A FLORISTIC AND PHYTOGEOGRAPHIC STUDY OF GLACIAL MOUNTAIN AND VICINITY: NORTHWESTERN BRITISH COLUMBIA

By

LAURANCE S.DONOVAN

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Department of BOTANY

The University of British Columbia
1956 Main Mall
Vancouver, Canada
V6T 1Y3

Date April 30, 1987

ABSTRACT

Botanical exploration in northern British Columbia has lagged behind that of adjacent Alaska and the Yukon Territories. This is particularly true of alpine and sub-alpine areas. For the most part, limited accessibility has restricted plant collecting to within a short distance of the few available roadways.

During the course of the present study, botanical field work was conducted in an alpine, sub-alpine area in the Three Sisters Range of the Cassiar Mountains (northwestern British Columbia). Over 1000 vascular plant collections were idenified from the study area. A total of 239 Taxa were recognized representing 116 genera and 44 families.

Taxonomic keys to the local flora and an annotated species list are provided. The annotated species list includes : habitat information for each taxon, a list of associated species and, where applicable, a discussion of noteworthy features of the taxon in question. Approximately 13% of the flora examined is listed as rare in British Columbia in Straley et al. (1985).

Virtually all of northern British Columbia was overridden by the Cordilleran Ice Sheet during the last major Wisconsin advance (approximately 22,000-15,000 yrs. b.p.). Potential Refugia from which taxa now present in the study area may have migrated post-glacially are discussed. Worldwide distributions of each taxon were examined and seven phytogeographic elements are recognized in the flora.

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INTRODUCTION AND OBJECTIVES

Botanical explorations have been conducted in northwestern Canada and adjacent Alaska for over a century. The body of plant collections accumulated over this time is such that few additions to the flora are expected. Even expert taxonomists, however, differ widely in their interpretation of the limits of taxa in this region. Multiple advances and recessions of Pleistocene ice sheets have "...transformed once continuously interbreeding populations into racial isolates of varying morphological expression and areal extent" (Jordal, 1951). In addition, vast areas remain virtually unexplored botanically. This is particularly true of alpine and subalpine habitats. Consequently, large gaps exist in our knowledge of the total geographic range and the extent of morphological variability of many taxa. Detailed phytogeographic and floristic studies conducted on a relatively small scale in Alaska and the Yukon (Gjaervoll, 1958, 1963, 1967; Johnson and Packer, 1965; Jordal, 1951; Raup, 1947; Scott, 1974) have proved to be of great value in filling in some of these gaps. Similar studies in northern British Columbia, however, have been virtually non-existent.

Before a satisfactory taxonomic treatment of the northern flora can be realized, further detailed floristic studies are required. Furthermore, as the results of such studies become available a more complete phytogeographical analysis of this important area will be possible. A sense of urgency accompanies this work in view of the fact that increasing human demands upon natural resources are bringing about the destruction of ecologically sensitive habitats at an unprecedented rate.

The principal objectives of the present study are:

A) To collect and record vascular plant taxa present in a remote alpine-subalpine area of northwestern British Columbia

B) to prepare keys for identification of families, genera and species of plants collected

C) to provide brief habitat descriptions for each taxon

D) to briefly discuss the origin of the flora since the last recession of the Pleistocene ice sheets.

Ideally, this work will both stimulate and facilitate future botanical investigation in similar critical areas.

CHAPTER 1

HISTORY OF BOTANICAL INVESTIGATION IN AREAS ADJACENT TO AND INCLUDING THE STUDY AREA

Detailed Historical References

In preparation for his "Flora of Alaska and Yukon", Hultén (1940) published a detailed account of the history of botanical work conducted in Alaska and adjacent territories from the time of Bering's expedition of discovery in 1741, up to 1940. With the publication of the final volume of this flora, Hultén (1950) included pertinent research that had been done since his 1940 publication as well as a comprehensive bibliography of the most significant taxonomic and floristic works, of all periods, pertinent to the flora with which he dealt. A synopsis of major events of botanical interest as well as an updated bibliography appear in the "Flora of Alaska and Neighbouring Territories" (Hultén, 1968).

Raup (1934) further illuminated the history of exploration of regions adjacent to the study area with colourful accounts of early botanical investigations in the Peace and Liard River regions and later (Raup, 1947), in the southwestern Mackenzie.

A brief history of botanical exploration in the Yukon was presented by Porsild (1951). Included in this account was a chronological list of noteworthy plant collections from his specific area of interest. A similar chronicle of exploration and collection appears in Porsild and Cody, (1980), updated and expanded to include works of relevance to the entire continental Northwest Territories.

Although the areas with which the previous authors are primarily concerned are peripheral to the present study area, their publications include references to work carried out in northern British Columbia.

Additional useful references, both historical and recent, can be found in "A Floristic Bibliography for British Columbia" (Douglas et al., 1983). General texts and floras, as well as papers dealing with taxonomy, floristics and vegetation considered to be of use to the student of the flora of British Columbia, are listed in this publication.

Historical Outline

The rugged interior of northern British Columbia, the Yukon and Alaska remained virtually unknown, botanically, until the mid-ninteenth century. Prior to this time there was little incentive to penetrate the formidable barriers presented by the Coast Mountains on the west and the Rockies on the east. As a rule, those few who did venture into the interior did so in the winter when travel was easier and insects were few, an appropriate time for collecting pelts, not plants.

With the sale of the Russian interest in Alaska to the United States in 1867, activity in the interior of that territory increased and information regarding the flora slowly began to emerge. Part of this activity involved the Western

Union Telegraph Company which set out to construct a telegraph line from western America to Europe via the Bering Strait. Although the original scheme was never realized, the scientific community owes much to the effort. During the course of this project certain officials of the company made scientific collections. Two notable examples, William Dall and Robert Kennicott, are credited with making the first botanical collections in the Yukon and interior Alaska. Most of the specimens they collected are housed in the National Herbarium in Washington (US).

Towards the end of the ninteenth century, the discovery of gold precipitated the next flurry of activity in the north. Although botanical studies were not foremost in the minds of the new immigrants, according to Hultén, "Prospectors who found no gold tried to cover the expenses of the trip, at least in part, by collecting plants for sale. Others were fascinated by the beautiful flora of this country and started plant collections" (Hultén,1940).

In addition to those seeking their fortunes, the discovery of gold also attracted the attention of the Geological Survey of Canada and expeditions were soon mounted to the most remote regions of the interior. Fortunately, these expeditions placed considerable emphasis on the flora of the areas under investigation and many valuable plant collections were made. These collections were deposited in the Geological Survey of Canada Herbarium, adding considerably to the resource bank of what was to become the National Herbarium of Canada (CAN).

From the standpoint of the present study, the most important early botanical collections made under the auspices of the Geological Survey of Canada, were those of George Mercer Dawson. In 1887, he conducted a party from the mouth of the Stikine River to Telegraph Creek, then overland to Dease Lake, some 25 km from the present study area. From Dease Lake the expedition continued north to the Yukon. During the course of his journey, Dawson made extensive plant collections that, for many years, were the only specimens available from the region. A list of plants collected by Dawson was published by John Macoun (1888), who at that time held the title of Naturalist to the Geological Survey of Canada. In addition to collecting plants, Dawson published a map of the principal vegetation boundaries, encountered along with useful notes on the distribution of trees and shrubs (Dawson, 1888).

Geological Survey expeditions since Dawson's time have continued to yield valuable plant collections. Regrettably, few of the results of these have been published.

Use of aircraft to gain access to remote areas of the interior was the next major development that opened a whole new chapter in northern botanical exploration. Regions once impossible to reach were finally accessible. The first published account of aerial reconnaissance in the vicinity of the study area was that of Dr. Charles Camsell (1936). He flew from Wrangell Alaska to Dease Lake and from there eastward over the Stikine Plateau, photographing and describing much previously uncharted wilderness.

Shortly thereafter, the strategic significance of Alaska, from a military standpoint, prompted the construction of an overland link from Dawson Creek to Fairbanks. In 1942 this route, now called the Alaska Highway, was opened to the public. Soon, numerous other roads were constructed opening up supply lines and connecting previously isolated settlements. Relatively easy access was now available to amateur and professional botanists and the number of important plant collections increased accordingly. Sufficient herbarium specimens and descriptive papers were soon available to provide a foundation upon which major floristic works could be built.

Recent Major Contributions

Until as recently as the late 1930's, literature pertaining to the flora of the region of interest was scattered widely. One of the first individuals to synthesize this information and combine it with his own wealth of experience in a major floristic work was Jacob Peter Anderson. Residing in Alaska from 1914 until 1940, he travelled extensively throughout the country collecting plants at every available opportunity. Although his collection of some 3300 numbers was destroyed by fire in 1924, he began again, and by 1940 had amassed the largest collection of Alaskan plants then in existence. After moving to Iowa in 1941, he returned on four separate occasions (1941, 1944, 1946 and 1948) to collect along the newly constructed highways in northern British Columbia, the Yukon and Alaska. The final result of his dedicated work was the publication, in nine parts, of a preliminary flora of Alaska and adjacent parts of Canada (Anderson 1943-1952). The J.P. Anderson Herbarium of Arctic and Boreal Plants now forms a permanent part of the Iowa State University Herbarium (IA).

Like Anderson, Eric Hultén devoted a major portion of his life to the study of the arctic and boreal flora. His work in Kamchatka in the 1920's, aroused an interest in the phytogeographical relationships of the northern flora which led to the publication of his "Outline of the history of arctic and boreal biota during the Quaternary period" (Hultén, 1937). Hultén then focused his attention on the Alaskan and Yukon floras recognizing, as did Anderson, the need to synthesize the scattered information in existence at that time. His ten volume "Flora of Alaska and Yukon" (1941-1950) represents the culmination of this effort. This work differs from that of Anderson's in that it does not provide keys to the families and genera represented in the flora nor does it include species descriptions or illustrations. Rather, it was intended to resolve the taxonomic inconsistencies of previous authors and to detail, as far as possible, the distributions of individual taxa. Further publications, dealing primarily with plant distributions (Hultén, 1958; 1962), followed extensive field work. Working with a considerably expanded resource base, Hultén (1968) produced the "Flora of Alaska and Neighbouring Territories". An indispensible manual for both amateur and professional botanist; it contains keys, species descriptions and illustrations as well as local and worldwide distribution maps for each accepted taxon. Reference material studied in preparation for this work consisted mainly of collections housed at the State Museum of Natural History at Stockholm (S), the National Herbarium at Washington, D.C. (US), the Gray Herbarium at Harvard (GH), the National Herbarium of Canada at Ottawa (CAN), the Herbarium of the University of Alaska at Fairbanks (ALA) and the Herbarium of the University of British Columbia (UBC).

Collections made by Hultén during his work in Alaska and the Yukon were depositied at the State Museum of Natural History at Stockholm (S) and the Herbarium of the University of Alaska (ALA).

Further major contributions to the knowledge of the boreal and arctic flora of North America were made by A.E. Porsild. He published some work on the Alaskan flora (Porsild, 1939, 1966a), however, his major efforts were concentrated in the Yukon and Northwest Territories. Travelling extensively throughout this vast region, he made numerous important plant collections, adding substantially to the list of plants known to occur there.

In 1944 he conducted a detailed botanical study in the southeastern Yukon along the newly constructed Canol Road. Porsild's report (1951) provides a complete catalogue of vascular plants reported from the entire Yukon territory, descriptions of plant communities encountered during his study and a phytogeographic analysis of the flora of the southeastern Yukon. He later carried his study to the southwestern Yukon, collecting plants along the Haines Road and Alaska Highway.

Incorporating his findings with those of other botanists (Raup, 1944, 1945; Crum and Schofield, 1957NP) he published an annotated list of noteworthy additions and range extensions to the flora of the southwestern Yukon including maps of their North American distributions (Porsild, 1966b). The construction of the Dempster Highway allowed Porsild to fill a large gap in his Yukon collections, resulting in the publication of "Materials for a flora of Central Yukon Territories" (Porsild, 1974).

Porsild's treatments of the flora of the NWT (1943; 1945), and later work in collaboration with William Cody (Cody and Porsild, 1968; Porsild and Cody, 1968) laid the groundwork for the publication of "Vascular Plants of the Continental Northwest Territories, Canada" (Porsild and Cody, 1980). This important work provides keys, species descriptions and illustrations and North American range maps (specifically, Northwest Territories range maps) for most of the taxa known to occur in the Northwest Territories.

In addition to the studies previously enumerated, Porsild's papers on the Canadian Arctic Archipelago (1955, 1957) and his "Geographical distribution of some elements in the flora of Canada" (1958) provide valuable maps of the Canadian distributions of certain arctic and boreal plants.

Most of the extensive collections made by Porsild, throughout some forty-five years of activity in the Canadian north, are to be found in the National Herbarium of Canada (CAN).

Considerable floristic and phytogeographic work was conducted in northern Canada by H.M. Raup. Taking part in an expedition launched by the Arnold Arboretum in 1932, Raup spent 3 1/2 months studying the flora of the Peace and Liard River regions. His account of the trip (Raup, 1934) includes the first comprehensive annotated list of species from the area as well as the first effort at a phytogeographic analysis of the flora. Later phytogeographic studies in the south-central Mackenzie (Raup, 1935, 1936, 1942) enabled a much more accurate depiction of the distribution of the boreal flora.

Perhaps Raup's most important work with respect to the present study, was his "Botany of the southwestern Mackenzie" (Raup, 1947). In this work he provided a discussion of local plant communities, an annotated list of all plants collected from the southwest Mackenzie, a phytogeographical treatment of the Mackenzie Mountain flora in light of hypotheses recently advanced by Fernald (1925) and Hultén (1939) and maps of the Canadian distributions of species he encountered at Britnell Lake.

Most of the specimens collected during Raup's visits to northern Canada are now housed at the Arnold Arboretum at Harvard (A), the Gray Herbarium at Harvard (GH) and the National Herbarium of Canada (CAN).

Miscellaneous Botanical Work Conducted in the Vicinity of the Study Area

Welsh and Rigby spent the summer of 1969 collecting plants throughout a portion of North Central British Columbia which encompassed the present study area. Their published findings include brief descriptions of plant communities encountered and an annotated list of 205 species of vascular plants (Welsh and Rigby, 1971).

Buttrick (1977), published a study of the alpine flora of Teresa Island, Atlin Lake, located approximately 250 km northwest of the study area. Based on research conducted for his Doctoral thesis (1978), this paper contains a comprehensive list of alpine vascular plants encountered during the course of his research, habitat types in which they were found, and a discussion of those taxa with noteworthy distributions.

Field surveys in northern British Columbia, conducted as part of the Ecological Reserves Program, resulted in the publication of a number of new records and range extensions of vascular plants (Pojar et al., 1975). Much of the plant collection was done within the general vicinity of the study area. Pojar (1986), later prepared a vegetation report for the British Columbia Ministry of Forests, concerning the Gladys Lake Ecological Reserve, located approximately 75 km southwest of the study area. The Ecological Reserves Program encourages research work within the boundaries of ecological reserves. A list of reports and publications for ecological reserves is published by the Ministry of Environment and Parks (1986).

Collections of vascular plants from alpine and subalpine localities in close proximity to the study area were made by: Szczawinski, 1960; Beamish et al., 1973; Krajina et al., 1973;

Krajina, 1975 and Pojar, 1975. Although the results of these collections were not published, species lists and herbarium specimens were deposited in the University of British Columbia Herbarium (UBC). In addition, collections taken by Demarchi (1980), in preparation for the "Cry Lake Biophysical Inventory" (Fenger, 1982) are deposited in the British Columbia Provincial Museum Herbarium (V). These collections are of particular interest since some were taken within the boundaries of the study area.

CHAPTER 2

GENERAL DESCRIPTION OF THE STUDY AREA

Location

The most prominent feature of the study area listed in the Gazetteer of Canada (1966) is Glacial Mountain, fixed at a position of 58° 129° SE (quadrilateral indexing system). Rising to an elevation of 2306 m a.s.l. it is the highest peak in the Three Sisters Range of the Cassiar Mountains. The settlement nearest the study area is the town of Dease Lake, situated approximately 35 km to the NW on the Stewart-Cassiar Highway.

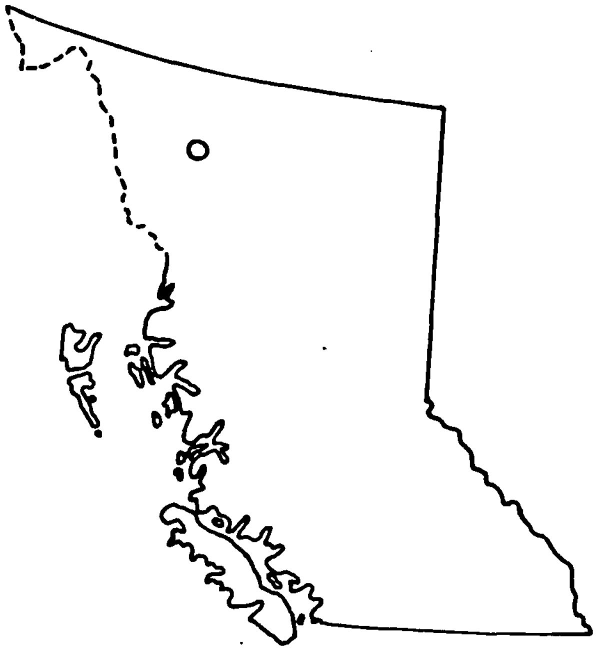


Figure 1: Study Area Location

Collections were taken throughout an area of roughly 100 square kilometers bordered on the north by a large, drift filled valley, through which flows the McBride River; on the west by a steep, volcanic ridge extending to the northern flank of Horn Mountain; on the south by portions of the Hotailuh Batholith and on the east by a series of unnamed lakes connected by a river that flows ultimately into the McBride River.

Physiography

The study area lies within the Stikine Ranges of the Interior Physiographic System of Holland (1976). These ranges are geologically complex, consisting of folded sedimentary and volcanic rocks of the McLeod Series (Hanson and McNaughton, 1936) intruded by granitic rocks of the Cassiar and Hotailuh Batholiths (Holland, 1976; Anderson, 1978, 1979; Gabrielse, 1979; Ryder, 1985).

Elevations within the study area range from 1540 m on the valley floors to 2306 m at the summit of Glacial Mountain. The terrain in the south is characterized by the rugged mountains of the Three Sisters Range. Cirques are common and small, remnant glaciers can be seen on the north face of both Glacial and Horn Mountains. Valleys in this portion of the study area are steep and narrow. In sharp contrast to this is the wide, drift-filled valley to the north. Here relief is gentle and the few hills are rounded.

Glacial Mountain marks the headwaters of the McBride River (Gazeteer of Canada, 1966), which drains the study area. The McBride is a major tributary of the Stikine River and, as such, forms part of the Pacific drainage system (Fenger, 1982).

A topographic overlay of the study area, as depicted in the following maps (figures 2, 3, 4), is included in a pocket at the back of this paper. The contour lines represent intervals of approximately 150 m (modified after NTS map sheet 104 I).

Geology

Historical:

The Central Plateau and Mountain Area, which includes the Cassiar Mountains, was profoundly affected by the Coast Mountain orogeny. Lasting from early Jurassic through the Cretaceous, the entire region was subjected to considerable folding and faulting of sedimentary and volcanic rocks and the intrusion of granitic batholiths (Alley and Young, 1978; Holland, 1976). Extensive metamorphism accompanied these events in the area of interest (Farley, 1979; Hanson and McNaughton, 1936). Regional uplift, which occurred once in the early Tertiary and again in the late Tertiary, was followed on each occasion by intense stream erosion. These erosional sequences removed much of the sedimentary and volcanic cover from the more resistant granitic intrusions, leaving numerous large outcrops exposed, such as those of the Hotailuh Batholith (Anderson, 1978; Fenger, 1982; Hanson and McNaughton, 1936; Holland, 1976). Thus, the general relief of the area was established by the late Tertiary. Subsequent modification has been effected by advances and retreats of the Pleistocene Ice Sheets and recent erosional processes (Fenger, 1982; Holland, 1976).

Bedrock Geology:

The first extensive geological explorations to include the region of interest were carried out by Hanson and McNaughton who described their findings in Geological Survey Memoir 194 (1936). According to these authors, the sedimentary and volcanic rocks found in the study area form part of the McLeod Series. This series is described as "...a rather complex interbedded assemblage of volcanic fragmental rocks and flows, and minor amounts of sandstone, greywacke, cherty quartzite and conglomerate" (Hanson and McNaughton, 1936). Intruding this country rock, and adding further complexity, are various phases of the Hotailuh Batholith (Anderson, 1979, 1980; Gabrielse, 1979; Gabrielse, 1980; Hanson and McNaughton, 1936; Ryder, 1985; Welsh and Rigby, 1971. Figure 2 modified after Gabrielse (1979) illustrates the general location of these various geologic formations within the study area.

Detailed studies of the distribution and emplacement history of plutons within the Hotailuh Batholith are provided by Anderson (1978, 1979, 1980). Younger phases of the Hotailluh Batholith represented by large outcrops of the Snowdrift Creek satellitic stock appear in the north-central portion of the study area (labelled mJgd in figure 2). These consist mainly of biotite-hornblende quartz monzodiorite. These intrude, include and metamorphose augite porphyry and possibly arkosic sediments. The age of this stock is given as 147 +/- 5 Ma. (Anderson, 1980). Older phases of the Hotailuh Batholith, notably outcrops of the Cake Hill Plutons, are exposed in the southern portion of the study area (labelled UTgd). These consist mainly of hornblende syenodiorite, hornblende granodiorite and hornblende monzonite and are assigned radiometric ages of roughly 215 Ma.

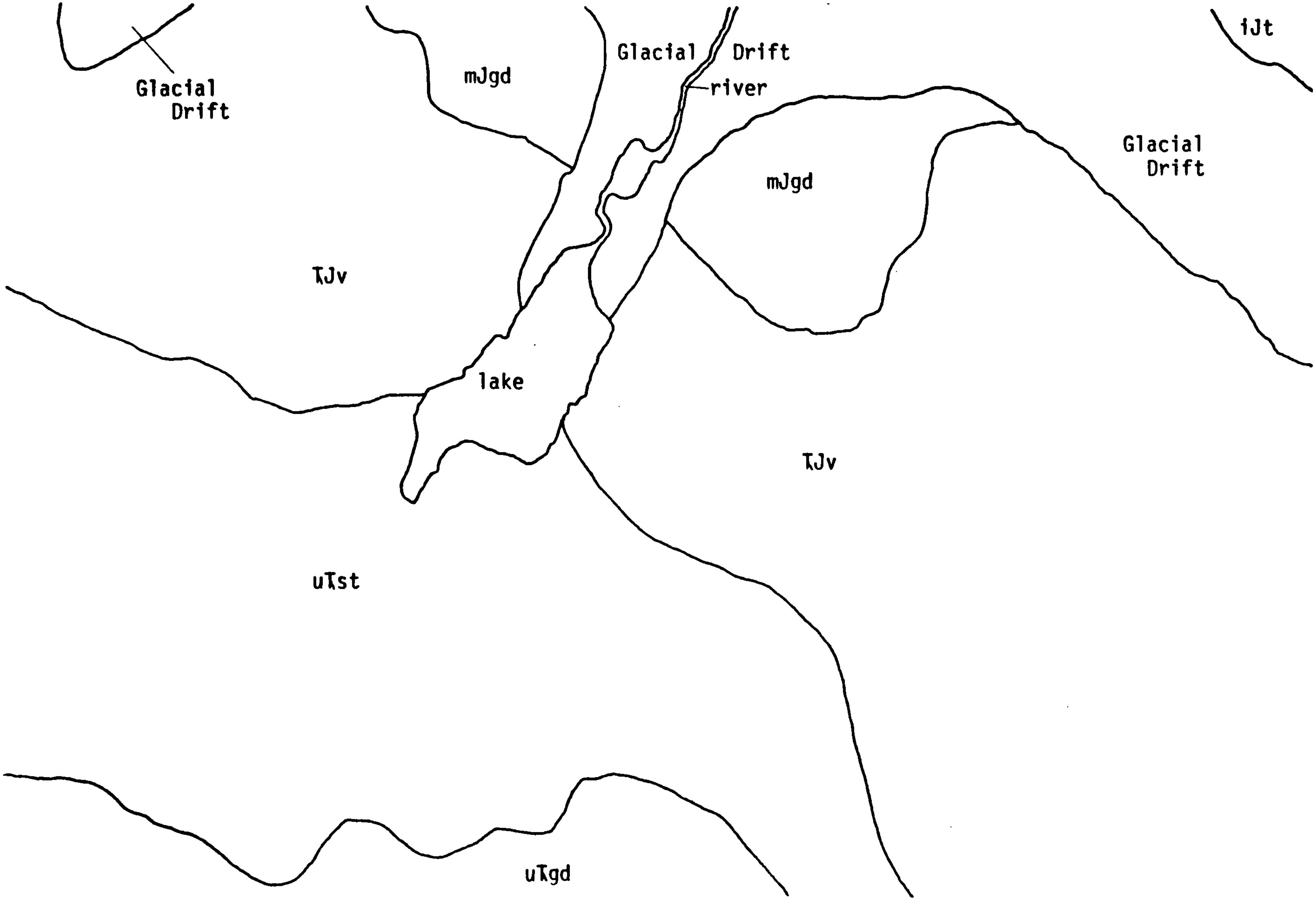
(Anderson, 1979; Gabrielse, 1979).

The remaining formations in the study area are made up of volcanic and sedimentary rocks. The volcanics to the east and west of the large lake on figure 2 (labelled TJv) exist as massive flows of predominantly fine grained, porphyritic andesites intercalated with tuffs and agglomerates. In addition, zones of maroon-weathering volcanics are also found within this area (Anderson, 1980; Gabrielse, 1979; Hanson and McNaughton, 1936). Although no precise age is given, these rocks are thought to be of early Jurassic and late Triassic age on the basis of regional correlations (Anderson, 1980; Gabrielse, 1979). The Stuhini Formation (UTST) is made up of a combination of volcanic and sedimentary rocks of Upper Triassic age. The volcanics consist of augite and coarse-bladed plagioclase porphyry breccia and flows. Local basal conglomerates, siltstone and greywacke constitute the sedimentary component. The Takwahoni Formation (iJt) in the northeast corner of the study area consists of middle Jurassic sedimentary rocks which include local basal conglomerates, siltstone and greywacke (Gabrielse, 1979).

Figure 2 : Bedrock geology of the study area (modified after Gabrielse *et al.*, 1978)

Legend

	Middle Jurassic	mJgd - Granodiorite, diorite; includes younger phases of Hotailuh Batholith, hornblende-biotite syenite, granite and monzonite, hornblende diorite and syenodiorite.
		iJt - Takwahoni formation: greywacke, shale, minor conglomerate.
Mesozoic	Upper Triassic & Lower Jurassic	TJv - Feldspar porphyry; agglomerate, breccia, tuff, in part maroon weathering.
	Upper Triassic	UTST - Stuhini Formation: augite and coarse-bladed plagioclase porphyry breccia and flows; local basal conglomerate, siltstone, greywacke.
		UTgd - Hotailuh Batholith, Older Phases: hornblende syenodiorite to granodiorite.



Glacial Drift
mJgd
Glacial Drift
river
iJt
Glacial Drift
mJgd
T̄Jv
lake
T̄Jv
uT̄st
uT̄gd

Glaciation:

Virtually all of the land surface of British Columbia was modified by cyclic advances and recessions of glacial ice-sheets throughout the Pleistocene epoch. The Cassiar Ranges, which include the study area, are believed to have been one of the centers of ice accumulation during this time (Holland, 1976). The last advance to have had a significant impact upon the study area was contemporary with that of the Fraser Glaciation (Alley and Young, 1978; Armstrong et al., 1968). Precisely when this episode of glaciation began in the region is uncertain, however, evidence from other parts of British Columbia suggests a probable time of 20-22,000 years b.p. (Alley and Young, 1978). At its maximum extent (approximately 15,000 years b.p.) sufficient ice had accumulated to eradicate, or at least largely obscure, the effects of previous glaciations (Alley and Young, 1978; Holland, 1976).

The orientation of drumlins and the distribution of erratics along local river valleys indicate that the last movement of ice in the study area was to the north (Fenger, 1982; Hanson and McNaughton, 1936). Granitic and volcanic boulders from mountains in the study area are found on all but the highest peaks bordering nearby river valleys indicating that local valley glaciers attained a minimum thickness of 610 m (Hanson and McNaughton, 1936). Although this is a conservative estimate compared with figures of up to 2100 m. given by Fenger (1982), it is of interest that Hanson and McNaughton observed hanging valleys nearby which "... lie transverse to the direction of movement of the Pleistocene ice-sheet and do not appear to have been glaciated" (Hanson and McNaughton, 1936).

Deglaciation features such as the occurrence of meltwater channels and spillways crossing between cols high in the relief or between criques; the location of kame terraces, eskers and outwash fans and the absence of recessional moraines indicate that the end of the last episode of glaciation in this area was characterized by the rapid, _in situ_ down wasting of ice (Alley and Young, 1978; Fenger, 1982). Accordingly, the higher peaks and ridges became ice-free earlier than the valleys where ice stagnated. This stagnant ice eventually separated into discontinuous blocks, before melting altogether (Fenger, 1982). The precise time of deglaciation is unclear but it seems probable that valleys in the study area were free of glaciers approximately 10,000 years ago (Rouse, pers. comm.). The disappearance of glaciers from most major valleys in the southern portion of British Columbia at this time (Fulton, 1971) supports this hypothesis. Further evidence is provided by a minimum radiocarbon date of 10,100 +/- 90 years b.p. (G.S.C.-2036) for deglaciation of the Omineca River Valley (Alley and Young, 1978) situated approximately 360 km SSW of the study area.

According to Holland (1976), the growth of glaciers into a regional ice-sheet follows a more or less predictable pattern in mountainous areas. Small cirque glaciers gradually expand into mountain and valley glaciers. These, in turn, grow to form mountain ice-caps, the movement of which is controlled by the underlying topography. Ultimately, these mountain ice-caps coalesce to form a regional ice-sheet that moves largely in response to climatic factors, more or less independent of the underlying terrain.

These various stages of glaciation produce many of the prominent surficial landforms observed in the study area. Large cirques, such as those in evidence on the north-facing peaks of Horn and Glacial Mountains are produced by expanding mountain glaciers (Holland, 1976; Strahler, 1975). Broad, U-shaped valleys such as the one located in the northern portion of the study area result from the growth of valley glaciers (Alley and Young, 1978; Holland, 1976). Depositional landforms observed from aerial photographs of the study area (Figure 3) include a medial moraine (Mm) which is formed where two ice streams join; till (T) and till plains (TP) which are deposited directly from the ice without water transport (Strahler, 1975); and outwash terraces (OT) and kame-esker complexes (KE) which result from the down wasting of ice (Alley and Young, 1978; Fenger, 1982).

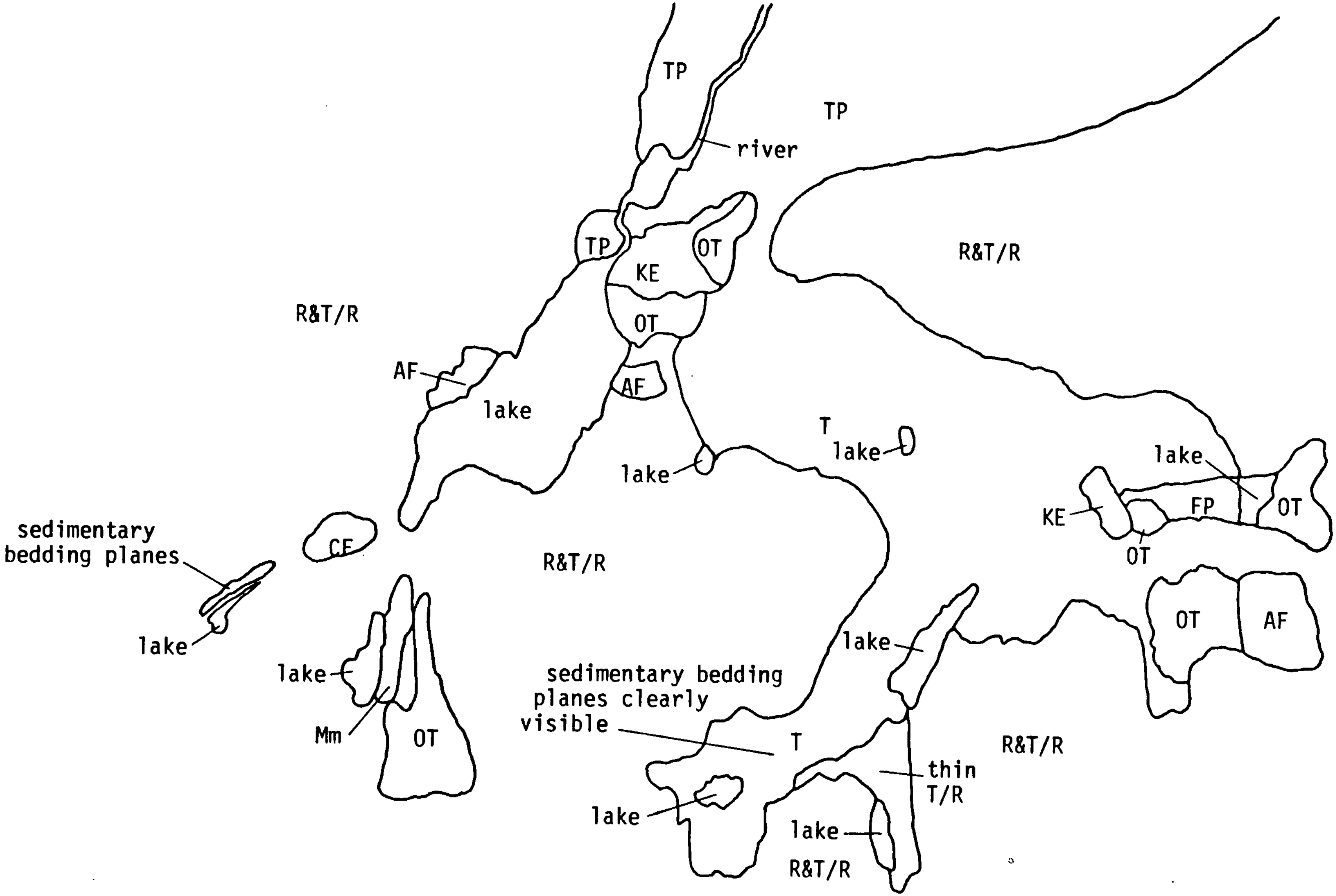
Recent Features:

A number of geomorphic processes have been at work to further modify the study area since the Pleistocene (Figure 3). The most dramatic of these are brought about as a result of the periglacial activity and include various forms of mass wasting, in particular the formation of colluvial fans (CF) and talus slopes (Alley and Young, 1978; Fenger, 1982; Ryder, 1985). Minor glacial advances occurring approximately 5000 years b.p.,

Figure 3 : Surficial land forms of the study area

Legend

AF	- Alluvial Fan
CF	- Colluvial Fan
FP	- Flood Plain
KE	- Kame-Esker Complex
Mm	- Medial Moraine
OT	- Outwash Terrace
R & R/T	- Rock and Till over Rock; Colluvial Fans Common
T	- Glacial Till
TP	- Till Plain
T/R	- Till over Rock


TP
TP
river
R&T/R
TP
OT
KE
R&T/R
OT
AF
AF
lake
T
lake
lake
lake
KE
FP
OT
OT
sedimentary
bedding planes
CF
R&T/R
OT
AF
lake
lake
sedimentary bedding
planes clearly
visible
lake
Mm
OT
T
R&T/R
thin
T/R
lake
lake
R&T/R

3000 years b.p. and again within the last 1000 years (Alley and Young, 1978; Holland, 1976) accentuated these processes.

Soils

Soils throughout the study area were at best, weakly developed. In alpine environments, mechanical rather than chemical weathering plays the dominant role in soil formation. As a result, soils are generally medium to coarse textured and therefore rapidly drained. Steep terrain in conjunction with regular freeze-thaw cycles render the landscape prone to mass wasting as evidenced by colluvial fans, talus slopes, nivation hollows and solifluction lobes. Furthermore, the severe climate results in widespread cryoturbation reflected by the presence of frost hummocks, mud boils and sorted circles in the valleys and sorted stripes on rocky slopes of higher elevations. Under such conditions the development of a mature, stable soil profile, differentiated into recognizable horizons is rarely, if ever, achieved (French, 1976; Ritchie, 1984; Tedrow and Cantlan, 1958).

The study area was included in the "Cry Lake Biophysical Inventory" (National Topographic Series, map 104I) conducted by Fenger (1982). In this study, two general observations regarding local soil development were made:

1) There is a trend towards increasing depth of organic layers with increasing soil moisture. Rapidly drained soils exhibit little or no organic accumulation in or above the surface horizon. Moderately well to poorly drained soils on the

other hand, tend towards increasing quantities of organic matter both in and above the surface horizon.

2) Soil depth tends to increase as elevation decreases. Little or no profile development is observed above treeline while subalpine areas, particularly valleys, exhibit at least partial profile development.

Specific observations based on field data gathered by Fenger showed that well to poorly drained Brunisols and Gleysols typified the broad, drift-filled valley in the north of the study area. Soils of the steep, rocky terrain in the west, south and portions of the east were predominantly coarse textured, Podzols and poorly weathered, thin cold Regosols. The valley which flanks Glacial Mountain on the west, north and east (roughly coinciding with the 1676 m. contour line) was not sampled. Extrapolation of information obtained from similar sites, however, led Fenger to conclude that the area would most likely be characterized by weakly developed Podzols, Brunisols and Gleysols (Fenger, 1982; Fenger pers. comm., 1986).

In addition to the soil types reported by Fenger, localized Fibrisols were observed at the north end of the large lake at the foot of Glacial Mountain and immediately to the west of the lake on the eastern boundary of the study area. (All soil types quoted conform to the taxonomy outlined in "The Canadian System of Soil Classification" (Canada Soil Survey Committee, 1978)).

Climate

General Climate of the Region:

Situated well away from the ameliorating influence of the Pacific Ocean, the climate of the study area is distinctly continental. Winters are long and cold while summers are short and cool. The major climatic control is brought about by the movement of pressure systems within the zone of prevailing Westerlies while further influence is exerted by cool, dry arctic air moving in from the north and northeast (Fenger, 1982).

The coastal mountains intercept moisture-laden clouds moving inland from the Pacific Ocean and, as a result, most of the moisture is precipitated before reaching the Central Plateau and Mountain Area (Holland, 1976). The Stikine Plateau, which is situated between the Coast Mountains and the Cassiar Mountains, is relatively dry as a result of this "rainshadow" effect. Precipitation increases once again, though not to the same degree, as the air masses rise over the Stikine Ranges of the Cassiar Mountains wherein lies the study area (Fenger, 1982; Holland, 1976; Farley, 1979).

Long term climatic data have been recorded in the general vicinity of the study area at two Environment Canada weather stations; one at the town of Dease Lake (35 km northwest) and the other at Cassiar (79 km north). Selected information from these stations is presented in table I. These data typify climatic variability within the region. Dease Lake (816 m a.s.l.) is situated on the Tanzilla Plateau and, as such, is still within the "rainshadow" effect of the Coast Mountains. Cassiar (1077 m a.s.l.), on the other hand, is located within the Stikine Ranges and is subject to the increased levels of precipitation and lower mean annual temperatures associated with increasing elevation throughout the area (Holland, 1976; Farley, 1978; Fenger, 1982). Snowfall normally accounts for approximately 40 to 50 percent of the precipitation at lower elevations and up to 60% at higher elevations (Environment Canada, 1981).

This far north, late spring and early summer days are long. Temperatures during this time can rise relatively high (temperatures in excess of 24^{o}C were not uncommon in the study area during the months of July and August). The combination of high latitude and high elevation, however, results in rapid cooling and sub-zero temperatures can occur at any time (Strahler, 1978; Fenger, 1982). The annual frost-free period, and consequently the growing season, is accordingly short.

Mean annual air temperatures at both Dease Lake and Cassiar fall within the -1^{o}C to -4^{o}C range recognized by Brown (1967) and French (1976) as defining the zone of discontinuous permafrost. Periglacial processes such as gelifraction, cryoturbation, solifluction, nivation and general mass movements are common within this zone (Alley and Young, 1978; French, 1976) and were observed regularly throughout the study area. These are processes which figure prominently in influencing the vegetation, primarily through influencing soil development and habitat stability.

Local Climate:

Temperature and precipitation were monitored at two locations within the study area for the duration of the field season. Data obtained were consistent with local observations of increasing precipitation and decreasing temperatures with increasing altitude (Holland, 1976; Fenger, 1982) as can be seen in table II.

Ritchie observes that "Many of the important ecological characteristics of northern climates are not registered in regional, macroscale meteorological information ..." (Ritchie, 1984). The topographic diversity of the study area provides for a variety of microclimatic conditions that may differ radically from the regional climate. In alpine environments even slight differences in slope and aspect can result in significant differences in soil and air temperatures, soil moisture and snow accumulation and duration. In addition, thermal inversions are locally common and cool air often collects in valley bottoms and low lying depressions (Alley and Young, 1978; Fenger, 1982; Farley, 1979). These factors are among many which influence the distribution of vegetation (Barry and Van Wie, 1974). Vegetation, in turn, influences microclimate by ameliorating climatic extremes within its cover and by affecting factors such as wind patterns, relative humidity and snow distribution (Barry and Van Wie, 1974; French, 1976).

Soil texture also influences microclimate inasmuch as the low water holding capacity of the characteristically coarse textured alpine soils results in rapid drainage, thus creating a drier environment than precipitation measurements would imply. These and other variables, many of which are unique to northern and alpine environments, combine to produce a wide range of microclimates within which individual plants or groups of plants can grow.

Table I : Temperature and precipitation data from two Environment Canada weather stations in the Dease River Watershed

<u>Cassiar</u> Position: 59° 129° SW Elevation: 1077 m

Temperature (°C)

	J	F	M	A	M	J	J	A	S	O	N	D	# years recorded
Daily max. temp.	-14.1	-8.5	-3.8	2.5	7.1	15.2	17.0	15.4	9.7	2.4	-6.1	-11.6	5-19
Daily min. temp.	-24.4	-20.4	-17.0	-9.2	-2.1	2.4	5.1	4.1	0.1	-5.9	-15.2	-21.2	5-19
Mean daily temp.	-19.2	-14.5	-10.6	-3.3	3.5	8.8	11.2	9.8	5.0	-1.7	-10.5	-16.6	5-19

Average number of frost-free days per year over the past 17 years = 31
Temperature extremes over the past 23 years
minimum: -47.2
maximum: 29.4

Precipitation: rain (mm), snow (cm), total (mm)

	J	F	M	A	M	J	J	A	S	O	N	D	Year	# years recorded
rainfall	2.4	0.4	0.8	2.2	25.2	45.8	61.4	60.2	65.1	36.8	3.6	1.3	305.2	25-29
snowfall	61.5	60.3	46.9	23.4	8.8	1.5	0.0	0.2	6.4	47.4	61.2	77.4	395.0	25-29
total	62.9	60.4	47.7	25.7	34.1	47.7	61.4	60.4	71.8	84.2	64.8	78.7	699.5	25-29

<u>Dease Lake</u> Position: 58° 130° SE Elevation: 816 m

Temperature (°C)

	J	F	M	A	M	J	J	A	S	O	N	D	# years recorded
Daily max. temp.	-15.0	-7.1	-0.8	6.5	12.9	17.5	19.4	18.2	13.0	5.8	-4.1	-11.6	30
Daily min. temp.	-24.4	-18.6	-14.0	-6.0	-0.9	3.3	5.7	5.0	1.3	-3.3	-12.8	-20.4	30
Mean daily temp.	-19.7	-12.9	-7.4	0.3	6.1	10.4	12.5	11.6	7.1	1.3	-8.5	-16.0	30

Average number frost-free days per year over 25 years = 44
Temperature extremes over the past 35 years
minimum: -51.1
maximum: 33.9

Precipitation: rain (mm), snow (cm), total (mm)

	J	F	M	A	M	J	J	A	S	O	N	D	Year	# years recorded
rainfall	0.9	0.1	0.4	2.0	18.5	43.2	54.5	52.5	44.8	18.6	2.6	0.5	238.6	30
snowfall	33.9	30.9	26.6	12.0	4.6	0.4	1.0	0.0	1.4	17.6	34.7	41.5	204.6	30
total	27.8	24.6	22.3	12.3	23.1	43.6	55.5	52.5	46.2	35.2	29.3	33.5	405.9	30

Table II: A comparison of selected climatic data obtained in the field through July and August with similar data collected over the same time period at the Dease Lake Environment Canada weather station

Dease Lake Position: 58° 130° SE Elevation: 816 m

Average daily temperature ($^{\circ}$C)	July	August
maximum	20.0	21.2
minimum	6.0	4.5
mean	13.0	12.8
Average daily precipitation (mm)	1.0	0.2
* no snow		

Glacial Mountain Position: 58° 129° SE Elevation: 1540 m

Average daily temperature ($^{\circ}$C)	July	August
maximum	17.0	17.8
minimum	3.9	3.2
mean	10.4	10.5
Average daily precipitation (mm)	0.7	1.3
* @ 5.0 cm of snow in July		

Vegetation

Geographic location, physiography, geology, soils and climate are prominent factors in determining the vegetation. The vegetation of the study area falls within two biogeoclimatic zones as developed and elaborated for British Columbia by Krajina (1959, 1965, 1969, 1973, 1975, 1987 (pers. comm)). The Spruce-Willow-Birch subalpine zone extends from the valley bottoms to the limit of erect conifer growth (approximately 1600 m elevation, locally). Beyond this zone, extending to the summits of all but the highest peaks in the study area (up to approximately 2200 m elevation), is the Alpine Tundra zone.

Spruce-Willow-Birch Subalpine Zone:

The absence of Engelmann spruce (*Picea engelmannii*) north of 58° N latitude led Halliday (1937) and later, Rowe (1972) to omit a distinct subalpine zone from the vicinity of the study area. Presumably this resulted because the main thrust of their work was directed toward economically important forested regions of Canada. Krajina (1973, 1975, 1987 (pers. comm.)), however, observes that although Engelmann spruce is missing locally, a legitimate subalpine zone occurs in northern British Columbia. Diagnostic conifers include white spruce (*Picea glauca*) intermixed with some black spruce (*P. mariana*) at lower elevations. At higher elevations these are replaced by subalpine fir (*Abies lasiocarpa*) (Krajina, 1973, 1975, 1987 (pers. comm.)).

This zone was originally treated as a northern subzone of the Engelmann Spruce-Subalpine Fir biogeoclimatic zone (Krajina, 1959, 1965). Differences in climate (most notably warmer night-time temperatures in summer) and accompanying differences in vegetation, however, led Krajina to recognize it as distinct (Krajina, 1973) and later describe it as a new biogeoclimatic zone, the Spruce-Willow-Birch Subalpine zone (Krajina, 1975). In British Columbia this zone occurs north of $57^{\circ}10'$ N latitude at elevations ranging from 950-1750 m in the portion of its range relevant to the present study (Beil et al., 1976; Krajina et al., 1982; Krajina, 1987 (pers. comm.)).

The vegetation at lower elevations in the study area accurately reflects Krajina's description of the upper shrub sub-zone of the Spruce-Willow-Birch subalpine zone with *Salix glauca*, *S. planifolia* and particularly *Betula glandulosa* representing the dominant shrubs (Krajina, 1975). The white and black spruce characteristic of the lower forest subzone are all but absent.

In addition to those shrubs indicated by Krajina as diagnostic of the zone, *Salix barrattiana* and *S. alaxensis* also form a significant component of the shrub cover, particularly in those areas designated as willow thickets (C) in figure 4. Areas with impeded drainage (E) are dominated by *Eriophorum angustifolium*, *E. scheuchzeri*, *Carex aquatilis* and *C. sitchensis*. Sphagnum hummocks have developed on localized patches of these wetland areas and here the vascular plant cover is represented predominantly by those plants that can obtain their nitrogen from ammonium, ie., Ericaceae, including

Andromeda polifolia, *Ledum decumbens*, *Vaccinium oxycoccus* and *V. uliginosum*.

Forest cover (B) is discontinuous, apparently restricted to protected sites where seepage water from snow melt is available throughout the growing season. *Abies lasiocarpa*, which attains a maximum height of approximately 8 m, is virtually the only conifer represented. *Picea glauca* and *Pinus contorta* occur, but are rare.

Meadows (F) are dominated by *Calamagrostis canadensis*, *Festuca altaica* and *Poa arctica*. *Betula glandulosa* is common in meadows as well, especially along run-off channels and in seepage sites where it occurs with the willows noted earlier, *Angelica lucida*, *Heracleum sphondylium* and *Castilleja unalaschcensis*.

Important components of lakeshore and streambank vegetation include *Aconitum delphinifolium*, *Delphinium glaucum*, *Mertensia paniculata*, *Polemonium caeruleum* and *Valeriana sitchensis* in shaded sites, and *Anemone narcissiflora*, *A. parviflora*, *A. richardsonii*, *Caltha leptosepala*, *Leptarrhena pyrolifolia*, *Mitella pentandra*, *Parnassia fimbriata*, *P. kotzebuei*, *Petasites frigidus* and *P. nivalis* in open sites. The latter group, however, is not restricted to the subalpine zone.

Alpine Tundra Zone:

Vegetation beyond the limit of erect conifer growth is representative of the Interior Subzone of the Alpine Tundra biogeoclimatic zone (Krajina, 1959, 1965, 1969; Krajina et al., 1982; Beil et al., 1976). Lighter cover and shorter duration of snow distinguish the Interior subzone from the Coastal Subzone (Krajina, 1965, 1987 (pers. comm.)), and may account for the greater extent of alpine vegetation in the interior (Spence, 1986). Subalpine fir (Abies lasiocarpa) occurs in the alpine zone in scattered localities but only in krummholz form. The zonal combination of plant indicators include Cassiope mertensiana, C. tetragona, Phyllodoce empetriformis, P. glanduliflora and Empetrum nigrum (Krajina, 1965), all of which occur in abundance throughout the alpine portion of the study area.

The vegetation cover of the lower limit of the Alpine Tundra zone is essentially continuous. The aforementioned zonal indicators often form dense cover over relatively large areas, in some cases, to the virtual exclusion of other taxa (Figure 4, D). Other important components of these rocky heathlands include Equisetum scirpoides, Huperzia selago, Luetkea pectinata, Lycopodium alpinum and Vaccinium caespitosum. The willows that occur in abundance in the subalpine zone (Salix glauca, S. planifolia, S. barrattiana and S. alaxensis) are replaced in the alpine zone by those with prostrate growth forms; Salix polaris, S. arctica and especially S. reticulata. Dryopteris fragrans, Epilobium latifolium, Hierochloe alpina and Saxifraga tricuspidata are common in areas frequently disturbed by various forms of mass wasting and cryoturbation.

Vegetation cover becomes less continuous at higher elevations as a result of factors such as harsher climate and less available water. _Dryas integrifolia_ and _Arctostaphylos rubra_ assume prominent roles in the rocky heathlands above 1700 m. Most common in the vicinity of, but not restricted to, late remaining snow, are herbaceous taxa such as _Astragalus alpinus_, _Potentilla diversifolia_, _P. hyparctica_, _P. uniflora_, _Luzula arctica_ and _L. confusa_.

The uppermost reaches of the alpine zone are characterized by lichen dominated fellfields. Here, conditions are windy and, because of the early disappearance of snow, quite dry. Important vascular plant taxa include _Antennaria alpina_, _A. monocephala_, _Hierochloe alpina_, _Potentilla diversifolia_, _P. hyparctica_, _Salix reticulata_ and _Silene acaulis_. These taxa match very closely those reported by Welsh and Rigby (1971) as dominant in high alpine sites approximately 100 km south of the present study area.

Important additional habitats, largely independent of biogeoclimatic zones, include rock faces (Figure 4, A) and aquatic environments. Although vascular taxa are scarce in both of these habitats, they are nonetheless of particular interest.

Damp crevices and ledges on rock faces harbour rarely collected plants such as _Draba fladnizensis_, _D. lactea_, _D. macounii_, _Lloydia serotina_, _Luzula arctica_ and _L. confusa_. Additional species occurring in these habitats include; _Carex nardina_, _C. scirpoidea_, _Saxifraga caespitosa_, _S. nivalis_ and _S. oppositifolia_.

Most lakes in the study area occupy a basin that falls away steeply from the shoreline and are oligotrophic resulting in few suitable habitats for vascular aquatics. Shallow seepage ponds, slow moving streams and areas where sufficient silt has been deposited at river mouths, however, support populations of *Callitriche anceps*, *Lysimachia thyrsiflora* and, most commonly, *Ranunculus aquatilis*. Not restricted to aquatic habitats, but often partially submerged are: *Caltha leptosepala*, *Carex aquatilis*, *C. canescens*, *C. sitchensis*, *Eriophorum angustifolium* and *E. scheuchzeri*.

Figure 4 : Generalized vegetation of the study area

Legend

A - Steep rock faces; boulders and talus common

B - Sub-Alpine Fir

C - Willow thickets

D - Rocky heathlands; Scrub Glandular Birch common

E - Wetlands; predominantly Sphagnum, Sedge and Cotton-Grass

F - Open meadows

Where more than one general vegetation type is indicated, the order of appearance of letters reflects the relative dominance of that type.

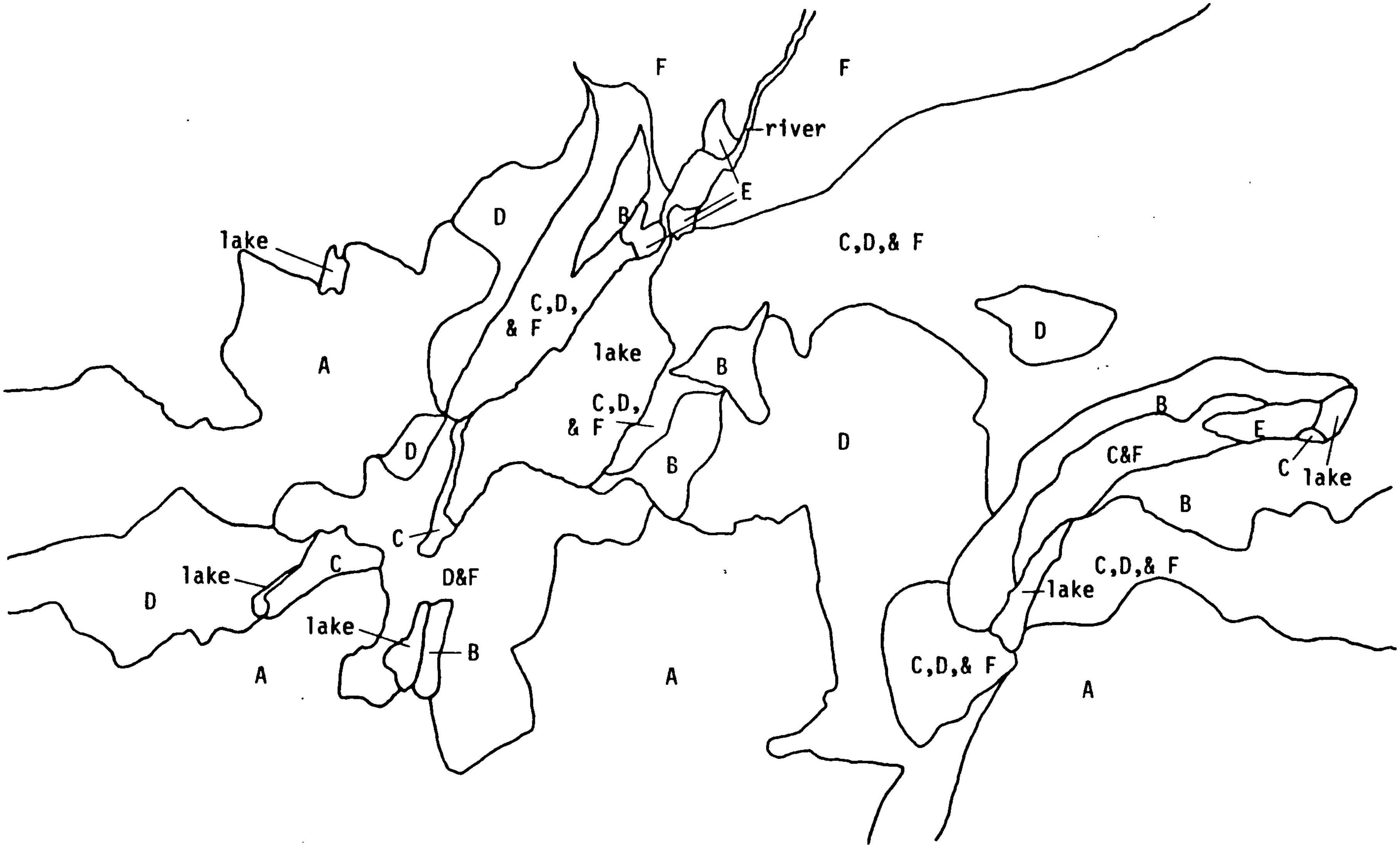

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Figure 5: General views of the study area.

A.-Aerial view of the study area looking south as seen from a helicopter at approximately 2800 m altitude. The western flank of Glacial Mountain is clearly visible on the left side of the photograph.

B.- Drift filled valley in the northern portion of the study area.

A

B

Figure 6: Selected habitats of the study area.

A.- *Betula glandulosa* thickets typical of the upper shrub subzone of the Spruce-Willow-Birch subalpine zone.

B.- Upper reaches of the Alpine Tundra Zone with *Potentilla uniflora* and *Silene acaulis* in the foreground.

A

B

CHAPTER 3

MATERIALS AND METHODS

Preparatory Studies

Prior to commencement of the field season, aerial photographs (British Columbia Ministry of the Environment reference numbers 127, 128, 129, 237, 238 and 239), topographic (National Topographic Series, map 104I) and geologic (Gabrielse, 1979) maps were studied in order to become acquainted with the general landforms and habitats likely to be encountered in the study area. In addition, pertinent vascular plant floras and species lists (K.I. Beamish , 1973a NP, 1973b NP; T.C. Brayshaw, 1971 NP; Buttrick, 1978;D. Galloway, 1974 NP; Gjaervoll, 1958, 1963, 1967; Hultén, 1941-1950, 1968; V.J. Krajina, 1975 NP, 1973a NP, 1973b NP; J. Pojar, 1975 NP; Porsild and Cody, 1980; Raup, 1947;A. Szczawinski, 1960 NP; Taylor and MacBryde, 1977; Welsh, 1974) were researched and a list of taxa that could conceivably be found in the study area was compiled to aid in a preliminary study of the anticipated flora.

Field Work

Ice on lakes in the study area had melted sufficiently to allow a small float plane safe landing by the last week of June. Equipment and supplies were flown in at this time and a permanent camp was established at the southwest foot of Glacial Mountain.

Two Steveston screens equipped with R. Fuess recording hydrothermographs and "Tru-Check" rain gauges were set up to record on-site climatic data. Mean values of the data obtained from these stations were later compared with similar data gathered over the same time interval at the Dease Lake Environment Canada weather station. (A comparative summary of data obtained is given in table I).

Daily collecting trips were made throughout the growing season. During this time as many habitats as possible were sampled. For the most part, travel on foot was relatively unhampered, however, a canoe proved useful in gaining access to collecting localities obstructed by waterways and also in the collection of aquatics.

Initially, specimens were collected in plastic bags. With the onset of warmer temperatures, however, this method proved to be inappropriate as many plants were prone to wilting. Returning to camp throughout the day would have proven too restrictive in terms of the area that could be covered; therefore, a field press was employed. At the time each collection was made a number was assigned and field notes including date, elevation, habitat, description, habit, relative abundance, size and flower colour (where applicable) were recorded.

In the evening, collections were removed from the field press and, wherever possible, tentative identifications were made. The plants were then transferred to a larger press for drying. The "field dryer" consisted of a waterproof tarpaulin covering an improvised wooden frame. The large plant press was suspended from this frame and beneath it, at a distance of approximately 1 meter, was a propane fired catalytic heater. Once dry, the specimens were packed in boxes and placed in a waterproof storage locker.

Herbarium Study

General references frequently utilized in keying collections from the study area included the works of Calder and Taylor, 1968; Henry, 1915; Hitchcock et al., 1955, 1959, 1961, 1964, 1969; Hitchcock and Cronquist, 1973; Hulten, 1968; Looman and Best, 1979; Moss, 1959; Porsild and Cody, 1980; Scoggan, 1978a, 1978b, 1978c, 1979 and Welsh, 1974. Several references specific to a particular family, genus or species also proved invaluable; these are cited in the annotated species list under the appropriate family. In many instances, final identification of material required direct comparison with herbarium collections. Specimens housed at the University of British Columbia Herbarium (UBC) in Vancouver and the British Columbia Provincial Museum Herbarium (V) in Victoria were referred to extensively for this purpose. Particularly troublesome taxa were sent to authorities for verification or identification. Where such was the case, the authorities are acknowlegdged in the appropriate section of the annotated species list.

Over 1000 collections were identified from the study area. A total of 239 taxa were recognized representing 116 genera and 44 families. A complete set of voucher specimens has been deposited in the University of British Columbia herbarium, duplicate material of the genus *Salix* is housed in the herbarium of the National Museum of Canada (CAN) in Ottawa and duplicate material of the genus *Carex* is housed in the British Columbia Provincial Museum in Victoria (V).

CHAPTER 4

FLORISTICS

The Vascular Plant Flora of Glacial Mountain and Vicinity: North Western British Columbia

Taxonomic treatment of much of the flora of Northern British Columbia and adjacent territories varies according to the individual philosophy of a given author. This is particularly evident at the subspecific level. For example, Hultén makes liberal use of the rank of subspecies to distinguish "...taxonomically separate but closely related populations in which all or some of the individuals in each population [of a given species] differ in minor morphological characteristics from those of the other, the two populations occupying large and partially or completely isolated geographic areas, and being potentially capable of interbreeding without substantial reduction of fertility" (Hultén, 1968). Welsh, on the otherhand, adopts a more conservative approach. He frequently acknowledges Hultén's subspecies but is at times reluctant to afford them separate taxonomic status, suggesting ecological rather than genetic control of morphological variability (Welsh, 1974). The scattered nature of collection localities in northern B.C., the Yukon and parts of Alaska, together with the paucity of some material are among the factors rendering resolution of these differences in approach difficult if not impossible.

It is not within the aims of the present paper to attempt to resolve questions of taxonomy. For the sake of consistency, therefore, it was decided to adhere to one reference for both systematic placement and nomenclature. Taylor and MacBryde (1977) provide the most recent and complete catalogue of the vascular plants of British Columbia and it is from their work that the order of presentation and names of taxa in the following keys and species lists are derived.

Keys to the Local Flora

1a. Plants producing spores.......................PTERIDOPHYTA

1b. Plants producing pollen................................2

2a. Ovules naked, not enclosed in an ovary...........PINOPHYTA

2b. Ovules enclosed in an ovary..................MAGNOLIOPHYTA

PTERIDOPHYTA

1a. Sporangia aggregated into sori, borne on the lower surface of a frond..................................ASPLENIACEAE

1b. Sporangia aggregated into terminal strobili, on a spike-like segment of a frond or solitary in the axils of sporophylls...2

2a. Stems jointed; leaves whorled; sporangia borne beneath peltate sporangiophores in a terminal strobilus...EQUISITACEAE

2b. Stems not jointed; leaves compound and 1-2 per stem or simple, numerous and spirally arranged (less commonly opposite); sporangia aggregated on spike-like segment of a frond or solitary in the axils of sporophylls............3

3a. Spores of 2 types (heterosporous), sporangia producing numerous microspores and 1-4 megaspores...SELAGINELLACEAE

3b. Spores all alike (homosporous)..........................4

4a. Sporangia borne on spike-like segment of a frond.........
....OPHIOGLOSSACEAE

4b. Sporangia solitary in the axils of sporophylls...........
....LYCOPODIACEAE

PINOPHYTA

1a. Leaves needle-like or subulate 0.3-1.0 cm long, appearing in whorls; ovulate cones blue to purple and fleshy at maturity......................................CUPRESSACEAE

1b. Leaves needle-like mostly greater than 1.0 cm long, borne singly and arranged spirally or borne in clusters, spirally arranged on spur branches; ovulate cones woody...
....PINACEAE

MAGNOLIOPHYTA

1a. Leaves net-veined; flower parts usually in 4's or 5's; vascular bundles arranged in a circle or fused to form a tubular vascular cylinder; embryo producing 2 cotyledons..
....DICOTYLEDONEAE

1b. Leaves parallel-veined; flower parts usually in 3's; vascular bundles scattered throughout stem; embryo producing a single cotyledon.............MONOCOTYLEDONEAE

DICOTYLEDONEAE

1a. Corolla absent (sepals in 2 whorls, the inner whorl appearing as petals in Empetraceae).......................2

1b. Corolla present...10

2a. Woody trees or shrubs; flowers borne in catkins..........3

2b. Herbs or shrubs; flowers not borne in catkins............4

3a. Plants dioecious; flowers solitary in the axils of scale-like bracts; fruit a 2-4 valved capsule.........SALICACEAE

3b. Plants monoecious; flowers 3-6 subtended by each scale-like bract; fruit a 1-seeded nutlet or samara....... ....BETULACEAE

4a. Low, spreading shrub; leaves needle-like, evergreen, alternate or whorled..........................EMPETRACEAE

4b. Plants herbaceous; leaves not needle-like, leaves opposite, alternate and/or basal..........................5

5a. Sepals and stamens borne on hypanthium...................6

5b. Hypanthium lacking.......................................7

6a. Leaves pinnately compound; flowers numerous in dense spikes; hypanthium saucer shaped, not winged......ROSACEAE

6b. Leaves simple; flowers solitary or few flowered in bracteate cymes; hypanthium sub-globose, narrowly winged.. ......................................SAXIFRAGACEAE

7a. Leaves with sheathing stipules (ocreae).......POLYGONACEAE

7b. Leaves lacking sheathing stipules (sometimes with stipule-like petiolar basal sheaths in Ranunculaceae)...........8

8a. Leaves alternate, whorled or basal, or a combination of these; pistils 2-numerous; fruit an achene or follicle.... ....RANUNCULACEAE

8b. Leaves opposite; pistils 1; fruit a schizocarp or a capsule 9

9a. Plants aquatic; flowers monoecious, lacking both calyx and corolla; fruit a schizocarp...............CALLITRICHACEAE

9b. Plants terrestrial; flowers perfect, calyx consisting of 4-5 separate or united sepals; fruit a capsule........... ......................................CARYOPHYLLACEAE

10a. Petals (some or all) united, at least partially.........11

10b. Petals distinct (sometimes connate distally)...........25

11a. Flowers in involucrate heads; corollas of two types (ligulate and tubular), or merely one type (either ligulate or tubular)...........................ASTERACEAE

11b. Flowers not in involucrate heads.......................12

12a. Corolla zygomorphic....................................13

12b. Corolla actinomorphic (nearly so in Veronica)...........16

13a. Ovary inferior; rootstock strongly scented............... ....VALERIANACEAE

13b. Ovary superior; rootstock not strongly scented..........14

14a. Corolla with one petal spurred at the base, inner petals connate at the apex; stamens 6, diadelphous, in 2 groups of 3..FUMARIACEAE

14b. Corolla papilionaceous or bilabiate (merely lobed with the top lobe the largest in <u>Veronica</u>); stamens 2, 4 or 10...15

15a. Corolla papilionaceous, the upper petal large (banner) enclosing the lateral pair (wings) and the lower usually connate pair (keel); stamens 10...................FABACEAE

15b. Corolla strongly bilabiate; stamens 4, in 2 pairs (corolla merely lobed, the upper lobe largest; stamens 2 in <u>Veronica</u>) ..............................SCROPHULARIACEAE

16a. Plants woody...17

16b. Plants herbaceous..18

17a. Anthers opening by way of terminal pores or slits, (dehiscing full length in <u>Kalmia</u>); stamens usually 10 (8-12) ....ERICACEAE

17b. Anthers dehiscing lengthwise; stamens 4-5................. ....CAPRIFOLIACEAE

18a. Ovary inferior...19

18b. Ovary superior...21

19a. Cauline leaves alternate; fruit a capsule....CAMPANULACEAE

19b. Cauline leaves opposite or whorled; fruit a schizocarp or dry berry....................................20

20a. Basal leaves lacking; cauline leaves opposite or whorled, simple, entire; stamens 4-5; fruit a schizocarp..........
....RUBIACEAE

20b. Basal leaves long petiolate, ternately compound; cauline leaves opposite, palmately lobed; stamens 8-10; fruit a dry berry....................................ADOXACEAE

21a. Stamens 2...........................SCROPHULARIACEAE

21b. Stamens 4-5..22

22a. Stamens opposite the corolla lobes............PRIMULACEAE

22b. Stamens alternating with the corolla lobes.............23

23a. Leaves pinnately compound; ovary simple.....POLEMONIACEAE

23b. Leaves simple; ovary 2-carpellate......................24

24a. Cauline leaves opposite; fruit a capsule.....GENTIANACEAE

24b. Cauline leaves alternate; fruit 4 nutlets....BORAGINACEAE

25a. Calyx and/or corolla zygomorphic.......................26

25b. Calyx and corolla actinomorphic........................29

26a. Sepals 5, petaloid, showy, bluish purple....RANUNCULACEAE

26b. Sepals 2-5, not petaloid, not showy, green.............27

27a. Sepals united forming a tubular calyx; stamens 10.........
....FABACEAE

27b. Sepals distinct; stamens 5 or 6.........................28

28a. Sepals 2, bract-like; petals 4, 2 connate distally;
stamens 6.....................................FUMARIACEAE

28b. Sepals 5; petals 5, distinct distaly; stamens 5...........
....VIOLACEAE

29a. Flowers with 5 pectinate, glandular tipped staminodia
alternating with the stamens................PARNASSIACEAE

29b. Pectinate, glandular-tipped staminodia lacking..........30

30a. Pistils 3-numerous......................................31

30b. Pistils 1...33

31a. Leaves succulent; plants dioecious...........CRASSULACEAE

31b. Leaves not succulent; flowers perfect...................32

32a. Sepals and petals borne on the rim of a hypanthium........
....ROSACEAE

32b. Sepals and petals borne on receptacle, hypanthium lacking
....RANUNCULACEAE

33a. Plants woody..34

33b. Plants herbaceous.......................................35

34a. Petals and stamens borne near the top of a free hypanthium; leaves deciduous, lobed........GROSSULARIACEAE

34b. Hypanthium lacking; leaves evergreen, leathery, not lobed ....ERICACEAE

35a. Pistil compound, 2 (rarely 3-5) carpellate, 1-loculed..... ....SAXIFRAGACEAE

35b. Pistil simple, 1-5 loculed..............................36

36a. Ovary superior...37

36b. Ovary inferior...40

37a. Sepals 4-5; petals 4-5; stamens 5-10....................38

37b. Sepals 2 or 4; petals 4 or 5; stamens 5 or 6............39

38a. Leaves mainly basal, evergreen, leathery; anthers opening by way of terminal pores.......................PYROLACEAE

38b. Leaves mainly cauline, opposite, not leathery; anthers dehiscing longitudinally..................CARYOPHYLLACEAE

39a. Sepals 2; petals 5; stamens 5; fruit a capsule............ ....PORTULACACEAE

39b. Sepals 4; petals 4; stamens 6; fruit a silique or silicle ....BRASSICACEAE

40a. Calyx 4-lobed; petals 4; stamens 4 or 8; flowers arranged in cymes or racemes....................................41

40b. Calyx 5-lobed; petals 5; stamens 5; flowers arranged in compound umbels.................................APIACEAE

41a. Inflorescence a solitary umbellate cyme subtended by usually 4, cream to pink, petaloid bracts; stamens 4...... ....CORNACEAE

41b. Flowers arranged in racemes; petaloid bracts lacking; stamens 8....................................ONAGRACEAE

MONOCOTYLEDONEAE

1a. Perianth consisting of 6 segments in 2 series; fruit a capsule..2

1b. Perianth reduced to 2 fleshy lodicules, bristles, or lacking; fruit an achene or caryopsis....................3

2a. Sepals and petals scale-like, scarious...........JUNCACEAE

2b. Sepals and petals herbaceous, coloured, often showy....... ....LILIACEAE

3a. Stems usually hollow; leaves 2-ranked; perianth reduced to 2 fleshy lodicules; fruit a caryopsis.............POACEAE

3b. Stems usually solid and triangular; leaves 3-ranked; perianth composed of bristles or absent; fruit an achene.. ....CYPERACEAE

PTERIDOPHYTA

ASPLENIACEAE

1a. Fronds evergreen; petioles with 3 or more vascular bundles; indusium reniform, attached at the sinus...*Dryopteris* (*fragrans*)

1b. Fronds deciduous; petioles with 2 vascular bundles (at least near the base); indusium lobed or lacking..........2

2a. Indusium lacking, even when young..*Gymnocarpium* (*dryopteris* var. *disjunctum*)

2b. Indusium present, at least when young....................3

3a. Indusium enclosing the sorus with hairlike lobes; petioles jointed near the base (except in *W. scopulina*); veins of pinnae not reaching the margin..........*Woodsia* (*glabella*)

3b. Indusium hood-like, withering with age; petioles not jointed; veins of pinnae reaching the margin...*Cystopteris*

Cystopteris

1a. Leaf blade somewhat deltoid in outline, lower pair of pinnae much larger than those immediately above them...*Cystopteris montana*

1b. Leaf blade lanceolate to lanceolate oblong in outline; lower pair of pinnae approximately the same size as those immediately above them................*Cystopteris fragilis*

EQUISITACEAE

Equisetum

1a. Plant densely tufted; stems solid 0.5-1 mm thick..........
..................................*Equisetum scirpoides*

1b. Plant rhizomatous; stems hollow, dimorphic...............2

2a. Spring phase (strobilus bearing stems) lacking chlorophyll, usually unbranched; summer phase (vegetative stems) green, with whorls of simple, ascending branches.................
....................................*Equisetum arvense*

2b. Spring phase (strobilus bearing stems) lacking chlorophyll and whorls of forked branches; summer phase (vegetative stems) green, with whorls of forked, recurving branches...
......................*Equisetum sylvaticum* var. *sylvaticum*

LYCOPODIACEAE

1a. Sporangia borne in the axils of otherwise undifferentiated leaves (sporophylls); plants tufted......................
...........................*Huperzia* (*selago* var. *selago*)

1b. Sporangia borne in terminal strobili; plant rhizomatous...
....*Lycopodium*

Lycopodium

1a. Leaves 4-ranked (occasionally 6-ranked on some stems); stems creeping slightly below surface......................2

1b. Leaves 8-many-ranked; stems creeping mostly above ground..
....3

2a. Strobili pedunculate; branches strongly flattened.........
.................................*Lycopodium complanatum*

2b. Strobili essentially sessile; sterile branches only slightly flattened.....................*Lycopodium alpinum*

3a. Strobili pedunculate; leaves tipped with a long, hair-like bristle.............................*Lycopodium clavatum*

3b. Strobili sessile; leaves tipped with a sharp spine........
....................*Lycopodium annotinum* subsp. *annotinum*

OPHIOGLOSSACEAE..............*Botrychium lunaria* subsp. *lunaria*

SELAGINELLACEAE......................*Selaginella selaginoides*

PINOPHYTA

CUPRESSACEAE...................*Juniperus communis* subsp. *alpina*

PINACEAE

1a. Leaves borne in fascicles of 2 on short branches..........
.............................*Pinus contorta* var. *latifolia*

1b. Leaves borne singly on the branches.....................2

2a. Leaves pointed, roughly square in cross section, lacking petioles, deciduous above the base leaving persistent peg-like leaf bases; ovulate cones turned downward, not falling apart at maturity..................*Picea* (*glauca*)

2b. Leaves blunt, flat, petiolate; fully deciduous leaving circular leaf scar; ovulate cones erect, shedding scales leaving a persistent axis................................
........................*Abies* (*lasiocarpa* var. *lasiocarpa*)

MAGNOLIOPHYTA (DICOTYLEDONAE)

ADOXACEAE..............................*Adoxa moschatellina*

APIACEAE

1a. Leaves twice to three times ternately compound; taproots with internal transverse partitions at the apex of the crown ....*Angelica (lucida)*

1b. Leaves once ternately compound; taproots lacking internal transverse partitions at the apex of the crown............ ....*Heracleum* (*sphondylium* subsp. *montanum*)

ASTERACEAE

1a. Both ray and disk florets present (sometimes vestigial in *Petasites*)..2

1b. Heads lacking either ray or disk florets................8

2a. Pappus lacking.........*Achillea* (*millefolium* var *borealis*)

2b. Pappus present, consisting of capillary bristles.........3

3a. Ray florets yellow to yellow-orange.....................4

3b. Ray florets white, pink or purple (sometimes vestigial in *Petasites*)..6

4a. Cauline leaves opposite.............................*Arnica*

4b. Cauline leaves alternate..............................5

5a. Involucral bracts in 1-2 series..................*Senecio*

5b. Involucral bracts in several series........................
..................Solidago (multiradiata var. multiradiata)

6a. Basal leaves long petiolate, broad; cauline leaves much reduced...Petasites

6b. Basal leaves not long petiolate, narrow; cauline leaves, when present, of various shapes and sizes................7

7a. Involucral bracts in 3 or more rows.......Aster (modestus)

7b. Involucral bracts in 1-2 rows....................Erigeron

8a. Ray florets lacking...................................9

8b. Disk florets lacking.................................11

9a. Involucral bracts in 1 series; disk florets orange........
....................................Senecio (pauciflorus)

9b. Involucral bracts in several series; disk florets white to greenish-yellow...................................10

10a. Plants dioecious; heads solitary or in corymbose cymes; pappus of capillary bristles....................Antennaria

10b. Flowers mostly perfect; heads in spicate racemes or paniculate clusters; pappus lacking or in a short crown...
....Artemisia

11a. Cauline leaves present; heads several, borne in corymbose cymes...Hieracium

11b. Cauline leaves lacking; heads solitary..................12

12a. Disk florets yellow; achenes spiny.....*Taraxacum* (*lyratum*)

12b. Disk florets brownish-orange (drying purplish); achenes smooth...............*Agoseris* (*aurantiaca* var. *aurantiaca*)

Antennaria

1a. Plants usually less than 10 cm tall; heads solitary....... ....*Antennaria monocephala*

1b. Plants usually greater than 15 cm tall; heads 2-several per peduncle..2

2a. Scarious portion of involucral bracts bright pink to white ....*Antennaria microphylla*

2b. Scarious portion of involucral bracts blackish green to tawny coloured.....................................3

3a. Involucral bracts mostly rounded apically, the scarious portion tawny coloured..............*Antennaria umbrinella*

3b. Involucral bracts mostly acuminate apically, the scarious portion blackish green........*Antennaria alpina* var. *media*

Arnica

1a. Heads solitary (rarely more in *Arnica louiseana*), nodding 2

1b. Heads more than 1, not nodding...........................3

2a. Anthers purple; pappus brownish..........*Arnica lessingii*

2b. Anthers yellow; pappus white................................ ....*Arnica louiseana* subsp. *frigida*

3a. Lower cauline leaves mostly cordate, petioles 25 mm - 40 mm long; ray florets tapering slightly before terminating in long (usually greater than 1.5 mm long) slender apical teeth; achenes hirsute throughout or at least on the distal two-thirds..........*Arnica cordifolia*

3b. Lower cauline leaves cuneate to subcordate, sessile or with winged petioles up to 10 mm long; ray florets truncate with short (usually less than 1.0 mm long), blunt apical teeth; achenes glabrous or hirsute on the distal third.....................*Arnica latifolia* var. *latifolia*

Artemisia

1a. Basal and lower cauline leaves bipinnately dissected...... ....*Artemisia arctica* subsp. *arctica*

1b. Basal and lower cauline leaves merely lobed, the lobes broadly or narrowly lanceolate...........................2

2a. Inflorescence branched................................... ....*Artemisia tilesii* subsp. *unalaschcensis*

2b. Inflorescence spike-like, unbranched...................... ....*Artemisia tilesii* subsp. *tilesii*

Erigeron

1a. Stems branched; heads several.............................
..........................*Erigeron acris* subsp. *debilis*

1b. Stems simple; heads solitary.............................2

2a. Plant low growing, usually less than 12 cm tall; involucrum densely wooly, appearing purple as a result of the dark purple crosswalls occurring in each of the involucral hairs..........................*Erigeron humilis*

2b. Plant taller, usually greater than 20 cm tall; involucral bracts glandular, lacking purple tomentum.................
..................*Erigeron peregrinus* subsp. *callianthemus*

Hieracium

1a. Upper portion of stem and involucral bracts conspicuously stipitate glandular, grey-black villous, hairs usually less than 1.5 mm long...................*Hieracium gracile*

1b. Upper portion of stem and involucrum not stipitate glandular, grey-black villous, hairs usually greater than 2.0 mm long............................*Hieracium triste*

Petasites

1a. Leaves deeply lobed, the sinuses extending nearly half-way to the midrib, the lobes secondarily toothed.............
....*Petasites nivalis*

1b. Leaves not deeply lobed; the margins coarsely toothed.....
......................................*Petasites frigidus*

Senecio

1a. Basal leaves lacking; cauline leaves several, large triangular, triangular-hastate, or triangular cordate..... ....*Senecio triangularis*

1b. Basal leaves present; cauline leaves reduced upwards.....2

2a. Involucral bracts in 2 series, conspicuously black-tipped; ray florets yellow, 7-12 mm long...........*Senecio lugens*

2b. Involucral bracts in 1 series, lacking black tips; ray florets (when present) yellow to yellow-orange, 5-7 mm long.................................*Senecio pauciflorus*

BETULACEAE...................*Betula glandulosa* var. *glandulosa*

BORAGINACEAE

1a. Basal leaves large, up to 15 cm long; flowers large, 10-19 mm long expanded portion of corolla (limb) longer than the tube, campanulate; flowers with leafy bracts..... ....*Mertensia* (*paniculata* var. *paniculata*)

1b. Basal leaves smaller, up to 10 cm long; flowers smaller, 2-5 mm long, expanded portion of corolla (limb) spreading; flowers lacking leafy bracts..........*Myosotis* (*asiatica*)

BRASSICACEAE

1a. Plants hirsute (at least the leaves) with simple, forked, stellate or cruciform hairs (or a combination of these); fruit a silicle or short silique, less than 10 times longer than broad, more or less elliptic............*Draba*

1b. Plants glabrous, or with a few simple or forked hairs; fruit a silique; greater than 10 times longer than broad, linear..2

2a. Cauline leaves sessile, occasionally appearing broadly petiolate in *Arabis drummondii*; valves of siliques 1-nerved....................................*Arabis*

2b. Cauline leaves petiolate; valves of siliques nerveless.... ....*Cardamine*

Arabis

1a. Basal leaves usually lyrate-pinnatified; sepals 2-3 mm long; petals 4.5-7 mm long; cauline leaves tapering to a broad petiole, not auriculate; seeds in 1 row, not winged ....*Arabis lyrata* subsp. *kamchatica*

1b. Basal leaves entire (rarely denticulate); sepals 3-4.5 mm long; petals 7-10 mm long; cauline leaves sessile, auriculate; seeds in 2 rows, broadly winged............... ....*Arabis drummondii*

Cardamine

1a. Leaves all simple; style 1-3 mm long.................... ....*Cardamine bellidifolia* subsp. *bellidifolia* var. *bellidifolia*

1b. Leaves compound; leaflets oval to ovate or lobed; style 0.4-1 mm long.......................*Cardamine umbellata*

Draba

1a. Plants scapose..2

1b. Cauline leaves present..................................5

2a. Stems sparsely pubescent; petals yellow.....*Draba macounii*

2b. Stems glabrous; petals white............................3

3a. Upper and lower leaf surfaces densely covered with stellate hairs..............................*Draba nivalis*

3b. Leaf surfaces glabrous to sparsely pubescent, hairs mostly simple to few-forked (some stellate hairs appearing concentrated towards the apex in *Draba lactea*)...........4

4a. Styles less than 0.3 mm long; leaves lacking stellate hairs...................................*Draba fladnizensis*

4b. Styles greater than 0.4 mm long; leaves sometimes with stellate hairs concentrated towards the apex...*Draba lactea*

5a. Cauline leaves 4-16; siliques covered with simple to few forked hairs..............................*Draba borealis*

5b. Cauline leaves 1-3; siliques glabrous or rarely with simple hairs along suture lines..........................6

6a. Upper leaf surfaces exhibiting mainly trifid and cruciform hairs, rarely glabrous; stems with mostly cruciform hairs ....*Draba stenoloba*

6b. Upper leaf surfaces exhibiting mainly simple and bifid hairs; stem hairs mostly simple............*Draba albertina*

CALLITRICHACEAE.............................*Callitriche anceps*

CAMPANULACEAE...........*Campanula lasiocarpa* subsp. *lasiocarpa*

CAPRIFOLIACEAE...............*Linnaea borealis* subsp. *americana*

CARYOPHYLLACEAE

1a. Sepals united, forming a tube.....................*Silene*

1b. Sepals distinct or nearly so.............................2

2a. Petals (when present) bilobed; stamens inserted at the base of the ovary.....................................3

2b. Petals (when present) entire to slightly emarginate, not bilobed; stamens inserted at the base of a glandular disk 4

3a. Styles 3 (rarely 4-5);capsules ovoid or oblong, dehiscing by way of 6 (rarely 8 or 10) teeth..............*Stellaria*

3b. Styles 4-5; capsules cylindrical, dehiscing by way of 10 teeth........*Cerastium* (*beeringianum* subsp. *beeringianum*)

4a. Styles usually 3, opposite exterior sepals; capsules dehiscing by way of 6 valves...*Arenaria* (*longipedunculata*)

4b. Styles 4-5, alternating with the sepals, capsules dehiscing by way of 4-5 valves.........*Sagina (intermedia)*

Silene

1a. Densely matted cushion forming plants; pedicels glabrous; petals 8-12 mm long, pink, almost entire to emarginate.... ....*Silene acaulis* subsp. *acaulis*

1b. Plants tufted but not forming dense cushions; pedicels ciliate; petals included within or barely exserted from the calyx, white to pink, bilobed......................... ....*Silene uralensis* subsp. *attenuata*

Stellaria

1a. Leaves shiny, somewhat glaucous, distinctly keeled.......2

1b. Leaves dull, not glaucous, lacking a keel................3

2a. Sepals ciliate on margin.....*Stellaria longipes* var. *laeta*

2b. Sepals lacking cilia on margin............................ ....*Stellaria longipes* var. *altocaulis*

3a. Leaf margins flat, minutely serrulate..................... ....*Stellaria calycantha* var. *calycantha*

3b. Leaf margins distinctly wavy, entire...*Stellaria umbellata*

CORNACEAE..................................*Cornus canadensis*

CRASSULACEAE...........*Sedum integrifolium* subsp. *integrifolium*

EMPETRACEAE..............*Empetrum nigrum* subsp. *hermaphroditum*

ERICACEAE

1a. Ovary inferior; stamens 8-10....................*Vaccinium*

1b. Ovary superior; stamens 5-10.............................2

2a. Leaves needle-like, evergreen............................3

2b. Leaves not needle-like, evergreen or deciduous...........4

3a. Leaves closely appressed, usually 4-ranked.......*Cassiope*

3b. Leaves spreading, alternate, not 4-ranked......*Phyllodoce*

4a. Anthers opening by way of terminal pores.................5

4b. Anthers dehiscing full length............................ ....*Kalmia* (*microphylla* subsp. *microphylla*)

5a. Corolla rotate, the segments almost distinct; leaves brown-orange tomentose beneath......................*Ledum*

5b. Corolla urceolate; leaves glabrous beneath..............6

6a. Flowers in terminal umbels; leaves narrowly elliptic, revolute; fruit a capsule................................ ....*Andromeda* (*polifolia* subsp. polifolia)

6b. Flowers in terminal racemes; leaves obovate, not revolute; fruit a berry.....................*Arctostaphylos* (*rubra*)

Cassiope

1a. Leaves with conspicuous longitudinal groove on convex lower surface............*Cassiope tetragona* var. *tetragona*

1b. Leaves lacking longitudinal groove on convex lower surface ....*Cassiope mertensiana* var. *mertensiana*

Ledum

1a. Leaves linear, usually 1-3 cm long; stems 1-5 dm long; stamens usually 10.........*Ledum palustre* subsp. *decumbens*

1b. Leaves oblong to linear oblong, usually 2-4.5 cm long; stems 3-15 dm long; stamens usually 8.................... ....*Ledum groenlandicum*

Phyllodoce

1a. Corolla greenish-yellow, urceolate, stipitate glandular... ....*Phyllodoce glanduliflora*

1b. Corolla pale to deep pink, sparsely stipitate glandular to glabrous, narrowly to broadly campanulate................2

2a. Corolla pale pink, sparsely stipitate glandular, narrowly campanulate.......................*Phyllodoce* X *intermedia*

2b. Corolla deep pink, glabrous, broadly campanulate.......... ....*Phyllodoce empetriformis*

Vaccinium

1a. Leaves evergreen, leathery..............................2

1b. Leaves deciduous..3

2a. Corolla campanulate; stems ascending, not rooting......... ....*Vaccinium vitis-idaea* subsp. *minus*

2b. Petals distinct, reflexed; stems prostrate, rooting....... ....*Vaccinium microcarpum*

3a. Branchlets angled; calyx shallowly lobed.................4

3b. Branchlets round in cross section; calyx deeply lobed..... ....*Vaccinium uliginosum* subsp. *alpinum*

4a. Stems usually 1-3 dm tall; branchlets usually puberulent; leaves acute basally, the margins serrulate throughout.... ....*Vaccinium caespitosum* var. *caespitosum*

4b. Stems usually 4-10 dm tall; branchlets usually glabrous; leaves rounded to subcordate basally, the margins entire to finely serrulate mainly in the lower half.............. ....*Vaccinium ovalifolium*

FABACEAE

1a. Leaves palmately compound................................ ....*Lupinus* (*arcticus* subsp. *arcticus*)

1b. Leaves pinnately compound...............................2

2a. Keel beaked..............*Oxytropis* (*sericea* var. *spicata*)

2b. Keel lacking a beak.....................................3

3a. Wings as long as or usually longer than the keel; fruit a legume.................*Astragalus* (*alpinus* subsp. *alpinus*)

3b. Wings shorter than the keel; fruit a loment..............
.....................*Hedysarum* (*alpinum* subsp. *americanum*)

FUMARIACEAE..............................*Corydalis pauciflora*

GENTIANACEAE

1a. Plants perennial; corolla with pleats in the sinuses of the lobes..............................*Gentiana* (*glauca*)

1b. Plants annual; corolla lacking pleats in the sinuses of the lobes..........................*Gentianella* (*propinqua*)

GROSSULARIACEAE..............................*Ribes glandulosum*

ONAGRACEAE

Epilobium

1a. Calyx tube lacking; petals entire.........................2

1b. Calyx tube present; petals emarginate....................3

2a. Inflorescence compact; style shorter than stamens, glabrous; leaves glaucous..............................
....................*Epilobium latifolium* subsp. *latifolium*

2b. Inflorescence elongate; style longer than stamens, hirsute basally; leaves not glaucous...........................
..............*Epilobium angustifolium* subsp. *angustifolium*

3a. Petals mostly dark to light pink; stems mostly under 15 cm tall, often reddish tinged, often producing leafy basal shoots.........................*Epilobium anagallidifolium*

3b. Petals mostly greenish white to white; stems mostly over 20 cm tall, green, not producing leafy basal shoots....... ....*Epilobium lactiflorum*

PARNASSIACEAE

Parnassia

1a. Flowers showy; petals approximately twice as long as the sepals, fimbriate along the lower margins; leaves long petiolate..............*Parnassia fimbriata* var. *fimbriata*

1b. Flowers inconspicuous; petals approximately equal in size to the sepals, entire; leaves short petiolate to almost sessile ....*Parnassia kotzbuei* var. *kotzbuei*

POLEMONIACEAE.............*Polemonium caeruleum* subsp. *villosum*

POLYGONACEAE

1a. Inconspicuous annual herbs; stems mostly 2-5 cm long; perianth consisting of 3 segments.....*Koenigia* (*islandica*)

1b. Conspicuous, erect, annual, biennial or perennial herbs; stems mostly greater than 10 cm long; perianth consisting of 3 segments..2

2a. Flowers borne in terminal spike-like racemes, the lower flowers replaced by bulbils...........*Bistorta* (*vivipara*)

2b. Flowers borne in panicles; bulbils lacking...............3

3a. Perianth consisting of 4 segments; leaves reniform; stems usually 10-60 cm tall ...._Oxyria_ (_digyna_)

3b. Perianth consisting of 6 segments (rarely 4); leaves mostly sagittate; stems usually 30-100 cm tall.. _Rumex_ (_acetosa_ subsp. _arifolius_)

PORTULACACEAE.............................._Claytonia_ _sarmentosa_

PRIMULACEAE

1a. Leaves all basal, long petiolate...._Dodecatheon_ (_frigidum_)

1b. Leaves cauline, sessile (or nearly so)..................2

2a. Leaves opposite, dotted with black glands; flowers borne in axillary racemes near the middle of the stem... _Lysimachia_ (_thyrsiflora_)

2b. Leaves alternate and reduced below, whorled above; flowers solitary on slender, axillary pedicels... _Trientalis_ (_europaea_ subsp. _arctica_)

PYROLACEAE

1a. Flowers solitary.........._Moneses_ (_uniflora_ var. _uniflora_)

1b. Flowers many, borne in terminal racemes..................2

2a. Flowers secund; petals greenish white.._Orthilia_ (_secunda_ subsp. _secunda_)

2b. Flowers not secund; petals white to deep pink......._Pyrola_

Pyrola

1a. Anthers opening by way of sessile pores (not located at the end of short tubes); style straight, included to barely exserted from corolla.................*Pyrola minor*

1b. Anthers opening by way of pores at the end of short tubes; style curved, conspicuously exserted from corolla........2

2a. Flowers fragrant; petals creamy white, sometimes suffused with pink; anthers yellow..............*Pyrola grandiflora*

2b. Flowers scentless; petals pink to crimson; anthers pink... ....*Pyrola asarifolia* var. *purpurea*

RANUNCULACEAE

1a. Flowers zygomorphic; sepals 5, petaloid, blue to purple... 2

1b. Flowers actinomorphic; sepals 3-12, green or petaloid; petaloid sepals yellow or cream coloured and often tinged with blue...3

2a. Upper sepal highly modified, forming a large helmet-like structure; petals 2, enclosed within the helmet........... ....*Aconitum* (*delphinifolium* subsp. *delphinifolium*)

2b. Upper sepal conspicuously spurred; petals 4............... ....*Delphinium* (*glaucum*)

3a. Petals present, usually 5-16; sepals usually caducous..... ....*Ranunculus*

3b. Petals lacking; sepals usually petaloid..................4

4a. Leaf blades simple, reniform to cordate with crenate margins; fruit a follicle..Caltha (leptosepala var. leptosepala)

4b. Leaf blades ternately compound or, if simple, palmately lobed; fruit an achene..................................5

5a. Perianth conspicuous, borne 1 per peduncle.........Anemone

5b. Perianth inconspicuous, borne in racemes or panicles...Thalictrum

Anemone

1a. Sepals yellow.........................Anemone richardsonii

1b. Sepals creamy white, tinged with blue externally.........2

2a. Achenes woolly..........................Anemone parviflora

2b. Achenes glabrous.....Anemone narcissiflora subsp. interior

Ranunculus

1a. Plants either aquatic or amphibious; stems at least partially prostrate and rooting at the nodes.............2

1b. Plants terrestrial; stems erect, not rooting at the nodes 3

2a. Plants aquatic; submerged leaves finely dissected; petals white.............................Ranunculus aquatilis

2b. Plants amphibious; leaves 3-5 lobed, lobes entire; petals yellow...........*Ranunculus hyperboreus* subsp. *hyperboreus*

3a. Plants dwarf, 3-10 cm tall; flowers relatively inconspicuous, petals 1.5-4 mm long, usually shorter than the sepals...........................*Ranunculus pygmaeus*

3b. Plants usually taller; flowers conspicuous, petals 6-12 mm long, longer than sepals..............................4

4a. Pedicels orange-brown hirsute; sepals brown hirsute, not reflexed.............*Ranunculus sulphureus* var. *sulphureus*

4b. Pedicels glabrous, sepals pubescent, reflexed when flowers open...........*Ranunculus occidentalis* subsp. *occidentalis*

Thalictrum

1a. Flowers perfect; basal leaves dark green and glossy....... ....*Thalictrum alpinum* var. *alpinum*

1b. Flowers unisexual, plants dioecious; basal leaves much lighter green, not glossy................................. ....*Thalictrum venulosum* var. *venulosum*

ROSACEAE

1a. Flowers borne in dense spikes; sepals 4, petaloid; petals lacking..........*Sanguisorba* (*canadensis* subsp. *latifolia*)

1b. Flowers solitary or borne in cymes or racemes; sepals 5-10; petals 5-10...............................2

2a. Sepals 5, alternating with 5 sepaloid bractlets; petals 5 3

2b. Sepals 5-10, sepaloid bractlets lacking; petals 5-10.....6

3a. Flowers inconspicuous; petals linear oblong, shorter than sepals; stamens 5..................<u>Sibbaldia</u> (<u>procumbens</u>)

3b. Flowers showy; petals not linear oblong, longer than sepals; stamens 10-numerous...............................4

4a. Petals creamy white; plant producing slender trailing stolons, rooting at the nodes; leaves basal; receptacle ripening to produce an edible accessory fruit.............
.......................<u>Fragaria</u> (<u>virginiana</u> subsp. <u>glauca</u>)

4b. Petals mostly yellow; plant not producing nodally rooting stolons; leaves cauline or basal and cauline; receptacle not ripening to produce an accessory fruit...............5

5a. Hypanthium lined with a glandular disk; styles inconspicuous, jointed to the achene, usually deciduous...
....<u>Potentilla</u>

5b. Hypanthium not lined with a glandular disk; styles elongate, persistent...................................
.....................<u>Geum</u> (<u>macrophyllum</u> var. <u>macrophyllum</u>)

6a. Flowers solitary on long scapose peduncles; petals 8-10; leaves simple, leathery; fruit an achene with a long plumose style.....<u>Dryas</u> (<u>integrifolia</u> subsp. <u>integrifolia</u>)

6b. Flowers solitary or few to many; sepals usually 5-7; petals usually 5-7; leaves alternate, variously compound or simple and lobed, not leathery; fruit a several seeded follicle or an aggregate....................................7

7a. Leaves biternately dissected; flowers borne in dense, spike-like racemes; fruit a several seeded follicle....... ....Luetkea (pectinata)
7b. Leaves pinnately or palmately compound, or simple and palmately lobed; flowers solitary or few in cymes; fruit an aggregate...Rubus

Potentilla

1a. Plants shrubby......Potentilla fruticosa subsp. floribunda
1b. Plants herbaceous.......................................2

2a. Leaves consisting of 5-7 leaflets; flowers few-several in cymes............Potentilla diversifolia var. diversifolia
2b. Leaves palmately 3-foliolate (rarely 5, the lower pair reduced in Potentilla uniflora); flowers 1-few...........3

3a. Leaflets white tomentose beneath.......Potentilla uniflora
3b. Leaflets glabrous to silky pilose beneath................. ....Potentilla hyparctica

Rubus

1a. Plants dioecious; leaves simple, the blades palmately lobed...................................*Rubus chamaemorus*

1b. Flowers perfect; leaves palmately 3-foliolate (sometimes appearing 5-foliolate in *Rubus pedatus*)..................2

2a. Petals pink; leaves distinctly 3-foliate..*Rubus arcticus* subsp. *acaulis*

2b. Petals white; leaves appearing 5-foliolate as a result of lobing of the lateral leaflets..............*Rubus pedatus*

RUBIACEAE...................................*Galium boreale*

SALICACEAE

Salix (Key revised from Argus, 1973)

1a. Dwarf or prostrate, trailing shrubs under 2 dm tall......2

1b. Erect shrubs, exceeding 2 dm tall, or trees..............4

2a. Leaves prominently reticulate; pistillate and staminate flowers with 2 nectaries, one on either side of the stipe; aments borne on prominent, subterminal floriferous branchlets.............*Salix reticulata* subsp. *reticulata*

2b. Leaves not reticulate; pistillate flowers with one nectary between the stipe and the ament axis; aments borne on lateral floriferous branchlets..........................3

3a. Leaves green or pale green beneath, not glaucous..*Salix polaris*

3b. Leaves glaucous beneath......................*Salix arctica*

4a. Flowering coetaneous or serotinous..........................
..............................*Salix glauca* var. *acutifolia*

4b. Flowering precocious......................................5

5a. Leaves densely white lanate beneath, bright green above; stipes 0-0.4 mm long........*Salix alaxensis* var. *alaxensis*

5b. Leaves sericeous or densely villous to sparsely pubescent or glabrescent beneath; stipes 0.2-2 mm long.............6

6a. Buds and stipules oily; stipules broadly ovate, margins prominently glandular; leaves white or grey sericeous-lanate beneath..........................*Salix barrattiana*

6b. Buds and stipules not oily; stipules linear; leaves glabrous, glabrate or sericeous beneath..................
..............*Salix planifolia* subsp. *pulchra* var. *pulchra*

SAXIFRAGACEAE

1a. Sepals 4; petals lacking.......*Chrysosplenium* (*tetrandrum*)

1b. Sepals 5; petals 5...................................2

2a. Petals fringed (laciniately lobed); stamens 5.............
...................................*Mitella* (*pentandra*)

2b. Petals entire; stamens 10..............................3

3a. Leaves 3-8 cm long, obovate, crenate-serrate, leathery, dark green and glossy above; carpels united only at the base............................Leptarrhena (pyrolifolia)

3b. Leaves various in size and shape; not leathery (leaves stiff in Saxifraga tricuspidata but much smaller (0.6-1.9 cm long) and not dark green); carpels united beyond the base ....Saxifraga

Saxifraga

1a. Cauline leaves 1-several.................................2

1b. Cauline leaves lacking...................................7

2a. Leaves opposite, densely imbricate...Saxifraga oppositifolia

2b. Leaves alternate...3

3a. Terminal flower (occasionally 2 flowers) of the inflorescence developing, the rest replaced by bulbils in the axils of the upper leaves............Saxifraga cernua

3b. Bulbils lacking in the axils of upper leaves (often observed in the axils of basal leaves of Saxifraga rivularis)..4

4a. Basal leaves mostly long petiolate; often bearing axillary bulbils; plant arising from fibrous roots..................................Saxifraga rivularis var. flexuosa

4b. Basal leaves not long petiolate; axillary bulbils lacking; plant arising from a taproot or a caudex with a taproot..5

5a. Leaves rigid, sharply tricuspidate, spinulose tipped...... ....*Saxifraga tricuspidata*

5b. Leaves not rigid, 3-7 toothed or lobed, not spinulose tipped..6

6a. Basal leaves reddish-green, 3 (occasionally 5)-toothed; capsules 3-5 mm long.................................. ....*Saxifraga adscendens* subsp. *oregonensis*

6b. Basal leaves green, 3-5 lobed; capsules 6-10 mm long...... ....*Saxifraga caespitosa* subsp. *sileneflora*

7a. Anther filaments subulate...............*Saxifraga nivalis*

7b. Anther filaments clavate..................................8

8a. Lower leaf surfaces with reddish, glandular tomentum ....*Saxifraga occidentalis*

8b. Lower surface of leaves lacking reddish, glandular tomentum..9

9a. Leaf blades orbicular to reniform, usually cordate basally; branches of the inflorescence glandular villous........... ....*Saxifraga nelsoniana* subsp. *porsildiana*

9b. Leaf blades oblanceolate of fan-shaped, cuneate basally; branches of the inflorescence not glandular-villous....... ....*Saxifraga lyallii* subsp. *hultenii*

SCROPHULARIACEAE

1a. Flowers nearly actinomorphic; leaves (at least the lower ones) opposite; stamens 2...Veronica (wormskjoldii var. wormskjoldii)

1b. Flowers distinctly zygomorphic; leaves alternate or whorled; stamens 4.......................................2

2a. Flowers subtended by brightly coloured bracts; corolla almost completely enclosed within the calyx...Castilleja (unalaschcensis)

2b. Flowers subtended by green bracts; corolla extending well beyond the calyx...............................Pedicularis

Pedicularis

1a. Galea lacking distinct teeth at or near the apex (occasionally with obscure teeth in Pedicularis capitata) 4

1b. Galea with distinct teeth at or near the apex............2

2a. Calyx 2-3 lobed; corolla with long slender teeth near the apex; stems usually branched.......Pedicularis labradorica

2b. Calyx distinctly 5-lobed; corolla with short roughly triangular teeth at or near the apex; stems simple.......3

3a. Flowers spirally arranged; basal leaves pinnately lobed, the lobes incised and these divisions again toothed; stems mostly with 0-3 leaves; calyx teeth 3-5 mm long; staminal filaments glabrous....*Pedicularis sudetica* subsp. *interior*

3b. Flowers not obviously spirally arranged; basal leaves pinnately lobed, the lobes merely crenate; stems with numerous leaves; calyx teeth 2-3 mm long; staminal filaments pubescent...*Pedicularis langsdorfii* subsp. *arctica*

4a. Cauline leaves arranged in whorls; inflorescence with several flowers; corolla pink, 11-16 mm long...*Pedicularis verticillata*

4b. Cauline leaves alternate, or more commonly lacking; inflorescence few flowered; corolla cream coloured, usually suffused with red or pink, 25-40 mm long...*Pedicularis capitata*

VALERIANACEAE............*Valeriana sitchensis* subsp. *sitchensis*

VIOLACEAE

1a. Plants with thickened rhizomes; stolons lacking, aerial stems short...........................*Viola langsdorfii*

1b. Plants with thin rhizomes; slender creeping stolons present aerial stems lacking...*Viola epipsila* subsp. *repens*

MAGNOLIOPHYTA (MONOCOTYLEDONAE)

CYPERACEAE

1a. Flowers perfect; perianth represented by numerous silky bristles.................................Eriophorum

1b. Flowers imperfect; perianth lacking.....................2

2a. Plants rhizomatous or caespitose; ovary surrounded by a flask-shaped perigynium...............................Carex

2b. Plants caespitose; ovary surrounded by a glume, the ends of which meet but do not fuse.......Kobresia (myosuroides)

Carex - Key to Subgenera

1a. Solitary, terminal spike........................Primocarex

1b. Spikes two or more......................................2

2a. Spikes sessile; usually bisexual..................Vignea

2b. Spikes peduncled; usually unisexual...............Eucarex

Primocarex

1a. Plants rhizomatous; dioecious (rarely monoecious)........2

1b. Plants caespitose; monoecious (androgynous).............3

2a. Stigmas 2; perigynia glabrous.............................. ....Carex dioica subsp. gynocrates

2b. Stigmas 3; perigynia pubescent............................ ....Carex scirpoidea var. stenochlaena

3a. Stigmas 2; pistillate scales persistent......*Carex nardina*

3b. Stigmas 3; pistillate scales deciduous....................
.........................*Carex pyrenaica* subsp. *micropoda*

Vignea

1a. Perigynia with conspicuous wing on margin.................
......................*Carex macloviana* subsp. *pachystachya*

1b. Perigynia lacking wing on margin.........................2

2a. Spikes 2-3 (occasionally 4), congested; culms stiff......3

2b. Spikes 3-9, loosely aggregated (especially the lower ones); culms slender...................................4

3a. Culms very scabrous above; lowest bract 0.3-0.6 cm long...
......................*Carex heleonastes* subsp. *heleonastes*

3b. Culms smooth; lowest bract scale-like......*Carex bipartita*

4a. Perigynia appressed-ascending, tapering gradually into a short beak, lacking distinct dorsal suture; leaves glaucous..5

4b. Perigynia spreading; abruptly contracted into a distinct, minutely bidentate beak; distinct, hyaline-margined dorsal suture on perigynia; leaves not glaucous.................
........................*Carex brunnescens* subsp. *alaskana*

5a. Scales not enveloping perigynia; perigynia conspicuous on spikes; lower spikes remote..............................

.........................*Carex canescens* subsp. *canescens*

5b. Scales partially enveloping perigynia particularly near the base; perigynia inconspicuous in spikes; spikes more closely aggregated.....*Carex canescens* subsp. *arctaeformis*

Eucarex

1a. Stigmas mostly 2 (rarely 3 in *Carex saxatilis* and *Carex enanderi*); achenes lenticular..............................2

1b. Stigmas mostly 3; achenes trigonous.......................6

2a. Achenes continuous with the style; perigynia lustrous..... ....*Carex saxatilis* subsp. *laxa*

2b. Achenes jointed with the style; perigynia not lustrous...3

3a. Terminal spike bisexual, gynaecandrous......*Carex enanderi*

3b. Terminal spike staminate.................................4

4a. Plants strongly stoloniferous, the culms arising one to few together; lowest bract shorter than the inflorescence; pistillate scales with obsolete or slender midvein........ ....*Carex bigelowii*

4b. Culms arising in larger clumps; lowest bract equalling or exceeding the inflorescence; pistillate scales with conspicuous midvein......................................5

5a. Lower most pistillate spikes often nodding on long peduncles, pistillate scales whitened at tip (especially in age); long horizontal stolons absent; culms roughly triangular in cross section; lowest bract usually 20-50 cm long..*Carex sitchensis*

5b. Spikes all erect, peduncles shorter, pistillate scales not whitened at tip; long horizontal rhizomes present; culms round in cross section; lowest bract usually 7-25 cm long ....*Carex aquatilis* var. *aquatilis*

6a. Achenes continuous with style; perigynia lustrous......... ....*Carex rostrata*

6b. Achenes jointed with style; perigynia not lustrous.......7

7a. Perigynia pubescent............................*Carex rossii*

7b. Perigynia glabrous......................................8

8a. Lower bracts long sheathing.............................. ....*Carex capillaris* subsp. *capillaris*

8b. Lower bracts sheathless or nearly so....................9

9a. Roots covered with yellow felt...........*Carex macrochaeta*

9b. Roots not clothed with yellow felt......................10

10a. Terminal spike gynaecandrous; pistillate scales usually much shorter than the perigynia.........................11

10b. Terminal spike staminate; pistillate scales equal to or longer than the perigynia..............................12

11a. Scales purplish-brown to purplish-black, with conspicuous white-hyaline margins............*Carex media* subsp. *media*

11b. Scales black, lacking conspicuous white-hyaline margins... ....*Carex atrosquama*

12a. Culms phyllopodic, clothed at base with dried leaves of the previous year, not purplish tinged at base............ ....*Carex microchaeta*

12b. Culms strongly aphyllopodic; leaves of previous year lacking or greatly withered at flowering time, purplish tinged at base...................................13

13a. Staminate and pistillate scales with obsolete or inconspicuous midvein; achenes long stipitate............ ....*Carex podocarpa*

13b. Staminate and pistillate scales with conspicuous midvein; achenes short stipitate.................*Carex spectabilis*

Eriophorum

1a. Spikes 2-10, at least some pendulous.................. ....*Eriphorum angustifolium* subsp. *triste*

1b. Spikes solitary, erect..............................2

2a. Plants mostly rhizomatous; sterile scales usually less than 7..........................*Eriophorum scheuchzeri*

2b. Plants caespitose; sterile scales usually more than 7....3

3a. Sheath conspicuously expanded upwards; at least the lower scales reflexed......Eriophorum vaginatum subsp. vaginatum

3b. Sheath not expanded or only slightly expanded upwards; scales not reflexed..4

4a. Cauline leaves usually 2 or more, at least 1 situated above the middle of the culm; bristles creamy white...Eriophorum brachyantherum

4b. Cauline leaves usually solitary (or lacking) situated below the middle of the culm; bristles shiny white..Eriophorum callitrix

JUNCACEAE

1a. Leaf sheaths open; leaves glabrous; capsules with numerous (more than 3) seeds...................................Juncus

1b. Leaf sheaths closed; leaves usually pubescent; capsule with 3 seeds...Luzula

Juncus

1a. Culms arising singly along rhizome........................2

1b. Culms densely tufted.....................................3

2a. Culms arising along rhizome like "teeth in a comb"; leaves all basal; inflorescence located at the base of a terete bract which makes it appear lateral...Juncus arcticus subsp. alaskanus

2b. Culms solitary but not appearing as above; leaves cauline

and basal; inflorescence terminal........................
.......................*Juncus castaneus* subsp. *castaneus*

3a. Inflorescence located at the base of a terete bract which makes it appear lateral; anthers equal to or longer than the filaments...........................*Juncus drummondii*

3b. Inflorescence terminal; anthers shorter than the filaments 4

4a. Leaves basal and cauline, the blades half-round........... *Juncus mertensianus* subsp. *mertensianus* var. *mertensianus*

4b. Leaves 1-4 per culm, all basal or nearly so, the blades terete..5

5a. Inflorescence usually 2-flowered, usually surpassed by the involucral bract; capsule retuse apically................ ....*Juncus biglumis*

5b. Inflorescence usually 3-flowered, not surpassed by the involucral bract; capsule acute apically.................. ....*Juncus triglumis*

Luzula

1a. Flowers borne singly (occasionally 2-3) at the ends of long, nodding pedicels.................................2

1b. Flowers clustered in spikes or glomerules................3

2a. Plants up to 6 dm tall; basal leaves thin and shiny;

perianth pale green; capsules pale green..................
.......................*Luzula parviflora* subsp. *parviflora*

2b. Plants 2-4 dm tall; basal leaves thick and dull; perianth dark brown; capsules dark brown.............*Luzula piperi*

3a. Inflorescence erect: flowers clusters sessile or borne on ascending branches....................................4

3b. Inflorescence nodding...................................6

4a. Basal leaf sheaths suffused with purple; leaf blades channeled throughout (occasionally only apically).........
....*Luzula confusa*

4b. Basal leaf sheaths brown to straw coloured; leaf blades flat (sometimes slightly channeled apically).............5

5a. Leaf blades sparingly ciliate to glabrous in margin; inflorescence consisting of 1 (rarely 2) sessile, capitate flower clusters...........*Luzula arctica* subsp. *latifolia*

5b. Leaf blades with conspicuous soft, white cilia marginally; inflorescence consisting of 1-5 congested, capitate flower clusters, the lateral ones, when present, usually on straight, stiff branches....*Luzula multiflora* var. *frigida*

6a. Inflorescence consisting of 3-several capitate or spicate flower clusters borne on slender nodding branches; bracts of flowers shorter than the flowers.......................
.....................*Luzula arcuata* subsp. *unalaschcensis*

6b. Inflorescence consisting of 1 (occasionally 2-3) spicate, sessile flower cluster(s); bracts of flowers conspicuous, often longer than the flowers..............*Luzula spicata*

LILIACEAE

1a. Flowers usually solitary; styles 1........................ ....*Lloydia* (*serotina* subsp. *serotina*)

1b. Flowers numerous; styles 3................................2

2a. Plant short (0.5-2.5 dm tall); leaves basal, equitant, bases not sheathing...................*Tofieldia* (*pusilla*)

2b. Plant taller (10-25 dm); leaves cauline, bases sheathing.. ....*Veratrum* (*viride* subsp. *eschscholtzii*)

POACEAE

1a. Spikelets 1-flowered....................................2

1b. Spikelets 2-several flowered...........................5

2a. Spikelets borne in cylindrical, spike-like panicles......3

2b. Spikelets borne in open to contracted panicles...........4

3a. Articulation below the glumes; palea, rachilla and lodicules absent...................................... ....*Alopecurus* (*aequalis* subsp. *aequalis*)

3b. Articulation above the glumes; palea, rachilla and lodicules present........*Phleum* (*alpinum* var. *commutatum*)

4a. Base of lemma surrounded by a tuft of stiff hairs.........
....Calamagrostis

4b. Base of lemma lacking tuft of stiff hairs................
......................................Agrostia (scabra)

5a. Spikelets borne in spike-like panicles...................
.......................Trisetum (spicatum var. spicatum)

5b. Spikelets borne in open to contracted panicles...........6

6a. Spikelets 3-flowered, the lower 2 flowers staminate, the upper perfect (aromatic, smelling like vanilla)...........
.......................Hierochloe (alpina subsp. alpina)

6b. Spikelets 2-10 flowered, flowers perfect or imperfect (not smelling like vanilla).................................7

7a. Lemmas awned dorsally; glumes as long as or longer than the lowest floret...
...........Vahlodea (atropurpurea subsp. paramushirensis)

7b. Lemmas lacking awns or awned from or near the tip of a bifid apex.....................................8

8a. Lemmas awnless, erose at the apex; tips of leaf blades prow-like; leaf sheaths usually partially closed......Poa

8b. Lemmas awned or acuminate; tips of leaf blades not prow-like; leaf sheaths open..........................Festuca

Calamagrostis

1a. Plant densely tufted; awn twisted and geniculate; anthers 2-3 mm long..Calamagrostis purpurascens subsp. purpurascens

1b. Plant loosely tufted to strongly rhizomatous; awn straight to slightly curved; anthers 1-1.8 mm long................2

2a. Panicle spreading; callus hairs numerous, all roughly the same length, usually as long or longer than the lemma..... Calamagrostis canadensis subsp. canadensis var. canadensis

2b. Panicle contracted; callus hairs sparse, unequal in length, usually much shorter than the lemma.................................... Calamagrostis stricta var. stricta

Festuca

1a. Plants tall (2-10 dm); panicle open, 7-15 cm long; anthers 3-4 mm long...............................Festuca altaica

1b. Plants usually much shorter (0.7-3.5 dm tall); panicle contracted, 1.5-9 cm long; anthers 0.5-1.5 mm long or lacking 2

2a. Spikelets mainly to solely viviparous (pseudoviviparous, Pavlick, 1984).......................Festuca vivipara s.l.

2b. Spikelets perfect....................................3

3a. Anthers 0.5-1.0 (1.2) mm long; young leaf sheaths usually united their full length; leaf blades smooth.............

....................................*Festuca brachyphylla*

3b. Anthers 1.0-1.5 mm long; young leaf sheaths usually united 1/3 to 1/2 their length; leaf blades usually scabrous.....
....................................*Festuca saximontana*

Poa

1a. Plants producing rhizomes...................................2

1b. Plants tufted, not producing rhizomes....................3

2a. Culms exceeding 35 cm in length; lower panicle branches mostly 4-6 together.........*Poa arctica* subsp. *longiculmis*

2b. Culms less than 30 cm in length; lower panicle branches mostly in pairs.................*Poa arctica* subsp. *arctica*

3a. Spikelets less than twice as long as broad; leaf blades greater than 2 mm wide, flat...................*Poa alpina*

3b. Spikelets greater than twice as long as broad; leaf blades usually folded and less than 2 mm wide..........*Poa glauca*

Annotated Species List

Information included with each taxon consists of the following:

Synonyms - Where a given taxon is recognized by Hultén (1968), Porsild and Cody (1980), or Welsh (1974) under a name other than that used in Taylor and MacBryde (1977), the synonym is provided. The list also includes, where applicable, any additional synonyms found in the index of Taylor and MacBryde (1977).

Collection numbers - These represent my personal collection numbers. In the event that any specimens are transferred from the herbarium at the University of British Columbia these numbers will remain constant.

Habitat information - This category provides on-site abundance of the taxon in question, as well as a brief description of the site or sites from which collections were made. The abundance categories are, of necessity, broad and rather subjective. They are defined as follows:

Rare - One to few populations consisting of one to few individuals.

Sparse - Scattered populations consisting of few to many individuals.

Common - Many populations consisting of many individuals.

Abundant - Forming a major component of the vegetation throughout the area in question.

Overall abundance - Relative abundance of the taxon in question throughout the study area. Abundance classes and definitions are consistent with those of the preceding category.

Occurring with - A brief list of commonly associated plants. These are provided to augment the habitat description.

Additional notes - In some instances collections taken from the study area either did not key readily in the standard references or exhibited atypical characteristics. Where such was the case, a discussion of problems encountered or distinctive features is included within this category.

Where references other than those already cited in the "Materials and Methods" sections were used to clarify a particular problem, they are listed under the appropriate family.

PTERIDOPHYTA

(Club Mosses, Quillworts, Horsetails or Scouring Rushes and Ferns)

Aspleniaceae (Spleenwort Family)

Additional reference: Taylor, 1956.

Cystopteris Bernh. (Bladder Fern)

Cystopteris fragilis (L.) Bernh. in Schrad. (Fragile Fern)

Synonyms: *Cystopteris fragilis* subsp. *dickieana* (Sim.) Hyl.; *C. fragilis* subsp. *fragilis*; *C. fragilis* var. *fragilis*

Collection numbers: 271, 323, 718, 733

Habitat information: Sparse in damp, shady locations; growing from footholds in granodiorite cliff faces and in thin organic mats covering granitic boulders.

Overall abundance: Rare.

Occurring with: *Parnassia fimbriata* var. *fimbriata*, *Poa arctica* subsp. *arctica*, *Pyrola grandiflora* and *Salix polaris*.

Cystopteris montana (Lam.) Desv. (Mountain Bladder Fern)

Collection number: 399

Habitat information: Locally rare. A single collection was taken from a thin organic mat in a wet, gravelly run-off gulley.

Overall abundance: Rare.

Occurring with: *Hedysarum alpinum* subsp. *americanum* and *Astragalus alpinus* subsp. *alpinus*.

Dryopteris Adans. (Shield Fern)

Dryopteris fragrans (L.) Schott (Fragrant Shield Fern)

Synonyms: *Dryopteris fragrans* var. *remotiuscula* Kom.; *D. fragrans* var. *fragrans*

Collection numbers: 314, 529

Habitat information: Sparse; almost exclusively on open boulder slopes where accumulated soil was sufficient to accomodate the stout rhizome. Frequent throughout the study area but always locally sparse.

Overall abundance: Sparse to common.

Occurring with: *Festuca brachyphylla*, *Huperzia selago* subsp. *selago*, *Pedicularis labradorica* and *Salix glauca*.

Gymnocarpium Newm. (Oak Fern)

Gymnocarpium dryopteris (L.) Newm. var. *disjunctum* (Rupr.) Ching. (Oak Fern)

Synonyms: *Dryopteris disjuncta* (Ledeb.) Morton

Collection numbers: 373, 537

Habitat information: Common in damp, mossy sites beneath an overstory of stunted *Abies lasiocarpa* var. *lasiocarpa*.

Overall abundance: Rare to sparse.

Occurring with: *Saxifraga nelsoniana* subsp. *porsildiana*, *Corydalis pauciflora* and *Cassiope mertensiana* var. *mertensiana*.

Woodsia R. Br. (Woodsia)

Woodsia alpina (Bolton) S. F. Gray (Northern Woodsia)

Collection numbers: 557, 682a

Habitat information: Rare to sparse; growing from exposed rock crevices.

Overall abundance: Rare.

Occurring with: _Cassiope mertensiana_ var. _mertensiana_, _Hierochloe alpina_ subsp. _alpina_ and _Phllodoce empetriformis_.

Equisitaceae (Horsetail Family)

Additional reference: Taylor, 1956.

Equisetum L. (Horsetail, Scouring-Rush)

Equisetum arvense L. (Common Horsetail)

Synonyms: _Equisetum arvense_ var. _boreale_ (Bong.) Ledeb.; _E. arvense_ var. _campestre_ Schultz; _E. arvense_ var. _decumbens_ B. Meyer

Collection numbers: 116, 121, 164, 242, 696

Habitat information: Common in damp, open heathlands, particularly near run-off channels; along mossy lakeshores and open to partly shaded stream banks.

Overall abundance: Sparse to common.

Occurring with: _Anemone narcissiflora_ subsp. _interior_, _Antennaria monocephala_, _Epilobium anagallidifolium_, _Erigeron humilis_, _Petasites nivalis_, _Phleum alpinum_ var. _commutatum_, _Phyllodoce glanduliflora_, _Salix alaxensis_ var. _alaxensis_, _S. polaris_ and _Valeriana sitchensis_.

Additional notes: Collection number 649 is typical _Equisetum arvense_ except for the presence of strobili at the apex of chlorophyllose stems. This morphotype is erratic in its appearance later in the season well after normal strobilus production has occurred.

Equisetum scirpoides Michx. (Dwarf Scouring-Rush)
Collection number: 132
Habitat information: Common in open, usually well-drained heaths.
Overall abundance: Common.
Occurring with: *Cassiope mertensiana* var. *mertensiana*, *Cassiope tetragona* var. *tetragona*, *Dryas integrifolia* subsp. *integrifolia*, *Hierochloe alpina* subsp. *alpina*, *Lycopodium clavatum* and *Phyllodoce empetriformis*.

Equisetum sylvaticum L. var. *sylvaticum* (Wood Horsetail)
Collection number: 247
Habitat information: Sparse in damp, partially open meadow adjacent to lakeshore.
Overall abundance: Rare.
Occurring with: *Epilobium latifolium* subsp. *latifolium*, *Festuca saximontana*, *Phleum alpinum* var. *commutatum*, *Trisetum spicatum* var. *spicatum*, *Salix barrattiana* and *Salix glauca* var. *acutifolia*.

Lycopodiaceae (Club-Moss Family)

Additional reference: Taylor, 1956.

Huperzia Bernh. (Club-Moss)

Huperzia selago (L.) Bernh. ex Schrank & Mart. var. *selago* (Fir Club-Moss)

Synonyms: _Lycopodium selago_ L.; _L. selago_ subsp. _selago_; _L. selago_ var. _selago_; _L. selago_ var. _appressum_ Desv.; _L. selago_ subsp. _appressum_ (Desv.) Hult.

Collection numbers: 152, 228, 316

Habitat information: Common in open heaths and meadows.

Overall abundance: Common.

Occurring with: _Anemone richardsonii_, _Cassiope mertensiana_ var. _mertensiana_, _Phyllodoce empetriformis_, _Festuca altaica_ and _Festuca brachyphylla_.

Additional notes: Taylor and MacBryde (1977) recognize three varieties of _Huperzia selago_, namely _H. selago_ var. _chinensis_, _H. selago_ var. _patens_ and _H. selago_ var. _selago_. In their treatment _Huperzia selago_ var. _selago_ includes both _Lycopodium selago_ L. subsp. _appressum_ (Desv.) Hult. and _Lycopodium selago_ L. subsp. _selago_ which appear in Hultén (1968). Welsh (1974) notes the recognition of infraspecific taxa but maintains that "all are connected by a continuous series of intermediates and the control appears to be ecological rather than genetic" (Welsh, 1974). Collection #152 and some samples from collection #316 differ from the other collections in having spreading, darker green leaves.

Lycopodium L. (Club-Moss)

Lycopodium alpinum L. (Alpine Club-Moss)

Collection numbers: 125, 376, 882

Habitat information: Common in open heaths adjacent to lakeshore and on steep gravel slopes near persistent snow.

Overall abundance: Common.

Occurring with: *Empetrum nigrum* subsp. *hermaphroditum*, *Phyllodoce glanduliflora*, *Salix reticulata* subsp. *reticulata* and *Sibbaldia procumbens*.

Lycopodium annotinum L. subsp. *annotinum* (Stiff Club-Moss)

Synonyms: *Lycopodium annotinum* L. var. *annotinum*

Collection numbers: 133, 229, 950

Habitat information: Sparse on mossy rocks along lakeshore and in moist meadows. Forming solid mats 1-2 m in diameter under dense stands of stunted *Abies lasiocarpa* var. *lasiocarpa*.

Overall abundance: Sparse.

Occurring with: *Anemone narcissiflora* subsp. *interior*, *Betula glandulosa* var. *glandulosa*, *Carex macrochaeta*, *Ribes glandulosum*, *Rubus pedatus* and *Salix barrattiana*.

Lycopodium clavatum L. (Running Club-Moss)

Synonyms: *Lycopodium clavatum* var. *monostachyon* Grev. & Hook.; *L. clavatum* subsp. *monostachyon* (Grev. & Hook.) Sel.; *L. clavatum* subsp. *clavatum*; *L. clavatum* var. *clavatum*; *L. clavatum* var. *integerrimum* Spring

Collection number: 330

Habitat information: Common on well-drained, open heaths.

Overall abundance: Common.

Occurring with: *Cassiope tetragona* subsp. *tetragona*, *Lupinus arcticus* subsp. *arcticus*, *Phyllodoce empetriformis*, *Phyllodoce glanduliflora*.

Lycopodium complanatum L. (Ground-Cedar)

Synonyms: *Lycopodium complanatum* L. var. *canadense* Vict.; *L. complanatum* var. *complanatum*

Collection number: 802

Habitat information: Common on exposed, well-drained gravel slopes.

Overall abundance: Rare to sparse.

Occurring with: *Cornus canadensis*, *Empetrum nigrum* subsp. *hermaphroditum*, *Linnaea borealis* subsp. *americana* and *Salix polaris*.

Ophioglossaceae (Adders'-Tongue Family)

Botrychium Sw. (Grape Fern)

Botrychium lunaria (L.) Sw. in Schrad. subsp. *lunaria* (Moonwort)

Synonyms: *Botrychium lunaria* (L.) Sw. in Schrad. var. *lunaria*

Collection numbers: 913, 971

Habitat information: Rare in moist meadows and mossy seepage areas.

Overall abundance: Rare.

Occurring with: *Bistorta vivipara*, *Parnassia kotzebuei* var. *kotzebuei*, *Poa alpina* and *Salix alaxensis* var. *alaxensis*.

Selaginellaceae (Selaginella Family)

Selaginella Beauv. (Selaginella)

Selaginella selaginoides (L.) Link (Mountain-Moss)

Collection number: 658

Habitat information: Apparently sparse but easily overlooked. Partially buried in mosses on moist open slope.

Overall abundance: Rare.

Occurring with: Betula glandulosa var. glandulosa, Poa arctica subsp. arctica and Potentilla diversifolia var. diversifolia.

PINOPHYTA (Conifers)

Cupressaceae (Cypress Family)

Juniperus L. (Juniper)

Juniperus communis L. subsp. alpina (Neilreich) Celakovsky

Synonyms: Juniperus communis L. subsp. nana (Willd.) Syme; J. communis var. saxatilis Pall.; J. communis var. montana Ait.

Collection numbers: 124, 279

Habitat information: Rare on open, well-drained gravel slopes.

Overall abundance: Rare.

Occurring with: Lycopodium alpinum, Oxytropis sericea var. spicata, Phyllodoce empetriformis, Salix polaris and Salix reticulata subsp. reticulata.

Pinaceae (Pine Family)

Abies Mill. (Fir)

Abies lasiocarpa (Hook.) Nutt. var. lasiocarpa (Sub-Alpine Fir)

Synonyms: Abies balsamea (L.) Mill. subsp. lasiocarpa (Hook.) Boiv.

Collection numbers: 195, 949, 984

Habitat information: Common in moderately damp seepage sites at elevations of 1540 to 1600 m. Maximum size of approximately 5 m tall, 20 cm d.b.h. was attained in sheltered locations such as on the leeward side of hills and in protected valleys. Specimens from more open locations and at higher elevations were sporadic in occurrence and severely stunted (krummholz). Few specimens grew above elevations of 1650 m.

Overall abundance: Common.

Occurring with: *Adoxa moschatellina*, *Arnica cordifolia*, *Calamagrostis canadensis* subsp. *canadensis* var. *canadensis*, *Lycopodium alpinum* and *Rubus pedatus*.

Additional notes: The aecial stage of the parasitic rust *Pucciniastrum goeppertianum* (Kuehn.) Kleb. is evident on the needles of collection numbers 949 and 984. This infection of *Abies lasiocarpa* var. *lasiocarpa* was common in damp sheltered localities.

Picea Dietr. (Spruce)

Picea glauca (Moench) Voss (White Spruce)

Synonyms: *Picea glauca* (Moench) Voss var. *albertiana* (S. Brown) Sarg.; *P. glauca* var. *porsildii* Raup; *P. glauca* var. *glauca*

Collection number: 629

Habitat information: Only one stunted specimen, 1.3 m tall, was found in the study area. Growing adjacent to the lakeshore on rocky substratum overlain by thin turf.

Overall abundance: Rare.

Occurring with: *Carex brunnescens* subsp. *alaskana*, *Carex pyrenaica* subsp. *micropoda* and *Saxifraga nivalis*.

Pinus L. (Pine)

Pinus contorta Dougl. ex Loud. var. *latifolia* Engelm. in S. Wats. (Lodgepole Pine)

Synonyms: *Pinus contorta* subsp. *latifolia* (Engelm.) Critchfield

Collection numbers: 205, 788

Habitat information: Rare and extremely stunted (1 to 1.5 m tall), in wet, boggy areas.

Overall abundance: Rare.

Occurring with: _Empetrum nigrum_ subsp. _hermaphroditum_, _Kalmia microphylla_ subsp. _microphylla_, _Ledum palustre_ subsp. _decumbens_, _Luzula arcuata_ subsp. _unalaschkensis_, _Salix barrattiana_ and _Pedicularis labradorica_.

MAGNOLIOPHYTA: DICOTYLEDONEAE (Flowering Plants)

Adoxaceae (Moschatel Family)

Adoxa L. (Moschatel)

Adoxa moschatellina L. (Moschatel)

Collection number: 414

Habitat information: Rare to sparse in damp, shady areas around lakeshores and along run-off streams.

Overall abundance: Rare.

Occurring with: Abies lasiocarpa var. lasiocarpa, Agoseris aurantiaca var. aurantiaca, Draba albertina, Veronica wormskjoldii var. wormskjoldii var. wormskjoldii and Salix glauca var. acutifolia.

Apiaceae

Angelica L. (Angelica)

Angelica lucida L. (Seacoast Angelica)

Synonyms: Coelopleurum gmelinii (D C.) Ledeb.

Collection number: 232

Habitat information: Common at lower elevations in the study area (1540 to 1600 m). In damp, open meadows close to lakeshores and along stream banks where soil is relatively deep.

Overall abundance: Sparse.

Occurring with: Heracleum sphondylium subsp. montanum, Pedicularis verticillata, Petasites nivalis, Salix planifolia subsp. pulchra and Veratrum viride subsp. eschscholtzii.

Heracleum L. (Cow-Parsnip)

Heracleum sphondylium L. subsp. *montanum* (Gaud.) Brig. in Schinz & Keller (Common Cow-Parsnip)

Synonyms: *Heracleum lanatum* Michx.

Collection number: 705

Habitat information: Common in damp open meadows close to lakeshores and along stream banks where soil is relatively deep. (As with *Angelica lucida*).

Overall abundance: Sparse.

Occurring with: *Angelica lucida*, *Pedicularis verticillata*, *Petasites nivalis*, *Salix planifolia* subsp. *pulchra* and *Veratrum viride* subsp. *eschscholtzii*.

Asteraceae (Aster Family)

Additional references: Douglas, 1982; Straley, 1980; Guppy, 1975.

Achillea L. (Yarrow)

Achillea millefolium L. var. *borealis* (Bong.) Far. (Northern Yarrow)

Synonyms: *Achillea borealis* Bong.; *A. millefolium* subsp. *borealis* (Bong.) Breitung, *A. nigrescens* (E. Mey.) Rydb.

Collection numbers: 514, 903

Habitat information: Common along open gravelly lakeshore and damp, partially shaded, sandy streambank.

Overall abundance: Sparse.

Occurring with: *Carex brunnescens*, *Carex saxatilis* subsp. *laxa*, *Empetrum nigrum* subsp. *hermaphroditum* and *Epilobium latifolium* subsp. *latifolium*.

Agoseris Raf. (False Dandelion)

Agoseris aurantiaca (Hook.) Greene var. *aurantiaca* (Orange False Dandelion)

Collection numbers: 309, 411, 493, 511, 879, 880

Habitat information: Sparse to common in damp open meadows, adjacent to lakeshores and along stream banks. Partially shaded by *Betula glandulosa* var. *glandulosa* and *Salix alaxenesis* var. *alaxensis*.

Overall abundance: Sparse.

Occurring with: *Aconitum delphinifolium* subsp. *delphinifolium*, *Draba albertina*, *Erigeron peregrinus* subsp. *callianthemus*, *Rumex acetosa* subsp. *arifolius* and *Valeriana sitchensis* subsp. *sitchensis*.

Antennaria Gaertn. (Pussytoes)

Antennaria alpina (L.) Gaertn. var. *media* (Greene) Jepson (Alpine Pussytoes)

Synonyms: *Antennaria media* Greene; *A. stolonifera* Porsild; *A. alpina* var. *stolonifera* (Porsild) Welsh.

Collection numbers: 237, 421, 444, 779

Habitat information: Sparse to common on open, rocky lakeshores, open gravel slopes and exposed, well-drained heath slopes.

Overall abundance: Sparse.

Occurring with: *Antennaria monocephala*, *Cassiope empetriformis*, *Empetrum nigrum* subsp. *hermaphroditum*, *Dryas integrifolia* subsp.

integrifolia, Epilobium angustifolium var. angustifolium and Potentilla fruticosa subsp. floribunda.

Antennaria microphylla Rydb. (Rosy Pussytoes)

Synonyms: Antennaria rosea Greene; A. nitida Greene; A. rosea var. nitida (Greene) Breitung; A. rosea var. rosea; A. alborosea A.E. & M.P. Pors.; A. oxyphylla Greene; A. incarnata Porsild; A. elegans Porsild

Collection numbers: 562, 884

Habitat information: Occurring on well-drained gravel slopes and open heaths.

Overall abundance: Sparse.

Occurring with: Artemisia arctica subsp. arctica, Erigeron acris subsp. debilis, Poa alpina and Solidago multiradiata var. multiradiata.

Antennaria monocephala DC. (One-Headed Pussytoes)

Synonyms: Antennaria angustata Greene; A. philonipha Pors.; A. monocephala subsp. angustata (Greene) Hult.; A. monocephala subsp. philonipha (Pors.) Hult.; A. monocephala subsp. philonipha var. philonipha; A. monocephala subsp. monocephala; A. monocephala subsp. monocephala var. monocephala; A. monocephala subsp. monocephala var. exilis (Greene) Hult.

Collection numbers: 112, 238, 239, 240, 384, 403, 420, 423, 443, 445, 640, 660, 683, 751, 963, 1003, 1004

Habitat information: Common along mossy, rocky lakeshores, open heaths and gravelly areas particularly near persistent snow.

Overall abundance: Common.

Occurring with: *Antennaria alpina*, *Draba albertina*, *Draba nivalis*, *Cassiope mertensiana* var. *mertensiana*, *Erigeron humilis*, *Festuca vivipara*, *Salix polaris* and *Solidago multiradiata*.

Antennaria umbrinella Rydb. (Dusky Brown Pussytoes)

Synonyms: *Antennaria isolepis* Greene; *A. pallida* E. Nels.

Collection numbers: 179, 380, 1005

Habitat information: Sparse on damp, open heaths and from thin organic mats covering boulders.

Overall abundance: Rare to sparse.

Occurring with: *Cassiope mertensiana* var. *mertensiana*, *Festuca altaica*, *Phyllodoce glanduliflora* and *Pyrola grandiflora*.

Arnica L. (Arnica)

Arnica cordifolia Hook. (Heart-Leaved Arnica)

Synonyms: *Arnica cordifolia* var. *cordifolia*; *A. cordifolia* var. *pumila* (Rydb.) Maguire

Collection numbers: 483, 539, 616

Habitat information: Sparse to common in damp, open to semi-open meadows, along lakeshores and run-off streams. Often found growing under partial shade of *Abies lasiocarpa* var. *lasiocarpa* and *Salix alaxensis* var. *alaxensis*.

Overall abundance: Sparse.

Occurring with: *Agoseris aurantiaca* var. *aurantiaca*, *Arabis drummondii*, *Artemisia tilesii* subsp. *tilesii*, *Festuca altaica*, *Pedicularis sudetica* subsp. *interior* and *Trisetum spicatum* var.

spicatum.

Arnica latifolia Bong. var. latifolia (Broad-Leaved Arnica)
Collection numbers: 416, 422, 494, 535, 892, 893
Habitat information: Common in damp, open meadows and open heaths.
Overall abundance: Sparse to common.
Occurring with: Antennaria alpina var. media, Antennaria monocephala, Cassiope mertensiana var. mertensiana, Carex macrochaeta, Erigeron peregrinus subsp. callianthemus, Salix glauca var. acutifolia and Senecio lugens.

Arnica lessingii Greene (Lessing's Arnica)
Synonyms: Arnica lessingii Greene subsp. lessingii
Collection number: 607
Habitat information: Sparse on open heaths and mossy areas surrounding sorted stone circles.
Overall abundance: Rare to sparse.
Occurring with: Betula glandulosa var. glandulosa, Carex capillaris subsp. capillaris, Cassiope mertensiana var. mertensiana, Salix glauca var. acutifolia and Senecio pauciflorus.

Arnica louiseana Farr. subsp. *frigida* (C.A. Mey. ex Ilgin) Maguire (Lake Louise Arnica)

Synonyms: *Arnica frigida* C.A. Mey.; *A. louiseana* var. *frigida* (C.A. Mey.) Welsh; *A. louiseana* var. *pilosa* Maguire

Collection number: 642

Habitat information: Rare in rocky heathlands and exposed cliff ledges.

Overall abundance: Rare.

Occurring with: *Cassiope mertensiana* var. *mertensiana*, *Dryas integrifolia* subsp. *integrifolia* and *Phyllodoce empetriformis*.

Artemisia L. (Sagebrush, Wormwood, Mugwort)

Artemisia arctica Less. subsp. *arctica* (Boreal Mugwort)

Synonyms: *Artemisia norvegica* Fries; *A. norvegica* var. *saxatilis* (Bess.) Jepson

Collection numbers: 154, 156, 561, 708

Habitat information: Sparse on well-drained rocky slopes and boggy areas near lake margins.

Overall abundance: Rare to sparse.

Occurring with: *Kalmia microphylla* subsp. *microphylla*, *Ledum palustre* subsp. *decumbens* and *Parnassia fimbriata* var. *fimbriata*.

Artemisia tilesii Ledeb. subsp. *tilesii* (Aleutian Mugwort)

Synonyms: *Artemisia tilesii* var. *tilesii*

Collection numbers: 571, 707, 709, 710, 933, 993

Habitat information: Sparse to common on rocky slopes and open meadows.

Overall abundance: Sparse.

Occurring with: Achillea millefolium var. borealis, Agrostis scabra, Artemisia arctica subsp. arctica, Erigeron humilis and Salix barrattiana.

Artemisia tilesii Ledeb. subsp. unalaschcensis (Bess.) Hult. (Aleutian Mugwort)

Synonyms: Artemisia tilesii Ledeb. var. unalaschcensis Bess.

Collection number: 954

Habitat information: Common in a moist, hummocky, partially open meadow adjacent to a small seepage pond.

Overall abundance: Rare.

Occurring with: Aster modestus, Geum macrophyllum var. macrophyllum, Mertensia paniculata var. paniculata and Petasites nivalis.

Aster L. (Aster)

Aster modestus Lindl. in Hook. (Great Northern Aster)

Collection numbers: 955, 1025

Habitat information: Common at one site along sandy shore of small seepage pond.

Overall abundance: Rare.

Occurring with: Epilobium anagallidifolium, Senecio triangularis and Valeriana sitchensis subsp. sitchensis.

Erigeron L. (Fleabane)

Erigeron acris L. subsp. *debilis* (Gray) Piper (Bitter Fleabane)

Synonyms: *Erigeron acris* var. *debilis* Gray

Collection numbers: 564, 989

Habitat information: Sparse, on open, well-drained gravel slopes.

Overall abundance: Rare to sparse.

Occurring with: *Achillea millefolium* var. *borealis*, *Antennaria microphylla*, *Erigeron humilis* and *Solidago multiradiata* var. *multiradiata*.

Erigeron humilis Grah. (Arctic Fleabane)

Collection numbers: 118, 233, 287, 389, 570, 649, 992

Habitat information: Common, although never in great abundance, along mossy lakeshores and open rocky slopes near late remaining snow.

Overall abundance: Sparse.

Occurring with: *Anemone narassiflora* subsp. *interior*, *Antennaria alpina*, *Arctostaphylos rubra*, *Draba albertina*, *Hedysarum alpinum* subsp. *americanum*, *Luzula parviflora* subsp. *parviflora* and *Vaccinium caespitosum*.

Erigeron peregrinus (Pursh.) Greene subsp. *callianthemus* (Greene) Cronq. (Subalpine Fleabane)

Synonyms: *Erigeron peregrinus* subsp. *callianthemus* var. *scaposus* (Torr. & Gray) Cronq.; *E. peregrinus* subsp. *callianthemus* var. *eucallianthemus* Conq.

Collection numbers: 473, 510, 531

Habitat information: Sparse to common along damp, shady stream banks and moist, semi-open meadows.

Overall abundance: Sparse.

Occurring with: *Aconitum delphinifolium* subsp. *delphinifolium*, *Delphinium glaucum*, *Mertensia paniculata* var. *paniculata*, *Rumex acetosa* subsp. *arifolius*, *Salix planifolia* subsp. *pulchra* var. *pulchra* and *Valeriana sitchensis* subsp. *sitchensis*.

Hieracium L. (Hawkweed)

Hieracium gracile Hook. (Slender Hawkweed)

Synonyms: *Hieracium triste* subsp. *gracile* (Hook.) Calder & Taylor; *H. gracile* var. *alaskanum* Zahn.; *H. gracile* var. *gracile*

Collection numbers: 534, 679, 889, 932

Habitat information: Sparse in habitats ranging from open grassy heaths to open rocky slopes near late remaining snow.

Overall abundance: Sparse.

Occurring with: *Arnica latifolia* var. *latifolia*, *Carex capillaris* subsp. *capillaris*, *Cassiope mertensiana* var. *mertensiana*, *Hierachloe alpina* subsp. *alpina*, *Luzula arctica* subsp. *arctica* and *Salix polaris*.

Additional notes: Porsild and Cody (1980) employ achene colour as one of the characteristics separating this species from *H. triste*. Achenes of *H. gracile* are reported to be red while those of *H. triste* are supposed to be black. No mention of this distinction is made by Guppy (1975), however, and examination of herbarium material cast doubt on the reliability of this character. Material from the study area was separated by the more widely employed characters pertaining to the presence or absence of stipitate glands and the length of grey-black hairs on the upper portion of the stem and involucral bracts.

Hieracium triste Willd. ex Spreng. (Woolly Hawkweed)

Synonyms: Hieracium triste subsp. triste; H. triste var. tristiforme Zahn.

Collection numbers: 931, 936

Habitat information: Sparse along open, sandy stream bank and on steep rocky gulley near persistent snow.

Overall abundance: Rare.

Occurring with: Arnica latifolia var. latifolia, Betula glandulosa subsp. glandulosa, Cassiope mertensiana var. mertensiana, Leptarrhena pyrolifolia, Mitella pentandra and Saxifraga lyallii.

Petasites Mill. (Colt's-Foot)

Petasites frigidus (L.) E.M. Fries (Arctic Colt's-Foot)

Synonyms:

Collection numbers: 605, 946

Habitat information: Sparse to common in open, muddy areas and, in one location, along the margin of a stagnant seepage pond. Often partially shaded by dwarf birch and willow.

Overall abundance: Rare.

Occurring with: Aster modestus, Betula glandulosa var. glandulosa, Carex sitchensis, Eriophorum brachyantherum, Juncus *castaneus* subsp. *castaneus* and *Lycopodium annotinum* subsp. *annotinum*.

Additional notes: Representatives of the genus *Petasites* Mill. occurring in the study area form part of a complex within which three taxa are generally recognized. Calder and Taylor (1968), Hulten (1968), Taylor and MacBryde (1977) and Porsild and Cody (1980) separate these taxa at the species level, whereas, Hitchcock et al. (1955, 1973), Welsh (1974) and Douglas (1982) regard them as varieties within *P. frigidus*. Leaf morphology, the presence or absence of lobes and the degree of lobation when present, separate these taxa. Specimens collected from the study area exhibited almost continuous variation in leaf lobation from lobes absent to sinuses of lobes extending more than half way to the base. Examination of herbarium collections revealed a similar degree of leaf variation, thus failing to provide enlightenment. Although hybridization is cited as the explanation for this variation (Hulten, 1973; Welsh, 1974), it seems evident that further taxonomic work is in order.

Collection numbers 605 and 946 are ascribed to *Petasites frigidus* primarily on the basis of leaf diagrams provided in Hultén (1950). The remainder of the collections are assigned to *P. nivalis*. Separate species are indicated in order to remain consistent with Taylor and MacBryde (1977), however, limited personal observations would suggest a more conservative treatment.

Petasites nivalis Greene (Greene's Colt's-Foot)

Synonyms: *Petasites hyperboreus* Rydb.; *P. frigidus* (L.) E.M. Fries var. *nivalis* (Greene) Cronq.

Collection numbers: 119, 153, 243, 375, 447, 471, 479, 620, 951, 1002

Habitat information: Common in wet, open to partly shaded areas along stream banks, lakeshores, meadows and seepage areas where snow remains late.

Overall abundance: Sparse to common.

Occurring with: *Aconitum delphinifolium* subsp. *delphinifolium*, *Caltha leptosepala* var. *leptosepala*, *Corydalis pauciflora*, *Equisetum arvense*, *Gentiana glauca*, *Juncus biglumis*, *Luzula parviflora* subsp. *parviflora*, *Mertensia paniculata*, *Salix polaris*, *Saxifraga lyallii* and *Valeriana sitchensis*.

Additional notes: See *P. frigidus*.

Senecio L. (Ragwort)

Senecio lugens Richard in Franklin (Black-Tipped Ragwort)

Collection numbers: 406, 530

Habitat information: Sparse in damp open meadows and open boggy areas near lake outflow. Frequently partially shaded by dwarf fir, birch and willow.

Overall abundance: Rare to sparse.

Occurring with: *Carex aquatilis* var. *aquatilis*, *Erigeron peregrinus* subsp. *callianthemus*, *Eriophorum scheuchzeri*, *Mertensia paniculata* var. *paniculata*, *Pedicularis labradorica* and *Thalictrum alpinum*.

Senecio pauciflorus Pursh (Rayless Alpine Ragwort)

Synonyms: *Senecio pauciflorus* var. *fallax* Greenm.

Collection numbers: 308, 608

Habitat information: Sparse to common on open, damp moss carpeted areas where seepage water is evident.

Overall abundance: Sparse.

Occurring with: *Agoseris aurantiaca*, *Anemone richardsonii*, *Caltha leptosepala* var. *leptosepala*, *Carex capillaris* subsp. *capillaris*, *Corydalis pauciflora*, *Juncus biglumis* and *Salix polaris*.

Senecio triangularis Hook. (Arrow-Leaved Ragwort)

Synonyms: *Senecio triangularis* var. *triangularis*; *S. triangularis* var. *angustifolius* G.N. Jones

Collection number: 486

Habitat information: Common along damp, shady stream banks where the soil is relatively deep.

Overall abundance: Sparse.

Occurring with: *Castilleja unalashcensis*, *Delphinium glaucum*, *Draba borealis*, *Festuca altaica*, *Polemonium caeruleum* subsp. *villosum* and *Valeriana sitchensis* subsp. *sitchensis*.

Solidago L. (Goldenrod)

Solidago multiradiata Ait. var. *multiradiata* (Northern Goldenrod)

Collection numbers: 563, 753, 782

Habitat information: Common on exposed, well-drained areas, particularly gravel slopes.

Overall abundance: Sparse.

Occurring with: _Antennaria microphylla_, _Artemisia arctica_ subsp. _arctica_, _Erigeron acris_ subsp. _debilis_ and _Potentilla fruticosa_ subsp. _floribunda_.

Taraxacum Wig. (Dandelion)

Taraxacum lyratum (Ledeb.) DC. (Lyrate-Leaved Dandelion)

Synonyms: _Taraxacum scopulorum_ (Gray) Rydb.; _T. alaskanum_ Rydb.; _T. kamtschaticum_ Dahlstedt.

Collection numbers: 294, 336, 558, 643

Habitat information: Rare in damp, open meadows, around mossy lakeshores and along open, grassy stream banks.

Overall abundance: Rare.

Occurring with: _Anemone narcissiflora_ subsp. _interior_, _Bistorta vivipara_, _Caltha leptosepala_ var. _leptosepala_, _Cardamine umbellata_, _Draba stenoloba_, _Epilobium anagallidifolium_, _Festuca altaica_, _Myosotis asiatica_ and _Poa arctica_ subsp. _arctica_.

Betulaceae

Betula L. (Birch)

Betula glandulosa Michx. var. _glandulosa_ (Scrub Glandular Birch)

Collection numbers: 137, 204, 886

Habitat information: Abundant throughout the study area forming a major component of the overstory along with the willows. Found in greatest abundance around lakeshores, along open stream banks, heathlands, meadow perimeters and gravelly sites where late snow run-off was evident.

Overall abundance: Abundant.

Occurring with: Because *Betula glandulosa* var. *glandulosa* was found to occur in such a wide variety of habitats throughout the study area the taxa with which it occurred, for the most part, varied widely. *Cassiope mertensiana* var. *mertensiana*, *Phyllodoce empetriformis*, *Salix alaxensis* var. *alaxensis*, *S. barrattiana*, *S. glauca* var. *acutifolia*, *S. planifolia* subsp. *pulchra* var. *pulchra*, however, were usually found in close association.

Boraginaceae (Borage Family)

Mertensia Roth. (Mertensia)

Mertensia paniculata (Ait.) G. Don var. *paniculata* (Hairy Panicled Mertensia)

Synonyms: *Mertensia paniculata* subsp. *paniculata*

Collection numbers: 191, 199, 482, 496, 952

Habitat information: Common in damp meadows and along stream banks where the soil was found to be relatively deep. Found in open to partially shaded sites.

Overall abundance: Sparse to common.

Occurring with: *Aconitum delphinifolium* subsp. *delphinifolium*, *Anemone narcissiflora* subsp. *interior*, *A. parviflora* var. *grandiflora*, *Carex canescens* subsp. *canescens*, *C. sitchensis*, *Draba borealis*, *Myosotis asiatica*, *S. glauca* var. *acutifolia*, *Veronica wormskjoldii* var. *wormskjoldii* and *Valeriana sitchensis* subsp. *sitchensis*.

Myosotis L. (Forget-Me-Not)

Myosotis asiatica (Vestergr.) Schischk. & Serg. in Kryl. (Mountain Forget-Me-Not)

Synonyms: *Myosotis alpestris* F.W. Schmidt. subsp. *asiatica* Vestergr.; *M. sylvatica* Hoffm. var. *alpestris* (F.W. Schmidt) Koch; (included within *M. sylvatica* by Welsh, 1974)

Collection numbers: 188, 285, 339, 492, 653

Habitat information: Sparse to common around damp, rocky lakeshores, along open stream banks and on open, well-drained rocky slopes.

Overall abundance: Sparse to common.

Occurring with: *Anemone narcissiflora* subsp. *interior*, *Claytonia sarmentosa*, *Draba borealis*, *Epilobium latifolium* subsp. *latifolium*, *Mertensia paniculata* var. *paniculata*, *Salix planifolia* subsp. *pulchra* var. *pulchra*, *S. reticulata* subsp. *reticulata* and *Valeriana sitchensis*.

Additional notes: For the most part the flowers of *Myosotis asiatica* were cobalt blue in colour. Rare occurrences of specimens with white flowers were observed and one collection (#653) was taken from a population of pink-flowered specimens found growing on a well-drained open, rocky slope. As is the case for some members of this family, flower colour may change as the open flowers become older.

Brassicaceae (Mustard Family)

Additional references: Mulligan, 1970, 1974, 1974a, 1976.

Arabis L. (Rock Cress)

Arabis drummondii Gray (Drummond's Rock Cress)

Collection numbers: 488, 978

Habitat information: Sparse to common in damp, shaded areas near run-off streams.

Overall abundance: Rare to sparse.

Occurring with: _Aconitum delphinifolium_ subsp. _delphinifolium_, _Calamagrostis canadensis_ subsp. _canadensis_ var. _canadensis_, _Cerastium beeringianum_ subsp. _beeringianum_, _Draba borealis_, _Festuca altaica_, _Salix barrattiana_, _S. glauca_ subsp. _acutifolia_ and _Stellaria calycantha_ var. _calycantha_.

Arabis lyrata L. subsp. _kamchatica_ (Fisch.) Hult. (Lyre-Leaved Rock Cress)

Synonyms: _Arabis lyrata_ var. _kamchatica_ Fisch.

Collection number: 665

Habitat information: Rare. Found only once in a damp, grassy heath mat at the foot of a steep granodiorite cliff face.

Overall abundance: Rare.

Occurring with: _Carex scirpoidea_ var. _stenochlaena_, _Cassiope mertensiana_ var. _mertensiana_ and _Phyllodoce empetrifomis_.

Cardamine L. (Bitter Cress)

Cardamine bellidifolia L. subsp. _bellidifolia_ var. _bellidifolia_ (Alpine Bitter-Cress)

Collection numbers: 146, 317, 434

Habitat information: Sparse to common, growing in protected areas on rockslides and in mossy, rocky areas near late remaining snow.

Overall abundance: Rare to sparse.

Occurring with: Cassiope tetragona var. tetragona, Epilobium anagallidifolium, Luzula piperi, Salix polaris and Silene acaulis subsp. acaulis.

Cardamine umbellata Greene

Synonym: Cardamine oligosperma Nutt. ex Torr. & Gray var. kamtschatica (Regel) Detling

Collection numbers: 186, 295, 346, 687, 731, 905

Habitat information: Sparse to common around damp, rocky lake margins, moist depressions in meadows and wet, partially shaded stream banks.

Overall abundance: Sparse.

Occurring with: Betula glandulosa var. glandulosa, Bistorta vivpara, Draba borealis, Epilobium anagallidifolium, Luzula parviflora subsp. parviflora and Salix planifolia subsp. pulchra var. pulchra.

Draba L. (Whitlow Grass)

Draba albertina Greene (Slender Whitlow-Grass)

Synonyms: Draba nitida Greene; (included within D. stenoloba Ledeb. by Hulten, 1968 and D. stenoloba var. nana (O.E. Schultz) C.L. Hitchc. by Welsh, 1974)

Collection numbers: 413, 574, 686, 752

Habitat information: Sparse to common. Primarily in exposed, rocky areas near run-off streams and damp seepage sites.

Overall abundance: Rare to sparse.

Occurring with: Epilobium anagalidifolium, Salix glauca var. acutifolia, Stellaria calycantha var. calycantha and Trientalis europaea subsp. arctica.

Additional information: This species was difficult to distinguish from Draba stenoloba. The characteristics given by Mulligan (1974, 1976) which differentiate the two, focus on the morphology of stem and leaf hairs. Draba albertina is described as having mostly simple hairs on the stem and mostly simple or bifid hairs on the upper leaf surfaces. Draba stenoloba, on the other hand, is described as having a preponderance of cruciform hairs on the stem and trifid or cruciform hairs on the upper leaf surfaces (rarely glabrous). Collections taken from the study area and identified by Mulligan as Draba albertina, however, were found to have cruciform hairs on both the stems and upper leaf surfaces. In some cases, particularly collection #413, it was not immediately obvious which type of hair was in greatest abundance.

Draba borealis DC. (Northern Whitlow-Grass)

Collection numbers: 189, 196, 340, 489, 761, 977

Habitat information: Ranging in abundance from sparse to common in open, damp, grassy areas, especially near streams and along lake margins.

Overall abundance: Sparse.

Occurring with: _Aconitum delphinifolium_ subsp. _delphinifolium_, _Angelica lucida_, _Castilleja unalaschcensis_ and _Heracleum sphondylium_ subsp. _montanum_.

Draba fladnizensis Wulfen in Jacq. (Austrian Whitlow-Grass)

Collection number: 659

Habitat information: Sparse; in a damp, rocky site shaded by dwarf birch and willow.

Overall abundance: Rare.

Occurring with: _Antennaria monocephala_, _Betula glandulosa_ var. _glandulosa_, _Poa arctica_ subsp. _arctica_ and _Salix glauca_ var. _acutifolia_.

Additional notes: Often confused with _Draba lactea_ (Porsild & Cody, 1980; Mulligan, 1974). Material from the study area was distinguished by its shorter styles (less than 0.3 mm long compared with greater than 0.4 mm long for _Draba lactea_) and the absence of stellate leaf hairs.

Draba lactea Adams (Milky Whitlow-Grass)

Collection number: 670

Habitat information: Locally rare; the single collection taken was from a damp, mossy north-facing cliff ledge.

Overall abundance: Rare.

Occurring with: _Draba macounii_, _Luzula arctica_ subsp. _latifolia_ and _Saxifraga adscendens_ subsp. _oregonensis_.

Draba macounii O.E. Schultz in Engler (Macoun's Whitlow-Grass)

Collection numbers: 645, 675

Habitat information: Rare on damp boulder slopes and cliff ledges.

Overall abundance: Rare.

Occurring with: Draba stenoloba, Luzula arctica subsp. latifolia and Saxifraga oppositifolia.

Draba nivalis Liljebl. (Snow Whitlow-Grass)

Synonym: Draba nivalis var. nivalis

Collection number: 639

Habitat information: Sparse; from footholds on damp west-facing granodiorite cliff face.

Overall abundance: Rare.

Occurring with: Antennaria monocephala and Carex nardina.

Additional notes: Closely related to both Draba fladnizensis and D. lactea (Mulligan, 1974). D. nivalis is distinguished by the dense covering of stellate hairs on both upper and lower leaf surfaces. Keys to the genus Draba (Mulligan, 1974, 1976) describe Draba nivalis as having stellate hairs on stem and pedicels in addition to those on the leaves. Specimens collected from the study area (identification verified by Mulligan), however, had glabrous stems and pedicels.

Draba stenoloba Ledeb. (Alaska Whitlow-Grass)

Synonyms: Draba albertina Greene (of some authors according to Porsild & Cody, 1980); D. stenoloba var. stenoloba

Collection numbers: 182, 337, 573, 663, 677, 787

Habitat information: Sparse to common in damp, open, gravelly sites and among mossy rocks along lakeshores.

Overall abundance: Sparse.

Occurring with: *Arenaria longipedunculata*, *Carex scirpoidea*, *Draba albertina*, *D. lactea*, *Eriophorum callitrix*, *Salix planifolia* subsp. *pulchra* var. *pulchra*, *Saxifraga nelsoniana* subsp. *porsildiana*, *Stellaria umbellata* and *Taraxacum lyratum*.

Additional notes: The difficulties in distinguishing *Draba stenoloba* from *D. albertina* have been discussed under the latter. Collection #787 is noteworthy in that it was the only collection of *Draba stenoloba* with essentially glabrous leaf surfaces taken from the study site, apparently a rarity for this species (Mulligan, 1975).

Callitrichaceae (Water Starwort Family)

Callitriche L. (Water Starwort)

Callitriche anceps Fern. (Two-Edged Water Starwort)

Synonym: *Callitriche heterophylla* Pursh (of some authors according to Taylor & MacBryde, 1977)

Collection numbers: 939, 1019

Habitat information: Common in silty bottomed, shallow seepage pond; usually submersed. Later in the season, however, some specimens were observed growing just on pond margins as the water level subsided. Only one site in the study area offered this combination of shallow, still water and silty bottom.

Overall abundance: Rare.

Occurring with: *Lysimachia thyrsiflora* and *Ranunculus aquatilis*.

Campanulaceae (Harebell Family)

Campanula L. (Harebell)

Campanula lasiocarpa Cham. subsp. *lasiocarpa* (Mountain Harebell)

Collection numbers: 507, 553

Habitat information: Rare to sparse in damp moss hummocks along rocky lakeshores and on damp, mossy cliff ledges.

Overall abundance: Rare.

Occurring with: *Juncus castaneus* subsp. *castaneus*, *Luzula multiflora* var. *frigida*, *Parnassia kotzebuei* var. *kotzebuei* and *Potentilla diversifolia* var. *diversifolia*.

Caprifoliaceae (Honeysuckle Family)

Linnaea L. (Twinflower)

Linnaea borealis L. subsp. *americana* (Forbes) Hult. (Northern Twinflower)

Synonyms: *Linnaea borealis* var. *americana*

Collection number: 800

Habitat information: Sparse on partially shaded, well-drained, gravel slopes.

Overall abundance: Rare.

Occurring with: *Betula glandulosa* var. *glandulosa*, *Cornus canadensis*, *Empetrum nigrum* subsp. *hermaphoditum*, *Lycopodium camplanatum* and *Salix polaris*.

Caryophyllaceae (Pink Family)

Arenaria L. (Sandwort)

Arenaria longipedunculata Hult. (Low Sandwort)

Synonym: *Arenaria humifusa* Wahlenb.

Collection numbers: 551, 572

Habitat information: Sparse on basaltic rock shelves in spray of waterfall and on open well-drained gravel slope near snow run-off stream.

Overall abundance: Rare to sparse.

Occurring with: *Artemisia tilesii* subsp. *tilesii*, *Draba albertina*, *D. stenoloba*, *Erigeron humilis* and *Salix polaris*.

Cerastium L. (Chickweed)

Cerastium beeringianum Cham. & Schlect. subsp. *beeringianum* (Bering Chickweed)

Synonyms: *Cerastium beeringianum* var. *grandiflorum* Hult., *C. beeringianum* var. *beeringianum*

Collection numbers: 325, 632, 795, 973

Habitat information: Sparse to common in damp meadows; bare, silty areas near game trails, rock slopes and mossy seepage sites.

Overall abundance: Sparse.

Occurring with: *Aconitum delphinifolium* subsp. *delphinifolium*, *Arctostaphylos rubra*, *Delphinium glaucum*, *Festuca vivipara*, *Koenigia islandica*, *Polemonium caerulium* subsp. *villosum*, *Salix reticulata* subsp. *reticulata*, *Silene uralensis* subsp. *attenuata* and *Stellaria longipes* var. *laeta*.

Sagina L. (Pearlwort)

Sagina intermedia Fenzl in Ledeb. (Snow Pearlwort)

Collection number: 612

Habitat information: Sparse to common in damp, open sites on exposed soil patches.

Overall abundance: Rare.

Occurring with: *Festuca vivipara*, *Gentianella propinqua* and *Koenigia islandica*.

Silene L. (Campion, Catchfly)

Silene acaulis (L.) Jacq. subsp. *acaulis* (Moss Campion)

Synonyms: *Silene acaulis* var. *exscapa* (All.) DC.

Collection numbers: 208, 436

Habitat information: Sparse on exposed, well-drained rocky slopes and ridges.

Overall abundance: Rare to sparse.

Occurring with: *Luzula piperi*, *Poa arctica* subsp. *arctica*, *Potentilla uniflora* and *Salix reticulata* subsp. *reticulata*.

Silene uralensis (Rupr.) Bocquet subsp. *attenuata* (Farr) McNeill (Apetalous Campion)

Synonyms: *Lychnis apetala* L.; *L. apetala* var. *attenuata* Farr; *Melandrium attenuatum* (Farr) Hara; *M. apetalum* (L.) Fenzl.; *M. apetalum* subsp. *arcticum* (E. Fries) Hult.

Collection number: 324

Habitat information: Rare to sparse on open, east-facing boulder slope near late snow run-off.

Overall abundance: Rare.

Occurring with: *Cerastium beeringianum* subsp. *beeringianum*, *Festuca altaica*, *Potentilla fruticosa* subsp. *floribunda* and *Salix polaris*.

Stellaria L. (Starwort)

Stellaria calycantha (Ledeb.) Bong. var. *calycantha* (Northern Starwort)

Synonym: *Stellaria calycantha* (Ledeb.) Bong. subsp. *calycantha*

Collection numbers: 583, 749, 985

Habitat information: Sparse to common, growing in damp moss carpets along shady stream banks.

Overall abundance: Sparse.

Occurring with: *Agrostis scabra*, *Carex brunnescens* subsp. *alaskana*, *C. canescens* subsp. *canescens*, *Epilobium anagallidifolium*, *Equisetum arvense*, *Eriophorum scheuchzeri*, *Polemonium caeruleum* subsp. *villosum* and *Salix planifolia* subsp. *pulchra* var. *pulchra*.

Stellaria longipes Goldie var. *altocaulis* (Hult.) C.L. Hitchc. in Hitchc. et al. (Long-Stalked Starwort)

Synonym: *Stellaria monantha* Hult.

Collection number: 178

Habitat information: Sparse to common in damp, mossy herbmats adjacent to lakeshores and along open run-off streams.

Overall abundance: Rare to sparse.

Occurring with: *Anemone richardsonii*, *Antennaria umbrinella*, *Claytonia sarmentosa*, *Draba stenoloba*, *Parnassia kotzebuei* var. *kotzebuei*, *Potentilla diversifolia* var. *diversifolia* and *Saxifraga rivularis* var. *flexuosa*.

Additional notes: *Stellaria longipes* Goldie s.l. exhibits a high degree of morphological variability throughout its range. Numerous segregates from the complex have been proposed on the basis of pubescence position, bract type and flower number. Hulten (1968) and Porsild and Cody (1980) go so far as to recognize separate species based on these characters. After examining numerous specimens within the complex from Alaska and adjacent territories, however, Welsh (1974) concluded that it was "... possible to designate taxa within the complex only arbitrarily and a conservative treatment is indicated". Studies by Chinappa and Morton (1976, 1984) support this view. The authors found that clonal material grown under a variety of environmental conditions exhibited considerable morphological variability. Characters most affected were leaf shape, inflorescence development, growth habit and development of scarious bracts. These characters, commonly used in keys to separate taxa, were therefore concluded to be merely manifestations of phenotypic plasticity. Furthermore, breeding programs revealed that pubescence position and capsule colour were examples of inherited variation, and a variety of phenotypes were observed in both wild populations and in cultivation (Chinappa and Morton, 1984; Chinappa, 1986 pers.

comm.).

In light of these observations it seems most appropriate to regard Stellaria longipes as a single, highly variable species.

Stellaria longipes Goldie var. laeta (Richards.) S. Wats. in Gray (Long-Stalked Starwort)
Synonym: Stellaria laeta Richards.
Collection numbers: 147a, 756, 794, 796, 970
Habitat information: Common in damp moss carpets overlying rocks on lakeshore, open seepage areas and in damp soil patches among rocks on boulder slopes.
Overall abundance: Sparse.
Occurring with: Bistorta vivipara, Cerastium beeringianum subsp. beeringianum, Gentianella propinqua, Polemonium caeruleum subsp. villosum, Salix reticulata subsp. reticulata, Saxifraga rivularis var. flexuosa and Veronica wormskjoldii var. wormskjoldii.
Additional notes: See Stellaria longipes var. altocaulis.

Stellaria umbellata Turcz. ex Karel. & Kiril. (Umbellate Starwort)
Collection numbers: 567, 667, 693
Habitat information: Sparse along damp, mossy stream banks, silty areas along run-off channels and in moist open heath-meadows.
Overall abundance: Rare to sparse.
Occurring with: Epilobium anagallidifolium, Juncus drummondii,

Parnassia fimbriata var. *fimbriata* and *Veronica wormskjoldii* var. *wormskjoldii*.

Cornaceae

Cornus L. (Dogwood, Bunchberry)

Cornus canadensis L. (Canadian Bunchberry)

Collection numbers: 578, 801

Habitat information: Sparse on open gravelly heaths and damp grassy sites near persistent snow patches.

Overall abundance: Rare to sparse.

Occurring with: *Empetrum nigrum* subsp. *hermaphroditum*, *Linnaea borealis* subsp. *americana*, *Lycopodium complanatum*, *Salix polaris*, *Valeriana sitchensis* subsp. *sitchensis* and *Veratrum viride* subsp. *eschscholtzii*.

Crassulaceae

Sedum L. (Stonecrop)

Sedum integrifolium (Raf.) A. Nelson in Coulter & Nelson subsp. *integrifolium* (Roseroot)

Synonyms: *Rhodiola integrifolia* Raf.; *Sedum rosea* (L.) Scop. subsp. *integrifolium* (Raf.) Hult.; *S. rosea* var. *integrifolium* (Raf.) Berger; *S. rosea* subsp. *rosea*; *S. rosea* var. *rosea*

Collection numbers: 174, 737, 1018

Habitat information: Common along open, gravelly lakeshores.

Overall abundance: Sparse.

Occurring with: *Chrysosplenium tetrandrum*, *Erigeron humilis* and *Saxifraga nelsoniana* subsp. *porsildiana*.

Empetraceae (Crowberry Family)

Additional reference: Love and Love, 1959.

Empetrum L. (Crowberry)

Empetrum nigrum L. subsp. *hermaphroditum* (Hagerup) Bocher (Black Crowberry)

Synonym: *Empetrum nigrum* L. var. *hermaphroditum* (Lange) Sorens.

Collection numbers: 517, 519

Habitat information: Common; a dense mat-forming species on exposed, fairly well-drained, gravelly heaths and in wet, boggy sites.

Overall abundance: Sparse to common.

Occurring with: *Calamagrostis purpurascens* subsp. *purpurascens*, *Cornus canadensis*, *Festuca saximontana*, *Hierochloe alpina* subsp. *alpina*, *Ledum groenlandicum*, *Lycopodium complanatum*, *Poa arctica* subsp. *arctica* and *Salix polaris*.

Ericaceae (Heath Family)

Additional reference: Szczawinski, 1962.

Andromeda L. (Bog Rosemary)

Andromeda polifolia L. subsp. *polifolia* (Bog Rosemary)

Collection number: 162

Habitat information: Sparse to common, growing almost excusively in damp sphagnum hummocks.

Overall abundance: Sparse.

Occurring with: *Kalmia microphylla* subsp. *microphylla*, *Ledum groenlandicum*, *Pedicularis labradorica*, *Rubus chamaemorus* and

Vaccinium _microcarpum_.

Arctostaphylos Adans. (Manzanita)

Arctostaphylos _rubra_ (Rehd. & Wils.) Fern. (Red Manzanita)
Synonyms: _Arctostaphylos_ _alpina_ (L.) Spreng. var. _rubra_ (Rehd. & Wils.) Bean; _A._ _alpina_ subsp. _rubra_ (Rehd. & Wils.) Hult.; _Arctous_ _alpina_ (L.) var. _ruber_ Rehd. & Wils.
Collection numbers: 635, 651, 719
Habitat information: Rare to sparse on well-drained, rocky slopes and open heaths.
Overall abundance: Rare.
Occurring with: _Betula_ _glandulosa_ var. _glandulosa_, _Cassiope_ _mertensiana_ var. _mertensiana_, _Cerastium_ _beeringianum_ subsp. _beeringianum_, _Festuca_ _vivipara_, _Hedysarum_ _alpinum_ subsp. _americanum_, _Phyllodoce_ _empetriformis_, _Salix_ _glauca_ var. _acutifolia_ and _S._ _reticulata_ subsp. _reticulata_.

Cassiope

Cassiope _mertensiana_ (Bong.) D. Don var. _mertensiana_ (Merten's Cassiope)
Collection numbers: 440, 536, 673
Habitat information: Common to abundant throughout the study area forming dense mats on open, moderately moist heathlands. A major component of the ground cover.
Overall abundance: Common to abundant.
Occurring with: _Antennaria_ _alpina_, _A._ _monocephala_, _Cassiope_ _tetragona_ var. _tetragona_, _Phyllodoce_ _empetriformis_, _P._

glanduliflora and *P.* X *intermedia*.

Cassiope tetragona (L.) D. Don var. *tetragona* (Four-Angled Cassiope)

Synonym: *Cassiope tetragona* subsp. *tetragona*

Collection numbers: 135, 147, 368, 555, 575

Habitat information: Abundant throughout the study area. Frequently forming dense mats, almost to the exclusion of the other taxa, on open gravelly slopes and around sandy, rocky lakeshores.

Overall abundance: Abundant.

Occurring with: *Antennaria monocephala*, *Cassiope mertensiana* var. *mertensiana*, *Hierochloe alpina* subsp. *alpina*, *Phyllodoce empetriformis*, *P. glanduliflora*, *P.* X *intermedia* and *Salix polaris*.

Kalmia L. (Kalmia)

Kalmia microphylla (Hook.) Heller subsp. *microphylla* (Western Swamp Kalmia)

Synonyms: *Kalmia polifolia* Wang. subsp. *microphylla* (Hook.) Calder & Taylor; *K. polifolia* var. *microphylla* (Hook.) Rehd.

Collection numbers: 113, 159, 468

Habitat information: Sparse to common in wet, open meadows, especially along mossy run-off channels and on sphagnum hummocks in boggy areas.

Overall abundance: Sparse.

Occurring with: *Andromeda polifolia* subsp. *polifolia*, *Anemone* narcissiflora subsp. interior, A. parviflora, A. richardsonii, Equisetum arvense, Pedicularis longsdorfii, Salix barrattiana, Tofieldia pusilla, Vaccinium caespitosum and V. microcarpum.

Ledum L. (Labrador Tea)

Ledum groenlandicum Oeder. (Common Labrador Tea)
Synonym: Ledum palustre L. subsp. groenlandicum (Oeder) Hult.
Collection numbers: 304, 518
Habitat information: Rare to sparse growing from sphagnum hummocks adjacent to lakeshore and in damp seepage site at the base of a basaltic cliff face.
Overall abundance: Rare.
Occurring with: Andromeda polifolia subsp. polifolia, Empetrum nigrum subsp. hermaphroditum, Kalmia microphylla subsp. microphylla, Rubus chamaemorus and Vaccinium microcarpum.

Ledum palustre L. subsp. decumbens (Ait.) Hult. (Northern Labrador Tea)
Synonym: Ledum decumbens (Ait.) Lodd. ex Steud.
Collection numbers: 157, 409, 439, 591
Habitat information: Common to abundant in and around sphagnum hummocks, in gravelly heathlands and on moderately well-drained, open, rocky slopes.
Overall abundance: Common.
Occurring with: Andromeda polifolia subsp. polifolia, Artemisia arctica subsp. arctica, Cassiope mertensiana var. mertensiana, Kalmia microphylla subsp. microphylla, Phyllodoce empetriformis,

Rubus chamaemorus and *Saxifraga oppositifolia*.

Phyllodoce Salisb. (Mountain Heather)

Phyllodoce empetriformis (Sm.) D. Don (Red Mountain Heather)

Collection numbers: 272, 540

Habitat information: A common component of the ground cover on damp open meadows and moderately well-drained, gravelly heathlands.

Overall abundance: Common.

Occurring with: *Betula glandulosa* var. *glandulosa*, *Cassiope mertensiana* var. *mertensiana*, *Lycopodium annotinum* subsp. *annotinum*, *Pedicularis sudetica*, *Salix alaxensis* var. *alaxensis*, *S. reticulata* subsp. *reticulata* and *Vaccinium caespitosum* var. *caespitosum*.

Phyllodoce glanduliflora (Hook.) Cov. (Cream Mountain Heather)

Synonym: *Phyllodoce aleutica* (Spreng.) Heller subsp. *glanduliflora* (Hook.) Hult.

Collection numbers: 127, 167, 441

Habitat information: Growing in abundance over rocks around lakeshores, along open stream banks, on damp, open gravelly slopes and in dense patches in meadows. Forming a major component of the heathlands which characterize the study area.

Overall abundance: Common to abundant.

Occurring with: *Anemone narcissiflora* subsp. *interior*, *Antennaria monocephala*, *Cassiope mertensiana* var. *mertensiana*, *C. tetragona* var. *tetragona*, *Phyllodoce X intermedia* and

Vaccinium vitis-idaea subsp. minus.

Phyllodoce X intermedia (Hook.) Camp (Hybrid Mountain Heather)
Collection number: 442
Habitat information: Common on damp open heaths; particularly abundant adjacent to lakeshore and along run-off streams where, at times, it forms a major component of the ground cover.
Overall abundance: Sparse to common.
Occurring with: Anemone narcissiflora subsp. interior, A. richardsonii, Antennaria monocephala, Cassiope mertensiana var. mertensiana, C. tetragona var. tetragona, Equisetum scirpoides, Lycopodium alpinum and Phyllodoce glanduliflora.

Vaccinium L. (Blueberry, Huckleberry, Cranberry)

Vaccinium caespitosum Michx. var. caespitosum (Dwarf Blueberry)
Collection numbers: 160, 250, 289, 533
Habitat information: Sparse to common on sphagnum hummocks, damp, mossy carpets along stream banks, open meadows and heathlands.
Overall abundance: Sparse.
Occurring with: Andromeda polifolia subsp. polifolia, Anemone narcissiflora subsp. interior, Cassiope mertensiana var. mertensiana, Claytonia sarmentosa, Erigeron humilis, Festuca brachyphylla, Myosotis asiatica, Phyllodoce glanduliflora, Salix reticulata subsp. reticulata and Vaccinium microcarpum.

Vaccinium ovalifolium Sm. in Rees (Oval-Leaved Blueberry)

Collection number: 668

Habitat information: Sparse in damp, grassy site shaded by krummholz _Abies_ _lasiocarpa_ var. _lasiocarpa_.

Overall abundance: Rare.

Occurring with: _Abies_ _lasiocarpa_ var. _lasiocarpa_, _Cassiope_ _tetragona_ var. _tetragona_, _Parnassia_ _fimbriata_ var. _fimbriata_ and _Poa_ _arctica_ subsp. _arctica_.

Vaccinium _microcarpum_ [Turcz. ex Rupr.] Schmalhausen (Dwarf Bog Cranberry)

Synonyms: _Oxycoccos_ _microcarpus_ Turcz. ex Rupr. (in Welsh, 1974); _O._ _microcarpus_ var. _microcarpus_ (in Welsh, 1974)

Collection number: 158

Habitat information: Common on sphagnum hummocks and along damp, mossy streambank in close proximity to bog.

Overall abundance: Sparse.

Occurring with: _Andromeda_ _polifolia_ subsp. _polifolia_, _Kalmia_ _microphylla_ subsp. _microphylla_, _Ledum_ _palustre_ subsp. _decumbens_ and _Rubus_ _chamaemorus_.

Vaccinium _uliginosum_ L. subsp. _alpinum_ (Bigel.) Hult. (Bog Blueberry)

Synonyms: _Vaccinium_ _uliginosum_ var. _uliginosum_; _V._ _uliginosum_ var. _alpinum_ Bigel.

Collection numbers: 579, 599, 684

Habitat information: Common on steep open scree slopes, sphagnum hummocks and less commonly, in damp, moss carpets overlying rocks along open run-off streams.

Overall abundance: Sparse.

Occurring with: Andromeda polifolia subsp. polifolia, Epilobium angustifolium var. angustifolium, Ledum palustre subsp. decumbens, Luetkea pectinata, Luzula spicata, Salix polaris and Saxifraga caespitosa subsp. sileneflora.

Vaccinium vitis-idaea L. subsp. minus (Lodd.) Hult. (Mountain Cranberry)

Synonym: Vaccinium vitis-idaea var. minus Lodd.

Collection numbers: 120, 165, 265, 320

Habitat information: Sparse to common in boggy area, mossy seepage sites and open, gravelly heathlands near persistent snow patches.

Overall abundance: Sparse.

Occurring with: Anemone parviflora, Cassiope mertensiana var. mertensiana, Dryas integrifolia subsp. integrifolia, Equisetum arvense, Festuca altaica, Gentiana glauca, Kalmia microphylla subsp. microphylla, Phyllodoce glanduliflora, Salix barrattiana and S. glauca var. acutifolia.

Fabaceae (Pea Family)

Additional references: Taylor, 1974; Dunn and Gillet, 1966.

Astragalus L. (Milk-Vetch)

Astragalus alpinus L. subsp. alpinus (Alpine Milk-Vetch)

Synonyms: Astragalus alpinus var. alpinus; A. alpinus subsp. alaskanus Hult.

Collection number: 398b

Habitat information: Sparse in damp herb mat at the base of a talus slope.

Overall abundance: Rare.

Occurring with: _Carex nardina_, _Cystopteris montana_ and _Hedysarum alpinum_ subsp. _americanum_.

Hedysarum L. (Hedysarum)

Hedysarum alpinum L. subsp. _americanum_ (Michx. ex Pursh) Fedtch. (Alpine Hedysarum)

Synonym: _Hedysarum alpinum_ var. _americanum_ Michx.

Collection numbers: 398b, 636, 652, 723, 789

Habitat information: Common on damp, open rocky slopes and open, mossy sites along run-off streams.

Overall abundance: Sparse.

Occurring with: _Aconitum delphinifolium_ subsp. _delphinifolium_, _Anemone narcissiflora_ subsp. _interior_, _Arctostaphylos rubra_, _Betula glandulosa_ var. _glandulosa_, _Erigeron humilis_, _Myosotis asiatica_, _Salix reticulata_ subsp. _reticulata_, _S. glauca_ var. _acutifolia_ and _Saxifraga nelsoniana_ subsp. _porsildiana_.

Lupinus L. (Lupine)

Lupinus arcticus S. Wats. subsp. _arcticus_ (Arctic Lupine)

Collection numbers: 203, 331, 776

Habitat information: Sparse to common in damp, open meadows and along stream banks in birch-willow thickets.

Overall abundance: Sparse.

Occurring with: _Anemone narcissiflora_ subsp. _interior_, _Betula glandulosa_ var. _glandulosa_, _Claytonia sarmentosa_, _Dryas integrifolia_ subsp. _integrifolia_, _Salix barrattiana_ and _S. glauca_ var. _acutifolia_.

Oxytropis DC. (Locoweed)

Oxytropis sericea Nutt. in Torr. & Gray var. _spicata_ (Hook.) Barneby (Early Yellow Locoweed)

Synonym: _Oxytropis spicata_ (Hook.) Standl.

Collection numbers: 274, 393

Habitat information: Sparse; on exposed, sandy, gravelly slopes and growing from open herb mats on rocky ridges.

Overall abundance: Rare.

Occurring with: _Bistorta vivipara_, _Juniperus communis_ subsp. _alpina_, _Phyllodoce empetriformis_, _Salix arctica_ subsp. _arctica_ and _S. polaris_.

Fumariaceae (Fumitory Family)

Additional reference: Ownbey, 1947.

Corydalis Vent. (Corydalis)

Corydalis pauciflora (Steph.) Pers. (Few-Flowered Corydalis)

Collection numbers: 194, 303, 374

Habitat information: Sparse to common. Found almost exclusively in damp moss carpets adjacent to lakeshores and along run-off streams.

Overall abundance: Sparse.

Occurring with: _Bistorta vivipara_, _Castilleja unalachensis_, Caltha leptosepala var. leptosepala, Pedicularis langsdorfii subsp. arctica, P. sudetica subsp. interior, Salix polaris and Senecio pauciflorus.

Additional notes: Flower colour of Corydalis pauciflora ranged, for the most part, from violet-blue to sky blue. In addition, a single population of white flowered individuals, from which collection # 374 was made, was found. A. E. Porsild in "Botany of Southeaastern Yukon Adjacent to the Canol Road" (1951) noted a white-flowered colony and accorded it separate varietal status, naming it Corydalis pauciflora (Steph.) Pers. var. albiflora Pors. This variety is recognized by Hulten, (1968), Welsh (1974) and Porsild and Cody (1980) but Taylor and MacBryde (1977), although acknowledging the existence of white-flowered individuals, make no mention of a distinct taxon.

Gentianaceae (Gentian Family)

Gentiana L. (Gentian)

Gentiana glauca Pall. (Glaucous Gentian, Pale Gentian)

Collection numbers: 166, 377, 426, 449

Habitat information: Sparse to common around lakeshores and along stream banks, in damp, open meadows and heathlands and occasionally on exposed rocky slopes near persistent snow.

Overall abundance: Sparse.

Occurring with: Anemone narcissiflora subsp. interior, Cassiope tetragona var. tetragona, Hierochloe alpina subsp. alpina, Pedicularis langsdorfii subsp. arctica, Phyllodoce glanduliflora, Salix barratiana, S. polaris and Veronica wormskjoldii var. wormskjoldii.

Additional notes: Typical Gentiana glauca has dark blue flowers. While this was the case throughout most of the study area, individuals were observed with flowers ranging in colour from violet blue to pale green.

Gentianella Moench (Gentian)

Gentianella propinqua (Richards. in Franklin) Gillett (Four-Parted Gentian)

Synonyms: Gentiana arctophila Griseb.; G. propinqua Richards.; G. propinqua subsp. propinqua; G. propinqua var. propinqua; G. propinqua subsp. arctophila (Griseb.) Hult.

Collection numbers: 613, 647, 755

Habitat information: Sparse on damp, open sites where soil was exposed, open heathlands and from moist, moss carpets adjacent to lakeshores.

Overall abundance: Rare to sparse.

Occurring with: Anemone narcissiflora subsp. interior, Cassiope tetragona var. tetragona, Dryas integrifolia subsp. integrifolia, Erigeron humilis, Koenigia islandica, Kobresia myosuroides, Sagina intermedia, Salix glauca var. acutifolia and Stellaria longipes var. altocaulis.

Grossulariaceae (Currant or Gooseberry Family)

Ribes L. (Currant, Gooseberry)

Ribes glandulosum Grauer (Skunk Currant)

Collection numbers: 138, 201

Habitat information: Rare to sparse in damp, shady areas around lakeshores and along stream banks.

Overall abundance: Rare to sparse.

Occurring with: Abies lasiocarpa var. lasiocarpa, Antennaria monocephala, Betula glandulosa var. glandulosa, Mertensia paniculata var. paniculata, Salix barratiana, S. glauca var. acutifolia and Valeriana sitchensis subsp. sitchensis.

Onagraceae (Evening Primrose Family)

Epilobium L. (Willowherb)

Epilobium anagallidifolium Lam. (Alpine Willowherb)

Synonym: Epilobium alpinum L. var. alpinum

Collection numbers: 297, 345, 499, 550, 569, 697, 748

Habitat information: Sparse to common in wet meadows, mossy stream banks and adjacent to lakeshores. Sites range in exposure from open to moderately shaded.

Overall abundance: Sparse.

Occurring with: Anemone narcissiflora subsp. interior, Bistorta vivipara, Carex bipartita, C. podocarpa, Epilobium lactiflorum, Erigeron humilis, Festuca altaica, Mertensia paniculata var. paniculata, Myosotis asiatica, Salix reticulata subsp. reticulata and Veronica wormskjoldii var. wormskjoldii.

Epilobium angustifolium L. subsp. angustifolium (Fireweed)

Synonyms: Epilobium angustifolium var. angustifolium

Collection numbers: 145, 780

Habitat information: Locally sparse. Found growing on exposed rocky sites.

Overall abundance: Rare to sparse.

Occurring with: Antennaria alpina var. media, Cardamine bellidifolia subsp. bellidifolia var. bellidifolia, Hierochloe alpina subsp. alpina, Potentilla fruticosa subsp. floribunda, Salix polaris and Solidago multiradiata var. multiradiata.

Epilobium lactiflorum Haussk. (Alpine Willowherb)

Synonyms: Epilobium alpinum L. var. lactiflorum (Hausskn.) C.L. Hitchc.

Collection numbers: 549, 614, 891, 990

Habitat information: Sparse. The habitats in which Epilobium lactiflorum was found were similar to those in which E. anagallidifolium occurred. Primarily found in open to shady areas along stream banks and lakeshores growing from damp moss carpets. A few specimens, however, were from gravelly areas near late-remaining snow.

Overall abundance: Rare to sparse.

Occurring with: Abies lasiocarpa var. lasiocarpa, Adoxa moschatellina, Erigeron humilis, Mertensia paniculata var. paniculata, Myosotis asiatica, Salix glauca var. acutifolia and Valeriana sitchensis subsp. sitchensis.

Additional notes: One of the characteristics employed to distinguish Epilobium lactiflorum from E. anagallidifolium is petal colour; those of the former being white while those of the latter are reddish-violet to pink (Hulten, 1968; Porsild and Cody, 1980). Collection # 891, while fitting the description of

E. lactiflorum as otherwise described, had some white flowers and some dark pink flowers on the same plants. Welsh, (1974), in his flora, treats both entities as varieties of one species, *E. alpinum* L.

Epilobium latifolium L. subsp. *latifolium* (Broad-Leaved Willowherb)

Collection numbers: 255, 516, 654

Habitat information: Sparse to common on talus slopes, rocky lakeshores and occasionally found in damp, open meadows.

Overall abundance: Sparse.

Occurring with: *Achillea millefolium* var. *borealis*, *Empetrum nigrum* subsp. *hermaphroditum*, *Festuca brachyphylla*, *Pedicularis langsdorfii* subsp. *arctica*, *Polemonium caeruleum* subsp. *villosum*, *Salix glauca* var. *acutifolia*, *Saxifraga tricuspidata* and *Trisetum spicatum* var. *spicatum*.

Parnassiaceae (Grass-of-Parnassus Family)

Parnassia L. (Grass-of-Parnassus)

Parnassia fimbriata Konig. var. *fimbriata* (Fringed Grass-of-Parnassus)

Collection numbers: 714, 734, 1022

Habitat information: Common on moss-carpeted rocks around lakeshores and in damp meadows.

Overall abundance: Sparse.

Occurring with: *Anemone narcissiflora* subsp. *interior*, *Leptarrhena pyrolifolia*, *Mitella pentandra*, *Parnasia kotzebuei* var. kotzebuei, Saxifraga lyallii subsp. hultenii, and Tofieldia pusilla.

Parnassia kotzebuei Cham. in Spreng. var. kotzebuei (Kotzebue's Grass-of-Parnassus)

Collection numbers: 396, 455, 466, 503, 526, 735, 911

Habitat information: Common in moss carpets adjacent to lakeshores and run-off streams and seepage areas in mossy heathlands.

Overall abundance: Sparse.

Occurring with: Anemone narcissiflora subsp. interior, Bistorta vivipara, Carex media subsp. media, Juncus castaneus subsp. castaneus, Leptarrhena pyrolifolia, Luzula multiflora subsp. multiflora var. frigida, Mitella pentandra, Parnassia fimbriata var. fimbriata, Pedicularis langsdorfii subsp. interior, Salix alaxensis var. alaxensis, S. polaris and Tofieldia pusilla.

Polemoniaceae (Phlox family)

Polemonium L. (Jacob's-Ladder)

Polemonium caeruleum L. subsp. villosum (Rudolf ex Georgi) Brand (Sticky Tall Jacob's-Ladder)

Synonyms: Polemonium acutiflorum Willd.

Collection numbers: 252, 400, 485, 515

Habitat information: Sparse to common in damp, open meadows, open to partly shaded stream banks and occasionally growing on damp, rocky lakeshores.

Overall abundance: Sparse.

Occurring with: Betula glandulosa var. glandulosa, Castilleja unalaschensis, Epilobium latifolium subsp. latifolium, Salix glauca var. acutifolia, Senecio triangularis and Thalictrum occidentale var. occidentale.

Polygonaceae (Buckwheat Family)

Additional reference: Smith, 1968.

Bistorta Mill. (Bistort)

Bistorta vivipara (L.) Gray (Alpine Bistort)

Synonyms: Polygonum viviparum L.; P. viviparum var. viviparum

Collection numbers: 291, 298, 305, 353, 394, 402, 754, 912, 958, 1006

Habitat information: Common along stream banks, around lake margins, in damp meadows and heathlands, and on gravelly slopes and rocky ledges where seepage water was evident.

Overall abundance: Sparse to common.

Occurring with: Anemone narcissiflora subsp. interior, Betula glandulosa var. glandulosa, Caltha leptosepala var. leptosepala, Carex bipartita, Cassiope tetragona var. tetragona, Equisetum arvense, Luzula parviflora subsp. parviflora, Salix polaris, Sanguisorba canadensis subsp. latifolia and Stellaria longipes var. laeta.

Koenigia L. (Koenigia)

Koenigia islandica L. (Island Koenigia)

Collection numbers: 633, 742, 968

Habitat information: Sparse in open to partly shaded sites on damp, bare soil.

Overall abundance: Rare to sparse.

Occurring with: *Carex brunnescens* subsp. *alaskana*, *C. rostrata*, *Cerastium beeringianum* subsp. *beeringianum*, *Epilobium anagallidifolium*, *Juncus biglumis*, *Stellaria calycantha* subsp. *calycantha* and *Ranunculus hyperboreus* subsp. *hyperboreus*.

Oxyria Hill (Mountain Sorrel)

Oxyria digyna (L.) Hill (Mountain Sorrel)

Collection numbers: 140, 329, 333, 379, 390, 671

Habitat information: Common on damp rocky areas near late remaining snow, wet meadows, lakeshores and stream banks. Open to partly shaded sites.

Overall abundance: Sparse.

Occurring with: *Agoseris aurantiaca* var. *aurantiaca*, *Anemone narcissiflora* subsp. *interior*, *Carex nardina*, *Cassiope mertensiana* var. *mertensiana*, *Delphinium glaucum*, *Erigeron humilis*, *Petasites nivalis*, *Salix planifolia* subsp. *pulchra* var. *pulchra*, *Sanguisorba canadensis* subsp. *latifolia* and *Valeriana sitchensis* subsp. *sitchensis*.

Rumex L. (Dock, Sorrel)

Rumex acetosa L. subsp. *arifolius* (All.) Blytt & Dahl (Common Sorrel)

Synonym: *Rumex acetosa* subsp. *alpestris* (Scop.) Love

Collection numbers: 192, 246, 475, 512, 765

Habitat information: Common along moist, open to well shaded stream banks, run-off streams and wet meadows.

Overall abundance: Sparse.

Occurring with: *Agoseris aurantiaca* var. *aurantiaca*, *Anemone narcissiflora* subsp. *interior*, *Caltha leptosepala* var. *leptosepala*, *Delphinium glaucum*, *Petasites nivalis*, *Salix planifolia* subsp. *pulchra* var. *pulchra*, *Sanguisorba canadensis* subsp. *latifolia* and *Valeriana sitchensis* subsp. *sitchensis*.

Portulacaceae (Puslane Family)

Claytonia L. (Spring Beauty)

Claytonia sarmentosa C.A. Mey. (Alaska Spring Beauty)

Synonym: Montia sarmentosa (C.A. Mey.) Robins

Collection numbers: 177, 288, 332

Habitat information: Sparse in grassy tussocks and moss carpets along lakeshores and partially shaded run-off streams.

Overall abundance: Rare to sparse.

Occurring with: *Anemone narcissiflora* subsp. *interior*, *Betula glandulosa* var. *glandulosa*, *Bistorta vivipara*, *Erigeron humilis*, *Lupinus arcticus* subsp. *arcticus*, *Salix glauca* var. *acutifolia* and *Stellaria longipes* var. *altocaulis*.

Primulaceae (Primrose Family)

Dodecatheon L. (Shootingstar)

Dodecatheon frigidum Cham. & Schlect. (Northern Shootingstar)

Collection number: 556

Habitat information: Rare. Found in only one location in the study area, growing in a wet seepage site in an open meadow.

Overall abundance: Rare.

Occurring with: Arenaria longipedunculata, Epilobium anagallidifolium, Heracleum sphondylium subsp. montanum, Poa arctica subsp. arctica, Salix glauca subsp. acutifolia and Veratrum viride subsp. eschscholtzii.

Lysimachia L. (Loosestrife)

Lysimachia thyrsiflora L. (Tufted Loosestrife)

Collection number: 941

Habitat information: Rare in shallow, silty-bottomed seepage pond. Partly submerged in approximately 12 cm of water.

Overall abundance: Rare.

Occurring with: Callitriche anceps and Ranunculus aquatilis.

Trientalis L. (Starflower)

Trientalis europaea L. subsp. arctica (Fisch. ex Hook.) Hult.

Synonyms: Trientalis arctica Fisch. ex Hook.

Collection numbers: 415, 738

Habitat information: Rare to sparse in open to partially shaded, mesic, grassy sites.

Overall abundance: Rare to sparse.

Occurring with: Abies lasiocarpa var. lasiocarpa, Agoseris aurantiaca, Artemisia tilesii subsp. tilesii, Draba albertina, Salix planifolia subsp. pulchra var. pulchra and Veronica wormskjoldii var. wormskjoldii.

Pyrolaceae (Wintergreen Family)

Additional references: Haber and Cruise, 1974; Haber, 1983; Knaben, 1965.

Moneses Salisb. ex S.F. Gray (One-Flowered Wintergreen)

Moneses uniflora (L.) Gray var. *uniflora* (One-Flowered Wintergreen)

Collection number: 987

Habitat information: Rare to sparse, growing from damp moss carpet shaded by a dense overstory of stunted *Abies lasiocarpa* var. *lasiocarpa*.

Overall abundance: Rare.

Occurring with: *Abies lasiocarpa* var. *lasiocarpa*, *Mertensia paniculata* and *Veronica wormskjoldii* var. *wormskjoldii*.

Orthilia Raf. (One-Sided Wintergreen)

Orthilia secunda (L.) House subsp. *secunda* (Few-Flowered One-Sided Wintergreen)

Synonyms: *Pyrola secunda* L.; *P. secunda* subsp. *secunda*; *P. secunda* var. *secunda*

Collection number: 883

Habitat information: Sparse in shady, well-drained site growing from a carpet of *Empetrum nigrum* subsp. *hermaphroditum*.

Overall abundance: Rare.

Occurring with: *Antennaria microphylla*, *Betula glandulosa* var. *glandulosa* and *Empetrum nigrum* subsp. *hermaphroditum*.

Pyrola L. (Pyrola)

Pyrola asarifolia Michx. var. purpurea (Bunge) Fern. (Common Pink Pyrola)

Collection numbers: 117a, 770

Habitat information: Sparse in damp moss carpets adjacent to lakeshores and in moist shady sites at the edge of meadows.

Overall abundance: Rare to sparse.

Occurring with: Antennaria monocephala, Anemone narcissiflora subsp. interior, Betula glandulosa var. glandulosa, Calamagrostis canadensis subsp. canadensis var. canadensis, Erigeron humilis, Equisetum arvense, Kalmia microphylla subsp. microphylla, Petasites nivalis, Phleum alpinum var. commutatum and Salix alaxensis var. alaxensis.

Additional notes: See discussion of Pyrola minor.

Pyrola grandiflora Radius (Arctic Pyrola)

Collection numbers: 326, 381, 528

Habitat information: Sparse to locally common on rocky sites where seepage water was evident, particularly near late snow run-off.

Overall abundance: Sparse.

Occurring with: Anemone parviflora, Antennaria umbrinella, Cerastium beeringianum subsp. beeringianum, Festuca altaica, Pedicularis labradorica, Salix polaris and Silene uralensis subsp. attenuata.

Pyrola minor L. (Lesser Pyrola)

Collection numbers: 565, 713, 775

Habitat information: Sparse to common on damp, shaded stream banks, lakeshores and damp protected areas on rocky slopes.

Overall abundance: Sparse.

Occurring with: Antennaria microphylla, Epilobium anagallidifolium, Juncus castaneus subsp. castaneus, Salix glauca var. acutifolia, Stellaria umbrinella and Veronica wormskjoldii var. wormskjoldii.

Additional notes: The most critical characters distinguishing Pyrola minor from P. asarifolia pertain to anther and style form (Haber, 1983). Anthers of P. minor are pale yellow to yellow, truncate with no tubes and the pores are large; the style is straight and included within the perianth. Anthers of P. asarifolia, on the other hand, are white to deep pink, oblong with distinct tubes and the pores are comparatively small; the style is curved and distinctly exserted. Anther and style descriptions for collection number 565 are compatible with those given for P. minor. Petal colour, however, is deep pink which is suggestive of P. asarifolia. Haber (1983) presents evidence of hybrids occurring between these two species in northern British Columbia. These suggested hybrids are morphologically more closely related to P. minor. In view of the fact that both P. minor and P. asarifolia occur in the study area, the possibility that collection number 565 is of hybrid origin should not be overlooked.

Ranunculaceae (Buttercup Family)

Additional reference: Morris, 1973.

Aconitum L. (Monkshood)

Aconitum delphinifolium DC. subsp. *delphinifolium* (Mountain Monkshood)

Synonyms: *Aconitum*

ubsp. *chamissonianum* (Reichb.) Boiv.; *Aconitum delphinifolium* var. *delphinifolium*

Collection numbers: 474, 974

Habitat information: Sparse to common along damp, shady stream banks.

Overall abundance: Sparse.

Occurring with: *Delphinium glaucum*, *Erigeron peregrinus* subsp. *callianthemus*, *Mertensia paniculata* var. *paniculata*, *Petasites nivalis*, *Rumex acetosa* subsp. *arifolius*, *Salix planifolia* subsp. *pulchra* var. *pulchra* and *Veratrum viride* subsp. *eschscholtzii*.

Anemone L. (Anemone, Windflower)

Anemone narcissiflora L. subsp. *interior* Hult. (Narcissus Anemone)

Synonyms: *Anemone narcissiflora* var. *monantha* Schlect.

Collection numbers: 114, 115, 150, 168, 286, 495, 778

Habitat information: Abundant in damp, open heathlands and meadows. Particularly along run-off streams and near lakeshores.

Overall abundance: Common to abundant.

Occurring with: *Anemone parviflora*, *A. richardsonii*, *Antennaria* monocephala, Carex podocarpa, Cassiope mertensiana var. mertensiana, Epilobium anagallidifolium, Equisetum arvense, Festuca altaica, Myosotis asiatica, Petasites nivalis, Phyllodoce glanduliflora, Salix reticulata subsp. reticulata and Veronica wormskjoldii var. wormskjoldii.

Anemone parviflora Michx. (Northern Anemone)
Synonyms: Anemone parviflora var. grandiflora Ulbr.
Collection numbers: 122, 206, 327, 469
Habitat information: Common along grassy stream banks, lakeshores, meadows and damp heathlands.
Overall abundance: Common.
Occurring with: Anemone narcissiflora subsp. interior, A. richardsonii, Cassiope mertensiana var. mertensiana, Cerastium beeringianum subsp. beeringianum, Equisetum arvense, Erigeron humilis, Pedicularis sudetica subsp. interior, Petasites nivalis and Salix polaris.

Anemone richardsonii Hook. (Yellow Anemone)
Collection numbers: 175, 227, 470
Habitat information: Sparse to common on damp, open seepage sites, along mossy lakeshores and near snow run-off channels in open heathlands and meadows.
Overall abundance: Sparse.
Occurring with: Anemone narcissiflora subsp. interior, A. parviflora, Antennaria monocephala, Cassiope mertensiana var. mertensiana, Cerastium beeringianum subsp. beeringianum,

Claytonia sarmentosa, Petasites nivalis, Potentilla diversifolia var. diversifolia, Salix polaris and Saxifraga rivularis var. flexuosa.

Caltha L. (Marsh-Marigold)

Caltha leptosepala DC. var. leptosepala (Alpine White Marsh-Marigold)

Synonyms: Caltha biflora DC. var. rotundifolia (Huth.) Hitchc.

Collection numbers: 193, 302, 509, 559, 586, 805

Habitat information: Common in open, marshy habitats along stream banks, lakeshores and around seepage ponds. At times partially submerged.

Overall abundance: Sparse to common.

Occurring with: Anemone narcissiflora subsp. interior, Corydalis pauciflora, Epilobium anagallidifolium, Heracleum sphondylium subsp. montanum, Petasites sagitattus, Rumex acetosa subsp. arifolius, Salix polaris and Valeriana sitchensis subsp. sitchensis.

Delphinium L. (Delphinium)

Delphinium glaucum S. Wats. (Glaucous Delphinium)

Collection numbers: 476, 975

Habitat information: Sparse to common along damp, shaded stream banks, lakeshores and meadows.

Overall abundance: Sparse.

Occurring with: Aconitum delphinifolium subsp. delphinifolium, Angelica lucida, Arabis drummondii, Calamagrostis canadensis subsp. *canadensis* var. *canadensis*, *Cerastium beeringianum* subsp. *beeringianum*, *Draba borealis*, *Festuca altaica*, *Petasites nivalis*, *Poa arctica* subsp. *arctica*, *Salix planifolia* subsp. *pulchra* var. *pulchra* and *Valeriana sitchensis* subsp. *sitchensis*.

Ranunculus L. (Buttercup, Crowfoot)

Ranunculus aquatilis L. (Common Water Crowfoot)

Synonyms: *Ranunculus aquatilis* var. *hispidulus* E.R. Drew; *R. trichophyllus* Chaix. var. *hispidulus* (E.R. Drew) W.B. Drew

Collection numbers: 930, 938, 940

Habitat information: Common in slow moving water near inflow to lake and in a large (approximately 30 m long by 10 m wide) seepage pond formed by a lateral moraine. Completely submerged in approximately 0.75 - 2.0 m of water and rooted in silty substratum.

Overall abundance: Rare to sparse.

Occurring with: *Callitriche anceps* and *Lysimachia thyrsiflora*.

Ranunculus hyperboreus Rottb. subsp. *hyperboreus* (Far-Northern Buttercup)

Synonym: *Ranunculus natans* var. *intertextus*

Collection numbers: 729, 743a

Habitat information: Sparse to common along margins and at times partially submerged in seepage ponds and slow moving streams, rooted in muddy substratum.

Overall abundance: Rare to sparse.

Occurring with: *Carex aquatilis* var. *aquatilis*, *C. canescens* subsp. _canescens_, _C._ _heleonastes_ subsp. _heleonastes_, _C._ _media_ subsp. _media_, _C._ _rostrata_, _Epilobium_ _anagallidifolium_, _Juncus_ _castaneus_ subsp. _castaneus_ and _Stellaria_ _calycantha_ var. _calycantha_.

Ranunculus _occidentalis_ Nutt. in T. & G. subsp. _occidentalis_ (Western Buttercup)
Synonyms: _Ranunculus_ _occidentalis_ Nutt. subsp. _occidentalis_ var. _brevistylis_ Greene; _R._ _occidentalis_ var. _brevistylis_ Greene; _R._ _occidentalis_ var. _occidentalis_
Collection numbers: 172, 184, 290, 491
Habitat information: Common in damp, open to somewhat shaded meadows, heathlands, and adjacent to lakeshores and run-off streams.
Overall abundance: Sparse to common.
Occurring with: _Anemone_ _narcissiflora_ subsp. _interior_, _Betula_ _glandulosa_ var. _glandulosa_, _Bistorta_ _vivipara_, _Cardamine_ _umbellata_, _Draba_ _borealis_, _Mertensia_ _paniculata_ var. _paniculata_, _Myosotis_ _asiatica_, _Polemonium_ _caeruleum_ subsp. _villosum_, _Salix_ _planifolia_ subsp. _pulchra_ var. _pulchra_ and _Valeriana_ _sitchensis_ subsp. _sitchensis_.

Ranunculus _pygmaeus_ Wahlenb. (Pygmy Buttercup)
Synonyms: _Ranuculus_ _pygmaeus_ Wahlenb. subsp. _pygmaeus_
Collection numbers: 151, 397, 592, 669
Habitat information: Sparse. Found exclusively in mossy seepage areas on boulder slopes.

Overall abundance: Rare to sparse.

Occurring with: *Arabis lyrata*, *Chrysosplenium tetrandrum*, *Draba lactea*, *D. stenoloba*, *Ledum palustre* subsp. *decumbens*, *Pedicularis labradorica* and *Stellaria umbellata*.

Ranunculus sulphureus Soland. ex Phipps var. *sulphureus* (Sulphur Buttercup)

Collection numbers: 432, 728

Habitat information: Sparse in damp meadows and open, moss covered rocky areas near persistent snow.

Overall abundance: Rare to sparse.

Occurring with: *Cardamine umbellata*, *Luzula piperi*, *Parnassia fimbriata* var. *fimbriata*, *Salix polaris* and *Thalictrum alpinum* var. *alpinum*.

Thalictrum L. (Meadow-Rue)

Thalictrum alpinum L. var. *alpinum* (Alpine Meadow-Rue)

Collection numbers: 532, 957

Habitat information: Sparse to common in damp, open meadows, bogs and along grassy stream banks and lakeshores.

Overall abundance: Rare to sparse.

Occurring with: *Artemisia tilesii* subsp. *tilesii*, *Aster modestus*, *Bistorta vivipara*, *Carex sitchensis*, *Erigeron peregrinus* subsp. *callianthemus*, *Hieracium gracile*, *Salix planifolia* subsp. *pulchra* var. *pulchra*, *Senecio lugens* and *Valeriana sitchensis subsp. sitchensis*.

Thalictrum occidentale Gray var. *occidentale* (Western Meadow-Rue)

Collection numbers: 484, 759

Habitat information: Sparse to common in damp meadows and along shaded stream banks.

Overall abundance: Rare to sparse.

Occurring with: *Arabis drummondii*, *Delphinium glaucum*, *Draba borealis*, *Erigeron peregrinus* subsp. *calliathemus*, *Mertensia paniculata* var. *paniculata*, *Polemonium caeruleum* subsp. *villosum*, *Salix planifolia* subsp. *pulchra* var. *pulchra* and *Senecio triangularis*.

Rosaceae (Rose Family)

Additional reference: Taylor, 1973.

Dryas L. (Mountain-Avens)

Dryas integrifolia M. Vahl subsp. *integrifolia* (Entire-Leaved White Mountain-Avens)

Synonym: *Dryas integrifolia* var. *integrifolia*

Collection numbers: 266, 391, 777

Habitat information: Sparse to common in open, rocky heathlands, often near persistent snow.

Overall abundance: Sparse.

Occurring with: *Anemone narcissiflora* subsp. *interior*, *Betula glandulosa* var. *glandulosa*, *Cassiope tetragona* var. *tetragona*, *Lupinus arcticus* subsp. *arcticus*, *Phyllodoce glanduliflora*, *Salix arctica* subsp. *arctica*, *S. glauca* var. *acutifolia*, *S. reticulata* subsp. *reticulata* and *Vaccinium vites-idaea* subsp.

minus.

Fragaria L. (Strawberry)

Fragaria virginiana Duchesne subsp. *glauca* (S. Wats.) Staudt (Blue-Leaved Wild Strawberry)

Synonyms: *Fragaria glauca* (S. Wats.) Rydb.; *Fragaria virginiana* var. *glauca* S. Wats.

Collection number: 699

Habitat information: Sparse in damp meadow, partially shaded by dwarf birch and willow.

Overall abundance: Rare.

Occurring with: *Abies lasiocarpa*, *Anemone narcissiflora* subsp. *interior*, *Geum macrophyllum* var. *macrophyllum*, *Heracleum sphondylium* subsp. *montanum*, *Salix alaxensis* var. *alaxensis*, *S. barrattiana* and *Sanguisorba canadensis* subsp. *latifolia*.

Geum L. (Avens)

Geum macrophyllum Willd. var. *macrophyllum* (Large-Leaved Avens)

Synonym: *Geum macrophyllum* subsp. *macrophyllum*; *Geum macrophyllum* subsp. *macrophyllum* var. *macrophyllum*

Collection numbers: 700, 953

Habitat information: Sparse in damp meadows, often partially shaded.

Overall abundance: Rare to sparse.

Occurring with: *Abies lasiocarpa* var. *lasiocarpa*, *Aster modestus*, *Epilobium anagallidifolium*, *Festuca altaica*, *Heracleum sphondylium* subsp. *montanum*, *Poa arctica* subsp. *arctica*, *Salix* alaxensis var. alaxensis, S. barrattiana and Sanguisorba canadensis subsp. latifolia.

Luetkea Bong. (Luetkea)

Luetkea pectinata (Pursh) Ktze. (Luetkea)

Collection number: 580

Habitat information: Common to abundant on rocky slopes near persistent snow and gravelly heathlands.

Overall abundance: Common.

Occurring with: Calamagrostis canadensis subsp. canadensis var. canadensis, Cassiope tetragona var. tetragona, Dryas integrifolia subsp. integrifolia, Epilobium angustifolium subsp. angustifolium, Phyllodoce glanduliflora, Salix reticulata subsp. reticulata, Vaccinium uliginosum and Veronica wormskjoldii var. wormskjoldii.

Potentilla L. (Cinquefoil)

Potentilla diversifolia Lehm. var. diversifolia (Blue-Leaved Cinquefoil)

Synonym: Potentilla diversifolia subsp. glaucophylla Lehm.

Collection numbers: 176, 463, 508, 762

Habitat information: Common in damp meadows and along mossy, rocky lakeshores.

Overall abundance: Common.

Occurring with: Anemone narcissiflora subsp. interior, A. richardsonii, Campanula lasiocarpa subsp. lasiocarpa, Carex atrosquamma, C. podocarpa, Castilleja unalaschensis, Eriophorum scheuchzeri, Juncus castaneus subsp. castaneus, Salix alaxensis var. alaxensis and Sanguisorba canadensis subsp. latifolia.

Potentilla fruticosa L. subsp. floribunda (Pursh) Elkington (Shrubby Cinquefoil)

Collection numbers: 197, 209, 322, 453, 781

Habitat information: Sparse to common in meadows, along lakeshores, rocky heathlands and boulder slopes. Habitats ranging from damp to moderately well-drained.

Overall abundance: Sparse.

Occurring with: Anemone narcissiflora subsp. interior, Cassiope tetragona var. tetragona, Draba borealis, Epilobium latifolium subsp. latifolium, Mertensia paniculata var. paniculata, Potentilla uniflora, Salix alaxensis var. alaxensis, S. planifolia subsp. pulchra var. pulchra, Solidago multiradiata var. multiradiata and Valeriana sitchensis subsp. sitchensis.

Potentilla hyparctica Malte (Arctic Cinquefoil)

Synonym: Potentilla hyparctica Malte var. elatior (Abrom.) Fern.

Collection number: 312

Habitat information: Sparse in damp, mossy areas between rocks at the base of a boulder slope.

Overall abundance: Rare.

Occurring with: Festuca brachyphylla, Saxifraga nivalis and S. rivularis var. flexuosa.

Potentilla uniflora Ledeb. (One-Flowered Cinquefoil)

Synonym: Potentilla ledebouriana Pors.

Collection numbers: 226, 435, 783, 784

Habitat information: Sparse to common in open rocky sites, occasionally growing from clefts in large boulders.

Overall abundance: Sparse.

Occurring with: Epilobium anagallidifolium, Potenilla fruticosa subsp. floribunda, Salix reticulata subsp. reticulata, Saxifraga rivularis var. flexuosa, Silene acaulis subsp. acaulis and Solidago multiradiata var. multiradiata.

Additional notes: Collection numbers 783 and 784 have longer darker caudices than the other specimens of P. uniflora gathered from the study area. In "The Flora of Alaska and Neighbouring Territories " (Hulten, 1968) this description would suggest P. vahliana Lehm. Welsh, (1974), however, regards P. vahliana as a synonym of P. uniflora.

Rubus L. (Bramble, Blackberry, Raspberry)

Rubus arcticus L. subsp. acaulis (Michx.) Focke (Dwarf Nagoon Berry)

Synonym: Rubus acaulis Michx.

Collection numbers: 173, 293, 407

Habitat information: Sparse to common in damp, seepage sites near lakeshores and partially shaded boggy areas.

Overall abundance: Sparse.

Occurring with: Abies lasiocarpa var. lasiocarpa, Anemone narcissiflora subsp. interior, Betula glandulosa var.

glandulosa, *Bistorta vivipara*, *Claytonia sarmentosa*, *Epilobium anagallidifolium*, *Erigeron humilis*, *Myosotis asiatica*, *Pedicularis labradorica*, *Salix planifolia* subsp. *pulchra* var. *pulchra* and *S. reticulata* subsp. *reticulata*.

Rubus chamaemorus L. (Cloudberry)
Collection numbers: 163, 438
Habitat information: Common on open to partially shaded sphagnum hummocks.
Overall abundance: Rare.
Occurring with: *Andromeda polifolia* subsp. *polifolia*, *Betula glandulosa* var. *glandulosa*, *Kalmia microphylla* subsp. *microphylla*, *Sedum palustre* subsp. *decumbens* and *Vaccinium microcarpum*.

Rubus pedatus Sm. (Five-Leaved Creeping Raspberry)
Collection number: 948
Habitat information: Common at one location, growing in patches up to 2 m. in diameter from a damp moss carpet beneath a dense thicket of *Abies lasiocarpa* var. *lasiocarpa*.
Overall abundance: Rare.
Occurring with: *Abies lasiocarpa* var. *lasiocarpa*, *Lycopodium annotinum*, *Mertensia paniculata* var. *paniculata* and *Petasites nivalis*.

Sanguisorba L. (Burnet)

Sanguisorba canadensis L. subsp. *latifolia* (Hook.) Calder and Taylor (Sitka Burnet)

Synonyms: *Sanguisorba stipulata* Raf.; *S. sitchensis* C.A. Mey

Collection numbers: 712, 766

Habitat information: Common in damp, open to somewhat shady meadows, especially near run-off streams.

Overall abundance: Sparse.

Occurring with: *Aconitum delphinifolium* subsp. *delphinifolium*, *Carex atrosquamma*, *C. podocarpa*, *Castilleja unalaschensis*, *Geum macrophyllum* var. *macrophyllum*, *Heracleum sphondylium* subsp. *montanum*, *Salix alaxensis* var. *alaxensis*, *Senecio lugens* and *Rumex acetosa* subsp. *arifolius*.

Sibbaldia L. (Sibbaldia)

Sibbaldia procumbens L. (Creeping Sibbaldia)

Collection numbers: 171, 253, 338, 450, 881

Habitat information: Sparse to common in open rocky heathlands, often near late remaining snow.

Overall abundance: Sparse.

Occurring with: *Cassiope tetragona* var. *tetragona*, *Draba stenoloba*, *Dryas integrifolia* subsp. *integrifolia*, *Empetrum nigrum* subsp. *hermaphroditum*, *Epilobium latifolium* subsp. *latifolium*, *Festuca brachyphylla*, *Lycopodium alpinum*, *Salix arctica*, *S. barrattiana*, *Saxifraga tricuspidata* and *Trisetum spicatum* var. *spicatum*.

Rubiaceae (Madder Family)

Galium L. (Bedstraw, Cleavers)

Galium boreale L. (Northern Bedstraw)

Collection number: 804

Habitat information: Sparse in damp, protected grassy site adjacent to seepage pond.

Overall abundance: Rare.

Occurring with: Abies lasiocarpa var. lasiocarpa, Achillea millefolium var. borealis, Caltha leptosepala var. leptosepala, Epilobium anagallidifolium, Heracleum sphondylium subsp. montanum and Poa arctica subsp. arctica.

Salicaceae (Willow Family)

Additional references: Brayshaw, 1976; Argus, 1973.

Salix L. (Willow)

Salix alaxensis (Anderss.) Cov. var. alaxensis (Alaska Willow)

Synonym: Salix alaxensis (Anderss.) Cov. subsp. alaxensis

Collection numbers: 211, 541, 544, 545, 638, 909

Habitat information: Abundant in damp meadows and along stream banks where it attains heights of up to 6 m. tall. Rare individuals were also found on open boulder slopes where the habit was more that of a spreading shrub, usually under 0.5 m. tall.

Overall abundance: Common to abundant.

Occurring with: Anemone narcissiflora subsp. interior, Bistorta vivipara, Betula glandulosa var. glandulosa, Bistorta vivipara, Castilleja unalaschensis, Heracleum sphondylium subsp. montanum,

Luzula parviflora subsp. parviflora, Poa alpina, P. arctica subsp. arctica, Salix barrattiana, S. glauca var. acutifolia and S. planifolia subsp. pulchra var. pulchra.
Additional notes: Leaves of collection number 909 exhibit galls caused by the willow apple gall sawfly Pontania pomum Walsh.

Salix arctica Pall. (Arctic Willow)
Synonyms: Salix arctica Pall. subsp. arctica; S. arctica subsp. crassisulis (Trautv.) Skvortz.; S. arctica subsp. torulosa (Trautv.) Hult.
Collection numbers: 264, 273, 275, 365, 547
Habitat information: Common in moist meadows and heathlands particularly along stream banks and adjacent to lakeshores.
Overall abundance: Common.
Occurring with: Cassiope tetragona var. tetragona, Epilobium anagallidifolium, E. lactiflorum, Leptarrhena pyrolifolia, Mitella pentandra, Oxytropis sericea var. spicata, Poa arctica and Salix glauca var. acutifolia.

Salix barrattiana Hook. (Barratt's Willow)
Synonyms: Salix barrattiana Hook. var. angustifolia Anderss.; S. barrattiana var. marcescens Raup
Collection numbers: 136, 202, 215, 216, 261, 270, 378, 467, 542, 543, 991
Habitat information: Common to abundant along rocky run-off channels, wet meadows and heathlands.
Overall abundance: Common.

Occurring with: Anemone narcissiflora subsp. interior, Betula glandulosa var. glandulosa, Cassiope tetragona var. tetragona, Dryas integrifolia subsp. integrifolia, Epilobium lactiflorum, Erigeron humilis, Festuca altaica, Myosotis asiatica, Parnassia fimbriata var. fimbriata, Phyllodoce empetriformis, Poa arctica, Salix alaxensis var. alaxensis, S. glauca var. acutifolia and S. planifolia subsp. pulchra var. pulchra.

Salix glauca L. var. acutifolia (Hook.) Schneid. (Diamond Willow)

Synonym: Salix glauca L. subsp. acutifolia (Hook.) Hult.

Collection numbers: 129, 200, 210, 217, 259, 260, 262, 263, 269, 318, 364, 418, 650, 657, 720, 721

Habitat information: Common to abundant in damp meadows, especially near creek edges, gravelly heathlands, rocky run-off channels and along the base of boulder slopes. Collections taken from boulder slopes were prostrate trailing shrubs whereas those taken from damp meadows were erect in habit and 1.0 - 2.0 m tall.

Overall abundance: Common to abundant.

Occurring with: Abies lasiocarpa var. lasiocarpa, Betula glandulosa var. glandulosa, Cassiope tetragona var. tetragona, Mertensia paniculata var. paniculata, Salix planifolia subsp. pulchra var. pulchra, S. polaris, Saxifraga nivalis and Valeriana sitchensis subsp. sitchensis.

Salix planifolia Pursh subsp. *pulchra* (Cham.) Argus var. *pulchra* (Tea-Leaved Willow)

Synonym: *Salix phylicifolia* L. subsp. *planifolia* (Pursh) Hiitonen

Collection numbers: 139, 190, 212, 213, 214, 218, 231, 335, 451, 478

Habitat information: Common to abundant throughout damp meadows, along lakeshores and stream margins and on wet, rocky heathlands near snow run-off channels.

Overall abundance: Common to abundant.

Occurring with: *Anemone richardsonii*, *Angelica lucida*, *Betula glandulosa* var. *glandulosa*, *Cassiope tetragona* var. *tetragona*, *Carex pyrenaica* subsp. *micropoda*, *C. spectabilis*, *Luzula parviflora* subsp. *parviflora*, *Parnassia kotzebuei* var. *kotzebuei*, *Petasites nivalis*, *Salix barrattiana*, *S. glauca* var. *acutifolia* and *Valeriana sitchensis* subsp. *sitchensis*.

Salix polaris Wahlenb. (Polar Willow)

Synonym: *Salix polaris* Wahlenb. subsp. *pseudopolaris* (Flod.) Hult.

Collection numbers: 123, 143, 282, 301, 328, 367, 371, 392, 395, 427, 429, 430, 431, 472, 552, 682, 732, 799, 1015

Habitat information: Occurring commonly throughout the study area on moss covered rocks along lake margins, rock ledges where seepage was evident, and on talus slopes, particularly near late remaining snow.

Overall abundance: Common.

Occurring with: Parnassia kotzebuei var. kotzebuei, Linnaea borealis subsp. americana and Gentiana glauca.

Salix reticulata L. subsp. reticulata (Net-Leaved Dwarf Willow)
Collection numbers: 126, 284, 437
Habitat information: Common to abundant on open heath slopes, around lake shores and on gravelly slopes where snow remains late.
Overall abundance: Common.
Occurring with: Phyllodoce glandulifera, Cassiope mertensiana var. mertensiana, Lycopodium alpinum and Erigeron humilis.

Saxifragaceae (Saxifrage Family)

Chrysosplenium L. (Golden Saxifrage)

Chrysosplenium tetrandrum (Lund.) Fries (Northern Golden Saxifrage)
Collection numbers: 183, 595, 674, 736
Habitat information: Rare to sparse on rocky lakeshores, protected areas on boulder slopes and damp, shady herb mats.
Overall abundance: Rare to sparse.
Occurring with: Ledum palustre subsp. decumbens, Lloydia seratina, Poa glauca, Ranunculus pygmaeus, Salix alaxensis var. alaxensis, S. planifolia subsp. pulchra var. pulchra and Sedum integrifolium subsp. integrifolium.

Leptarrhena R. Br. (Leatherleaf Saxifrage)

Leptarrhena pyrolifolia (D. Don) R. Br. ex Ser. in DC. (Leatherleaf Saxifrage)

Synonym: *Leptarrhena amplexifolia* (Sternb.) R. BR.

Collection numbers: 548, 621, 934

Habitat information: Common to abundant along open, damp, mossy stream banks and seepage sites in open heathlands.

Overall abundance: Sparse to common.

Occurring with: *Cassiope tetragona* var. *tetragona*, *Epilobium anagallidifolium*, *E. lactiflorum*, *Mitella pentandra*, *Petasites nivalis* and *Saxifraga lyallii* subsp. *hultenii*.

Mitella L. (Mitrewort)

Mitella pentandra Hook. (Five-Stamened Mitrewort)

Collection numbers: 525, 546, 937, 1023

Habitat information: Common in damp, open seepage sites along gravelly stream banks and lakeshores.

Overall abundance: Sparse.

Occurring with: *Cassiope tetragona* var. *tetragona*, *Epilobium anagallidifolium*, *E. lactiflorum*, *Hieraclium triste*, *Leptarrhena pyrolifolia*, *Parnassia fimbriata* var. *fimbriata*, *P. kotzebuei* var. *kotzebuei*, *Salix polaris* and *Saxifraga lyallii* subsp. *hultenii*.

Saxifraga L. (Saxifrage)

Saxifraga adscendens L. subsp. *oregonensis* (Raf.) Bacigalupi in Abrams (Wedge-Leaved Saxifrage)

Synonym: *Saxifraga adscendens* var. *oregonensis* (Raf.) Breitung

Collection number: 676

Habitat information: Sparse in damp crevices on boulder slope.

Overall abundance: Rare.

Occurring with: *Draba macounii* and *D. stenoloba*.

Saxifraga caespitosa L. subsp. *sileneflora* (Sternb. ex Cham.) Hult. (Tufted Saxifrage)

Collection numbers: 554, 685

Habitat information: Rare to sparse on rock shelves and on damp boulder slopes near persistent snow.

Overall abundance: Rare.

Occurring with: *Arenaria longipedunculata*, *Draba albertina*, *Salix polaris* and *Vaccinium uliginosum* subsp. *alpinum*.

Saxifraga lyallii Engler subsp. *hultenii* (Calder & Savile) Calder & Taylor.

Synonym: *Saxifraga lyallii* Engler var. *hultenii* Calder & Savile.

Collection numbers: 241, 619, 791, 803,935.

Habitat information: Common on mossy rocks along lakeshores and stream banks, wet heathlands and seepage areas near late remaining snow.

Overall abundance: Common.

Occurring with: *Antennaria monocepahala*, *A. alpina* var. *media*, *Cassiope tetragona* var. *tetragona*, *Leparrhena pyrolifolia*, *Mitella pentandra*, *Petasites nivalis*, *Saxifraga nelsoniana* subsp. porsildiana and S. nivalis.

Saxifraga nelsoniana D. Don. subsp. porsildiana (Calder & Savile) Hult. (Porsild's Cordate-Leaved Saxifrage)
Synonyms: Saxifraga punctata L. var. porsildiana (Calder & Savile) B. Boi.; S. punctata subsp. porsildiana Calder and Savile
Collection numbers: 148, 181, 342, 369, 790
Habitat information: Sparse to common along rocky lakeshores and stream banks, damp, mossy ledges on rock outcrops and mossy, protected areas on boulder slopes.
Overall abundance: Sparse.
Occurring with: Cardamine umbellata, Draba stenoloba, Epilobium anagallidifolium, Hedysarum alpinum subsp. americanum, Hierochloe alpina subsp. alpina, Salix reticulata subsp. reticulata, Saxifraga lyallii subsp. hultenii and S. nivalis.

Saxifraga nivalis L. (Arctic Saxifrage)
Collection numbers: 141, 311, 606, 628, 630, 634, 655, 792
Habitat information: Sparse to common on ledges and clefts of rock outcrops, in damp protected areas on boulder slopes and occasionally on open, gravelly heathlands.
Overall abundance: Sparse.
Occurring with: Arctostaphylos rubra, Arnica lessingii, Carex capillaris subsp. capillaris, Cassiope tetragona var. tetragona, Cerastium beeringianum subsp. beeringianum, Festuca brachyphylla, F. vivipara, Saxifraga lyallii subsp. hultenii and

S. rivularis var. *flexuosa*.

Saxifraga occidentalis S. Wats. (Western Saxifrage)

Collection number: 258

Habitat information: Sparse. A single population was found on a steep rocky slope near late remaining snow.

Overall abundance: Rare.

Occurring with: *Epilobium latifolium* subsp. *latifolium*, *Festuca brachyphylla*, *F. saximontana*, *Saxifraga tricuspidata* and *Trisetum spicatum* var. *spicatum*.

Saxifraga oppositifolia L. (Purple Mountain Saxifrage)

Synonyms: *Saxifraga oppositifolia* subsp. *oppositifolia*; *Saxifraga oppositifolia* subsp. *smalliana* (Engler & Irmsch.) Hult.

Collection numbers: 590, 644

Habitat information: Rare to sparse. Found growing on damp, open gravel slopes and on ledges on exposed rock outcrops.

Overall abundance: Rare.

Occurring with: *Draba macounii*, *Ledum palustre* subsp. *decumbens* and *Poa glauca*.

Saxifraga rivularis L. var. *flexuosa* (Sternb.) Engler & Irmsch. (Brook Saxifrage)

Synonym: *Saxifraga rivularis* var. *rivularis*

Collection numbers: 144, 180, 225, 310, 344, 387, 798

Habitat information: Sparse to common on rocky lakeshores, along damp, mossy run-off streams in crevices of rock outcrops and on moss-carpeted boulder fields.

Overall abundance: Sparse.

Occurring with: *Cardamine umbellata*, *Carex bipartita*, *Cerastium beeringianum* subsp. *beeringianum*, *Draba stenoloba*, *Epilobium anagallidifolium*, *E. angustifolium* subsp. *angustifolium*, *Festuca brachyphylla*, *Salix polaris* and *Saxifraga nelsoniana* subsp. *porsildiana*.

Saxifraga tricuspidata Rottb. (Three-Toothed Saxifrage)

Collection numbers: 117, 128, 254, 452

Habitat information: Common on open, well-drained, gravelly heaths, rocky lakeshores and crevices in exposed rock faces.

Overall abundance: Common.

Occurring with: *Cassiope tetragona* var. *tetragona*, *Festuca brachyphylla*, *Salix glauca* var. *acutifolia* and *Saxifraga occidentalis*.

Scrophulariaceae (Figwort Family)

Additional reference: Taylor, 1974.

Castilleja Mutis ex L.fil. (Indian Paintbrush)

Castilleja unalaschcensis (Cham. & Schlecht.) Malte (Alaska Indian Paintbrush)

Collection numbers: 193b, 249, 251, 490, 758, 767

Habitat information: Common in damp meadows, often shaded by dwarf birch and willow.

Overall abundance: Sparse.

Occurring with: Betula glandulosa var. glandulosa, Carex podocarpa, Equisetum sylvaticum, Festuca altaica, F. brachyphylla, Pedicularis verticillata, Phleum alpinum var. commutatum, Poa alpina, P. arctica subsp. arctica, Rumex acetosa subsp. arifolius, Salix alaxensis var. alaxensis, S. barrattiana and Sanguisorba canadensis var. latifolia.

Pedicularis L. (Lousewort)

Pedicularis capitata Adams (Capitate Lousewort)

Collection numbers: 169, 296, 417, 424, 785

Habitat information: Common on open, well-drained gravelly heathlands. Rare to sparse along damp, open lakeshores and river banks.

Overall abundance: Sparse.

Occurring with: Anemone narcissiflora subsp. interior, Antennaria monocephala, Bistorta vivipara, Cassiope tetragona var. tetragona, Draba stenoloba, Dryas integrifolia subsp. integrifolia, Erigeron humilis, Festuca brachyphylla, Myosotis asiatica, Salix glauca var. acutifolia and S. reticulata subsp. reticulata.

Pedicularis labradorica Wirsing (Labrador Lousewort)

Collection numbers: 161, 408, 527, 596

Habitat information: Sparse along damp, sandy riverbanks; open, boggy areas and moderately well-drained heathlands.

Overall abundance: Sparse.

Occurring with: Andromeda polifolia subsp. polifolia, Betula glandulosa var. glandulosa, Cassiope tetragona var. tetragona, Ledum palustre subsp. decumbens, Luzula arcuata subsp. unalaschkensis, Pyrola grandiflora and Vaccinium caespitosum.

Pedicularis langsdorfii Fisch. ex Steven subsp. arctica (R.Br.) Pennell (Langsdorf's Lousewort)

Synonym: Pedicularis arctica R.Br.

Collection numbers: 306a, 425, 464, 656, 786

Habitat information: Sparse to common in diverse habitats. Collections were taken from mossy lakeshores, well-drained, rocky slopes and open heathlands.

Overall abundance: Sparse.

Occurring with: Anemone parviflora, Cassiope tetragona var. tetragona, Draba stenoloba, Gentiana glauca, Hierochloe alpina subsp. alpina, Pedicularis capitata, P. sudetica subsp. interior, Potentilla diversifolia var. diversifolia, Salix polaris, Saxifraga nivalis and Vaccinium caespitosum var. caespitosum.

Pedicularis sudetica Willd. subsp. interior (Hult.) Hult. (Sudeten Lousewort)

Synonym: Pedicularis sudetica var. gymnocephala

Collection numbers: 207, 306a, 538, 637

Habitat information: Sparse on damp, mossy stream banks and lakeshores; moist, open meadows and heathlands.

Overall abundance: Rare to sparse.

Occurring with: Anemone parviflora, Bistora vivipara, Cassiope tetragona var. tetragona, Corydalis pauciflora, Festuca altaica, Ledum groenlandicum, Pedicularis langsdorfii subsp. arctica, P. verticillata and Salix polaris.

Pedicularis verticillata L. (Whorled Lousewort)
Collection numbers: 230, 307, 585, 757
Habitat information: Sparse to locally common in open, damp to moderately well-drained meadows and along mossy lake margins.
Overall abundance: Sparse.
Occurring with: Angelica lucida, Bistorta vivipara, Caltha leptosepala var. leptosepala, Corydalis pauciflora, Erigeron humilis, Festuca altaica, Ledum groenlandicum, Pedicularis labradorica, Salix planifolia subsp. pulchra var. pulchra and S. polaris.

Veronica L. (Speedwell)

Vernonica wormskjoldii Roem. & Schult var. wormskjoldii (Alpine Speedwell)
Synonyms: Veronica alpina L.; V. alpina var. alterniflora Fern.; V. stelleri Pall.; V. wormskjoldii subsp. alterniflora; V. wormskjoldii var. stelleri (Pall.) Welsh; V. wormskjoldii subsp. wormskjoldii
Collection numbers: 412, 448, 497, 568, 797
Habitat information: Sparse to common along open, grassy lakeshores and along gravelly run-off streams.
Overall abundance: Sparse.
Occurring with: Adoxa moschatellina, Betula glandulosa var.

glandulosa, Carex podocarpa, Cerastium beeringianum subsp. beeringianum, Draba albertina, Festuca altaica, Luzula parviflora subsp. parviflora, Mertensia paniculata var. paniculata, Phleum alpinum var. commutatum and Salix planifolia subsp. pulchra var. pulchra.

Valerianaceae (Valerian Family)

Valeriana L. (Valerian)

Valeriana sitchensis Bong. subsp. sitchensis (Sitka Valerian)

Collection numbers: 187, 198, 244, 477, 513

Habitat information: Common in damp meadows and along shaded stream banks.

Overall abundance: Sparse to common.

Occurring with: Aconitum delphinifolium subsp. delphinifolium, Agoseris aurantiaca var. aurantiaca, Delphinium glaucum, Heracleum sphondylium subsp. montanum, Salix glauca var. acutifolia, S. planifolia subsp. pulchra var. pulchra and Rumex acetosa subsp. arifolius.

Violaceae (Violet Family)

Viola L. (Violet)

Viola epipsila Ledeb. subsp. repens (Turcz.) Becker (Dwarf Marsh Violet)

Synonym: Viola palustris L. (in Welsh, 1974)

Collection number: 185

Habitat information: Rare to sparse in damp, shaded meadows adjacent to run-off streams.

Overall abundance: Rare.

Occurring with: Cardamine umbellata, Castilleja unalaschensis, Chrysosplenium tetrandrum, Draba borealis, Festuca altaica, Myosotis asiatica, Salix alaxensis var. alaxensis, S. planifolia subsp. pulchra var. pulchra and Rumex acetosa subsp. arifolius.

Viola langsdorfii (Regel) Fisch. in DC. (Alaska Violet)

Collection numbers: 248, 410, 584

Habitat information: Sparse to locally common in damp, open meadows and seepage sites.

Overall abundance: Rare to sparse.

Occurring with: Agoseris aurantiaca var. aurantiaca, Castilleja unalaschensis, Draba albertina, Erigeron peregrinus subsp. callianthemus, Pedicularis verticillata, Poa arctica subsp. arctica, Salix glauca var. acutifolia, S. planifolia subsp. pulchra var. pulchra and Valeriana sitchensis subsp. sitchensis.

MAGNOLIOPHYTA: MONOCOTYLEDONEAE (Flowering Plants)

Cyperaceae (Sedge Family)

Additional references: Taylor, 1983; Hudson, 1977; Murray, 1969; Ceska, 1976 in M.S.; Eastham (N.D.) in M.S.

Carex L. (Sedge)

Carex aquatilis Wahlenb. var. *aquatilis* (Water Sedge)

Synonym: *Carex aquatilis* Wahlenb. subsp. *aquatilis*

Collection numbers: 405, 725, 744

Habitat information: Common to abundant in marshy sites along slow moving streams and in sphagnum bogs.

Overall abundance: Common.

Occurring with: *Andromeda polifolia* subsp. *polifolia*, *Betula glandulosa* var. *glandulosa*, *Carex brunnescens*, *C. canescens* subsp. *canescens*, *C. heleonastes*, *Eriophorum scheuchzeri*, *Epilobium anagallidifolium*, *Juncus castaneus* subsp. *castaneus*, *Ledum palustre* subsp. *decumbens* and *Ranunculus hyperboreus* subsp. *hyperboreus*.

Carex atrosquama Mack. (Black-Scaled Sedge)

Synonyms: *Carex atrata* L. (in Welsh, 1974); *C. atrata* subsp. *atrosquama* (Mack.) Hult.

Collection numbers: 691, 726, 763, 768

Habitat information: Common in wet, open meadows and moss hummocks adjacent to run-off streams.

Overall abundance: Common.

Occurring with: *Aconitum delphinifolium* subsp. *delphinifolium*, *Carex dioica* subsp. *gynocrates*, *C. media* subsp. *media*, *Castilleja unalaschensis*, *Heracleum sphondylium* subsp. *montanum*, *Juncus drummondii*, *Potentilla diversifolia* var. *diversifolia*, *Rumex acetosa* subsp. *arifolius*, *Salix planifolia* subsp. *pulchra* var. *pulchra* and *Senecio pauciflorus*.

Carex bigelowii Torr. in Schwein (Bigelow's Sedge)

Collection numbers: 1010, 1011

Habitat information: Found growing along a muddy riverbank. Common at this location but otherwise rare.

Overall abundance: Rare.

Occurring with: *Betula glandulosa* var. *glandulosa*, *Eriophorum brachyantherum*, *E. vaginatum* subsp. *vaginatum*, *Gentiana glauca*, *Juncus castaneus* subsp. *castaneus*, *Pedicularis labradorica* and *Petasites sagitattus*.

Carex bipartita Bellardi ex All. (Two-Parted Sedge)

Synonym: *Carex lachenalii* Schkuhr

Collection numbers: 347, 363

Habitat information: Common along damp, mossy streambanks.

Overall abundance: Sparse.

Occurring with: *Bistorta vivipara*, *Cardamine umbellata*, *Epilobium anagallidifolium*, *Eriophorum scheuchzeri*, *Juncus drummondii*, *Luzula parviflora* subsp. *parviflora*, *Phleum alpinum* var. *commutatum*, *Poa alpina* and *Salix alaxensis* var. *alaxensis*.

Carex brunnescens (Pers.) Poir. in Lam. subsp. alaskana Kalela (Brownish Sedge)

Collection numbers: 627, 741, 901, 1009

Habitat information: Common in wet meadows, mossy stream banks and sphagnum bogs.

Overall abundance: Common.

Occurring with: Abies lasiocarpa var. lasiocarpa, Betula glandulosa var. glandulosa, Carex aquatilis var. aquatilis, C. canescens subsp. canescens, Epilobium anagallidifolium, Eriophorum scheuchzeri, Equisetum arvense, Ledum palustre subsp. decumbens, Ranunculus hyperboreus subsp. hyperboreus and Salix alaxensis var. alaxensis.

Carex canescens L. subsp. arctaeformis (Mack.) Calder & Taylor (Hoary Sedge)

Synonyms: Carex arctaeformis Mack.

Collection number: 895

Habitat information: Open, marshy site. Common at this one location but otherwise rare.

Overall abundance: Rare to sparse.

Occurring with: Carex aquatilis var. aquatilis, Eriophorum scheuchzeri and Ledum palustre subsp. decumbens.

Carex canescens L. subsp. canescens (Hoary Sedge)

Collection numbers: 745, 945

Habitat information: Common to abundant along muddy, slow moving streambanks and in protected seepage sites. Occasionally forming tussocks in shallow water.

Overall abundance: Common.

Occurring with: Carex aquatilis var. aquatilis, C. saxatilis subsp. laxa, C. sitchensis, Epilobium anagallidifolium, Equisetum arvense, Eriophorum scheuchzeri, Juncus castaneus subsp. castaneus, Ranunculus hyperboreus subsp. hyperboreus and Stellaria calycantha var. calycantha.

Carex capillaris L. subsp. capillaris (Hairlike Sedge)

Collection numbers: 610, 680

Habitat information: Sparse to common in damp, open grassy and mossy sites adjacent to lakeshores.

Overall abundance: Sparse.

Occurring with: Arnica louiseana subsp. frigida, Betula glandulosa var. glandulosa, Hierochloe alpina subsp. alpina, Juncus arcticus subsp. alaskanus, J. biglumis, Poa arctica subsp. arctica, Salix glauca var. acutifolia, Salix polaris and Senecio pauciflorus.

Carex dioica L. subsp. gymnocrates (Wormsk.) Hult. (Yellow Bog Sedge)

Synonym: Carex gynocrates Wormsk.

Collection numbers: 690, 994

Habitat information: Common in damp moss carpets and meadows adjacent to lakeshores and streambanks.

Overall abundance: Sparse to common.

Occurring with: Agrostis scabra, Betula glandulosa var.

glandulosa, *Carex enanderi*, *C. media* subsp. *media*, *C. microchaeta* subsp. *microchaeta*, *Salix glauca* var. *acutifolia* and *Poa arctica* subsp. *arctica*.

Carex enanderi Hult. (Enander's Sedge)

Synonym: *Carex eleusinoides* Turcz.

Collection numbers: 702, 703, 996

Habitat information: Common in damp, open, mossy sites along lakeshores and run-off streams.

Overall abundance: Sparse to common.

Occurring with: *Agrostis scabra*, *Bistorta vivipara*, *Carex microchaeta* subsp. *microchaeta*, *C. podocarpa*, *Eriophorum vaginatum* subsp. *vaginatum*, *Salix reticulata* subsp. *reticulata* and *Tofieldia pusilla*.

Additional notes: Ceska (1985, pers. comm.) suggested that collection number 703 be regarded as *Carex eleusinoides* Turcz. on the basis of its densely caespitose habit. Collection numbers 702 and 996, by way of contrast, exhibit loosely caespitose growth forms. Overlap of characters in keys provided by Hultén (1968) and Welsh (1974), however, precluded differentiation of collections from the study area on any other grounds.

Taylor and MacBryde (1977) treat *C. eleusinoides* as a synonym of *C. enanderi*. In view of the fact that the name *Carex eleusinoides* was first published by Turczaninow in 1837 while the name *Carex enanderi* was first published by Hultén in 1952, the former name should be adopted if these are to be regarded as a single taxon.

Carex heleonastes Ehrh. in L. fil. subsp. heleonastes (Hudson Bay Sedge)

Collection number: 747

Habitat information: Common along a muddy, slow-moving streambank in a sheltered valley.

Overall abundance: Sparse.

Occurring with: Agrostis scabra, Carex brunnescens subsp. brunnescens, C. canescens subsp. canescens, C. media subsp. media, Epilobium anagallidifolium, Juncus castaneus subsp. castaneus, Koenigia islandica, Ranunculus hyperboreus subsp. hyperboreus and Stellaria calycantha subsp. calycantha.

Carex macloviana d'Urv. subsp. pachystachya (Cham. ex Steud.) Hult. (Thick-Headed Sedge)

Synonym: Carex pachystachya Cham.

Collection number: 625

Habitat information: Sparse on open, well-drained rocky heath-slopes.

Overall abundance: Rare to sparse.

Occurring with: Betula glandulosa var. glandulosa, Carex nardina, C. pyrenaica, Cassiope tetragona subsp. tetragona, Lupinus arcticus subsp. arcticus, Luzula arcuata subsp. unalaschkensis and Salix polaris.

Carex macrochaeta C.A. Mey. (Large-Awned Sedge)

Collection numbers: 130, 134, 419

Habitat information: Common to abundant in wet, open seepage sites and along run-off channels. A few populations were also found in open, rocky heathlands.

Overall abundance: Common.

Occurring with: *Anemone narcissiflora* subsp. *interior*, *Betula glandulosa* var. *glandulosa*, *Bistorta vivipara*, *Cassiope tetragona* var. *tetragona*, *Hierochloe alpina* subsp. *alpina*, *Pedicularis capitata*, *Phyllodoce glanduliflora* and *Salix glauca* var. *acutifolia*.

Carex media R.Br. in Richards. subsp. *media* (Scandinavian Sedge)

Collection numbers: 454, 689, 746

Habitat information: Common in damp, mossy sites around lakeshores and along stream banks.

Overall abundance: Sparse to common.

Occurring with: *Anemone narcissiflora* subsp. *interior*, *Bistorta vivipara*, *Carex aquatilis* var. *aquatilis*, *C. brunnescens* subsp. *alaskana*, *Epilobium anagallidifolium*, *Equisetum arvense*, *Juncus drummondii*, *Koenigia islandica*, *Parnassia kotzbuei* var. *kotzbuei*, *Salix glauca* var. *acutifolia*, *S. reticulata* subsp. *reticulata* and *Stellaria calycantha* var. *calycantha*.

Carex microchaeta Holm subsp. *microchaeta* (Small-Awned Sedge)

Synonym: *Carex podocarpa* R.Br. in Richards. (in Welsh, 1974)

Collection numbers: 997, 999

Habitat information: Common in wet, mossy areas along lakeshores and run-off streams. Culms occasionally partly submerged.

Overall abundance: Sparse to common.

Occurring with: Anemone narcissiflora subsp. interior, Bistorta vivipara, Carex enanderi, C. podocarpa, Eriophorum scheuchzeri, Juncus biglumis, Salix reticulata subsp. reticulata and Tofieldia pusilla.

Carex nardina E.Fries (Spikenard Sedge)

Collection numbers: 388, 624, 641

Habitat information: Sparse in abundance; occupying cliff ledges, rock crevices and open, rocky heathlands.

Overall abundance: Rare to sparse.

Occurring with: Arnica louiseana subsp. frigida, Betula glandulosa var. glandulosa, Carex macrochaeta subsp. pachystachya, Cassiope tetragona var. tetragona, Dryas integrifolia subsp. integrifolia, Erigeron humilis, Lupinus arcticus subsp. arcticus, Luzula arctica subsp. unalaschkensis, Oxyria digyna and Salix reticulata subsp. reticulata.

Carex podocarpa R.Br. in Richards. (Short-Stalked Sedge)

Collection numbers: 502, 769, 998

Habitat information: Common in damp meadows, along mossy streambanks and lakeshores.

Overall abundance: Sparse to common.

Occurring with: *Abies lasiocarpa* var. *lasiocarpa*, *Carex microchaeta* subsp. *microchaeta*, *Epilobium anagallidifolium*, *Festuca altaica*, *Luzula parviflora* subsp. *parviflora*, *Mertensia paniculata* var. *paniculata*, *Phleum alpinum* var. *commutatum*, *Salix alaxensis* var. *alaxensis* and *Veronica wormskjoldii* var. *wormskjoldii*.

Carex pyrenaica Wahlenb. subsp. *micropoda* (C.A. Mey.) Hult. (Pyrenean Sedge)
Collection numbers: 457, 626, 962, 966
Habitat information: Sparse to common in open, rocky heathlands and mesic meadows.
Overall abundance: Sparse.
Occurring with: *Anemone narcissiflora* subsp. *interior*, *Betula glandulosa* var. *glandulosa*, *Carex macloviana* subsp. *pachystachya*, *C. nardina*, *Cassiope tetragona* var. *tetragona*, *Dryas integrifolia* subsp. *integrifolia*, *Festuca altaica*, *Juncus drummondii*, *Lupinus arcticus* subsp. *arcticus*, *Luzula arctica* subsp. *latifolia* and *Salix reticulata* subsp. *reticulata*.

Carex rossii Boott in Hook. (Ross' Sedge)
Collection number: 617
Habitat information: Sparse in open, gravelly heathlands.
Overall abundance: Rare.
Occurring with: *Betula glandulosa* var. *glandulosa*, *Cassiope tetragona* var. *tetragona*, *Phyllodoce glanduliflora*, *Salix glauca* var. *acutifolia* and *Trisetum spicatum* var. *spicatum*.

Carex rostrata Stokes in With. (Beaked Sedge)

Collection numbers: 743, 946

Habitat information: Common along sheltered, muddy streambanks and around seepage ponds.

Overall abundance: Sparse.

Occurring with: _Carex aquatilis_ var. _aquatilis_, _C. canescens_ subsp. _canescens_, _Epilobium anagallidifolium_, _Equisetum arvense_, _Eriophorum scheuchzeri_, _Juncus castaneus_ subsp. _castaneus_, _Petasites sagitattus_, _Ranunculus hyperboreus_ subsp. _hyperboreus_ and _Stellaria calycantha_ var. _calycantha_.

Carex saxatilis L. subsp. _laxa_ (Trautv.) Kalela (Russet Sedge)

Collection numbers: 897, 943

Habitat information: Common to abundant in marshy areas; often forming dense tussocks in shallow seepage ponds.

Overall abundance: Common.

Occurring with: _Agrostis scabra_, _Carex canescens_ subsp. _canescens_, _C. sitchensis_ and _Eriophorum scheuchzeri_.

Carex scirpoidea Michx. var. _stenochlaena_ Holm. (Northern Single-Spiked Sedge)

Collection numbers: 666

Habitat information: Common on heath covered boulder slopes and damp cliff ledges.

Overall abundance: Rare to sparse.

Occurring with: _Arabis lyrata_ subsp. _kamchatica_, _Cassiope_ tetragona var. tetragona, Draba stenoloba and Stellaria umbellata.

Carex sitchensis Prescott in Bong. (Sitka Sedge)

Collection numbers: 944, 956

Habitat information: Common to abundant on sphagnum hummocks and forming tussocks in and around shallow seepage ponds.

Overall abundance: Common.

Occurring with: Andromeda polifolia subsp. polifolia, Bistorta vivipara, Carex saxatilis subsp. laxa, Eriophorum scheuchzeri, Ledum palustre subsp. decumbens, Sanguisorba canadensis subsp. latifolia and Thalictrum alpinum var. alpinum.

Carex spectabilis Dew. (Showy Sedge)

Collection number: 222

Habitat information: Common in damp meadows.

Overall abundance: Sparse to common.

Occurring with: Arnica latifolia var. latifolia, Cassiope mertensiana var. mertensiana, Erigeron perigrinus subsp. callianthemus, Festuca altaica, Hieracium gracile, Phleum alpinum var. commutatum, Poa arctica, Salix alaxensis var. alaxensis and Thalictrum alpinum var. alpinum.

Eriophorum L. (Cotton-Grass)

Eriophorum angustifolium Honck. subsp. triste (T.Fries) Hult. (Narrow-Leaved Cotton-Grass)

Synonym: Eriophorum triste (T. Fries) Hadac & Love

Collection numbers: 598, 600, 1012, 1013

Habitat information: Common to abundant on sphagnum hummocks and around muddy seepage ponds. Frequently submerged to approximately one-third culm length in water.

Overall abundance: Common.

Occurring with: *Andromeda polifolia* subsp. *polifolia*, *Carex aquatilis* var. *aquatilis*, *Kalmia microphylla* subsp. *microphylla*, *Ledum palustre* subsp. *decumbens* and *Vaccinium microcarpum*.

Eriophorum brachyantherum Trautv. & Mey. (Short-Anthered Cotton-Grass)

Collection number: 602

Habitat information: Common in damp meadows and muddy sites near ponds and run-off streams.

Overall abundance: Sparse to common.

Occurring with: *Betula glandulosa* var. *glandulosa*, *Eriophorum vaginatum* subsp. *vaginatum*, *Juncus castaneus* subsp. *castaneus*, *Petasites sagitattus* and *Salix glauca* var. *acutifolia*.

Eriophorum callitrix Cham. (Arctic Cotton-Grass)

Collection number: 793

Habitat information: Sparse in rocky, grassy heathlands.

Overall abundance: Sparse.

Occurring with: *Cassiope tetragona* var. *tetragona*, *Dryas integrifolia* subsp. *integrifolia*, *Phyllodoce glanduliflora* and *Salix reticulata* subsp. *reticulata*.

Eriophorum scheuchzeri Hoppe (Scheuchzer's Cotton-Grass)
Collection numbers: 360, 404, 462, 739, 942
Habitat information: Common to abundant in bogs, along damp lakeshores, muddy streambanks and shallow seepage ponds. Frequently growing in up to 10 cm of water.
Overall abundance: Common.
Occurring with: *Anemone narcissiflora* subsp. *interior*, *Carex aquatilis* var. *aquatilis*, *C. rostrata*, *Draba albertina*, *Epilobium anagallidifolium*, *Equisetum arvense*, *Juncus castaneus* subsp. *castaneus*, *J. drummondii*, *Koenigia islandica*, *Parnassia kotzebuei* var. *kotzebuei*, *Potentilla diversifolia* var. *diversifolia* and *Salix planifolia* subsp. *pulchra*.

Eriophorum vaginatum L. subsp. *vaginatum* (Sheathed Cotton-Grass)
Collection numbers: 604, 701, 1014
Habitat information: Common in muddy seepage sites, wet heathlands and along mossy lakeshores and run-off streams.
Overall abundance: Common.
Occurring with: *Betula glandulosa* var. *glandulosa*, *Cassiope tetragona* var. *tetragona*, *Eriophorum brachyantherum*, *Juncus arcticus* subsp. *alaskanus*, *Petasites sagitattus*, *Salix polaris*, *Trisetum spicatum* var. *spicatum* and *Vahlodea atropurpurea* subsp. *paramushirensis*.

Kobresia Willd. (Kobresia)

Kobresia myosuroides (Vill.) Fiori & Paol. (Bellard's Kobresia)

Collection numbers: 646

Habitat information: Rare to sparse on open, rocky heathlands.

Overall abundance: Rare.

Occurring with: Cassiope tetragona var. tetragona, Dryas integrifolia subsp. integrifolia, Gentianella propinqua, Poa arctica subsp. arctica, Potentilla fruticosa subsp. floribunda and Salix reticulata subsp. reticulata.

Juncaceae (Rush Family)

Juncus L. (Rush)

Juncus arcticus Willd. subsp. alaskanus Hult. (Arctic Rush)

Synonym: Juncus arcticus var. alaskanus (Hult.) Welsh

Collection number: 609

Habitat information: Sparse to common in open, to partly shaded, mossy sites near late snow run-off.

Overall abundance: Rare to sparse.

Occurring with: Arnica lessingii subsp. lessingii, Betula glandulosa var. glandulosa, Carex capillaris subsp. capillaris, Juncus biglumis, Salix glauca var. acutifolia, Saxifraga nivalis and Senecio pauciflorus.

Juncus biglumis L. (Two-Flowered Rush)

Collection numbers: 611, 969, 1001

Habitat information: Sparse to common in sphagnum hummocks, on damp, exposed soil and along mossy lakeshores.

Overall abundance: Sparse.

Occurring with: Arnica lessingii subsp. lessingii, Betula glandulosa var. glandulosa, Carex capillaris subsp. capillaris, Juncus arcticus subsp. alaskanus, Koenigia islandica, Salix glauca var. acutifolia, Saxifraga nivalis, Senecio pauciflorus and Tofieldia pusilla.

Juncus castaneus Sm. subsp. castaneus (Chestnut Rush)

Collection numbers: 505, 603, 672, 740, 774

Habitat information: Common around damp lakeshores, mossy run-off channels and muddy stream banks.

Overall abundance: Sparse to common.

Occurring with: Betula glandulosa var. glandulosa, Carex aquatilis var. aquatilis, Cassiope mertensiana var. mertensiana, Equisetum arvense, Epilobium anagallidifolium, Eriophorum scheuchzeri, Koenigia islandica, Luzula multiflora subsp. multiflora var. frigida, Petasites sagitattus, Salix alaxensis var. alaxensis, S. polaris and Stellaria calycantha subsp. calycantha.

Juncus drummondii E. Mey. in Ledeb. (Drummond's Rush)

Collection numbers: 362, 456, 692, 887

Habitat information: Common along mossy lakeshores, wet meadows and seepage sites.

Overall abundance: Sparse.

Occurring with: Anemone narcissiflora subsp. interior, Carex bipartita, C. pyrenaica subsp. micropoda, Cassiope tetragona var. _tetragona_, _Castilleja_ _unalaschensis_, _Eriophorum_ _scheuchzeri_, _Festuca_ _altaica_, _Hieracium_ _gracile_, _Hierochloe_ _alpina_ subsp. _alpina_, _Luzula_ _piperi_, _Poa_ _arctica_ subsp. _arctica_, _Salix_ _alaxensis_ var. _alaxensis_.

Juncus _mertensianus_ Bong. subsp. _mertensianus_ var. _mertensianus_ (Merten's Rush)

Collection numbers: 722, 1021

Habitat information: Common around muddy seepage ponds, mossy lakeshores and in wet meadows.

Overall abundance: Sparse to common.

Occurring with: _Arenaria_ _longipedunculata_, _Draba_ _stenoloba_, _Equisetum_ _arvense_, _Hedyarum_ _alpinum_ subsp. _americanum_, _Parnassia_ _fimbriata_ var. _fimbriata_, _Poa_ _arctica_ subsp. _arctica_ and _Salix_ _glauca_ var. _acutifolia_.

Juncus _triglumis_ L. (Three-Flowered Rush)

Synonyms: _Juncus_ _triglumis_ L. var. _triglumis_; _J._ _triglumis_ subsp. _triglumis_; _J._ _triglumis_ var. _albescens_ Lange: _J._ _triglumis_ subsp. _albescens_ (Lange) Hult.; _J._ _albescens_ (Lange) Fern.

Collection numbers: 601

Habitat information: Sparse to common in boggy areas and along mossy lakeshores.

Overall abundance: Sparse.

Occurring with: _Betula_ _glandulosa_ var. _glandulosa_, _Eriophorum_ _brachyantherum_, _Juncus_ _castaneus_ subsp. _castaneus_, _Ledum_ palustre subsp. decumbens, Salix glauca var. acutifolia var. Vaccinium uliginosum subsp. alpinum.

Luzula DC. (Wood-Rush)

Luzula arctica Blytt subsp. latifolia (Kjellm.) Pors. (Arctic Wood-Rush)

Synonyms: Luzula tundricola Gorodk.; L. nivalis (Laest.) Beurl. var. latifolia (Kjellm.) Sam.

Collection numbers: 678, 964

Habitat information: Rare to sparse. Occupying damp cliff ledges and talus slopes.

Overall abundance: Rare.

Occurring with: Artemisia tilesii subsp. tilesii, Draba macounii, D. stenoloba, Mertensia paniculata var. paniculata and Saxifraga adscendens subsp. oregonensis.

Luzula arcuata (Wahlenb.) Sw. subsp. unalaschkensis (Buchenau) Hult. (Curved Alpine Wood-Rush)

Synonym: Luzula arcuata (Wahlenb.) Sw. var. unalaschkensis Buchenau

Collection numbers: 385, 597, 623, 898, 900

Habitat information: Sparse to common in damp rock crevices, around sorted stone circles and on rocky heath slopes.

Overall abundance: Sparse.

Occurring with: Betula glandulosa var. glandulosa, Carex nardina, Cassiope mertensiana var. mertensiana, Empetrum nigrum subsp. hermaphroditum, Ledum palustre subsp. decumbens, Lupinus arcticus subsp. arcticus, Luzula arctica subsp. latifolia, Poa arctica subsp. arctica and Salix reticulata subsp. reticulata.

Luzula confusa Lindeb. (Northern Wood-Rush)

Collection numbers: 704, 960

Habitat information: Sparse to common on damp cliff ledges and rocky heath slopes.

Overall abundance: Sparse.

Occurring with: Betula glandulosa var. glandulosa, Calamagrostis canadensis subsp. canadensis var. canadensis, Phyllodoce glanduliflora and Salix reticulata subsp. reticulata.

Luzula multiflora (Retz.) Lej. subsp. multiflora var. frigida (Buchenau) Sam. in Hult. (Many-Flowered Wood-Rush)

Synonyms: Luzula campestris (L.) DC. ex DC. & Lam. var. frigida Buch.; L. multiflora (Retz.) Lej. subsp. frigida (Buch.) Krecz. var. frigida

Collection numbers: 506, 622, 1007, 1008

Habitat information: Common along damp, mossy lakeshores.

Overall abundance: Sparse.

Occurring with: Anemone narcissiflora subsp. interior, Betula glandulosa var. glandulosa, Bistorta vivipara, Campanula lasiocarpa, Carex brunnescens subsp. alaskana, Phyllodoce glanduliflora, Potentilla diversifolia var. diversifolia, Salix glauca var. acutifolia and Tofieldia pusilla.

Luzula parviflora (Ehrh.) Desv. subsp. *parviflora* (Small-Flowered Wood-Rush)

Synonym: *Luzula parviflora* var. *melanocarpa* (Michx.) Buch.

Collection numbers: 234, 352, 501, 711, 907, 908

Habitat information: Common in damp meadows and along open to partly shaded lakeshores and stream banks.

Overall abundance: Sparse to common.

Occurring with: *Aconitum delphinifolium* subsp. *delphinifolium*, *Antennaria alpina* var. *media*, *Bistorta vivipara*, *Cardamine umbellata*, *Carex bipartita*, *Epilobium anagallidifolium*, *Festuca altaica*, *Mertensia paniculata* var. *paniculata*, *Poa alpina*, *P. arctica* subsp. *arctica*, *Salix alaxensis* var. *alaxensis* and *Vahlodea atropurpurea* subsp. *paramushirensis*.

Luzula piperi (Cov.) M.E. Jones (Piper's Wood-Rush)

Synonyms: *Luzula wahlenbergii* Rupr. subsp. *piperi* (Cov.) Hult.

Collection numbers: 433, 458, 459

Habitat information: Common along run-off streams near late remaining snow and in damp meadows.

Overall abundance: Sparse.

Occurring with: *Anemone narcissiflora* subsp. *interior*, *A. richardsonii*, *Cardamine bellidifolia* subsp. *bellidifolia* var. *bellidifolia*, *Cassiope tetragona* var. *tetragona* and *Festuca altaica*.

Luzula spicata (L.) DC. in Lam. & DC. (Spiked Wood-Rush)

Collection number: 581

Habitat information: Sparse on exposed talus slopes near persistent snow.

Overall abundance: Rare.

Occurring with: Epilobium anagallidifolium, Luetkea pectinata, Vaccinium uliginosum subsp. alpinum and Veronica wormskjoldii var. wormskjoldii.

Liliaceae (Lily Family)

Additional reference: Taylor, 1974.

Lloydia Salisb. (Lloydia, Alp Lily)

Lloydia serotina (L.) Rchb. subsp. serotina (Alp Lily)

Collection numbers: 386, 594

Habitat information: Sparse on open, rocky heathlands, damp cliff ledges and damp, moss-covered boulder slopes.

Overall abundance: Rare to sparse.

Occurring with: Cassiope tetragona var. tetragona, Chrysosplenium tetrandrum, Ledum palustre subsp. decumbens, Poa arctica subsp. arctica, Salix polaris, Saxifraga oppositifolia and S. rivularis var. flexuosa.

Tofieldia Huds. (False Asphodel)

Tofieldia pusilla (Michx.) Pers. (Common False Asphodel)

Collection numbers: 170, 465, 1000

Habitat information: Sparse on damp moss hummocks adjacent to lakeshores and stream banks and in damp, open heathlands.

Overall abundance: Rare.

Occurring with: Betula glandulosa var. glandulosa, Carex *microchaeta* subsp. *microchaeta*, *Cassiope tetragona* var. *tetragona*, *Juncus biglumis*, *Kalmia microphylla* subsp. *microphylla*, *Parnassia kotzebuei* var. *kotzebuei*, *Salix barrattiana* and *S. polaris*.

Veratrum L. (False Hellebore)

Veratrum viride Ait. subsp. *eschscholtzii* (Gray) Love & Love (Green False Hellebore)

Synonym: *Veratrum eschscholtzii* Gray

Collection numbers: 481, 706

Habitat information: Common in damp open meadows and along stream banks where soil is relatively deep.

Overall abundance: Sparse.

Occurring with: *Angelica lucida*, *Arabis drummondii*, *Draba borealis*, *Mertensia paniculata* var. *paniculata*, *Petasites nivalis*, *Salix planifolia* subsp. *pulchra* and *Veratrum viride* subsp. *eschscholtzii*.

Poaceae (Grass Family)

Additional references: Hubbard, 1969; A.S. Hitchcock, 1950; Pavlick, 1984; Marsh, 1950; Pavlick and Looman, 1984.

Agrostis L. (Bent Grass)

Agrostis scabra Willd. (Hair Bent Grass)

Collection numbers: 576, 750, 896, 995

Habitat information: Sparse to common along muddy stream banks, in exposed silt of dried up seepage pond depressions, damp heathlands and rock slopes near late-remaining snow.

Overall abundance: Sparse.

Occurring with: *Anemone narcissiflora* subsp. *interior*, *Antennaria monocephala*, *Calamagrostis canadensis* subsp. *canadensis* var. *canadensis*, *Carex brunnescens* subsp. *alaskana*, *C. saxatilis* subsp. *laxa*, *Cassiope tetragona* var. *tetragona*, *Draba stenoloba*, *Equisetum arvense*, *Eriophorum scheuchzeri*, *Juncus castaneus* subsp. *castaneus* and *Salix barrattiana*.

Alopecurus L. (Meadow Foxtail)

Alopecurus aequalis Sobol. subsp. *aequalis* (Little Meadow Foxtail)

Collection number: 972

Habitat information: Rare to sparse in damp meadows near lakeshores and along stream banks.

Overall abundance: Rare.

Occurring with: *Aconitum delphinifolium* subsp. *delphinifolium*, *Arabis drummondii*, *Cerastium beeringianum* subsp. *beeringianum*, *Draba borealis*, *Festuca altaica*, *Phleum alpinum* var. *commutatum*, *Poa arctica* subsp. *arctica*, *Salix barrattiana* and *S. glauca* var. *acutifolia*.

Calamagrostis Adans. (Small Reed Grass)

Calamagrostis canadensis (Michx.) Beaux. subsp. *canadensis* var. *canadensis* (Bluejoint Small Reed Grass)

Synonyms: *Calmagrostis canadensis* (Michx.) Beaux. subsp. *canadensis*; *C. canadensis* var. *canadensis*; *C. canadensis* var. *macouniana* (Vasey) Stebbins

Collection numbers: 577, 582, 771, 959, 979, 981, 988

Habitat information: Common to abundant in damp open to partly shaded meadows. Sparse to common on open, rocky heathlands particularly near persistent snow.

Overall abundance: Common.

Occurring with: *Aconitum delphinifolium* subsp. *delphinifolium*, *Agrostis scabra*, *Betula glandulosa* var. *glandulosa*, *Cassiope tetragona* var. *tetragona*, *Cerastium beeringianum* subsp. *beeringianum*, *Draba borealis*, *D. stenoloba*, *Festuca altaica*, *Phleum alpinum* var. *commutatum*, *Poa arctica* subsp. *arctica*, *Salix glauca* var. *acutifolia* and *S. reticulata* subsp. *reticulata*.

Calamagrostis purpurascens R.Br. in Richards. subsp. *purpurascens* (Purple Small Reed Grass)

Collection number: 524

Habitat information: Rare in open, well-drained, gravel slopes.

Overall abundance: Rare.

Occurring with: *Empetrum nigrum* subsp. *hermaphroditum*, *Festuca saximontana*, *Hierochloe alpina* subsp. *alpina*, *Linnaea borealis* subsp. *americana*, *Lycopodium complanatum*, *Poa arctica* subsp. *arctica* and *Trisetum spicatum* var. *spicatum*.

Calamagrostis stricta (Timm) Koeler var. *stricta* (Slimstem Small Reed Grass)

Synonyms: *Calamagrostis neglecta* (Ehrh.) Gaertn. Mey. & Schreb.; *C. neglecta* var. *neglecta*

Collection number: 446

Habitat information: Rare to sparse in damp, rocky heathlands adjacent to lakeshores; also found growing from clefts in boulders.

Overall abundance: Rare to sparse.

Occurring with: *Antennaria monocephala*, *Cassiope tetragona* var. *tetragona*, *Equisetum scirpoides*, *Erigeron humilis*, *Phyllodoce glanduliflora*, *Salix reticulata* subsp. *reticulata* and *Saxifraga tricuspidata*.

Festuca L. (Fescue)

Festuca altaica Trin. (Altai Fescue)

Collection numbers: 221, 299, 321, 382, 460, 487, 500, 503, 976

Habitat information: Common to abundant in moist meadows, open heathlands, boulder slopes and rock outcrops.

Overall abundance: Common.

Occurring with: *Aconitum delphinifolium* subsp. *delphinifolium*, *Bistorta vivipara*, *Cassiope tetragona* var. *tetragona*, *Castilleja unalaschensis*, *Cerastium beeringianum* subsp. *beeringianum*, *Draba borealis*, *Mertensia paniculata* var. *paniculata*, *Pedicularis langsdorfii* subsp. *arctica*, *P. sudetica* subsp. *interior*, *Phleum alpinum* var. *commutatum*, *Poa arctica* subsp. *arctica* and *Salix glauca* var. *acutifolia*.

Festuca brachyphylla Schult. (Alpine Fescue)

Synonym: *Festuca ovina* L. var. *brevifolia* (R.Br.) S. Wats.

Collection numbers: 257, 313, 461

Habitat information: Sparse to common on rock outcrops, boulder fields and talus slopes; often near late remaining snow.
Overall abundance: Sparse.
Occurring with: _Epilobium latifolium_ subsp. _latifolium_, _Festuca saximontana_, _Potentilla hyparctica_, _Saxifraga nivalis_, _S. oppositifolia_, _S. rivulatis_ var. _flexuosa_, _S. tricuspidta_ and _Trisetum spicatum_ var. _spicatum_.

Festuca saximontana Rydb. (Rocky Mountain Fescue)
Synonym: _Festuca ovina_ L. var. _rydbergii_ St.-Yves
Collection numbers: 257, 520
Habitat information: Sparse to common on exposed, rocky slopes.
Overall abundance: Sparse.
Occurring with: _Calamagrostis purpurascens_ subsp. _purpurascens_, _Empetrum nigrum_ subsp. _hermaphroditum_, _Epilobium latifolium_ subsp. _latifolium_, _Festuca brachyphylla_, _Hierochloe alpina_ subsp. _alpina_, _Poa arctica_ subsp. _arctica_, _Saxifraga tricuspidata_ and _Trisetum spicatum_ var. _spicatum_.
Additional notes: Pavlick (1984) recognizes three varieties of _Festuca saximontana_ Rydb. According to his criteria for segregating these taxa, collection number 520 should be regarded as _F. saximontana_ var. _purpusiana_ (Saint-Yves) Frederiksen and Pavlick, and collection number 257 should be regarded as a mixture of _F. brachyphylla_ Schult. and _F. saximontana_ var. _robertsiana_ Pavlick.

Festuca vivipara (L.) Sm., s.l.

Collection number: 631

Habitat information: Rare. A single population was found in an open site on damp, bare soil.

Overall abundance: Rare.

Occurring with: *Arctostaphylos rubra*, *Betula glandulosa* var. *glandulosa*, *Cerastium beeringianum* subsp. *beeringianum* and *Koenigia islandica*.

Additional notes: In a treatment of *Festuca vivipara* (L.) Sm. s.l., Frederiksen (1981) described three distinct subspecies. He named the circumpolar taxon that extends southward in the North American Cordillera *Festuca vivipara* (L.) Sm. subsp. *glabra* Frederiksen. Pavlick (1984) proposed that this taxon be elevated to the rank of species, *Festuca viviparoidea* Krajina ex Pavlick, on the basis of leaf sclerenchyma pattern and chromosome number. Furthermore, he regards the Canadian Cordilleran material as a distinct subspecies, *F. viviparoidea* subsp. *krajinae* Pavlick.

Hierochloe R.Br. (Sweet Grass)

Hierochloe alpina (Sw.) Roem. & Schult. subsp. *alpina* (Alpine Sweet Grass, Holy Grass)

Collection numbers: 131, 149, 361, 372, 428, 523, 681, 902, 961

Habitat information: Common along open to shaded stream banks and in thin turf on rocky lakeshores. Sparse on rocky heathlands, cliff ledges and exposed gravel slopes (sorted stripes).

Overall abundance: Sparse.

Occurring with: *Betula glandulosa* var. *glandulosa*, *Carex brunnescens* subsp. *alaskana*, *Cassiope tetragona* var. *tetragona*, *Empetrum nigrum* subsp. *hermaphroditum*, *Festuca saximontana*, *Gentiana glauca*, *Pedicularis langsdorfii* subsp. *arctica*, *Poa arctica* subsp. *arctica*, *Phyllodoce glanduliflora* and *Salix polaris*.

Phleum L. (Timothy)

Phleum alpinum L. var. *commutatum* (Gaud.) Griseb. (Alpine Timothy)

Synonyms: *Phleum commutatum* Gandoger; *P. commutatum* var. *americanum* (Fourn.) Hult.

Collection numbers: 224, 245, 348, 498, 772, 983

Habitat information: Common in damp meadows, along open to shaded stream banks and lakeshores.

Overall abundance: Common.

Occurring with: *Aconitum delphinifolium* subsp. *delphinifolium*, *Arabis drummondii*, *Betula glandulosa* var. *glandulosa*, *Carex bipartita*, *Draba borealis*, *Epilobium anagallidifolium*, *Equisetum arvense*, *Festuca altaica*, *Mertensia paniculata* var. *paniculata*, *Petasites nivalis*, *Poa arctica* subsp. *arctica* and *Salix glauca* var. *acutifolia*.

Poa L. (Blue Grass)

Poa alpina L. (Alpine Blue Grass)

Collection numbers: 358, 760, 773, 885, 906, 910, 986

Habitat information: Common along damp, open to partly shaded stream banks, meadows and open heathlands.

Overall abundance: Common.

Occurring with: Achillea millefolium var. borealis, Aconitum delphinifolium subsp. delphinifolium, Betula glandulosa var. glandulosa, Bistorta vivipara, Calamagrostis canadensis subsp. canadensis var. canadensis, Draba borealis, Equisetum arvense, Mertensia paniculata var. paniculata, Parnassia kotzebuei var. kotzebuei, Poa arctica subsp. arctica and Salix glauca var. acutifolia.

Poa arctica R.Br. subsp. arctica (Arctic Blue Grass)

Collection numbers: 223, 235, 236, 319, 350, 383, 398, 521, 588, 593, 648, 661, 717, 899.

Habitat information: Common to abundant in damp meadows, mossy lakeshores, stream banks, open heathlands and rocky slopes.

Overall abundance: Common to abundant.

Occurring with: Aconitum delphinifolium subsp. delphinifolium, Betula glandulosa var. glandulosa, Cassiope tetragona var. tetragona, Draba borealis, Dryas integrifolia subsp. integrifolia, Festuca altaica, F. saximontana, Phleum alpinum var. commutatum, Potentilla diversifolia var. diversifolia and Salix glauca var. acutifolia.

Additional notes: Identifications of Poa arctica s.l. should be regarded as tentative since virtually all of the characters employed in distinguishing taxa of subspecific rank overlap. In some cases, reproduction by asexual means (apomyxis and vivipary) and the occurrence of aneuploid and polyploid series, throughout the genus, obscure even species distinctions (Porsild and Cody, 1980; Welsh, 1974). Hultén (1941) suggests that at least three races of _P. arctica_ survived the Pleistocene glaciations in different localities where they developed into morphologically distinct populations. Following the retreat of the glaciers, areas of these once isolated populations merged, resulting in the production of intermediate forms, thus rendering it "...impossible to draw any sharp lines of demarcation between the different races" (Hultén, 1941). Welsh (1974) observes that the high degree of variability within _Poa arctica_ s.l. appears to be independent of geographic or habitat differences. He further notes that "..._P. arctica_ seems to share characteristics not only with _P. alpina_ and _P. glauca_, but with _P. pratensis_ as well" (Welsh, 1974) and recommends treating the complex as a single polymorphic entity.

Typical material from the study area, identified as _P. arctica_ subsp. _arctica_, is glaucous with lower leaf blades 1.0-2.2 mm wide. Collection number 349, however, is green with lower leaf blades up to 3.2 mm wide. In addition, collection number 593 has predominantly green spikelets and contracted panicles in contrast to the predominantly purple spikelets and open panicles observed on the other collections.

Poa arctica R.Br. subsp. _longiculmis_ (Arctic Blue Grass)
Collection numbers: 904, 908.
Habitat information: Sparse to common along damp, shaded

streambanks.

Overall abundance: Sparse.

Occurring with: Aconitum delphinifolium subsp. delphinifolium, Arabis drummondii, Draba borealis, Festuca altaica and Salix glauca var. acutifolia.

Additional notes: Collection number 904 differs from the description of typical P. arctica subsp. longiculmis given by Hulten (1941) in having basal leaves 2-3 mm broad rather than filiform.

Poa glauca M.Vahl. (Glaucous Blue Grass)

Collection numbers: 715, 716

Habitat information: Sparse on steep boulder slopes.

Overall abundance: Rare.

Occurring with: Arctostaphylos rubra, Cystopteris fragilis and Poa arctica subsp. arctica.

Trisetum Pers. (Trisetum)

Trisetum spicatum (L.) Richter var. spicatum (Spike Trisetum)

Synonyms: Trisetum spicatum (L.) Richter subsp. spicatum

Collection numbers: 256, 522, 618, 1016

Habitat information: Sparse to common on exposed, rocky slopes (often near persistent snow) and open heathlands.

Overall abundance: Sparse.

Occurring with: Betula glandulosa var. glandulosa, Calamagrostis purpurascens subsp. purpurascens, Carex rossii, Empetrum nigrum subsp. hermaphroditum, Epilobium latifolium subsp. _latifolium_, _Festuca brachyphylla_, _Hierochloe alpina_ subsp. _alpina_, _Salix glauca_ var. _acutifolia_, _S. polaris_, _Saxifraga tricuspidata_ and _Vahlodea atropurpurea_ subsp. _parmushirensis_.

Vahlodea E.Fries (Vahlodea)

Vahlodea atropurpurea (Wahlenb.) E.Fries in Hartm. subsp. _paramushirensis_ (Kudo) Hult. (Mountain Vahlodea)

Synonyms: _Deschampsia atropupurea_ (Wahlenb.) Scheele; _D. atropurpurea_ var. _latifolia_ (Hook.) Scribn. ex Macoun; _Vahlodea atropurpurea_ (Wahlenb.) E.Fries subsp. _latifolia_ (Hook.) Pors.

Collection numbers: 587, 1017

Habitat information: Common in meadows, along mossy lakeshores and in damp, open to partly shaded, heathlands.

Overall abundance: Sparse.

Occurring with: _Betula glandulosa_ var. _glandulosa_, _Cassiope mertensiana_ var. _mertensiana_, _Eriophorum vaginatum_ subsp. _vaginatum_, _Kalmia microphylla_ subsp. _microphylla_, _Poa arctica_ subsp. _arctica_, _Salix polaris_ and _Trisetum spicatum_ var. _spicatum_.

CHAPTER 5

PHYTOGEOGRAPHY

Introduction

In the words of Hultén, "The geographical areas of different biota naturally exhibit the most profuse diversity. Practically speaking the areas of two different forms hardly ever cover one another completely. Different history, different specific properties, causing different reactions to the ecological conditions and other circumstances account for this ample variation which is met with in the distribution of living things."

"The variation is, however, by no means an irregular one; rather the contrary. The geographical areas of the biota can be divided up into more or less distinctly delimited groups, the interpretation and study of which will doubtless contribute substantially to our knowledge and conception of the origin and development of life on earth" (Hultén, 1937).

The elucidation of these groups, or phytogeographic elements, and the explanation of them in terms of ecological, biological and historical causes are the principle aims of phytogeography. Extensive treatments of the subject are presented by Cain (1944), Stott (1981), Seddon (1971 (biogeography)) and Wulff (1943).

A discussion of the widespread geographic distribution of individual taxa treated in a floristic or systematic work is an important, yet often omitted, component. When dealing with a localized flora, such an omission can easily obscure important historical information pertaining to the taxa under investigation. Drawing upon the present study area for an example, a student of the flora of eastern Canada might be inclined to regard Pyrola grandiflora as a lowland, temperate species since it occurs in the area around the Gulf of St. Lawrence. Examination of its distribution throughout the Northern Hemisphere, however, reveals that it belongs to the circumpolar arctic-alpine phytogeographic element. Investigation of this and several other plants of similar distribution patterns (Fernald, 1925; Given and Soper, 1981) has led to a more complete knowledge of the limits of the Pleistocene glaciations and where and how some plants were able to survive in response to the drastic changes brought about by these glaciations.

Historical factors figure prominently in the consideration of distribution patterns exhibited by the flora of the study area. Most notable of these were the widespread glaciations that repeatedly scoured much of the land surface of the northern hemisphere throughout the Pleistocene epoch. It is the aim of the present chapter to examine how the vascular flora of the study area responded to the last major ice advance in North America (Wisconsin Glaciation) by examining probable refugia where elements of the flora may have survived and correlating distribution patterns exhibited by individual components of the flora to these refugia.

Glacial Refugia

Abundant evidence in the form of cirques, kame-esker complexes, medial moraines, till plains and high elevation glacial scouring clearly indicates that the study area was thoroughly inundated by the Cordilleran ice sheet. At its maximum extent, approximately 15,000 Y.B.P. (Alley and Young, 1978; Holland, 1976; Nasmith, 1980), the ice had attained a thickness of up to 2100 m in the Cassiar Mountains (Fenger, 1982). As discussed previously, deglaciation of the area was characterized by the rapid *in situ* downwasting of ice (Alley, 1978; Alley and Young, 1978; Fenger, 1982) and was essentially complete by approximately 10,000 Y.B.P. (Alley and Young, 1978; Rouse, pers. comm., 1986).

The flora now present in the study area, therefore, has arrived from areas outside the limits of Wisconsin ice at some time within the last 15,000-10,000 years. These centers of post-glacial dispersal are termed refugia (Cain, 1944).

Beringia:

The least disputed Pleistocene refugium for the circumpolar biota is Beringia. The term was originally coined by Hultén (1937) to refer to the vast lowland plain that periodically joined northwestern North America and northeastern Asia during the Pleistocene epoch. In modern usage, the term Beringia is generally accepted as including unglaciated regions of Canada and Alaska (east Beringia), unglaciated regions of Siberia east of the Kolyma River (west Siberia) and the land bridge itself.

Evidence for the past existence of this combination land-bridge-refugium began to accumulate in the late 1800's with the discovery of fossil mammoth remains on Unalaska and Pribilof Islands (Dall and Harris, 1892). Soon after, George Mercer Dawson (1894) observed that the floors of the northeastern half of the Bering Sea, the Bering Strait and the Chukchi Sea represented a continuation of the continental plateau and, as such, were physiographically distinct from the adjacent ocean basins. Furthermore, he noted the absence of evidence for widespread glaciations both beneath these shallow seas and in large areas of the Alaskan mainland. From this he hypothesized that the area may have functioned as an ice-free corridor between North America and Asia more than once in the recent geologic past (Dawson, 1894). Daly (1934) proposed that a significant reduction in sea level, brought about by the vast amount of water stored in the continental ice sheets, was the most plausible mechanism to account for at least the more recent episodes of emergence of this corridor. The phytogeographic significance of the region was firmly established when Hultén (1937) observed the extraordinarily large number of arctic plants with ranges radiating from centers in this vicinity of the Bering Sea.

The occurrence of closely allied plant species on adjacent shores of two continental land masses, in itself, provides strong evidence that these areas were joined at some time in recent geologic history (Seddon, 1971). Hultén (1962) observes that the floras east of the Lena River and west of the Mackenzie River are essentially identical. Yurtsev (1972) acknowledges that extreme northeastern Asia and extreme northwestern North America share numerous species in common, some of which are found nowhere else. Nonetheless, he maintains that the Bering Strait constitutes a boundary between two floristic provinces. Hultén (1973) rejects this view stating that, although the forests of Siberia and America should be referred to separate floristic provinces, the once continuous broad, forestless area separating them is sufficiently uniform in floristic composition that dividing it into discrete floristic units is unjustifiable.

Extensive research in the Bering Sea region has now established, beyond any reasonable doubt, that the area functioned as an important biotic refugium throughout the Quaternary period. Furthermore, recent investigations are yielding a more precise chronology of Pleistocene events, such as the emergence of the land bridge, and enabling more refined interpretations of Beringian palaeoecology.

The most recent episode of emergence of the Bering Land Bridge occurred during the Duvanny Yar interval (Hopkins, 1983). This was the period of local maximum Wisconsin glaciation, beginning approximately 30,000 years B.P. and ending approximately 13,000 years B.P. (Hopkins, 1973; Hopkins et al., 1983). Sea levels declined to their lowest level (-90 to -100 m) by about 18,000 years B.P., exposing an essentially glacier-free land bridge over 1000 km wide, north to south, between northwestern North America and northeastern Asia (Hopkins, 1983; Porter, 1983). By 14,000 years B.P. sea levels had risen sufficiently (-48 m) to sever land connections between continents for the most recent time.

During the Duvanny Yar interval, factors such as reduced ocean temperatures, seasonal ice cover on the Bering Sea and interception of moisture-bearing clouds by the glacier covered southern mountain chains resulted in a substantial reduction of precipitation in central and northern Beringia. Modern precipitation values of from 100 to 400 mm annually were probably reduced by half (Hopkins, 1983). The dramatic changes in environment brought about by both reduced air temperatures and increased aridity had a pronounced effect on the terrestrial ecosystems of Beringia.

Palaeoecological reconstructions of Beringia throughout the Duvanny Yar interval have relied largely upon palynological, entomological and mammalian macrofossil studies. Plant macrofossil accumulations dating from this time are sparse (Hopkins, 1983). According to Hopkins et al. (1981) _Picea glauca_ and _P. mariana_ probably became extinct in Beringia about 30,000 years B.P. These authors provide evidence suggests that widely scattered populations of two species of _Populus_ and possibly _Larix_ and _Alnus_ may have been the only arboreal taxa occupying Beringia throughout the maximum Wisconsin glaciation. Palynological studies of Late Wisconsin sediments in unglaciated Alaska and northwestern Canada exhibit a much higher proportion of _Artemisia_ and grass pollen than that found in the modern pollen rain (Matthews, 1979). Late Wisconsin insect faunas in both eastern and western Beringia included taxa typical of modern tundra sites as well as an abundance of taxa that, today, are associated with open, dry grassland habitats (Matthews, 1979, 1983; Hopkins, 1983). In addition, vertebrate fossil studies (Matthews, 1979, 1983) indicate that Beringia supported a greater diversity of grazing mammals during the Duvanny Yar interval than can presently be found in any tundra ecosystem. Among these were mammoth, bison, horse, caribou, mountain sheep, saiga antelope and possibly two species of musk ox. Also found among vertebrate fossils of this time were remains of ferret and badger, two species absent from any modern tundra region (Matthews 1979, 1983).

Collectively, the evidence suggests that the Late Wisconsin environment of Beringia is without a modern counterpart, thus reinforcing the concept of the past existence of a "tundra-steppe" biome (Giterman et al., 1983) extending from northwestern Canada well into Siberia. Although forests were absent from Beringia during this last episode of emergence of the land-bridge, it is certain that refuge was provided for a considerable number of both tundra and grassland taxa.

An extensive treatment of the Quaternary history of Beringia is presented in "The Bering Land Bridge" (D.M. Hopkins (ed.), 1967) and an excellent compendium of palaeoecological research in Beringia is provided by Hopkins, Matthews, Schweger and Young (eds.) (1983) in "Palaeoecology of Beringia".

The Cordilleran Region and the "Ice-Free Corridor":

Porsild (1958) suggested that the relatively high degree of botanical endemism in the Canadian Cordillera provided strong evidence for the existence of large refugial areas during Pleistocene time. Recent geological investigations of Quaternary glaciations in western Canada, initiated by the International Geological Correlation Program project 24, have contributed greatly towards the verification of this suggestion.

The Cordilleran Ice Sheet was a complex system of intermontane, piedmont and valley glaciers that coalesced to form an integrated ice mass during one or more Wisconsin maxima (Prest, 1984). The last major episode of advance of this system began approximately 25,000 years B.P., bringing an end to a climate similar to that of modern day (Fulton, 1984). Expansion of the Cordilleran Ice Sheet was under the influence of both the climatic regime of the northeastern Pacific Ocean and the highly diverse topography over which it spread (Clague, 1978). At its maximum extent, attained some time after 17,500 years B.P. (Fulton et al., 1984; Fulton et al., 1986) it is thought to have covered all but the highest peaks and ridges of the northern Rocky Mountains (Matthews, 1980). Sporadic nunataks may also have existed in other mountain chains of the Cordillera such as those alluded to by Hanson and McNaughton (1936) in the Cassiar Mountains, but access to many areas is difficult and much of the terrain is unsuited to the preservation of non-glacial sediments (Fulton, 1984; Prest, 1976). Details pertaining to the presence of potential minor refugia are, therefore, scant.

In contrast to the Cordilleran Ice Sheet, expansion of the Laurentide Ice sheet was governed by air masses originating over the Arctic and Atlantic Oceans and from the Continental United States (Clague, 1978). Furthermore, the influence of topography was substantially diminished. In response to these different controlling factors, Laurentide Ice advanced to its maximum position approximately 20,000 years B.P. (Fulton et al., 1984; Fulton et al., 1986), some 2,500 years earlier than the Cordilleran Ice Sheet.

Between the western margin of the Cordilleran Ice Sheet and the eastern margin of the Laurentide Ice Sheet existed a controversial area frequently referred to as the "Ice-Free Corridor". Rutter (1984) defined this zone as "... a belt of land that was largely ice-free during maximum Pleistocene glaciations and that extended northward from about the Canada-United States border, east of the Rocky, Mackenzie and Richardson Mountains between Cordilleran and Laurentide glaciers.". Long suggested as a possible migration route for early man from the Bering Sea region to the continental United States (Morlan and Cinq-Mars, 1983), the area holds great significance for phytogeographers as well. Such an area would have provided an important refugium and center of post-glacial dispersal for plants.

Recent estimates as to the extent of this "ice-free corridor", proposed by Rutter (1984) indicate an area roughly 80 km wide extending along the eastern slopes of the Rocky

Mountains from the southern limits of Wisconsin ice to, at least, the Jasper-Hinton area. Northwards, the corridor is presumed to have been closed by local coalescence of the two ice sheets to a point just north of the junction of the British Columbia-Yukon Territories-Northwest Territories borders. Beyond this, a zone of limited glacier activity approximately 150 km wide, is thought to have existed between the Mackenzie and Selwyn Mountains extending northwest to the unglaciated western slopes of the Richardson Mountains (Rutter, 1984). This partially glaciated region lies within 170 km of the present study area. In his concluding remarks, Rutter (1984) states that, "...during the entire Wisconsinan, although we know very little about the early Wisconsinan, ice-free conditions in the area of the corridor were the rule rather than the exception."

Palynological evidence pertaining to the palaeoecology of the "ice-free corridor" is examined by Ritchie (1980). The earliest fossil pollen assemblages obtained from the southern portion of the corridor yielded radiocarbon dates of approximately 13,000 years B.P. These suggest a generally forested landscape dominated by spruce, with poplar preceding spruce at some localities. At roughly the same time, the northern portion of the corridor is depicted as having been an essentially treeless herb community with high pollen frequencies of grass, sedge and <u>Artemisia</u> or grass, sedge and <u>Salix</u>. In the lower Mackenzie region, this community was gradually replaced by one with high pollen frequencies of <u>Betula</u> some time after 12,000 years B.P. (Ritchie, 1980). Unfortunately, data available at the time of publication of Ritchie's article permitted only a very general interpretation of full and late-glacial environments in this important area. Several sites meriting future investigation are discussed (Ritchie, 1980).

South of the Wisconsin Ice Sheets:

The most important glacial refugium for the boreal flora of Canada was undoubtedly the large area of North America that lay south of the Cordilleran and Laurentide Ice Sheets. Except for local uncertainty regarding where these two ice masses coalesced, the southern limits of Wisconsin advances are well documented (Mickelson et al., 1983; Porter et al., 1983; Prest, 1969, 1976; Rutter, 1985; Sibrava et al., 1986; Waitt et al., 1983).

Studies of the type and distributions of relictual periglacial phenomena (Péwé, 1973) have assisted greatly in the interpretation of paleoclimatic conditions south of the glacial boundary. In addition, the Pleistocene vegetational history of this important area is becoming clearer as a result of extensive palynological and macrofossil research (Birks, 1976; Davis, 1976; Heusser, 1965, 1972, 1973, 1977; Ritchie, 1976; Wright, 1970, 1976).

In contrast to the tundra or polar desert conditions that characterized Europe, north of the Alps, at the height of the Würm Glaciations, the situation south of the Wisconsin Ice Sheets was considerably more complex (Matthews, 1979). Interpretation of Late Wisconsin fossil assemblages west of the Cascade Range in Washington indicate that a zone of tundra-like vegetation existed along the Cordilleran ice front. West of the Cascades a similar zone of ice-marginal tundra graded into parkland and eventually, coniferous forest along a latitudinal gradient (Heussser, 1983). Coniferous forest, similar to that now occupying the region, began to invade the parkland and tundra zones approximately 15,000-10,000 years B.P. (Heusser, 1977, 1983). Ritchie (1976) reports that in Late Wisconsin time the central interior of the continent was occupied by a spruce forest extending from the ice-margin in Manitoba, Saskatchewan and Alberta south to Kansas and east to the eastern Great Lakes region. Unlike modern spruce forests, however, significant quantities of herb pollen indicate that these Wisconsin forests were more open, thus resembling parkland vegetation. The presence of deciduous trees; black ash, elm and oak, further distinguished them from modern boreal forests (Matthews, 1979). From central Minnesota east to the New England states there is plentiful evidence that a discontinuous zone of tundra-like vegetation occupied an area of varying extent between the ice-front and the spruce forest (Birks, 1976; Given and Soper, 1981; Matthews, 1979; Ritchie, 1976; Scudder, 1979; Watts, 1983). This zone, although physiognomically similar to modern tundra, was floristically distinct in that both palynological and macrofossil evidence indicate the simultaneous occupation by arctic, boreal and sub-boreal taxa (Birks, 1976; Given and Soper, 1981; Matthews, 1979; Ritchie, 1976; Watts, 1983). Thus, vegetation of the so-called "open refugium" (Lindroth, 1963) south of the glacial boundary, although without modern counterpart, harbored many taxa that now occupy boreal and arctic areas.

Detailed treatments of the southern Wisconsin glacial limits are presented in "Quaternary Glaciations in the Northern Hemisphere" (Sibrava, et al.,1986). Excellent summaries of Quaternary vegetational history south of the Wisconsin ice sheets in North America are presented by Heusser, 1983; Matthews, 1979; Ritchie, 1976; Watts, 1983 and Wright, 1981.

Arctic Archipelago:

It has long been theorized that portions of the Arctic Archipelago served as important refugia throughout Pleistocene time (Fernald, 1925; Hultén, 1937; Porsild, 1955). The distribution patterns of many arctic vascular plants, the relatively high degree of endemism (approximately 19% of the vascular flora (Porsild, 1955, 1958)) together with both bryological (Brassard, 1971; Schuster, 1959) and entomological (Leech, 1966) evidence provide strong phytogeographic support for this view. The extent to which these islands lay beyond the limits of Wisconsin ice advances, however, is a subject of considerable controversy.

Prest (1969, 1976, 1983) indicates that a large part of Banks Island remained unglaciated throughout the Wisconsin. An uncompressed peat deposit at Worth Point (SW Banks Island) yielded a radiocarbon date of >49,000 years (GSC-367) (Prest, 1976). Pollen from this peat indicates the past existence of a flora similar to that now occupying the area. In addition, Prest (1976) states that some nunataks and portions of the eastern coastal lowlands on Baffin Island were free of glaciers during the last glacial maximum. This is supported by the work of Miller (1973). The remainder of the Archipelago, however, is depicted as having been thoroughly glaciated at some time during the Wisconsin interval (Prest, 1969, 1976, 1983). In contrast to this view, Vincent (1984) states, "Although local glaciers may have existed on uplands of eastern and western Melville Island and Prince Patrick Island, there is no direct evidence for complete Wisconsinan Stage ice cover of the western Queen Elizabeth Islands. Glacial sediments are present in these areas but are likely related to an extensive pre-Wisconsinan continental glaciation...". Furthermore, Prest (1984) acknowledges the work of England (1976, 1978a, 1978b) as indicating a less extensive Late Wisconsin ice cover of the eastern Arctic Islands than previously supposed. Accordingly, more recent Wisconsin glacial maps (Prest, 1983; Rutter, 1985) portray both minimum and maximum proposed glacial limits.

The nature of glaciation and the physiography of the islands of the Arctic Archipelago differ greatly from one region to another (Prest, 1976). Limited field data have necessitated generalized interpretations of the overall extent of Wisconsin advances based on the extrapolation of existing information. It now seems certain that large areas of the western Arctic Archipelago remained ice-free throughout the Pleistocene (Vincent, 1984). Increasing evidence suggests that parts of the eastern Arctic Archipelago also escaped at least Late Wisconsin glaciations (England, 1976, 1978a, 1978b). Confirmation or dismissal of the existence of additional Wisconsin refugia and the extent and suitability for the persistence of plants of those proposed, however, must await further research.

Coastal Refugia:

Generalized interpretations of the extent of Late Wisconsin glaciations depict the west coast of British Columbia and southeastern Alaska as having been completely overridden by the Cordilleran glacier complex (Nasmith, 1970; Prest, 1969, 1976). A growing body of evidence, however, suggests this may have been far from the case. Based largely on palynological evidence, Heusser (1960) identified six areas of the North Pacific as likely plant refugia and centers of post glacial dispersal. These included 1.) the Kenai Peninsula, 2.) Prince William Sound, 3.) the area from the mouth of the Copper River to Icy Point, 4.) portions of the Alexander Archipelago, 5.) portions of the Queen Charlotte Islands and 6.) the highest peaks of the north central part of Vancouver Island. More recent geological, botanical and archaeological studies, lend support, with some modifications, to this view.

Extensive study of the cordilleran Ice Sheet in Alaska, emphasizing the region around the Copper River basin and the Cook Inlet-Susitna lowland region, was conducted by Hamilton and Thorson (1983). The authors support the proposal of a Kodiak Island refugium put forth by Karlstrom and Ball (1969). In addition, their findings indicate that parts of the western Kenai Peninsula and many sites just east of the Talkeetna Mountains remained unglaciated throughout at least Late Wisconsin time. It also appears certain that the glacial ice retreated beyond the head of Cook Inlet by about 15,000 years B.P. (Hamilton and Thorson, 1983; Prest, 1984). Based on evidence obtained from seismic reflection profiles, bottom morphology and sediment cores, Late Wisconsin glacier limits are presumed to have lain at the edge of the continental shelf throughout the remainder of the Gulf of Alaska. This supposition is subject to future modification, however, in view of the complex regional dynamics of Late Wisconsin advances and recessions (Hamilton and Thorson, 1983).

Further south, in the Alexander Archipelago, the most extensive phase of glaciation is reported to have taken place during the Mid-Wisconsin interval (Swanston, 1969). At this time, maximum ice surfaces of up to 900 m were sustained in the central portion of the Archipelago. Fladmark (1975, 1979) maintains that this would have been insufficient to result in a coalesced ice mass on the outer west coasts and that headlands and ridges on the western margins of Chichagof, Baranov and Prince of Wales Islands probably remained ice-free. These areas, he feels, may have been sufficient to have provided the biotic refugia proposed by Heusser (1960).

A substantial body of biogeographical evidence indicates that the Queen Charlotte Islands were at least partially ice-free during the Pleistocene. Approximately 3.5% of the vascular plant taxa are endemic or near-endemic (Packer, 1971) and a number of mammals are clearly distinct from their mainland counterparts (Heusser, 1960). According to Calder and Taylor (1968), "The presence of plant taxa that have widely disjunct populations and the analysis of distribution patterns of the various taxa that occur on the Charlottes clearly indicate that there was a major biological refugium on the Islands during the last glaciation". This view is strengthened by Schofield (1969) who has concentrated on the bryoflora of the archipelago. Phytogeographic affinities exhibited by many of the Islands' bryophytes indicate that they are pre-Pleistocene relicts (Schofield, 1969). In addition, some of these relictual bryophytes appear to be obligate epiphytes. Providing their ecological requirements have not altered radically in a comparatively short period of time, it follows that their hosts must also have found refuge on the Charlottes throughout the Pleistocene (Schofield, pers. comm., 1987). Also of interest is the suggestion put forward by Heusser (1960) that the Queen Charlotte Islands may have been a center of post-glacial dispersal for _Picea sitchensis_ and _Tsuga heterophylla_ based on the remarkably high density of these two trees in this area.

The Queen Charlotte Islands were never overridden by the Cordilleran Ice Sheet. Rather, glaciers formed in the insular mountains of the archipelago, extended out over lowland areas and abutted, at least partially, with mainland ice (Prest, 1984). Brown and Nasmith (1962) and Brown (1968) claim that as little as 9 sq. km of the Islands' land surface projected above Wisconsin ice. This, however, would hardly be sufficient to account for the refugium suggested previously. More recent information gathered from both field studies and radiocarbon dating suggests that the Late Wisconsin ice cover on the Queen Charlotte Islands was much less extensive (Prest, 1984). Heusser (1960) maintains that the physiography of the archipelago, together with the great depth of the open Pacific, would have prevented the formation of a coalesced ice sheet on the western side of Moresby and Graham Islands. This, in turn, would result in potential refugial sites on slopes between ice-occupied valleys. Perhaps of greater significance, however, is the growing body of information regarding a possible refugium on the leeward side of the Charlottes. Fladmark (1975a, 1975b, 1979) cites stratigraphic evidence indicating that approximately 500 sq. km of northeastern Graham Island remained exposed during the last recognizable Wisconsin ice advance. A sample of wood from the uppermost till south of this proposed refugium yielded a finite radiocarbon date of 32,000 years B.P. (Fladmark, 1975a, 1975b). Furthermore, relative sea levels of -20 to -33 m in Hecate Straight during and immediately following the last glacial episode could have tripled the area of this proposed refugium, nearly connecting Graham Island with islands immediately adjacent to the mainland (Fladmark, 1979). In addition to providing a substantial plant refugium, such a situation would greatly facilitate explanations for the origins of unique races of mammals that occupy, or have occupied, the Queen Charlotte Islands. Among these, <u>Rangifer dawsonii</u> and <u>Ursus americanus carlottae</u> are thought to have been of pre-glacial or interglacial origin (McCabe and Cowan, 1945).

Mountain peaks of north-central Vancouver Island were considered by Heusser (1960) to have been the southernmost biotic refugia within the Pleistocene ice sheets. The occurrence of <u>Marmota vancouverensis</u> (Vancouver Island marmot) and Lagopus leucurus subsp. saxatilis (Vancouver Island white-tailed ptarmigan) on high alpine slopes of these mountains provided the principal biological evidence in support of this hypothesis. Both of these taxa are sufficiently distinct from their mainland relatives to have warranted speculation that they survived in isolation on the Island during the Pleistocene (McCabe and Cowan, 1945). Botanical evidence for the existence of these proposed mountain refugia was provided by Ogilvie and Cěska (1984). The authors reported on forty-four alpine taxa of phytogeographic interest from collections taken on seven northern Vancouver Island mountains. Among these, two were originally thought to be endemic to the Queen Charlotte Islands, two were previously regarded as Olympic Peninsula endemics, one represents the first record from North America and the remainder are mostly disjunctive taxa of circumpolar arctic-alpine, amphiberingian, north Pacific coastal or Cordilleran affinity (Ogilvie and Ceska, 1984). Studies of the glacial history of Vancouver Island conducted by Muller et al. (1974) and Muller (1977) indicate at least six of these seven peaks protruded above Pleistocene ice and are cited by Ogilvie and Cěska (1984) as corroborative evidence for the proposed refugia.

In addition to the northern mountains, it appears likely that plants persisted on the Brooks Penninsula during the Pleistocene. The flora of this area includes six of the previously supposed Queen Charlotte Island endemics as well as taxa largely confined to areas south of the Wisconsin maxima and numerous taxa exhibiting widely disjuctive distribution patterns

Pojar, 1981).

In contrast to the Queen Charlotte Islands, a relatively extensive continental shelf extends from much of the west coast of Vancouver Island. Fladmark (1979) cites sediment and bathymetric studies conducted in Barkley Sound and on the adjacent continental shelf by Carter (1973) and Tiffin (1976) indicating that the last glaciation to affect the area carved separate U-shaped valleys extending from the present coastline up to 35 km westward. This implies the advance of separate lobes of glacial ice, rather than a coalesced ice sheet, out over the continental shelf. Furthermore, Fladmark (1975b, 1979) presents evidence suggesting local sea levels of up to -130 m during and immediately following this glacial episode. If such was the case, extensive low-lying areas would have been available for colonization throughout this time. The Brooks Peninsula is particularly well placed to have escaped glaciation in that it extends well west from an area where the adjacent mountains would have prevented the formation of a coalesced ice sheet (Pojar, 1981).

Detailed examinations of potential Wisconsin coastal refugia including pertinent data on sea level fluctuations are presented by Fladmark (1975a, 1975b, 1979, 1983). He advances the hypothesis that unglaciated areas along the west coast of North America were sufficient in extent throughout much of Mid and Late Wisconsin time to have provided early human immigrants access to regions south of the glacial maxima. This route is put forward as a viable alternative to the widely discussed "Ice

Free Corridor". Literature available since this proposal, cited in the preceding discussion, strengthens Fladmarks' hypothesis.

Phytogeographic Elements of the Glacial Mountain Flora

The flora of the study area is subdivided into seven phytogeographic elements. In descending order of prominence, these are: Circumpolar Arctic-Alpine, Circumpolar Boreal, Amphiberingian, North American Cordilleran, North American Boreal, Western North American and North American Arctic-Alpine. Complete lists of taxa from the study area assigned to each element are provided in Appendix I. Selected distribution maps illustrating the characteristic range of each element are presented in Appendix II.

Information pertaining to the distributions of taxa from the study area was obtained from: Argus (1973), Hultén (1937, 1958, 1962, 1968, 1971, 1973, 1976), Little (1971), Meusel et al. (1965, 1978), Mulligan (1970, 1974a, 1974b), Pavlick (1984), Pavlick and Looman (1984), Porsild (1957), Porsild and Cody (1980), Raup (1947), Schofield (1969), Scott (1974) and Straley (1980).

The degree of continuity of distribution of a given plant is dependant upon its ecological tolerances, its dispersability, the availability of suitable habitats and historical factors (i.e. glaciations). The manner in which these variables interact is unique to each taxon, consequently, some taxa are nearly ubiquitous throughout their ranges (i.e. Equisetum arvense), while others exhibit greatly fragmented distributions (ie. *Stellaria umbellata*).

Circumpolar Arctic-Alpine Element:

The Circumpolar Arctic-Alpine element is widely distributed north of the tree-line, extending into boreal regions primarily along mountain ranges. Members of this group occasionally occur in boreal forest regions along streambanks emanating from mountains as well as in bogs and on cliffs and headlands (Schofield, 1969). The greatest proportion of taxa from the study area (28.8%) belong to this group.

This group is presumed to have survived glaciations over a particularly wide front. Of the individual components of this element represented in the study area, all are present on either side of the Bering Strait, thus, underscoring the importance of Beringia as a refugial site for this group. In all likelihood, most taxa belonging to this element were sufficiently hardy to have persisted in all available northern refugia including northwestern Canada, the Arctic Archipelago and numerous sites throughout Eurasia.

An important subset of this element consists of those taxa with disjunctive populations well south of their principle range in eastern North America. Fernald (1925) first drew attention to this conspicuous group. It was originally supposed that these southern outliers of the Arctic-Alpine element survived continental glaciations on nunataks (Fernald, 1925) and that the intervening portion of their previously continuous range was eliminated by the advancing ice sheets. Evidence of extensive glaciations in the region where these taxa are presumed to have persisted, however, has resulted in strong objection to this hypothesis (Given and Soper, 1981). Alternately, these taxa may have migrated post-glacially from refugia north of the ice front and persisted in edaphically suitable sites or they may represent relictual populations of a more extensive pre-Pleistocene range that escaped glaciation along the southern margins of the Laurentide Ice Sheet (Given and Soper, 1981). The discontinuous "tundra-like" zone that existed south of Wisconsin ice has been discussed previously.

Porsild (1958) implied that arctic-alpine taxa may have migrated south in advance of the expanding ice-sheets, noting the greater possibility of this occurring in North America, where the principal mountain ranges are oriented north to south, than in Europe, where the east-west oriented mountain ranges would have barred such migrations. Hultén (1937) objected to this view, as advanced by previous authors, on the basis that he did not believe plants could migrate fast enough. Furthermore, he cited the presence of forest communities at the foot of advancing glaciers in Alaska and the often luxuriant vegetation adjacent to the continental ice cap of Greenland as examples disproving this proposal. Conditions in the interior of North America during the Pleistocene ice advances, however, could not be considered comparable to Hultén's examples. As Hultén himself points out, the vegetation adjacent to the Greenland ice cap has, on its opposite flank, the ameliorating influence of the ocean. In addition, advancing glaciers in Alaska could not be assumed to have had the far reaching climatic affect that an event of the magnitude of an advancing continental ice sheet would have. According to Matthews (1979), vegetation was altered thousands of kilometers south of the Late Wisconsin ice margin. With regards to whether or not plants would have been capable of migrating at a sufficient rate to "keep ahead" of the advancing ice, Hopkins (1973) points out that the rate of all Wisconsin advances was considerably slower than the retreats and there appears to be no objection in the literature to the proposal that the ground left bare by retreating ice sheets was rapidly colonized. It seems possible, therefore, that at least some plants of northern distribution may have been able to extend their ranges southward in advance of the glaciers and now persist in ecologically suitable sites. One other possibility worth consideration is that large areas of continental shelf, exposed when sea levels were depressed, opened up potential migration routes for northern taxa.

Circumpolar Boreal Element:

Many of the taxa assigned to this element occur in arctic and alpine regions. However, the principal component of their ranges is south of the tree-line where they are widely distributed throughout North America and Eurasia. Approximately 17.5% of the taxa from the study area belong to this group.

Most representatives of this element (eg. *Carex rostrata*) have disjunct populations south of the boreal forest zone in Japan, central China and Southeast Asia. These disjunct populations are considered to be remnants of formerly continuous distributions, disrupted by Quaternary glaciations (Lausi and Nimis, 1985). In additon, this group is virtually absent from the Arctic Archipelago. These two points suggest that most of the plants belonging to this element survived glaciations south of the continental ice margins, extending northwards post-glacially. Some may have persisted also in Beringia and perhaps in coastal refugia but these were certainly of secondary importance.

Amphiberingian Element:

Taxa included within this element exhibit approximately equal areas on either side of the Bering Strait. Some, such as *Artemisia arctica* subsp. *arctica* have ranges extending well into northwestern North America on the east and eastern Asia on the west, while others, such as *Arnica lessingii* subsp. *lessingii* have considerably smaller ranges. A comprehensive treatment of vascular plant taxa with ranges radiating from the Bering Sea region is provided in Hultén's classic work, "Outline of the History of Arctic and Boreal Biota during the Quarternary Period" (Hultén, 1937). This group accounts for 15.9% of the taxa of the study area.

Undoubtedly, the most important refugium for taxa of this element was Beringia. Following glaciations, they were able to extend their ranges, in varying degrees, westwards into Siberia and eastwards into North America. In all probability, taxa with a significant coastal component to their ranges, such as *Carex macrochaeta*, *C. spectabilis* and *Angelica lucida*, were able to persist in unglaciated coastal refugia as well. Some may even have been absent from Beringia during the Wisconsin maxima, migrating northwards following the glacial retreats.

North American Cordilleran Element:

The North American Cordilleran element consists of those taxa that occur primarily or exclusively on the north-south tending mountain chains of western North America. This group constitutes 12.9% of the flora of the study area.

The individual components of this element must have persisted in unglaciated portions of the Cordillera south of Wisconsin ice, the unglaciated western slopes of the Richardson Mountains and portions of the "Ice-Free Corridor". In addition, isolated nunataks within the Cordilleran Ice Sheet may have served as minor refugia.

Distribution maps provided by Mulligan (1975) and Porsild and Cody (1980) indicate a conspicuous north-south disjunction in the distributions of both Draba albertina and D. stenoloba. Collections from the study area represent an intermediate locality.

One member of the Cordilleran element, Arnica cordifolia, has a disjunct population in eastern North America. This population is presumed to be a fragment of a once continuous or nearly continuous distribution south of the glacial boundary.

North American Boreal Element:

Plants assigned to this element are those with the major component of their ranges within boreal regions of North America. The majority of this group is restricted to North America but some, such as Betula glandulosa var. glandulosa and Ledum groenlandicum, reach Greenland while others, such as Cornus canadensis and Heracleum sphondylium subsp. montanun, occur in coastal areas of eastern Asia. Also within this group are taxa with marked eastern North America-western North America disjunctive distributions (eg. Geum macrophyllum subsp. macrophyllum). The North American Boreal element constitues 10.8% of the flora of the study area.

This group is thought to have survived glaciation in the extensive "boreal-like" zone south of the continental ice sheets, migrating northwards following deglaciation. Hopkins et al. (1981) discuss palynological evidence indicating that the most probable dispersal route taken by many forest species (most notably Picea glauca) that reinvaded eastern Beringia post-glacially was along the "Ice-Free Corridor". The virtual absence of this element from western Beringia implies that past land-bridge habitats were unsuitable. Those taxa with restricted populations in eastern Asia probably had much more extensive pre-Pleistocene ranges.

Western North American Element:

Many of the taxa assigned to this element have a substantial portion of their ranges in the Cordilleran region. Unlike the Cordilleran element, however, taxa belonging to the Western North American element also have a significant coastal, and/or interior component to their ranges. For example, _Anemone narcissiflora_ subsp. _interior_ and _Carex microchaeta_ subsp. _microchaeta_ are essentially restricted to Alaska and Northern British Columbia, _Artemisia tilesii_ subsp. _unalaschcensis_ is shown only in southwestern Alaska (Hultén, 1968) while _Carex rossii_ extends well into the interior of northern North America. This group represents 8.3% of the total flora of the study area.

The absence of this group from western Beringia indicates that land-bridge habitats were unsuitable during maximum Wisconsin glaciations. Those taxa with a strong coastal affinity were probably afforded refuge in coastal areas south of Beringia, migrating northwards following the retreat of the Cordilleran Ice Sheet. Those taxa with a significant interior distribution may have survived glaciations in unglaciated regions of the Yukon and Northwest territories, portions of the "Ice-Free Corridor" and/or south of the Wisconsin maxima.

North American Arctic-Alpine Element:

This element is widespread north of the tree-line in North America and extends south into the boreal zone primarily along mountain chains. As was the case with the Circumpolar Arctic-Alpine element, members of this group occur in boreal forest regions along streambanks emanating from mountains, in bogs and on cliffs and headlands. Accounting for only 5.8% of the flora from the study area, this is the smallest phytogeographic element represented.

Plants assigned to this element probably persisted in unglaciated areas of Alaska and northwestern Canada as well as in refugia in the Arctic Archipelago. Those taxa with populations in Siberia (eg. Anemone richardsonii and Cerastium beeringianum subsp. beeringianum) were probably able to persist in refugial sites in northern Beringia as well. Two members of this element, Dryas integrifolia subsp. integrifolia and Saxifraga tricuspidata, are widely distributed in Greenland and have disjunct populations in eastern North America. The explanation for this disjunction are the same as those presented for the similar disjunctive distributions pattern exhibited by certain members of the Circumpolar Arctic-Alpine element.

Summary:

Examination of distribution patterns exhibited by the individual components of the study area flora suggests that most taxa migrated post-glacially from refugia in eastern Beringia, south of the glacial boundary and sections of the "Ice-Free Corridor". In addition, a small component of the flora appears to have originated from refugia in the Arctic Archipelago. Isolated Cordilleran nunataks and coastal refugia may have contributed to the flora of the study area but the role of these was undoubtedly minor.

CONCLUSIONS

Botanical collecting in northern British Columbia has been carried out primarily along the few roadways penetrating this vast wilderness. A few short helicopter and float plane forays into remote regions (eg. Welsh and Rigby, 1971) have also been conducted but the success of these is ultimately dependant upon caprices of weather and timing. Prior to this study, the research of Buttrick (1977, 1978) represented the only extensive botanical investigation of a comparatively small geographical area carried out over the entire growing season in northern British Columbia.

Extensive studies of this nature allow the investigator time to observe and collect a much wider range of morphotypes than is possible any other way. Similarly, often overlooked species such as <u>Koenigia islandica</u> and <u>Selaginella selaginoides</u> are less likely to be missed. In addition, concentration on an area of limited geographical extent allows an opportunity to become familiar with the diversity of habitats a given taxon is able to occupy and observe what effects, if any, different habitats may produce on the morphology of that taxon.

Over 1000 vascular plant collections were identified from the study area. A total of 239 taxa were recognized representing 116 genera and 44 families. Taxonomic keys to the local flora were constructed based primarily on these collections, thus eliminating some of the ambiguities unavoidable in regional floras. The annotated species list provides habitat information as well as a brief list of associated species. In addition, taxa from the study area posing particular taxonomic problems are discussed. Ideally, this information will facilitate the work of future researchers conducting similar studies.

Among the 239 taxa recongized, 31 (approximately 13%) are listed as rare in British Columbia (Straley et al. 1985). A complete list of these, the category of rarity to which they are assigned and their relative abundance in the study area is provided in Appendix III. Most of the taxa appearing on this list are poorly represented in the major herbaria of British Columbia (UBC and V). An increase in botanical field work in alpine and sub-alpine environments of northwestern British Columbia would help to establish whether these taxa are truly rare or, in some instances, only rarely collected.

The paucity of collections from alpine and sub-alpine regions of northern British Columbia is reflected in dot distribution maps such as those provided by Porsild and Cody (1980). Examination of these maps appears to indicate distributional gaps in the vicinity of the study area for many taxa collected there (eg. Draba albertina and D. stenoloba).

Examination of individual species distribution patterns suggests that post-glacial migration of taxa to the study area occurred primarily from unglaciated areas of northwestern Canada and Alaska, south of the glacial boundary and from portions of the "Ice-Free Corridor". Revegetation of the study area following deglaciation appears to have been greatly facilitated by the physiography of North America. Summits of mountains in the north-south tending ranges of the western Cordillera were apparently free of ice long before valley glaciers waned (Fenger, 1982), thus, opening alpine regions for recolonization from refugia located both north and south of the study area. Furthermore, between the Cordilleran and Laurentide Ice Sheets there existed an extensive, though not always continuous, ice-free route (Rutter, 1984) along which many taxa of boreal affinity appear to have migrated from south of the glacial boundary (Hopkins et al., 1981).

A consideration of phytogeograhic aspects concerning the flora under investigation is of considerable value in assessing taxonomic relationships. Many taxa now occurring in the study area appear to have survived Pleistocene glaciations in a number of isolated refugia. Once continuous ranges, therefore, were fragmented into several remote populations. Such a situation is of particular interest to taxonomists. During isolation these remote populations were bound to develop morphologically distinct forms. Following the removal of barriers once separating them (i.e. retreat of the glaciers), these divergent populations were able to merge once again, producing a number of intermediate forms. Hultén (1941) invoked such an explanation to account for the bewildering variability encountered within *Poa arctica* s.l.. The mountains of northern British Columbia provide an unequalled opportunity to explore this phenomenon, situated as they are, roughly equidistant from a number of major

Pleistocene refugia.

An important feature of the study area is that it remains virtually undisturbed by man's activities. At the time of publication of "Vascular Plants of British Columbia:A descriptive resource inventory" (Taylor and MacBryde,1977) an estimated 21.1% of the total flora of British Columbia was considered to have been introduced. In contrast, none of the taxa found in the study area could be attributed to anthropogenic introduction. The greatest potential for plant introduction is with the horses that carry hunters, fishermen and guides into the area from mid-summer on into autumn. These horses, however, feed on indigenous grasses, as the expense involved in transporting exotic foodstuffs for livestock this far north is prohibitive. In view of the ever increasing human demand on natural resources, undisturbed natural areas are becoming scarce. These represent irreplacable "natural laboratories" in which innumerable processes can be studied, leading to a fuller understanding of many aspects of biological science.

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APPENDIX I

Taxa Assigned to each Phytogeographic Element

a. Circumpolar Arctic-Alpine Plants

Arctostaphylos rubra

Astragalus alpinus subsp. *alpinus*

Bistorta vivipara

Cardamine bellidifolia subsp. *bellidifolia* var. *bellidifolia*

Carex bigelowii

Carex bipartita

Carex brunnescens subsp. *alaskana*

Carex capillaris subsp. *capillaris*

Carex media subsp. *media*

Carex saxatilis subsp. *laxa*

Cassiope tetragona var. *tetragona*

Chrysosplenium tetrandrum

Cystopteris montana

Draba fladnizensis

Draba lactea

Draba nivalis

Dryopteris fragrans

Epilobium anagallidifolium

Epilobium latifolium subsp. *latifolium*

Equisetum scirpoides

Erigeron humilis

Eriophorum angustifolium subsp. *triste*

Eriophorum brachyantherum

Eriophorum callitrix

Eriophorum scheuchzeri

Festuca brachyphylla

Festuca vivipara

Hierochloe alpina subsp. *alpina*

Huperzia selago var. *selago*

Juncus arcticus subsp. *alaskanus*

Juncus biglumis

Juncus castaneus subsp. *castaneus*

Juncus triglumis

Kobresia myosuroides

Koenigia islandica

Luzula confusa

Luzula parviflora subsp. *parviflora*

Luzula spicata

Lycopodium alpinum

Myosotis asiatica

Oxyria digyna

Pedicularis capitata

Pedicularis langsdorfii subsp. *arctica*

Pedicularis verticillata

Phleum alpinum var. *commutatum*

Poa alpina

Poa arctica subsp. *arctica*

Poa glauca

Potentilla hyparctica

Pyrola grandiflora

Ranunculus hyperboreus subsp. hyperboreus

Ranunculus pygmaeus

Ranunculus sulphureus var. sulphureus

Rumex acetosa subsp. arifolius

Sagina intermedia

Salix arctica

Salix glauca var. acutifolia

Salix reticulata subsp. reticulata

Saxifraga caespitosa subsp. sileneflora

Saxifraga nivalis

Saxifraga oppositifolia

Sibbaldia procumbens

Silene acaulis subsp. acaulis

Silene uralensis subsp. attenuata

Stellaria umbellata

Thalictrum alpinum var. alpinum

Tofieldia pusilla

Vahlodea atropurpurea s.l.

Woodsia alpina

b. Circumpolar Boreal Plants

Adoxa moschatellina

Alopecurus aequalis subsp. *aequalis*

Andromeda polifolia subsp. *polifolia*

Botrychium lunaria subsp. *lunaria*

Calamagrostis stricta var. *stricta*

Carex aquatilis var. *aquatilis*

Carex canescens subsp. *arctaeformis*

Carex canescens subsp. *canescens*

Carex dioica subsp. *gynocrates*

Carex heleonastes subsp. *heleonastes*

Carex rostrata

Cystopteris fragilis

Empetrum nigrum subsp. *hermaphroditum*

Epilobium angustifolium subsp. *angustifolium*

Equisetum arvense

Equisetum sylvaticum var. *sylvaticum*

Eriophorum vaginatum subsp. *vaginatum*

Galium boreale

Gymnocarpium dryopteris var. *disjunctum*

Juniperus communis subsp. *alpina*

Ledum palustre subsp. *decumbens*

Lloydia serotina subsp. *serotina*

Luzula multiflora subsp. *multiflora* var. *frigida*

Lycopodium annotinum subsp. *annotinum*

Lycopodium clavatum

Lycopodium complanatum

Lysimachia thyrsiflora

Moneses uniflora var. uniflora

Orthilia secunda subsp. secunda

Pedicularis labradorica

Petasites frigidus

Potentilla fruticosa subsp. floribunda

Pyrola asarifolia var. purpurea

Pyrola minor

Ranunculus aquatilis s.l.

Rubus chamaemorus

Selaginella selaginoides

Stellaria calycantha var. calycantha

Trisetum spicatum var. spicatum

Vaccinium microcarpum

Vaccinium uliginosum subsp. alpinum

Vaccinium vitis-idaea subsp. minus

c. Amphiberingian Plants

Aconitum delphinifolium subsp. delphinifolium

Angelica lucida

Antennaria monocephala

Arabis lyrata subsp. kamchatica

Arnica lessingii

Arnica louiseana subsp. frigida

Artemisia arctica subsp. arctica

Campanula lasiocarpa subsp. lasiocarpa

Cardamine umbellata

Carex enanderi

Carex macrochaeta

Carex podocarpa

Carex pyrenaica subsp. micropoda

Carex spectabilis

Claytonia sarmentosa

Corydalis pauciflora

Dodecatheon frigidum

Draba borealis

Festuca altaica

Gentiana glauca

Hieracium triste

Luzula arctica subsp. latifolia

Luzula arcuata subsp. unalaschkensis

Polemonium caeruleum subsp. villosum

Potentilla uniflora

Rubus pedatus

Salix alaxensis var. *alaxensis*

Salix planifolia subsp. *pulchra* var. *pulchra*

Salix polaris

Sanguisorba canadensis subsp. *latifolia*

Saxifraga rivularis var. *flexuosa*

Sedum integrifolium subsp. *integrifolium*

Taraxacum lyratum

Trientalis europaea subsp. *arctica*

Viola epipsila subsp. *repens*

Viola langsdorfii

d. North American Cordilleran Plants

Abies lasiocarpa var. *lasiocarpa*

Agoseris aurantiaca var. *aurantiaca*

Antennaria alpina var. *media*

Arnica cordifolia

Arnica latifolia var. *latifolia*

Carex atrosquama

Cassiope mertensiana var. *mertensiana*

Delphinium glaucum

Draba albertina

Draba macounii

Draba stenoloba

Erigeron acris subsp. *debilis*

Hieracium gracile

Juncus drummondii

Kalmia microphylla subsp. *microphylla*

Leptarrhena pyrolifolia

Luetkea pectinata

Oxytropis sericea var. *spicata*

Parnassia fimbriata var. *fimbriata*

Pedicularis sudetica subsp. *interior*

Petasites nivalis

Phyllodoce X *intermedia*

Phyllodoce empetriformis

Phyllodoce glanduliflora

Potentilla diversifolia var. *diversifolia*

Salix barrattiana

Saxifraga adscendens subsp. *oregonensis*

Saxifraga lyallii subsp. *hultenii*

Senecio triangularis

Valeriana sitchensis subsp. *sitchensis*

Veratrum viride subsp. *eschscholtzii*

e. North American Boreal

Agrostis scabra

Antennaria microphylla

Arabis drummondii

Aster modestus

Betula glandulosa var. *glandulosa*

Calamagrostis canadensis subsp. *canadensis* var. *canadensis*

Callitriche anceps

Carex scirpoidea var. *stenochlaena*

Cornus canadensis

Festuca saximontana

Geum macrophyllum subsp. *macrophyllum*

Hedysarum alpinum subsp. *americanum*

Heracleum sphondylium subsp. *montanum*

Ledum groenlandicum

Linnaea borealis subsp. *americana*

Mertensia paniculata var. *paniculata*

Picea glauca

Ribes glandulosum

Rubus arcticus subsp. *acaulis*

Senecio pauciflorus

Solidago multiradiata var. *multiradiata*

Stellaria longipes var. *altocaulis*

Stellaria longipes var. *laeta*

Vaccinium caespitosum var. *caespitosum*

Vaccinium ovalifolium

f. Western North American Plants

Anemone narcissiflora subsp. _interior_

Artemisia tilesii subsp. _unalaschcensis_

Caltha leptosepala var. _leptosepala_

Carex macloviana subsp. _pachystachya_

Carex microchaeta subsp. _microchaeta_

Carex rossii

Carex sitchensis

Castilleja unalaschcensis

Erigeron peregrinus subsp. _callianthemus_

Fragaria virginiana subsp. _glauca_

Juncus mertensianus subsp. _mertensianus_ var. _mertensianus_

Lupinus arcticus subsp. _arcticus_

Luzula piperi

Mitella pentandra

Pinus contorta var. _latifolia_

Poa arctica subsp. _longiculmis_

Ranunculus occidentalis subsp. _occidentalis_

Saxifraga occidentalis

Senecio lugens

Thalictrum occidentale var. _occidentale_

g. North American Arctic-alpine

Achillea millefolium var. _borealis_

Anemone parviflora

Anemone richardsonii

Antennaria umbrinella

Arenaria longipedunculata

Calamagrostis purpurascens subsp. _purpurascens_

Carex nardina

Cerastium beeringianum subsp. _beeringianum_

Dryas integrifolia subsp. _integrifolia_

Epilobium lactiflorum

Gentianella propinqua

Parnassia kotzebuei var. _kotzebuei_

Saxifraga nelsoniana subsp. _porsildiana_

Saxifraga tricuspidata

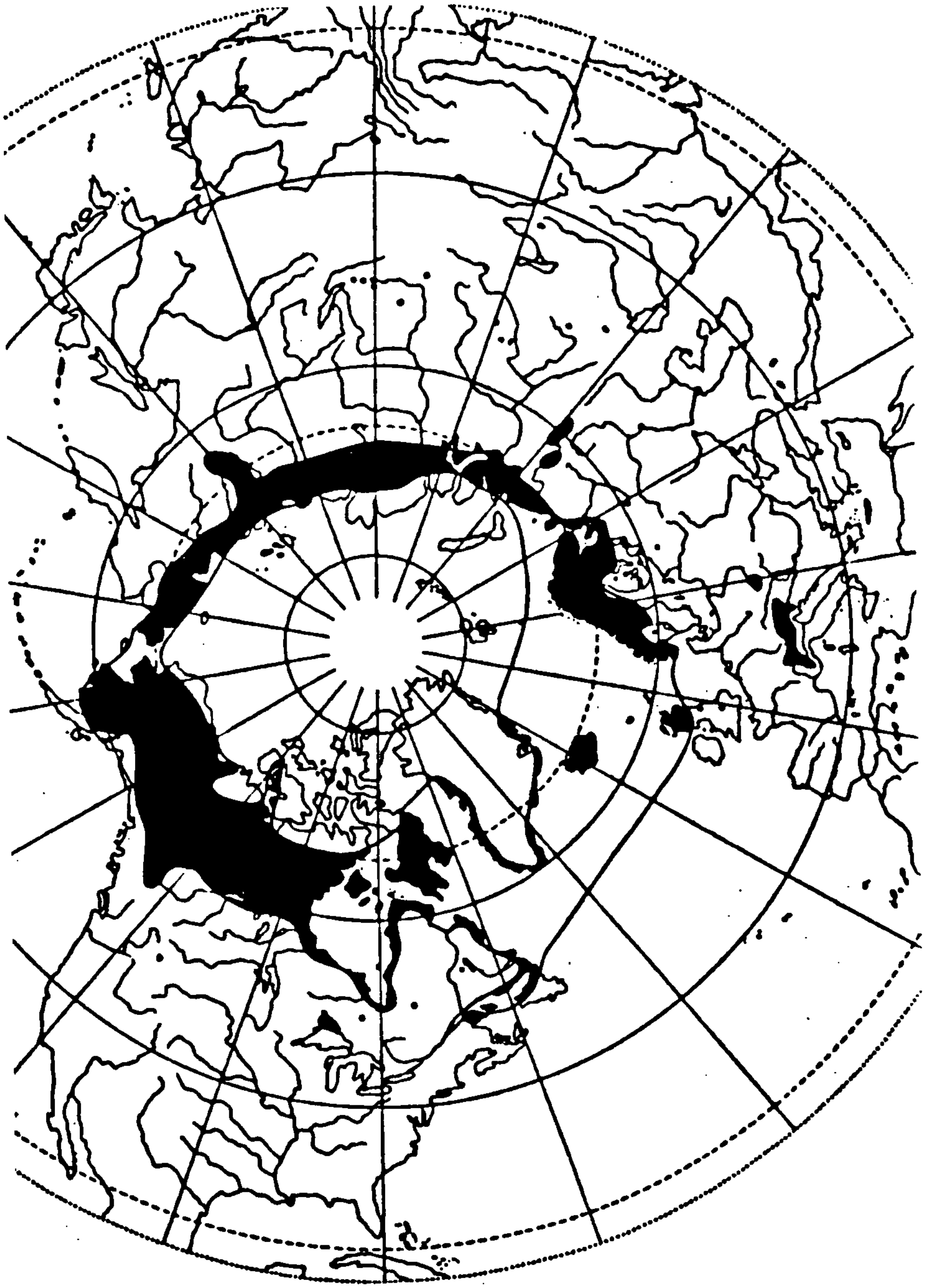
Vernonica wormskjoldii var. _wormskjoldii_

APPENDIX II

Selected Distribution Maps Illustrating Ranges of each Phytogeographic Element

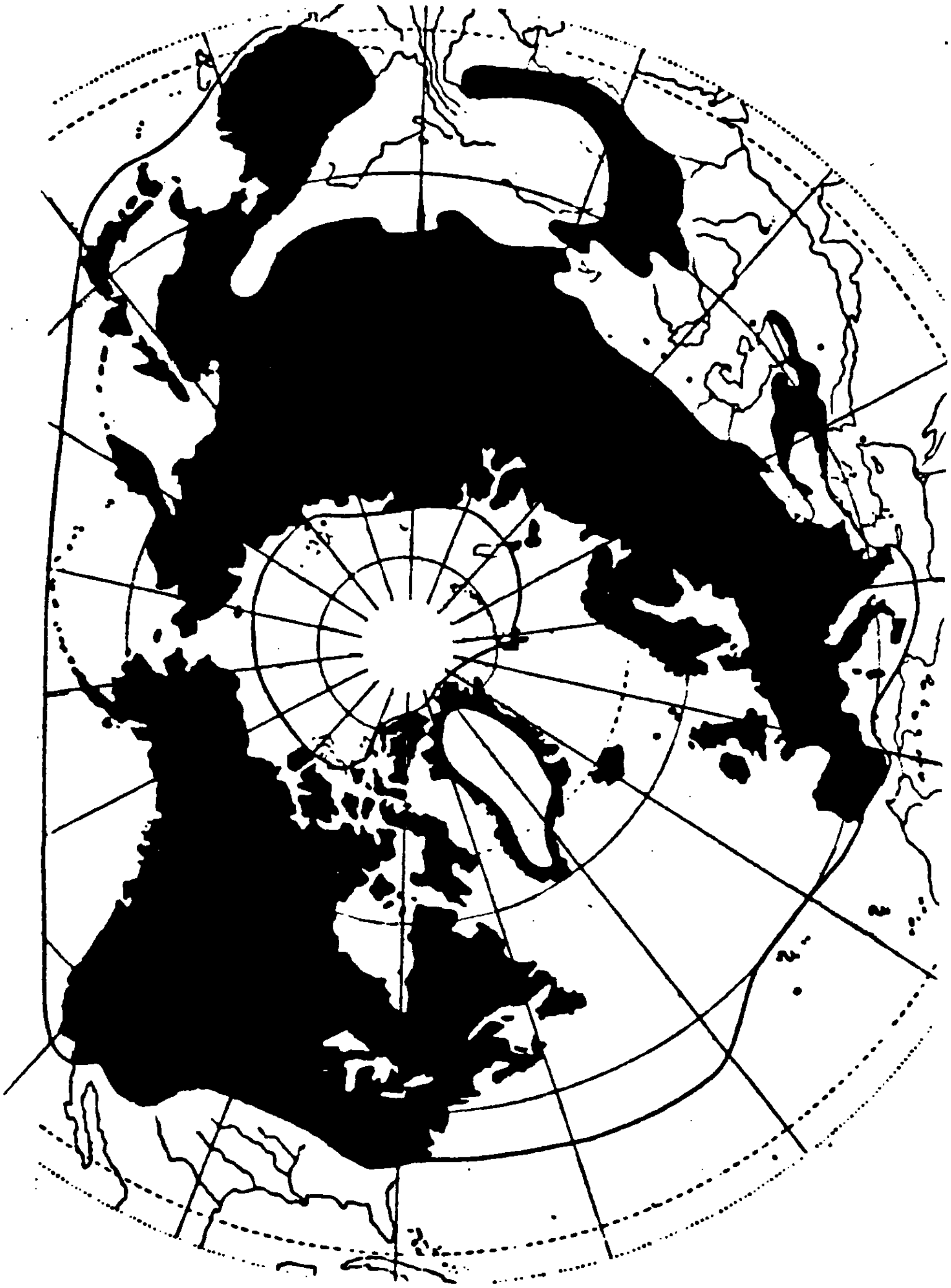
a. Circumpolar Arctic-Alpine Distribution

example: Tofieldia pusilla (modified after Meusel et al. (1965))



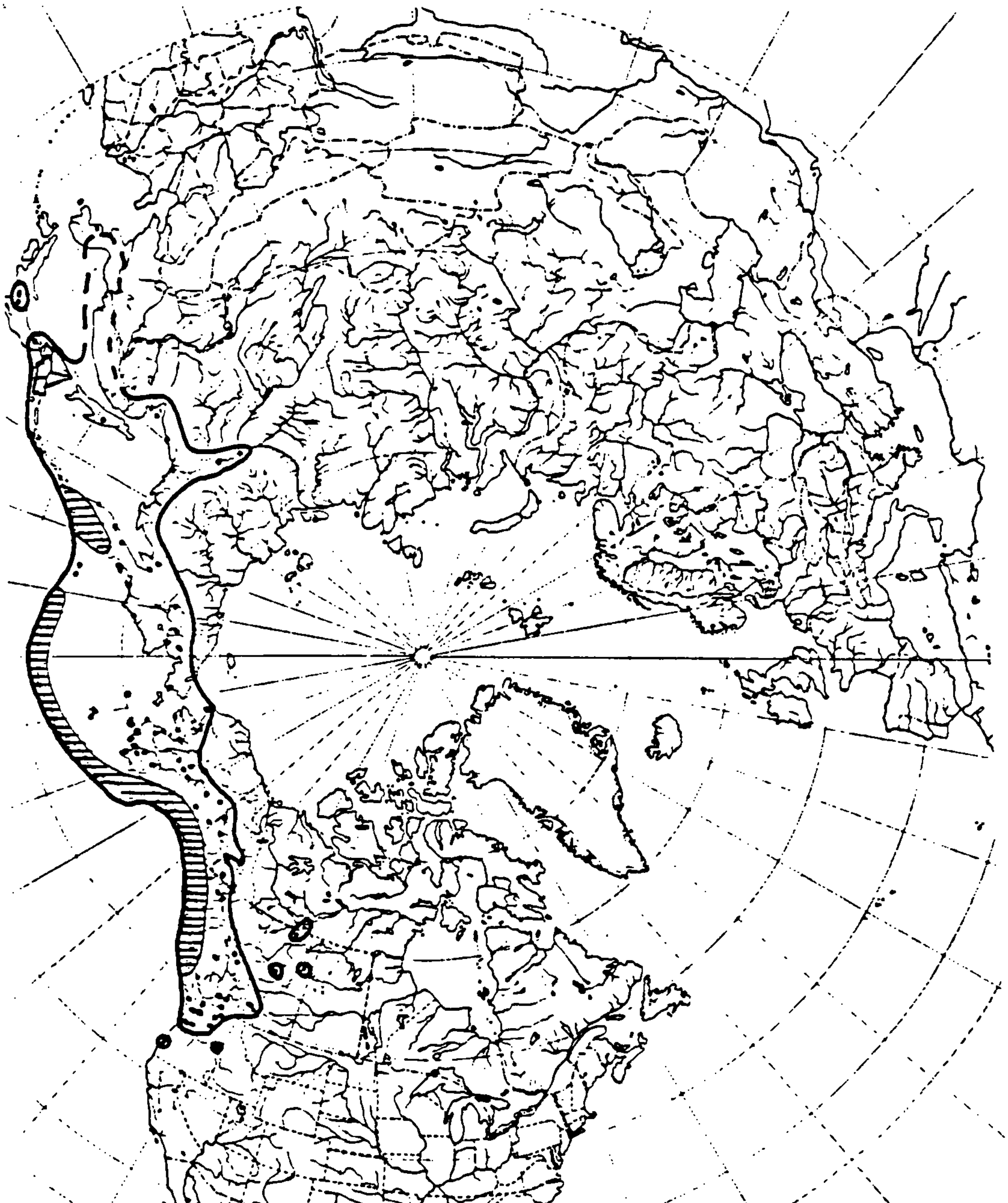
b. Circumpolar Boreal Distribution

example: Equisetum arvense (modified after Meusel et al. (1965))



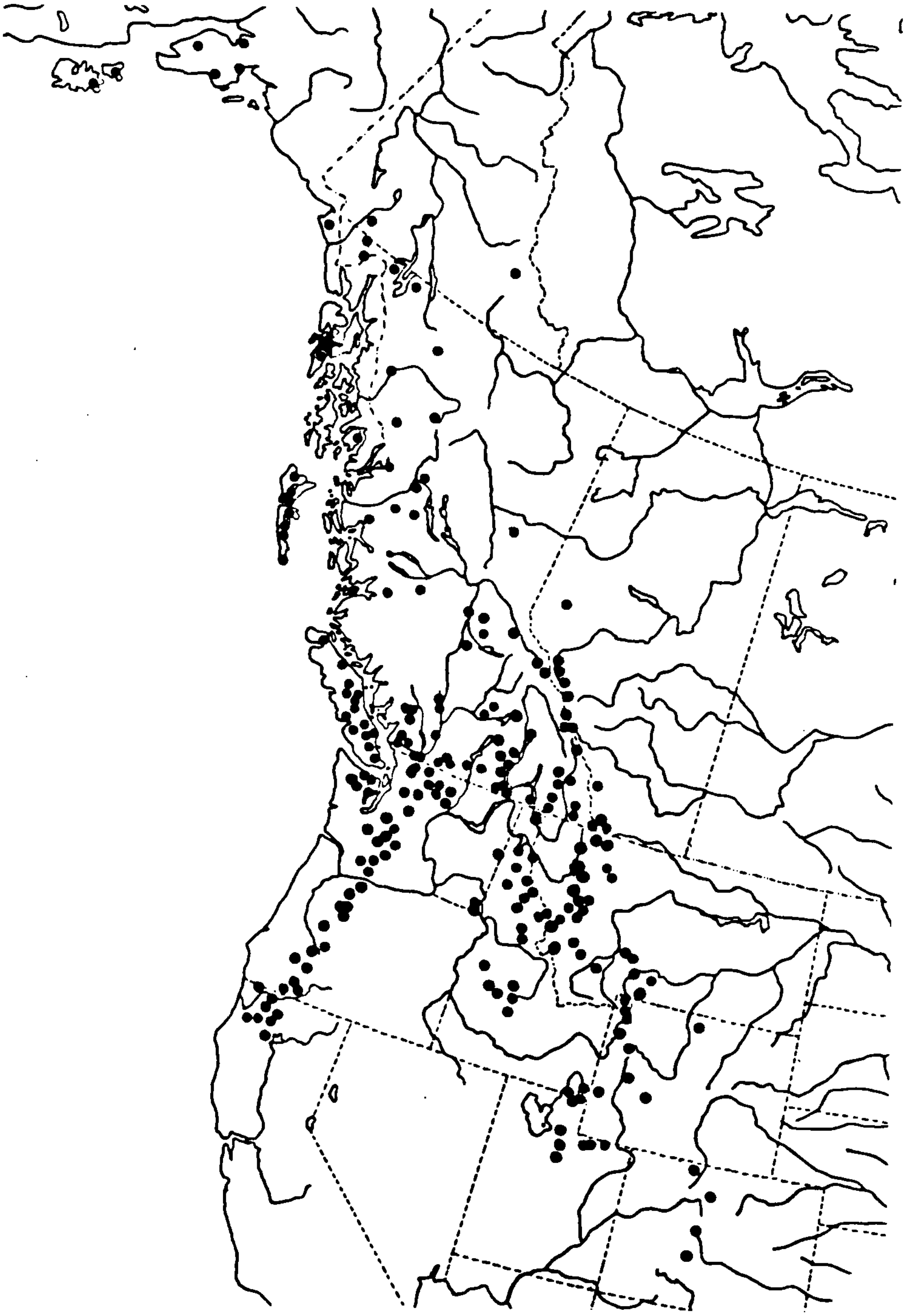
c. Amphiberingian Distribution

example: Trientalis europaea subsp. arctica (from: Hultén, (1971a))



d. North American Cordilleran Distribution

example: <u>Arnica</u> <u>latifolia</u> (from: Straley, (1980))

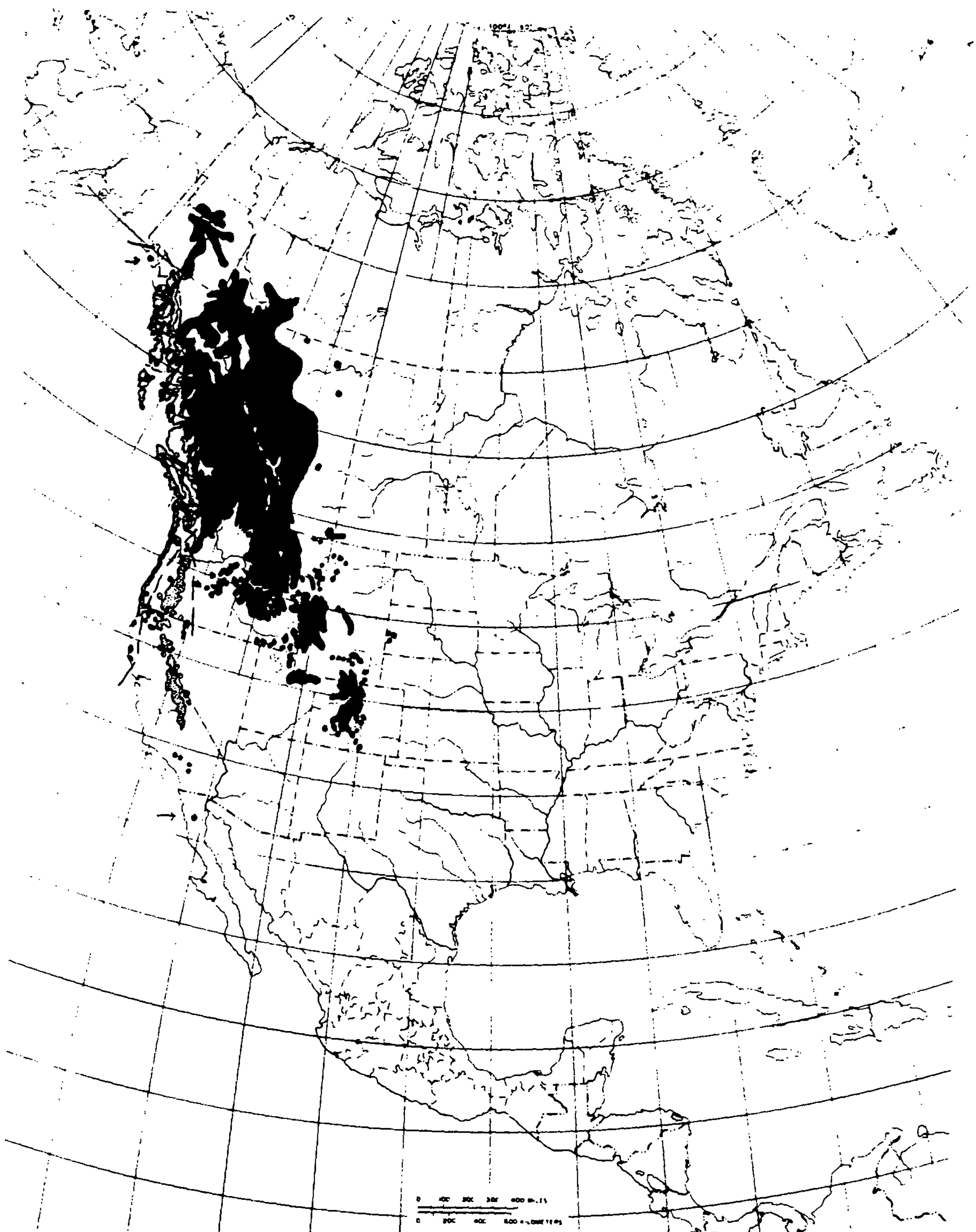


e. North American Boreal Distribution

example: <u>Picea glauca</u> (from: Little, (1971))

f. Western North American Distribution

example: Pinus contorta var. latifolia (from: Little, (1971))



g. North American Arctic-Alpine Distribution

example: Dryas integrifolia subsp. integrifolia (from: Porsild, (1958))

APPENDIX III

Rare Vascular Plants of British Columbia

Found in the Study Area

The rare vascular plants of British Columbia, as treated by Straley _et al_, (1985), are divided into four categories; R1, R2, R3 and R4. These categories are defined by the authors as follows:

R1 - Single or few populations, composed of few plants.

R2 - Several populations, locally common.

R3 - Widespread or scattered populations with small numbers of plants.

R4 - Restricted distributions, large populations.

The following table includes a list of plants collected from the study area which appear in one of the above categories, the category to which each is assigned and the local abundance of each. Plants are listed alphabetically.

Species	Category of Rarity	Local Abundance
Adoxa moschatellina	R3	rare
Arenaria longipedunculata	R1	rare to sparse
Calamagrostis stricta var. _stricta_	R3	rare to sparse
Callitriche anceps	R1	rare
Carex bigelowii	R3	rare
Carex enanderi	R3	sparse to common
Carex heleonastes	R2	sparse

Species	Category	Local Abundance
Cystopteris montana	R3	rare
Draba fladnizensis	R1	rare
Draba lactea	R3	rare
Draba macounii	R3	rare
Eriophorum callitrix	R2	sparse
Juncus arcticus subsp. *alaskanus*	R1	rare to sparse
Juncus biglumis	R1	sparse
Juncus triglumis	R2	sparse
Koenigia islandica	R3	rare to sparse
Ledum palustre subsp. *decumbens*	R4	common
Lloydia serotina	R4	rare to sparse
Luzula arctica subsp. *latifolia*	R2	rare
Luzula confusa	R1	sparse
Pedicularis verticillata	R3	sparse
Potentilla hyparctica	R3	rare
Pyrola grandiflora	R3	sparse
Ranunculus pygmaeus	R3	rare to sparse
Ranunculus sulphureus var. *sulphureus*	R1	rare to sparse
Sagina intermedia	R1	rare
Salix planifolia subsp. *pulchra* var. *pulchra*	R2	common to abundant

Species	Category	Local Abundance
Silene uralensis subsp. *attenuata*	R3	rare
Stellaria umbellata	R2	rare to sparse
Viola epipsila subsp. *repens*	R3	rare
Woodsia alpina	R1	rare

Total taxa - 239

Taxa on list - 31

R1 - 9 species - 3.8% of total flora

R2 - 6 species - 2.5% of total flora

R3 - 14 species - 5.9% of total flora

R4 - 2 species - 0.8% of total flora