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## BOTANICAL INVESTIGATIONS IN NORTHEASTERN SASKATCHEWAN: THE SUBARCTIC PATTERSON-HASBALA LAKES REGION

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### INTRODUCTION

Most vegetation maps of Canada depict a triangle in northeastern Saskatchewan within the subarctic. Rowe (1959) includes this region in his Northwestern Transition Section in which "coniferous forest passes northward into a zone of subarctic woodland"; Porsild (1958) includes it in the subarctic forest-tundra transition; and it is contiguous with Ritchie's (1962) "open spruce forest with lichen scrub" of Manitoba.

If this region does lie within the subarctic, botanical investigation should reveal (1) some low arctic species unknown in Saskatchewan (2) tundra vegetation, at least in exposed habitats and (3) the northern edge of the range of some boreal taxa. The study was designed to examine these possibilities and to add to the data concerning the taxonomy and distribution of taxa in the flora of northern Saskatchewan.

The locality selected for study was the Patterson-Hasbala Lakes region (Figure 1) which lies well within the supposed subarctic triangle in northeastern Saskatchewan. As the interests of the field party included ornithology as well as botany an extensive survey method, covering as much area as possible, was used. Although this method minimized the opportunity for intensive study, it led to the chance discovery of tundra habitats and unusual plant distributions which might otherwise have been missed. In 1962 and 1963 a total of 29 days were spent in the field; 7 days at "Quillwort" Lake (2.4 km south of Hasbala Lake), 11 days at Hasbala Lake, 10 days at Patterson Lake and 1 day at Warren Lake (Lat.  $59^{\circ}45' N.$ , Long.  $102^{\circ}42' W.$ ).

### ACKNOWLEDGMENTS

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#### PREVIOUS BOTANICAL INVESTIGATIONS

No botanical studies have been conducted in the subarctic triangle of northeastern Saskatchewan but several have been made in the vicinity. The earliest botanical collections in the vicinity of northeastern Saskatchewan were made by J. W. Tyrrell, a member of J. B. Tyrrell's geological expedition in 1893 (J. B. Tyrrell, 1898). During 1893 the expedition passed through Saskatchewan traveling from Lake Athabasca to Black Lake and northward on the Chipman River to Selwyn Lake, about 150 km west of Hasbala Lake. On a second trip in 1894 they passed about 48 km east of Hasbala Lake on the Little Partridge River, Manitoba, enroute to Kasba Lake, N.W.T. Unfortunately, there were no plants collected on the 1894 trip; however, some botanical observations were made. The area south of Kasba Lake was described as "generally low, flat and wooded with small black spruce". Stunted aspen were observed at the foot of a dry esker and *Vaccinium vitis-idaea*, *Empetrum nigrum* and *Arctostaphylos alpina* (as *A. arctica*) were noted to be abundant.

More recent collections have been made in the nearby northern coniferous forest and the arctic tundra. Collections in the northern coniferous forest have been made by Scotter (1961, 1964, 1965 and Thomson & Scotter, 1961), Ritchie (1959) and Baldwin (1953). Scotter's collections from the vicinity of Black Lake, Saskatchewan and Cochrane River, Manitoba (including Kasmere Lake and Fort Hall, about 73 km southeast of Hasbala Lake) were made in connection with his ecological study of the barren-ground caribou range. Ritchie's ecological studies were centered in Manitoba near the confluence of the Big Spruce and Seal Rivers, about 320 km southeast of the area described herein. Baldwin's collections were made over an area ranging from Reindeer Lake northward to Nueltin Lake, Manitoba.

Collections from the southern edge of the arctic tundra northeast of Saskatchewan have been made by several collectors. Harper's collection from a sparsely wooded portion of northwestern Nueltin Lake, N.W.T. were identified and published by A. E. Porsild (1950). Scoggan's collections from Baralzon and Nejanilini Lakes were listed in 1952 and later summarized in his Flora of Manitoba (1957). Larsen (1965) carried out ecological investigations at the north end of Ennadai Lake.

#### STUDY AREA

In general, the topography of northeastern Saskatchewan is rolling with elevations up to about 1,550 feet. A variable thickness of glacial till, consisting of loosely packed gravels containing many boulders derived from the underlying bedrock, covers most of the region (Taylor, 1963). At about longitude 104°W. we observed a change in the depth of the surficial till deposit. West of this point exposed bedrock was prominent and the till deposit was thin, but, to the east, little bedrock was exposed and such glacial features as eskers, drumlinoid ridges, ribbed moraines and abandoned beach lines were prominent.



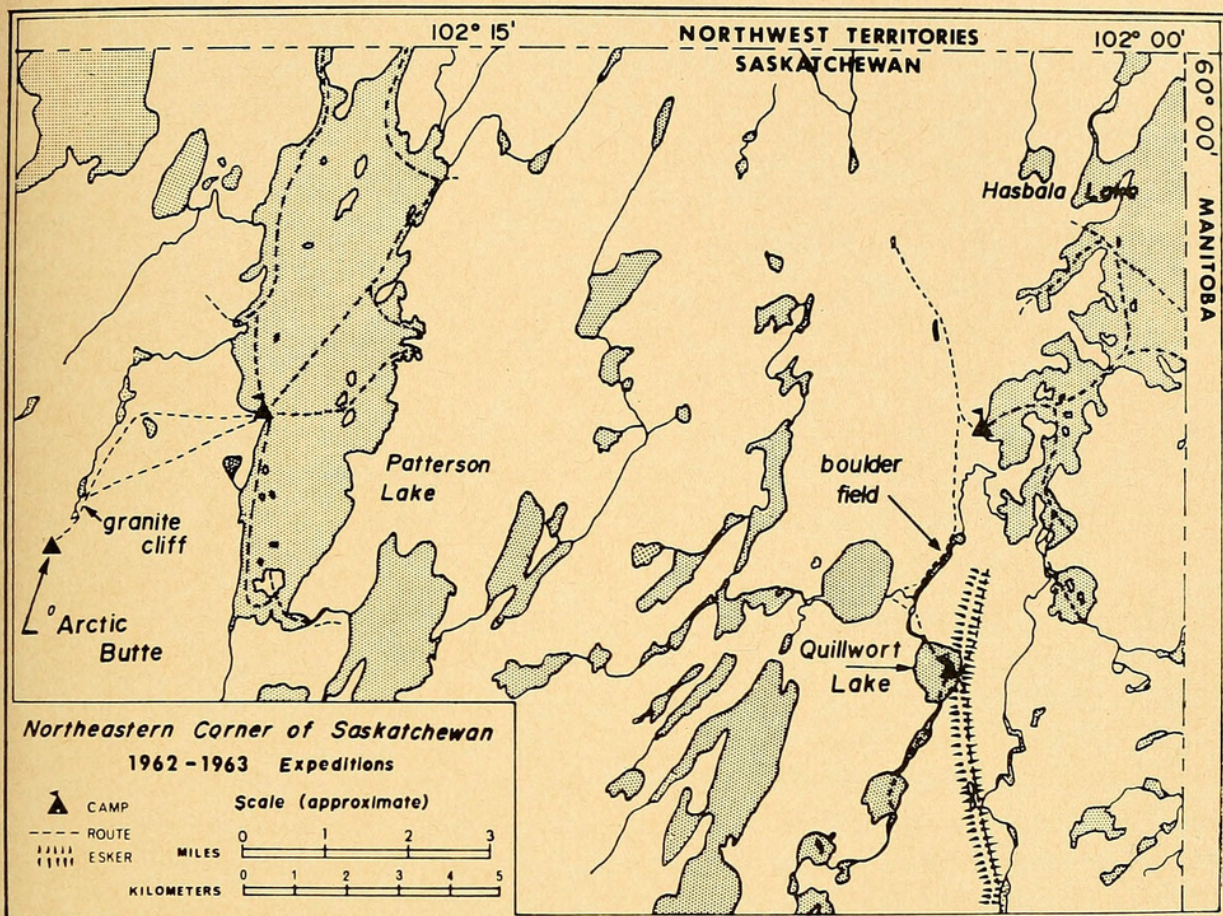


FIGURE 1. The northeastern corner of Saskatchewan.

Sand deposits located south and west of Hasbala Lake are probably attributable to Glacial Lake Kazan, in the southwestern District of Keewatin, which was described by Lee (1959). This Pleistocene Lake was estimated to stand between 1,253 and 1,260 feet above sea level and would have inundated much of the area around Hasbala and Patterson Lakes.

The strata underlying much of the area is granite which is often red in colour (Tremblay, 1959). Red granite cliffs and a hill composed of red granite were observed west of Patterson Lake. In the region around Hasbala Lake, which Tremblay did not visit, we observed metamorphic cliffs composed of gneisses similar to those described by Tremblay as "fine- to medium-grained, granular, massive to foliated, quartz-feldspar-biotite gneiss".

#### PLANT COMMUNITIES

A brief consideration of the vegetation of northeastern Saskatchewan will permit a better understanding of the habitat notes in the annotated catalogue of plant species. The communities described here were recognizable in the field; however, their limits are arbitrary. Vegetational patterns are often obscured by the complex regeneration of plants after fire and habitat intergradation. Some of the following communities were dominant features in the



landscape; others are noteworthy minor features. The types described in this report are:

Forest Communities

*Picea mariana* — lichen woods

*Picea mariana* — feather moss woods

*Picea mariana* muskegs

*Pinus banksiana* woods

*Picea glauca* woods

Lake Margin Communities

Aquatics

*Carex fens*

*Salix fens*

Rocky lake margins

Sand beaches

Esker Communities

Slopes and summits

Kettles

Sand blowouts

Open sandy—gravel surfaces

Cliff Communities

Granite cliff

Metamorphic cliff

Tundra Communities

Moist boulder field

Dry rock field

*Forest Communities*

A forest vegetation dominated by *Picea mariana* covers much of north-eastern Saskatchewan. *Picea mariana*, somewhat smaller than in forests to the south and west, occupies a variety of habitats from dry esker ridges to wet muskegs and stream margins. Individuals of *Pinus banksiana*, *Betula* “*papyrifera*”, *Larix laricina*, and, rarely, *Picea glauca* may be associated with *P. mariana*, but pure stands of these associates are uncommon. The following forest types are recognized (1) *Picea mariana* — lichen woods, (2) *Picea mariana* — feather moss woods, (3) *Picea mariana* muskegs and (4) *Pinus banksiana* woods. These four forest types are the predominant, more or less stable, forests observed in the area. Complex mixed forests are common resulting from intergradation of habitats and regeneration after fire which is a major environmental factor in subarctic forests (Scotter, 1965).

PICEA MARIANA—LICHEN WOODS. Dry woods dominated by *Picea mariana*, with a lichen-covered floor, occupied the summits and slopes of eskers, till ridges, old beach ridges, and outcrops covered with a shallow soil. These woods were park-like with widely spaced trees and sparse undergrowth. The ground cover was dominated by *Stereocaulon paschale*, *Cladonia* spp., and *Cetraria nivalis*. Interspersed among these lichens were the mosses *Ptilium*



*crista-castrensis* and *Hylocomium splendens* and mats of *Empetrum nigrum*, *Vaccinium vitis-idaea* and *Loiseulea procumbens*. The lycopods *Lycopodium annotinum*, *L. clavatum*, *L. complanatum* and *L. sabinaefolium* var. *sitchensis* were locally abundant. The shrub layer was composed of scattered clumps of *Betula glandulosa*, *Vaccinium myrtilloides*, *V. uliginosum*, *Ledum groenlandicum*, *Salix arbusculoides*, *S. bebbiana*, *S. glauca* and *S. planifolia*. The herb layer was sparse, and mainly consisted of *Calamagrostis canadensis*, *Oryzopsis pungens*, *Comandra livida*, *Epilobium angustifolium* and *Pedicularis labradorica*. *Pinus banksiana*, *Betula* "papyrifera" and *B. fontinalis* occurred as secondary species.

A soil pit dug in a till ridge west of Patterson Lake revealed a shallow organic horizon of 2 cm above 33 cm of sandy-stony parent material which was stained a reddish-brown colour. There was no frost at 35 cm, the depth of the pit.

PICEA MARIANA — FEATHER MOSS WOODS. On the lower slopes of eskers, till ridges, stream margins and other well drained mesic sites there was an increase in the proportion of the forest floor covered by feather mosses, principally *Hylocomium splendens*, *Pleurozium scherberi*, *Ptilium crista-castrensis*, *Ptilidium ciliare* and *Rhacomitrium canescens*. The shrub layer was more dense and lacked the park-like aspect of the *Picea mariana* — lichen woods. Common shrubs here included *Betula glandulosa*, *Alnus crispa* and *Salix bebbiana*. Less common were *Salix planifolia*, *S. arbusculoides*, *Ribes triste* and *Rubus idaeus* var. *strigosus*. The ground cover was usually sparse and included *Lycopodium annotinum*, *L. clavatum*, *Agrostis borealis*, *Calamagrostis canadensis*, *Carex capillaris*, *C. leptalea*, *C. vaginata*, *Smilacina trifolia*, *Stellaria longifolia*, *Mitella nuda*, *Ribes triste*, *Rubus chamaemorus*, *Viola palustris*, *Linnaea borealis* ssp. *americana*, *Erigeron lonchophyllus*, *Petasites frigidus* var. *palmatus*, *Taraxacum certophorum* and scattered patches of the lichen *Parmelia physodes*.

In moister habitats *Sphagnum* increased in importance. In this zone, between the feather moss woods and the muskegs, the forest floor usually consisted of patches of feather mosses, active *Sphagnum fuscum* hummocks, and dead mosses covered with lichens. Soil pits dug into inactive *Sphagnum* hummocks and lichen patches revealed a shallow but variable peat layer 8-36 cm deep and no frost at 40-50 cm, the depth of the pits. An actively growing *Sphagnum* hummock contained frost at 33 cm and no sign of inorganic material.

PICEA MARIANA MUSKEG. In areas of impeded drainage a vegetation dominated by *Picea mariana* and several species of *Sphagnum* occurred. The trees of *Picea mariana* were more closely spaced than in the other forest types and were sometimes accompanied by individuals of *Larix laricina*. The dominant shrubs were *Betula glandulosa*, *Ledum groenlandicum* and *Salix planifolia*. Low shrubs of frequent occurrence were *Rubus chamaemorus*, *Vaccinium vitis-idaea*, *Cornus canadensis*, *Salix myrtillofolia*, *Ribes hudsonianum*, *Kalmia polifolia* and *Chamaedaphne calyculata*. The ground cover



was mainly *Sphagnum fuscum* and other sphagna including *S. warnstorffianum*, *S. lindbergii*, *S. wulfianum*, and, in wet depressions, *S. cuspidatum*. Other mosses which occurred in varying abundance included *Aulacomnium palustre*, *Drepanocladus venicosus*, *Hylocomium splendens*, *Tomentypnum nitens* and *Pleurozium schreberi*. Herbs which occurred scattered in the mosses were *Equisetum sylvaticum*, *Carex capillaris*, *C. magellanica*, *Scirpus caespitosus*, *Smilacina trifolia*, *Parnassia multiseta*, *Rubus acaulis*, *Pedicularis labradorica*, *Petasites frigidus* var. *palmatus*, *Erigeron lonchophyllus* and *Senecio paupercula*.

Bare silt frost boils were sometimes observed in intermittent drainage channels between *Sphagnum* hummocks. These frost boils contained a unique assemblage of arctic and subarctic species including *Juncus triglumis* ssp. *albescens*, *J. castaneus* and *Carex bicolor*. Here also were *Tofieldia pusilla*, *Potentilla fruticosa* and *Senecio paupercula*.

Two general types of treeless vegetation were located in poorly drained pockets within the *Picea mariana* muskegs. Both types had a peaty substrate and graded into *Picea mariana* muskeg. The first was the SPHAGNUM BOG which was characterized by the dominance of *Sphagnum fuscum* and other sphagna including *S. recurvum*. Bogs of this type were observed at the margin of a lake south of Hasbala Lake and west of Patterson Lake. Characteristic species included *Carex limosa*, *Salix pedicellaris*, *Eriophorum chamissonis*, *Drosera anglica*, *Chamaedaphne calyculata*, *Utricularia intermedia* and the mosses *Drepanocladus exannulatus* and *Aulacomnium palustre*. An occasional tree of *Larix laricina* occurred on the bog margin.

A second type, THE CAREX — SCIRPUS FEN, was characterized by the presence of sedges and the absence of *Sphagnum*. The dominant species were *Carex limosa*, *C. diandra*, *C. aquatilis*, *Scirpus caespitosus*, *S. hudsonianus* and *Drepanocladus venicosus*. Associated with these species were *Equisetum fluviatile*, *Sparganium minimum*, *Triglochin maritima*, *Carex buxbaumii*, *C. chordorhiza*, *C. livida*, *Eriophorum viridi-carinatum*, *Utricularia intermedia* and *U. vulgaris*.

In the zone between the *Carex* — *Scirpus* fen and the *Picea mariana* muskeg was a drier, shrubby vegetation characterized by *Scirpus caespitosus* and *S. hudsonianus* and scattered shrubs of *Betula glandulosa*, *Myrica gale*, *Kalmia polifolia*, *Vaccinium uliginosum* and occasional trees of *Larix laricina* and *Picea mariana*. Associated with these species were *Lycopodium selago*, *Triglochin maritima*, *Tofieldia pusilla*, *Salix arctophila*, *S. reticulata*, *Pedicularis labradorica* and *Pinguicula vulgaris*.

PINUS BANKSIANA WOODS. Pure stands of *P. banksiana* were not common and this species was usually associated with *Picea mariana* on eskers, sandy till ridges, old beach lines and in burned areas. A few woods with *P. banksiana* the dominant species were observed in extensive sand blowouts. Here, the trees were widely spaced, the undergrowth was scanty and the forest floor was usually lichen covered. Characteristic species included scattered shrubs of *Betula glandulosa*, *Vaccinium myrtilloides*, *Vaccinium vitis-idaea* and *Ribes*



*glandulosum*, and the herbs *Carex abdita*, *C. foenea*, *Calamagrostis purpurascens*, *Festuca saximontana*, *Poa pratensis* and *Arnica lonchophylla*.

Putative introgressant forms of *Pinus* are discussed in the catalogue.

### Minor Forest Communities

**PICEA GLAUCA WOODS.** *Picea glauca* is rare in northeastern Saskatchewan and only one stand dominated by *P. glauca* and a possible stand remnant was seen. A small stand of *P. glauca* with associated *P. mariana* and *Larix laricina* was located a few kilometers west of Hasbala Lake. The habitat was wet and the ground moss covered. Common in this stand were *Carex scirpoidea*, *C. vaginata*, *Orchis rotundifolia*, *Salix abrusculoides*, *S. glauca*, *S. myrtillofolia*, *S. reticulata*, *Mitella nuda*, *Rubus acaulis*, *Arctostaphylos alpina* ssp. *rubra* and *Aster hysopifolius*.

A single individual of *Picea glauca*, standing about 5 m tall, was found on a small patch of turf in the middle of a sand blowout within a *Picea mariana* — lichen woods. The size of the tree and the well-developed turf in which it was growing suggested that it represented a relict of a more extensive forest that was destroyed by fire.

My observations on the occurrence of *P. glauca* in northeastern Saskatchewan do not agree with Tyrrell (1898), Ritchie (1959) and Larsen (1965) who maintain that *P. glauca* is the chief tree species on eskers in the subarctic. In this area *P. mariana* is the only species of *Picea* observed on eskers. A possible explanation for this apparent disagreement has been suggested by Ritchie who observed that *P. mariana* occurs on eskers where *P. mariana* forests are contiguous to the eskers, possibly because of the large number of seed parents. In the study area *P. mariana* forests occurred adjacent to the eskers and occupied much of the surrounding till plains. It is also possible that hybridization and introgression between *P. mariana* and *P. glauca*, which has been suspected by Larsen (1965), may result in species misidentification. A study of this possibility as well as further exploration of eskers in northern Saskatchewan is desirable.

### Lake Margin Communities

The marginal vegetation of lakes located on glacial till is subdivided, for convenience, into aquatic, *Carex* fen or meadow, *Salix* fen, rocky lake margin and sand beach communities.

The floating AQUATICS *Potamogeton richardsonii*, *P. filiformis*, *P. alpinus* var. *tenuifolia*, *Nuphar variegatum*, *Ranunculus aquatilis* var. *capillaceus* and *Calligeron giganteum* often occurred along lake margins. In shallow water, emergent *Equisetum fluviatile* may form extensive monodominant stands sometimes with *Utricularia intermedia* and *Potentilla palustris*. *Isoetes muricata* var. *braunii* occurred in sand between rocks on the margins of most lakes in the area, especially in protected coves.

CAREX FENS occurred on mucky or peaty lake margins and graded either directly into *Picea mariana* muskeg or through a *Salix* fen to muskeg. Large



*Carex* fens dominated by *Carex rostrata* or *C. aquatilis* were common. The following species occurred in these fens: *Carex canescens*, *C. paupercula*, *C. physocarpa*, *Eriophorum angustifolium*, *Scirpus hudsonianus*, *Salix arctophila*, *S. glauca*, *S. pedicellaris*, *Cicuta mackenzieana* and *Galium trifidum*.

SALIX PLANIFOLIA FENS with an understory of *Calamagrostis canadensis*, *Carex aquatilis*, *C. physocarpa*, *C. rostrata* and *Veronica scutellata* were common on lake margins. These fens were apparently seasonally flooded, although they were dry on the surface in late summer. Species which also occurred in these fens were *Equisetum arvense*, *Carex brunnescens*, *Eriophorum angustifolium*, *Myrica gale*, *Betula glandulosa*, *Stellaria calycantha*, *Actaea rubra*, *Ribes glandulosa* and *Rubus acaulis*.

ROCKY LAKE MARGINS were sometimes edged with turf shaded by species of *Salix* and the adjacent forest. Habitats of this type on Patterson and Hasbala Lakes supported a number of interesting arctic and subarctic species which were uncommon elsewhere. These included *Juncus filiformis* (dominant), *Selaginella selaginoides*, *Carex garberi*, *Luzula nivalis*, *Salix reticulata*, *Polygonum viviparum*, *Coptis trifolia* var. *groenlandica*, *Parnassia kotzebuei* and *Primula mistassinica*.

SAND BEACHES were uncommon here and occurred only where the lake was eroding a sandy esker or an old bench line. The vegetation on beaches was scanty and included *Equisetum arvense*, *Carex physocarpa*, *Juncus filiformis*, *Ranunculus reptans* and *Rorripa icelandica* var. *fernaldiana*.

### *Esker Communities*

Eskers are a prominent feature of the landscape in northeastern Saskatchewan. They occur as single or multiple ridges separated by elliptical or circular depressions (kettles) or as chains of isolated conical hills (Taylor, 1963). An esker of the multiple ridge type south of Hasbala Lake was visited and a brief visit was made to a single ridge esker near Warren Lake.

The ESKER SLOPES AND SUMMITS were usually covered with open *Picea mariana* — lichen and *P. mariana* — feather moss woods. *Pinus banksiana* occurred on eskers either in association with *Picea mariana* or in small, almost pure stands. *Betula* “*papyrifera*” occurred on moist slopes in association with *Picea mariana*.

The KETTLES or depressions on and between ridges were dry or held small lakes and ponds. Dry kettles and dry open slopes were dominated by *Cetraria*, *Cladonia* and *Stereocaulon* in association with *Agrostis scabra*, *Calamagrostis inexpansa*, *Festuca saximontana*, *Oryzopsis pungens* and *Poa glauca*. Mats of *Vaccinium vitis-idaea*, *Arctostaphylos uva-ursi*, *Saxifraga tricuspidata* and *Potentilla tridentata* also covered large areas. Here also were *Lycopodium complanatum*, *L. sabinae folium* var. *sitchensis*, *Trisetum spicatum*, *Carex foenea*, *Anemone multifida*, *Erigeron acris* var. *asteroides*, *Antennaria umbrinella*, *Artemisia campestris* var. *borealis* and *Solidago spathulata* var. *neomexicana*.



A stand of dwarfed *Picea mariana* was observed in the bottom of one dry kettle. The trees ranged from 2 to 3 m tall and showed signs of wind pruning. A similar condition was described by Larsen (1965) at Ennadai Lake, N.W.T.

SAND BLOWOUTS were common on sandy eskers but were rarely extensive. Mats of *Empetrum hermaphroditum*, *Potentilla tridentata*, and the trailing rhizomes of *Carex foenea* stabilized the sand. Also occurring in blowouts were *Agrostis scabra*, *Calamagrostis canadensis*, *C. inexpansa*, *C. purpurascens*, *Poa glauca*, *Festuca saximontana*, *Carex bigelowii*, *C. brevipes*, *C. supina* var. *spaniocarpa* and scattered shrubs of *Juniperus communis* var. *depressa*. The margin of one blowout at Warren Lake was occupied by a shrubby growth of *Populus tremuloides* less than 1 m tall.

OPEN SANDY-GRAVEL SURFACES supported such pioneer species as *Rhacomitrium canescens*, *Carex glacialis*, *C. supina* var. *spaniocarpa*, *Festuca saximontana* and *Poa glauca*.

### Cliff Communities

A GRANITE CLIFF west of Patterson Lake supported a community dominated by scattered trees of *Betula* "papyrifera", the shrubs *Ledum groenlandicum*, *L. palustre* var. *decumbens*, *Vaccinium uliginosum*, *V. vitis-idaea* and *Rubus idaeus* var. *strigosus*. Other vascular plants collected here were *Empetrum hermaphroditum*, *Ribes glandulosum*, *R. triste*, *Poa glauca* and *Calamagrostis canadensis*. Lichens covering the dry ledges included *Peltigera malacea*, *Cladonia amaurocraea*, *C. alpestris*, *C. alpicola*, *C. cornuta*, *C. rangiferina* and *Actinogyra mühlenbergia*. The fern *Polypodium vulgare* var. *virginiana* formed large colonies in some lichen mats and *Gymnocarpium robertianum* occurred in crevices with mosses. Some wet faces supported dense mats of the mosses *Ulota crispa*, *Cynodontium tenellum* and *Dicranum elongatum*.

### Tundra Communities

Tundra vegetation has not been previously described in Saskatchewan. Two communities considered to be tundra because of their treeless condition, arctic taxa and areal extent were studied in the Patterson—Hasbala Lakes region. One was a moist boulder field and the other a dry rock field.

MOIST BOULDER FIELD. A prominent assemblage of arctic and subarctic species was discovered on a boulder field which filled a narrow stream valley south of Hasbala Lake. The boulder field, about 1.5 km long, had a marked gradient and a shallow stream flowing down its centre.

At the upper end of the valley a deep, compact turf over the boulders was covered with a thicket dominated by *Betula glandulosa*, *Vaccinium uliginosum* and *Potentilla fruticosa*. Under these shrubs there was an almost continuous mat of the arctic willows *Salix arctophila* and *S. reticulata*. Scattered in the thicket were *Salix myrtillofolia*, *S. planifolia* and *Myrica gale*. Here also were *Carex norvegica*, *C. scirpoidea*, *C. dioica* ssp. *gynocrates*, *Scirpus caespitosus* var. *callosus* and *Polygonum viviparum*. The arctic-circumpolar



*Juncus triglumis* ssp. *albescens* occurred here, as in the *Picea mariana* muskeg, on open, hard packed silt frost boils.

Toward the lower end of the valley the turf became thinner and finally disappeared. The vegetation was progressively less dense and finally occurred only in sand-filled cracks and spaces between boulders. *Vaccinium uliginosum* increased in relative abundance over *Betula glandulosa*; *Salix arctophila* and *S. reticulata* remained prominent and the frequency of *S. glauca* increased. The number of herbaceous species increased downstream and *Equisetum arvense*, *E. scirpoides*, *Agrostis borealis*, *Carex bigelowii*, *C. diandra*, *C. dioica* ssp. *gynocrates*, *C. norvegica*, *C. saxatilis* var. *miliaris*, *C. scirpoidea*, *Polygonum viviparum*, *Anemone parviflora*, *Parnassia multisetata*, *Rubus acaulis*, *Astragalus alpinus*, *Epilobium palustre* and *Galium trifidum* were noted. A small, but conspicuous stand of *Poa alpina* occurred in cracks on a large boulder.

A dense thicket of *Salix planifolia*, *S. serissima* and *Betula glandulosa* 2 to 2.5 m tall occurred directly over the stream. Here the thicket was so dense that the tops of the shrubs could support the weight of a man. Growing in the deep shade beneath this thicket were *Viola palustris* and *Scutellaria galericulata* var. *epilobiifolia*.

**DRY ROCK FIELD.** Tundra vegetation was observed on the north and northwest sides of the summit of Arctic Butte, a granite hill at 1550 feet elevation located 3.2 km southwest of Patterson Lake. Arctic Butte was covered with red granite rubble and a shallow, coarse-textured soil.

Scattered, stunted individuals of *Picea mariana* and *Betula fontinalis* occurred on the hill, but in general the summit was treeless. The vegetation was dominated by *Empetrum hermaphroditum*, *Vaccinium uliginosum* and *Loiseleuria procumbens*. *Betula glandulosa*, *Pedicularis labradorica*, *Carex capitata* and *Vaccinium vitis-idaea* were common, and the shrubs *Salix bebbiana*, *S. planifolia*, *S. glauca*, *S. arbusculoides*, *Ledum palustre* var. *decumbens* and *Andromeda polifolia* were scattered throughout. Also here were *Carex bigelowii*, *Eriophorum brachyantherum* and *Calamagrostis canadensis*.

The arctic taxa *Carex capitata* and *Luzula confusa* occurred in deeper soil around the base of boulders and *Carex glacialis* occurred only on bare soil near the centre of frost boils. This rock field is similar to those described by Larsen (1965) from the south end of Ennadai Lake, N.W.T.

In subarctic Saskatchewan arctic taxa begin to appear, although infrequently, in both boreal and tundra communities. For example, *Salix reticulata* occurred in a small muskeg at the edge of an esker kettle and in a *Vaccinium uliginosum*—*Scirpus caespitosus* fen in association with *Salix arctophila*, *Lycopodium selago* and *Pinguicula vulgaris*. *Lycopodium selago* also occurred infrequently in *Picea mariana* muskegs sometimes with *Loiseleuria procumbens* and in wet *Picea mariana*—*Salix planifolia* woods on stream margins. *Salix arctophila* appeared infrequently in *Carex* fens and in wet drainageways in *Picea mariana* muskegs and *Loiseleuria procumbens* frequently was noted in *Picea mariana*—lichen woods. Arctic taxa also occurred in small numbers in such restricted habitats as rocky lake margins and silt frost boils.



## ANNOTATED CATALOGUE OF PLANT SPECIES

The following catalogue contains 203 taxa of vascular plants, 42 bryophytes and 24 lichens. The relatively high number of vascular plants in this area as compared with surrounding areas such as Black Lake, 132 taxa (Scotter, 1961), Big Spruce River, 135 taxa (Ritchie, 1959) and Neultin Lake, 134 taxa (Porsild, 1950) may be a reflection of its transitional subarctic vegetation in which some low arctic species begin to appear and boreal species still persist.

A number of species new to Saskatchewan are reported here, including 13 vascular plants, 15 bryophytes and 1 lichen.

The nomenclature is after Scoggan (1957) except where synonyms are cited.

All specimens have been identified by the author with the exception of the lichens (M. Hale and J. Thomson), bryophytes (H. Crum), Polypodiaceae (R. & A. Tryon), *Isoetes* (C. Reed) and *Betula* (J. Dugle). Other groups were verified by specialists: *Carex* (J. Calder or F. Hermann), *Juncus* (F. Hermann), Compositae (A. Cronquist), Gramineae (W. Dore), *Pinus* (R. Shoenike) and miscellaneous specimens (A. E. Porsild). A complete set of specimens is deposited in the W. P. Fraser Herbarium, University of Saskatchewan.

Abbreviations used in catalogue are: H. L., Hasbala Lake; P. L., Patterson Lake; W. L., Warren Lake. The collection numbers are the author's.

## Vascular Plants

## EQUISETACEAE

*EQUISETUM ARVENSE* L. Infrequent on lake shores, sandy beaches, and rocky shores; on mineral soil in *Picea mariana* burns; and in *Betula glandulosa* scrub vegetation. H. L. 259-63; P. L. 439-63.

*E. FLUVIATILE* L. Emergent aquatic on lake margins; infrequent in a wet *Menyanthes-Scirpus* fen. An extensive *E. fluviatile* marsh occurs at the south end of Hasbala Lake. H. L. 881-62, 178-63.

*E. PALUSTRE* L. In wet *Picea mariana* woods. H. L. 234-63, 285-63. A northward extension of the Saskatchewan range of this species (see map 89, Hultén, 1964).

*E. SCIRPOIDES* Michx. Frequent on compact moss hummocks in *Picea mariana* muskegs and in *P. mariana* burns, on rocky lake shores, and on mineral soil in tundra vegetation. H. L. 852-62, 1029-62, 225-63, 236-63.

*E. SYLVATICUM* L. In *Picea mariana* muskeg. H. L. 981-62, 216-63.

## LYCOPODIACEAE

*LYCOPodium ANNOTINUM* L. var. *PUNGENS* (La Pylaie) Desv. In dry, open *Picea mariana*—*Betula glandulosa*—lichen woods

on esker and on mineral soil in *Picea mariana* burns. H. L. 929-62, 260-63.

*L. CLAVATUM* L. In *Picea mariana*—lichen woods. H. L. 1042-62, 263-63.

*L. COMPLANATUM* L. Common in *Picea mariana*—lichen woods, dry lichen slopes on eskers, and on dry sandy slopes in *Picea mariana* burns. H. L. 104-63, 145-63.

*L. SABINAEFOLIUM* Willd. ssp. *SITCHENSE* (Rupr.) Calder & Taylor. Common on eskers in *Picea mariana*—lichen woods, on dry sandy slopes, and in *Picea mariana*—*Larix laricina*—*Pinus banksiana* woods. H. L. 928-62, 193-63, 485-63.

This is the second Saskatchewan record for this rarely collected species. It was previously collected by Raup (1936) on Lake Athabasca at the mouth of the William River. It resembles *L. alpinum* L. in its habit and the short sessile strobili (ca. 0.5-0.8 cm long), but differs from that species in lacking flattened dorsiventral branches and trowel-shaped leaves.

*L. SELAGO* L. Infrequent, but occurring in a variety of habitats from *Picea mariana*—*Larix laricina* woods on the edge of an esker in association with *L. sabinæfolium* ssp. *sitchense* and *Loiseleuria procumbens*, to a *Scirpus caespitosus*—*Vaccinium uliginosum*



fen on a pond margin in association with *Pinguicula vulgaris*, *Salix reticulata* and *S. arctophila*; and in a wet stream margin woods. H. L. 191-63, 194-63, 316-63.

This is the second report of this arctic species for Saskatchewan. It was previously collected on the shores of Lake Athabasca (Raup, 1936). Wherever this species was collected it was in association with other arctic species.

#### SELAGINELLACEAE

*SELAGINELLA SELAGINOIDES* (L.) Link. Rare, in moss on a rocky lake margin growing under *Salix planifolia* and *Betula glandulosa* in association with *Coptis trifolia* var. *groenlandica*, *Parnassia kotzebuei* and *Primula mistassinica*. P. L. 404-63.

#### POLYPODIACEAE

*GYMNOCARPIUM ROBERTIANUM* (Hoffm.) Newm. In mature streamside *Picea mariana*—*Betula "papyrifera"* woods, and locally abundant with mosses in crevices on granitic and metamorphic cliffs. H. L. 895-62, 227-63; P. L. 361-63, 456-63.

*POLYPODIUM VULGARE* L. var. *VIRGINIANUM* (L.) Eaton. Seen only as a large colony growing in a *Cladonia rangiferina*, *C. cornuta* mat on a granite block at the base of a cliff. P. L. 464-63.

*WOODSIA GLABELLA* R. Br. In crevices on an outcrop in *Picea mariana* woods, and in crevices on a metamorphic cliff. H. L. 226-63, 239-63.

#### ISOETACEAE

*ISOETES MURICATA* Dur. var. *BRAUNII* (Dm.) Reed. Rarely collected but widely distributed in lakes in northeastern Saskatchewan. Usually growing in sand in water 7-30 cm deep. H. L. 1044-62; P. L. 405-63, 432-63; W. L. 611-63.

#### PINACEAE

*JUNIPERUS COMMUNIS* L. var. *DEPRESSA* Pursh. Occasional in dry *Picea mariana*—lichen woods and in blowouts in *Pinus banksiana*—*Picea mariana* woods on sandy eskers. Most commonly seen on dry south-facing outcrops. H. L. 1013-62, 237-63.

*LARIX LARICINA* (Du Roi) K. Koch. A relatively uncommon species, collected from the margin of a *Sphagnum* bog and on the margin of an island in Hasbala Lake. This species has been observed in the transitional area between *Picea mariana* muskeg and *P.*

*mariana*—feather moss woods. H. L. 1051-62, 235-63.

*PICEA GLAUCA* (Moench) Voss. The least common conifer in northeastern Saskatchewan. Only two stands observed, one consisting of a single tree, 15 feet tall, growing on a patch of turf in a blowout in a *Picea mariana* woods on a sandy esker (H. L. 199-63) and the other a small stand in a wet *Picea glauca*—*P. mariana*—*Larix laricina* woods.

*PICEA MARIANA* (Mill.) BSP. The dominant conifer in the study area, occupying a wide variety of habitats from dry ridge tops and esker summits to wet muskegs and *Sphagnum* bogs. On very sandy sites it is often accompanied by or replaced by *Pinus banksiana*. H. L. 995-62, 996-62, 1039-62; W. L. 607-63.

*PINUS BANKSIANA* Lamb. A relatively common tree species on sandy sites where it may form almost monodominant stands (H. L. 1004-62, 303-63A). It also occurs in open *Picea mariana*—lichen woods on summits and sandy parts of eskers (H. L. 822-62, 932-62).

Some individuals referable to *P. banksiana* (cf., population sample 1004-62, specimen 303-63A and other collections from northern Saskatchewan) show some *P. contorta*-like characteristics including umbos with prominent and persistent spines, divergent cone axes and longer than average needles. *Pinus contorta* does not now occur in boreal Saskatchewan (known in Saskatchewan only from Cypress Hills) and the problem of explaining the presence of these characters in northeastern Saskatchewan is an interesting one. The evidence for introgression between *P. banksiana* and *P. contorta* in Saskatchewan is being assembled and it will appear in a separate paper.

#### SPARGANIACEAE

*SPARGANIUM ANGUSTIFOLIUM* Michx. Seen only once floating in a sluggish stream. H. L. 920-62.

*S. MINIMUM* (Hartm.) Fries. In shallow, sluggish water at edge of small lake and in very wet *Carex*—*Menyanthes* fens. H. L. 883-62, 134-63; P. L. 429-63.

#### POTAMOGETONACEAE

*POTAMOGETON ALPINUS* Balbis var. *TENUIFOLIUS* (Raf.) Ogden. Floating in fast-flowing streams and in shallow water on lake margins. H. L. 884-62, 246-63; P. L. 420-63.



*P. FILIFORMIS* Pers. var. *BOREALIS* (Raf.) St. John. Growing in shallow water at lake edge in sandy-gravel substrate. H. L. 1045-62.

This report is an extension of the range of this species into northern Saskatchewan.

*P. RICHARDSONII* (Benn.) Rydb. Occurs in fast-flowing streams and lakes in water 0.3 to 2 m deep. H. L. 885-62, 247-63, 350-63.

#### JUNCAGINACEAE

*TRIGLOCHIN MARITIMA* L. On wet pond margins in a *Scirpus*—*Menyanthes* fen, and in *Carex aquatilis*—*C. livida*—*Scirpus* fens. H. L. 135-63, 180-63, 184-63; P. L. 482-63.

#### GRAMINEAE

*AGROPYRON TRACHYCAULUM* (Link.) Malte var. *NOVAE-ANGLIAE* (Scribner.) Fern. A rare species in this area. Encountered only twice, once on the south-facing sandy slope of an esker associated with *Populus balsmifera* and again in a wet drainage area in a *Picea mariana* muskeg. H. L. 320-63; P. L. 445-63.

*AGROSTIS BOREALIS* Hartm. Common in the tundra on the moist boulder field, in *Salix* thickets, and on rocky lake shores. H. L. 1027-62, 1028-62, 340-63, 358-63; P. L. 396-63.

*A. SCABRA* Willd. Common in dry habitats including blowouts in *Pinus banksiana*—*Picea mariana* woods, dry depressions on eskers, on a beaver house, and on sand in partly burned *Pinus banksiana* woods. A meadow dominated by this species associated with dwarfed *Picea mariana* was observed on a sandy esker at Warren Lake. H. L. 915-62, 926-62, 1008-62, 304-63A; W. L. 602-63.

*CALAMAGROSTIS CANADENSIS* (Michx.) Beauv. Occupies a wide variety of habitats from *Picea mariana*—lichen woods to *Picea mariana* muskeg, sand blowouts in *Pinus banksiana* woods, granitic cliffs, rich graminoid—*Salix* thickets and the moist boulder field and dry rock field tundra. H. L. 949-62, 819-62, 1010-62, 863-62, 220-63; P. L. 377-63, 379-63A, 422-63, 428-63, 431-63, 450-63.

Two specimens have been referred to var. *langsдорffii* (Link.) Hult., 422-63, 949-62. The variation in this species is confusing and the two specimens from the dry rock field tundra on Arctic Butte, 377-63 and 379-63A, have been apparently so modified by their environment that they are not readily distinguishable as the species.

*C. INEXPANSA* Gray. Occurs in *Picea mariana*—lichen woods on eskers, in *Picea mariana* muskegs, among boulders on stream

margins, and in an *Agrostis scabra* meadow. H. L. 820-62, 848-62, 871-62; P. L. 427-63, 446-63; W. L. 603-63.

*C. PURPURASCENS* R. Br. On sandy eskers, blowouts in *Pinus banksiana*—*Picea mariana* woods and in *P. mariana* burns on sandy soils. H. L. 1000-62, 1009-62, 105-63; W. L. 591-63.

*FESTUCA SAXIMONTANA* Rydb. Apparently restricted to eskers where it occurs on open sandy-gravel slopes, sand blowouts, and in an *Agrostis scabra* meadow. H. L. 1005-62, 302-63A; W. L. 598-63, 606-63.

*ORYZOPSIS PUNGENS* (Torr.) Hitchc. In *Picea mariana*—lichen woods and dry depressions on eskers. H. L. 927-62, 970-62, 484-63.

*POA ALPINA* L. Seen only in the tundra vegetation on the moist boulder field south of Hasbala Lake in sand on and between boulders. H. L. 1025-62, 330-63.

This is the second report of this species for Saskatchewan. It was previously collected by Raup (1936) on the north shore of Lake Athabasca.

*P. GLAUCA* Vahl. Frequent in dry habitats including sandy eskers, mineral soil in *Picea mariana* burns, granitic and metamorphic cliffs, and open *Picea mariana*—lichen woods on eskers. H. L. 125-63, 202-63, 229-63, 233-63, 305-63, 833-63; P. L. 362-63, 457-63; W. L. 593-63, 596-63.

*TRisetum SPICATUM* (L.) Richter ssp. *MOLLE* (Michx.) Hult. In dry habitats on sandy eskers and in a *Picea mariana* burn. H. L. 925-62, 305-63A, 143-63.

#### CYPERACEAE

*CAREX ABDITA* Bickn. A pioneer on sand blowouts in *Pinus banksiana*—*Picea mariana* esker woods, and on open sand in *Picea mariana* burns. H. L. 1006-62, 1014-62, 160-63, 306-63.

New to the flora of Saskatchewan and representing a considerable northward extension of the range of this transcontinental temperate species. Reported by Ritchie (1956) from a similar habitat at Tod Lake, Manitoba about 400 km south of Hasbala Lake.

Some of this material was first identified as the closely related cordilleran species *C. brevipes*. However, it is probably best to refer this material to the transcontinental *C. abdita*, as suggested by Dr. J. Calder (personal communication). The taxonomy of this and the related taxa, *C. rossii*, *C. umbellata*, *C. tonsa*, *C. deflexa*, and *C. brevipes*, is in need of revision.



*C. AENEA* Fern. In *Picea mariana*—*Pinus banksiana* burn regeneration on a till ridge. H. L. 106-63.

*C. AQUATILIS* Wahl. Dominant in *Carex*—*Scirpus* fens and present on lake shores in wet drainage ways in *Picea mariana* woods. H. L. 174-63, 244-63; P. L. 392-63, 444-63 (the latter specimen is immature but near *C. aquatilis*).

*C. BICOLOR* All. Seen only once on a hard silt frost boil in a *Picea mariana* muskeg. H. L. 269-63.

A rarely collected arctic—subarctic species new to the flora of Saskatchewan. It is principally a coastal species known, to the east, from Churchill (Scoggan, 1957) and, to the northwest, from Great Bear Lake and Bathurst Inlet (Porsild, 1957, Map. 83).

*C. BIGELOWII* Torr. Infrequent in the tundra on the moist boulder field and on the dry rock field, and a member of the pioneer, sand-stabilizing communities on sand blow-outs. H. L. 1026-62, 325-63, 342-63, 286-63; P. L. 374-63, 379-63; W. L. 608-63.

New to the flora of Saskatchewan but previously reported from several arctic (Scoggan, 1957) and subarctic (Ritchie, 1959) localities in Manitoba.

*C. BRUNNESCENS* (Pers.) Poir. A member of moist streamside and rocky lake margin communities. Seen also on *Sphagnum* in a wet muskeg meadow. H. L. 977-62, 108-63, 250-63; P. L. 397-63.

*C. BUXBAUMII* Wahl. In wet *Carex*—*Scirpus* fens. H. L. 176-63.

*C. CANESCENS* L. Seen only once in a *Carex* fen associated with *Eriophorum angustifolium*. H. L. 865-62.

*C. CAPILLARIS* L. ssp. *CHLOROSTACHYS* (Stevens) Löve. Infrequent on lake and stream margins, in wet drainage ways in *Picea mariana* muskegs and in tundra on the moist boulder field. H. L. 859-62, 356-63; P. L. 393-63, 447-63.

*C. CAPITATA* L. Common in the tundra on the dry rock field. P. L. 372-63.

*C. CHORDORRHIZA* Ehrh. ex L. f. Seen only in a *Carex*—*Scirpus* fen. P. L. 481-63.

*C. DEFLEXA* Hornem. In a rich *Salix*—*Carex*—*Calamagrostis* thicket at the edge of a *Picea mariana* muskeg and in a *P. mariana* burn on a sandy esker. H. L. 979-62, 197-63.

*C. DIANDRA* Schrank. Occurs on the margin of a wet depression in a *Picea mariana* muskeg and in the tundra on the moist boulder field. H. L. 322-63; P. L. 477-63.

*C. DIOICA* L. ssp. *GYNOCRATES* (Wormskj.) Hult. In *Picea mariana* muskegs and associated with *Vaccinium uliginosum*, *Betula glandulosa* and *Potentilla fruticosa* on the moist boulder field. H. L. 853-62, 346-63.

*C. FOENEA* Willd. Common in dry sandy habitats, sand blowouts, *Picea mariana*—lichen woods, lichen-covered depressions on eskers, dry slopes in *Picea mariana* burns, and in an *Agrostis* meadow on an esker. H. L. 831-62, 931-62, 935-62, 1007-62; W. L. 601-63.

*C. GARBERI* Fern. (*C. hassei* in Breitung, 1957). Seen only once in moss on a rocky lake shore, associated with *Parnassia kotzebuei*. P. L. 394-63.

*C. GLACIALIS* Mack. In the tundra on the dry rock field growing on the mineral soil in a frost boil. Also seen as a pioneer on open sandy gravel on an esker associated with *C. supina*. P. L. 378-63, 382-63; W. L. 595-63.

An uncommon species in Saskatchewan reported previously by Raup (1936) from a dolomitic ledge on the north shore of Lake Athabasca. This usually calcicolous species (Gjaervoll, 1958; Raup, 1936) was collected from a granite outcrop.

*C. INTERIOR* Bailey. Seen only once growing on an outcrop in "Quillwort" Lake. H. L. 892-62.

*C. LEPTALEA* Wahl. In wet depressions and drainage ways in *Picea mariana* muskegs and on stream margins. H. L. 845-62, 847-62, 357-63; P. L. 419-63.

*C. LIMOSA* L. One of the mat-forming species in *Sphagnum* bogs, muskeg pools, and *Carex aquatilis*—*Scirpus* fens. H. L. 1050-62, 256-63; P. L. 478-63.

*C. LIVIDA* (Wahl.) Willd. Collected only once in a *Carex*—*Scirpus* fen. H. L. 181-63.

*C. LOLIACEA* L. Scattered in *Hylocomium splendens* in a wet drainage way in a *Picea mariana* muskeg. P. L. 418-63.

*C. MAGELLANICA* Lam. (*C. paupercula* Michx.) In wet *Sphagnum*-filled depressions in *Picea mariana* muskegs and in a *Sphagnum*, *Carex* meadow on a stream margin. H. L. 876-62, 256-63A, 295-63.

In using this name I am following Hultén (1942) and Calder (personal communication) who maintain that the North American *C. paupercula* cannot be clearly distinguished from the Southern Hemisphere *C. magellanica*.

*C. NORVEGICA* Retz. On frost hummocks and on sand between boulders in shrubby tundra on the moist boulder field. Also scattered in *Hylocomium splendens* in a wet



drainage way in a *Picea mariana* muskeg and in dry *Picea mariana*—lichen woods on a granite outcrop. H. L. 862-62, 213-63, 329-63, 347-63; P. L. 417-63.

*C. ROSTRATA* Stokes. A common species, dominant in large meadows in shallow water on lake margins. H. L. 919-62; P. L. 440-63.

*C. SAXATILIS* L. ssp. *LAXA* Kalela (*C. physocarpa* Presl., *C. saxatilis* var. *major* Olney). Found in lake margin habitats including a *Picea mariana* muskeg, a *Carex rostrata* fen, a *Salix*, *Carex*, *Calamagrostis* fen, between rocks in shallow water and on a sandy beach. H. L. 867-62, 918-62, 973-62, 112-63, 245-63.

For a discussion of *Carex physocarpa* and its relationship to *C. saxatilis* see Gjaervoll, 1958, Hultén, 1964 and Scoggan, 1957. These taxa are apparently confluent and the former is distinguished from the latter only by its more robust habit and the dropping pistillate spikes. I am following Hultén in treating *C. physocarpa* as *C. saxatilis* ssp. *laxa*.

*C. SAXATILIS* L. var. *MILIARIS* (Michx.) Bailey. On sand among boulders in the tundra on the moist boulder field, and on a sandy beach at the edge of *Picea mariana*—lichen woods. H. L. 328-63, 341-63; P. L. 435-63.

*C. SCIRPOIDEA* Michx. In tundra on the moist boulder field and in wet depressions and drainage ways in *Picea mariana* muskegs. H. L. 842-62, 843-62, 327-63, 339-63, 172-63; P. L. 443-63.

*C. SUPINA* Willd. ex Wahl. ssp. *SPANIOCARPA* (Steud.) Hult. Seen only as a pioneer on open sand and sandy-gravel slopes on an esker, associated with *C. glacialis* and *C. bigelowii*. W. L. 594-63, 609-63.

*C. VAGINATA* Tauscher. In wet drainage ways in *Picea mariana* muskegs. H. L. 169-63, 309-63; P. L. 444-63A.

*ERIOPHORUM ALPINUM* L. (*Scirpus hudsonianus* (Michx.) Fern.). Associated with *Scirpus caespitosus* on margins of muskeg pools and in *Carex*—*Scirpus* fens. A dominant in a *Carex* meadow on a bog island. H. L. 891-62, 192-63A; P. L. 476-63.

*E. ANGUSTIFOLIUM* Honck. ssp. *SUBARCTICUM* (Vassil.) Hult. (var. *majus* Schultz). In wet *Carex* meadow, *Carex Sphagnum* depressions in *Picea mariana* muskegs, and at stream edge in tundra on the moist boulder field. H. L. 864-62, 978-62, 248-63, 332-63.

*E. BRACHYANTHERUM* Trautv. Seen only twice, once in tundra on the dry rock field west of Patterson Lake and again, in a *Picea mariana* muskeg. H. L. 117-63; P. L. 370-63.

*E. CHAMISSONIS* Mey. Collected in a *Carex rostrata* fen on a lake margin and in a *Sphagnum* bog. H. L. 916-62, 1047-62.

*E. VAGINATUM* L. Forming tussocks in wet *Sphagnum* depressions in a *Picea mariana* muskeg. H. L. 298-63.

*E. VIRIDICARINATUM* (Engelm.) Fern. In a *Carex*—*Scirpus* fen. H. L. 177-63.

*SCIRPUS CAESPITOSUS* L. var. *CALLOSUS* Bigel. Dominant in *Carex*—*Scirpus* fens, common on the margins of muskeg pools, and in the tundra on the moist boulder field. H. L. 840-62; P. L. 434-63.

#### ARACEAE

*CALLA PALUSTRIS* L. Local in *Carex* meadows and on the wet margin of a beaver pond. H. L. 882-62; P. L. 470-63.

#### JUNCACEAE

*JUNCUS TRIGLUMIS* L. ssp. *ALBESCENS* (Lange) Hult. (*J. albescens* (Lange) Fern.). A pioneer species on hard silt frost boils in drainage channels in *Picea mariana* muskegs and in the tundra on the moist boulder field. H. L. 846-62, 348-63, 220-63A, 433-63.

New to the flora of Saskatchewan. This record represents a southern extension of the range of this arctic-circumpolar taxon. It has been reported as rare and restricted to frost-disturbed habitats in northern Manitoba by Ritchie (1959) and Scoggan (1957).

The taxonomic relationship of *Juncus albescens* and *J. triglumis* has been discussed by several authors. Scandinavian taxonomists (Hultén, 1943; Gjaervoll, 1958) generally regard them as conspecific, whereas, North American taxonomists (Fernald, 1924; Por-sild, 1939; Scoggan, 1957) regard them as distinct species. There is no doubt that these taxa are closely related and Hultén's decision to treat them as subspecies (1964) seems to be appropriate. He proposes the taxon ssp. *albescens*, for the "Greenland-American eastern Asiatic type, characterized by shorter capsules . . .", and also paler bracts and perianth, and taller culms.

*J. CASTANEUS* J. E. Sm. Collected once on a hard silt frost boil in a *Picea mariana* muskeg. H. L. 121-63.

New to the flora of Saskatchewan but not unexpected in view of its occurrence in Manitoba (Scoggan, 1957), Alberta (Moss, 1959), and the Northwest Territories (Thieret, 1963).



*J. FILIFORMIS* L. Locally abundant in sand between rocks on a lake shore and on a sandy beach. H. L. 113-63; P. L. 389-63.

*TUZULA CONFUSA* Lindb. Rare, but locally abundant in the tundra on the dry rock field on Arctic Butte. P. L. 373-63.

An arctic circumpolar taxon new to the flora of Saskatchewan. Known from heath and barrens communities in northern Manitoba (Ritchie, 1959) and the Northwest Territories (Porsild, 1950). It is characterized by a single compact head and channeled, subulate-tipped leaves which are purplish at the base.

*L. PARVIFLORA* (Ehrh.) Desv. Local in *Picea mariana* muskegs and with *Salix* spp. on moist slopes along lake edge. H. L. 824-62, 940-62, 118-63, 151-63.

*L. NIVALIS* (Laest.) Beurl. Rare in moss on a rocky lake margin, and in a *Picea mariana* muskeg. P. L. 388-63, 395-63.

This report of *Luzula nivalis* for northeastern Saskatchewan is not only a new species for the Province but a remarkable southward extension of the range of this high-arctic species. It was seen twice, once on a rocky lake margin growing in association with other rare or uncommon species which reach the arctic, including *Parnassia kotzebuei*, *Selaginella selaginoides*, *Polygonum viviparum* and *Primula mistassinica*, all growing in the shade of *Salix planifolia* and *Betula glandulosa*, and a second time as a single individual in a *Picea mariana* muskeg.

These specimens compare favorably with material of *Luzula nivalis* from Banks Island and Southampton Island. The inflorescence is a single compact head with a bract equaling but not exceeding the inflorescence. The leaves are flat, 2-2.5 mm broad, with blunt callus tips and the basal leaves are brown at the base.

#### LILIACEAE

*SMILACINA TRIFOLIA* (L.) Desf. On *Sphagnum* hummocks and in wet depressions in *Picea mariana* muskegs. H. L. 871-62, 893-62, 251-63; P. L. 407-63.

*TOFIELDIA PUSILLA* (Michx.) Pers. In *Picea mariana* muskegs on hard silt frost boils and in wet drainage ways and in a *Scirpus caespitosus*—*Vaccinium uliginosum* fen. H. L. 873-62, 120-63, 182-63; P. L. 448-63.

New to the flora of Saskatchewan but noted by Breitung (1957), (as *T. palustris* Huds.), to be expected in "... the extreme northern part of Saskatchewan." It has pre-

viously been reported by Raup (1936) from northeastern Alberta (Sand Pt., Lake Athabasca), by Porsild (1950) and Baldwin (1953) from Nueltin Lake, N.W.T., and from Kasmere Lake (Scotter, 1965) and Seal River (Ritchie, 1959) in northern Manitoba.

#### ORCHIDACEAE

*CORALLORHIZA TRIFIDA* Chat. Rare, seen only once in a *Picea mariana* muskeg. P. L. 424-63.

*CYPRIPEDIUM PASSERINUM* Richards. Collected once in a *Picea mariana* muskeg with *Spiranthes* and *Habenaria*. H. L. 218-63.

*HABENARIA HYPERBOREA* (L.) R. Br. Uncommon in *Picea mariana* muskegs and in *Carex*—*Scirpus* fens. H. L. 179-63, 217-63A.

*ORCHIS ROTUNDIFOLIA* Banks. Encountered only once scattered in mosses in a mixed *Picea glauca*—*P. mariana*—*Larix laricina* woods. H. L. 170-63.

*SPIRANTHES ROMANZOFFIANA* Cham. Local in *Picea mariana* muskegs. H. L. 855-62, 217-63.

#### SALICACEAE

*POPULUS BALSAMIFERA* L. Seen only on a sandy, dry, south-facing esker slope. Several individuals were present but all had been cut to the base by beavers and were regenerating by suckering. H. L. 319-63.

Observed here near the northern limit of the species.

*P. TREMULOIDES* Michx. Seen only once forming a low thicket around the margin of a sand blowout on an esker at Warren Lake. There were no shoots taller than 1 m and all shoots were vegetative. W. L. 600-63.

Occurring here near its northern limit. Observations concerning the shrubby habit of aspen near the northern edge of its range have been made by Tyrrell (1898) and Ritchie (1959).

*SALIX ARBUSCULOIDES* Anderss. Infrequent in *Picea mariana* muskegs, streamside woods, *Picea mariana*—lichen woods and in tundra communities. H. L. 870-62, 900-62, 1033-62, 124-63, 311-63; P. L. 365-63, 386-63.

A widely distributed species occurring as individuals rather than in stands. Shrub height varies from 3 to 7 m on wet stream-sides, and 0.3 to 1 m in dry or tundra situations.

*S. ARCTOPHILA* Cock. ex Heller. Common in the tundra and the *Betula glandulosa*—*Vaccinium uliginosum* scrub on the moist boulder field. Seen rarely in other habitats including a *Scirpus*—*Vaccinium* fen, a *Carex*



fen, and in a wet drainage way in a *Picea mariana* muskeg. H. L. 837-62, 877-62, 1030-62, 1036-62, 1037-62, 189-63, 190-63, 323-63, 336-63; P. L. 442-63.

New to the flora of Saskatchewan. *Salix arctophila* is an arctic taxon closely related to *S. arctica* Pall. neither of which has been known to occur in Saskatchewan. The ranges of these taxa overlap in northcentral Northwest Territories (see Raup, 1959, Map 7) and their apparent intergradation in this area has led Drury (1962) to consider them as conspecific. My experience with both of these taxa in regions outside of the zone of overlap supports maintaining them as separate species until a comprehensive study can be made.

Outside the zone of overlap these species can be distinguished as follows:

*S. arctophila*

1. Branchlets green, slender and trailing.
2. Stems and leaves glabrous (except the proximal leaves).
3. Nectaries short, about  $\frac{1}{2}$  the length of the pedicels.
4. Ovaries clothed with flat trichomes which refract light into a spectrum.

*S. arctica*

1. Branchlets and branches usually stout and prostrate, not conspicuously trailing.
2. Stems and leaves more or less pubescent, mature distal leaves "bearded" with a tuft of straight trichomes.
3. Nectaries longer than the pedicels.
4. Ovaries densely clothed with terete, non-refractive trichomes.

There is little doubt that these taxa do intergrade within the area of overlap and a thorough study may support Drury's opinion, but the "typical" forms are distinct enough to be maintained until the necessary study is made.

*S. BEBBIANA* Sarg. Common on dry esker slopes and in *Picea mariana*-*Betula* "papyrifera" woods on thin soil overlying granitic outcrops. Infrequent on lake margins and in the tundra on the dry rock field. H. L. 937-62, 366-63; P. L. 468-63; W. L. 590-63.

This is a minor northeastern extension of the range of this species. Map 21 in Raup (1959) should be amended accordingly.

*S. CANDIDA* Fluegge ex Willd. Rare. Observed only twice, once on a rocky lake shore, and a second time on a *Sphagnum* hummock in a very wet *Carex* meadow. H. L. 221-63, 283-63.

This species is usually confined to calcareous or alkaline habitats (Argus, 1964b, Raup, 1959) and is uncommon on the Precambrian Shield. This locality is near the northern limit of the range of the species.

*S. GLAUCA* L. Frequent as individuals in *Picea mariana* muskegs, *P. mariana*-feather moss and summit woods on eskers, in streamside and lake margin vegetation associated with *Salix planifolia*, in dry *Picea mariana*-lichen woods on granitic outcrops, and in the tundra on the moist boulder field and the dry rock field. H. L. 854-62, 939-62, 997-62, 1031-62, 1034-62, 1035-62, 116-63, 152-63, 153-63, 155-63, 156-63, 307-63A, 331-63, 353-63; P. L. 363-63, 364-63, 371-63, 383-63, 384-63, 385-63, 423-63, 436-63, 437-63, 469-63.

*S. MYRTILLIFOLIA* Anderss. Infrequent in *Picea mariana* muskegs, in deep turf under *Betula glandulosa* on the moist boulder field, and on lake margins. H. L. 850-62, 150-63, 243-63.

Only the "typical" form of the species with a decumbent, spreading habit was encountered in this area. Northeastern Saskatchewan is very near the northern edge of the range of this boreal forest species.

*S. PEDICELLARIS* Pursh (including var. *hypoglauca* Fern.). Uncommon, restricted to wet *Carex* fens, wet *Sphagnum*-filled depressions in *Picea mariana* woods, and *Sphagnum* bogs. H. L. 875-62, 1048-62, 131-63, 254-63; P. L. 472-63, 479-63.

Near the northern limit of the range of this species. Map 23 Raup, 1959, should be amended to include northeastern Saskatchewan.

*S. PEDICELLARIS* Pursh X *PLANIFOLIA* Pursh. Specimens representing this hybrid, or perhaps *S. glauca* X *planifolia* have been collected in several habitats. This material will be considered in a separate paper.

*S. PLANIFOLIA* Pursh. This is the most important species of willow in northeastern Saskatchewan, and is often dominant in moist or wet habitats. It has been observed in *Picea mariana* muskegs, *P. mariana*-lichen woods, *Scirpus* fens, in streamside and lake-shore vegetation, and in the tundra on the moist boulder field and the dry rock field. It is frequently the dominant in *Salix* scrub communities on lake margins. H. L. 901-62, 944-62, 1032-62, 253-63, 282-63, 284-63, 352-63; P. L. 368-63, 438-63.

*S. PYRIFOLIA* Anderss. Uncommon in *Picea mariana* woods and in rubble at the base of granitic cliffs. It was a dominant in a willow



thicket on the margin of a *Carex* fen at Warren Lake, but not observed in similar habitats elsewhere. P. L. 360-63, 430-63; W. L. 610-63.

*S. RETICULATA* L. Infrequent in *Picea mariana* muskegs, *P. mariana* mixed woods, *Vaccinium uliginosum*—*Scirpus* fens and on rocky lake shores. Common in the tundra on the moist boulder field. H. L. 823-62, 838-62, 1024-62, 149-63, 186-63, 276-63; P. L. 387-63.

New to the flora of Saskatchewan and a marked southern extension of the range of this arctic-alpine species (Map 3, Raup, 1959, should be amended accordingly). In view of its relative importance in this region and the variety of habitats that it occupies it is expected to occur in similar subarctic habitats further southward and westward.

*S. SERISSIMA* (Bailey) Fern. Rare, but locally abundant in a thicket covering a boulder-choked stream. H. L. 860-62, 335-63.

This species forms a dense thicket in association with *Betula glandulosa* and *Salix planifolia* over a stream flowing through the moist boulder field south of Hasbala Lake. This sterile, but vegetatively vigorous, population was observed for two years but no flowers or fruits were noted. This report represents a northeastward extension of the species range. Map 1 in Raup, 1959, should be amended to include this area.

#### MYRICACEAE

*MYRICA GALE* L. Occurs in *Carex*—*Scirpus* fens, under *Salix* on rocky lake shores, and in the tundra on the moist boulder field. H. L. 835-62, 188-63.

#### BETULACEAE<sup>1</sup>

*ALNUS CRISPA* (Ait.) Pursh. Infrequent on lake shores and in *Picea mariana* burn regeneration on sandy eskers. H. L. 938-62, 1003-62, 157-63.

*BETULA FONTINALIS* Sarg. Collected only in the tundra on the dry rock field. P. L. 381-62. Several putative hybrids involving this species were collected on the eskers at Hasbala Lake and presumably this species could be expected there also.

<sup>1</sup>*Betula* was identified by Dr. Janet Dugle, Osborn Botanical Laboratory, Yale University, New Haven, Conn., and the names used here follow her nomenclature. The absence of *B. papyrifera* from this collection probably reflects the insufficient collection of the genus from northeastern Saskatchewan. The genus *Betula* in northern Saskatchewan is very complex and deserves a thorough investigation.

Reported (as *B. occidentalis*) in a similar tundra habitat at Nueltin Lake by Porsild, 1950.

*B. FONTINALIS* Sarg. X *GLANDULOSA* Michx. (*B. X eastwoodae* Sarg.). In *Picea mariana*—lichen woods on esker and in the tundra on the dry rock field. H. L. 1062-62, 122-63, 123-63; P. L. 367-63.

*B. GLANDULOSA* Michx. Common in *Picea mariana*—lichen and feathermoss woods, dry lichen-covered slopes on eskers, *P. mariana* muskegs, *Carex*—*Scirpus* fens and tundra vegetation on the moist boulder field and on the dry rock field. H. L. 844-62, 1061-62, 1063-62.

*B. PAPYRIFERA* Marsh X *RESINIFERA* Brit. (*B. X winteri* Dugle). On a sandy esker. W. L. 589-63.

*B. RESINIFERA* Brit. Collected in *Picea mariana*—lichen woods on eskers and from the base of a granite cliff. H. L. 1064-62; P. L. 463-63.

#### POLYGONACEAE

*POLYGONUM VIVIPARUM* L. Rare in a *Betula glandulosa*—*Vaccinium uliginosum* thicket on the moist boulder field and in mossy turf in a muskeg at lake edge. H. L. 851-62, 114-63, 345-63.

Specimen 345-63 is floriferous at the apex and bulbiferous at the base, 851-62 is mixed and 114-63 is all bulbiferous.

New to the flora of Saskatchewan. This by Raup (1936), as indicated by Breitung (1957), but from Great Slave Lake and Calumet, Alberta, on the Athabasca River. This arctic—alpine species occurred only as rare, scattered individuals in mosses.

#### CARYOPHYLLACEAE

*ARENARIA MACROPHYLLA* Hook. Seen once in a *Picea mariana* burn. H. L. 147-63.

This species is apparently uncommon in northern Saskatchewan and has been previously reported only from Lake Athabasca (Raup, 1936).

*A. STRICTA* Michx. ssp. *DAWSONENSIS* (Britt.) Maguire. Occurs on dry slopes of sandy eskers and in the shrubby tundra on the moist boulder field. H. L. 1020-62, 1058-62, 198-63.

*CERASTIUM ALPINUM* L. var. *STRIGOSUM* Hult. Seen only in a burned *Picea mariana*—lichen woods. H. L. 207-63.

New to the flora of Saskatchewan and a southern extension of the range of this arctic taxon (see Hultén, 1956, Fig. 4).



STELLARIA CALYCANTHA (Ledeb.) Bong. In *Picea mariana* muskegs and in rich *Salix*—*Calamagrostis* vegetation along a stream. H. L. 948-62, 219-63.

S. LONGIFOLIA Muhl. ex Willd. In *Picea mariana* muskegs and *Salix planifolia* thickets on stream margins. H. L. 115-63, 257-63, 354-63.

#### NYMPHAEACEAE

NUPHAR VARIEGATUM Englem. Locally abundant in shallow lakes and sluggish streams. H. L. 921-62, 922-62.

#### RANUNCULACEAE

ACTAEA RUBRA (Ait.) Willd. Rare. Collected in a rich *Salix*—*Calamagrostis* community on a stream margin. H. L. 947-62.

ANEMONE MULTIFIDA Poir. Rare, known only from dry lichen covered depressions on an esker. H. L. 826-62, 827-62.

A. PARVIFLORA Michx. Uncommon, in a burned *Picea mariana*—lichen woods, and in the tundra on the moist boulder field where it was growing in sand between boulders. H. L. 1017-62, 209-63, 326-63.

Rare in northern Saskatchewan; previously reported in Saskatchewan from wet limestone cliffs at Carswell Lake (Argus, 1964a).

COPTIS TRIFOLIA (L.) Salisb. var. GROENLANDICA (Oeder) Fassett. Rare. Seen only on rocky lake margins in association with *Parnassia kotzebuei*, *Primula mistassinica*, *Selaginella selaginoides* and other rare species. P. L. 403-63.

RANUNCULUS AQUATILIS L. var. CAPILLACEUS (Thuill.) DC. An infrequent aquatic in shallow lakes and streams. H. L. 887-62, 349-63.

R. LAPPONICUS L. Rare. Seen only once in a *Hylocomium splendens* mat in a wet drainage way in a *Picea mariana* woods. P. L. 410-63.

R. REPTANS L. (*R. flammula* L. var. *ovalis* (Bigel.) Benson). On sandy beaches and in *Sphagnum* in wet *Picea mariana* muskegs. H. L. 110-63, 258-63.

#### PAPAVERACEAE

CORYDALIS SEMPERVIRENS (L.) Pers. Collected only in a *Picea mariana* burn. H. L. 144-63.

#### CRUCIFERAE

DRABA CINEREA Adams. Seen only on a dry metamorphic cliff. H. L. 231-63.

An arctic—circumpolar species rarely collected this far south. Represented in this

general region by collections from Lake Athabasca (Raup, 1936) and Churchill (Ritchie, 1956).

RORRIPA ICELANDICA (Oeder) Barbas var. FERNALDIANA Butt. & Abbe. On sandy beaches and in wet moss on lake edges. H. L. 111-63, 166-63.

#### DROSERACEAE

DROSERA ANGLICA Huds. Infrequent in *Sphagnum* bogs, and *Carex*—*Scirpus* fens. H. L. 1046-62, 175-63; P. L. 480-63.

#### SAXIFRAGACEAE

MITELLA NUDA L. Uncommon, in mixed *Picea glauca*—*P. mariana*—*Larix laricina* woods, *Picea mariana*—*Betula "papyrifera"* woods and in moss on rocky lake shores. H. L. 898-62, 172-63; P. L. 400-63.

PARNASSIA KOTZEBUEI Cham. Rare, seen only in moss on a rocky lake shore with other rare species including *Primula mistassinica*, *Carex garberi*, *Luzula nivalis*, *Selaginella selaginoides*, et al. P. L. 401-63.

P. MULTISETA (Ledeb.) Fern. (*P. palustris* L. ssp. *neogaea*). In *Picea mariana* muskeg and the tundra on the moist boulder field. H. L. 879-62, 1019-62; P. L. 402-63.

RIBES GLANDULOSUM Grauer. In *Pinus banksiana* burns, *Salix*—*Calamagrostis* vegetation on a creek margin and on a granite cliff. H. L. 946-62, 1002-62, 303-63; P. L. 451-63.

R. HUDSONIANUM Richards. In *Picea mariana* woods on eskers and in wet muskegs. H. L. 943-62, 242-63; P. L. 486-63.

R. LACUSTRE (Pers.) Poir. In *Picea mariana*—*Salix planifolia* woods. H. L. 312-63. Specimen vegetative.

R. OXYACANTHOIDES L. In burned *Picea mariana*—lichen woods on bedrock outcrop. H. L. 210-63. Specimen vegetative.

R. TRISTE Pall. In *Picea mariana*—*Salix planifolia* woods and on a granite cliff. H. L. 308-63; P. L. 458-63.

SAXIFRAGA TRICUSPIDATA Rottb. In dry habitats including lichen-covered depressions on eskers, *Picea mariana*—lichen woods and as a pioneer species on sandy-gravel ridges. H. L. 829-62, 100-63, 205-63.

#### ROSACEAE

POTENTILLA FRUITICOSA L. On lake margins, in *Picea mariana* muskegs and in a *Betula glandulosa*—*Vaccinium uliginosum* thicket on the moist boulder field where it is a co-dominant. H. L. 200-63, 344-63.



*P. NIVEA* L. Seen only on a metamorphic cliff. H. L. 230-63.

The second report of this arctic—circumpolar species reported previously from Lake Athabasca (Raup, 1936).

*P. NORVEGICA* L. Rare, in mossy drainage area in a *Picea mariana* woods, and on a bank beaver house. H. L. 913-62; P. L. 408-63.

*P. PALUSTRIS* (L.) Scop. Occurs in wet muskegs and in very wet *Carex fens*. H. L. 240-63, 252-63.

*P. TRIDENTATA* Ait. A pioneer species in sandy blowouts on eskers and on mineral soil in burns. H. L. 832-62, 1011-62, 163-63.

*RUBUS ACAULIS* Michx. Frequent in moist *Picea mariana* woods, mixed *P. glauca*—*P. mariana*—*Larix laricina* woods, *Salix* thickets and in the tundra on the moist boulder field. H. L. 974-62, 1023-62, 167-63; P. L. 409-63.

*R. CHAMAEMORUS* L. On *Sphagnum* in *Picea mariana* muskegs and in wet mossy streamside woods. H. L. 896-62, 241-63.

*R. IDAEUS* L. var. *STRIGOSUS* (Michx.) Maxim. In mossy streamside woods, burned *Picea mariana*—lichen woods on dry outcrop ridges, and on granite cliffs. H. L. 894-62, 203-63, 306-63A; P. L. 449-63.

#### LEGUMINOSAE

*ASTRAGALUS ALPINUS* L. Rare, in *Picea mariana* muskegs and in the tundra on the moist boulder field. H. L. 223-63, 268-63, 321-63.

*A. AMERICANUS* (Hook.) M. E. Jones. Rare, collected only in a *Picea mariana* burn. H. L. 224-63.

*A. EUCOSMUS* Robins. Rare, collected only on a metamorphic cliff. H. L. 232-63.

#### EMPETRACEAE

*EMPETRUM HERMAPHRODITUM* (Lge.) Hagerup (*E. nigrum* L.). A pioneer on sandy blowouts and dry, lichen covered depressions on eskers; common in *Picea mariana*—lichen woods and abundant in the tundra on the dry rock field. H. L. 966-62, 1012-62, 288-63; P. L. 369-63.

#### VIOLACEAE

*VIOLA PALUSTRIS* L. In streamside woods and in the tundra on the moist boulder field where it is growing in sand between boulders. H. L. 902-62, 1021-62, 34-63, 337-63, 474-63.

#### ELAEAGNACEAE

*SHEPHERDIA CANADENSIS* (L.) Nutt. Seen only once in a burned *Picea mariana* woods on a granite outcrop ridge. H. L. 206-63.

#### ONAGRACEAE

*EPILOBIUM ANGUSTIFOLIUM* L. Common in burns and in upland *Picea mariana* woods. H. L. 1040-62, 158-63.

*E. PALUSTRE* L. In *Sphagnum* in wet muskegs, in the tundra on the moist boulder field and on a bank beaver house. H. L. 914-62, 1018-62, 255-63, 338-63.

#### HALORAGIDACEAE

*HIPPURIS VULGARIS* L. Aquatic on lake margins. H. L. 889-62.

*MYRIOPHYLLUM SPICATUM* L. ssp. *EXALBESCENS* (Fern.) Hult. Aquatic in fast-flowing streams. H. L. 886-62.

#### UMBELLIFERAE

*CICUTA MACKENZIEANA* Raup. Frequent in wet *Carex fens* and in *Sphagnum* in wet muskegs. H. L. 912-62, 249-63.

#### CORNACEAE

*CORNUS CANADENSIS* L. In *Picea mariana* muskegs and on rocky lake shores. H. L. 1041-62.

#### PYROLACEAE

*PYROLA ASARIFOLIA* Michx. In *Picea mariana* muskegs and on sandy esker slopes. H. L. 215-63, 318-63.

*P. GRANDIFLORA* Radius var. *CANADENSIS* (Andres) Porsild. In a *Picea mariana*—*Betula* "*papyrifera*" woods along a stream. H. L. 899-62.

This variety, new to the flora of Saskatchewan, was previously reported from Nuelin Lake, N.W.T., by Baldwin (1953). The species is uncommon in northern Saskatchewan.

*P. MINOR* L. In *Salix* thickets on stream margins and in *Salix*—*Carex fens*. H. L. 355-63; P. L. 475-63.

*P. SECUNDA* L. Infrequent, in *Picea mariana* muskegs where it usually occurs on *Sphagnum* hummocks. H. L. 872-62; P. L. 359-63, 391-63.

#### ERICACEAE

*ANDROMEDA POLIFOLIA* L. In wet *Sphagnum* depressions in *Picea mariana* muskegs and in *Betula glandulosa*—*Vaccinium uliginosum* thickets. H. L. 841-62, 279-63.

*ARCTOSTAPHYLOS ALPINA* (L.) Spreng. ssp. *RUBRA* (Rehd. & Wils.) Hult. Common in *Picea mariana* muskegs and in *P. glauca*—*P.*



*mariana*—*Larix laricina* woods. H. L. 1038-62, 171-63, 277-63.

A. UVA-URSI (L.) Spreng. var. COACTILIS Fern. & Macbr. In dry *Picea mariana*—lichen woods and in lichen-covered depressions on eskers. H. L. 238-63.

CHAMAEDAPHNE CALYCVLATA (L.) Moench. Locally abundant in *Sphagnum* bogs and on the margins of *Carex* fens. H. L. 1049-62; P. L. 473-63.

KALMIA POLIFOLIA Wang. Scattered in *Picea mariana* muskegs and in *Scirpus*—*Vaccinium uliginosum* fens. H. L. 869-62, 159-63, 187-63, 296-63.

LEDUM GROENLANDICUM Oeder. Frequent, in *Picea mariana*—lichen woods and *P. mariana* muskegs. H. L. 909-62, 126-63.

L. PALUSTRE L. var. DECUMBENS Ait. In *Picea mariana*—lichen woods, *P. mariana* muskegs and in the tundra on the dry rock field. H. L. 910-62, 130-63; P. L. 380-63.

LOISEULERIA PROCUMBENS (L.) Desv. Frequent in *Picea mariana*—lichen and feather moss woods on eskers and abundant in the tundra on the dry rock field. H. L. 821-62, 195-63; P. L. 375-63.

This is the second report of this arctic—circumpolar for Saskatchewan, previously reported from Little Faroud Lake (Scotter, 1961). This species apparently becomes more important to the eastward for Ritchie (1959) reports that it dominates the summits of drift hills in the vicinity of Seal River, Manitoba, and Scotter (1965) has collected it at Kasmere Lake, Manitoba.

OXYCOCCUS MICROCARPUS Turcz. Trailing on *Sphagnum* in *Picea mariana* muskegs. H. L. 101-63, 119-63.

VACCINIUM MYRTILLOIDES Michx. Found only in dry *Picea mariana*—lichen woods and in *Pinus banksiana* woods on sandy soil. H. L. 969-62, 307-63.

V. ULIGINOSUM L. Frequent in *Picea mariana*—lichen woods and *P. mariana* muskegs, co-dominant in *Betula glandulosa* thickets on the moist boulder field, common on lake margins, granite cliffs and in *Carex* fens. H. L. 967-62, 343-63.

V. VITIS-IDAEA L. var. MINUS Lodd. Frequent in *Picea mariana*—lichen and feather moss woods, and muskegs and occurs on dry lichen slopes on eskers. H. L. 127-63.

#### PRIMULACEAE

PRIMULA MISTASSINICA Michx. Rare, occurring as individuals in mosses on rocky lake

shores. H. L. 1043-62; P. L. 398-63. The latter collection may be referred to forma *leucantha* Fern.

#### GENTIANACEAE

GENTIANELLA AMARELLA (L.) Börner ssp. ACUTA (Michx.) J. M. Gillett. Occasional on dry slopes in *Picea mariana* burns. H. L. 936-62, 999-62, 212-63.

MENYANTHES TRIFOLIATA L. On stream margins and in very wet *Carex* fens. H. L. 874-62, 133-63.

#### HYDROPHYLLACEAE

PHACELIA FRANKLINII (R. Br.) Gray. In burned *Picea mariana*—lichen woods on dry slopes. H. L. 146-63, 204-63.

#### LABIATAE

SCUTELLARIA GALERICULATA L. var. EPILOBIFOLIA (Hamilt.) Jordal. Seen only under a dense thicket of *Salix serissima*, *S. planifolia* and *Betula glandulosa* on the moist boulder field. H. L. 333-63.

#### SCROPHULARIACEAE

PEDICULARIS LABRADORICA Wirsing. Occasional in *Picea mariana*—lichen woods on eskers, pond margins in *Vaccinium uliginosum*—*Scirpus* fens, and frequent in the tundra on the dry rock field. H. L. 816-62, 107-63, 129-63, 185-63; P. L. 376-63.

This is the second report of this species for Saskatchewan; previously known from McKeever L. (Scotter, 1961).

VERONICA SCUTELLATA L. Seen only in a *Salix*—*Calamagrostis* fen on a lake margin. H. L. 972-62.

#### LENTIBULARIACEAE

PINGUICULA VULGARIS L. Locally abundant in a *Vaccinium uliginosum*—*Scirpus* fen on a pond margin but not seen elsewhere. H. L. 183-63.

This record is a northward extension of the Saskatchewan range of this arctic (sub-arctic)—circumpolar species. It was previously known from isolated southern populations at Prince Albert where it occurs in a *Carex* fen (calcareous bog) and at Strawberry Lakes, a remarkable record well within the prairie 42 miles east of Regina, Saskatchewan (Jones, 1964).

UTRICULARIA INTERMEDIA Hayne. Frequent as an aquatic in sluggish streams and in pools



in *Picea mariana* muskegs and *Sphagnum* bogs. H. L. 888-62, 1052-62; P. L. 483-63.

U. VULGARIS L. var. AMERICANA Gray. Frequent in sluggish streams and very wet *Carex fens*. H. L. 890-62, 923-62, 132-63.

#### RUBIACEAE

GALIAM TRIFIDUM L. Of scattered occurrence, trailing in wet mosses on lake margins, in *Carex fens* and in the tundra on the moist boulder field. H. L. 917-62, 1022-62, 165-63, 324-63.

#### CAPRIFOLIACEAE

LINNAEA BOREALIS L. ssp. AMERICANUM (Forbes) Hult. Infrequent in mixed woods on stream margins and in *Picea mariana*—*Pinus banksiana* burn regeneration. H. L. 897-62, 103-63.

VIBURNUM EDULE (Michx.) Raf. Uncommon in *Picea mariana* muskegs and in burned *P. mariana*—lichen woods. H. L. 868-62, 208-63.

#### SANTALACEAE

GEOCAULON LIVIDUM (Richards.) Fern. In *Picea mariana*—lichen woods on esker. H. L. 968-62, 128-63.

#### COMPOSITAE

ANTENNARIA NEGLECTA Greene. On dry slopes in *Picea mariana* burn regeneration. H. L. 933-62.

A. PULCHERRIMA (Hook.) Greene. In a *Picea mariana* burn on a boulder field. H. L. 222-63.

A. ROSEA (D. C. Eat.) Greene. On a dry slope in *Picea mariana* burn regeneration. H. L. 934-63.

A. UMBRINELLA Rydb. (*A. isolepis* Greene). In a lichen covered depression on an esker. H. L. 828-62.

ARNICA LONCHOPHYLLA Greene. On mineral soil in *Picea mariana* burns, and in *P. mariana*—lichen woods. H. L. 817-62, 998-62, 162-63.

ARTEMISIA CAMPESTRIS L. ssp. BOREALIS (Pall.) Hall & Clements. A pioneer species in sand blowouts and open sandy-gravel slopes on eskers. H. L. 834-62, 317-63; W. L. 599-63, 605-63.

ERIGERON ACRIS L. var. ASTEROIDES (Andrez) Bess. On dry esker slopes, lichen-covered depressions and in *Picea mariana* burns. H. L. 825-62, 148-63, 196-63.

E. HYSSOPIFOLIUS Michx. In *Sphagnum* in *Picea mariana* muskegs and in *P. glauca*—*P. mariana*—*Larix laricina* woods. H. L. 941-62, 168-63.

Apparently only the second collection of this species for Saskatchewan; previously collected by J. Hudson at Amisk Lake (Breitung, 1957).

E. LONCHOPHYLLUS Hook. In *Picea mariana* muskegs and in *Salix*—*Betula glandulosa* thickets on lake margins. H. L. 856-62, 314-63; P. L. 399-63.

PETASITES FRIGIDUS (L.) Fries var. PALMATUS (Ait.) Cronq. Common in *Picea mariana* muskegs and in moist, mossy woods along streams. H. L. 942-62, 214-63, 310-63, 313-63.

P. SAGITTATUS (Pursh) Gray. Seen only once in a *Picea mariana* muskeg. H. L. 878-62.

SENECIO PAUPERULUS Michx. Common in *Picea mariana* muskegs and on moist slopes. H. L. 866-62, 1016-62, 154-63, 201-63.

SOLIDAGO SPATHULATA DC. ssp. SPATHULATA var. NEOMEXICANA (Gray) Cronq. Frequent on eskers in *Picea mariana*—lichen woods, dry lichen-covered slopes, and in an *Agrostis scabra* meadow. H. L. 818-62, 830-62, 930-62; W. L. 604-63.

A specimen (H. L. 164-63) collected on a till ridge growing in mineral soil is very similar to the above specimens but may represent ssp. *randii* var. *racemosa* (Greene) Cronq. (Cronquist, personal communication).

TARAXACUM CERATOPHORUM (Ledeb.) DC. Rare in *Picea mariana* muskegs, wet mossy woods along streams and on a metamorphic cliff. H. L. 1015-62, 315-63, 228-63.

This is the second report of this species for Saskatchewan; previously reported from Lake Athabasca (Raup, 1936).

### Bryophyta

#### HEPATICAEE

LOPHOZIA WENZELII (Nees) Steph. In *Picea mariana* muskegs and *Salix*—*Calamagrostis* thickets. H. L. 980-62, 987-62.

New to the flora of Saskatchewan.

PTILIDIUM CILIARE (L.) Nees. In *Picea mariana*—lichen woods on eskers and in mixed woods on stream margins. H. L. 903-62, 959-62, 960-62.

### Musci

#### SPHAGNALES

SPHAGNUM CAPILLACEUM (Weiss) Schrank. Muskegs. H. L. 986-62.

S. CAPILLACEUM var. TENELLUM (Schimp.) Andr. Muskegs. H. L. 911-62, 992-62.



*S. CUSPIDATUM* Ehrh. In standing water in muskeg. H. L. 266-63.

New to the flora of Saskatchewan; known also from Manitoba (Ritchie, 1959).

*S. FUSCUM* (Schimp.) Klinggr. Muskegs and *Sphagnum* bogs. H. L. 1053-62, 275-63, 278-63.

*S. GIRGENSOHNII* Russ. Muskegs. H. L. 984-62.

*S. LINDBERGII* Schimp. Muskegs. H. L. 302-63B.

New to the flora of Saskatchewan; known also from Manitoba (Ritchie, 1959).

*S. RECURVUM* P. Beauv. var. *PARVIFOLIUM* Sendt. ex Warnst. *Sphagnum* bogs. H. L. 1056-62, 1057-62.

This is the first report of this variety from Saskatchewan; the species was previously reported by Macoun (1892).

*S. SQUARROSUM* Crom. In *Picea mariana*—*Betula* "papyrifera" woods along a stream. Associated with *Drepanocladus uncinatus* and *Hylocomium splendens*. H. L. 905-62.

*S. WARNSTORFIANUM* Du Rietz. Muskegs. H. L. 279-63, 281-63.

*S. WULFIANUM* Girg. Muskegs H. L. 267-63.

This is the second Saskatchewan record of this species previously reported by Macoun (1892).

#### EUBRYA

*AULACOMNIUM PALUSTRE* (Hedw.) Schwaegr. In muskegs, bogs, and wet drainage areas in *Picea mariana* woods. H. L. 982-62, 1055-62; P. L. 411-63B, 415-63.

*BRYUM PSEUDOTRIQUETRUM* (Hedw.) Schwaegr. Muskegs. H. L. 274-63.

*CALLIERGON GIGANTEUM* (Schimp.) Kindb. Aquatic moss in lake. H. L. 102-63.

New to the flora of Saskatchewan.

*CINCLIDIUM STYGIUM* Sw. Wet drainage area in *Picea mariana* woods. P. L. 412-63.

*CYNODONTIUM STRUMIFERUM* (Hedw.) Lindb. On a lichen-covered boulder. H. L. 961-62.

*C. TENELLUM* (BSG) Limpr. On dripping wet granite cliff. P. L. 465-63, 467-63A.

New to the flora of Saskatchewan.

*DICRANUM ANGUSTUM* Lindb. Muskegs. H. L. 273-63.

New to the flora of Saskatchewan.

*D. BERGERI* Bland. Muskegs. H. L. 271-63.

*D. ELONGATUM* Schleich. In mossy stream-side woods and on dripping wet granite cliffs. H. L. 906-62, 907-62; P. L. 466-63.

*DREPANOCCLADUS EXANNULATUS* (BSG) Warnst. *Sphagnum* Bog. H. L. 1054-62.

New to the flora of Saskatchewan.

*D. REVOLVENS* (Turn.) Warnst. var. *INTERMEDIUS* (Lindb.) Richs. & Wall. Muskeg H. L. 302-63A.

New to the flora of Saskatchewan.

*D. UNCINATUS* (Hedw.) Warnst. Muskegs. H. L. 274-63.

*D. VERNICOSUS* (Lindb.) Warnst. Wet drainage area in *Picea mariana* woods. P. L. 413-63, 416-63.

New to the flora of Saskatchewan.

*HYLOCOMIUM SPLENDENS* (Hedw.) BSG. In muskegs, *Picea mariana*—feathermoss woods and in mixed woods along streams. H. L. 908-62, 983-62D, 988-62, 265-63; P. L. 411-63.

*HYPNUM CUPRESSIFORME* Hedw. On a rock outcrop in a muskeg. H. L. 1059-62.

*MEESIA ULIGINOSA* Hedw. Muskegs. H. L. 272-63, 274-63.

New to the flora of Saskatchewan.

*MNIUM ANDREWSIANUM* Steere. Muskegs. H. L. 274-63.

*PALUDELLA SQUARROSA* (Hedw.) Brid. Muskegs. H. L. 270-63.

*PLEUROZIUM SCHREBERI* (Brid.) Mitt. *Picea mariana*—lichen woods, muskegs, and mixed woods on stream margins. H. L. 904-62 959-62, 993-62, 300-63.

*POHLIA CRUDA* (Hedw.) Lindb. On rock outcrop in muskeg. H. L. 272-63.

*P. NUTANS* (Hedw.) Lindb. In mixed woods on stream margin. H. L. 906-62.

*POLYTRICHUM COMMUNE* Hedw. Muskegs. H. L. 990-62A.

*P. JUNIPERINUM* Hedw. In a *Picea mariana* burn on esker. H. L. 1001-62.

*P. PILIFERUM* Hedw. In *Picea mariana*—lichen woods. H. L. 290-63.

*PITILUM CRISTA-CASTRENSIS* (Hedw.) De-Not. In muskegs and *Picea mariana*—feather moss woods. H. L. 990-62B, 991-62, 264-63.

*RHACOMITRIUM CANESCENS* (Hedw.) Brid. On a lichen-covered boulder in *Picea mariana*—lichen woods. H. L. 962-62.

New to the flora of Saskatchewan.

*R. CANESCENS* f. *ERICOIDES* (Brid.) Mönk. On open sandy-gravel on esker. W. L. 597-63.

New to the flora of Saskatchewan.

*SPLACHNUM LUTEUM* Hedw. In *Picea mariana* woods. P. L. 421-63.

New to the flora of Saskatchewan.

*TAYLORIA LINGULATA* (Dicks.) Lindb. Muskegs. H. L. 274-63.

*TETRAPLADON MNIROIDES* (Hedw.) BSG. In muskeg, on bone chips and other animal remains in substrate. H. L. 924-62, 989-62.



*TOMENTHYPNUM NITENS* (Hedw.) Loeske. Muskegs. H. L. 280-63.

*ULOTA CRISPA* (Hedw.) Brid. On dripping wet granite cliffs. P. L. 465-63A, 467-63B.

New to the flora of Saskatchewan.

### Lichens

*ACTINOGYRA MUHLENBERGII* (Ach.) Schol. On a granite cliff. P. L. 461-63.

*ALECTORIA NADVORNIKIANA* Gyl. On dead branches of *Picea mariana*. H. L. 953-62.

*CETRARIA NIVALIS* (L.) Ach. In *Picea mariana*—lichen woods on esker. H. L. 952-62.

*CLADONIA ALPESTRIS* (L.) Rabh. On a granite cliff. P. L. 454-63.

*C. ALPICOLA* (Flot.) Vainio. On a granite cliff. P. L. 455-63.

*C. AMAUROCRAEA* (Flk.) Schaer. In muskegs and on a granite cliff. H. L. 985-62, 299-63; P. L. 453-63.

*C. CORNUTA* (L.) Schaer. On granite cliffs. P. L. 459-63.

*C. DEFORMIS* (L.) Hoffm. In a muskeg. H. L. 983-62C.

*C. MITIS* Sandst. In upland *Picea mariana*—lichen woods and in muskegs. H. L. 951-62, 983-62A, 291-63.

*C. PLEUROTA* (Flk.) Schaer. In *Picea mariana*—lichen woods on esker. H. L. 964-62.

*C. RANGIFERINA* (L.) Web. In *Picea mariana* muskegs, feathermoss woods and on

a granite cliff. H. L. 983-62B, 262-63, 301-63; P. L. 460-63.

*C. UNCIALIS* (L.) Web. In *Picea mariana*—lichen woods on a granitic outcrop. Mixed with *C. amaurocraea*, *C. alpestris* and *C. mitis*. H. L. 293-63.

*ICMADOPHILA ERICETORUM* (L.) Zahlbr. On mineral soil in *Picea mariana*—lichen woods on an esker. H. L. 955-62.

*LECANORA DISPERSA* (Pers.) Rohl. On a boulder in a *Picea mariana*—lichen woods. H. L. 965-62A.

New to the flora of Saskatchewan.

*L. POLYTROPA* (Ehrh.) Rabenk. On a boulder in a *Picea mariana*—lichen woods. H. L. 965-62A.

*LECIDEA LAPICIDA* Ach. On rock outcrop in muskeg. H. L. 1060-62.

*NEPHROMA ARCTICUM* (L.) Torss. In *Picea mariana*—lichen woods. H. L. 958-62, 261-63.

*PARMELIA PHYSODES* (L.) Ach. On dead branches of *Picea mariana*. H. L. 954-62.

*PELTIGERA APHTHOSA* (L.) Willd. In a *Picea mariana* muskeg. H. L. 944-62.

*P. MALACEA* (Ach.) Funck. On a granite cliff. P. L. 452-63.

*RHIZOCARPON DISPORUM* (Naeg.) Müll. Arg. On a boulder in a *Picea mariana*—lichen woods. H. L. 965-62.

*R. GEOGRAPHICUM* (L.) DC. On a boulder in *Picea mariana*—lichen woods on an esker. H. L. 965-62A.

*STEREOCAULON PASCHALE* (L.) Hoffm. Common in *Picea mariana*—lichen woods on eskers. H. L. 950-62, 289-63, 292-63.

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