

A BOTANICAL INVESTIGATION IN THE DRUMHELLER AREA, ALBERTA

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INTRODUCTION

Drumheller, located in the Red Deer River Valley sixty miles east-north-east of Calgary in the Mixed Grassland vegetation zone of southern Alberta, is probably best known for its hot, dry climate and its rugged badlands which have been created by intensive erosion. The region is curiously interesting because of biological and topographical features which contrast strikingly with the surrounding cultivated plain. The landscape is sharply dissected by numerous coulee systems that lead into the valleys of the Rosebud River, Kneehills Creek, and Red Deer River. The topography of these coulees creates a great diversity of vegetation types. For example, in this arid region, located approximately 75 miles east of the coniferous foothills forest and 110 miles south of the northern boreal forest, there is an abundance of white spruce (*Picea glauca*) on slopes which have more favorable moisture regimes.

Strangely enough, little biological work has been carried out in the area. Brief notes on the fauna of the region were made by Taveraer in 1919 and Soper in 1964. The avifauna of the area was more intensively studied by Salt (1938, 1939, 1950, 1958, 1966). Moss and Campbell (1947) and Moss (1955) made brief references to the flora of this area. Preliminary analyses of the flora of the Drumheller region were carried out by Bird (1962, 1971).

Therefore, in view of the paucity of information on the botany of the Drumheller area, the authors analyzed the vascular and non-vascular flora during 1971 in order to catalogue the plant species found there and to consider them as components of the various vegetation types.

HISTORY OF THE AREA

Prior to the white man's invasion, both Blackfoot and Cree Indian tribes occupied the area which, because of the abundance of deer and buffalo, was prime hunting ground. The steep cliffs of the coulees and river valleys afforded numerous excellent buffalo jumps. So abundant was saskatoon (*Amelanchier alnifolia*) that the Cree named the Rosebud River, "Misaskatoonina Sipisis" (Saskatoon Creek).

The first white man known to enter this area was Fidler who, in 1793, crossed the Red Deer River at its junction with the Rosebud River (Tyrell 1886). He remarked on the great quantities of coal present along the Rosebud River, a fact which prompted him to name it "Edge Coal Creek". These and other coal deposits were instrumental in the development of mining operations in the early 1900's although few still persist. In the spring of 1858, Captain John Palliser reached a part of the Rosebud River near its eastern end (Palliser 1863). Macoun followed shortly thereafter (Macoun 1882). Both Macoun and Palliser remarked on the arid appearance of the region. Tyrell, in 1886, was the first person to note the occurrence of white spruce. Commenting on the eastern portion of the Rosebud River, he writes, "the banks become very precipitous and the lateral coulees are filled with a thick growth of spruce." With the discovery of excellent quality dinosaur bones and skeletons, a number of "fossil-hunters" were attracted to the area (Sternberg 1917).

The first settlers in the area were ranchers who arrived in 1885. Martin (1963) in a discussion of the history of the Rosebud district writes, "The ranchers had their day, then the lowly plough took over turning the

vast prairie wrong-side-up". As a result of poor farming practices, the area became a dust bowl during the 1930's. Nowadays, the area is still extensively cultivated with the coulees and river valleys being the sole refugia for native or semi-native vegetation (Fig. 1). In the proximity of the study area, the only sizeable uncultivated areas remaining lie to the east along the escarpment of the Hand Hills and to the southeast along the north slopes of the Wintering Hills.

DESCRIPTION OF THE STUDY AREA

The area sampled centered around 51° 25' N Lat. and 112° 50' W Long., and included the lower reaches of the Rosebud River valley and Kneehills

Creek valley and also incorporated that portion of the Red Deer River valley lying between them (Fig. 2). More specifically, the Rosebud River and Kneehills Creek were sampled from the towns of Rosebud and Hesketh respectively, eastward to their junctions with the Red Deer River. The coulees leading from the three major streams were also sampled. Collecting sites are indicated in Figure 2. It should be noted that no collections were made outside the coulees and river valleys because all other areas were under intensive cultivation. It is difficult to determine precisely the number of square miles or acres covered by the study. Throughout this area, the coulees and valleys averaged about one-quarter of



Air Photo A21757, Dept. Energy, Mines and Resources

Fig. 1. Study area showing extensive cultivation. Red Deer River in upper right (NE) corner. Scale, $2\frac{2}{3}$ miles per inch.

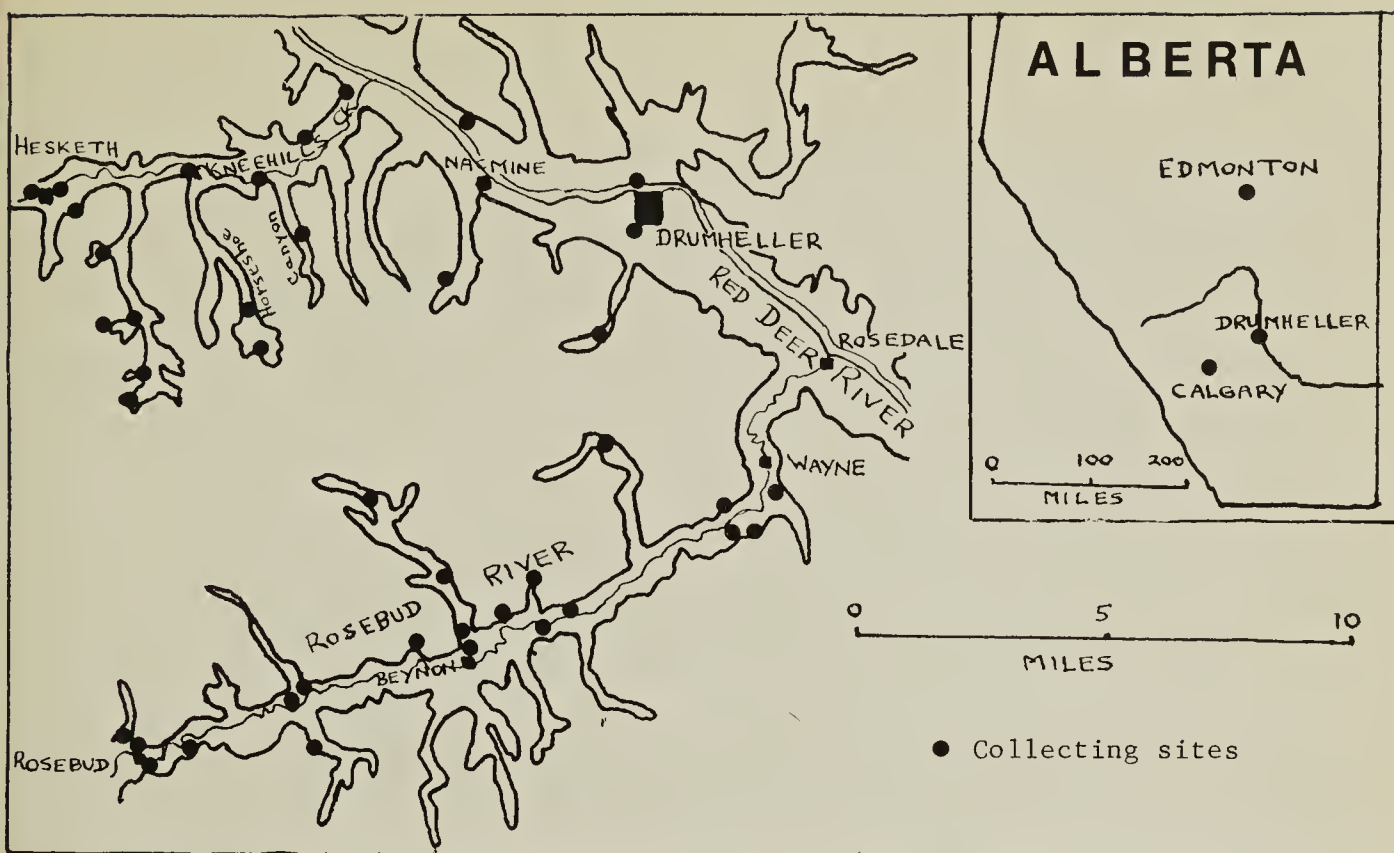


Fig. 2. Map of the study area showing collecting sites.

a mile in width and, end to end, their total length would be approximately 110 miles, giving an area of about 30 square miles.

PHYSIOGRAPHY AND GEOLOGY

The most striking aspect of the area is the river valleys and numerous coulees which cut deeply into the flat landscape. Located within the wider valleys, there is an abundance of bare conical buttes and other formations produced by erosion which give the area a badland appearance. The coulees generally run in a north-south direction and range from deep, narrow gorges (Fig. 3) to shallow, broad valleys with gently sloping sides (Fig. 4). Creeks within these coulees empty into either the Rosebud River or Kneehills Creek which in turn empty into the Red Deer River approximately ten miles apart. No permanent lakes exist in the area, although numerous temporary alkaline sloughs are scattered throughout the cultivated fields. A few springs are located within the coulees (Martin 1963, 1967).

Near Drumheller, the Red Deer River varies in width from 100 to

200 yards; its bed is usually sandy, and sand-bars and sandy islands occur at intervals. The depth of its valley ranges from 300 to 450 feet, and its width approximates one mile. Near their junctions with the Red Deer River, the Rosebud River and Kneehills Creek are similar, each having steep gorges up to 400 feet in depth. Here, both streams average 30 feet in width in mid-summer. Further upstream, the gorges give way to more gently rolling sides, the width of their valleys ranging from one-half to three-quarters of a mile.

The cliffs that flank the three major streams are composed of many coloured layers of varying thickness and composition which give these bare cliffs a highly variegated and picturesque appearance. These strata were termed "Banded Clays" by Dr. Hector of the Palliser expedition. The softness of these strata makes them very susceptible to erosion, a fact which is illustrated by the numerous steep coulees and badland features present (Fig. 5). Dawson (1884) writes, "the ramifications of the coulees, upon uniting, gradually detach small portions of the plateau,

and leave these an easy prey to the degrading influence of sub-aerial erosion, by the agency of which they have been sculptured into dome and pyramid, scarp and terrace and all the endless variety of form characteristic of the badlands of the West”.

Surface deposits underlying the cultivated plains of the Drumheller area are of two major types (Craig 1957). Clay lake deposits are the most widespread and range to fifty feet in thickness. These were laid down in Lake Drumheller (which occupied about 1100 square miles) during deglaciation which occurred approximately 15,000 years ago. The other type of surface deposit is a clayey till left as a ground moraine by glacial ice of northeastern origin.

In the coulees and valleys bedrock is exposed. These strata belong to the Edmonton Group which is Late Cretaceous in age. This group is non-marine and was formed by deposition

of sediments in deltaic, estuarine and flood plain environments. Fine-grained argillaceous sandstones, siltstones, sandy shales, shales with intermixed ironstone layers, calcareous sandstones, carbonaceous shales and coal are typical of the Edmonton Group (Irish 1967, 1970). Bentonite is an important component of the sediments and forms bentonitic clays, shales and sandstones.

SOILS

The study area is located entirely within the Dark Brown Soil Zone. This is a narrow zone situated between the Light Brown Soil characteristic of the short-grass prairie to the south and the Black Soil of the aspen parkland to the north. There is a shallow phase of the Black Soil zone in isolated areas on the western fringe of the study area. Soils of the area are non-saline, have a pH of about 7.5, contain very few rocks, and are generally clayey. However, they range from light to heavy clays to clay loams to silt loams (in a few areas) and from heavy to light loams along the river valleys (Wyatt *et al.* 1943).

CLIMATE

The climate of the Drumheller region is of the continental type, characterized by relatively long cold winters and short hot summers. It is a climate which exhibits wide fluctuations, daily and annually. The prevailing winds are westerly. This area lies on the northern edge of the main chinook belt of southern Alberta. The warm, dry chinook winds bring about significant warming of temperatures. Their duration may be a few hours or several days. During the winter they are able to melt and evaporate considerable amounts of snow, thereby decreasing spring runoff. Precipitation and temperature for the area have been recorded at Rosedale since 1914 and at Drumheller since 1924.

The area has a relatively cool mean annual temperature of 36° F with an average yearly maximum of 48° F



Fig. 3. Deep, narrow gorge as seen looking north toward Nacmine. The spruce trees at the top of the gorge on the left side average 30-40 feet.



Fig. 4. Shallow, broad valleys as seen 1 mile west of Nacmine. It is on this type of terrain that the greatest development of grassland occurs.



Fig. 5. Horseshoe Canyon, showing the badland terrain. The underlying exposed strata are of the Edmonton group.

and minimum of 24° F. July is the hottest month and January the coldest (Fig. 6). The average frost free period is 110 days. However, there is a wide variation with the longest frost free period being 147 days and the shortest 71 days. The earliest fall frost recorded was on August 19 and the latest on October 4. The latest known spring frost fell on June 18 (Met. Div., Dept. Trans. 1956).

The average annual precipitation is between 12 and 14 inches, decreasing from west to east. Over 70% of the precipitation falls as rain. Approximately half the precipitation occurs from June to August (Fig. 6). Cyclonic activity creates a considerable amount of the summer rainfall. Periodically, this region is subject to drought, for example, in the 1890's (Martin 1967) and in the 1930's (Wyatt *et al.* 1943). At the other extreme, severe spring flooding occurs frequently, for example, in 1899, 1904, 1920, 1931, and 1948 (Martin 1963). Floodwaters have been known to cover large areas in the Rosebud River valley. The combination of the great volume of spring meltwaters and the huge mobile ice-blocks has often broken up train trestles along both the Rosebud River and Kneehills Creek. By the end of summer, however, the volumes of water in these streams have been drastically reduced.

As a result of the irregular topography, a considerable microclimatic effect is evident in the coulees. The north- and east-facing slopes have more favourable moisture regimes. These slopes receive less solar radiation, and consequently have lower evaporation, and longer snow duration than the southerly-facing slopes. Moisture conditions are reflected in the vegetation patterns which will be discussed later.

MINOR FACTORS INFLUENCING VEGETATION

An assortment of minor factors influence the vegetation.

Although probably important in former times, fire presently plays a minor role in determining the extent of the major vegetation types within the coulees. It is possible that, following fires, the boundaries of the various vegetation types could be extended or diminished. However, it is difficult to ascertain the effects of fire at the present time because there have been no fires in the area for 66 years. The last major fire, which occurred in 1905, burned the entire ridge between the Rosebud River and Kneehills Creek from Rosebud to Drumheller (Martin 1963).

On the steeper slopes, a fairly important factor is the occurrence of slumping. This process affects very small areas as well as entire hillsides. Although most noticeable in grasslands and dry eroded areas, slumping has been observed in dense spruce forests. On the steepest slopes, the result may be the destruction of the vegetation.

Native mammals have little influence on the vegetation. Porcupines strip the bark of deciduous trees and shrubs, and there is evidence of browsing and grazing by deer, but the overall effect is minor.

The steep sides of the majority of the coulees have long prevented man from entering and utilizing them. Nevertheless, in the more accessible

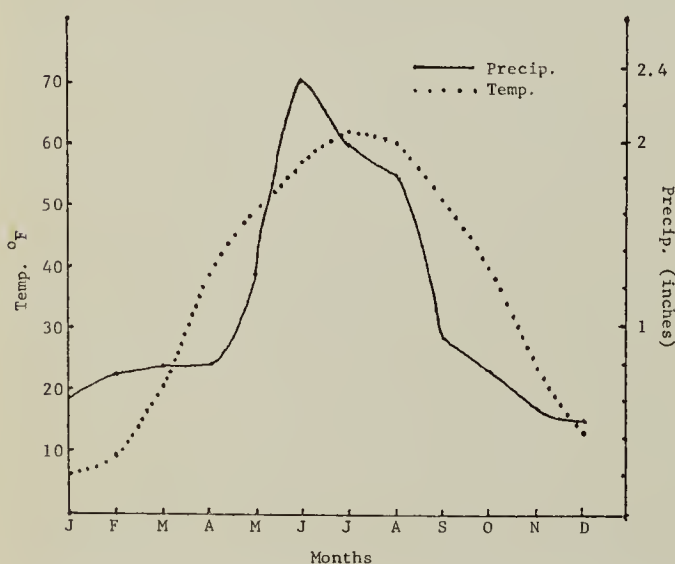


Fig. 6. Precipitation - temperature regimes for the Drumheller area (Climatology Div., Meteor. Branch, Dept. Transp. 1964 & 1965).

areas considerable damage has resulted. Where cattle have access, severe trampling and grazing occur. The grassland, while appearing like freshly mowed lawns, suffers to a lesser degree than do the forested areas. Complete eradication of the ground cover occurs in many of the wooded areas and weeds often invade these areas to the exclusion of the native flora.

VEGETATIONAL ANALYSIS

There are four major vegetation types occurring within the coulees and river valleys: sageland, grassland, thickets, and forested areas. The extent of the various vegetation types varies considerably within each coulee. Abrupt demarcations often exist even to the extreme of having dense stands of white spruce bordering bare sageland (Fig. 7). Where the topography is not so steep, gradual transitions of the vegetation are common (Fig. 8). This variety provides the area with exceptional beauty. The various vegetation types and their characteristic

species will be discussed. It should be noted, however, that because of the abrupt zonations occurring over short distances there is an overlap of species between each vegetation type. For example, prairie anemone (*Anemone patens* var. *wolfgangiana*) has been observed growing in the moss carpet of dense spruce woods.

Sageland

Because of the forces of erosion and climate, extensive bare areas have been produced which are favorable only for sageland. This sparse type of vegetation occurs on the steep south-facing slopes, the periphery of buttes, and the higher borders of the valley bottoms (Fig. 9). These areas are dominated by sagebrush (*Artemisia cana*) averaging 2-3 feet in height.

Characteristic associated species include *Atriplex nuttallii*, *Artemisia longifolia*, *Eurotia lanata*, *Gutierrezia sarothrae*, and *Aster canescens*. A common soil lichen of these bare areas is *Parmelia chlorochroa*.



Fig. 7. North end of Horseshoe Canyon, showing the abrupt transition between the dense white spruce stand and the bare area dominated by sagebrush. Here, the spruce are on an east-facing slope.



Fig. 8. The area four miles northwest of Beynon, illustrating the gradual transition from white spruce (upper right) to aspen (lower right) to shrubs (centre left) to mixed grasses (upper left). The spruce are on a northeast-facing slope.



Fig. 9. Sageflat at the junction of Kneehills Creek and Red Deer River. The bare sageland is dominated by *Artemisia cana* and *Atriplex nuttallii*. The riverine community in the background, dominated by *Populus* spp. is at a lower elevation than the sage.

Grassland

Grassland areas are generally located on south and west oriented slopes and on the level plain adjacent to the coulees where cultivation has not occurred. Three major conditions in grassland vegetation exist within the coulees in response to varying moisture regimes.

On the driest sites or on heavily grazed mesic areas, blue grama grass (*Bouteloua gracilis*) is dominant. Where grazing is not severe, *Stipa viridula* is the codominant. Heavily grazed areas are characterized by an increasing abundance of *Opuntia polyacantha*, *Artemisia frigida*, and *Artemisia ludoviciana* var. *gnaphalodes*. Other associated species include *Selaginella densa*, *Phlox hoodii*, *Sphaeralcea coccinea*, *Erigeron ochroleucus*, *Lomatium foeniculaceum*, *Lomatium macrocarpum*, *Lithospermum incisum*, and *Eriogonum flavum*.

In mesic areas, the most widespread grassland type of the region occurs. This is dominated by the spear grasses, *Stipa spartea* var. *curtiseta* and *Stipa viridula*. Associated grasses include *Stipa comata*, *Koeleria cristata*, *Agropyron trachycaulum* var. *unilaterale*, *Calamagrostis montanensis*, and *Poa interior*. Associated herbaceous species include *Allium textile*, *Comandra pallida*, *Anemone patens* var. *wolfgangiana*, *Potentilla concinna*, *Astragalus missouriensis*, *Oxytropis sericea* var. *spicata*, *Linum lewisii*, *Viola nuttallii*, *Gaura coccinea*, *Selaginella densa*, *Penstemon nitidus*, *Campanula rotundifolia*, *Achillea millefolium* subsp. *lanulosa*, *Erigeron caespitosus*, *Gaillardia aristata*, *Ratibida columnifera*, *Senecio canus*, and *Solidago missouriensis*.

In the wettest grassland areas, rough fescue (*Festuca scabrella*) becomes dominant. However, in relation to the size of the *Stipa* grassland, the area occupied by the fescue is small. Either a lack of suitable environmental conditions, overgrazing, or competition from aspen, shrubs, or *Stipa* has limited the distribution of fescue grassland to narrow bands or

patches. Species commonly found with fescue in the area include *Lilium philadelphicum* var. *andinum*, *Sisyrinchium montanum*, *Cerastium arvense*, *Anemone multifida*, *Geum triflorum*, *Hedysarum alpinum* var. *americanum*, *Hedysarum boreale* var. *cinerascens*, *Zizia aptera*, *Galium boreale*, *Achillea millefolium* subsp. *lanulosa*, and *Agoseris glauca*.

Non-vascular plants common to the grasslands, especially in the drier areas, include: the mosses *Hypnum cupressiforme*, *Tortella fragilis*, *Tortula ruralis* and the lichens *Ochrolechia upsaliensis*, *Dermatocarpon hepaticum* and *Cladonia* spp.

Shrub Vegetation

In depressions or gulleys in grasslands or on north oriented slopes where moisture is not sufficient enough to support tree growth, there is a considerable development of thickets. The dominant shrub species are *Rosa woodsii*, *Rosa acicularis*, *Symphoricarpos occidentalis*, *Amelanchier alnifolia*, *Elaeagnus commutata*, *Shepherdia argentea*, *Prunus virginiana* var. *melanocarpa*, *Prunus pennsylvanica*, *Ribes oxycanthoides*, and *Ribes americanum*. These species tend to segregate into two groupings: an *Elaeagnus* - *Symphoricarpos* - *Rosa* group, and a *Prunus* - *Amelanchier* - *Ribes* group. The taller shrubs grow in the wettest parts of the thickets. *Shepherdia argentea*, although abundant along the river valleys, is less common than the other shrubs.

Herbaceous species common to these thickets include *Lilium philadelphicum* var. *andinum*, *Smilacina stellata*, *Arenaria lateriflora*, *Heracleum lanatum*, *Vicia americana*, *Zizia aptera*, *Monarda fistulosa* var. *menthaefolia*, and *Galium boreale*.

Forested Areas

On north- and east-facing slopes, aspen (*Populus tremuloides*) and spruce (*Picea glauca*) woods predominate with varying degrees of admixture. Although it proved easy to delimit dense spruce stands floristically, difficulties arose in separating

mixed woods and pure aspen stands by species composition.

Pure aspen woods tended to have a greater abundance of shrubs (*Prunus* sp., *Rosa* sp., *Symphoricarpos* sp.) than mixed woods. In aspen woods, commonly associated species include *Prunus pensylvanica*, *P. virginiana* (tall shrubs); *Rosa acicularis*, *R. woodsii*, *Shepherdia canadensis*, *Symphoricarpos albus* var. *pauciflorus*, *S. occidentalis*, *Lonicera dioica* var. *glaucescens* (low shrubs); *Smilacina stellata*, *Arenaria lateriflora*, *Actaea rubra*, *Anemone canadensis*, *Thalictrum venulosum*, *Fragaria virginiana* var. *glauca*, *Fragaria vesca* var. *americana*, *Lathyrus ochroleucus*, *Viola adunca*, *Viola rugulosa*, *Heraclium lanatum*, *Galium boreale* (herbs).

A large area now covered by aspen woods gives evidence of various stages of spruce regeneration (seedlings, saplings and small spruce). From a number of core samples, it was found that the spruce trees have rapid growth rates. Many trees have an annual diameter increment of up to 0.6 inches and an annual height increase of up to one foot. The largest spruce trees examined were two feet in diameter at breast height and sixty feet tall; however, the average size was 9 inches in diameter and 25 feet in height. The oldest trees examined were sixty-five years of age. (Because of the fire history of the area no older trees were found.) The trees are healthy and during 1971 there was an abundant cone crop.

Mixed woods with a greater abundance of spruce show differences from those with few spruce. Those woods with few spruce are similar floristically to pure aspen woods. With increasing amounts of spruce, species such as *Elymus innovatus*, *Schizachne purpurascens*, *Disporum trachycarpum*, *Smilacina racemosa* var. *amplexicaulis*, *Anemone cylindrica*, *Galium triflorum*, and *Aralia nudicaulis* become dominant herbs.

In dense spruce woods, there is a notable absence of the shrub and herb strata (Fig. 10). The white spruce

form a continuous canopy underlain by a similarly continuous moss carpet dominated by *Plagiomnium cuspidatum*, *Abietinella abietina*, and *Hylocomium splendens*. Wintergreens (*Pyrola asarifolia* and *P. secunda*) are commonly found growing in the moss carpet.

Lichens common to the aforementioned wooded areas include: *Alectoria glabra*, *Evernia mesomorpha*, *Hypogymnia physodes*, *Physcia adscendens*, *Physcia aipolia*, and species of *Cladonia*, *Parmelia*, *Peltigera*, *Usnea* and *Xanthoria*.

Occasionally, aspen and white spruce are found along the major streams, but poplars (*Populus balsamifera* and *P. sargentii*) dominate. Immediately adjacent to the river, the characteristic species are *Juncus balticus* var. *montanus*, and species of *Eleocharis* and *Scirpus*. Separating this semi-aquatic community from the poplar woods is a dense belt of *Salix interior* var. *pedicellata*. In disturbed wooded areas, there is a notable increase of *Urtica gracilis*, *Solidago gigantea* var. *leiophylla*, and *Hackelia floribunda*.

INTRODUCED PLANTS

An interesting point in relation to the vascular flora of the Drumheller area concerns the large proportion of introduced plants. Some 53 taxons (about 1/6 of the flora) are introduced entities. This is probably due to the great amount of agriculture practised in the area. The commonest introduced weeds are *Agropyron cristatum*, *Bromus inermis*, *Hordeum jubatum*, *Chenopodium album*, *Thlaspi arvense*, *Melilotus alba*, *Melilotus officinalis*, *Medicago sativa*, *Lappula echinata*, *Hyoscyamus niger*, *Cirsium arvense*, *Lactuca serriola*, *Sonchus uliginosus*, *Taraxacum officinale* and *Tragopogon dubius*.

DISCUSSION OF THE FLORA

The diversity of the vegetation in the Drumheller region would lead one to expect the existence of representatives of plants from many of the vegetation zones of Alberta — the

Coniferous Forest, Aspen Parkland and Grassland areas, for instance. The vascular and non-vascular plants will be analyzed to determine which vegetation zones are best represented in the study area.

An analysis of the data in the papers of Coupland (1950), Clarke, Tisdale and Skoglund (1947) and Smoliak (1965) reveals that both Short-Grass and Mixed Grass vegetation prevail in the Drumheller area. The dominants, as well as most of the secondary species of almost all the faciations of the mixed grassland as described by Coupland, exist in similar situations in the study area. Notably absent, however, are *Carex eleocharis*, which is a principal species in all of Coupland's faciations, and *Muhlenbergia cuspidata*, a species common to the dry eroded slopes elsewhere in the Mixed Grassland zone. Similarly, with respect to the Short-Grass Prairie (Coupland's *Bouteloua-Stipa* faciation and that grassland analyzed by Clarke *et al.*), the same principal and secondary species occur in the Drumheller area, although *Stipa comata* is apparently not as abundant.

An examination of the papers by Moss (1944), Moss and Campbell (1947), Coupland and Brayshaw (1953), and Looman (1969), on the Fescue Grassland, shows that the fescue vegetation of the study area bears a strong resemblance to the so-called "northern prairie" as described by Moss (1932). This is evident by the presence of most of the dominant and secondary species. However, *Helictotrichon hookeri* and *Danthonia intermedia* were not present in the study area, although Moss and Campbell found both in the vicinity. Although dominant in the Fescue Grassland of southwestern Alberta, *Festuca idahoensis*, *Danthonia parryi*, *Carex eleocharis*, *Geranium viscosissimum* and *Potentilla fruticosa* are notably lacking in the fescue grassland of the Drumheller area.

Moss' data in his paper on the poplar association of Alberta (Moss, 1932) make it apparent that our forested areas are closely related to those aspen stands of the parkland of central Alberta. Of the 38 species that were present in more than 50% of Moss' stands, 29 species (76% of



Fig. 10. Dense spruce woods near Beynon. This type of vegetation, although fairly common in the area, has not been recognized or associated with the Drumheller region previously.

Moss' most abundant species) were common throughout the wooded areas of the Drumheller region. Four species which were widespread in Moss' study were found only occasionally in our area. Five species — *Corylus cornuta*, *Bromus ciliatus*, *Mertensia paniculata*, *Cornus canadensis* and *Maianthemum canadense* — were not collected in our study area, but are common to the parkland of central Alberta. Of the 118 species that Moss found in his aspen stands, the study area has 72 (about 60%).

Figure 11 shows a map of spruce distribution along the Red Deer River. Spruce forest is continuous down the Red Deer to the junction of Tail Creek. Downstream from here, however, the spruce woods become more and more restricted, existing only in small pockets on north-facing slopes in the coulees which adjoin the river. The Ghostpine, Kneehills and Rosebud valleys provide an area for the spruce to expand by increasing the area of

suitable habitat. The study area is at the southern end of spruce distribution along the Red Deer River and represents the furthest invasion of white spruce into the prairies of Alberta. It is our belief that the distribution of spruce is prevented from going further down the Red Deer by the drier climate and from going up the Rosebud River and Kneehills Creek because the valleys of these rivers become gently sloping and exposed.

Over 100 vascular plant species present in the study area are common to the cordilleran and boreal forests (MacKenzie-Grieve 1970, La Roi 1967, Moss 1953), but are also found in the aspen parkland. No vascular species found in the study area are restricted to coniferous forests in other parts of the province. A review of the literature dealing with the coniferous vegetation of Alberta makes it apparent that, although there are a large number of vascular species common to both the study area and the coniferous forest, the community structure differs considerably.

Correlated with this diversity in the vascular vegetation is the diversity found in the lichen species. Slightly more than one-half (54 species) of the lichen taxa are restricted to forested areas, with 28 of these restricted to spruce woods in the study area. Of those 28 species, 17 are confined to coniferous forests in Alberta. The species included here are *Alectoria glabra*, *Cetraria pinastri*, *Cladonia chlorophaea*, *Cladonia coniocraea*, *Cladonia deformis*, *Cladonia gracilis* var. *dilatata*, *Cladonia multiformis*, *Hypogymnia tubulosa*, *Letharia vulpina*, *Parmelia flaventior*, *Peltigera canina*, *Peltigera horizontalis*, *Peltigera leucophlebia*, *Peltigera spuria*, *Usnea cavernosa*, *Usnea hirta*, and *Usnea scabrata* subsp. *nylanderiana*. Likewise, certain moss species collected in spruce woods in the Drumheller area are restricted to coniferous forests in Alberta. These, however, are comparatively scarce in the study area, and include the species *Dicranum drummondii*, *Dicranum*

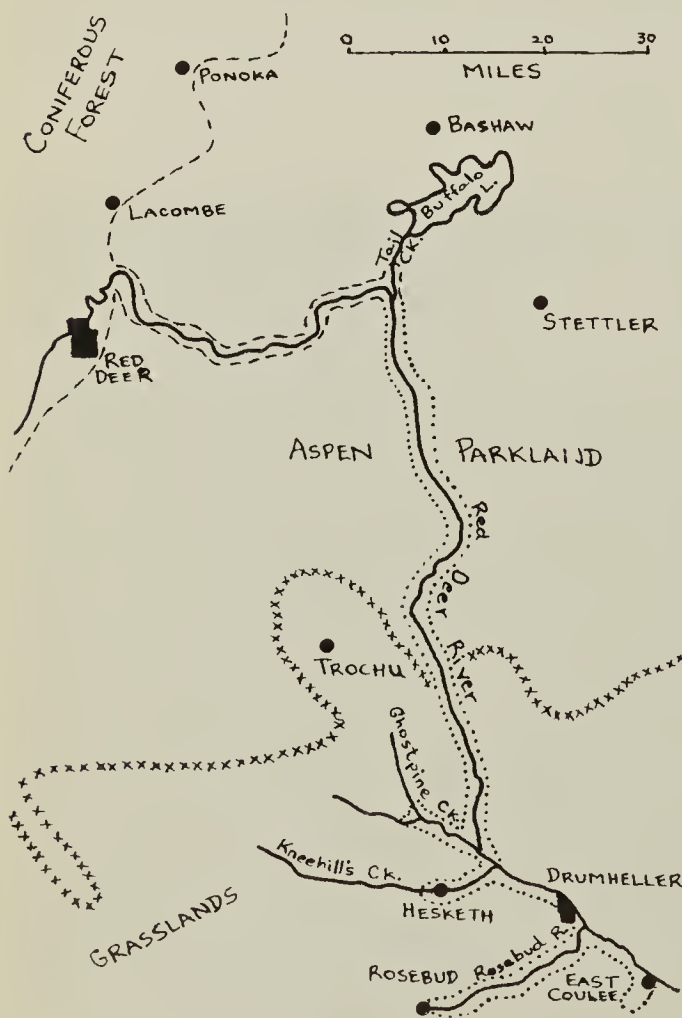


Fig. 11. Discontinuous distribution (dotted line) of coniferous forest along the Red Deer River.

polysetum, *Dicranum scoparium*, *Oncophorus wahlenbergii*, *Pleurozium schreberi*, *Pohlia nutans* and *Ptilium crista-castrensis*. In regard to the lichens, it is interesting to note that 78% (81 of the 104 species) are circumpolar, and that less than 1/5 are endemic to North America.

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ANNOTATED CATALOGUE OF THE NON-VASCULAR PLANTS

In the following list, 139 species of non-vascular plants are recorded, including 104 lichens, 33 mosses and 2 liverworts. The species are arranged alphabetically. Nomenclature for the lichens follows Hale and Culberson (1970) and for the mosses Crum, Steere and Anderson (1965). All voucher specimens have been deposited in the University of Calgary Herbarium. The numbers, unless prefixed, refer to collections made by the authors. A CDB prefix refers to those collected by Dr. C. D. Bird and a PM prefix refers to Pat MacNeill's collections.

In a few places, there is some taxonomic confusion. *Parmelia infumata*

was treated separately, although it is closely related to *Parmelia elegantula*. Because taxonomic difficulties between *Lecanora hageni* and *L. pini-perda* have occurred in the past, it is, therefore, not known whether *L. hageni* (PM 640) genuinely occurs here.

Lichens

- Acarospora arenacea* Magn. Rare, on sandstone outcrop. 884.
Acarospora strigata (Nyl.) Arn. Occasional, on rock. 772, 773.
Acarospora veronensis Mass. Rare, on rock. PM 672.
Agrestia cyphellata Thoms. Occasional, on dry, exposed soil. 752, 774.
Alectoria chalybeiformis (L.) S. Gray. Rare, on rock. PM 825.
Alectoria glabra Mot. Common, mainly on spruce twigs, also on rotting stumps, 793, 797, 870, 880.
Buellia alboatra (Hoffm.) Branth & Rostr. Scarce, on sandstone outcrop. 888.
Buellia triphagmioides Anzi. Scarce, on dead spruce branch. 895.
Caloplaca cerina (Ehrh.) Th. Fr. Occasional, on aspen bark. 890.
Caloplaca flavovirescens (Wulf.) Dalla Torre & Sarnth. Occasional, on sandstone outcrops. 885, 891.
Caloplaca holocarpa (Hoffm.) Wade. Common on aspen bark. 734, 746, 890, 897.
Caloplaca jungermanniae (Vahl.) Th. Fr. Occasional, on soil in dry grassland. 697.
Caloplaca stillicidiorum (Vahl.) Lynge. Rare, on vegetabilia in dry area. PM 648.
Candelaria concolor (Dicks.) B. Stein. Common, mainly on spruce twigs, also on aspen bark and lignum. 731, 795, 855, 873, 894.
Candelariella aurella (Hoffm.) Zahlbr. Common, on sandstone outcrops and soil in dry grassland. 697, 885, 888, 891.
Candelariella vitellina (Ehrh.) Mull. Arg. Occasional, on lignum. 895, 898.

- Catillaria glauconigrans* (Tuck.) Hasse. Occasional, on aspen bark. 734.
- Cetraria pinastri* (Scop.) S. Gray. Fairly common, on rotting logs and spruce bark. 849, 850.
- Cladonia arbuscula* subsp. *beringiana* (Ahti). Rare, on exposed, dry soil. PM 653.
- Cladonia cariosa* (Ach.) Spreng. Occasional, on exposed dry soil. PM 644, PM 654.
- Cladonia chlorophaea* (Florke) Spreng. sens. lat. Occasional, on soil in spruce woods. 837, 919.
- Cladonia coniocraea* (Florke) Spreng. Common, on rotting logs and soil in spruce woods. 714, 726, 727, 796, 829.
- Cladonia deformis* (L.) Hoffm. Rare on soil in spruce woods. 913.
- Cladonia fimbriata* (L.) Fr. Common, on rotting logs and on soil in spruce woods. 706, 727, 784, 825, 828.
- Cladonia gracilis* var. *dilatata* (Hoffm.) Schaer. Occasional, on soil, once on rotting log, in spruce woods. 805, 859, 912.
- Cladonia mitis* Sandst. Common, on soil in dry grasslands and in spruce woods. 753, 754, 756, 769, 847, 851, 918.
- Cladonia multiformis* Merr. Occasional, on soil in spruce woods. 848, 858.
- Cladonia pityrea* (Florke) Fr. Rare, on exposed dry soil. One of only two specimens collected in Alberta, and placed in the University of Calgary Herbarium. CDB 12734.
- Cladonia pocillum* (Ach.) O. Rich. Common, on soil in dry grassland. 696, 767, 768.
- Cladonia pyxidata* (L.) Hoffm. Common, on soil in grassland. 701, 703, 872.
- Cladonia robbinsii* Evans. Occasional, on exposed, dry soil. 766.
- Cladonia uncialis* (L.) Wigg. Rare, on exposed, dry soil. CDB 12737.
- Collema tenax* (Sw.) Ach. em Degel. Occasional, on soil in spruce woods. 836.
- Cornicularia aculeata* (Schreb.) Ach. Occasional, on exposed, dry soil. 764, 765.
- Dermatocarpon hepaticum* (Ach.) Th. Fr. Fairly common, on soil in dry grassland. 694, 695, 766.
- Dimelaena oreina* (Ach.) Norm. Rare, on rock. PM 826.
- Diploschistes canadensis* Ras. Occasional, on exposed, dry soil. PM 638, PM 788, CDB 12730.
- Diploschistes scruposus* (Schreb.) Norm. Rare, on soil in spruce woods. 907.
- Evernia mesomorpha* Nyl. Very common, on soil, rotting logs, and spruce bark, in spruce woods. 728, 732, 739, 740, 741, 852, 853, 854, 874.
- Fulgensia bracteata* (Hoffm.) Ras. Occasional, on soil in grassland. 887.
- Fulgensia fulgens* (Sw.) Elenk. Occasional, on soil in dry grassland. 694, 695.
- Hypogymnia physodes* (L.) W. Wats. Fairly common, on rotting logs and spruce twigs in spruce woods. 785, 849, 876, 914.
- Hypogymnia tubulosa* (Schaer.) Hav. Rare, on twig. PM 667.
- Lecanora caesiocinerea* Nyl. Rare, on rock. 773.
- Lecanora chrysoleuca* (Sm.) Ach. Occasional, on rock. 900.
- Lecanora cinerea* (L.) Somm. Rare, on sandstone outcrop. 905.
- Lecanora hageni* (Ach.) Ach. Uncertain status, on lignum. This species has been confused with *Lecanora piniperda* in the past. PM 640.
- Lecanora melanophthalma* (Ran.) Ran. Occasional, on rock and sandstone. 776, 902.
- Lecanora muralis* (Schreb.) Rabenh. Occasional, on sandstone outcrop. 886.
- Lecanora piniperda* Korb. Uncertain status, on lignum in spruce woods. See *L. hageni*. 894, 896.
- Lecanora rugosella* Zahlbr. Rare, on lignum. PM 664.
- Lecanora rupicola* (L.) Zahlbr. Rare, on sandstone outcrop. 901.
- Lecanora variolascens* Nyl. (now *L. impudens*). Rare, on spruce bark. 868.
- Lecidea decipiens* (Ehrh.) Ach. Scarce, on exposed dry soil. PM 633, CDB 25416.

- Lecidea glomerulosa* (DC. in Lam. & DC.) Steud. Common, on rotting logs, spruce bark, and aspen bark. 806, 840, 869, 897, 898.
- Lecidea lithophila* (Ach.) Ach. Rare, on rock. 783.
- Lecidea stigmatea* Ach. Occasional, on rock and sandstone. 778, 779, 906.
- Lecidea symmicta* (Ach.) Ach. Rare, on lignum in spruce woods. 894, 896.
- Lecidea turgidula* Fr. Rare, on lignum. This is the only specimen of this species in the University of Calgary Herbarium. CDB 25417.
- Lepraria membranacea* (Dicks.) Vain. Fairly common, on spruce twigs, soil, and rotting logs in spruce woods. 709, 796, 798.
- Letharia vulpina* (L.) Hue. Rare, on spruce bark. 860.
- Ochrolechia upsaliensis* (L.) Mass. Common, on exposed, dry soil. 763, 764, 775, 781.
- Parmelia chlorochroa* Tuck. Very common, on exposed, dry soil. 704, 748, 764, 770, 771, 780, 781, 782.
- Parmelia exasperatula* Nyl. Common, on saskatoon twigs, rotting logs, and spruce bark. 733, 807, 808, 873.
- Parmelia flaventior* Stirt. Common, on rotting logs in spruce woods. 811, 812, 813, 823.
- Parmelia infumata* Nyl. Rare, on sandstone outcrop. 904.
- Parmelia mexicana* Gyeln. Occasional, on rock. 757.
- Parmelia subdecepiens* Vain. Rare, on sandstone outcrop. One of four specimens in the University of Calgary Herbarium. 899.
- Parmelia subolivacea* Nyl. Fairly common, on spruce twigs, spruce bark and *Betula occidentalis* bark. 794, 795, 839, 877, 898.
- Parmelia substygia* Ras. Rare, on sandstone outcrop. 903.
- Parmelia sulcata* Tayl. Very common, on rotting logs and spruce bark in spruce woods, also on aspen bark. 735, 737, 738, 740-742, 788, 805, 812, 815-817, 820, 849.
- Parmelia taractica* Kremp. Occasional, on rock. 758, 759.
- Peltigera canina* (L.) Willd. Fairly common, on soil and rotting logs in spruce woods. 726, 800, 857.
- Peltigera horizontalis* (Huds.) Baumg. Occasional, on soil in spruce woods. 826.
- Peltigera lepidophora* (Nyl.) Vain. Rare, on exposed, dry soil in grassland. CDB 25418.
- Peltigera leucophlebia* (Nyl.) Gyeln. Rare, on soil in spruce woods. 911.
- Peltigera polydactyla* (Neck.) Hoffm. Fairly common, on soil and rotting logs in spruce woods and mixed woods. 711, 726, 743.
- Peltigera spuria* (Ach.) DC. Rare, on soil on north-facing slope. CDB 25420.
- Pertusaria finkii* Zahlbr. Scarce, on lignum. PM 640, PM 666.
- Physcia adscendens* (Th. Fr.) Oliv. Common, on aspen twigs, also on aspen log and saskatoon twigs. 734, 745, 786, 787, 822, 897.
- Physcia aipolia* (Ehrh.) Hampe. Common, on aspen bark and spruce, also on rotting log. 746, 789, 806, 838, 865.
- Physcia caesia* (Hoffm.) Hampe. Rare, on sandstone outcrop. 906.
- Physcia orbicularis* (Neck.) Poetsch. Rare, on spruce bark. 865.
- Physcia stellaris* (L.) Nyl. Scarce, on lignum. PM 666, CDB 25427.
- Physconia grisea* (Lam.) Poelt. Occasional, on rotting logs and spruce bark in spruce woods. 823, 864.
- Physconia muscigena* (Ach.) Poelt. Fairly common, on exposed, dry soil and soil in spruce woods. 761, 844.
- Ramalina fastigiata* (Pers.) Ach. Occasional, on spruce twigs, spruce bark and aspen bark. 866, 875, 892.
- Ramalina pollinaria* (Westr.) Ach. Fairly common, on spruce twigs and spruce stump. 867, 879, 893, 908.
- Rhizocarpon bolanderi* (Tuck) Herre. Rare, on rock. (Thomson, 1967).
- Rhizocarpon disporum* (Naeg.) Mull. Arg. Occasional, on rock. 759, 762.
- Rinodina roscida* (Somm.) Arn. Rare, on vegetabilia. PM 648.
- Rinodina turfacea* (Wahlenb.) Korb. Rare, on dry soil in grassland. 697.
- Staurothele fuscocuprea* (Nyl.) Zsch. Rare, on sandstone outcrop. 889.

- Toninia caeruleonigricans* (Lightf.) Th. Fr. Rare, on exposed, dry soil. PM 792.
- Usnea cavernosa* Tuck. Occasional, on bark and twigs of white spruce. 861, 909.
- Usnea compacta* Mot. Rare, on aspen bark in mixed woods. 736.
- Usnea glabrescens* (Nyl. ex Vain.) Vain. Rare, on rotting log in spruce woods. 818, 819.
- Usnea hirta* (L.) Wigg. Occasional, on spruce twigs and spruce bark in spruce woods. 843, 846, 862.
- Usnea scabrata* subsp. *nylanderiana* Mot. Fairly common, on bark and twigs of white spruce. 744, 863, 881, 883, 910.
- Usnea subfloridana* Stirt. Occasional, on bark and twigs of white spruce. 845, 878.
- Usnea substerilis* Mot. Very common, on bark and twigs of white spruce and on rotting logs in spruce woods. 732, 735, 799, 809, 821, 882, 898.
- Xanthoria elegans* (Link) Th. Fr. Common, on rock and sandstone outcrops. 698, 702, 886.
- Xanthoria fallax* (Hepp) Arn. Common on aspen bark in aspen woods, also found on rotting log in spruce woods. 710, 734, 810, 814.
- Xanthoria polycarpa* (Ehrh.) Oliv. Common, on twigs of white spruce. 789, 790, 791, 792, 795.
- Liverworts**
- Lophocolea heterophylla* (Schrad.) Dum. Rare, known from only one collection. CDB 4011.
- Murchantia polymorpha* L. Occasional, in wet spruce woods. 824, 827, 830, 834, 835.
- Mosses**
- Abietinella abietina* (Hedw.) Fleish. Very common, in spruce woods. 711, 712, 715, 717, 719-723, 841, 856.
- Amblystegium juratzkanum* Schimp. Found in riverine forest. PM 630.
- Amblystegium serpens* (Hedw.) B. S. G. Occasional, on soil and rotting logs in spruce woods. 726, 834.
- Brachythecium salebrosum* (Web & Mohr) B. S. G. Common, on soil and rotting logs in aspen and spruce woods. 705, 707, 713, 714, 728, 802-804.
- Bryoerythrophyllum recurvirostre* (Hedw.) Chen. Scarce, on soil in spruce woods. 712, 715.
- Bryum creberrimum* Tayl. Reported for the region by Bird (1971) but no specimens seen.
- Campylium chrysophyllum* (Brid.) J. Lange. Rare, in spruce woods. CDB 3996.
- Ceratodon purpureus* Brid. Fairly common, on soil in woods and grassland. 711, 730, 750, 802.
- Dicranum drummondii* C. Mull. Rare, on soil in spruce woods. 917.
- Dicranum polysetum* Sw. Scarce, but abundant where found, in spruce woods on soil. 915.
- Dicranum scoparium* Hedw. Rare, on soil in spruce woods. 842.
- Drepanocladus uncinatus* (Hedw.) Warnst. Occasional, on soil in spruce woods. 711, 712, 719, 841.
- Encalypta rhaptocarpa* var. *subspathulata* (C. Mull. & Kindb. ex Mac. & Kindb.) CDB 25421.
- Eurhynchium pulchellum* (Hedw.) Jenn. Fairly common, on rotting logs and soil in spruce and aspen woods. 708, 803, 804, 825, 827, 829, 830, 834, 837.
- Fontinalis duriaei* Schimp. In the Red Deer River. PM 627, CDB 25407.
- Funaria hygrometrica* Hedw. Rare, on wet soil in spruce woods. 831.
- Grimmia apocarpa* Hedw. Rare, on limestone boulder. CDB 3997.
- Hygrohypnum luridum* (Hedw.) Jenn. In the Red Deer River. CDB 25408.
- Hylocomium splendens* (Hedw.) B. S. G. Common, on soil in spruce woods. 718, 724, 725, 829, 841.
- Hypnum cupressiforme* Hedw. Common, on soil in dry grassland. 693, 699-701, 748, 749, 751, 767.
- Oncophorus wahlenbergii* Brid. Scarce, on rotting wood in forested areas. CDB 4005.
- Orthotrichum speciosum* var. *elegans* Nees ex Sturm. Rare, on dead willow. CDB 4010.
- Plagiomnium cuspidatum* (Hedw.) Kopponen. Very common, on soil and rotting logs in wooded areas. 705-707, 711, 715, 729, 804, 824-830, 832-834.

Pleurozium schreberi (Brid.) Mitt.
Rare, on rotting logs in spruce
woods. CDB 4007.

Pohlia nutans (Hedw.) Lindb. Rare,
spruce woods. CDB 4006.

Polytrichum juniperinum Hedw.
Scarce, but abundant where found,
on soil in spruce woods. 916.

Pseudoleskeella tectorum (Funck ex
Brid.) Kindb. ex Broth. Rare, on
rotting logs in spruce woods. 801.

Ptilium crista-castrensis (Hedw.) De
Not. Rare, on rotting logs in spruce
woods. CDB 4007.

Pylaisiella polyantha (Hedw.) Grout.
Occasional, on rotting logs in spruce
woods. 716, 726, 727.

Rhytidium rugosum (Hedw.) Kindb.
Occasional, on soil in dry grassland.
701, 747, 755.

Tortella fragilis (Hook. ex Drumm.)
Limpr. Occasional, on soil in dry
grassland. 692, 701.

Tortula mucronifolia Schwaegr. Occa-
sional, on soil and rotting logs in
spruce woods. 802, 803, 824, 825.

Tortula ruralis (Hedw.) Gaertn.,
Meyer & Scherb. Common, on soil
in dry grasslands and occasionally
on soil in spruce woods. 692, 749,
871.

ANNOTATED CATALOGUE OF THE VASCULAR PLANTS

In this catalogue, the various families of vascular plants are listed in the botanical order followed by Moss (1959). The genera and species, however, are listed in alphabetical order. The numbers following the listings refer to the authors' collection numbers or where noted, to the few collections made by others. These other collections have been included to make the list as complete as possible. Our specimens are deposited in the University of Calgary Herbarium. Nomenclature for the vascular plants is according to Moss (1959), unless otherwise noted.

The catalogue contains species from 53 families and includes some 315 specific or subspecific entities. The bulk of the species is contained within a comparatively small number of

families, the three largest as follows: Compositae (59), Gramineae (42), Leguminosae (29).

POLYPODIACEAE

Cystopteris fragilis (L.) Bernh. (*Filix fragilis* (L.) Gilib.) Fairly common in forested areas and wet thickets. 73, 141, 345, 504.

Woodsia oregana D. C. Eat. Rare, known from only one collection. Moss 7075 (University of Alberta Herbarium, Edmonton).

EQUISETACEAE

Equisetum arvense L. Occasional along creeks in spruce woods. 609, 612.

Equisetum laevigatum A. Br. Fairly common along railways and moist disturbed areas. 552.

Equisetum variegatum Schleich. Reported for the region by Bird (1971) but no specimens seen.

SELAGINELLACEAE

Selaginella densa Rydb. Very common and abundant, a characteristic species of the dry grassland. 375.

PINACEAE

Juniperus communis L. var. *depressa* Pursh. Fairly common in moist depressions in grassland and adjacent forested areas. 75, 567.

Juniperus horizontalis Moench. Common on dry exposed hillsides. 591.

Picea glauca (Moench) Voss. Very common and abundant on north-oriented slopes and occasionally in valley bottoms. 277.

TYPHACEAE

Typha latifolia L. Abundant where found, but restricted somewhat due to the absence of ponds within the coulee systems. 679.

GRAMINEAE

Agropyron cristatum (L.) Gaertn. Common in disturbed grassland areas. 200, 228, 296, 318, 555.

Agropyron dasystachyum (Hook.) Scribn. Fairly common on dry open hillsides. 688.

Agropyron repens (L.) Beauv. Fairly common on damp disturbed areas and along roads and creeks. 234, 384, 458. 1.

- Agropyron smithii* Rydb. var. *molle* (Scribn. & Smith) Jones. 689.
- Agropyron spicatum* (Pursh) Scribn. & Smith var. *inermis*. Occasional in dry grasslands. 422.
- Agropyron trachycaulum* (Link) Malte var. *unilaterale*. Common in grasslands and open woods. 421, 455.
- Agropyron trachycaulum* (Link) Malte (*A. pauciflorum* (Schwein.) Hitchc.) Occasional in moist disturbed areas and grassland. 377, 457. 1, 544.
- Avena fatua* L. Scarce, as an introduced weed. 523.
- Beckmannia syzigachne* (Steud.) Fern. Fairly common in wet places. 615.
- Bouteloua gracilis* (HBK.) Lag. Common on dry south-oriented slopes. 371.
- Bromus inermis* Leyss. Very common and abundant, especially in disturbed habitats. Introduced. 235, 524, 551, 672.
- Calamagrostis canadensis* (Michx.) Beauv. Common in wet areas, especially along creeks. 616.
- Calamagrostis inexpansa* A. Gray. Scarce, in damp places. 675.
- Calamagrostis montanensis* Scribn. Fairly common in dry grassland. 300, 460.
- Calamovilfa longifolia* (Hook.) Scribn. Scarce, on dry open slopes. 670.
- Deschampsia caespitosa* (L.) Beauv. Occasional in wet meadows and along creeks. 327.
- Elymus canadensis* L. Common and often abundant along creeks. 684.
- Elymus innovatus* Beal. Occasional but sometimes abundant in spruce woods. 225, 671.
- Elymus macounii* Vasey (= *Agropyron trachycaulum* × *Hordeum jubatum*). 549.
- Festuca scabrella* Torr. Fairly common, the dominant species of moist grasslands. 423, 578.
- Glyceria grandis* S. Wats. Occasional in shallow water. 569.
- Hordeum jubatum* L. Common and often abundant as an introduced roadside weed. 376, 545, 673.
- Hordeum jubatum* L. var. *caespitosum* (Scribn.) Hitchc. Scarce in disturbed areas. 404.
- Hordeum vulgare* L. Rare, as an escape from cultivation. 508.
- Koeleria cristata* (L.) Pers. (*K. gracilis* Pers.) Frequent in dry grassland. 269, 398, 419.
- Muhlenbergia richardsonis* (Trin.) Rydb. Fairly common in moist grasslands. 456, 522.
- Phleum pratense* L. Occasional beside creeks, introduced. 683.
- Poa canbyi* (Scribn.) Piper. 226.
- Poa compressa* L. 85.
- Poa cusickii* Vasey. 233, 266.
- Poa interior* Rydb. Common in dry grassland. 227, 399, 424.
- Poa palustris* L. Fairly common in aspen woods and thickets. 323, 550.
- Poa secunda* Presl (*P. sandbergii* Vasey). 380.
- Puccinellia nuttalliana* (Schult.) Hitchc. (*P. airoides* (Nutt.) Wats. & Coult.) Occasional in moist grassland areas. 457.
- Schizachne purpurascens* (Torr.) Swallen. Occasional in woodlands and thickets. 686.
- Secale cereale* L. Rare, as an escape from cultivation. 87, 230.
- Setaria viridis* (L.) Beauv. Rare, at the edge of a cultivated field. 664.
- Spartina gracilis* Trin. Common along creeks. 295.
- Stipa columbiana* Macoun var. *nelsonii* (Scribn.) Hitchc. Rare, in moist grassland. 540.
- Stipa comata* Trin. & Rupr. Fairly common on dry grassland. 425.
- Stipa spartea* Trin. var. *curtiseta* Hitchc. Very common, a principal grassland species. 420, 453.
- Stipa viridula* Trin. Very common, also a principal grassland species. 288, 417, 454, 492.

CYPERACEAE

- Carex aquatilis* Wahlenb. Common along rivers and creeks. 99.
- Carex atherodes* Spreng. Scarce, but abundant where found, along creeks. 921.
- Carex filifolia* Nutt. Occasional on dry exposed grassy slopes. 86.
- Carex* cfr. *lasiocarpa* Ehrh. var. *lati-*

folia (Bock) Gleason (*C. lanuginosa* Michx.) 94.

Carex sprengelii Dewey. Occasional in aspen woods. 124, 324.

Eleocharis acicularis (L.) R. & S. Rare, at the bottom of dry ponds. 561.

Eleocharis palustris (L.) R. & S. Occasional along rivers. 98.

Scirpus acutus Muhl. Occasional along rivers, creeks and ponds. 382.

Scirpus americanus Pers. Occasional along rivers, creeks and ponds. 97.

Scirpus microcarpus Presl. Occasional in wet places. 444, 613.

Scirpus validus Vahl. Common along rivers, creeks and ponds. 83, 100, 381, 445, 487.

LEMNACEAE

Lemna minor L. Rare, on stagnant pool. 203.

JUNCACEAE

Juncus balticus Willd. var. *montanus* Engelm. Very common and abundant along creeks and rivers and in other wet places. 95, 102, 491, 674.

Juncus bufonius L. Rare, in old creek bed. 590.

LILIACEAE

Allium textile Nels. & Macbr. Very common in dry grasslands. 42, 65.

Asparagus officinalis L. (Bailey, 1964). Rare, in poplar woods. Introduced. 389, 418.

Disporum trachycarpum (S. Wats.) B. & H. Common in aspen woods. 28, 56, 140.

Lilium philadelphicum L. var. *andinum* (Nutt.) Ker. Fairly common in moist grasslands and thickets. 282, 365.

Smilacina racemosa (L.) Desf. var. *amplexicaulis* (Nutt.) S. Wats. Frequent in aspen woods. 171.

Smilacina stellata (L.) Desf. Very common in aspen woods and thickets. 43, 66, 122, 136, 183.

IRIDACEAE

Sisyrinchium montanum Greene. Fairly common in moist grasslands. 127, 128, 207, 209.

SALICACEAE

Populus balsamifera L. Very common along the major streams. 262, 565.

Populus sargentii Dode (*P. deltoides* Marsh var. *occidentalis* Rydb.) Common along major streams. 261, 576.

Populus tremuloides Michx. Very common and abundant throughout the coulees and river valleys. 620.

T. C. Brayshaw (1965) provides further insight into the hybrid poplars which frequently occur in this region. Using his index, we have found a 4/8 cross between *P. balsamifera* and *P. trichocarpa* (no. 116). Brayshaw found trispecific hybrids of *P. balsamifera*, *P. sargentii* and *P. tremuloides* as well as hybrids between *P. sargentii* and *P. tremuloides*.

Salix bebbiana Sarg. Common along creeks in coulees and river valleys. 23, 25, 37, 117.

Salix interior Rowlee var. *pedicellata* (Anderss.) Ball. Common and abundant along river valleys. 118, 586.

Salix lutea Nutt. Fairly common along streams. 63, 96, 587.

BETULACEAE

Betula occidentalis Hook. (*B. fontinalis* Sarg.) Common in wooded areas especially near streams. 39.

URTICACEAE

Urtica gracilis Ait. Fairly common in disturbed habitat in forested areas, especially aspen woods. 414.

SANTALACEAE

Comandra pallida A. DC. Fairly common in grasslands. 78, 115, 343.

POLYGONACEAE

Eriogonum flavum Nutt. Common on dry exposed sites. 129, 177, 272, 392.

Polygonum coccineum Muhl. Common and abundant in sloughs on land adjacent coulees. 490.

Polygonum convolvulus L. Rare in wet disturbed area along creek, introduced weed. 600.

Polygonum lapathifolium L. Scarce, along creeks. 588.

Rheum rhaponticum L. (Bailey, 1964). Rare, at edge of railway, escape from cultivation. 257.

Rumex mexicanus Meisn. Frequent in wet places. 268, 359, 446, 634.

Rumex occidentalis S. Wats. var. *fenestratus* (Greene) LePage. Occasional in wet places. 685.

CHENOPODIACEAE

Atriplex hortensis L. Occasional as an introduced weed of waste places. 577, 629, 676.

Atriplex nuttallii S. Wats. Common in sageland. 273, 391, 515.

Axyris amaranthoides L. Rare, in overgrazed spruce forest, introduced. 564.

Chenopodium album L. Fairly common as an introduced weed of disturbed areas. 427, 475, 480, 506.

Chenopodium capitatum (L.) Aschers. Rare, in spruce woods. 656.

Chenopodium cfr. *fremontii* S. Wats. 563.

Chenopodium hybridum L. var. *gigantospermum* (Aellen) Rouleau. Scarce, in moist areas. 654, 680.

Eurotia lanata (Pursh) Moq. Common in sageland. 199, 213, 461.

Salsola kali L. var. *tenuifolia* Tausch. Occasional as an introduced weed of dry disturbed areas. 554.

Sarcobatus vermiculatus (Hook) Torr. C. D. Bird 12743 (University of Calgary Herbarium).

AMARANTHACEAE

Amaranthus graecizans L. Occasional as an introduced weed of roadsides. 678.

Amaranthus retroflexus L. Occasional as an introduced weed of roadsides. 677.

NYCTAGINACEAE

Mirabilis hirsuta (Pursh) MacM. Scarce in moist depressions in grassland. 458, E. H. Moss 7072 (University of Alberta Herbarium, Edmonton).

CARYOPHYLLACEAE

Arenaria lateriflora L. Common in thickets and aspen woods. 153, 164, 252, 582.

Cerastium arvense L. Common in moist grasslands and thickets. 58, 77, 89, 154, 344.

RANUNCULACEAE

Actaea rubra (Ait.) Willd. Frequent in aspen woods. 139, 214, 250, 483.

Actaea rubra (Ait.) Willd. forma *neglecta* (Gillman) Robins. This

form was observed once. A specimen was collected, but the fruits became detached and lost before they could be preserved.

Anemone canadensis L. Common in woods adjacent streams. 142, 222, 249, 388, 493.

Anemone cylindrica A. Gray. Fairly common in moist grasslands and forests. 340, 605, 607, 636.

Anemone multifida Poir. var. *hudsoniana* DC. Occasional in moist grassland. 246, 294.

Anemone patens L. var. *wolfgangiana* (Bess.) Koch. Common in dry grasslands. 1, 4.

Aquilegia brevistyla Hook. Occasional in forested areas. 165, 293.

Clematis verticellaris DC. var. *columbiana* (Nutt) A. Gray. Frequent in aspen woods. 22, 472.

Ranunculus abortivus L. Rare in damp spruce woods. 210.

Ranunculus acris L. Rare, clearing in spruce woods. Introduced. 329.

Ranunculus cymbalaria Pursh. Common in wet areas. 93, 103, 172, 668.

Ranunculus macounii Britt. Occasional along creeks. 306, 653.

Ranunculus rhomboideus Goldie. Occasional in grasslands. 920.

Ranunculus sceleratus L. Occasional at the margin of ponds. 326, 571.

Thalictrum venulosum Trel. Common in aspen woods. 137, 248.

FUMARIACEAE

Corydalis aurea Willd. Occasional in aspen woods. 107, 166, 205, 666.

CAPPARIDACEAE

Cleome serrulata Pursh. Rare, disturbed roadside. 548.

CRUCIFERAE

Arabis hirsuta (L.) Scop. var. *glabrata* T. & G. Occasional in moist grassland. 151, 156, 168, 298.

Arabis holboellii Hornem. var. *retrofracta* (Graham) Rydb. A scarce plant of dry exposed hillsides. 44.

Armoracia rusticana Gaertn. Rare, as an escape from cultivation. 258.

Brassica hirta Moench. Rare, on disturbed ground. 530.

Brassica juncea (L.) Cosson. Rare, on disturbed ground. 459.

- Brassica kaber* (DC.) L. C. Wheeler var. *pinnatifida* (Stokes) Wh. (*Sinapis arvensis* L.) Occasional as an introduced weed. 190, 663.
- Capsella bursa-pastoris* (L.) Medic. Weed of moist disturbed areas, scarce. 682.
- Descurainia pinnata* (Walt.) Britt. Scarce in dry disturbed areas. 202, 264.
- Descurainia richardsonii* (Sweet) O. E. Schulz. Occasional in damp forested areas. 413, 655.
- Erysimum cheiranthoides* L. Rare, in aspen woods. 410.
- Erysimum inconspicuum* (S. Wats.) MacM. Fairly common in open grasslands. 74, 92, 150, 158, 184.
- Hesperis matronalis* L. Rare, at the edge of a thicket, garden escape. 197, 259.
- Lesquerella arenosa* (Richards.) Rydb. Fairly common in dry grasslands. 49, 70, 149.
- Rorippa islandica* (Oeder) Borbas S. Luyken 24 (University of Calgary Herbarium).
- Rorippa islandica* (Oeder) Borbas var. *hispida* (Desv.) Butters & Abbe. Rare, in abandoned field. 111.
- Sisymbrium altissimum* L. Rare, as an introduced weed, in roadside ditch. 379.
- Sisymbrium loeselii* L. Fairly common as an introduced weed of waste places. 84, 123, 240.
- Thlaspi arvense* L. Common introduced weed of disturbed areas. 11, 109, 181, 265, 283.

SAXIFRAGACEAE

- Heuchera richardsonii* R. Br. Fairly common in moist grasslands. 347.
- Ribes americanum* Mill. Fairly common in thickets and aspen woods. 159.
- Ribes oxycanthoides* L. Common in thickets and aspen woods. 36, 566.

ROSACEAE

- Amelanchier alnifolia* Nutt. Very common on hillsides where it forms thickets and in aspen woods. 20, 34.
- Crataegus chrysoarpa* Ashe. Scarce, at the edge of aspen woods. 593.
- Fragaria vesca* L. var. *americana* Porter (*F. americana* (Porter) Britt.) Occasional in mixed woods. 468, 649.

- Fragaria virginiana* Duchesne var. *glauca* S. Wats. (*F. glauca* (S. Wats.) Rydb.) Very common in wooded areas. 19, 82, 138, 167, 216, 409.
- Geum allepicum* Jacq. var. *strictum* (Ait.) Fern. Occasional in open woods. 621, 640.
- Geum triflorum* Pursh. Frequent in moist grasslands. 24, 147.
- Potentilla anserina* L. Common in wet areas. 104, 143, 212, 572.
- Potentilla arguta* Pursh. Occasional in moist grasslands and thickets. 285, 353.
- Potentilla concinna* Richards. Common in dry grasslands. 30, 52, 68, 80, 152.
- Potentilla gracilis* Dougl. var. *pulcherrima* (Lehm.) Fern. Rare, moist grasslands. 352.
- Potentilla norvegica* L. Scarce, in damp wooded areas. 617, 637.
- Potentilla pensylvanica* L. 28, 368.
- Potentilla pensylvanica* L. var. *bipinnatifida* (Dougl.) T. & G. Both the variety and the species are fairly common in dry grasslands. 260, 331.
- Prunus pensylvanica* L. f. Occasional in aspen woods and thickets. 27, 498.
- Prunus virginiana* L. var. *melanocarpa* (A. Nels.) Sarg. Very common in thickets and open woods. 64, 81.
- Rosa acicularis* Lindl. Common in aspen woods and thickets. 106, 242.
- Rosa arkansana* Porter. Scarce, in dry exposed grasslands. 309.
- Rosa woodsii* Lindl. Very common in aspen woods and thickets. 174, 224, 241, 434.
- Rubus strigosus* Michx. Occasional, sometimes abundant, in mixed woods. 626, 650.

LEGUMINOSAE

- Astragalus aboriginum* Richards. Rare, at the edge of roadside thicket. 239.
- Astragalus adsurgens* var. *robustior* Hook. (*A. striatus* Nutt.) Fairly common in moist grasslands. 281, 337, 447.

- Astragalus agrestis* Dougl. Grasslands and disturbed areas, occasional. 120, 157, 188.
- Astragalus bisulcatus* (Hook.) A. Gray. Fairly common in grasslands. 114, 121, 307.
- Astragalus canadensis* L. C. Pilling 48. (University of Calgary Herbarium).
- Astragalus drummondii* Dougl. Occasional in dry grassland. 180, 194.
- Astragalus flexuosus* Dougl. E. H. Moss 7064. (University of Alberta Herbarium, Edmonton).
- Astragalus gilviflorus* Sheld. (*A. triphyllus* Pursh). Occasional in dry south-facing areas. 54.
- Astragalus missouriensis* Nutt. Fairly common in dry grassland. 17, 57, 311.
- Astragalus tenellus* Pursh. Fairly common in dry grasslands and disturbed areas. 193, 208, 312, 339, 499.
- Caragana arborescens* Lam. Scarce, as a garden escape. 110.
- Glycyrrhiza lepidota* (Nutt.) Pursh. Fairly common at the edge of thickets. 209, 371.
- Hedysarum alpinum* L. var. *americanum* Michx. Fairly common in moist grasslands. 245, 279, 346, 355, 501.
- Hedysarum boreale* Nutt. var. *cinerascens* (Rydb.) Rollins. Fairly common in grasslands. 254, 308, 408.
- Lathyrus ochroleucus* Hook. Very common in aspen woods. 160, 206, 244, 251, 321.
- Medicago lupulina* L. Rare, introduced weed, overgrazed wet area. 330.
- Medicago sativa* L. Common as an introduced weed in roadside ditches. 169, 204, 291, 462.
- Melilotus alba* Desr. Occasional in roadside ditches, introduced weed. 451, 525.
- Melilotus officinalis* (L.) Lam. Common in roadside ditches, introduced weed. 191, 393, 450.
- Oxytropis campestris* (L.) DC. var. *gracilis* (A. Nels.) Barneby. Fairly common in grasslands. 334, 356, 407.
- Oxytropis sericea* Nutt. var. *spicata* (Hook.) Barneby. Fairly common in dry grasslands. 16, 40, 255.
- Petalostemon candidum* (Willd.) Michx. Occasional in dry grassland. 405.
- Petalostemon purpureum* (Vent.) Rydb. Fairly common in grasslands. 304, 314, 363, 406, 436, 459. 1.
- Psoralea esculenta* Pursh. Rare, on dry south-facing slope. 130.
- Thermopsis rhombifolia* (Nutt.) Richards. Common in grasslands and disturbed areas. 9, 13, 21, 596.
- Trifolium repens* L. Occasional as an introduced weed of roadsides. 211.
- Vicia americana* Muhl. Very common in thickets and open woods. 148, 175, 236, 502.
- Vicia americana* Muhl. var. *truncata* (Nutt.) Brewer. Occasional in thickets and open woods. 511.
- Vicia sparsifolia* Nutt. Occasional in grasslands. 71, 76, 187.

LINACEAE

- Linum lewisii* Pursh. Fairly common on dry slopes. 144.
- Linum rigidum* Pursh. Occasional in dry grasslands. 223, 315.
- Linum usitatissimum* L. Rare, an escape from cultivation. In waste places. 529.

ACERACEAE

- Acer negundo* L. var. *interius* (Britt.) Sarg. Scarce, along streams. An introduced garden escape. 387.

MALVACEAE

- Malva rotundifolia* L. H. F. Irwin (no number) (University of Alberta Herbarium, Edmonton).
- Sphaeralcea coccinea* (Pursh) Rydb. Fairly common in dry grasslands. 134, 313, 400.

VIOLACEAE

- Viola adunca* J. E. Smith. Common in aspen woods. 15, 45, 125, 432, 647.
- Viola nuttallii* Pursh. Fairly common in grasslands. 7, 12, 47, 46.
- Viola rugulosa* Greene. Common in aspen woods. 60, 126, 170, 469.

CACTACEAE

- Opuntia fragilis* (Nutt.) Haw. Occasional, sometimes forming large patches in *Stipa* grassland. 416.
- Opuntia polyacantha* Haw. Very common on overgrazed and sparse exposed grasslands. 196, 263.

ELAEAGNACEAE

- Elaeagnus commutata* Bernh. Very common, forming thickets on slopes and in valleys. 113, 162.
Shepherdia argentea Nutt. Fairly common in river valleys and occasionally on moist slopes. 26, 62.
Shepherdia canadensis (L.) Nutt. Occasional in spruce and aspen woods. 164, 215.

ONAGRACEAE

- Epilobium angustifolium* L. Occasional at the edge of woods and on disturbed ground. 267, 411, 536.
Epilobium glandulosum Lehm. Scarce but abundant where found, along creeks in wooded areas. 622, 628, 638, 643.
Gaura coccinea Pursh. Common in grasslands. 131, 192, 237, 256, 386, 390.
Gaura coccinea Pursh var. *glabra* (Lehm.) Torr. & Gray. Rare, dry grassland. 132.
Oenothera biennis L. var. *hirsutissima* Gray. Rare, at the edge of thicket. 452, 542.

ARALIACEAE

- Aralia nudicaulis* L. Common and often abundant in wooded areas. 163, 439, 610, 646.

UMBELLIFERAE

- Cicuta douglasii* (DC.) Coult. & Rose. Scarce, in creek bottom in spruce woods. 604, 625.
Heracleum lanatum Michx. Fairly common in wet thickets and along creeks in forested areas. 286, 662.
Lomatium foeniculaceum (Nutt.) Coult. & Rose. Common in dry grassland. 2, 6, 10, 53.
Lomatium macrocarpum (Hook. & Arn.) Coult. & Rose. Fairly common in eroded grassland areas. 32, 50, 189.
Musineon divaricatum (Pursh) Nutt. var. *hookeri* T. & G. Occasional in dry grassland. 31, 41, 51, 91.
Sanicula marilandica L. Rare in spruce woods. 639.
Saxifraga aptera (A. Gray) Fern. (*S. cordata* (Walt.) Koch.) Common in thickets and aspen woods. 79, 135.

CORNACEAE

- Cornus stolonifera* Michx. Common in *Populus* woods. 72.

PYROLACEAE

- Pyrola asarifolia* Michx. Common in the mossy carpet of dense spruce woods. 641, 648, 667.
Pyrola secunda L. Common in the mossy carpet of dense spruce woods. 471, 642.

ERICACEAE

- Arctostaphylos uva-ursi* (L.) Spreng. Common in moist thickets and edges of woods on north-oriented slopes. 33.

PRIMULACEAE

- Androsace occidentalis* Pursh. Marion E. Moodie 831 (Harvard University-Gray Herbarium).
Androsace septentrionalis L. Occasional in exposed grasslands. 195, 229.
Dodecatheon radicans Greene. Rare, in dry grassland. 8.
Lysimachia ciliata L. Scarce, but sometimes abundant, along creeks in woods. 594.

APOCYNACEAE

- Apocynum cannabinum* L. S. S. Stephens (no number) (University of Alberta Herbarium, Edmonton).

CONVOLVULACEAE

- Convolvulus sepium* L. Occasional in open wet areas and locally abundant along roadsides on land adjacent the coulee systems. 299, 305.

POLEMONIACEAE

- Collomia linearis* Nutt. Rare, in dry grassland. 284, 287.
Phlox hoodii Richards. Very common in eroded grassy areas. 3, 5, 29, 55.

BORAGINACEAE

- Echium vulgare* L. Rare, adjacent railway. 597.
Hackelia americana (A. Gray) Fern. Scarce, in forested areas. 320, 644.
Hackelia floribunda (Lehm.) I. M. Johnston. Fairly common in aspen woods. 320. 1, 470, 482, 535.
Lappula echinata Gilib. Fairly common in disturbed areas. 108, 201, 507, 631.

Lappula redowskii (Hornem.) Greene
var. *occidentalis* (Wats.) Rydb.
Rare, in overgrazed dry grassland.
182.

Lithospermum incisum Lehm. Occa-
sional in dry grassland. 48, 69, 88.

LABIATAE

Lycopus asper Greene. Rare, at the
edge of a pond. 443.

Mentha arvensis L. var. *villosa*
(Benth.) S. R. Stewart. Occasional
in wet areas. 442, 611, 645.

Moldavica parviflora (Nutt.) Britt.
Occasional at edges of cultivated
fields. 690.

Monarda fistulosa L. var. *menthae-
folia* (Graham) Fern. Common in
thickets and moist grassland. 328,
357.

Prunella vulgaris L. Rare, at the edge
of a pond. 338.

Stachys palustris L. var. *pilosa*
(Nutt.) Fern. Rare, in creek bot-
tom. 691.

SOLANACEAE

Hyoscyamus niger L. Fairly common
and often abundant in disturbed
land. 90, 238.

SCROPHULARIACEAE

Orthocarpus luteus Nutt. Scarce in
grasslands. 517.

Penstemon gracilis Nutt. Scarce in
dry grassland. 276, 317.

Penstemon nitidus Dougl. Frequent
in dry grassland. 14, 35.

OROBANCHACEAE

Orobanche fasciculata Nutt. A. L.
Bird 216 (University of Calgary
Herbarium).

PLANTAGINACEAE

Plantago eriopoda Torr. J. H. Brodie
(no number) (University of
Alberta Herbarium, Edmonton).

Plantago major L. Common in wet
areas along streams. 383, 570, 589.

RUBIACEAE

Galium boreale L. Very common in
moist grasslands, thickets and
aspen woods. 155, 180, 221, 243, 253,
448, 500.

Galium triflorum Michx. Occasional
in aspen and mixed woods. 412.

CAPRIFOLIACEAE

Linnaea borealis L. var. *americana*
(Forbes) Rehd. Occasional, but

abundant where found, in spruce
woods. 599.

Lonicera dioica L. var. *glaucescens*
(Rydb.) Butters. Common in aspen
woods. 173, 247.

Lonicera tartarica L. Reported for
region (Bird, 1971) but no speci-
mens seen. An introduced garden
escape.

Symphoricarpos albus (L.) Blake var.
pauciflorus Robbins. Fairly com-
mon in aspen and mixed woods. 562,
595, 598, 651.

Symphoricarpos occidentalis Hook.
Very common, forming thickets on
hillsides. 322, 333, 349, 574, 602.

Viburnum edule (Michx.) Raf. Occa-
sional in mixed woods. 530, 657.

CAMPANULACEAE

Campanula rotundifolia L. Common
in grasslands. 278, 290, 360.

COMPOSITAE

Achillea millefolium L. subsp. *lanu-
losa* (Nutt.) Piper. Very common
in grassland. 67, 185, 601.

Achillea millefolium L. subsp. *lanu-
losa* (Nutt.) Piper var. *alpicola*
(Rydb.) Garrett. 157.

Achillea sibirica Ledeb. Scarce, but
sometimes abundant, along creeks
in woods. 494.

Agoseris glauca (Pursh) Raf. var.
agrestis (Osterh.) Q. Jones. Fairly
common on the edge of thickets and
moist grassland. 335, 351, 373.

Agoseris glauca (Pursh) Raf. var.
glauca. Rare, in grassland. 303.

Antennaria nitida Greene. Fairly com-
mon in moist grassland. 218, 332.

Antennaria parviflora Nutt. Scarce
in grasslands. 179.

Antennaria rosea Greene. Fairly com-
mon in moist grassland. 217.

Arnica fulgens Pursh. Scarce, in dry
grassland. 219.

Arnica sororia Greene. Rare, in dry
grassland. 289.

Artemisia absinthium L. Scarce, in
waste places. 556, 630.

Artemisia biennis Willd. Occasional
along creeks on bare ground. 635.

Artemisia campestris L. subsp.
campestris. Occasional in disturbe
areas adjacent creeks. 539, 614.

Artemisia cana Pursh. Very common
forming sage communities on bar

- flats and hillsides. 573.
- Artemisia dracunculus* L. Rare, in riverine community. 575.
- Artemisia frigida* Willd. Common in grasslands, increasing with grazing. 465, 516.
- Artemisia longifolia* Nutt. Common in sageland. 270, 275, 429, 464, 581, 608.
- Artemisia ludoviciana* Nutt. var. *gnaphalodes* (Nutt.) T. & G. Common in grasslands and increasing with grazing. 476, 531, 652, 660.
- Aster brachyactis* Blake. Rare, in wet creek bottom in spruce woods. 623.
- Aster campestris* Nutt. Reported for the region (Bird, 1971) but no specimens seen.
- Aster canescens* Pursh. Dry eroded areas and sagelands, common. 435, 518, 632, 665.
- Aster ciliolatus* Lindl. Scarce, in moist woods. 580, 606.
- Aster falcatus* Lindl. Common in dry grasslands. 438, 479, 482, 485, 520, 579.
- Aster hesperius* A. Gray. Fairly common in wet woods. 584, 619, 629, 669.
- Aster laevis* L. var. *geyeri* A. Gray. Common in disturbed moist habitats. 474, 481, 526, 538.
- Aster pansus* (Blake) Cronq. Common in disturbed areas and woodlands. 512, 533, 585, 618.
- Chrysopsis villosa* (Pursh) Nutt. var. *villosa* Cronq. Common in dry eroded areas. 534, 539, 547, 568.
- Cirsium arvense* (L.) Scop. Occasional in waste places, introduced. 514.
- Cirsium undulatum* (Nutt.) Spreng. Occasional in dry exposed sites. 341.
- Crepis tectorum* L. Scarce, an introduced weed of disturbed areas. 178, 319.
- Erigeron caespitosus* Nutt. Common in dry grasslands. 302, 325, 342, 348, 364, 369, 372, 402, 431, 433, 440, 466, 473, 484, 489, 503, 519, 527.
- Erigeron glabellus* Nutt. subsp. *pubescens* (Hook.) Cronq. Occasional in moist grasslands and woods. 488, 528, 583, 681.
- Erigeron ochroleucus* Nutt. Fairly common in dry sageland. 198, 271, 367, 370, 495.
- Gaillardia aristata* Pursh. Common in dry grassland. 231, 292, 336, 354, 394, 426.
- Grindelia squarrosa* (Pursh) Dunal var. *quasiperennis* Lunell. Common in dry sageland. 350, 403, 437, 543.
- Gutierrezia sarothrae* (Pursh) Britt. & Rusby. Common in dry sageland. 430, 521, 553.
- Haplopappus spinulosus* (Pursh) DC. Scarce, on arid sites. 366.
- Helenium autumnale* L. var. *montanum* (Nutt.) Fern. Rare, edge of pond. 441, 486.
- Helianthus annuus* L. subsp. *lenticularis* (Dougl.) Cockerell. Fairly common in dry grassland. 316, 358, 396, 496, 537.
- Helianthus laetiflorus* Pers. var. *sub-rhomboides* (Rydb.) Fern. Occasional in dry grassland. 497.
- Helianthus petiolaris* Nutt. Occasional in grasslands. 467, 546.
- Hieracium umbellatum* L. Scarce, in creek bottoms. 477, 659.
- Hymenoxys richardsonii* (Hook.) Cockerell. Common in dry grasslands. 105, 176, 220, 401.
- Lactuca pulchella* (Pursh) DC. Occasional in grasslands and moist places. 385, 415, 541, 557.
- Lactuca serriola* L. Fairly common on disturbed ground, introduced. 505, 603, 627.
- Liatris punctata* Hook. Rare, on dry eroded slope. 449.
- Lygodesmia juncea* (Pursh) D. Don. Scarce, in waste places. 513, 559.
- Ratibida columnifera* (Nutt.) Wooton & Standl. Occasional in grassland. 310, 374.
- Senecio canus* Hook. Common in dry grassland. 133, 232, 362, 395.
- Senecio vulgaris* L. L. A. Mykek 21 (University of Calgary Herbarium).
- Solidago decumbens* Greene. Common in dry grassland. 397, 428, 510.
- Solidago gigantea* Ait. var. *leiophylla* Fern. Fairly common in disturbed areas in forests and waste places. 509, 558, 592.
- Solidago missouriensis* Nutt. Fairly common in grasslands. 361, 463, 478.
- Solidago rigida* L. var. *humilis* Porter. Rare, tall grass by roadside. 532.

Sonchus asper (L.) Hill. Rare, creek bottom, introduced. 658.
Sonchus oleraceus L. Rare, roadside ditch, introduced. 633.
Sonchus uliginosus Bieb. Occasional, in moist disturbed areas, introduced. 378.
Taraxacum officinale Weber. Occasional, weed of disturbed areas. 119.
Townsendia sericea Hook. Occasional, in dry grassland. 18, 59, 61.
Tragopogon dubius Scop. Frequent, becoming well established in grassland habitat, especially where disturbed. 146.
Xanthium strumarium L. Reported for the area by Bird (1971) but no specimens seen.

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