILY:

Polygonatum biflorum (Walt.) Ell. [P. canaliculatum sensu auctt. non (Muhl.) Pursh; P. commutatum (Schultes f.) Morong] - GREAT SOLOMON'S SEAL.

Moist, shaded, riverine, deciduous woods on alluvial flats. Estevan (37760, 37775); Roche Percee (36014); s of Hirsch (38607); Oxbow (38261, 38699, 38960); Glen Ewen (38940); between Glen Ewen & N. Dak. border (38914); and near N. Dak. border (38912): - the only Saskatchewan records. Earlier collections include those on 19 July 1951 from Oxbow by B. Boivin & W.G. Dore (8041, DAO, SASK), and subsequently by B. Boivin from several localities s and se of Glen Ewen (DAO). It was collected on 20 June 1961 and reported by Hudson (1961), from about 1 mi. s-se of Estevan in ne 11-2-8-W2 (JHH2093, SASK). The Great Solomon's Seal appears restricted in Saskatchewan to the elm-ash-boxelder riverine woods along the immediate Souris River channel below Estevan to near the North Dakota border south of Glen Ewen. The present collections help to narrow some previously apparent large distributional gaps along the extent of the middle and lower Souris River. With its quite limited Saskatchewan range and the local populations relatively infrequent and mostly small, it qualifies as an "especially rare" species in the province. This species appears

quite intolerant of cattle grazing and trampling, being absent wherever the latter has been moderate to heavy, and also where the forest understory has become "weedy", dominated by such introduced plants as Stinging Nettle and Smooth Brome. Since such cattle-impacted and/or weedy conditions now characterize most of the present-day riverine woods along the entire extent of the middle and lower Souris River in southeastern Saskatchewan, they may help to explain the scarcity of this species today, although documentation is lacking for its presumed greater abundance in the past. The still persisting remnants of the distinctive elm-ash-boxelder gallery woods with good natural understory growth on the Souris River floodplains, including such native plants as the Great Solomon's Seal, appear endangered by the proposed dam-constructions upstream and the building of multiple irrigation weirs along the channel below, predictably resulting in unnatural water-fluctuations, much reduced and intermittent water flows, artificial shorelines, and a general water-deprivation significantly lowering the ground-water table level of the floodplains.

URTICACEAE - NETTLE FAMILY:

Laportea canadensis (L.) Wedd. - WOOD NETTLE

Moist shady riverine deciduous woods on alluvial flats. Estevan; Roche Percee (36002, 37055, 37930); Oxbow (38796); Glen Ewen (38846, 38891); midway between Glen Ewen to N. Dak. border (38916); and near N. Dak. border (38880, 38888); - the only Saskatchewan records. This species was collected on 22 July 1956 and reported as new for Saskatchewan by Hudson (1956) from about 1.5 mi. s-sw of Glen

Ewen in nw 1-3-1-W2 (JHH1884, SASK), and subsequently in 1958 and 1960 from 4 mi. sw and 5 mi. s of Glen Ewen by B. Boivin et al. (11813 & 14045, DAO, SASK). On 8 Aug. 1978 it was collected from about 1 mi. s-se of Estevan in nw 12-2-8-W2 by J.H. Hudson (3652, SASK). This appears to be a regionally much restricted species in Saskatchewan to the immediate Souris River gallery woods, with local populations relatively infrequent and usually small, supporting its status as an "especially rare" native plant in Saskatchewan. Similarly to the Great Solomon's Seal, it appears intolerant of more than light cattle-grazing pressure, being absent wherever the latter has been heavy, which unfortunately characterizes the present situation along much of the river's course in southeastern Saskatchewan. Also, with increased disturbance of the floodplain woods, its introduced weedy relative, Common Stinging Nettle (Urtica dioica L.), has dramatically spread to frequently dominate the understory and perhaps, through competition, decrease the native Wood Nettle populations. No documentation is available, however, to support the presumed greater abundance of the Wood Nettle in the past. Similarly to the Great Solomon's Seal, and for the identical reasons, the Wood Nettle appears endangered by the proposed major dam-constructions upstream. Despite its being a rare indigenous member of the natural flora, protection of a stinging nettle species may find little public sympathy.

ROSACEAE - ROSE FAMILY:

Potentilla finitima Kohli & Packer [P. pensylvanica s. lat., pro parte sensu auctt., non L.] - PRAIRIE CINQUEFOIL.

Grassland slopes. 5 mi. e of Goodwater (37531-B); sw of Midale (37617-A); s of Hitchcock (37718-B); Roche Percee (37899); Oxbow (38094); and Moose Mtn. Creek ne of Alameda (38439). Elsewhere in the province, it has been recorded from various wide-spread localities across the grassland region of the western half of the province, but its total Saskatchewan range and frequency of occurrence still need to be better ascertained from a comprehensive restudy and reassignment of pertinent available herbarium specimens of the P. pensylvanica s. lat. complex. This recently described species by Kohli & Packer (1976) was not recognized separate from P. pensylvanica by Maher et al. (1979) and thus omitted from that Saskatchewan rare plant list. Its tentative inclusion here as a provincially rare species is based largely on its tentative listing by Argus & Pryor (1986) as rare in Canada, but the species' total distribution and actual rarity status in Saskatchewan still needs clarification. It may prove too frequent and widespread in the province to deserve a rarity status.

Prunus americana Marsh. - AMERICAN PLUM

Margins of riverine or bluff-ravine deciduous woods and tall shrub-thickets. Estevan (36686, 37731); Shand (37978); Roche Percee (35320, 35998, 36144B, 37053, 37980); Pinto (36128-B, 36992); Glen Ewen (38866); and between Glen Ewen & N. Dak. border (38902). Elsewhere in Saskatchewan, this species has only been recorded from along the Antler River south of Gainsborough. Earlier herbarium

records of this tall shrub species from the Souris Valley include a collection on 15 August 1948 from w of Roche Percee in 26-1-7-W2 by R.H. Cooper (s.n., SASK), on 3 August 1957 from se of Estevan in sw 6-2-7-W2 by J.H. Hudson (1995, SASK), and from 4 mi. sw of Glen Ewen by B. Boivin et al. (DAO). Perhaps once more common than now in the Souris River valley, the frequency of this species in the wild state may have been reduced by various disturbances and frequent transplantations to homesteads. Some quite sizeable plum-thickets were encountered (e.g. e of Roche Percee and s of Estevan), but most often the local colonies consisted of relatively few (i.e. <10) or solitary shrubs. The American Plum is regionally limited in Saskatchewan to the valleys of the Souris River below Estevan and lower Antler River near the Manitoba border. Its considerable regional restriction plus rather sporadic occurrence within this region, support its retention on the list of provincially rare plants.

FABACEAE - LEGUME FAMILY:

Lotus purshianus (Benth.) Clem. & Clem. [L. americanus (Nutt.) Bisch.] - PRAIRIE BIRD'S-FOOT TREFOIL.

Open, grassy to ± brushy, stony, intermittent streamlet channel margins in ravine bottoms, sandy shores and well drained drying sloughs. Goodwater; s of Hirsch (38668); Elcott; and ne of Alameda (38392). Elsewhere in Saskatchewan, this species has been recorded from along the Antler River s of Carievale and Gainsborough, the Big Muddy Valley se of Big Beaver, and the Qu'Appelle River at Katepwa Beach. Earlier collections of this species in the Souris River basin were those by J.H. Hudson on 19 July 1966 from Jewell Creek near

Goodwater in ne 14-5-13-W2 (JHH2630, SASK), and on 7 Aug. 1978 from s of Elcott in sw 13-1-3-W2 (JHH3647, SASK), the latter collection actually being from the headwaters of the Riviere des Lacs drainage, although only 3 mi. s of the Souris River. This species in Saskatchewan is apparently restricted to the general southeastern region from the Big Muddy Valley eastwards and the Qu'Appelle River southwards, with the very infrequent and sporadically occurring local colonies varying in size from only a few to sometimes quite numerous plants. At collection sites near Goodwater and the Coalfields Community Pasture s of Hirsch, as well as various ones seen along the Antler River, the local colonies were quite sizable. This species in Saskatchewan appears borderline between deserving a rare or an "especially rare" status. It appears potentially endangered in the Souris Valley by the construction the proposed Rafferty Dam if the ground-water table level of the whole Souris Valley downstream is significantly lowered. The Moose Mountain Creek colony ne of Alameda would be inundated by the reservoir of the proposed Alameda Dam. It was listed by Argus & Pryor (1986) as also rare for Canada.

Oxytropis lambertii Pursh - LAMBERT'S PURPLE LOCOWEED.

Dry-mesic, south-facing, middle to upper, prairie slopes and summits of river bluffs. S of Macoun; Estevan; Shand; Roche Percee (35322); Pinto (36045, 36115); Moose Mtn. Creek ne of Alameda (37122); Oxbow (37317, 37327, 38064, 38089-90); and midway Glen Ewen to N. Dak. border (39199, 39211). Elsewhere in Saskatchewan, this locoweed has been recorded only from along the Qu'Appelle River valley at Fort Qu'Appelle, Katepwa n of Indian Head, and Hyde (ca. 6 mi. w of Crooked

Lake). This species was collected earlier in the Souris Valley from Estevan on 26 June 1917 (Anonymous s.n. SASK) and subsequently by B. Boivin & W.G. Dore on 16 July 1951 from s of Macoun (7944, DAO), and also by them on 19 July from Oxbow (8050, DAO; 8051 DAO, SASK). On 8 June 1978 it was collected from about 3 mi. se of Estevan in ne 6-2-7-W2 by J.H. Hudson (3521, SASK). This species appears restricted in Saskatchewan to the prairie bluffs along the Qu'Appelle and Souris Rivers and lower Moose Mountain Creek. Local populations in the Souris Valley are moderately frequent, although rather sporadically occurring, consisting of only a few to sometimes about a score of plants. Due to its regional restriction and limited frequency, this species continues to deserve the status of a provincially rare plant.

POLYGALACEAE - MILKWORT FAMILY:

Polygala alba Nutt. - WHITE MILKWORT.

Dry-mesic, grassland ridges and south-facing bluff slopes, mostly associated with granitic rock erratics or sandstone outcrops. Estevan; Shand (38011); Roche Percee (35970, 36946, 37896, 38305); Pinto (36074); and Moose Mtn. Creek w of Alida (10 mi. n of Oxbow) (37244-5, 39314). Elsewhere in Saskatchewan, this species has been recorded only in the Big Muddy basin. It was originally collected in the Souris Valley from Roche Percee on 11 July 1899 by T.N. Willing (s.n. SASK), and subsequently on 17 July 1951, also from Roche Percee, by B. Boivin & W.G. Dore (8022, DAO, SASK). On 8 June 1978, it was collected from about 3 mi. se of Estevan at ne 6-1-7-W2 by J.H. Hudson (3524, SASK). This species appears to be regionally restricted to the immediate valley bluffs along the Big Muddy and Souris Rivers and

lower Moose Mountain Creek, in southeastern Saskatchewan. While White Milkwort is now known to be more frequent in the Souris Valley than once realized, and also locally quite numerous at some sites (e.g. Roche Percee and Pinto), its occurrence in the region appears rather sporadic and most local populations are relatively small. This combined with its regional restriction, justifies the continued recognition of this species as a provincially rare plant. It was listed by Argus & Pryor (1986) as also rare in Canada.

Polygala verticillata L. - WHORLED MILKWORT

Dry, ± alkaline, clayey, shaly, eroded and outwashing coulee slopes and bottom flats. Estevan. Elsewhere in Saskatchewan, this species has been recorded only at Yarbo, ne of Esterhazy,within the Qu'Appelle River watershed. The only regional collection was made on 14 July 1972 from about 3.5 mi. w-sw of Estevan in nw 18-2-8-W2 by J.H. Hudson (2777, SASK) and reported as new for Saskatchewan (Hudson 1973). This is also the local site of the largest of only 3 known Saskatchewan colonies of Buffalo Grass (Buchloe dacytyloides) and one of the only two known provincial colonies of Whorled Milkweed (Asclepias verticillata). Whorled Milkwort ranks as an "especially rare" species in Saskatchewan, with the plants locally scarce in only a few patches at the Estevan and Yarbo sites in the province. With the occurrence of the single small local colony in the Souris Valley in a grazed pasture as well as relatively near the proposed Rafferty Dam construction activities, this species may also be endangered here.

CELASTRACEAE - STAFF-TREE FAMILY

Celastrus scandens L. - CLIMBING BITTERSWEET.

Deciduous wooded or tall-shrubby, n- or e-facing, steepish slopes of bluffs or ravines of Souris River tributary streamlets, vining on tall shrubs or upon itself. Estevan (36744); and Pinto (36843, 36995, 37991); - the only Saskatchewan localities. This species was originally discovered and collected on 3 August 1957 by J.H. Hudson (1993, SASK) from about 3.5 mi. se of Estevan in se 6-2-7-W2 and reported by him (Hudson 1958) as new for Saskatchewan. The author's recent (24 Aug. 1986) collection no. 36744, was from a local site about 3 mi. s-se of Estevan in sw 6-2-7-W2 about 0.5 mi. w of Hudsons original collection locality. The recent Pinto area collections were from local sites about a mile apart, at 0.3 mi. nw of the former C.P.R.R. Pinto Station in ne 26-1-6-W2 , and 0.6 mi. ne of Pinto in ne 25-1-6-W2, respectively, both located about 0.5 mi. s of the Souris River, on densely tangle-wooded, steepish, ravine slopes along tributary streamlets. In 1986-1988, all natural plants of Climbing Bittersweet observed near Estevan and Pinto were vegetative with no evidence of flowering or fruiting during any of these seasons, but Hudson's original 1957 collection was in a fruiting stage. In Saskatchewan, the natural occurrence of this species appears regionally very restricted to only these several, small, local populations se of Estevan and n of Pinto, respectively. Thus the species deserves the status of an "especially rare" native plant in the province. Estevan nursery-men may have engaged in some limited horticultural trade of this attractive climbing shrub species from transplanted native stock, hardly a desirable practice if from local

sources from the view of preserving such a rare native species in its natural state and original habitat.

VITACEAE - GRAPE FAMILY

Parthenocissus inserta (Kerner) Fritsch [=P. vitacea (Knerr) Hitchc; (P. quinquefolia (L.) Planchon forma macrophylla (Lauche) Boivin] - THICKET CREEPER; WOODBINE; LARGE-LEAVED VIRGINIA CREEPER.

Moist riverine or bluff woods and shrub-thickets, sprawling loosely on rocks and/or low vegetation. Roche Percee (38276, 38307); and Oxbow (38121); - the only, apparently indigenous, Saskatchewan records. A specimen of this woody vine species was obtained from the general vicinity of Roche Percee in the Souris River valley by an early (pre-1925?) anonymous collector (perhaps T.N. Willing; s.n. SASK), and on 2 June 1978 it was collected from a more precisely indicated locality about 0.5 mi. e-se of Roche Percee by G.F. Ledingham (5844, USAS, DAO). Both of these earlier Roche Percee collections had been identified as P. quinquefolia, but are now revised to P. inserta. In the present study, this species was collected on 10 August 1987 from apparently near Ledingham's earlier site at about 0.25 mi. e of the historical "monument rocks" and 0.5 mi. e-se of the village of Roche Percee in sw 30-1-6-W2, where about a dozen plants vined loosely over rocks and/or low vegetation near the shrubby to grassy summit of a steep n-facing wooded bluff slope about 0.3 mi s of the Souris River (38276). On the same date, a small colony was also discovered and collected on gradual midslopes of the bluffs about 0.2 mi. n of the Souris River, across the river from the village of Roche Percee, in sw 31-1-6-W2, where a few plants were

loosely sprawling over low shrubs and several large low sandstone outcrops (38307). Subsequently, on 25 July 1987, this species was discovered about 1.5 mi. w of Oxbow in nc 21-3-2-W2, on a springy, wooded (elm-ash-boxelder), steep, w-facing bluff-slope above the e shore of lower Moose Mountain Creek about 1 mi. above (i.e. n of) its confluence with the Souris River, a site still within the broad main Souris River valley (38121). Here over a dozen plants were sprawling loosely over shrubby native vegetation in an essentially undisturbed natural habitat. These recent collections and the earlier ones from Roche Percee, form the basis for now recognizing the presence of this taxon as a naturally occurring native species in the province. Its apparent regional limitation, infrequency and local sparsity would give it the status of an "especially rare" species in Saskatchewan. The previously known native range of Parthenocissus inserta in Canada was from Quebec west to Manitoba (Scoggan 1978), and in the northern Great Plains states, west through North Dakota to Montana (McGregor et al. 1977). Thus its natural occurrence in southeastern Saskatchewan is not unexpected. For such a species that, like its close relative, P. quinquefolia, has been used for horticultural plantings, the question arises as to whether the naturally occurring plants encountered truly represent outliers of the species' native range or instead possible escapes from cultivation. Since the above-listed Souris Valley colonies occurred in apparently little disturbed natural habitats at some distance from any human habitations, there seems no reason to assume them to represent horticultural escapes rather than native occurrences.

VIOLACEAE - VIOLET FAMILY:

Viola pedatifida G. Don - CROWFOOT VIOLET.

Warm, mesic, ± sandy slopes of prairie bluffs. Estevan; Roche Percee (35354); Pinto (35364); n of Portal; and Elcott (35422). Elsewhere in Saskatchewan, this species has been recorded from along the upper Moose Mountain Creek near Arcola and Wordsworth, and at Bengough, Mortlach, Swift Current, Saskatoon area, Blaine Lake, Humboldt, McKague, Greenwater Lake, Raymore and Foam Lake. The species was collected earlier in the Souris region from "n of Portal" on 4 July 1902 by T.N. Willing (s.n. SASK), and on 3 June 1966 from 1 mi. s-se of Estevan at sw 13-2-8-W2 by J.H. Hudson (2269, SASK). This violet is relatively widespread in Saskatchewan and known from over a dozen general localities. While its recorded occurrences in the Souris Valley appear somewhat sporadic, the plants were quite numerous at various local sites. The Crowfoot Violet appears too widespread and frequent overall in Saskatchewan, and often locally too numerous, at least in the Souris Valley, to any longer deserve the provincial rarity status accorded to it by Maher et al. (1979). Its removal from the Saskatchewan rare plant list is now recommended.

APIACEAE - PARSLEY FAMILY:

Lomatium orientale Coult. & Rose - WHITE-FLOWERED PARSLEY.

Dry, non-sandy, prairie bluffs and plains. Estevan; "Bienfait?"; and Pinto; - the only Saskatchewan records. This species was collected on 3 June 1966 from about 1 mi. s-se of Estevan in sw 13-2-8-W2 by J.H. Hudson (2267, SASK), and subsequently on 8 May 1971 by him (JHH2742, SASK) from just ne of Pinto in nw 25-1-6-W2.

Breitung (1957) had included this species for Saskatchewan based on a collection cited from "on dry plains at Bienfait" filed in DAO, although such a specimen could not be located. The label data on both Hudson collections indicate that the plants were only occasional at these sites. Thus because of its highly restricted range in the province, infrequent occurrence, and local sparsity, this species deserves the status of an "especially rare" plant in Saskatchewan. White-flowered Parsley also appears to be a threatened and probably endangered species in the Souris study region and the province since the known sites are in grazed pastures. The species is also rare in Manitoba, where limited to several localities on the Souris River (White & Johnson 1980), and is considered rare for Canada.

ASCLEPIADACEAE - MILKWEED FAMILY:

Asclepias syriaca L. - SILKY MILKWEED.

Open grassy/low-shrubby upper floodplain of river valley. Pinto (R. Dunbar s.n., SASK); - the only known Saskatchewan locality. A specimen of this species collected in 1954 by Harold Longney was sent in for determination to Dr. R.C. Russell at the University of Saskatchewan, where it has since been filed in the Fraser Herbarium (SASK), representing for 34 years the sole basis for the species' known occurrence in Saskatchewan. The specimen-label data was given as "Locality: Roche Percee; Habitat: River Valley; Notes: only 12 stems found." Recently, on 1 July 1988, Richard Dunbar, a North Portal area resident and currently a student at the University of Saskatchewan, was able to contact the original collector, Harold Longney, who personally showed him the site where this milkweed had

been found in 1954. The local population was well established, currently consisting of about 200 plants. A voucher specimen recollected for verification confirms that the Silky Milkweed is still extant in Saskatchewan. The location of the single known provincial colony can be more precisely indicated now as follows: open river valley upper floodplain s of the Souris River, about 0.6 mi. n-ne of the former C.P.R.R. Pinto Station (about 4.5 mi. e of Roche Percee) in sw 36-1-6-W2. Interestingly, this site is just across the river from, and only about 0.3 mi. s-sw of the recently discovered single known Saskatchewan colony of Indian Grass (Sorghastrum nutans) (Harms 1987), and only about 0.5 mi. distant from both of the two recently recorded Pinto area sites for Climbing Bittersweet (Celastrus scandens). With only a single local colony recorded in Saskatchewan, Asclepias syriaca must be considered an "especially rare" species for the province. Although this solitary colony has thrived to date, it occurs precariously in a grazed pasture, and is at least potentially threatened by future agricultural activities (specifically increased grazing and/or tillage for forage-cropping). In addition the single floodplain colony of this species appears distinctly endangered by the proposed construction of the Rafferty Dam upstream and multiple irrigation weirs along the channel below, predictably resulting in an alteration of the water-regime and a significant lowering of the ground-water table levels of these river floodplains.

Asclepias verticillata L. - WHORLED MILKWEED.

Dry, stony, ± alkaline, clayey, shaly, grassy and ± eroded, coulee slopes and bottoms. Estevan area; - the only Saskatchewan

records. This species was discovered on 4 Aug. 1957 about 2 mi. w-sw of Estevan in se 17-2-8-W2 by J.H. Hudson (1998, DAO) and reported as new for Saskatchewan (Hudson 1958). Subsequently on 19 August 1971, Hudson also collected it from about 3.5 mi. w-sw of Estevan in nw 18-2-8-W2 (JHH2753, SASK), a site about 1.5 mi. w-nw of the previous. Interestingly, these local sites are also those for two of the three Saskatchewan records of Buffalo Grass (Buchloe dactyloides), and the latter is one of the only two recorded Saskatchewan stations for the Whorled Milkwort (Polygala verticillata). Whorled Milkweed in Saskatchewan is highly infrequent, regionally much restricted, and locally sparse, thus deserving the status of an "especially rare" plant in the province. With the only known two colonies very sparse and occurring in grazed pastures and with the second site also near the proposed Rafferty Dam construction activities, it is potentially endangered in Saskatachewan. This species was listed by Argus & Pryor (1986) as also rare in Canada.

BORAGINACEAE - BORAGE FAMILY

Onosmodium molle Michx. var. occidentale (Mack.) Johnston [O. occidentale Mack.] - WESTERN FALSE GROMWELL.

Open or semi-open shrubby edges of riverine woods, shore shrub-thickets and buckbrushy pastures. Estevan (37738); Shand; Roche Percee (37918); Pinto (36970); and s of Hirsch (38664). Elsewhere in Saskatchewan, this taxon has been recorded from along the Antler River from e of Carnduff, and s of Carievale and Gainsborough to the Manitoba border where relatively frequent and locally numerous, and also from along the Qu'Appelle River where sparse at two Crooked Lake

local sites. An old 1902 collection, uncertainly labelled as from the Souris Valley n of Portal, was made by T.N. Willing (s.n. SASK). It was collected in 1960 by B. Boivin et al., from along the Antler River at Carnduff and s of Gainesville, but apparently not from along the Souris. On 18 July 1969, it was collected from about 2 mi. s-se of Shand in se 34-1-7-W2 by J.H. Hudson (2625, SASK). The present records now show this species to be considerably more frequent in the Souris Valley than once realized, but most observed local populations consisted of relatively few plants. Elsewhere in Saskatchewan, large local populations were seen only along the Antler River towards the Manitoba border. Thus this geographically limited and usually locally sparse species in Saskatchewan, continues to deserve the status of a provincially rare species.

VERBENACEAE - VERVAIN FAMILY:

Verbena hastata L. - BLUE VERVAIN.

Moist, open or semi-open margins and lower flood plains of often intermittent streamlets. Roche Percee (36864, 38281); Pinto (37013); and s of Hirsch (38669); - the only records verified for Saskatchewan, discounting a disputed collection labelled from "Wadena" (S.E. Clarke s.n., July 1939, SASK). It was collected earlier in the Souris Valley on 17 July 1951 from Roche Percee by B. Boivin and W.G. Dore (8000, DAO), and subsequently on 12 Aug. 1971 from about 3 mi. e of Roche Percee in nw 27-1-6-W2 by J.H. Hudson (2750, SASK). The plants were found to be locally quite numerous at 3 mi. e of Roche Percee (36864) in nw 27-1-6-W2, and 4 mi. s of Hirsch in ne 10-2-5-W2 (38669), but sparse at 2 mi. ne of Pinto in nc 31-1-5-W2 (37013) and n

of Roche Percee in sw 31-1-6-W2 (36864 & 38281). This appears to be a regionally very limited species in Saskatchewan, with local populations infrequent and usually rather sparse, thus deserving the status of an "especially rare" species in the province. This species characteristic of moist edges of tributary streamlets in ravines of river bluffs appears dependent upon a high ground-water table in the Souris Valley. Thus it is potentially threatened by the general water-deprivation that will predictably lower ground-water table levels in the Souris Valley downstream from the proposed Rafferty Dam.

LAMIACEAE - MINT FAMILY:

Prunella vulgaris L. var. lanceolata (Bart.) Fern. - LANCE-LEAVED HEAL-ALL or SELF-HEAL.

Moist places in open woodlands, shrublands or grasslands. Shand; Roche Percee; and Moose Mtn. Creek w of Alida (ca. 10 mi. n of Oxbow) (38135, 38365) - the only Saskatchewan records for this native variety; the introduced Eurasian variety vulgaris is recorded at Regina. The Lance-leaved Heal-all was collected earlier in the Souris Valley region from near Roche Percee on 17 July 1951 by B. Boivin & W.G. Dore (8003, DAO, SASK), and subsequently on 18 July 1969 from about 3 mi. s of Shand in se 34-1-7-W2 by J.H. Hudson (2627, SASK). Neither of these collections had been identified to the varietal level to distinguish their native status, since, unlike many other North American botanists, Boivin (1972), with his characteristically ultra-conservative taxonomic approach, never distinguished var. lanceolata as a native North American taxon separate from the introduced Eurasian var. vulgaris. These earlier Roche Percee and

Shand collections, that now have been revised to Prunella vulgaris var. lanceolata, and our present Moose Mountain Creek collections from 10 mi. n of Oxbow in nw 10-5-2-W2 (38135 & 38365), form the basis for now first recognizing and recording this native variety in Saskatchewan. This taxon appears to be highly infrequent and locally sparse, as well as regionally much restricted in the province, thus qualifying it as an "especially rare" plant in Saskatchewan if it taxonomically distinguished from the introduced var. vulgaris. It may also be endangered in the Souris Valley and in Saskatchewan, — the Shand-Roche Percee populations because of a significant lowering of the ground-water table levels of the Souris River valley floodplains predictably resulting downstream from the proposed construction of the Rafferty Dam, and the Moose Mountain Creek colony north of Oxbow because of innundation by the proposed Alameda Dam reservoir.

Scutellaria lateriflora L. - BLUE SKULLCAP.

Moist, muddy or marshy, usually shaded, river-shore bank-bases, streamlet edges, and moist depressions such as in shallow oxbows on alluvial flats under riverine elm-ash-boxelder deciduous woods. Estevan (37746, 37751, 37757); Roche Percee-Pinto (36860); s of Hirsch (37029, 38594, 38605, 38655); N of Portal (38616); Elcott (38953); Oxbow (38587, 38722, 38815); Glen Ewen (38783, 38825, 38835, 38858, 38865, 38868, 38890, 38938); midway Glen Ewen & N. Dak. border (38921) and near the N. Dak. border (38878, 38881, 38884, 38908). Elsewhere in Saskatchewan, this species has been recorded from w of Weyburn (near Trossachs in the Moose Jaw Creek drainage basin), along the Antler River s of Carievale to s of Gainsborough, in the Qu'Appelle

River valley at Rocky Lake, Crooked Lake, Tantallon and Welby, and in east-central Saskatchewan at Mountain Cabin, Armit, s of Hudson Bay and s of Somme. This species was collected earlier in the Souris River Valley from Estevan on 23 August 1952 by B. Boivin and J.F. Alex (10237, DAO, SASK), and subsequently, on 17 August 1971 from 3 mi. e of Roche Percee in nw 27-1-6-W2 by J.H. Hudson (2751, SASK). Blue Skullcap is now revealed to have a fairly widespread range in eastern Saskatchewan, west to latitude 105° and north to the Carrot River. The recent collections of D.F. Hooper have tripled the known localities for it in east-central Saskatchewan as have those of the present study in southeastern Saskatchewan. The latter have now shown the species to be quite frequent along both the Souris River from Estevan to the North Dakota border, and the Antler River from south of Carievale to the Manitoba border, with the observed local populations often quite sizeable. Because of its quite wide range in the province, and its relative frequency and often sizable local colonies in southeastern Saskatchewan, it would now be recommended that this floodplain and river-edge species be removed from the provincial list of rare native plants were not the Souris River populations presently much threatened by the Rafferty and Alameda dam constructions.

CAPRIFOLIACEAE - HONEYSUCKLE FAMILY:

Viburnum lentago L. - NANNYBERRY.

Moist riverine or bluff-ravine deciduous woods, mostly on lower north-facing slopes. Roche Percee 36144-A, 36798); and Pinto (36128-A, 36844, 36993, 37003, 37989). Elsewhere in Saskatchewan, supposedly native stands of this tall shrub species have been recorded

in natural habitats along the Antler River from s of Gainsborough to the Manitoba border, along Pipestone Creek near Wapella, in the lower Qu'Appelle River valley e of Tantallon and n of Ste.-Marthe-de-Rocanville (Maher et al. 1979), and near the Swan River on Thunderhill n of Arran (Hooper 1981). The single earlier record in the Souris Valley was based on a collection made on 6 June 1978 from about 0.5 mi. s of the former C.P.R.R. Pinto Station in sw 25-1-6-W2 by J.H. Hudson (3516, SASK) (Hudson 1980). In the present study, this species was again found at Hudson's original site, and in addition, two other small natural colonies were discovered nearby at 0.3 and 0.7 mi. s of Pinto, both in se 26-1-6-W2, another about 0.5 mi. ne of Pinto in ne 25-1-6-W2, and still another about 1.5 mi. ne of Pinto on the Souris River n shore in ne 36-1-6-W2. A colony of native Nannyberry was also found about 2.5 mi. w of the Pinto ones on the n shores of the Souris River within the Roche Percee Campground in se 33-1-6-W2, about 2 mi. e-ne of Roche Percee. Thus, although seven different local colonies of this species are now known in the Souris Valley, each consisting of 20 or fewer tall shrubs, all of these are concentrated within 3.5 miles of each other in the Roche Percee-Pinto area, with two occurring on the n banks of the Souris River channel itself, four from ravines along the same tributary streamlet n and s of Pinto, and a fifth from along an east fork of the latter. While, with the relatively recent Thunderhill record, Nannyberries are now known to have a fairly wide overall natural range in the province from southeastern to east-central Saskatchewan, their occurrence appears highly infrequent and sporadic, with the local colonies relatively small, thus supporting the continued status of this species as provincially rare

and borderline to "especially rare". Estevan nursery-men may have engaged in some limited horticultural trade of Nannyberry shrubs from transplanted native stocks, which, if from rare local sources, would represent an unfortunate practice from the view of preserving a rare native species in its natural habitat and state.

ASTERACEAE - ASTER FAMILY:

Antennaria neodioica Greene [A. neglecta Greene var. attenuata (Fern.) Cronq.] - TOMENTOSE PUSSYTOES.

Mesic-moist, open-grassland, bluff slopes and grassland-shrubland borders. Roche Percee (Hooper, Harms & Baker 86-05-27-02) and Pinto (36109). Elsewhere in Saskatchewan, this taxon has been recorded at Lac Ile-a-la-Crosse, Otter Rapids on the Churchill River, and in the Cypress Hills. The single earlier record of it in the Souris Valley was based on a 6 June 1978 collection from s of Pinto in sw 25-1-6-W2 by J.H. Hudson (3519, SASK). Those of the present study were from n of the Souris River about 1 mi ne of Pinto in ne 36-1-6-W2 and from about 2 mi. e-ne of Roche Percee in ne 33-1-6-W2. Thus the three Souris Valley records are all located within a 2-mile radius. The known Saskatchewan distribution of this species forms an unusual and difficult to explain pattern of 3 widely disjunct general localities. Although treated by some taxonomists as only a variant of the common species, A. neglecta, it appears to represent a distinctive taxon quite worthy of species rank. An easier phytogeographical interpretation would be possible if it were considered only an extreme form sporadically appearing within the range of a widespread species. If recognized as a distinct taxon at

either the specific or varietal level, it qualifies as an "especially rare" native plant in Saskatchewan. The known occurrences of the sparse local colonies in cattle-grazed pastures in the Souris Valley point to it as also being a potentially endangered plant here.

Helianthus tuberosus L. var. subcanescens Gray - Jerusalem Artichoke

Near shores under or at margins of riverine hardwoods, or on ± open or shrubby shores. Goodwater (37403); Shand (37992); Roche Percee (37054); Pinto (37016); Elcott (3952); Oxbow (38263, 38766); Moose Mtn. Creek e of Alameda (38207). Elsewhere in Saskatchewan, this species has only been recorded from along the Antler River s of Gainsborough. It was collected on 4 Sept. 1957 and reported as new for Saskatachewan by Hudson (1958) from the n bank of the Souris River about 6 mi. n of Northgate (=3 mi. n-ne of Elcott) in ne 36-1-3-W2 (JHH2016, DAO), and subsequently on 8 October 1978 it was also collected and reported by Hudson (1980) from 5 mi. e of Goodwater in sw 17-5-12-W2 (JHH3762, SASK). This species appears restricted in the province to the valleys of the Souris River, Antler River and lower Moose Mountain Creek, in southeastern Saskatchewan. Within this quite limited region, fewer than a dozen local colonies have been recorded, sometimes consisting of numerous (i.e. over 50) plants (e.g. s of Oxbow and e of Roche Percee), but mostly of fewer plants. At least the smaller colonies may be largely clonal. The apparent natural range of this sunflower species extends from eastern North America, westward in Canada across southern Manitoba to southeastern Saskatchewan (Boivin 1972), and in the northern Great Plains states northwestward to Burke County, North Dakota (McGregor et al., 1977),

just south of the U.S.A.-Canada border from our Shand-Pinto-Roche Percee records. Thus, these localities for the Jerusalem Artichoke along the Souris River in southeastern Saskatchewan appear to represent colonies at the northwestern limit of the species' native range. Scoggan's (1979) contention that Helianthus tuberosus is an introduced naturalized species in Canada and northern United States appears erroneous and disagrees with the generally accepted botanical consensus. The assumed native status of the species in the Souris River valley is supported by its occurrence in apparently natural habitats that have been relatively well protected from disturbance and distant from human habitations. Only once, this just south of Shand, were several plants observed in the less than natural habitat of a roadside ditch rather than along naturally vegetated river shores. The species' great regional restriction and relative infrequency in Saskatchewan justify its status as a provincially rare native plant. While local colonies may often appear rather too sizeable for this species to be given an "especially rare" status, it would at least seem borderline to such, especially, when realized that these colonies are largely clonal, thus in reality even the larger colonies probably consist of relatively few different individuals. Furthermore all recorded colonies of Jerusalem Artichoke along the Souris River would appear endangered by either the upstream or downstream effects of the construction of the proposed Rafferty and Alameda Dams, excepting possibly the Oxbow "golf-course" population. The northwesternmost range records in the Goodwater vicinity, near the confluence of the Souris River and Roughbark Creek and on Jewell Creek, are destined for inundation by the upstream reach of the Rafferty Dam reservoir. The

known Moose Mountain Creek colony at the proposed Alameda Dam site would certainly be destroyed by its construction. The other recorded colonies on the Souris River shores below the dam sites are predictably threatened if construction proceeds, similarly to Polygonatum biflorum and Laportea canadensis, by a combination of water-deprivation, altered river-flows, unnatural shorelines, and lowered ground-water table levels of the river floodplains.

III. Threats to the Provincially Rare Plants in the Souris River Valley

To date, the most serious environmental impacts in the Souris River Valley of southeastern Saskatchewan have been the agricultural ones of cattle-overgrazing/trampling and floodplain forage-cropping. Cattle-impacts on floodplain woods and meadows appear heavy all along the extent of the Souris River channel in the province. Only where there has been at least some degree of local protection from heavy cattle usage by fencing or by topographic barriers such as steep bank slopes that exclude livestock, or reduce their accessibility, or else as a result of rare good pasture-management practices, has the natural rich understory of the floodplain woods persisted in relatively good condition, sometimes including provincially rare plants. The understory of disturbed riverine woods is often dominated by such introduced weedy species as Bromus inermis Leyss. (Smooth Brome-grass) and/or Urtica dioica L. (Stinging Nettle). Also most of the former natural moist meadows and low-buckbrush shrublands on the floodplains have been either utilized for forage-cropping or subjected to relatively heavy cattle-grazing. These agricultural activities have clearly reduced the frequency and abundance of many native plants and often appear to have locally eliminated the rarer species on both wooded and more open floodplains. Various parks and campsite areas in the Souris Valley — most specifically the Woodlawn Regional Park south of Estevan, Roche Percee Campground, and Bow Valley Regional Park south of Oxbow — represent areas where more-or-less notable concentrations of rare species have been preserved in floodplain habitats, apparently because the direct human-disturbances present there, in contrast to those caused by cattle elsewhere, have been less

pervasive in their destruction of the natural undergrowth vegetation. It is not too surprising, however, that no rare plants have been found in river shore or floodplain habitats at the Elcott Picnic Site (where too highly disturbed including by cattle) nor the Dr. Mainprize Regional Park (where exists unnatural shorelines and largely artificial floodplain vegetation).

Most prairie bluff slopes in the Souris Valley also show the effects of relatively heavy cattle-grazing, often with only the steeper mid-slopes appearing more lightly grazed. Even the natural grasslands within the extensive P.F.R.A. Coalfields Community Pasture appear no better managed than are most other seriously overgrazed private pastures. Tributary streamlets cutting ravines into bluff slopes that are steep-sloped and wooded or tall-shrubby, with limited cattle-accessibility, often contain pockets of persistent natural vegetation where some rare plants may have survived.

Although all provincially rare plant species in the Souris River Valley are more-or-less vulnerable to cattle-impacts, those appearing most threatened, because of their higher susceptibility plus greater infrequency and/or local scarcity, are listed below. The plants appearing particularly endangered are preceded on the list by an asterisk (or double-asterisk if already limited both regionally and provincially).

*Antennaria neodioica	Tomentose Pussytoes
*Asclepias syriaca	Silky Milkweed
**Asclepias verticillata	Whorled Milkweed
*Buchloe dactyloides	Buffalo Grass
Carex assiniboiensis	Assiniboia Sedge
Carex gravida	Heavy-fruited Sedge
Carex tetanica	Rigid Sedge
*Dichanthelium wilcoxianum	Wilcox's Panic or Switch Grass
Eleocharis engelmannii	Engelmann's Spike-rush
Helianthus tuberosus	Jerusalem Artichoke

var. subcanescens	
*Laportea canadensis	Wood Nettle
*Lomatium orientale	White-flowered Parsley
Lotus purshianus	Prairie Bird's-foot Trefoil
Panicum virgatum	Switch Grass
**Polygala verticillata	Whorled Milkwort
*Polygonatum canaliculatum	Great Solomon's Seal
Prunella vulgaris	Lance-leaved Healall
var. lanceolatum	
Scirpus pallidus	Pale-green Bulrush
**Sorghastrum nutans	Indian Grass
Verbena hastata	Blue Vervain

A serious non-agricultural impact on the natural environment of the Souris River Basin from Estevan to Bienfait and n-ne of Pinto, has been the coal strip-mining that has devastated extensive land areas, leaving behind a waste-land of spoil fields. Since most of the regional rare plants appear limited to the actual Souris River Valley and its bluffs, it is perhaps fortunate that the primary river bluff faces have not yet been strip-mined, except in the immediate Estevan area. But the spoil fields often extend right to the summits of the immediate Souris River bluffs and at least affect the headwaters of small tributary streamlets whose ravines dissect these bluffs. The extent to which the ground-water quality and/or level in the Souris Valley may be affected by these extensive mine-spoil fields extending back from just behind the valley bluff faces, is uncertain. The provincially rare plants in habitats of bluff-slope seepages and in streamlet ravines, that potentially would appear most vulnerable to possibly altered water-regimes and/or quality by adjacent coal spoil-fields, are listed below. Those plants considered the most threatened because of their greater habitat-restriction and regional rarity are indicated on the list by an asterisk (or a double-asterisk

if already extremely limited and especially rare provincially, and thus particularly endangered):

Andropogon gerardii	Big Bluestem
*Antennaria neodioica	Tomentose Pussytoes
Bouteloua curtipendula	Side-oats Grama
*Lomatium orientale	White-flowered Parsley
*Lotus purshianus	Prairie Bird's-foot Trefoil
Onosmodium molle occidentale	Western False Gromwell
Oxytropis lambertii	Lambert's Purple Locoweed
Panicum virgatum	Switch Grass
*Parthenocissus inserta	Thicket Creeper; Woodbine
Polygala alba	White Milkwort
Potentilla finitima	Prairie Cinquefoil
**Sorghastrum nutans	Indian Grass
*Verbena hastata	Blue Vervain
*Viburnum lentago	Nanny-berry
Viola pedatifida	Crowfoot Violet

Coal strip-mining of the immediate Souris River Valley bluff-faces would, of course, totally destroy all provincially rare and other native plant species present in the affected areas, including those listed below occurring in river bluff between Estevan and Pinto. While all would be equally vulnerable to strip-mining if present, those plants whose loss is considered most serious because they are provincially "especially rare" are indicated with an asterisk in the following list (a double-asterisk if now already extremely limited both provincially and in the Souris River valley):

Andropogon gerardii	Big Bluestem
*Antennaria neodioica	Tomentose Pussytoes
**Asclepias syriaca	Silky Milkweed
**Asclepias verticillata	Whorled Milkweed
Bouteloua curtipendula	Side-oats Grama
**Buchloe dactyloides	Buffalo Grass
**Celastrus scandens	Creeping Bittersweet
Cyperus schweinitzii	Schweinitz's Umbrellawort
*Dichanthelium wilcoxianum	Wilcox's Panic or Switch Grass
**Lomatium orientale	White-flowered Parsley
*Lotus purshianus	Prairie Bird's-foot Trefoil
Oxytropis lambertii	Lambert's Purple Locoweed
Panicum virgatum	Switch Grass
*Parthenocissus inserta	Thicket Creeper; Woodbine
Polygala alba	White Milkwort

**Polygala verticillata	Whorled Milkwort
Potentilla finitima	Prairie Cinquefoil
**Sorghastrum nutans	Indian Grass
*Verbena hastata	Blue Vervain
*Viburnum lentago	Nanny-berry
Viola pedatifida	Crowfoot Violet

While locally just as devastating to the natural landscape as is coal strip-mining, gravel-excavation sites are much more limited in areal extent, although quite extensive in some places (e.g. at Estevan and Oxbow). More seriously with respect to the Souris Valley plant rarities, gravel pits often have involved the immediate Souris River bluffs. The species most subject to destruction would be those of bluff slopes and ravines, - i.e. the same as those on the preceding list.

Various clay-mining operations in the Estevan area have similarly destroyed the vegetational cover at local pit-sites. Because of their extreme provincially and regional scarcity, the following rare plants limited to very clayish sites, one already being immediately adjacent to a clay-mining pit-site, might be threatened by such activities:

Asclepias verticillata	Whorled Milkweed
Buchloe dactyloides	Buffalo Grass
Polygala verticillata	Whorled Milkwort

In addition to the foregoing mining activities with impacts on the environment, oil wells are numerous in the Souris River Basin. The oil well drilling and ongoing operations have produced some localized adverse environmental effects on the natural vegetation cover. In most of the Souris River Basin, oil wells were not observed any closer to the Souris River than the immediate bluff summits, but

from near Oxbow to south of Glen Ewen they were quite frequently noted within the main Souris River Valley itself.

While all of the above impacts represent more-or-less serious threats to the native rare plants of the Souris River Valley, now a further even more ominous environmental threat(because of its pervasiveness)has arisen to endanger the continued existence of the rare native plants of at least the floodplains of the Souris River Valley. The Souris Basin Development Authority, with provincial government approval, now intends to proceed with the construction of two major dams in the Souris Basin, —viz. the Rafferty Dam on the Souris River about three miles west of Estevan, and the Alameda Dam on lower Moose Mountain Creek about three miles northwest of Oxbow and 3.5 miles above the confluence with the Souris River. The expressed objectives of this mega-project are: (1) to pipe reservoir water to cool a major coal-burning power-station being constructed by the Saskatchewan Power Corporation at Shand (about 5 miles southeast of Estevan), (2) to "manage the river" for flood-control, and (3) to provide water for the irrigation of floodplain forage fields downstream from the dams. The Rafferty-Alameda Project was approved by the Saskatchewan Department of the Environment despite a highly deficient environmental impact assessment with regard to the flora and vegetation that concerned itself only, and none to thoroughly, with the plants of the actual Rafferty Dam reservoir area, but failed entirely to consider the vegetation and rare native plants along the Souris River Valley downstream from the dam sites that would be greatly affected by the predictably altered water regimes. Other serious environmental concerns, such as losses of wildlife habitat,

also appear to have been essentially ignored or else dealt with by implausible "mitigation" measures.

The rare plants of the Souris River Valley are mostly concentrated downstream, not upstream, from the proposed dams, so the major environmental threat to them is not from the inundation of their habitats by the reservoirs, but from the predictably severe alteration of the water-regime of the Souris River Valley floodplains (and perhaps also the lower bluff slopes) downstream from the dams. Despite the impressive valley dimensions largely carved out by the voluminous melt-waters at the end of the last glacial age, the present Souris River is for most of the year a quite meager stream. With average seasonal rainfall, it will predictably take many years (probably at least a decade and quite possibly up to half a century) for the respective dam reservoirs to fill. Serious water-deprivation of the Souris River channel and valley floodplains downstream below the dams will predictably result, as well as a marked alteration of the occurrences, times and levels of natural seasonal river floodings upon which the native plants on the floodplains are finely atuned and depend for their survival. A significant lowering of the natural groundwater table level in the whole or much of the downstream floodplains is anticipated, with potentially disasterous results for the the still remaining natural floodplain vegetation and especially the rarer native plants included therein. About 40% of the provincially rare plants listed for the Souris Valley occur in the various floodplain and river-bank habitats, —e.g. open or shrubby shorelines, riverine woods, shore shrublands and moist floodplain meadows, which would be most directly affected by alterations of the

river-channel flows, lowered water-levels, and reduction of the natural cycle of springtime inundation of the floodplains. With the proposed dam construction and planned usage of the Souris River water, a serious reduction of the water-flow downstream from the dams is anticipated, with it becoming quite discontinuous with extensive dried channel stretches during most of the year.

The planned construction of numerous small weirs on the Souris River downstream from the dams for the intended purpose of creating multiple reservoir ponds to provide water for irrigating floodplain forage fields, promises to accentuate the problem of altered water-regimes by further diminishing the total quantity of water-flow, changing the natural seasonal water level fluctuations, and altering the natural shorelines, essentially modifying the natural riverine shoreline habitats along a flowing stream into unnatural lacustrine-like ones along a series of intermittent ponds. Also the proposed channelization of the Souris River for about a 10-mile stretch below the Rafferty Dam to near Shand, involving not only the deepening of the present channels but also the cutting across of present river channel loops, potentially endangers especially the rarer native plants along the river edge by alteration of the natural shorelines.

The other approximately 60% of the Souris Valley native plant rarities, not characteristic of floodplain or river-bank habitats, but occurring at higher elevations in wooded or open tributary streamlet ravines, bluff woods, shrublands, and on prairie bluff slopes (where many are found on local moisture-seepage sites), are also dependent on the maintenance of high enough ground-water table levels on the river

valley bluff slopes. It is uncertain to what extent, if any, the markedly reduced river-flows and altered water-regimes downstream from the dams might effect a lowering of the natural ground-water table levels of the valley bluff slopes above the river floodplains and thus threaten the rare plants of these habitats.

Among the recorded rare plants that eventually would be subject to inundation by the Rafferty Dam Reservoir if projected water levels are reached, would be the northwesternmost native colonies known in North America of Helianthus tuberosus (Jerusalem Artichoke) recorded near the confluence of the Souris River with Roughbark Creek west of Midale and on Jewel Creek near Goodwater, the colony of Lotus purshianus (Prairie Bird's-foot Trefoil) recorded along Jewel Creek east of Goodwater, and possibly that of Eleocharis engelmannii (Engelmann's Spike-rush) along Roughbark Creek near Colgate. The known colony of Oxytropis lambertii (Lambert's Purple Locoweed) recorded on the Souris River bluff slopes south of Macoun, might also be inundated by the Rafferty Reservoir, although the other bluff species, Bouteloua curtipendula (Side-oats Grama), Dicanthelium wilcoxianum (Wilcox's Panic Grass), and Potentilla finitima (Prairie Cinquefoil), may be able to persist on slopes above the reservoir level if their habitats are not too altered.

Possibly threatened by proximity to the planned construction activities of the Rafferty Dam and associated projects, with at least one or two recorded sites for all three species being located in relatively close proximity of the proposed Rafferty Dam site and its associated project activities of the proposed diversion channel from

Boundary Dam, the access road to Highway 18, and the relocation of the CPRR tracks, are the locally sparse and provincially very rare clay flat species, Asclepias verticillata (Whorled Milkweed), Buchloe dactyloides (Buffalo Grass), and Polygala verticillata (Whorled Milkwort). The same is true for local colonies of the regionally more frequent rare grasses, Side-oats Grama and Big Bluestem (Godwin & Abouguendia 1985).

Subject to inundation by the Alameda Dam Reservoir would be the colonies of Lotus purshianus (Prairie Bird's-foot Trefoil) and of Panicum virgatum (Switch Grass) recorded about 8 mi. north of Oxbow, the colony of Prunella vulgaris var. lanceolata (Lance-leaved Healall) recorded about 12 mi. north of Oxbow, those of Bouteloua curtipendula (Side-oats Grama) and Helianthus tuberosus (Jerusalem Artichoke) at or just above the Alameda Dam site, and at least most of the various recorded localities for Andropogon gerardii (Big Bluestem) along lower Moose Mountain Creek. The known colonies of Polygala alba (White Milkwort) and Oxytropis lambertii (Lambert's Purple Locoweed) on higher bluffs along the Moose Mountain Creek Valley may doubtfully be able to persist above the Alameda Reservoir level if their habitats are not too altered.

The provincially rare native plant species that appear most threatened by the construction of the Rafferty and Alameda Dams because of their occurrence on Souris River shores or floodplains downstream from the dams, are listed below. Those species considered particularly endangered because of their great infrequency and/or local sparsity are preceded by an asterisk (or a double-asterisk if

already extremely limited and locally sparse both provincially and regionally).

**Asclepias syriaca	Silky Milkweed
*Carex assiniboiensis	Assiniboia Sedge
**Carex gravida	Heavy-fruited Sedge
**Celastrus scandens	Creeping Bittersweet
*Eragrostis hypnoides	Creeping Love Grass
*Helianthus tuberosus var. subcanescens	Jerusalem Artichoke
*Laportea canadensis	Wood Nettle
Lotus purshianus	Prairie Bird's-foot Trefoil
Onosmodium molle occidentale	Western False Gromwell
Panicum virgatum	Switch Grass
*Polygonatum canaliculatum	Great Solomon's Seal
Prunella vulgaris var. lanceolatum	Lance-leaved Healall
Prunus americana	American Plum
Scirpus pallidus	Pale-green Bulrush
Scutellaria lateriflora	Blue Skullcap
*Viburnum lentago	Nanny-berry

While only time will provide a full accounting of the extent of the damage to the natural vegetation and to the many provincially rare native plant species of the Souris Valley by the Rafferty-Alameda Project, it appears to represent the most serious environmental threat to rare native plants of any such development mega-projects in Saskatchewan during the last generation or more.

Nowhere else in the province are so many provincially rare native plant species concentrated along such a narrow corridor as are found along the linear extent of the Souris River from west of Estevan to the North Dakota border. This linear concentration of the rarities is a major reason for their predicted great vulnerability to an altered Souris River water-regime resulting from the proposed major dam constructions.

Not only does the Souris River Valley in southeastern Saskatchewan represent a botanically unique region containing a

surprising number of provincially and nationally rare native plant taxa, but they and their habitats are now increasingly threatened by human-caused impacts on the regional environment. The destruction of natural habitats with their rare native species represents essentially a permanent loss; once they, or those portions including the rarest species, are gone, they are not truly replaceable, and thus can not be considered "renewable resources".

Given the choices between environmental conservation to save our natural heritage on the one hand, and the short-term economic benefits of increased profits and jobs on the other hand, societies and their governments must finally learn to make more intelligent and balanced decisions.

IV. Some Potential Natural Areas in the Souris Valley

In addition to compiling information on the distributions, frequencies, sizes, and habitats of local populations of the provincially rare plant taxa found in the Souris River and Lower Moose Mountain Creek valleys in southeastern Saskatchewan, indicating the perceived potential threats to them, and reevaluating their rarity status, a final study objective has been to identify, if possible, particular areas in the Souris Valley where notable concentrations of provincially rare native plants have been recorded that might be proposed as floristically significant candidate "natural areas" for legal protection. While additional criteria besides the occurrence of rare native plants would be used in any eventual designations of such "natural areas", floristic uniqueness as exemplified by the presence of rare plants should represent an important one. Unfortunately, to now propose sites along the Souris Valley as candidate "natural areas" for legal protection may well represent an exercise in futility if the ongoing plans proceed to the construction of the Rafferty and Alameda Dams, plus the associated downstream channelization and weir-building (see previous chapter). If the major, river-altering Rafferty-Alameda Project is allowed to proceed, the predictable loss of downstream natural floodplain woods, shrublands and meadows, and the irretrievable depletion of many rarer native plants in at least these habitats, would reduce or negate the viability of these proposed candidate natural area sites.

Nevertheless, based upon present knowledge of the local occurrences of provincially and nationally rare plants in the Souris Valley region, as well as of present stands of still existent,

relatively undisturbed, natural plant communities, a total of 11 sites in the Souris River Valley are here proposed for consideration as potential, legally protected "natural areas". These are presented below in an upstream to downstream sequence, from west of Estevan to near the North Dakota border south of Glen Ewen (see figure 3 map), and are located by mileages from known places and by legal descriptions according to the Section-Township-Range-Meridian survey system. A topographic map segment (scale 1:50,000) is included for each recommended site, showing the proposed boundaries and included areas. Each area is briefly described in terms of topography, vegetation and often edaphic features (i.e. the soil types and/or rock-outcrops present). The rare plants recorded in each described area are listed in a rough order of presumed rarity, with abbreviated indications of their respective rarity status using the symbols given in Table 1. The recorded locations of rare plants within each proposed area is shown on the included maps. The numbers and categories of the rare species are summarized for each candidate area, and each of these 11 proposed areas has been assigned one of the following five relative priority ratings: 1 (highest), 2 (high), 3 (moderately high), 4 (secondary), 5 (lower). In the choice of these proposed natural areas no consideration has been given to whether or not they they occurred on public or private lands.

1. The Proposed "West Estevan Buffalo Grass Prairie Natural Area"

   A. Location: 3 mi. w and ca. 0.5 mi. s of Estevan (about 1 mi. s-se of proposed Rafferty Dam site).

   B. Legal Description and Boundaries: nw 18-2-8-W2; & ne part of ne ¼ (i.e. LSD 16) 13-2-9-W2 (omitting the clay pit-mine site). (Figure 4).

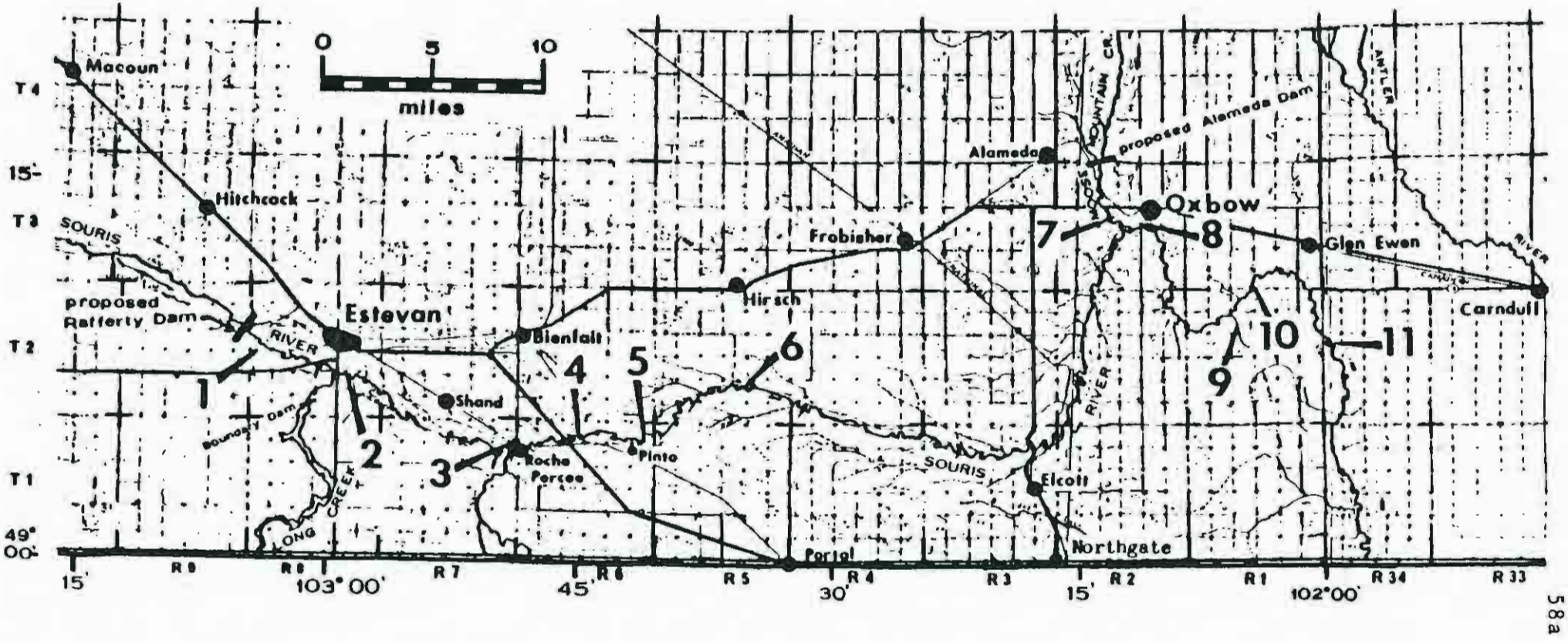

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Fig. 3. Proposed Natural Areas in the Souris River Valley

C. Topography, Vegetation and Soils: Includes grassy, shaly, clayish, ± stony, shallow valley bottom and bluff slopes; located where a small tributary streamlet cuts into an elongate shallow valley paralleling just sw of the Souris River.

D. Rare Plants Recorded in Area:

(1) Buchloe dactyloides (Buffalo Grass) RR!ER!E!C!

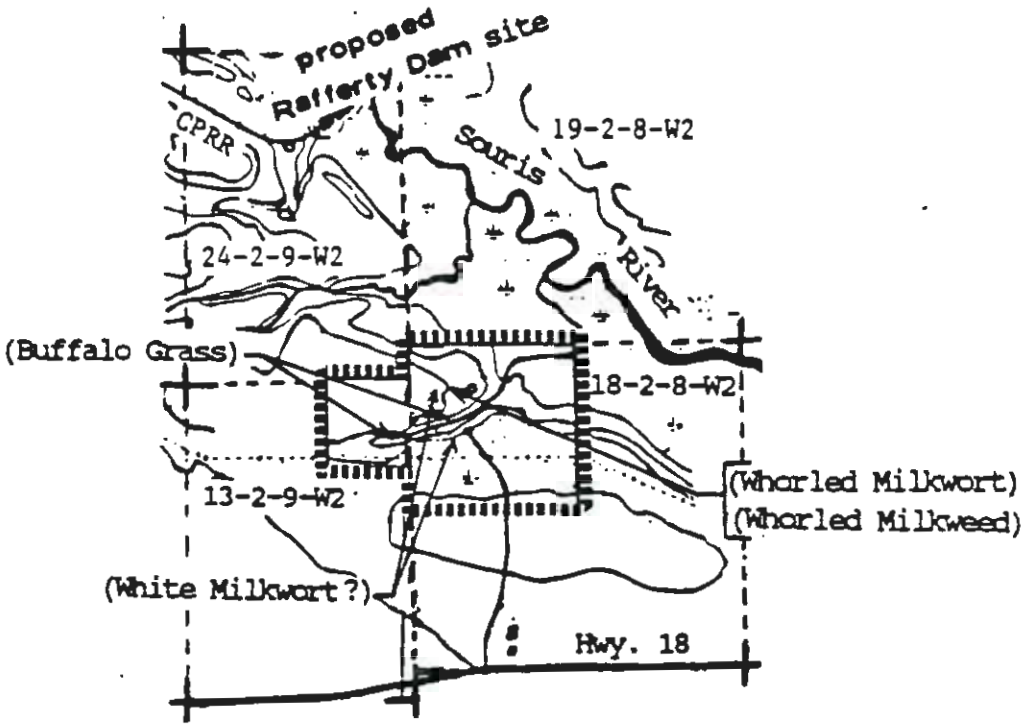
(2) Polygala verticillata (Whorled Milkwort) RR!ER!E!

(3) Asclepias verticillata (Whorled Milkweed) RR!ER!E!C!

(4) (?) Polygala alba (White Milkwort) RR, C!; although Hudson (1973) referred to the presence of this species here, it was not observed in 1987, and no voucher specimen has been located.

E. Relative Priority and Notes: Assigned only moderately high priority (3rd) because of its limited size and homogeneous nature. Recorded at this site are a total of 3(-4) provincially rare plant species, 3 that are classified as "especially rare", "regionally very restricted" and "endangered" in Saskatchewan, with 2 of these (plus the regionally more frequent White Milkwort if documented) also considered rare for Canada. Included is the largest known colony of Buffalo Grass in Saskatchewan, and 1 of only 2 recorded provincial sites for both Whorled Milkwort and Whorled Milkweed. Their occurrences here and elsewhere in cattle-grazed pastures, make these very rare plants potentially endangered by future overgrazing. The adjoining clay pit-mine has apparently already eliminated part of this unique habitat, and its expansion could entirely destroy it.

Additional threats to this site and its plant rarities are related to its possibly vulnerable location near construction activities only about 1 mi. s-sw of the proposed Rafferty Dam site, and within one-half mile of the planned routings of the diversion channel between the Rafferty and the Boundary Dam reservoirs, the access road to be built from the Rafferty Dam site south to Hwy. 18, and perhaps also the relocation of the CPRR tracks.



4. The Proposed "West Estevan Buffalo Grass Prairie Natural Area"

2. The Proposed "Estevan/Souris River Natural Area".

A. Location: 1 mi. s of Estevan.

B. Legal Description and Boundaries: n 11, nw 12, se part of sw (=L.S.D. 3) 13, & sw part of sw (i.e. LSD 4) 14-2-8-W2; including the Souris River channel, open and shaded shorelines, and bordering riverine woods of north portion of Woodlawn Regional Park, plus the river channel, riverine woods and prairie bluffs to the n and e-ne of the park (Figure 5).

C. Topography, Vegetation and Soils: Includes the Souris River channel, bordered by ash-elm-boxelder riverine woods, tall- and short-shrub zones; prairie bluff slopes north of the river; soils locally often quite shaly and clayish.

D. Rare Plants Recorded in Area:

(1) Polygonatum biflorum (Great Solomon's Seal) RR!ER!E!

(2) Lomatium orientale (White-flowered Parsley) RR!ER!E!C!

(3) Laportea canadensis (Wood Nettle) RR!ER!E!

(4) Onosmodium molle var. occidentale (Western False Gromwell) RR!

(5) Prunus americana (American Plum) RR!

(6) Panicum virgatum (Switch Grass) RR!

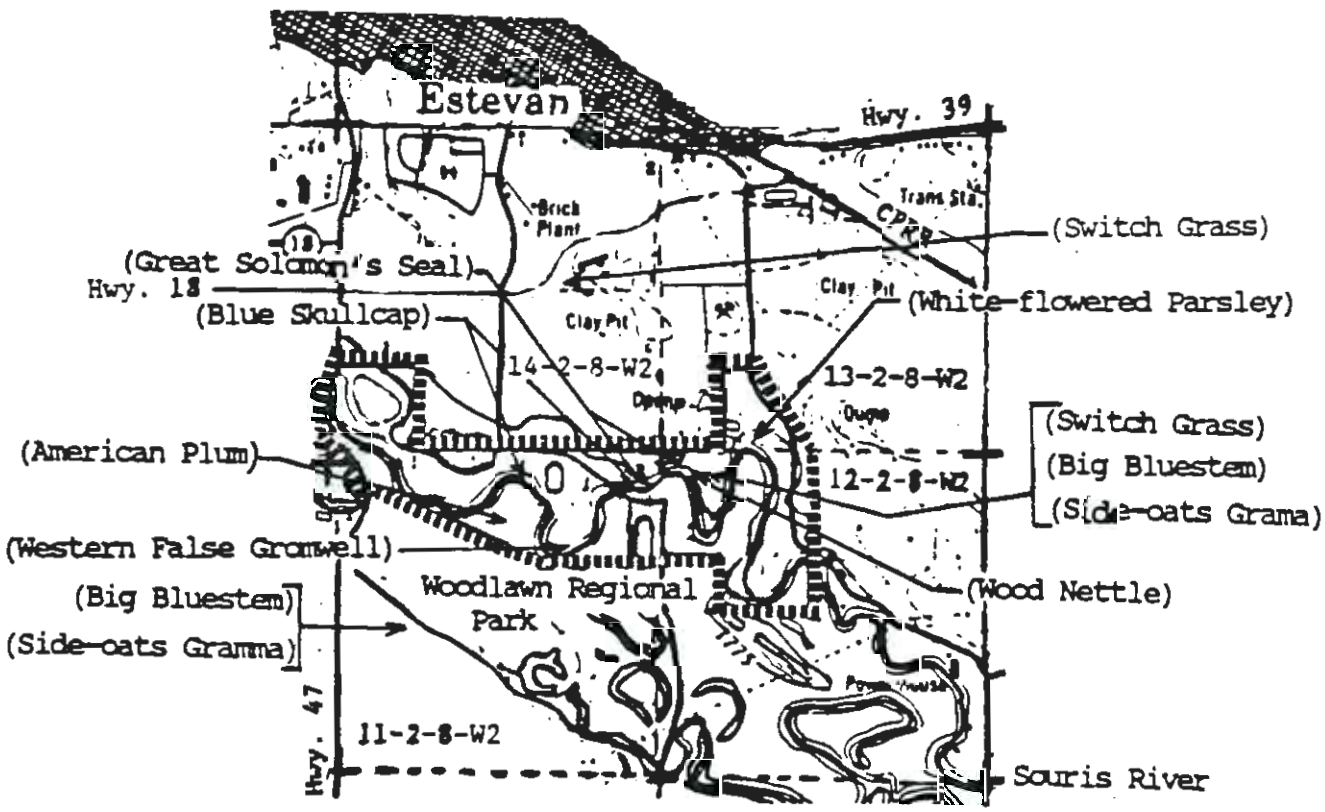
(7) Bouteloua curtipendula (Side-oats Grama) RR, C!

(8) Andropogon gerardii (Big Bluestem)

(9) Scutellaria lateriflora (Blue Skullcap)

E. Relative Priority and Notes: Given a high priority (2nd); containing a total of 9 provincially rare plant species, including 3 that are considered "especially rare" and "endangered" for Saskatchewan, 2 that are listed as rare for Canada, and 6 that are "regionally very restricted" in the

province. Included are significant stands of good riverine woods, with those in the regional park having been protected from cattle-browsing and -trampling. The prairie bluffs reveal three grass species of the True (i.e. Tall-grass) Prairie Association, plus the "especially rare" and "endangered" White-flowered Parsley. The various plant rarities present here in the riverine woods all appear locally quite sparse. This site would be affected by the planned channelization in addition to the other afore-mentioned predictable effects from an altered water-regime downstream from the proposed Rafferty Dam.



5. The Proposed "Estevan/Souris River Natural Area"

3. The Proposed "Roche Percee/Souris River Natural Area".

   A. Location: Just n of Roche Percee village.

   B. Legal Description and Boundaries: L.S.D. 2, 3, 4 & 5 in s 31, & L.S.D. 13, 14 & 15 in n 31-1-6-W2 (but omitting land south of the Souris River, west of the Bienfait-Roche Percee Road, the C.P.R.R. track corridor, and the strip-mine spoils behind the immediate river bluff summits on the north edge (Figure 6).

   C. Topography, Vegetation and Substrate: Includes the Souris River channel, bordered by floodplain boxelder-ash-elm riverine woods, tall- and buckbrush-shrublands, and prairie bluff slopes. Large, often statuesque, sandstone and limestone outcrops are frequent.

   D. Rare Plants Found in Area:

      (1) Verbena hastata (Blue Vervain) RR!ER!E!

      (2) Parthenocissus inserta (Thicket Creeper) RR!ER!

      (3) Prunella vulgaris var. lanceolata (Lance-leaved Healall) RR!ER!

      (4) Polygala alba (White Milkwort) RR, C!

      (5) Potentilla finitima (Prairie Cinquefoil) R?C!

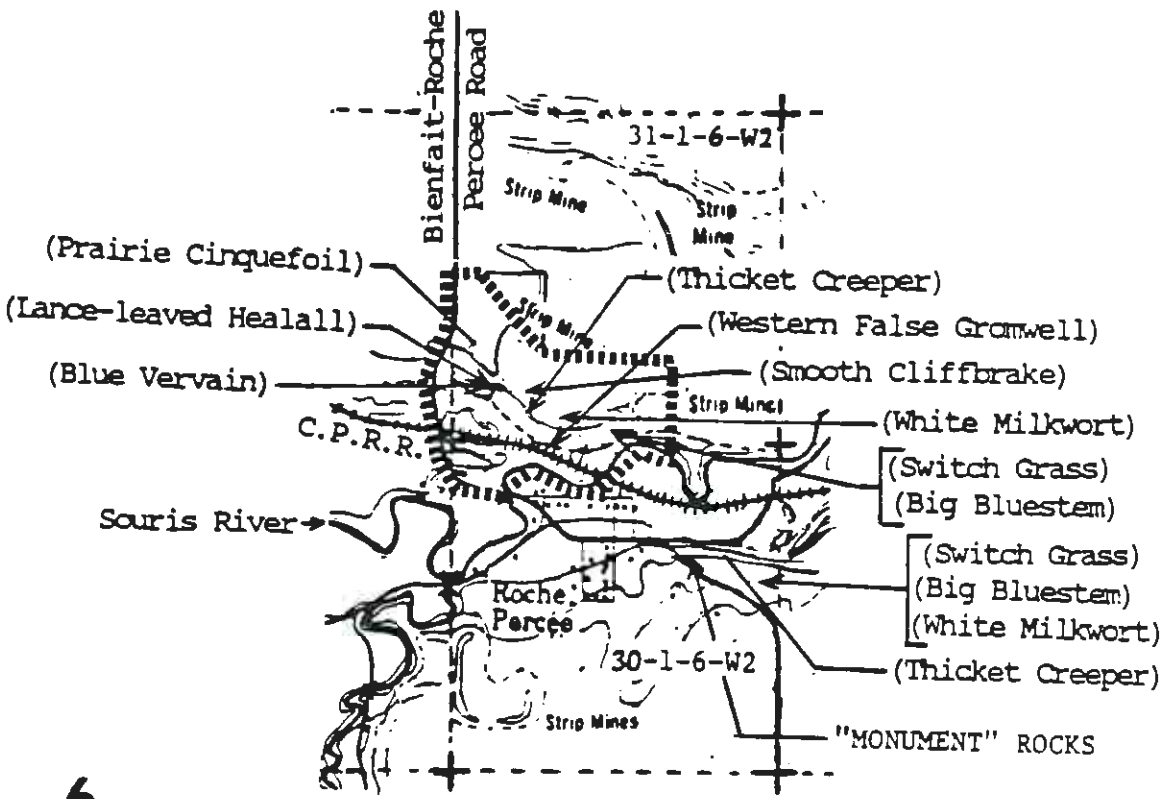
      (6) Panicum virgatum (Switch Grass) RR!

      (7) Onosmodium molle var. occidentale (Western False Gromwell) RR!

      (8) Pellaea glabella (Smooth Cliffbrake)

      (9) Andropogon gerardii (Big Bluestem)

E. Relative Priority and Notes: Given a high priority (2nd); containing a total of 9 provincially rare plant taxa, including 3 considered "especially rare" for Saskatchewan, 1 that is possibly endangered, 2 listed as rare for Canada (although neither are especially rare regionally), and 5 that are "regionally very restricted" in the province. Uniquely present here are large limestone outcrops on which may be found the rare calceophilous fern, Smooth Cliffbrake; also many large sandstone outcrops.



6. The Proposed "Roche Percee/Souris River Natural Area"

4. The Proposed "Roche Percee Campground/Souris River Natural Area"

   A. Location: 1.5 - 2.5 mi. e and 0-1 mi. n of Roche Percee.

   B. Legal Description and Boundaries: s & ne 33, & w ½ of nw (i.e. LSD 12 & 13) 34-1-6-W2 (but in Sec. 33, omitting the residences, the sw corner sw of Hwy. 39, the cultivated lands in the se part, the strip-mine spoils in LSD 10—i.e. sw part of ne 1/4). Included in the area are the present Roche Percee Campground lands, the riverine woods to the southeast, and the wooded ravine and prairie bluffs to the north (Figure 7).

   C. Topography, Vegetation and Soils: Includes the channel, shorelines, ash-elm-boxelder riverine woods, and tall- and short-shrubland zones along the loops of the Souris River and along a small tributary streamlet northward, plus prairie bluffs and grassy to ± shrubby valleys in n & ne part of section. Soil of floodplain is silty alluvium, that of prairie bluffs mostly ± clayish and shaly, but locally sandy and with some sandstone outcrops.

   D. Rare Plants Recorded in Area:

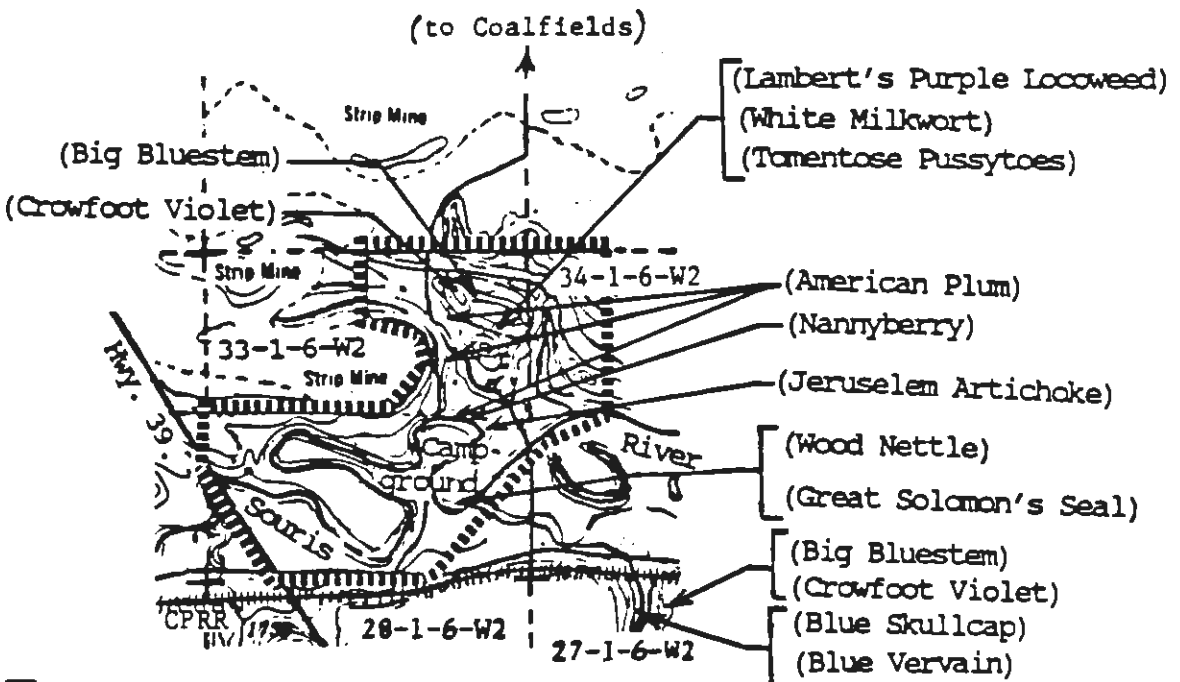
      1. Polygonatum biflorum (Great Solomon's Seal) RR!ER!E!
      2. Laportea canadensis (Wood Nettle) RR!R-ER,E!
      3. Antennaria neodioica (Tomentose Pussytoes) ER!
      4. Viburnum lentago (Nannyberry) R-ER
      5. Polygala alba (White Milkwort) RR,C!
      6. Helianthus tuberosus (Jeruselem Artichoke) RR!R-ER?E!
      7. Oxytropis lambertii (Lambert's Purple Locoweed) RR
      8. Prunus americana (American Plum) RR!
      9. Andropogon gerardii (Big Bluestem)
      10. Viola pedatifida (Crowfoot Violet)

Also mapped in figure 7 are the additional two species found in nearby Section 27:

11. Verbena hastata (Blue Vervain) RR!ER!E!

12. Scutellaria lateriflora (Blue Skullcap)

E. Relative Priority and Notes: Given a high priority (2nd), containing a total of 10 provincially rare plant species, including 2-4 considered "especially rare" for Saskatchewan, 3 considered "endangered", 1 listed as rare for Canada, and 4 "regionally very restricted" in the province. The area contains a significant stand of good riverine woods, sizeable American Plum thickets, a relatively good stand of Nanny-berry shrubs, one of the largest known concentrated colonies of Jerusalem Artichokes, several well developed Wood Nettle colonies, and the sparse occurrence of Tomentose Pusseytoes, an "especially rare" prairie taxon.



7. The Proposed "Roche Percee Campground/Souris River Natural Area"

5. The Proposed "Pinto/Souris River Natural Area"

   A. Location: 0.75 mi. s and 0.5 mi. w, to 1.25 mi. n and 1.0 mi. e of former Pinto CPRR Station (4-5.5 mi. e and 0.5 mi. s to 1.0 mi. n of Roche Percee).

   B. Legal Description and Boundaries: Sec. 36, n & sw 25 & e 26-1-6-W2; and the narrow strip w of road in nw (&wc) 31-1-5-W2. The portion of the above-circumscribed area north of the Souris River formed part of the originally proposed I.B.P. Pinto-Souris Natural Area (I.B.P. 1972), and a major part of this proposed natural area as reduced in size by Adam (1985) (Figure 8).

   C. Topography, Vegetation and Soils: Includes the Souris River channel, with bordering elm-ash-boxelder riverine woods, tall and low shrublands, and floodplain meadows; also prairie bluff slopes (silty and sandy), and aspen bluff woods. Sandstone outcrops (some large and statuesque) are present on s-facing bluffs n of river.

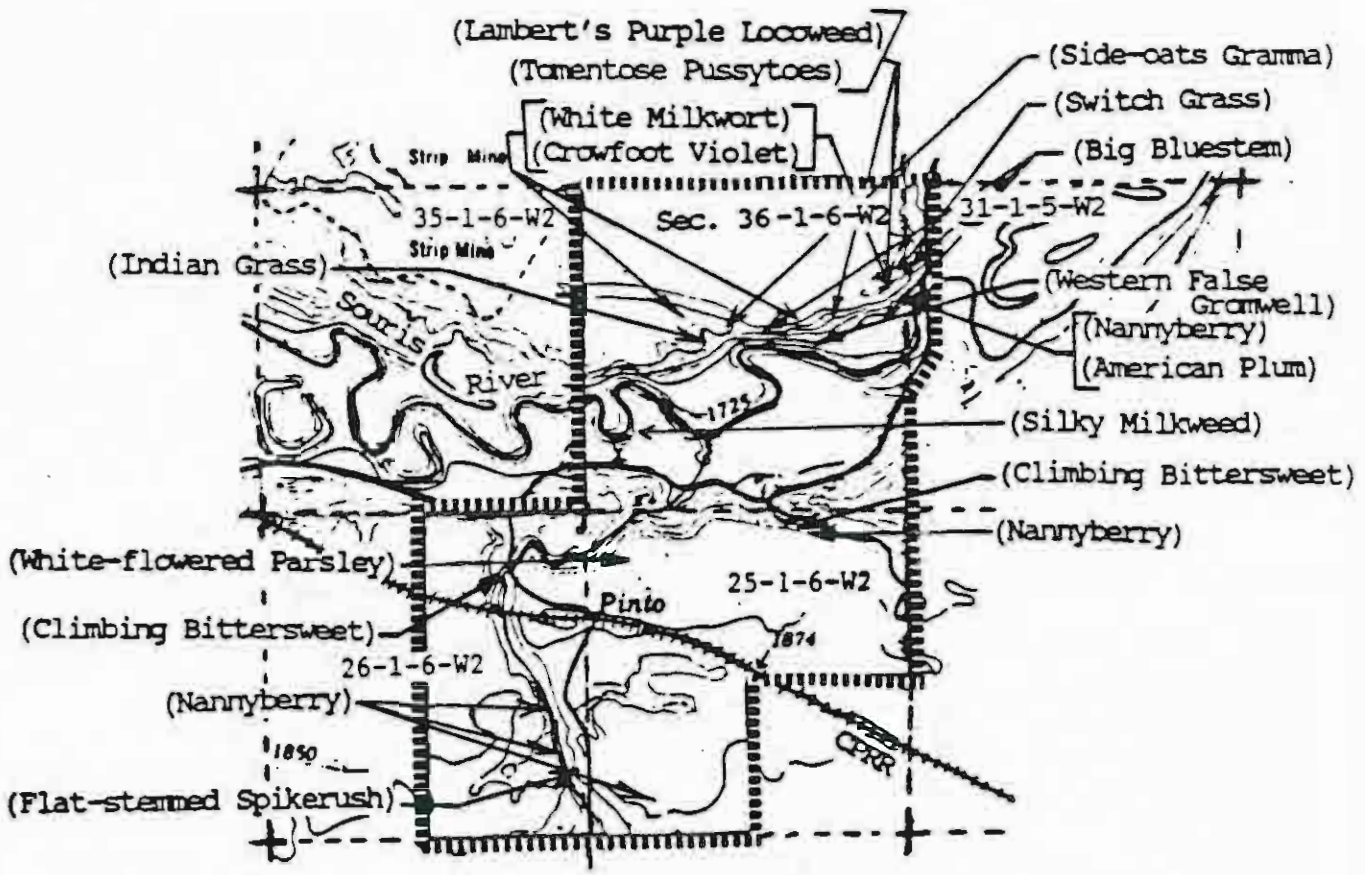
   D. Rare Plants Recorded in Area:

      1. Sorghastrum nutans (Indian Grass) RR!S!ER!E!C!
      2. Asclepias syriaca (Silky Milkweed) RR!S!ER!E!
      3. Celastrus scandens (Climbing Bittersweet) RR!S!ER!E!
      4. Lomatium orientale (White-flowered Parsley) ER!E!C!
      5. Antennaria neodioica (Tomentose Pussytoes) ER!
      6. Viburnum lentago (Nannyberry) R-ER?
      7. Bouteloua curtipendula (Side-oats Grama) RR,C!
      8. Onosmodium molle var. occidentalis (Western False Gromwell) RR!

9. Polygala alba (White Milkwort) RR,C!
10. Oxytropis lambertii (Lambert's Purple Locoweed) RR
11. Panicum virgatum (Switch Grass) RR!
12. Prunus americana (American Plum) RR!
13. Eleocharis compressa (Flat-stemmed Spikerush)
14. Viola pedatifida (Crowfoot Violet)
15. Andropogon gerardii (Big Bluestem)

E. Relative Priority and Notes: Given the highest priority (1st); containing a total of 15 provincially rare plant species, including 5-6 considered "especially rare" for Saskatchewan, 4 that are considered "endangered", 2 that are known in the province only from this site, 4 that are considered rare for Canada, and 6 that are "regionally very restricted" in the province. Included is a considerable diversity of habitat types, including good examples of dry to mesic grasslands, aspen bluff woods, floodplain marshes and meadows (although these quite overgrazed and cattle-trampled), extensive buckbrush-shrublands and good tall-shrublands, and a fair extent of riverine woods (although the latter quite heavily cattle impacted and apparently lacking any herbaceous understory rarities). There are some good, naturally wooded, streamlet ravines especially in n part of sections 25 and 26, apparently spared from cattle-disturbance by their steep slopes. The most notable plant rarities are colonies of Indian Grass and Silky Milkweed, which are known only from here in Saskatchewan. Also occurring here are Climbing Bittersweet, known elsewhere in the province only from se of

Estevan, Nannyberry, with 6 of the 7 recorded natural colonies in the Souris Valley within the described boundaries of this site, and the two very rare prairie herbs, White-flowered Parsley and Tomentose Pussytoes. Present here is a notable coincidence of the characteristic grasses of the True (i.e. Tall-grass) Prairie Element, including the listed 4 rarities, Side-oats Grama, Switch Grass, Indian Grass, and Big Bluestem, plus also Sporobolus heterolepis Gray (Plains Dropseed), Stipa spartea Trin. var spartea (Porcupine Grass); Spartina pectinata Link (Cord Grass), and Schizachyrium scoparium (Michx.) Nash (Little Bluestem).



8. The Proposed "Pinto/Souris River Natural Area"

6. The Proposed "Hirsch-Coalfields Community Pasture/Souris River Natural Area".

   A. Location: 4-4.5 mi. s of Hirsch (8 mi. n & 3.5-4 mi. w of North Portal).

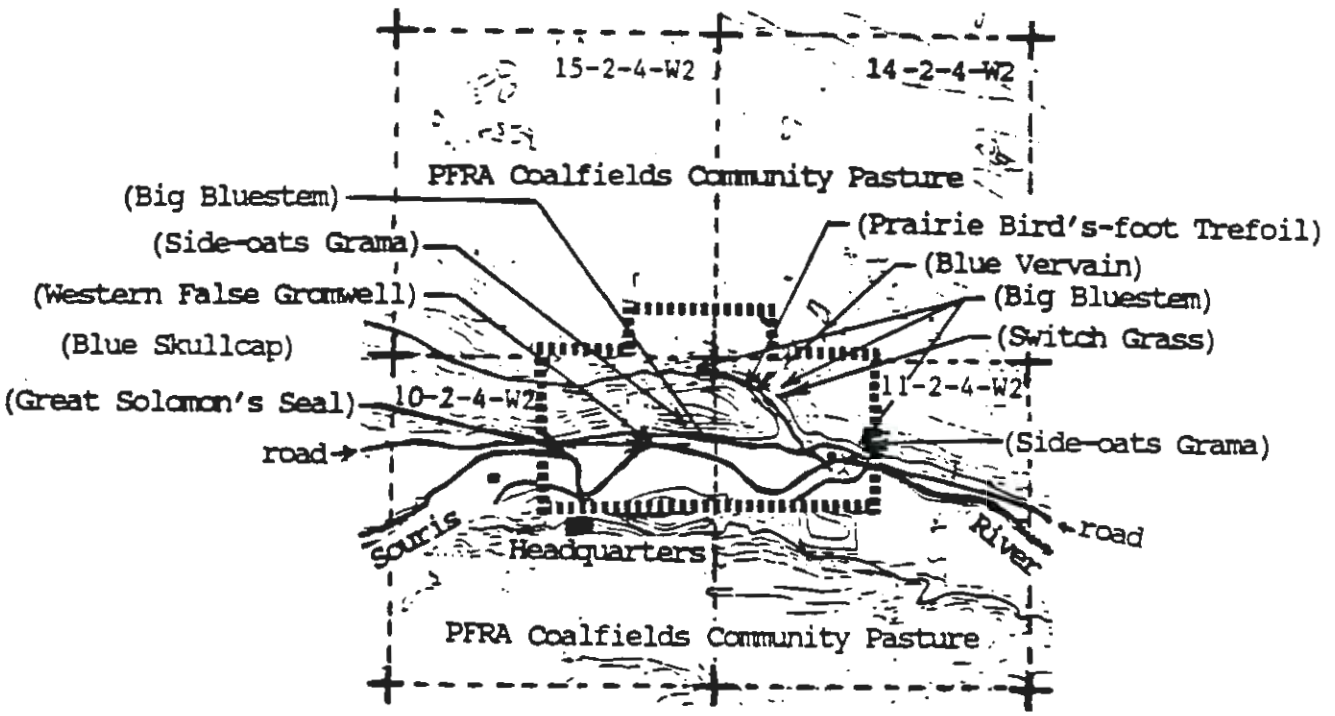
   B. Legal Description and Boundaries: ne 10, nw 11, sw part of sw 14, & se corner of se 15-2-4-W2. This area is included within the present PFRA Coalfields Community Pasture boundaries and opposite from (i.e. just n-nw of) the Headquarters of the latter (Figure 9).

   C. Topography and Vegetation: Includes the Souris River channel bordered by a narrow strip of riverine woods and shrublands, the prairie bluff slopes n of river, and the grassy and low-shrubby to marshy edges of tributary streamlet in shallow ravine of side valley.

   D. Rare Plants Recorded in Area:

      1. Verbena hastata (Blue Vervain) RR!ER!E!
      2. Polygonatum biflorum (Great Solomon's Seal) RR!ER!E!
      3. Lotus purshianus (Prairie Bird's-foot Trefoil) ER!C!
      4. Panicum virgatum (Switch Grass) RR!
      5. Onosmodium molle var. occidentale (Western False Gromwell) RR
      6. Bouteloua curtipendula (Side-oats Grama) RR, C!
      7. Scutellaria lateriflora (Blue Skullcap)
      8. Andropogon gerardii (Big Bluestem)

E. Relative Status and Notes: Given a secondary priority (4th); containing 8 provincially rare plant species, including 3 considered "especially rare" and 2 "endangered" in Saskatchewan, 2 listed as rare for Canada, and 3 that are "regionally very restricted" in the province. Locally quite frequent are the 3 provincially rare grasses of the True Prairie Element - viz. Side-oats Grama, Switch Grass and Big Bluestem. The largest colony of Prairie Bird's-food Trefoil noted in the Souris Valley occurred in the streamlet side-valley, as well as a good stand of Blue Bluestem.



9. The Proposed "Hirsch-Coalfields Community Pasture/Souris River Natural Area"

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7. The Proposed "Oxbow/Lower Moose Mountain Creek Natural Area".

A. Location: 1.5-2 mi. w and 0-0.5 s of Oxbow.

B. Legal Description: 21-3-2-W2 (excepting the gravel-pit areas of c, ne ¼, & nc, the area n of Hwy. 18, and the upland plateau in the sw part of sw 1/4) (Figure 10).

C. Topography and Vegetation: open grassy and ± marshy floodplain meadows; elm-ash-boxelder wooded and tall-shrub covered banks and valley slopes along lower Moose Mountain Creek; prairie bluff-slopes; and tall- and short-shrublands. This site along lower Moose Mountain Creek about 0.5-1.5 mi. above the confluence with the Souris River, is still actually within the broad main Souris River valley.

D. Rare Plants Recorded in Area:

1. Parthenocissus inserta (Thicket Creeper) RR!ER!
2. Polygala alba (White Purple Milkwort) RR,C!
3. Oxytropis lambertii (Lambert's Purple Locoweed) RR
4. Potentilla finitima (Prairie Cinquefoil) C!
5. Panicum virgatum (Switch Grass) RR!
6. Bouteloua curtipendula (Sideoats Grama) RR,C!
7. Andropogon gerardii (Big Bluestem)

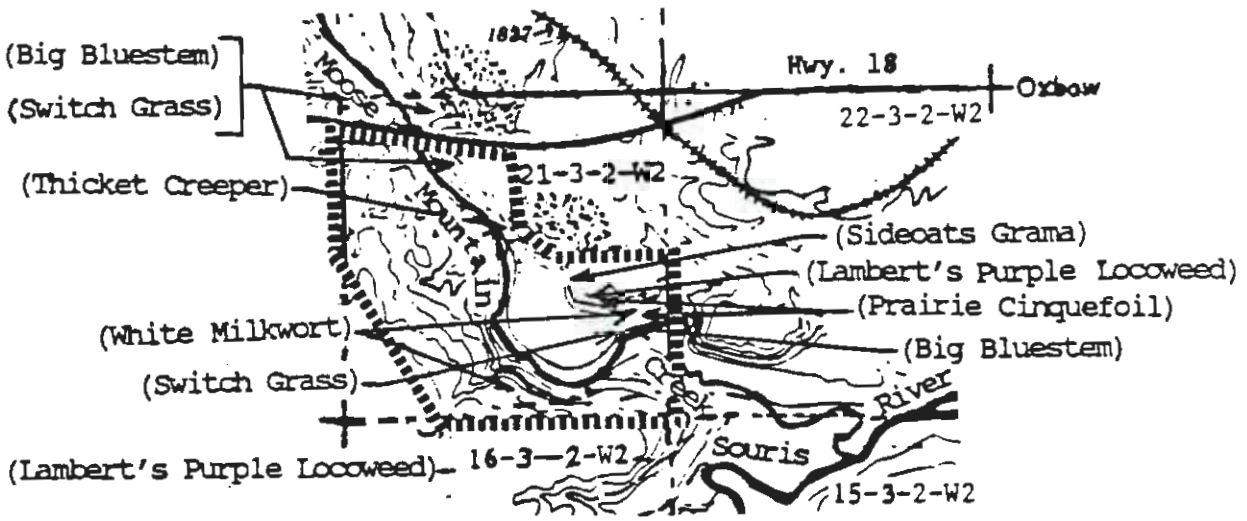
E. Relative Status and Notes: Given a moderately high priority (3rd); containing a total of 7 provincially rare plant species, including 1 considered "especially rare" for Saskatchewan, 3 that have been listed as rare for Canada, and 2 that are "regionally very restricted" in the province. The area includes relatively good, but limited, natural riverine and bluff woods, sometimes on springy, and often quite steepish, wooded slopes, and mesic to dry Mixed-grass Prairie on bluff-slopes with admixtures of the 3 rare grasses of Tall Grass Prairie affinities, viz. Switchgrass, Side-oats Grama and Big Bluestem. This represents 1 of only 2 recorded general localities in Saskatchewan for naturally occurring Thicket Creeper. Lambert's Purple Locoweed is relatively

D. Rare Plants Recorded in Area:

1. Carex gravida (Heavy-fruited Sedge) RR,ER!C!E!
2. Polygonatum biflorum (Great Solomon's Seal) RR!ER!E!
3. Bouleloua curtipendula (Side-oats Grama) RR,C!
4. Helianthus tuberosus (Jerusalem Artichoke) RR!R-ER?E!
5. "Quercus macrocarpa (Bur-Oak)", a native tree species not on the provincial rare plant list, but unusual in the Souris Valley where limited to only about a 10-mile extent of the river from about 3 mi. above to ca. 7 mi. below Oxbow, and now found mostly along only a few tributary ravines.

E. Relative Priority and Notes: Given only a moderately high priority (3rd) because of its limited-size and already being within the boundaries of a regional park; containing a total of 4 provincially rare plant species, including 2-3 that are considered "especially rare" and 3 "endangered" in Saskatchewan, 2 listed as rare for Canada, and 2 "regionally very restricted" in the province. It also includes a limited stand of bur-oak woods, the largest observed natural colony of Jerusalem Antichokes in Saskatchewan, and fairly well established local populations of the Great Solomon's Seal. While protected from cattle-impacts, the human disturbance appears to have been heavy in the campground and picnic areas. The naturally wooded ravine may be the most significant portion for preservation.

frequent on the prairie bluff mid-slopes. The natural flood-plain vegetation at this site only two miles below the proposed Alameda Dam, may be greatly altered by its construction.



10. The Proposed "Oxbow/Lower Moose Mountain Creek Natural Area"

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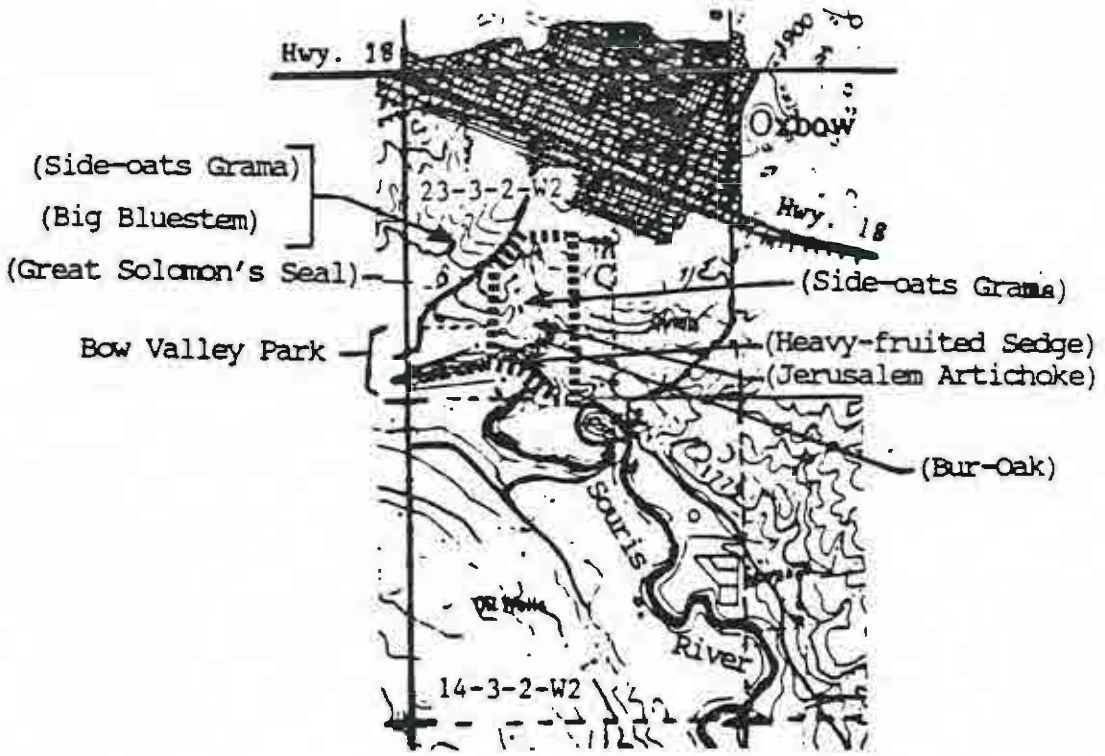
8. The Proposed "Oxbow - Bow Valley Park Natural Area".

   A. Location: 0.25-0.5 mi. s of Oxbow.

   B. Legal Description: parts of L.S.D. 3 and 6 in sw 23 - 3-2-W2; (only n side of Souris River, including the Bow Valley Regional Park campground area and a natural-wooded ravine extending northward, bissecting the golf course on the grassy bluff slopes (Figure 11).

   C. Topography and Vegetation: Includes the boxelder-ash-elm riverine woods on n shore of Souris River, and the wooded-ravine with oak-woods in lower, and ash-boxelder woods in higher portions.



11. The Proposed "Oxbow - Bow Valley Park Natural Area"

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9. The Potential "Oxbow-Glen Ewen Oak - Big Bluestem Natural Area"

   A. Location: ca. 6-6.5 mi. s-se of Oxbow (4.5-5 mi. sw of Glen Ewen), along an oak-wooded, beaver-ponded streamlet about 0.5-1.0 mi. se of the Souris River channel.

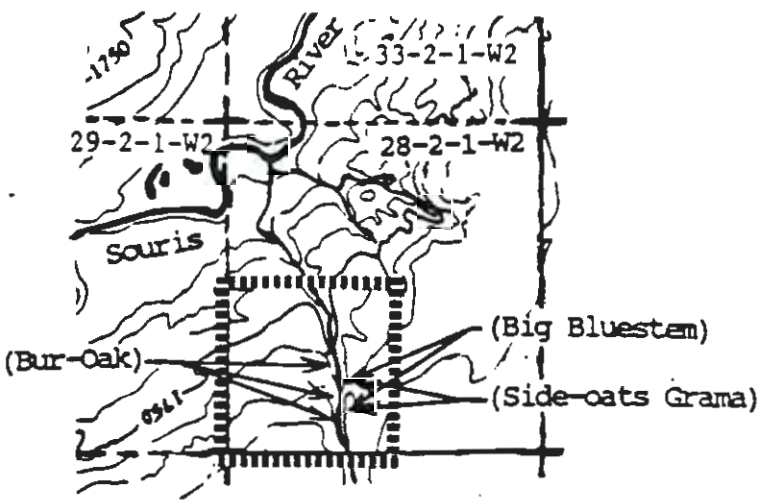
   B. Legal Description and Boundaries: sw 28-2-1-W2 (Figure 12).

   C. Topography and Vegetation: Includes a beaver-ponded streamlet with open marshy shores, bordered by open bur-oak woods on west bank-slopes, and east bank sw-facing prairie slopes in part dominated by Big Bluestem.

D. Rare Plants Recorded from Area:

1. Bouteloua curtipendula (Side-oats Grama) RR,C!
2. Andropogon gerardii (Big Bluestem)
3. "Quercus macrocarpa (Bur-Oak)," a native tree species not on the provincial rare list, but unusual in the Souris Valley where it, and the oak-dominated woods it forms, were found only in the general Oxbow region.

E. Relative Status and Notes: Given a lower status (5th) because it is a quite limited area. Included is a narrow strip of bur-oak riparian woods, bordering a beaver-ponded tributary streamlet, with a diverse mixture of strand and wetland plants along ± marshy streamlet shores and low prairie slopes, in part dominated by Big Bluestem and with some Side-oats Grama present.



12. The Proposed "Oxbow-Glen Ewen Oak - Big Bluestem Natural Area"

10. The Proposed "Glen Ewen (West)/Souris River Natural Area":

A. Location: 3-3.5 mi. sw of Glen Ewen.

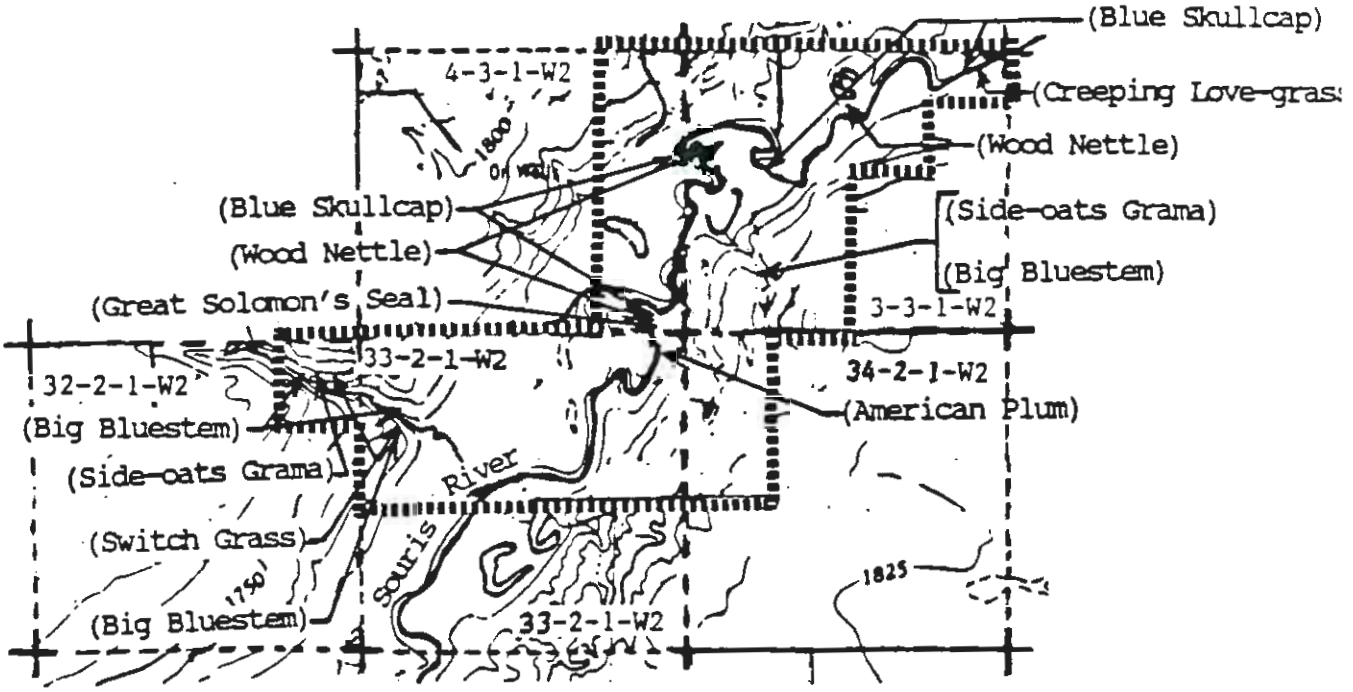
B. Legal Description and Boundaries: w ½ & ne ¼ (except LSD 9) Sec. 3; & e ½ (i.e. LSD 1, 8, 9 & 16) Sec. 4—3-1-W2; ne ¼ of ne (i.e. LSD 16) Sec. 32; n ½ Sec. 33, & w ½ of nw (i.e. LSD 12 & 13) Sec. 34. (Figure 13).

C. Topography, Soils, and Vegetation: Includes the Souris River multiple channel-loops, ash-elm-boxelder riverine woods, some open floodplain wet meadows, upper floodplain shrublands, and prairie bluff-slopes.

D. Rare Plants Recorded in Area:

1. Polygonatum biflorum (Great Solomon's Seal) RR!ER!E!
2. Laportea canadensis (Wood Nettle) RR!ER!E!
3. Eragrostis hypnoides (Creeping Love-grass) RR!ER!E!
4. Bouteloua curtipendula (Side-oats Grama) RR,C!
5. Prunus americana (American Plum) RR!
6. Panicum virgatum (Switch Grass) RR!
7. Scutellaria lateriflora (Blue Skullcap)
8. Andropogon gerardii (Big Bluestem)

E. Relative Status and Notes: Assigned a relatively high priority (2nd); containing a total of 8 provincially rare plant species, including 3 that are considered both "especially rare" and "endangered" for Saskatchewan, 1 that is listed as rare in Canada, and 5 that are regionally very restricted in the province. Present here are relatively extensive, although mostly quite cattle-impacted, ash-elm-boxelder riverine woods. The ± marshy open floodplain meadows and prairie bluff slopes above are also mostly quite over-grazed and/or cattle-trampled, but habitat pockets exist for the survival of some rare plants.



13. The Proposed "Glen Ewen (West)/Souris River Natural Area"

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11. The Proposed Glen Ewen (South)/Souris River Natural Area:

    A. Location: 4-5 mi. s and 0-0.5 mi. e of Glen Ewen.

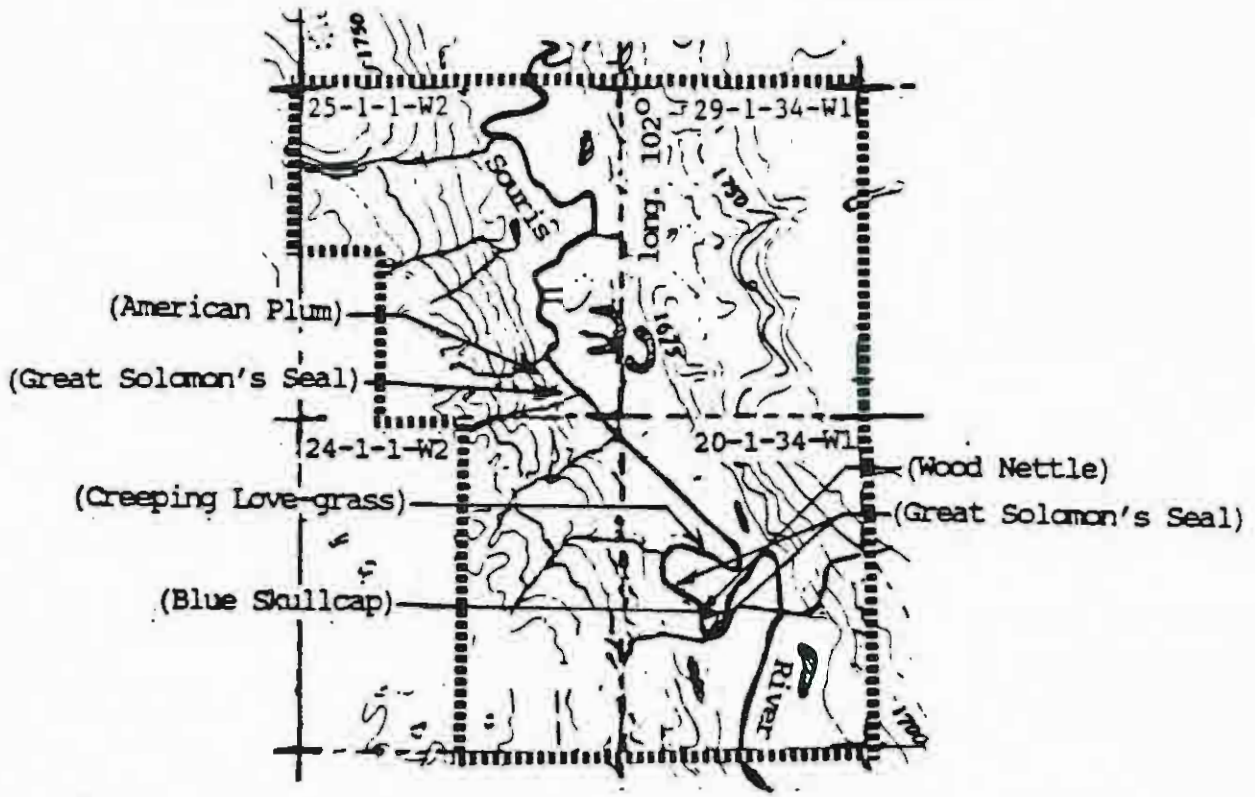
    B. Legal Description and Boundaries: Sec. 20 & 29-1-34-W1; e ½ Sec.24, & Sec. 25 (except w ½ of sw ¼, i.e. LSD 4 & 5)-1-1-W2. (Note: Section 20 & 29 are attenuated to about 0.5 mi. in width because of abutting onto the 2nd Meridian, long. 102°) (Figure 14).

    C. Topography and Vegetation: Souris River multiple channel loops with ash-elm-boxelder riverine woods, open ± marshy floodplain meadows, grassy bank slopes, and adjacent prairie bluff-slopes.

    D. Rare Plants Found in Area:

        1. Polygonatum biflorum (Great Solomon's Seal) RR!ER!E!
        2. Eragrostis hypnoides (Creeping Love-grass) RR!ER!E!
        3. Laportea canadensis (Wood Nettle) RR!ER!E!
        4. Scutellaria lateriflora (Blue Skullcap)

E. Relative Status and Notes: Assigned a moderately high priority (3rd), containing a total of 4 provincially rare plant species, including 2 that are both "especially rare" and "endangered", and 3 that are "regionally very restricted" in Saskatchewan. The most notable or distinctive rare plant in this proposed natural area is Creeping Love-grass. Present here is an extensive stand of relatively good ash-elm-boxelder riverine woods, which, despite considerable cattle-disturbance overall, retains largely natural understory and shoreline plants at various local sites more or less protected from cattle-damage by steepish banks, etc. Also in places good natural shoreline and marsh vegetation exists, although river shores, open floodplain marshes and meadows, and prairie bluff-slopes are mostly quite heavily cattle-impacted.



14. The Proposed "Glen Ewen (South)/Souris River Natural Area"

V. Acknowledgements

The study of the rare plants of the Souris River Valley was largely made possible by financial support from the A.J. & M. Breitung Saskatchewan Flora Assistance Fund and a grant from the World Wildlife Fund (Canada). Most of the field work that recorded the rare plants of the lower Moose Mountain Creek Valley was supported by Environmental Management Associates (Sask.) Ltd, as a part of a study of the vegetation resources of the proposed Alameda Reservoir for the Souris Basin Development Authority (EMA 1987). The valuable contributions of earlier collectors in the study region have already been cited in the text. Last, but not least, the word-processing skills of Ms. Joan Ryan are much appreciated.

TABLE 1. THE PROVINCIALLY RARE PLANTS RECORDED FOR THE SOURIS RIVER AND LOWER MOOSE MOUNTAIN CREEK VALLEYS IN SOUTHEASTERN SASKATCHEWAN, CANADA.

	SCIENTIFIC NAMES	COMMON NAMES	PLANT FAMILIES	RARITY STATUS
1.	Andropogon gerardii	Big Bluestem	Poaceae	WS.FF.LN.NR
2.	Antennaria neodioica	Tomentose Pussytoes	Asteraceae	WS.INF!LS.ER!
3.	Asclepias syriaca	Silky Milkweed	Asclepiadaceae	RR!S!ER!E!
4.	Asclepias verticillata	Whorled Milkweed	Asclepiadaceae	RR!INF!LS.ER!E!C!
5.	Bouteloua curtipendula	Side-oats Grama	Poaceae	RR.FF.LN.C!
6.	Buchloe dactyloides	Buffalo Grass	Poaceae	RR!INF!LS.ER!E!C!
7.	Carex assiniboiensis	Assiniboia Sedge	Cyperaceae	WS.INF!LS.R-ER?C!
8.	Carex gravida	Heavy-fruited Sedge	Cyperaceae	RR.INF.LS.ER!E!C!
9.	Carex tetanica	Rigid Sedge	Cyperaceae	+RR.INF.LS.R-ER?C!
10.	Celastrus scandens	Creeping Bittersweet	Celastraceae	RR!INF!LS.ER!
11.	Cyperus schweinitzii	Schweinitz's Umbrellawort	Cyperaceae	WS.INF.LN.R?
12.	Dichanthelium wilcoxianum	Wilcox's Panic or Switch Grass	Poaceae	WS.INF!LS.ER!C!
13.	Eleocharis compressa	Flat-stemmed Spike-rush	Cyperaceae	WS.INF.LN
14.	Eleocharis engelmannii	Engelmann's Spike-rush	Cyperaceae	WS.INF!R-ER.C!
15.	Eragrostis hypnoides	Creeping Love Grass	Poaceae	RR!FF.LN.ER!E!
16.	Helianthus tuberosus var. subcanescens	Jerusalem Artichoke	Asteraceae	RR.FF.LN.R-ER!E!
17.	Laportea canadensis	Wood nettle	Urticaceae	RR!FF.ER!E!
18.	Lomatium orientale	White-flowered Parsley	Apiaceae	RR!INF!LS.ER!E!C!
19.	Lotus purshianus	Prairie Bird's-foot Trefoil	Fabaceae	±RR.INF!.LN.R-ER? C!
20.	Onosmodium molle var. occidentale	Western False Gromwell	Boraginaceae	RR.FF.LS.
21.	Oxytropis lambertii	Lambert's Purple Loco weed	Fabaceae	RR.FF.LN
22.	Panicum virgatum	Switch Grass	Poaceae	RR!FF
23.	Parthenocissus inserta	Thicket Creeper; Woodbine	Vitaceae	RR!INF!LS.ER!
24.	Pellaea glabella var. occidentalis	Smooth Cliffbrake	Polypodiaceae	WS.LS
25.	Polygala alba	White Milkwort	Polygalaceae	RR.FF.LN.C!
26.	Polygala verticillata	Whorled Milkwort	Polygalaceae	RR!INF!LS.ER!E!
27.	Polygonatum biflorum	Great Solomon's Seal	Liliaceae	RR!FF.LS.ER!E!
28.	Potentilla finitima	Prairie Cinquefoil	Rosaceae	WS.FF.R?C!
29.	Prunella vulgaris var. lanceolatum	Lance-leaved Healall	Lamiaceae	RR!INF!LS.ER!E!
30.	Prunus americana	American Plum	Rosaceae	RR!FF.LN
31.	Scirpus pallidus	Pale-green Bulrush	Cyperaceae	RR.INF!LS.ER!C!
32.	Scutellaria lateriflora	Blue Skullcap	Lamiaceae	WS.FF.LN.NR
33.	Sorghastrum nutans	Indian Grass	Poaceae	RR!S!LS.ER!E!C!
34.	Verbena hastata	Blue Vervain	Verbenaceae	RR!INF!LN.ER!E!
35.	Viburnum lentago	Nanny-berry	Caprifoliaceae	+WS.INF!R-ER?
36.	Viola pedatifida	Crowfoot Violet	Violaceae	WS.FF.LN.NR

(See p. 82 for legend of symbols used for rarity status categories)

SYMBOLS USED IN TABLE 1 FOR RARITY STATUS CATEGORIES:

C! = rare in Canada.
E! = endangered in Saskatchewan
E? = possibly endangered in Saskatchewan.
ER = "especially rare" provincially.
FF = fairly frequent localities within Saskatchewan range.
INF = infrequent localities within Saskatchewan range.
INF! = very infrequent localities within Saskatchewan range.
LN = locally often numerous (i.e. local populations often large).
LS = locally sparse (i.e. local populations small, with few individuals).
NR = no longer considered provincially rare.
R? = borderline to removal from provincially rare status.
RR = regionally restricted (i.e. a limited range) in Saskatchewan.
RR! = regionally very restricted (i.e. a highly limited range) in Saskatchewa
+RR = more-or-less regionally restricted in province.
R-ER? = borderline rare to "especially rare" in province.
S! = a single known local site in Saskatchewan.
WS = widespread range in province (includ. localities widely spaced).
+WS = more or less widespread range in province.

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AN EVALUATION OF THE CONSERVATION VALUE OF THE MIDDLE SAND HILLS STUDY AREA

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1.0 INTRODUCTION

1.1 Purpose of Study

With over 30 prairie species being identified as rare, threatened or endangered, saving prairie wildlife habitats has become one of Canada's top conservation priorities. In particular, sand-based eolian habitats of the Mixed Grass Ecoregion are significant in that a number of these species occur within them. An objective means of evaluating these habitats based on need and significance would contribute toward their protection by substantiating their conservation value and justifying the allocation of human resources for them.

This study involves an evaluation of the conservation value of the Middle Sand Hills Area and was initiated for the World Wildlife Fund's (Canada) Wild West Program. Its purpose was threefold and stems from the objectives outlined for the programs Prairie Conservation Action Plan;

1) to develop a systematic procedure to evaluate site conservation value,
2) to assess the conservation value of the Middle Sand Hills Area and
3) based on (2); recommend a mechanism for protection of the area.

The focus of this study is the measurement of threat levels and site significance in an absolute sense and not in relation to other sites.

1.2 Evaluating Conservation Value

It is important to clarify the meaning of conservation evaluation and how it differs from other related forms of nature assessment.

Van der Maarel and Dauvellier (1978) have outlined a range of benefits of the natural environment, including production, carrier, information and regulation functions. Ploeg and Vlijm (1978) state that ecological evaluations should concentrate on the ecological functions of information and regulation. Margules (1981, p. 8) disagrees, suggesting;

> Ecological values should be derived from the entire range of functions ... Ecological evaluation requires the assessment of ecosystem productivity and the quality of products, the degree to which components of the natural environment regulate and stabilize products, the quality of physical properties such as soil, air and water, and the ability of both physical and biological components to deal with waste products, as well as factors such as biological diversity, rarity and natural ecosystem representation.

Conservation evaluation only assesses the latter group of diversity, rarity and representation and is therefore a subset of ecological evaluation. Several authors (Ratcliffe, 1977; Margules and Usher, 1981) have identified these three attributes as the major criteria used both intuitively and theoretically to assess conservation value.

Another type of natural resource assessment is landscape evaluation which is related to, but distinctly different from, conservation evaluation. In the United Kingdom where the majority of such evaluation has occurred, "landscape" denotes only the topographic

form and surface elements of the environment, or "scenery" (Lowenthal, 1979). Land is assessed primarily as a visual resource where those sites conserved are those that are the most visually attractive. Landscape and conservation evaluation differs in that the former is narrower in scope, solely and anthropocentric construct and has a limited theoretical basis.

Distinguishing between the different types of nature evaluation prevents misconceptions as to what a particular assessment should accomplish.

2.0 METHODOLOGY

Information used in evaluating the conservation value of the Middle Sand Hills area was collected using the following methods:

1. Aerial Photograph Interpretation
2. Literature Review
3. Interviews

2.1 Aerial Photograph Interpretation

Aerial photographs of the study area were examined to verify landscape information in past reports on land-use, disturbance patterns and other features of interest. Complete coverage of the area was available using 1:30,000 (1985) colour and 1:60,000 (1982) black and white photos.

The following features were searched for:

1) site size and boundaries
2) disturbances
3) general vegetation diversity
4) general landscape features
5) eolian landforms
6) potential areas of environmental sensitivity

2.2 Literature Review

Reports and area maps of Canadian Wildlife Service, Parks Canada and Alberta Forestry, Lands and Wildlife were surveyed. Various reports prepared by private consultants were also reviewed. Relevant information in this literature was used in the evaluation of the study area.

2.3 Personal Communication

The Middle Sand Hills are located within the Suffield Military Reserve. Government personnel representing the Department of National Defence were contacted to establish current federal policy on and conditions of the study area including ownership, prohibited activities, area zoning, and future plans.

3.0 CRITERA BASED EVALUATION SYSTEMS

3.1 Introduction

Conflicting land uses and the limitations of management agencies to effectively manage a large and diverse number of sites has necessitated planners develop a means to identify those sites that are the most desirable to protect. This priorization implies a comparison of the alternative sites, ideally using an objective, unbiased evaluation system. However, objective or reproducible measurements are greatly affected by several factors including the experience of assessors, the number and timing of measurements and the objectives for which the measurements are being taken. To minimize the inherent subjectivity of the procedure, it becomes critical that the evaluation become explicit and standardized. This assists in objectivity by allowing a variety of persons reviewing a wide range of sites to arrive at similar conclusions.

Furthermore, the process of decision-making will always occur after information is provided by evaluative research. Priorities developed through an evaluative process should be viewed as guidelines to be used by decision-makers and not decisions themselves.

3.2 Concepts of System Development

There are several concepts which underly the development of explicit and reproducible evaluation systems. These are abstracted from Braidwood (1987) and listed below.

3.2.1 Criteria Development

(1) The criteria set should be comprehensive so that all factors important for evaluation are included.

(2) Criteria should be operational so that managers may use them effectively and that decision-makers may understand the implications of their decisions.

(3) Criteria should be mutually exclusive. Evaluations should avoid creating two (or more) criteria for what is essentially a single factor and thus placing unwarranted emphasis on an individual criterion.

(4) Criteria sets should not exceed twelve criteria. Beyond this limit, the accuracy, consistency and realiability of assigning values to criteria are reduced. Also, the use of a large number of criteria increases the averaging of the final value of an area and the masking of very high or very low criteria. These high and low values may provide enough of a reason to protect an area, irrespective of other values.

3.2.2 Weighting

(1) Weighting of criteria reflects the difference in importance of the criteria to the objectives of the evaluation.

(2) Weighting is a subjective process but the reproducibility of evaluative data need not be affected if a standardized and agreed upon weighting scheme is developed.

(3) Specific weightings should be applied to criteria once the criteria are ordinally ranked.

3.2.3 Measurement

(1) Criteria must be measurable if they are to be useful.

(2) Measurement is a process of measuring characteristics of a site, not the site itself. However, there is an empirical relation which allows the placing of sites in the same order as the characteristic, with respect to that characteristic.

(3) Some criteria may not be measurable using existing scales. In these cases, constructed scales need to be developed with each level along the scale clearly defined. Clearly defined levels increase reproducibility.

(4) When using constructed scales, it is assumed that the levels are equidistant in value.

(5) The range of a measurement scale must represent the plausible range of that criterion, not possible or even actual.

(6) Each level of a scale must be sufficiently distinct from the others so that the different levels reflect significant changes in an area for a given criterion.

3.2.4 Aggregation

(1) For most decision-making problems, criteria values need to be aggregated into one or a few indices.

(2) The summing of the scores for all the criteria is the most used method of score aggregation.

(3) If a comparison of total value is to be made for the purposes of priorizing a list of sites, the comparison must be between sites which are similar in their major attributes.

4.0 COMPONENTS OF SYSTEM

Based on the above concepts and an examination of past studies which have assessed the value of conservation areas (see Table 1), a criteria set was identified. This study aggregated the criteria into three relatively distinct classes:

(1) Level of Threat
(2) Level of Biophysical Representativeness
(3) Level of Biophysical Specialness

4.1 Level of Threat

A set of circumstances exist for landscapes, ecosystems or communities which indicate the level of urgency for protective action. These may be defined as the level of threat which is imposed on an area. Several terms are commonly considered synonomous with threat. These include "impact" (Jain, et at, 1985)", perturbation" (Loucks, 1975), and "disturbance" (Whitehead and Pickett, 1980). Each author tends to define a unique group of attributes to measure threat, depending on what is being threatened - landscapes, species, etc. - and what the objectives of the measurement exercise are.

This study incorporates Ratcliffe's (1977) twofold definition of "extrinsic disturbance" and "intrinsic sensitivity". Disturbances are considered random events which tend to appear without prelude and are not part of some familiar pattern. Disturbances may be treated as a group and evaluated as such. Factors which diminish or enhance disruptive forces may also be evaluated under this heading. This study attempted to specify and measure the most important threat criteria.

Intrinsic sensitivity involves the areas fragility or its component parts as well as its ability to recover after disturbance. Site factors to consider under this heading include elevation level, seral stage, susceptibility to erosion and degree of specialization of the resident plant and animal species.

Principal threats to native plants and communities in sand dune terrain relate to encroachment of vegetation on active dunes. Threats to wildlife include natural drought, proliferation of road networks in natural habitats, drainage and cultivation of natural habitats, placement of dugouts in ephemeral wetlands and heavy summer grazing.

Threat levels were measured at the ecoregion level (Rate of Ecoregion Loss, Extent of Ecoregion Loss, Degree of Ecoregion Protection) and at the site level (Current Protection of Site, Land Use Conflicts, Site Sensitivity).

TABLE 1

CLASSES OR CRITERIA AND THE NUMBER OF TIMES EACH USED IN 16 STUDIES

(Different studies used different words to describe similar criteria, so it was necessary to construct these classes, some of which may be arbitrary).

	Class of Criteria	Number of Schemes
*	Diversity (habitat and species)	15
*	Rarity	12
*	Naturalness	12
*	Area	10
	Representativeness	9
*	Threat of Human Interference	8
	Amenity Value	7
	Educational Value	6
	Scientific Value	5
*	Recorded History	4
	Population Size	3
*	Uniqueness	2
*	Ecological Fragility	2
*	Position in Ecological/Geographical Unit	2
	Potential Value	2
	Wildlife Reservoir Potential	1
	Availability	1
	Replaceability	1
*	Management Factors	1
	Archaeological Interest	1
	Importance for migratory wildlife	1
	Successional Stage	1
	Silvicultural Gene Bank	1

(*) Indicates criteria used in this report.

From Margules, C.R. 1981.

4.2 Level of Biophysical Diversity

One primary goal of conserving natural environments is the protection of the broadest possible range of natural diversity found in an area. Diversity is considered by many to be the most important measure of conservation value but should not be used exclusively. To do so would be to potentially exclude whole guilds of species, and exclude areas with rare or unique features only because the diversity of the area is low.

Landscape, community and habitat diversity can be measured using widely accepted vegetation classifications in conjunction with diversity indices. Species diversity can be a measure of an areas species "richness" (number of species present), or a function of the number of different species and their relative abundances. Relative abundance may be simply the number of individuals per species or some measure of importance such as biomass. Many studies measure diversity by the cumulative number of "types" at a given organizational level (landscape, community, etc.).

In the absence of data, community and habitat diversity can give an indication of potential, if not actual species diversity.

Closely linked to the concept of diversity is that of "naturalness". Its value has been largely derived from the notion that systems that have evolved with little human disturbance contain a greater number of native plant and animal species. The greater number of exotic species present or an excelerated loss of native species renders an area less diverse in terms of a naturally maintained environment.

Several questions arise regarding how naturalness should be measured. For instance, should an environment which, while containing native species exclusively, has been repeatedly and intentionally burned be considered a natural environment? Also what arbitrary baseline is to be used to determine what is a totally natural condition? Finally, as truly undisturbed sites become increasingly rare, even in Alberta, does the criterion lose most of its meaning as a way to assess conservation value? For example, in 1979 the Yorkshire Naturalists Trust managed three wetlands, all of which were formed from old mine workings and abandoned quarries. Consequently, we may conclude that in the measurement of naturalness, the origin of an areas formation or maintenance is less important than the measure of its compliment of native species or communities.

Diversity has also been linked to "area" in that the number of species present are expected to increase as the size of the area assessed increases. While studies on the species-area relationship have focused on islands, the similarity between islands and nature reserves have led researchers to generate similar implications for the latter. These include that, for larger areas:

1. A greater number of species are conserved
2. Extinction rates are lower, and
3. Range requirements for larger animal species are realized

Some qualifications to total acceptance of "bigger is better" have arisen in the last ten years. Studies and theory have demonstrated that for heterogeneous or fragmented areas, a set of smaller preserves may contain more species than a single large reserve of the same area (Jarvinen, 1982). Smaller, interconnected, and clustered reserves with the smallest possible boundary edge may also contribute in meeting the three aforementioned advantages (Margules, et.al., 1982). Smaller reserves may be more practical from a socio-political

stand point as well and in countries such as Great Britian where the loss of natural landscapes is very high. It may also apply to regions where the loss of natural communities is high, such as in Alberta's grassland landscapes.

For the purposes of this study, diversity, naturalness and area were used as evaluative criteria under the heading of "Level of Biophysical Diversity". Landscape, community and habitat diversity were measured cumulatively. Species diversity was measured by assigning points to sets of species numbers for mammals, birds, fish, amphibians and reptiles. The scoring of diversity was based on a literature review. For scoring purposes an upper limit was set for each.

Naturalness was measured as being the extent of remaining natural vegetation cover in the study area. Natural vegetation cover refers to vegetation communities which have developed in response to microclimate, site conditions and a "natural" disturbance regime. Measurement was at the landscape and community levels of organization and derived by consulting existing site data and airphoto interpretation. No attempt was made to examine naturalness at the species level.

Area, or size, of the study area was measured using existing data and airphoto interpretation and will be scored using upper and lower limits. The lower acceptable limit was four sections. This is thought to be the minimal size required to ensure continual ecosystem functioning and ongoing protection. The upper limit was set at twenty sections which while politically optimistic, reflects the great size of Alberta's existing land base which can still support large natural reserves.

4.3 Level of Biophysical Specialness

Specialness is defined in this study in terms of the various levels of rarity (i.e. rare, threatened and endangered). Rare or unusual natural features are valued for the unique character they impart to an area. Rare species are valued due to the high interest in their undoubtedly unusual ecological requirements, research potential regarding population dynamics and factors limiting geographic distribution, as well as the ethical considerations of species extinction.

Rarity is a function of abundance and distribution within an identified jurisdiction, and includes the concepts of peripherality, endemicity and disjuntivity (Rabinowitz, 1981). Features and species that are threatened or endangered world-wide are considered of greatest conservation value because the potential loss is absolute. Conversely, sites where the threat of extirpation is at a regional scale and only involves a rare species, conservation value is the smallest for this criterion. The greater number of "special" species present in an area the greater the conservation value of that area.

The level of biophysical specialness for the Middle Sand Hills area was measured with reference to the level of rarity (rare, threatened or endangered), the number of features within the area that are ascribed to each level, and the jurisdictional level involved (regional, provincial, national, international).

5.0 STUDY AREA

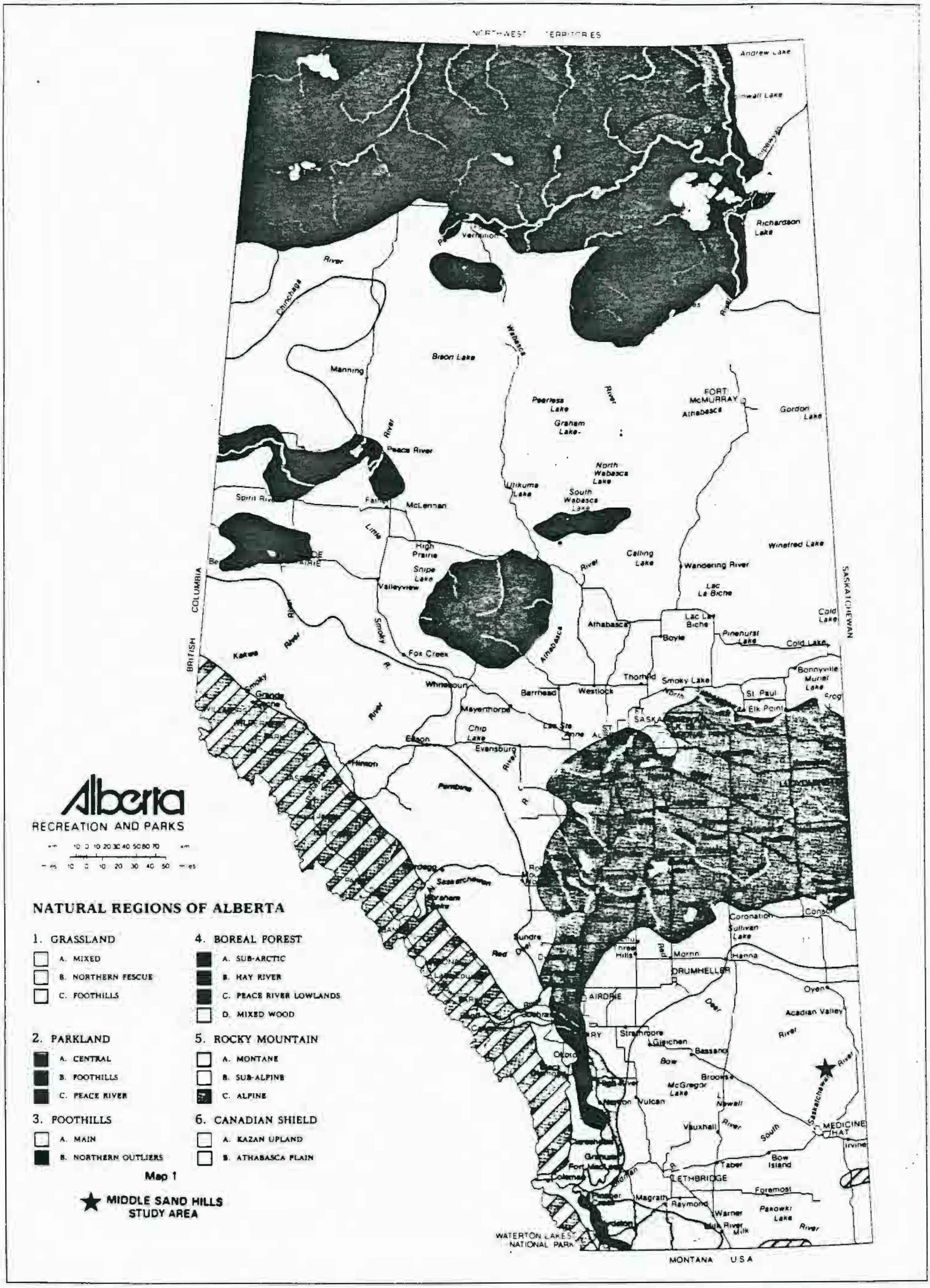
5.1 Ecoregion Overview

The Middle Sand Hills is located in the Mixed Grass Ecoregion of Alberta (see Map 1). The landscape of this ecoregion is characterized by low relief ground moraine with limited and minor upland areas. Areas of hummocky moraine, outwash and sand plains, eroded plains and dune fields also occur; as do emphemeral alkaline wetlands and a few permanent streams.

Dark Brown Chernozem soils are found in the cooler and more poorly drained areas of the region while Brown Chermozems dominate the drier portions. Solenetzic soils occupy a large segment of the more central parts of the Mixed Grassland.

Currently, two thirds of the Mixed Grassland region has given way to the plow. The remainder is subject to grazing pressures which, if sufficiently heavy, may alter native species composition and degrade sensitive wetland habitats. In upland areas, Agropyron and Stipa species occur most often in lightly grazed areas while Bouteloua and Poa species dominate more heavily grazed areas along with a variety of forbs. Sand dune environments display a different array of vegetation types, the specific composition of which depends largely on site stability and moisture levels. Low lying valleys support grass and forb communities, coulee shrublands, both tall and low, and small stands of trees in the more protected sites.

The rate of loss of native vegetation is considered rapid in the Mixed Grass Ecoregion and the level of its representation within a provincial or national system of protected areas is minimal.


Alberta
RECREATION AND PARKS
NATURAL REGIONS OF ALBERTA
1. GRASSLAND
A. MIXED
B. NORTHERN FESCUE
C. FOOTHILLS
2. PARKLAND
A. CENTRAL
B. FOOTHILLS
C. PEACE RIVER
3. POOTHILLS
A. MAIN
B. NORTHERN OUTLIERS
4. BOREAL FOREST
A. SUB-ARCTIC
B. HAY RIVER
C. PEACE RIVER LOWLANDS
D. MIXED WOOD
5. ROCKY MOUNTAIN
A. MONTANE
B. SUB-ALPINE
C. ALPINE
6. CANADIAN SHIELD
A. KAZAN UPLAND
B. ATHABASCA PLAIN
Map 1
MIDDLE SAND HILLS STUDY AREA
BRITISH COLUMBIA
SASKATCHEWAN
MONTANA U.S.A.
WATERTON LAKES NATIONAL PARK
FORT McMURRAY
Peace River
McLennan
High Prairie
Valleyview
Fox Creek
Whitecourt
Mayerthorpe
Barrhead
Westlock
Athabasca
Boyle
Smoky Lake
St. Paul
Elk Point
Bonnyville
Edson
Hinton
Evansburg
Sundre
Three Hills
Drumheller
Hanna
Coronation
Oyen
Acadian Valley
Strathmore
Gleichen
Bassano
Brooks
Vulcan
Vauxhall
MEDICINE HAT
Bow Island
Taber
LETHBRIDGE
Foremost
Raymond
Magrath
Warner
Milk River
Manning
Bison Lake
Wandering River
Lac La Biche
Winefred Lake
Gordon Lake
Richardson Lake
Andrew Lake

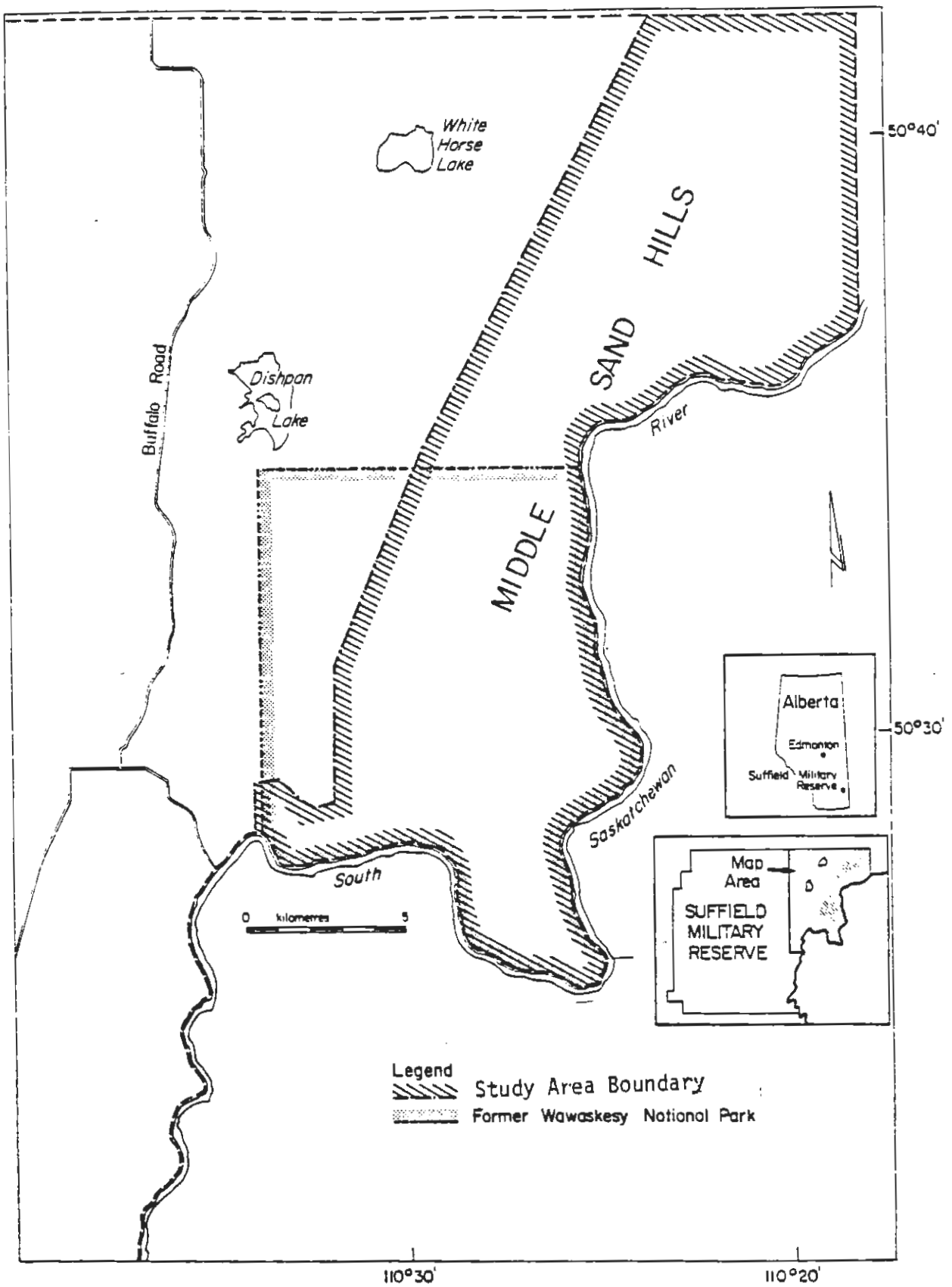
5.2 Location

Except for a small northeast portion, the Middle Sands Hills lie entirely within the Suffield Military Block. The land is federally owned by the Department of National Defence (DND). For the purposes of this study, the area is defined as the "out-of-bounds" zone established by DND within the Suffield Block (see Map 2). This area was also proposed by Shandruk et al (1984) as a Cooperative Wildlife Management Area for the Canadian Wildlife Service. The lower half of the study area was part of the former Wawaskesy National Park. It is bordered on its east side by the South Saskatchewan River valley and beginning 48 km north of Medicine Hat, extends northwards for approximately 35 km. Its total size is estimated at approximately 300 sq. km. however, similar adjacent dunes exist south of the area which extend the sand dune complex considerably.

The legal description of the hills includes portions of Township 17 to 20 in Ranges 3 and 4, west of the fourth meridian. Its geograpic co-ordinates are 50° 25' to 50° 42' latitude, 110° 17" to 110° 34 W latitude.

5.3 Vegetation and Landscape Units

Middle Sand Hills is a superb example of rolling nonclimax Mixed Grass Prairie. It is considered nonclimax due to the presence of sandy and moderately drained soils, the increased slope aspect, and the resulting vegetation. It has extensive representation of dune field, non/weak solonetz, open alkali wetland and eroded non-marine bedrock landscapes. There is limited representation of hummocky moraine, active blowouts, outwash/sand plain, wet meadows and protected areas. There is a group of interconnecting steep-sided ridges formed by glacial action, called Kame moraine, that occurs to a limited extent but is extensive for the grasslands.



MAP 2 - Middle Sand Hills Study Area Boundary
Source: Shandruk et al (1984)

The South Saskatchewan River forms the east boundary of the area. Its banks are approximately 125 feet above water level forming steep-sided gullies and coulees.

The vegetation at Middle Sand Hills is very diverse, consisting of sand drop seed, sand grass, indian rice grass and Canada wild rye on the exposed and stabilized dunes. On the blow-outs and areas of unstabilized dunes, colonizing species occur such as scurf pea and viened dock, as well as the more wide ranging wheat grasses. Creeping juniper may also occur on stabilized blowouts.

A variety of plant associations characterize the depressional areas among stabilized dunes. These include various combinations of tall and low shrubs such as willows, wild rose, buckbrush, sagebrush, choke cherry, thorny buffaloberry, saskatoon berry and wolf willow. The most common community in the wettest areas is dominated by stands of aspen.

5.4 Significant Features

The entire Middle Sand Hills could be considered significant due to its being a large and excellent representative of the sand dune terrain and life of the Mixed Grass Prairie. Its approximately 25,000 hectares include a remarkable diversity of plant communities primarily due to its proximity to the south Saskatchewan River and its complex topography. Many plant and animal species are significant because they are rare, threatened and restricted to these native grasslands, or are abundant here because of the areas location within the Suffield Military Reserve - as native prairie declines, these areas will become increasingly critical for the survival of these species.

The following is a brief listing of significant features found in the area as derived from Shandruk *et al* (1984) and Wallis and Wershler (1988):

Birds

- Diverse nesting bird populations including song birds, game birds, waterfowl, shorebirds and birds of prey.
- Nesting loggerheaded shrikes.
- Upland sandpipers, grasshopper sparrows, lark sparrows, Brewer's sparrows, violet-green swallows, all uncommon or declining in Canada.
- Productive sharp-tailed grouse habitat with some of the highest densities for Alberta.
- Nesting burrowing owls and ferruginous hawks, both threatened in Canada.
- Nesting golden eagles and large Canadian geese.

Mammals

- Key mule deer and pronghorn antelope habitat.
- Ord's kangaroon rat, rare in Canada.
- Olive backed pocket mouse, rare in Canada.
- Badlands white-footed mouse, rare in Canada.

Reptiles and Amphibians

- Prairie rattlesnake, which has only localized distribution in Canada.
- Eastern short-horned lizard, peripheral in Alberta.
- Western hognose snake, declining.
- Large snake hibernacula.

Invertebrates

- Scorpion, rare and locally distributed.

Plants

- Pussytoes spp.
- Fairy candelabra
- Annual lupine
- Silver leaf psoralea
- Cryptantha fendleri
- Vulpid octoflora
- Polanisia dodecandra
- Major ungrazed springs occur just north of the Middle Sand Hills and contain rare plants such as little-seed rice grass, prairie wedge grass and paper birch.

6.0 STUDY AREA EVALUATION

After criteria were identified in conjunction with associated weights and measurement scales, the evaluation system was applied to the Middle Sand Hills area. Upper limits were set on several criteria for two reasons. Firstly, these are the levels which are considered the highest probable to achieve for a given criterion. Secondly, at some point adding additional levels to the measurement scales of Rare, Threatened or Endangered Species (criteria A and B), Vegetative Diversity (criteria D and E), Site Size (criteria G), etc.; would only add a decreasing marginal value to the site.

The system was designed so that, in the absence of many sites with which to compare scores the score received by the study area could be measured against the total score possible. The results of the evaluation are illustrated below on a scoring sheet, with the final score indicating the "conservation value" of the Middle Sand Hills.

6.1 Results of Evaluation

I. Level of Biophysical Specialness

A. Threatened or Endangered Species

number at international/national level (max. 3)	3 x (2.5)	= 7.5
number at provincial level (max. 3)	2 x (1.5)	= 3.0
	10.5 x (2.0)	= 21

B. Rare Species

number at international/national level (max. 3)	3 x (2.5)	= 7.5
number at provincial level (max. 3)	2 x (1.5)	= 3.0
number at regional level (max. 3)	1 x (.5)	= .5
	11 x (1.0)	= 11

C. Presence of Special Natural Features

Low	0 points
Low/Moderate	2
Moderate/High	4
High	5
4	x (0.5) = 2

II. Level of Biophysical Diversity

D. Vegetative Diversity

Landscape Units		Community Type		Habitat Type	
1-5	1 points	1-3	1 points	1	1 points
6-10	2	4-7	2	2	2
11-15	3	8-10	3	3-4	3
16-19	4	11-14	4	5-6	4
20+	5	15+	5	7+	5
	4	+	4	+	4 =

12 x (1.5) = 18

E. Animal Diversity

No. of Mammals		No. of Birds		No. of Fish, Amphibians & Reptiles	
0	0 points	0	0 points	0	0 points
1-5	1	1-10	1	1-3	1
6-10	2	11-30	2	4-6	2
11-20	3	31-60	3	7-9	3
20+	5	60+	5	10+	5
	5	+	2	+	3 = 10 x (0.9) = 9

F. Natural Vegetation Cover

< 5%	0 points	
6 - 25%	1	
26 - 50%	2	
51 - 75%	3	
76 -100%	5	
	5	x (0.9) = 4.5

G. Site Size

1 - 3 section (very small)	0 points	
4 - 10 sections (small)	1	
10.1 - 15 sections (moderate)	2	
15.1 - 25 (large)	3	
> 25 sections (very large)	5	
	5	x (0.9) = 4.5

III. Level of Threat

H. Extent of Ecoregion Loss

< 10% in nonnative cover	0 points	
10 - 25% in nonnative cover	1	
26 - 50% in nonnative cover	3	
51 - 75% in nonnative cover	4	
76 -100% in nonnative cover	5	
	4	x (0.5) = 2

I. Rate of Ecoregion Loss

Low	0 points	
Moderate	2.5	
Rapid	5	
	2.5	x (0.5) = 1.25

J. Number of Species Extirpated from Ecoregion in Last 100 years

0	0 points	
1	1	
2	2	
3	3	
4	4	
5+	5	
	5	x (0.2) = 1

K. Current Protective Status of Area

Legally protected for conservation purpose	0 points	
Legally protected but poorly managed	1	
Protected by non-binding agreement	2	
Benevolent protection	4	
No protection	5	
	4	x (0.5) = 2

L. Current Protective Status of Ecoregion
(Legal Protection Only)

7-10% or 3 or more large sites or large number of clustered small to moderately sized sites	0 points	
4- 6% or 1 or 2 large site or several small sites	2	
1- 3% or a few small sites	4	
0% or no sites	5	
	4	x (0.5) = 2

M. Site Sensitivity

Low	0	
Moderate	2.5	
High	5	
	5	x (0.4) = 2

Total conservation Value of Middle Sand Hills

Add:	A.	21
	B.	11
	C.	2
	D.	18
	E.	9
	F.	4.5
	G.	4.5
	H.	2
	I.	1.25
	J.	1
	K.	2
	L.	2
	M.	2
TOTAL CONSERVATION VALUE		80.25 = 82%

6.2 Summary of Results

The Middle Sand Hills received 80.25 out of a possible 98 points, or a conservation value of 82.0%. The results are discussed under the three general criteria headings of Biophysical Specialness, Biophysical Diversity and Threat.

6.2.1 Biophysical Specialness

The study area received 34 of a possible 40 points for special natural features. The number of possible points is a reflection of the heavy weighting placed on the criterion, especially threatened and endangered species. It is considered in this study to be several times greater in importance than all other criteria, except for Vegetative Diversity. Most points were scored for species that are

rare, threatened or endangered at the international/national level. These include the ferruginous hawk, burrowing owl, plains hognose snake, olive-backed pocket mouse, badlands white-footed mouse and the plant Oryzopsis micrantha and prairie wedge grass. Ord's kangaroo rat is considered rare in both Alberta and Canada, but was scored only as a nationally rare species.

One reference lists paper birch as rare in the study area and this was taken to mean that the species is significant at the regional level only.

Special Natural Features were left open to interpretation due to the wide range of features which could be considered as special. Excluded from the list were rare, threatened and endangered species because they were evaluated under separate criteria. The entire Middle Sand Hills area has been considered special for decades by virtue of its extensive sand-dune topography. There also exists extensive examples of eroded non-marine bedrock. There is a special habitat in the area in the form of a hibernaculum, which at one time contained a population of the rare plains hognose snake.

6.2.2 Biophysical Diversity

The study area received 36 of a possible 45 points. The diversity of landscapes, communities and habitats were weighted most heavily within this heading and was reflected in the points scored (18). While most habitat types and many community types can be found in the area, only 16 out of approximated 25 landscape units were present. Predictably, many landscapes associated with water were absent or very rare including shallow and deep marsh, springs, river terraces and abandoned channels and streams of any description.

Animal Diversity received 9 out of 13.5 possible points; half of which were scored for the mammal species present. The bulk of the mammals were comprised of rodents. Bird species were not abundant, likely due to the small amounts of shrub and tree dominated habitats and the overall specialized sand dune environment. Amphibians and reptiles were also present including the plains spadefoot toad, short-horned lizard, plains garter snake, bull snake, prairie rattle snake and the prairie hognose snake.

Although not specifically measured, the native species composition of the Middle Sand Hills can be assumed to be largely intact. Human disturbances are minimal and related to oil and gas exploration and the tresspassing of grazing livestock. Of greater concern is the loss of habitat types, specifically blowout areas, and the effects on the rare species found within them. Only 4 of 12 sand blowouts active in 1951 remain unstabilized and one of these is 90% stabilized. The other 3 have remained unchanged.

The size of the study area is approximately 300 sq. km. which is the equivalent of approximately 110 sections. Relative to most other provincially and nationally protected conservation areas, and the internationally recommended minimum size of 4 square miles for protected ecosystems, this is a very large area. Areas of this size which are not situated on federally-owned land would not be likely politically or socially feasible to protect. Consequently a parcel of land this size is highly valued and is weighted accordingly.

6.2.3 Threat

Threat is an important consideration in valueing landscapes, but it is not usually considered as significant as rarity and diversity. The weighting of the criteria under this heading reflect this view. Of the 98 points possible under this evaluation system only a maximum of 13 points could be scored for threat criteria. 10.25 out of the possible 13 points were scored under this heading by the study area.

Only 25-30% of the Mixed Grassland Ecoregion of Canada currently exists in a natural condition and the rate of loss is excelerating. Over the course of the last 100 years, the result has been the loss of several species including the plains bison, big plains grizzly bear, great plains wolf and the northern swift fox. Unfortunately, only a very few small sites, including natural areas and one ecological reserve, have been formally designated to protect the Mixed Grass Subregion in which the Middle Sand Hills is found. This constitutes perhaps 1% of the Subregion. The site itself has been provided a measure of environmental protection by DND through zoning, and two standing committees formed in the 1970's inspect the area annually. However, this protection is benevolent at best. The priorities of DND are militaristic not environmental and the Middle Sand Hills natural heritage values are not protected under legislation.

The site is considered to be highly sensitive due to its eolian terrain, making it easily disturbed by human activities, and once disturbed, slow to recuperate to a natural condition.

7.0 CONCLUSION AND RECOMMENDATIONS

7.1 Conservation Value of Middle Sand Hills Area

Based on past reports and recommendations, as well as the 82% score received in this study, the Middle Sand Hills is a highly significant site. The number of rare and endangered species present as well as the rapid rate at which the Mixed Grass Ecoregion is being lost, is sufficient justification for identifying the area as being of national significance and possessing a high conservation value. However, its protection can only be considered as moderately critical since it is protected fairly well by the policies of DND.

7.2 Potential Conservation Mechanisms

The question is not if the Middle Sand Hills is worth protecting but how can it best be protected to retain it's conservation values. Unfortunately, this issue is complicated by the restrictions placed on formal protection by the legal land owner - DND.

The most suitable provincial mechanism for this area is the Ecological Reserves Program. It is strictly a nature conservation program whose objectives are the protection of representative provincial landscapes and special natural features, including rare species. Unfortunately, as stated in the act which controls the program, only sites located on provincial crown lands are eligible for consideration. It is also unlikely that the federal government would allow any of their lands, particularly ones of such significance, to become provincial property.

Federal mechanisms available for protecting the conservation values of the study area are through a National Park designation or the establishment of a National Wildlife Area. Due to the high tourist potential associated with a National Park and the legitimate concerns of DND regarding unrestricted public access, such a designation is untenable.

Upon discussions with Major Brent MacDonald, Range Commander at CFB Suffield, it was clear that the base is not receptive to any attempt at cooperative management strategies for the Middle Sand Hills. They insist on full management control and argue that their policies and standing committees are all that's required to secure the conservation values of the area. In 1984, the Canadian Wildlife Service (CWS) proposed to make the northeast corner of the Suffield Block a Cooperative Wildlife Management Area. This would make it, in effect, a National Wildlife Area with joint managerial responsibilities. The area would be controlled by the military, while CWS would manage the ecology of the area and deal with all

environmental issues. While the proposal went to the Minister of the Environment for review, the military's resistance effectively killed the initiative. Today, they still insist on retaining complete management control.

Based on the position of DND personnel at Suffield, legal protection for the Middle Sand Hills is not likely to occur in the near future. However, the base commander is not opposed to the area being used for the reintroduction of species, scientific research and environmental education (Archer, 1988). Consequently, the military should be allowed to continue to manage the area using the mechanisms they have established without outside pressure.

Efforts to legislatively protect the area should not be ruled out indefinitely. It is recommended that attempts to establish a Cooperative National Wildlife Area or National Wildlife Sanctuary be pursued within the out-of-bounds area of CFB Suffield which comprises the Middle Sand Hills only after;

1) A comprehensive biophysical inventory is completed and evaluated.

2) In-depth research is initiated on the biology of prairie species and the ecological dynamics of sand dune terrain, particularly blow-out areas. The process of reintroducing endangered species could be the result of information generated.

3) Public interest in the area is heightened through the use of various media and by using the findings of inventory work and research. Groups of limited size could be given an opportunity to tour the area. This would have to be organized with the cooperation of the Suffield Base Commander.

4) Non-governmental representation increases on the two standing committees. At least one independent grassland ecologist is required to ensure decisions made which affect the area are in its best interests and reflect its importance as a nationally significant conservation area.

The intent of these recommendations is to:

1) generate sufficient data to further substantiate the conservation values of the area and the need to protect them.

2) by successfully reintroducing rare and endangered species to the area, dramatically increase the need for formalized protection.

3) create a high level of public awareness and concern over the lack of formalized protection. Since non-action on the part of the federal government is largely political, public pressure could go a long way in getting the area formally protected. Once public support is behind the concept of a Cooperative National Wildlife Area or Wildlife Sanctuary, lobbying efforts at the federal level should begin again.

4) ensure that until the area is formally designated its natural heritage values are not eroded.

While the military is taking a responsible attitude towards the Middle Sand Hills, this could change with a change in policy or base commander. The current environmental policies are well entrenched so further degradation or loss of the area in the near future is not likely. However, securing formal protection is essential for protecting this sensitive area in the future. The above recommendations will undoubtedly be necessary if this objective is to be realized.

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APPENDIX I

COMMON AND SCIENTIFIC PLANT NAMES

PLANTS

Annual Lupine	*Lupinus pusillus*
Aspen	*Populus* spp
Buckbrush	*Symphoarpis occidentalis*
Canadian Wild Rye	*Elymus canadensis*
Choke Cherry	*Prunus virginiana*
Creeping Juniper	*Juniperus horizontalis*
Fairy Candelabra	*Androsace occidentalis*
Indian Rice Grass	*Oryzopsis hymenoides*
Little Seed Rice Grass	*Oryzopsis micrantha*
Paper Birch	*Betula papyrifera*
Prairie Wedge Grass	*Sphenopholis obtusata*
Pussytoes	*Antennaria dimorpha*
Sagebrush	*Artemisia cana*
Sand Dropseed	*Sporobolus cryptandrus*
Sand Grass	*Calamovilfa longifolia*
Saskatoonberry	*Amelanchier alnifolia*
Scurf pea	*Psoralea lanceolata*
Silver Leaf Psoralea	*Psoralea argophylla*
Viened dock	*Rumex Venosus*
Thorny Buffaloberry	*Sheperdia argentea*
Wheat grass	*Agropyron* spp.
Wild Rose	*Rosa woodsii*
Willow spp	*Salix* spp.
Wolf Willow	*Elaeagnus commutata*

W18

PHASE I of a Study

On the Restoration of the Trumpeter Swan Populations in Saskatchewan

Historical Range, Exploitation and Population Trends 1743-1987

July 1987

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1. Introduction

In 1986, the Committee on the Status of Rare and Endangered Species in Canada (COSEWIC) listed 16 species of birds that were considered endangered, threatened or rare from the prairie provinces. According to COSEWIC, rare species are those that exist in low numbers or in very restricted areas in Canada, but are not likely threatened with immediate extinction due to the actions in man. The Trumpeter swan (*Cygnus buccinator*), the subject of this report, was classified as one of the six "rare" avian species of the prairie provinces.

The Trumpeter swan is reported to have been "abundant and widespread across the continent" (Banko 1960: 25), and "a regular nester throughout the prairies" (Taverner 1938: 77), before fur-traders and early settlers puportedly took their toll from 1750-1900.

The present status of the Trumpeter swan has improved significantly improved from the period 1910- 1930, when biologists and conservationists voiced alarm at the low number of Trumpeter swans in continental North America. In 1913, the annual meeting of the American Ornithologists Union discussed the status of the Trumpeter swan, and voiced a collective opinion that "this magnificent bird was nearing extinction, and would soon disappear forever" (Coale 1915: 82). Edson (1926), echoed this sentiment when he suggested

that Trumpeters were to be "counted with the extinct birds".

In 1985, the Canadian Wildlife Service, Trumpeter Swan Society and U.S. Fish and Wildlife Service conducted the most thorough Trumpeter swan survey on record. Their estimates of the continental Trumpeter swan population indicated that approximately 11,400 Trumpeters could be found in Continental North America, 95 % of which were free-flying birds (Anon. 1986a).

McKelvey and his associates at the Canadian Wildlife Service have more recently documented the status of the Trumpeter swan in Canada, and concluded that the population of Trumpeter swans is currently expanding under natural conditions in Western Canada, at a rate of 8-11 % per year (pers. comm. 1987). If this rate continues to the year 2000, the Canadian population of Trumpeter swans should be between 1500 and 2300 birds, meeting the population objectives outlined in the North American Waterfowl Management Plan (Anon. 1986b), without any human intervention. However, McKelvey and his associates (pers. comm.) have cautioned that in areas such as Saskatchewan, the Trumpeter swan is perilously close to extirpation.

Through funding provided by the World Wildlife Fund, we have been asked by the Saskatchewan Natural History Society, to design a "recovery" plan for the Trumpeter swan in Saskatchewan, with particular attention to "re-establishing"

a population at Last Mountain Lake Wildlife Management Unit in south-central Saskatchewan. We have broadly defined a recovery plan one which seeks to return a species to its former numbers and range before the impact of man adversely affected its population(s). In the course of our research, historical records have forced us to examine the position that the Trumpeter swan routinely bred "across the central plains" (Munro 1962: 3), or that "the trappers of the north and homesteaders of the plains, exterminated the Trumpeters from the heartland of the U.S. and Canada" (Anon. 1986c). In light of our research, we have doubts about the biological integrity of a prairie "recovery" plan for a species, which at best, may only have been present in isolated boreal populations, or as a common spring and fall migrant through Saskatchewan.

2. Historical Range and Exploitation in Western Canada

2.1 Banko's 1960 Monograph - The Trumpeter Swan

In a classic monograph of 1960, Winston Banko documented the historical range and exploitation of the Trumpeter swan in North America. His range map of the historical breeding range of the Trumpeter swan in Western Canada, included all of Manitoba, Saskatchewan, Alberta, British Columbia, the Yukon and southern half of the Northwest Territories. These range maps were based opon an survey of the recent and historical literature, and a broad interpolation from

documented breeding localities. However, it is noteworthy that Banko (1960:20) specifically wrote, "the prairie pothole country in the provinces of Southern Canada and the Great Plains marshes of the United States were of small importance in supporting the continental breeding population", a statement often neglected in current Trumpeter swan management plans.

Banko's (1960) range map of the former western breeding range of the Trumpeter swan has more or less been dogmatically accepted by researchers and natural historians in this century. However, as we will illustrate in the coming pages, the historic evidence for the presence of the Trumpeter swan in Saskatchewan, lends greater support that the Trumpeter swan was a migrant, or a rare breeding bird of the tundra or boreal forest, rather than a breeding bird of the central and southern prairies in Canada.

2.2 Early History and Exploitation in Western Canada (1700-1800)

The earliest record of swans in north western North America, can be traced to the notes and observations of George Isham from 1743 - 1749 (Johnson 1949). Of the many birds found on, or in the vicinity of York Fort, Hudson's Bay, Isham noted (Rich and Johnson 1949:127);

> "Swans we have great and small, a fine noble

> lofty bird swimming in the water - seeing morning and evening some hundreds at a time in the water, - amongst the islands, but are very shy, there is no killing them but as they fly by when setting in a stand. They are larger than the English swans and fatter, the flesh turning black soon after dres'd but a young swan is reckon'd tolerable good eating;"

In 1744, Athur Dobbs, recorded swans (of unspecified varieties) in the lands to the north of the Nelson River on Hudson's Bay, and at Fort Albany during the fall migration. In his summer notes of the exlpoartion of the interior lands as far south of Hudson's Bay as Lac des Pluis (Rainy Lake) and Lake Ouinipique (Lk. Winnipeg) in Manitoba, there was mention of the presence of geese and other waterfowl, but no specific reference to swans.

To what extent the early traders exploited swans for food or their skins in the mid 1700's is not clear. As food items, Isham noted that geese were the preferred and more heavily exploited than swans. Wallace (1954: 43) has summarized the trade records for the Hudson's Bay Company for the 10 year period of 1738 - 1748, and listed the following items of trade in each of those years - beaver skins, martins, otters, cats, foxes, wolverins (sic) bears, wolves, woodshocks (sic), elks, deer, bed feathers (of an unrecorded species of bird), castorum, ivory, whale fins, minks, whale

oil and blubber, ermins (sic) raccoons. squirril (sic), wecsuckapuca (recorded in number of hides), deer skin, goose quills, musquash (sic - muskrats), and badger. There was no reference to trade in swan skins. Isham was clearly aware of the presence of swans in the Hudson's Bay area as in the same account (Wallace 1954: 89) he noted that there were "two species of swan" in the coastal areas of Hudson's Bay.

In 1772, Mathew Cocking left York Fort on Hudson's Bay on an exploration of the interior countries to the south and west. His trip began on 1 July and took him up the Nelson River, and through the areas we now know as the Pas (Manitoba); Cumberland house, Fort a la Corne, Rosthern, Warman, Biggar, the Battlefords, Prince Albert, Fort a la Corne (Saskatchewan); and back to York Fort. Throughout this inland voyage in the heartland of central Saskatchewan, Cocking kept detailed records of the edible plants, fish, mammals, bird life and waterfowl encountered or collected on his trip. Absent from his list was any reference to swans. While nothing conclusive can be made of a lack of reference to swans, it strikes us as peculiar that he would not see or record the presence of the largest free-flying bird in North America, if it was present along his route.

In 1774, Samuel Hearne followed a similar route that would take him as far west as the present site of Cumberland House (Tyrell 1934). On 23 June, Hearne left York Fort on his inland trip. On 5, 7 and 9 July, Hearne records that he and

his men collected moulting swans which they consumed as supplements to their general provisions. These birds were collected within 150 km of the coast, 3 days journey upstream from the union of the Fox and Bigstone River. Throughout the balance of his trip inland, there was no further mention of swans being encountered or collected, although other comestible elements of the native fauna such as geese , moose, pike, sturgeon, tittemeg (whitefish), perch, burbutt (sic), deer and beaver were routinely noted. On the 19 th. of August, as he approached the Pas, he noted "the lakes and ponds adjacent are also said to be remarkable for plenty of geese, swans &c every **spring and fall**". We have emphasized the spring and fall aspect of this statement because the historical evidence is more supportive of a migratory rather than a breeding habit in Saskatchewan. Hearne arrived at the site of Cumberland House on 7 September 1774. He and his men built winter accomodations at this site, and did not record any swans until the next sping on April 10. Throughout April and May of 1775, there were numerous references to killing swans, ducks and geese for food. The numbers of swans taken was usually in the order of 1-4 animals per hunt, and Hearne noted that he was willing to trade at a rate of 1 beaver per swan, on 28 April. Throughout June, July and August, there were many records of hunting mammals, references to a variety of vertebrates collected for food, but no reference to swans. It was not until 2 October of 1775, that swans were again mentioned (Tyrell 1934). Like Umfreville and Isham, Hearne

(1795:435) recognised that there were 2 species of swans in the Hudson Bay area, noting that "There are two species of this bird (swan) that visit Hudson's Bay in the summer...Both species usually breed on the islands which are in the lakes". Unfortunately, there is no direct reference as to how far inland either of the species ranged.

From 1775 to 1782 the residents of Cumberland House (Saskatchewan) and Hudson House (Saskatchewan) included Mathew Cocking (1775-1777); William Walker, William Tomison, and Joseph Hansom (1776-1882); Robert Longmoor, James Elphinstone and George Hudson 1779-1782). These men recorded swans in passage, or being taken for food, on at least 24 separate occasions in this seven year period at several locations along the length of the Saskatchewan River (Rich and Johnson 1951). Of these records, 20 were in the months of April and May, 4 were recorded from October and November. There were no records of swans from June through to September. We note that this pattern of spring and fall sightings, or utilization of swans, is seemingly more consistent with observations of a migratory rather than a resident, breeding species.

Houston and Street (1959) cited evidence that eggs of the Trumpeter swan were collected and eaten by Hearne while at Cumberland House in 1774. This was interpreted as evidence of a breeding record for that area. However, the quotation cited by Houston and Street (1959) was taken from

recollections written in 1795, and cannot be specifically related to the Hearne's stay at Cumberland House. Indeed, in Hearne's journals kept at Cumberland House in the summer of 1774 (Tyrell 1934), there was no reference to the consumption of swan eggs.

Johnson (1967), in her edited version of the "Saskatchewan Journals and Correspondence", provided several other late 18 th. century records of swans in western Canada. Between 8 and 21 September, 1799, Peter Fidler was en route from Meadow Lake (Saskatchewan) to Lac la Biche (Alberta). During this period, Johnson reported that the men existed on an "insufficient diet of ducks, geese and swans". On 18 May, 1796, W. Tomison recorded the receipt of 2 swans at Edmonton House, but not again for the balance of the summer. On 1 March, 1797, George Sutherland recorded the passage of a swan at Edmonton House, but not again for the balance of the summer. On May 4 of 1799, Tomison recorded the receipt of 4 swans, again at Edmonton House. All of these spring and fall records are consistent with a migratory rather than resident habit for swans.

The only summer record of swans that we have been able to uncover in West-central Canada for the period 1700-1800, comes from the travels of W. Tomison on July 30, 1798 (Johnson 1967). On this occasion, Tomison recorded having caught a few swans, between the Pas and Cedar Lake, Manitoba in the heart of the boreal forest. While these might have

been breeding birds, we cannot discount the possibility that these were non-breeders, moulting birds, or birds that were somehow waylayed on their migration to the regular nesting grounds.

The observations of swans in west-central Canada in the 1700's are clearly biassed to spring and fall accounts. Alexander McKenzie's trip from Fort Chipewyan, to the Beaufort Sea in 1789 (Daniells 1971), was the first to documment the summer presence of Trumpeter swans north of 60 degrees. As with most other explorers and traders cited in this report, Mackenzie recorded much of the wildlife he encountered on his inland voyages. As Daniells noted (1971:64), "His (Mackenzies) brief notations give us glimpses of the country itself... and of the abundance of fish and game which alone made life possible for men". Swans were noted "in the spring" (Daniells 1971:65), and on 11 June and 13 June. These latter references were reported from that section of the Mackenzie River between Great Slave Lake, and the union of the Liard River with the Mackenzie River. As Mackenzie approached the Beaufort Sea, in the delta region, he once again noted that swans were taken by his party. In light of our present understanding of the life histories and range of the Tundra (C. columbianus) and Trumpeter swans (Godfrey 1986) it seems likely that the birds taken on the early part of his trip, were most likely Trumpeter swans, and those taken near the coast may very have been either Tundra or Trumpeter swans.

Philip Turnor and his party in 1791 recorded a swan nest on an island off the north shore of Lake Athabasca in the northern boreal forest ecoregion, a few miles from Fond du Lac (Saskatchewan), as well as a miscellaneous reference to several swans near Spring Bay on the same water body in late August of that year (Tyrell 1934). If this was a Trumpeter swan nest, it represents the only breeding record outside of Cypress Hills, for the province of Saskatchewan. It may not be coincidental that Nero (1963, 1967), reported the summering of Trumpeter and Tundra swans in the Stony Rapids area from 1952- 1963, including second hand accounts of young having been fledged. However, upon a review of his published notes, Nero (pers. comm. 1987) could not be certain of the exact species that he observed.

This brings us to the end of our account of the 1700's. It is clear that some of the early explorers recognized that there were 2 species of swans, and that the observations of these birds were restricted to the coastal and coastal lowland regions of Hudson's Bay, North of Fort Chipewyan on the Mackenzie River, the Mackenzie Delta, and Lake Athabasca region of Saskatchewan. We have also noted the preponderance of fall and spring records of swans along a line which stretches roughly from the Pas (Manitoba) to Edmonton House (Alberta), which suggest a migratory habit at that latitude. The only exception to this pattern, was a record of 2 swans being taken south-east of the Pas, in late

July - at the close of the 18 th. century. With the exception of birds being taken in small numbers for their food value, there were no accounts of trade in swan skins or mass exploitation of swans prior to 1800. Finally, despite the early traders widespread peregrinations through the interior, there was no mention of a consistent summer presence of swans on the prairies in the grassland or parkland ecoregions.

2.3 Exploitation and records of the Trumpeter Swan (1800-1900)

Soon after the turn of the century, David Thompson recorded some general observations of swans from the land he called the "musk rat country" (Tyrell 1916:55). This land was defined as, "the region bounded to the west by the great chain of lakes, the principal of which are Lake Superior, Rainy Lake , the Lake of the Woods, Winepeg (sic), the Cedar, and the chain of lakes northward to the Athabasca and Great Slave Lakes" (Tyrell 1916:55), and to the east by Hudson's Bay. This area basically defines the Hudson's Bay lowlands, and southern and northern boreal forest ecoregions in Manitoba and eastern Saskatchewan. Like others before him, Thompson (Tyrell 1916:64) could differentiate two species of swans;

> "There are two species of swan (in the musk rat country), the largest weighs twenty four pounds and the lesser fifteen pounds when fat. They lay from seven to nine eggs. When shot, twelve eggs have been counted in them; but nine is the greatest number I have found in the nest, and

also the number that they rear."

It is noteworthy that in his discussion on of the flora and fauna of the Great Plains, Swan River Country, and the lands in the vicinity of Lake Winnipeg, there were many references to assorted mammals, birds and fish, but none of swans (Tyrell 1916).

From 1799-1808, Alexander Henry established several trading posts and travelled extensively in southern Manitoba, North Dakota, and Eastern Saskatchewan. As noted by Coues (1897:xix), "Henry was of course familiar with all of the animals whose furs or pelts had any commercial value, or whose flesh was staple or food". When reading through Henry's manuscript journals, one can only be struck by the infrequent mention of swans, given the presumed widespread occurence of this species across the prairies (Munro 1962), and their potential value as trading resource (Banko 1960).

The earliest reference to swans in Henry's journal (Coues 1897), occurs from his winter camp on the Mouse River (Southern-Manitoba), on 13 March 1800. Other references are made to swans on 8 September, 10 October, 16 October 1800; and 11 and 14 March 1801. Not unlike the paterns which were emerging from the records of the 1700's, Henry's notations about swans were restricted to the fall and spring when the birds would be migrating. In the detailed fur returns of the Lower Red River Department for the years 1800-1801, there was no mention of trade in swan skins (Coues

1897:184). Throughout the summer and winter seasons, Henry mades continual reference to a wide variety of bird, mammal and fish life, yet no mention of swans.

For each of the years 1801-1808, Henry recorded detailed trading records at Fort Pembina for the returns of trappers from the following areas of the Great Plains grassland and parkland regions; Park River, Reed River, Grand Fourches, Hair Hills, Riviere aux Gratias, Pembina River, Fort Pembina, Turtle River, Prairie en Longue, Bears Head, Lake Manitoba, Portage la Prairie, Dead River, The Forks, Dog Lake, White Mud River and Fort Wasp Mountain. From all of these trading locations, there was not one record of a swan skin being traded. In addition, we note that the winter provisions for Fort Pembina, for the period of 1 September 1808 to 1 June 1808, include 3 swans, 1 white crane, and other assorted wildlife species, but it is clear that swans comprised a very minor, and probably incidental part of the diet of this settlement (Coues 1987:284). Collectively, these records suggest neither a widespread occurence of swans, nor an extensive utilization or trade in swan skins in southern Manitoba and eastern Saskatchewan in the early years of the 19 th. century.

On 8 August 1808, Henry left Fort Pembina en route to Fort Vermilion, Alberta. The route which he followed took him through the central Manitoba (Cedar Lake), eastern Saskatchewan (Nipiwan), central Saskatchewan (Carlton House,

Redberry Hills), arriving at Fort Vermilion on 6 September. Throughout this trip, there was mention of hunts, including those for; white cranes, ducks, grizzly bear, black bear, gulls, pelicans, outardes (geese), white and grey geese, buffalo, and various fish species. There was however, no mention of swans.

Two years later, when Henry moved his men to Fort Terre Blanche, on the N. Saskatchewan River, he recorded a trade in swan skins (Coues 1897:615). On 23 July 1810, several of his men returned from a location noted as Smokey Lake, 24 km north-west of Fort Terre Blanche, with 70 swan skins that were reported to have been killed at that location. Later, on the 31 st. of July, Henry noted that they have in the stores of Fort Terre Blanche 208 swan skins, to which several more were added before departing the Fort at the end of September. Through the thousands of pages of journals and accounts that we have reviewed, this observation represents the only evidence of a sytematic exploitation of swans for the trading value of their skins, while on the central or southern prairies of Canada. From the information that was provided for the Fort Terre Blanche swans, it cannot be ascertained whether these birds were killed on migration or during the summer months.

During the same era, there is additional evidence that suggests that both species of swan were killed in this general area of the North Saskatchewan River by the

nineteenth century fur traders. Both Trumpeter swans and Tundra swans are represented in the archeological remains of Fort Sturgeon (near Prince Albert, Saskatchewan) and Fort George (west of Vermilion, Alberta), but there is no record of the season the birds in which the birds were collected (Kidd 1970, Barka and Barka 1976).

A few years later, at Ile a la Crosse (Saskatchewan), Robert Hood (midshipman with the Franklin expedition of 1819-1821) noted, "The only birds visible at this season (spring), are common to every part of the Missinnippi; gulls, ducks, pigeons, goatsuckers, and the raven; the geese and swans pay a momentary visit in passing to the north and returning" (Houston 1974:113). These comments suggest that the swan was a migratory, not a resident breeder of north central Saskatchewan.

Of his account of a trip from York Fort on Hudson's Bay, to the Pacific Ocean in 1828, George Simpson recorded a single swan (McLeod 1951). This swan was observed on 15 August, one day's journey west of Fort Chipewyan. Throughout his journey from from Hudson's Bay to North-western Alberta, there were references to buffalo, rats (muskrats ?), ducks, gold eyes (sic - fish), pigeons, black bears, several species of native berries, pelicans and geese, indicating that Simpson was recording much of the "edible" wildlife that he was encountering on his trip. With the exception of the Fort Chipewyan observation, swans were not noted

anywhere else along the length of his journey.

The most significant historical account of the Trumpeter swan in Saskatchewan, comes from John Richardson in 1831. Richardson, who was the scientific author of this species noted, "It is the most common Swan of the interior of the fur-countries. It breeds as far south as lat. 61 degrees, but principally within the Arctic circle...it is to the Trumpeter that the bulk of the swan-skins imported by the Hudson's Bay Company belong" (Swainson and Richardson 1831:464). Moreover, the status of the Trumpeter was noted as one "of passage, spring and autumn" (op cit. xxxiii), from observations made while on the Saskatchewan river. These statements, from the leading scientific authority on the Trumpeter swan in his day, are indicative of a migratory habit, not of a breeding status in southern or central Saskatchewan.

Payne (1984) reviewed the social history of York Fort for the period 1788-1870, based on an extensive review of the Hudson's Bay Company records and other pertinent journals of the early traders of the Fort. From his analysis, it was clear that the men of the Fort relied heavily on the native game for maintaining their levels of food stores. In a table entitled "Country Provisions at York", Payne (1984:212) has summarized (on an annual basis) the native wildlife that was utilized by the Fort, for the years of 1834-1851. This time period is coincident with the years of

most extensive exploitation of swans (Banko and Mackay 1964). The list includes; methe (sic ?), trout, lake whitefish, river whitefish, jack, fish of sorts (sic), fresh venison, dried venison, deer heads, deer tongues, ducks, geese, plovers, partridges, rabbits, beaver, porcupine, white whales and cranberries. Given their value as a trade item, and the long standing tradition of the early fur traders to consume swans, it is puzzling why swans should be absent from the items consumed at the Fort, unless one assumes that they were not present in any significant numbers.

Barnston (1860:253) was aware that there two species of swan when he wrote,

> "Swans, except in a few particular localities, are scarce rather than plentiful birds along the shores of Hudson's Bay. They are seen at the same time as the other migratory birds winging their way to the secluded recesses of the North, resting throughout the interior, and losing units of there number here and there by the Indian's gun...They sometimes breed in the interior before reaching the coast. I had 2 eggs brought to me from a nest on the banks of a lake near Norway House <Manitoba>, but I cannot say whether these were of the Cygnus americanus or Cygnus buccinator. Towards Eastmain Fort <Quebec> in James Bay, a considerable number of swans hatch..."

This record supports David Thomson's (Tyrell 1916) earlier account of breeding swans in north-central Manitoba, but lends little support to the notion of an intensive utilization of swans in the Hudson's Bay area. R. McKay (pers. comm. 1987) has written that Taverner recorded Trumpeter swans breeding at Shoal Lake (Manitoba, 1893-94),

but we have been unable to locate Taverner's original notes to confirm this record.

In 1858, Henry Hind was charged to "...illustrate the natural history of the country" (Hind 1971), on his exploratory expedition of central Saskatchewan and Manitoba. On his extensive travels through prime waterfowl breeding habitat, Hind recorded detailed observations of the avifauna of the plains. What emerged from his journals was the image of a man who clearly knew his birds. However, throughout his summer travels, there was never a mention of Trumpeter swans.

A few years later, Milton and Cheadle (1865) recorded their expedition across the North America in the years 1862-1863. In western Canada, their journey started in early July as they approached Fort Garry (Manitoba) from the United States. There were notations on the native fauna of the area including, black and golden orioles, kingfishers, whip-poor-wills, loons, a spotted woodpecker, eagles and hawks, accounts of crop depredation by blackbirds, and plagues of grasshoppers. From Fort Garry, the expedition headed further west to Portage la Prairie and then cross-country to Carleton (Saskatchewan), through some of the best waterfowl breeding habitat on the plains. As the men approached Fort Ellice (Manitoba), there was mention of hunting ducks, geese and prairie grouse (sic), the former abundance of buffalo, and the low density of settlers they

encounter along the Assiniboine River, but no mention of swans. In mid-September, between Fort Ellice and Touchwood Fort, they commented;

> "...travelling for several days through rich, park-like country, similar to that we have previously traversed. Innumerable Lakes and pools swarming with wild-fowl supplied us with constant shooting, and Rover with abundance of work. Canada geese, white geese, mallards, canvass-backs, spoon-billed ducks, various kinds of pochards, blue-winged teal and common teal were the most common of the different species which thronged the waters. Ocasionally the appearance of a new species of duck, or a flock of white swans, gave fresh zest to the sport..."
>
> Milton and Cheadle (1865:55-56)

These swans were the first recorded in their journal, and were most likely fall migrants.

On 6 April 1863, the men found themselves near Carleton, and witnessing the spring migration of waterfowl. Still heading west, enroute to Fort Pitt, through country they describe as "of the usual rich character-mingled woods, rolling prairies, and lakes and streams" (Milton and Cheadle 1865:169), the men mentioned ducks and geese, prairie chickens, and the mating rituals of the prairie grouse (sic). Given their obvious knowledge of ornithology, and previous encounter with swans, it again strikes us as puzzling that the men would not record the presence of the swan if it was one of the natural features of the area.

Throughout the balance of the 1800's there are other isolated references to migrating swans in western Canada. However, it should be noted that after approximately 1860,

the number of swan skins being traded by the Hudson's Bay Company was reduced, which was potentially a reflection of declining numbers of both species (Banko 1960).

Macfarlane (1891) noted 24 Trumpeter swan nests in Franklin Bay in the barren grounds, though these records pertain to his 1861-1866 tenure at Fort Anderson. Seton (1891) classified the Trumpeter swan as a rare migrant over Manitoba, and cited several cases of migratory observations, spring and fall for Winnipeg and Portage la Prairie, Manitoba. Coues (1874) noted that he had only seen Trumpeter swans in North Dakota, and only on migration in September and October. Nuttall (1834) paraphrased Swainson and Richardson's (1831) comments on the Canadian range of the Trumpeter swan, and added little to the known range of this bird in Western Canada. Baird et al. (1864) cited an interesting account of Major Long's expedition to the Rocky Mountains (in an unspecified year) but we have been unable to track-down this obscure reference. From the details provided by Baird et al. (1884), we can only infer that the Trumpeter swan was migratory, rather than resident in the area of the Rocky mountains where Long was travelling. Baird et al. (1884) also provide undated records that suggest the Trumpeter swan bred in the Lower Anderson River, and near Fort Yukon.

Macoun and Macoun (1909) provided several noteworthy records of Trumpeter swans at the close of the 1800's. They

observed that the Trumpeter was the most common swan in the interior of the Northwest Territories, and a migrant over Indian Head, Saskatchewan. They also cited a nest and egg record of the Trumpeter swan, from "Sounding Lake, Saskatchewan" (sic-Sounding Lake is actually in Alberta). The scientific authority for this breeding record (and perhaps for the Buffalo Lake record as discussed below), was credited to **Walter Raine**, of whom the following notes may be considered pertinent. Walter Raine was a prodigious collector and trader of bird eggs around the turn of the twentieth century. In 1934, P.A. Taverner had the following to say about Raine's records, "I think we had better disregard everything he ever said or did unless supported by contributory evidence" (cited in Houston 1981:169). Furthermore, Houston (1981:168) reported that James L. Baillie, curator of the Royal Ontario Museum, had the following advice for the treatment of Raines observations, "any record that passed through the hands of Walter Raine should be rejected". While outright rejection of Raine's observations may be too reactionary (Houston 1981), acceptance of the Sounding Lake observation as the only prairie nesting record for the Trumpeter swan, is not entirely defensible.

Houston (1981:172) also reported, "Raine tells us that one of his collectors that year (1891) had taken two sets of five and two eggs on 7 April from **Buffalo Pound** Lake north of Moose Jaw ...these represent our only documented historic

records for Saskatchewan outside of the Cypress Hills". However, we note that the details of this record are identical Macoun and Macoun's (1909) report of a nesting pair of Trumpeter swans breeding at a **Buffalo Lake**, Alberta, on the same day, year, and coincidentally with an identical clutch of 5 eggs. As it was known that John Macoun collaborated extensively with Raine, and that, "many of our (Macoun's) rare eggs have been obtained from him (Raine)" (cited in Houston 1981:177), we suggest that it is be reasonable to ask whether the Buffalo Pound and Buffalo Lake records may be one in the same. Furthermore, as with the Sounding Lake record, the veracity of those from Buffalo Lake and/or Pound should be regarded with some caution. This is particularly so as the two records represent the only historic records for Trumpeter swans breeding in southern or central regions of the Prairie provinces, outside of the Cypress Hills.

No account of the Trumpeter swan in the 1800's would be complete without direct reference to the trade records for this "commodity" of the Hudson's Bay Company and Canadian Company. Banko (1960:19) wrote;

> "Since this trade began before 1772 and (as John Richardson said in 1832) was principally at the expense of the Trumpeter, the effect of such exploitation on the far flung breeding populations of this species for more than 125 years must have been devastating and largely responsible for its extermination over vast regions, particularly in the heartland of its Canadian range."

However, from the research that we have conducted, the

temporal, spatial and quantitative exploitation of the swan in Western Canada is less well defined that suggested above. The notion that the Trumpeter swan bore the brunt of the trade in swan skins is attributable to a single comment made by Richardson in 1831.

The earliest records of exploitation of swans for their skins in western Canada is closer to 1806 than it is to 1772. Pilder (1914, as cited by Banko 1960), reported that 396 skins were traded by the Hudson Bay Company in that year. As was noted in the recollections of Alexander Henry (see above) trade in swan-skins was evident at Fort Terre Blance, Alberta in 1810, but not earlier at Fort Vermilion, Edmonton, or Pembina.

From the trading record supplied by Banko (1960:19), it appears that the distribution of trade records was restricted to Northern Alberta and the Northwest Territories - the areas coincident with the only consistent summer records. Of the 6291 swan skins of known origin, 4 were from outposts in Saskatchewan south of Lake Athabasca, none were from Manitoba, and the balance (greater than 99.99 %) were reported from the Athabasca and Mackenzie River trading districts. These data, while cursory, are inconsistent with the notion of a species which was reported to be widespread, abundant, and exploited across the prairies.

By the close of the 1800's it was evident that the number of Trumpeter swans in North America had been significantly diminished. From the data that we presently have at hand, the principal area where swans were taken in any significant numebers, was restricted to the Yukon, Northwest Territories and Northern Alberta/Saskatchewan. In the southern and central parts of the prairie provinces, south of the boreal forest, we, nor anyone else we are aware of, have uncovered any unequivocal breeding records for the Trumpeter swan. As was the case in the 1700's (prior to exploitation) the majority of the records of swans are made spring and fall. Together with the comments made by Richardson in 1831 and Hood in 1820, the best case that can be built for the historic range of the Trumpeter swan in Saskatchewan, is for a migratory bird, with (an) isolated nesting record(s) in the far-northern reaches of the province. In Manitoba, one or both species of swan was recorded breeding inland. In Alberta, there may be limited support for summering birds in the Peace River area, for one location in the Rocky Mountains (Rich et al. 1955).

2.4 Trumpeter swans in Western Canada in the 1900's

As mentioned earlier in this report, the scientific community and general public voiced considerable alarm at the diminished numbers of the Trumpeter swan in the first quarter of the twentieth century. The Lacey Act of 1900 in

the United States, and the joint signing of the Migratory Bird Convention Act in 1916, were instrumental in slowing or halting the decline of the Trumpeter swan and other waterfowl populations across North America.

In the early 1900's, there were several records of Trumpeter swans migrating through, or wintering in, Western Canada. In 1921 and 1922, a Geo. Laing of Indian Head (Saskatchewan) recorded several small flocks of Trumpeter swans on fall migration at Deep Lake and in the Qu'appelle Valley (Mitchell 1924). In 1924, Brooks noted that there were at least 5 wintering "colonies" (sic) and 18 birds in British Columbia. In December 1924, the Vaseaux Lake (British Columbia) flock of Trumpeter swans was purportedly decimated by unseasonably cold weather (Funke 1981).

The earliest twentieth century records of summering Trumpeter swans in Western Canada was provided from the recollections of swans in the Cypress Hills (Saskatchewan) in 1914 (Symons 1967), and Grande Prairie (Alberta) in 1918 (Mackay 1981). By 1938, Taverner suggested that the Canadian contingent of Trumpeter swans was restricted to a few small flocks and isolated breeding pairs in British Columbia and Alberta. Clarke (1944) reported that swans were occasionally found, in small lakes in the south-western reaches of the Yukon, and suggested that these might have been Trumpeter swans. However, it was not until 1949, when Soper recorded 64 adults and 14 cygnets in the Grande Pairie

area of Alberta, that a significant breeding population of Trumpeter swans was documented. Prior to 1950, there were several unconfirmed accounts of Trumpeter swans (in addition to Symons (1967) account), summering in the Cypress Hills of Saskatchewan. The first confirmed Saskatchewan record was established in 1953 (Bard 1953), and small numbers (less than 4 breeding pairs) have persisted in that area ever since (Nieman, pers. comm.). Further accounts of the recent history of these and other isolated breeding records for Trumpeter swans in Western Canada are given in Turner (1981), Turner and Mackay (unpubl) and Brechtel (1982).

The most recent status of Trumpeter swans in Western Canada has been summarized by McKelvey and his associates (pers. comm.). In 1985, a total of 60 broods (191) cygnets were produced from 147 breeding pairs in the Yukon, Northwest Territories, British Columbia, Alberta and Saskatchewan. Another 164 birds were observed as singles or in non-breeding flocks. The Canadian birds represent approximately 6% of the world population (in 1985), and are expanding their population base in Western Canada at a rate of 8-11% per annum under natural conditions.

3. Canadian Propagation and Release Programs

The first Canadian attempt to propagate Trumpeter swans in captivity was initiated at the Delta Waterfowl Research Center (Manitoba) in 1954, with 3 swans from the Grande

Prairie (Alberta) flock, and 9 from the Red Rock Lakes National Wildlife Refuge in the United States. Delta has maintained captive Trumpeter swans since that date and has made limited attempts to release hand-reared birds. While no swans have returned to the Delta Marsh and bred, several have migrated southwards in the fall, and been seen in Mnaitoba in the subsequent spring. Whether the Delta Marsh, with its high recreational activity, waterfowl hunting and concomitant lead shot loads, is the best habitat for a release program for the Trumpeter swan, remains to be clearly established (Batt unpubl. MS, pers. comm. 1987).

Following recommendations by Brechtel (1982), a pilot Trumpeter swan transplant project was initiated at Elk Island National Park (Alberta) in 1983. The purpose of this project was to evaluate techniques that would promote the establishment of a breeding population of Trumpeter swans with eggs from the Grande Prairie (Alberta) flock and adult guide birds from British Columbia, thereby establishing a migratory tradition that would result in Trumpeter swans wintering in British Columbia. This project was modified in 1984, and met with limited success (Shandruk 1986). However, an independant review of the Elk Island project by Burgess and Burgess (1986, unpubl. MS) has recommended that foster parents be selected from the LaCreek (North Dakota) flock, in an attempt to alleviate some of the problems encountered in the initial pilot program.

The Ministry of Natural Resources in Ontario has attempted to establish Trumpeter swans near Toronto since 1982, and successfully fledged some cygnets from foster Mute swan (C. olor) parents, and eggs from the Grande Prairie (Alberta) flock. From 1982-1986, 11 cygnets have fledged (from 44 eggs) (Lumsden 1986).

While these pilot projects have developed or improved techniques for the release of Trumpeter swans into new environments, it is important to note that none have succeeded in establishing self-perpetuating populations. Lumsden et al. (1986) have suggested that under optimal conditions that it will take 12 years, and 600 eggs, to reach a target of 15 wild breeding pairs. The most recent guidelines for Trumpeter swan restoration projects from the Canadian Wildlife Service (Turner and McKelvey 1983), restrict the number eggs that may be removed from the Grande Prairie flock to 25 per annum. Clearly, eggs from captive Trumpeter swans will be needed if these and other release programs are initiated in the coming years.

4. Current status of the Trumpeter Swan in Saskatchewan

The present status of the Trumpeter swan "population" in Saskatchewan, can best be described as precarious. On 21 June 1987, the provincial Trumpeter swan count was limited to a single pair, and 2 cygnets on Coulee Lake in the

Cypress Hills (R. Leslie, pers. comm. D. Dobson, pers. comm.), leaving the population at its lowest level since the 1950's when the presence of breeding swans in the area was first recorded. The current management plans for the Cypress Hills swans are limited to monitoring the population, protecting and improving the existing nesting lakes. Efforts are currently underway to stabilize water levels in nearby Adams Lake, thereby maintaining a suitable habitat base for a second breeding pair of Trumpeter swans in future years.

In recent years, there have been several reports of summering swans in other areas of Saskatchewan, as detailed below. However, to date, there have been no other confirmed breeding records for Trumpeter swans outside the Cypress Hills.

From 1973-1981, a breeding pair of swans (which fledged an average 1.9 cygnets per year), was recorded approximately 90 km north of North Battleford. While it was initially thought that these were Trumpeter swans, more careful examination of the dimensions of the eggs and various mensural characteristics of the adults, revealed that these birds were Tundra swans (Nieman et al. 1983).

In 1972, a pair of Trumpeter swans was reported at Tobin Lake by the proprietor of the Tobin Lake Resort. Subsequent capture of these molting swans on 28 August, revealed that

the birds were represented by one male and one female. On the basis on various physical measurements, it was determined that this was a pair of Tundra swans (Riome 1976).

Through contacts made with Saskatchewan Conservation Officers and Regional Biologists, we have been able to document several other summer records for swans in Saskatchewan during the summer of 1987, but no other confirmed breeding records. Whether the following records are of Trumpeter or Tundra swans, has not been determined at this time.

In the third week of June, 1987, Conservation Officer Cam Leuken (Sandy Bay), recorded 1 (one) swan on an island on Marchel Lake (55 23 N, 102 45 W), north of Pelican Narrows. This bird was viewed several times throughout the day from a helicopter, while picking-up buckets of water to combat a local forest fire. Subsequent visits to the location at the end of June, failed to locate the bird again, or any nesting structure. However, a heavy deposition of feces at the site suggested that the swan had been roosting on the island for a considerable period of time. Leuken also reported that a local hotel proprietor at Sandy Bay had records of up to 5 swans on Sokatisewin Lake (55 32 N, 102 24 W) over a period of several years. These birds apparently bred in the area until 4 years ago. In the first week of July, 1987, 3 adult swans were recorded

on Sokatisewin Lake and neighboring Wasawakish Lake, by Saskatchewan Parks, Recreation and Culture employees. Unfortuneately, these sightings have not afforded an opportunity to accurately determine the species of the swans in question.

Officer Leuken also reported that a Mr. Keith Staszko has seen summering swans (undetermined number) on Cul de Sac Lake (53 37 N, 101 47 W) and Murphy Lake (53 42 N, 101 47 W) in the Hudson Bay Region for the past several years, but these records have yet to be confirmed by an independent observer. In the spring of 1987, 5 Trumpeter swans staged in the Hudson's Bay area (R. Beaulieu, pers. comm), and one Trumpeter swan was observed in the 1985 Christmas Bird Count at Squaw Rapids (Houston 1986). It may be noteworthy that this area in north-eastern Saskatchewan lies within the former breeding range of the Trumpeter swan (the Musk Rat Country) as defined by Thompson at the beginning of the last century.

Conservation Officer Murdoch Carriere initiated an inquiry with Native Cree elders in the Cumberland House area in the summer of 1987 to determine if there was any recent or historical accounts of summering swans. To date, these inquiries have not revealed any summer records of swans in the Cumberland House area. Mr. Tim Trottier (Regional Biologist, La Ronge) made inquiries at Stony Rapids and Black Lake, where summering swans were recored by B. Nero in

the 1950's and 60's (as noted above), and by several of the 18 th. century explorers, but these inquiries have failed to turn-up any new records for those areas.

From the above, it is clear that swans are periodically viewed during the summer months in Northern Saskatchewan. It is curious that the only positive identifications to the species level (North Battleford and Tobin Lake) have both been identified as Tundra swans.

5. Summary and Recommendations

While the Trumpeter swan has been frequently reported as formerely widespread across the Canadian prairies from 1750-1850, we have found no empirical support for this hypothesis in the recent or historical literature. The evidence at hand suggests that swans, Tundra and Trumpeter, were spring and fall migrants through Saskatchewan. One, or both of these species may have bred in the North and North-eastern reaches of the province. The exploitation of swans for their feathers and meat by the early fur-traders in the Canadian West, appears to have been limited to the boreal forest ecoregions, but a more thorough examination of the Hudson's Bay Comapany Records would be required to adequately test this hypothesis.

At the present time the Canadian Trumpeter swan population is healthy and expanding. At the current rate of population growth, the objectives of the North American Waterfowl

Management plan should be met, or exceeded by the year 2000. Wintering habitat, rather than breeding habitat, would appear to be the limiting factor for Canadian Trumpeter swans.

Trumpeter swans are currently being experimentally released at two sites in Canada (Ontario and Alberta). These projects have made significant and important inroads into release technology, but it is important to note that the projects are still experimental and as yet unproven. To date, we do not have the technonolgy or techniques to establish new, migratory populations of Trumpeter swans, that will return to their release sites and breed in subsequent years. Thus, any new endeavor to release Trumpeter swans in Saskatchewan should be viewed as a research program, the success of which may not necessarily be realized at the outset of the program.

The Trumpeter swan population in Saskatchewan is at its lowest point in recorded history, hanging precariously on the reproductive output of a single mated pair. Sightings of summering swans in 1987, and anecdotal accounts of the production of cygnets in recent years, from the North-eastern reaches of Saskatchewan, hold some promise that there may be breeding pairs in elsewhere in Saskatchewan.

As mentioned in the introduction, the research presented in

this report was sponsored by the Saskatchewan Natural History Society and the World Wildlife Fund, to prepare a recovery or reintroduction plan for the Trumpeter swan in the province of Saskatchewan, and in particular at Last Mountain Lake Wildlife Management Unit.

Based on our research, we suggest that Last Mountain Lake lies outside the historical breeding range and habitat of the Trumpeter swan. As such, Lat Mountain Lake should not be considered as reintroduction site. Other factors such as significant water level fluctuations, high risk of nest site disturbance, intensive localized hunting pressure, outbreaks of avian botulism and blue-green algal poisoning, and the potential for lead shot ingestation, would also argue against Last Mountain Lake as a potential release site for Trumpeter swans.

Phase II in this research project will be largely up to the Executive of the Saskatchewan Natural History Society. We would ask that they review this manuscript and see if they concur with the evidence which suggests that the Trumpeter swan was not endemic to the prairie environment, and therefore should not be introduced into the grasslands ecoregion through an experimental release program.

Second, in order to fully document the history of the exploitation of the Trumpeter swan in Saskatchewan, it will be necessary to visit the Hudson's Bay Company archives in

Winnipeg. The notion of a widespread exploitation of the Trumpeter swan from 1750 onwards as reported in the literature, is based on relatively few data. A careful examination of the records will afford an opportunity to define the extent of the exploitation of swans, and may shed additional light on the historic range of the Trumpeter swan.

The third recommendations of this report is that an intensive, structured questionaire be designed and circulated to Conservation Officers and forest fire fighting crews (Forest Protection Workers and Aircrews) in the north, to document the localities where swans have been viewed in recent years. These questionnaires should be reviewed, and where warranted, backed-up with site specific surveys to verify the species and numbers of swans which are reported.

Finally, we would ask that the Executive consider whether other sites which are more consistent with the historic range and habitat of the species, be evaluated as potential release sites for Trumpeter swans in Saskatchewan.

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