Botanical Excursion . . .

to Jasper and Banff National Parks, Alberta.

By

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CANADA
Department of Northern Affairs and National Resources

NATIONAL MUSEUM OF CANADA

BOTANICAL EXCURSION

to Jasper and Banff National Parks, Alberta: alpine and subalpine flora

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Issued under the authority of
The Honourable Alvin Hamilton, P.C., M.P.
Ottawa, 1959

72623-1

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THE QUEEN'S PRINTER AND CONTROLLER OF STATIONERY
OTTAWA, 1959

Cat. No. R92-1459

BOTANICAL EXCURSION TO JASPER AND BANFF NATIONAL PARKS, ALBERTA: ALPINE AND SUBALPINE FLORA, JULY 20 to 30, 1959

This field trip through Jasper and Banff National Parks in the southeastern Canadian Rocky Mountains (Alberta) is designed for the study of alpine and subalpine vegetation undisturbed by man or by the grazing of livestock. The general area lies between lat. 51° and 53°, at elevations above sea-level between 4,000 and 8,000 feet (1,220–2,440 m.). The flora is comparatively rich and varied. Approximately 1,250 species of vascular plants are known from the eastern Canadian Rockies between lat. 49° and 54°, among them many of arctic-alpine range that here reach their southern limit. Of particular interest is the large Cordilleran element and a much smaller group of Amphi-Beringian species. In the dry easternmost parts of the area a large number of plains and foothill species occur in alpine grassland near or above timberline. Timberline is usually at about 7,000 feet. The principal forest-forming species, in order of importance, are: *Pinus contorta* var. *latifolia*, *Picea Engelmanni*, *P. glauca*, *Abies lasiocarpa*, *Populus tremuloides*, *P. balsamifera*, *Pseudotsuga taxifolia* var. *glauca*, *Picea mariana*, and *Larix Lyallii*. There will be ample opportunity for examining vegetation on valley floodplains, screes, and moraines, as well as on meadows, tundra, and heath above timberline.

ROUTE. Assemble at Jasper, Alberta, on July 20. During the following two days, meadow and forest types of the Athabasca valley floodplains will be studied, together with vegetation on dry slopes and ridges of the eastern dry belt. During a trip to Mount Edith Cavell, alpine vegetation on fresh moraines, snowbeds, and alpine meadows will be studied (elevation 6,000–6,500 ft.). On July 23 the tour continues south along the Jasper-Banff highway. Several stops will be made en route at points of interest. In Sunwapta Pass (7,200 ft.), alpine meadows and tundra will be examined near Columbia Glacier. From July 24 to 30 a series of excursions will be made from Banff (4,500 ft.) to

points of botanical interest. Two full days will be spent above timberline. One day will be devoted to general sightseeing.

All travel will be by chartered bus, and no private cars will be allowed. None of the trips will require strenuous or difficult climbing, but walks of up to four miles over moderately rough terrain should be anticipated.

[1]"From Edmonton, on the North Saskatchewan River, the route into Jasper National Park is through the hummocky country underlain by the moraines left by the continental ice-sheet. At about Hinton it enters the rolling forest-covered foothills of the Rocky Mountains and follows Athabasca River into the mountains and Jasper National Park.

"The Rocky Mountains here consist of northwesterly trending ridges of Palæozoic rocks that consist largely of massive carbonates. These ridges have been carried up on thrust faults over younger Mesozoic shales and sandstones which form the valleys

1. Columbia Icefield Chalet at Mile 65 on Jasper-Banff highway. In centre is Dome glacier with its fast retreating snout. Mt. Kitchener to the right.

[1]General notes on topography and geology of the route were kindly prepared by Dr. Helen Belyea, Geological Survey of Canada, Department of Mines and Technical Surveys, Calgary, Alta.

and, at Pocahontas, contain deposits of coal. Distortion of the strata in the mountain ridges on either side of the valley bears witness to the forces at work.

"The Athabasca river between the mountain front and Jasper townsite (3,470 ft.) has cut a deep valley across the mountain ranges. The river itself is flanked by pleasant lakes, remnants of a large ice-age lake which filled the valley. Terraces, the ancient shore lines of this lake, are visible along the route.

"The Banff-Jasper Highway from Jasper townsite southeastward up Athabasca river follows a structural valley in early Palæozoic and Precambrian sedimentary rocks, older rocks than those seen east of Jasper. The effect of mountain glaciation is more apparent here than in the mountains to the east. The peaks are sharply angular, often horn-shaped, with vertical cliffs underlain by hollows or cirques, many of which still contain glaciers. Mount Edith Cavell is a typical example. Here the Angel glacier rests at the back of a cirque under the jagged peak.

"South of Mount Edith Cavell a view westward up the Whirlpool River follows an early route of the fur traders from the Athabasca across the mountains to the headwaters of the Columbia. Shortly before the Sunwapta Falls the road leaves the Athabasca valley and follows the Sunwapta River to its headwaters in the Athabasca glacier, at Sunwapta Pass. The Athabasca glacier as well as the Stutfield, Dome (Fig. 1), and Saskatchewan glaciers are tongues from the Columbia Icefield. Hummocks of gravel and boulders in front of the Athabasca glacier are the moraine left as the ice retreated to its present position. A small lake is fed by melt waters that trickle from the ice.

"From the chalet the road passes over the moraine through an alpine meadow to Sunwapta Pass, thence down into the headwaters of the North Saskatchewan River, the magnificent view of Mount Coleman appearing at every bend in the road. The North Saskatchewan, last seen as a broad stream at Edmonton, here follows a valley parallel to the trend of the mountain ridges to Saskatchewan River Crossing where it turns eastward and has cut a narrow channel across the mountain ranges on its way to the Plains. At Saskatchewan River Crossing, the river is a typical braided mountain stream carrying a load of gravel, much of which has been left behind as bars in the stream-bed. From the crossing the road continues along the same southeasterly trending valley through early Palæozoic and Precambrian sedimentary rocks, following the Mistaya River to its headwaters at Bow Pass.

Horn peaks, knife-edge ridges, glaciers, and glacial lakes and streams make the view to the west an interesting one. From Bow Pass the route follows the ever-broadening Bow River to Banff. A side trip from Lake Louise Junction will be made to Lake Louise. At the head of the lake the magnificent Victoria glacier is seen topped by vertical cliffs that rise to the Continental Divide. Another side road to Moraine Lake follows the Valley of the Ten Peaks, a hanging valley a thousand feet above the broad U-shaped valley of the Bow.

"From Lake Louise Junction the highway follows the same southeasterly trend to Eisenhower Junction. There, the river turns eastward to cut across the mountain ranges past the town of Banff (4,538 ft.). These ranges are the southwestward extension of those crossed on the route up the Athabasca River to Jasper and are also formed largely of late Palæozoic carbonate rocks thrust over Mesozoic shales and sandstones."

From the look-out on Sulphur Mt. (7,500 ft.) south of Banff there is a fine view of the town and a panoramic view of the Bow valley east and west of Banff and to Mount Norquay and the Cascade range across the valley.

Orographically the region is of considerable interest. In the east-west transect across the Rocky Mountains, from the Cascade trough near Banff to Golden and the Columbia valley, all geological periods from the Precambrian to the Cretaceous inclusive, except the Triassic, are represented. In this section the uptilted stratified rocks exposed aggregate more than 52,628 feet (16,049 m.) in thickness (Allan, 1913)[1].

Photographs (Fig. 1,4,6, and 7) were kindly supplied by the Canadian Government Travel Bureau; the rest were taken by the author.

From Jasper two all-day excursions by bus are planned for July 21 and 22. One to the north side of Athabasca valley, the other to an alpine valley near Mount Edith Cavell.

EXCURSION NO. 1. TUESDAY, JULY 21. DEPARTURE FROM HOTEL ASTORIA AT 9:00 A.M.

Leaving Jasper townsite we travel east along the main highway toward Edmonton, across the alluvial flats of Athabasca valley. A 15-minute stop is made near Mile 11 to examine a stand of black spruce *(Picea mariana)*, near the southern limit of that

[1]Guide Book No. 8, part 2. Dept of Mines. Transcontinental Excursion, C. 1.

species in western Canada. Black spruce, normally characteristic of acid peat bogs, here and elsewhere in the valley of the Athabasca grows in mineral, alluvial soils rich in calcium. In such places it is accompanied by such obligate calcicoles as *Tofieldia glutinosa, Dodecatheon pauciflorum, Habenaria hyperborea, Potentilla fruticosa, Kobresia simpliciuscula,* and *Solidago decumbens.* We also note the absence here of *Sphagnum.*

Proceeding on our trip we soon leave the main highway by a small fire road heading toward the north side of the valley. One mile from the road fork we stop for one hour to examine an open white spruce bog or fen on calcareous clay. The water table is close to the surface, and water stands in all depressions. A short distance north of the road is a shallow pond, the remnant of a lake which not long ago occupied this part of the valley. The pond is fringed by tall willow (*Salix* spp.) and *Cornus stolonifera;* in the water grow *Carex aquatilis, C. rostrata, Scirpus* spp., and *Polygonum amphibium.*

Some of the spruces show a slight pubescence of the young twigs but otherwise are typical *Picea glauca* var. *albertiana.* No black spruce is present. In the comparatively rich flora of the fen we notice the following primary species: *Triglochin maritimum, Carex scirpoidea, C. flava, C. Buxbaumii, Scirpus Rollandii, Juncus alpinus* var. *insignis, Tofieldia glutinosa, Salix brachycarpa, S. myrtillifolia, Potentilla fruticosa, Arctostaphylos Uva-ursi, Galium boreale, Aster junciformis,* and *A. laevis* var. *Geyeri.* Common, but of more casual occurrence are *Equisetum variegatum, Selaginella selaginoides, Juniperus horizontalis, Triglochin palustre, Deschampsia caespitosa, Agropyron trachycaulum, Carex aurea, Eriophorum viridi-carinatum, Juncus balticus* var. *montanus, Sisyrinchium angustifolium, Zygadenus elegans, Smilacina stellata, Lilium philadelphicum* var. *montanum, Cypripedium passerinum, Habenaria hyperborea, Populus balsamifera, Salix planifolia, Geocaulon lividum, Anemone parviflora, Arabis lyrata* var. *kamchatica, Parnassia montanensis, Fragaria glauca, Rosa Woodsii, R. acicularis, Rubus acaulis, Shepherdia canadensis, Castilleja* sp., *Pinguicula vulgaris, Campanula rotundifolia (petiolata), Antennaria pulcherrima, Solidago lepida,* and *S. decumbens.* Toward the pond the spruces are denser with an understory of willow. On partly shaded hummocks grow a few woodland species, including *Pyrola asarifolia* var. *purpurea, Linnaea borealis* var. *americana,* and *Orchis rotundifolia.*

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A few miles farther on, the road crosses better-drained glacial till slopes and boulder fans, on which grow dense stands of lodgepole pine *(Pinus contorta* var. *latifolia)*. The stands of Douglas fir *(Pseudotsuga taxifolia* var. *glauca)* that formerly occupied these sites were removed by logging long ago. Here and there a few trees have been spared by the loggers. We stop for a few minutes at Mile 13 in a small grove of Douglas fir mixed with white spruce. A few plants of *Disporum trachycarpum* grow under the trees, but no regeneration of the Douglas fir can be seen. Where, half a mile farther on, the road crosses a boulder fan, we pass through a small grove of paper birch *(Betula papyrifera)*.

As we travel east the landscape looks drier. The decreasing precipitation is reflected by the xeric vegetation of the valley slopes and terraces left by ice-dammed lakes that formerly occupied the valley. The lodgepole pine forest here gives place to grassland and aspen forest. We cross several small areas of grassland and stop for 30 minutes to examine the flora. These prairies once were more extensive but are now being encroached by aspen *(Populus tremuloides)*, which, however, is kept in check, to some extent, by the grazing of elk *(Cervus canadensis)* and horses. The top soil is a fine alluvium resting on coarse river gravels. Primary species in the prairie are: *Stipa comata, Calamagrostis montanensis, Bromus Pumpellianus, Agropyron trachycaulum, Astragalus striatus, Artemisia camporum,* and *A. frigida.* Frequent but of less importance are: *Koeleria cristata, Commandra Richardsiana, Potentilla Hippiana, Oxytropis splendens, Linum Lewisii, Lappula Redowskii, Campanula rotundifolia (petiolata),* and *Gaillardia aristata.*

Leaving the prairies, we stop for 1½ hours at Corral Creek. A few hundred yards below the picnic site is a beaver pond and several well-developed beaver houses. While lunch is being readied, there will be time for a brief inspection of the beaver pond and of an open stand of Douglas fir on a dry slope above the road. The ground cover between the trees consists mainly of *Arctostaphylos Uva-ursi* and large, flat bushes of *Juniperus communis;* among these grow *Elaeagnus commutatus, Elymus innovatus, Rosa Woodsii, Artemisia frigida,* and *Solidago decumbens.*

A mile or so beyond Corral Creek the road crosses the south spur of De Smet Range. Several game trails converge here, and the stony, windswept ridge is a favourite resting place for bighorn sheep *(Ovis canadensis)*. Dominant on the ridge are: *Arctostaphylos Uva-ursi, Potentilla fruticosa, Juniperus horizontalis,* and *Artemisia frigida.* In recent years Russian thistle *(Salsola Kali* var. *tenuifolia)* has made its appearance here. Frequent also are most of the species previously noted in the prairies and, besides *Kobresia myosuroides, Carex scirpoidea, C. obtusata, Physaria didymocarpa, Braya* sp., *Dryas integrifolia*, Symphoricarpos albus, Chamaerhodos erecta, Crypthantha Macounii*, Lappula Redowskii,* and *Erigeron compositus,* the last four evidently spread by the sheep. Return trip for Jasper starts at 6:00.

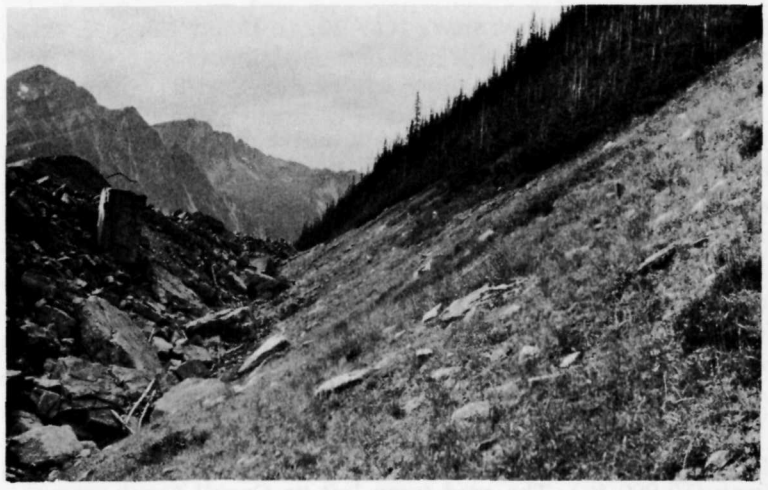
EXCURSION NO. 2. WEDNESDAY, JULY 22, TO MOUNT EDITH CAVELL. DEPARTURE FROM ASTORIA HOTEL AT 9:00 A.M.

Distance from Jasper is about eighteen miles by bus. Approximate length of easy walk about four miles. Leaving Jasper we follow the Jasper-Banff highway for 9 miles along the west side of Athabasca River, mainly through stands of lodgepole pine showing fine examples of fire succession. Toward the east there is a fine view of Maligne Range with peaks between 8,000 and 9,000 feet. After crossing the Astoria River we turn right, following a smaller road which climbs steeply along the left side of the Astoria canyon. From a point overlooking the Astoria valley there is a fine view to Oldhorn Mountain across the valley (9,780 ft.) and to a mass of high, rugged peaks surrounded by glaciers beyond Amethyst Lakes; the highest of these is Simon Peak (10,900 ft.). The road turns left up Cavell Creek, passing above Cavell Lake and ends at the tea room (elev. 6,100 ft.) facing Angel Glacier and Mount Edith Cavell (11,033 ft.).

From a catchment area on the north slope of Mount Cavell, Angel Glacier descends over a rock face, as an ice-fall, to the floor of the valley below, where the broken fragments are again consolidated into a mass of now stagnant glacier ice, covered by till and broken rocks from the crags above. Several terminal and lateral moraines testify to former advances; during one of these, the glacier snout pushed against the east side of the valley as shown by a wall of angular blocks of massive sandstone, from the face of Mount Cavell, now lodged against the steep east slope. An interesting assembly of pioneer species grow on this yet unstable rock wall, as well as on other moraines and on

*Species here and elsewhere marked by an asterisk are protected and may not be collected without a permit.

glacial debris now partly covering the stagnant glacier. Some of those noted along the footpath leading from the tea room up the east side of the valley are: *Cryptogramma acrostichoides, Dryopteris disjuncta, Athyrium alpestre, Abies lasiocarpa* (seedlings only), *Agropyron latiglume, Poa alpina, Festuca brachyphylla, Trisetum spicatum, Deschampsia caespitosa, Carex concinna, Luzula arcuata, L. Piperi, Salix glauca, S. vestita* var. *erecta, Oxyria digyna, Sagina Linnaei, Parnassia fimbriata, Tiarella unifoliata, Saxifraga bronchialis* ssp. *saximontana, Epilobium latifolium,* and *Menziesia ferruginea.*



2. Looking north along trough formed between terminal moraine of Angel glacier and the east slope of valley. In winter snow accumulates in trough from top of moraine to lower limit of *Abies lasiocarpa* scrub.

After crossing the lower part of the moraine flat, the path descends into a trough formed between the forested east slope of the valley and the east-facing wall of the lateral moraine (Fig. 2). Much snow accumulates in this trough during winter, creating a variety of snowbed sites, of which those against the rock-wall are the deepest and the last to become free of snow. By the end of the winter, snow masses extend from the top of the wall up the slope to the edge of the alpine fir forest *(Abies lasiocarpa).* The snow accumulated in the lower part of the trough may last until the end of July or even to mid-August. On such sites are found snow-bed vegetation composed only of species that are able to endure the

most prolonged snowcover. Some dominant species of the late snowbeds are listed below in descending order of ability to endure prolonged snowcover: *Carex pyrenaica, Equisetum variegatum, Salix nivalis, Equisetum arvense, Leptarrhena pyrolifolia, Sibbaldia procumbens, Parnassia fimbriata,* and *Caltha leptosepala.* Among the additional species of more casual occurrence here, some are true late snowbed plants while others belong in the less deeply covered herbmat community of the slopes above: *Lycopodium alpinum, Poa paucispicula, Carex capillaris, Juncus biglumis,* Koenigia islandica*, Silene acaulis, Anemone parviflora, Ranunculus pygmaeus, Cardamine bellidifolia, Saxifraga rivularis, Epilobium anagallidifolium, Cassiope Mertensiana,* and *Taraxacum scopulorum.*

A good many of the late snowbed species are arctic. None are calcicolous. Of special interest among the arctic species is *Koenigia islandica,* thus far not collected elsewhere in the Canadian Rockies. Its nearest stations are in Southeast Yukon and in the high mountains of Colorado.

Along the east slope of the valley, facing the rock-wall of the terminal moraine, is a succession of somewhat richer snowbed sites. All have good internal drainage. Some are comparatively dry in late summer, being watered mainly from melting snowdrifts; some derive their water supply from brooks or from seepage from large snowbanks on the plateau above and remain wet throughout the growing season. The steeper and drier sites are covered by heath communities with the following primary species: *Carex spectabilis, Salix Barrattiana, Pulsatilla occidentalis, Sibbaldia procumbens, Luetkea pectinata, Phyllodoce glandulifera, Vaccinium scoparium,* and *Artemisia arctica.* Casual or less frequent are: *Lycopodium Selago, L. alpinum, Agrostis humilis, Veratrum Eschscholtzii, Polygonum viviparum, Mitella pentandra, Pyrola minor, P. secunda, Vaccinium membranaceum, Penstemon fruticosus,* and *Campanula lasiocarpa*.*

The permanently wet sites are found mainly on erosion fans formed by rock slides or stream deposition, at the foot of gullies. On these are found a somewhat richer assembly of herbmat – fen species, including a number of ubiquitous snowbed plants. Common or primary species here are: *Carex spectabilis, C. pyrenaica, Juncus Mertensianus, Salix vestita* var. *erecta, S. Barrattiana, Pulsatilla occidentalis, Trollius albiflorus, Caltha leptosepala, Parnassia fimbriata, Leptarrhena pyrolifolia, Cassiope Mertensiana,* and *Phyllodoce glandulifera.* Of more

casual occurrence are: *Lycopodium Selago, L. alpinum, Equisetum arvense, E. scirpoides, Selaginella selaginoides, Agrostis humilis, Calamagrostis canadensis, Phleum commutatum, Poa alpina, P. paucispicula, Vahlodea atropurpurea* var. *latifolia, Carex eurystachya* (recently described by F.J. Hermann from this vicinity), *Eriophorum angustifolium, Juncus castaneus, J. Drummondii, Veratrum Eschscholtzii, Polygonum viviparum, Anemone parviflora, Saxifraga Lyallii, Tiarella unifoliata, Sibbaldia procumbens, Epilobium Hornemannii, E. latifolium, Viola orbiculata, Pyrola minor, P. secunda, P. bracteata, P. asarifolia* var. *purpurea, Phyllodoce empetriformis, Vaccinium membranaceum, V. scoparium, Pedicularis contorta, Veronica alpina, Castilleja miniata, Valeriana sitchensis, Arnica mollis, A. amplexicaulis,* and *Artemisia arctica.*

Farther up the valley on a more exposed and well-drained slate scree we note: *Agrostis humilis, Poa lanata, Trisetum spicatum, Carex pyrenaica, Salix arctica, Sagina intermedia, Arenaria sajanensis, Anemone Drummondii, A. parviflora, Ranunculus Eschscholtzii, Cardamine bellidifolia, Saxifraga ferruginea* var. *Macounii, S. bronchialis* ssp. *saximontana, S. rivularis, Tiarella unifoliata, Astragalus alpinus, Epilobium angustifolium, E. latifolium, Viola adunca, Gentiana glauca, G. propinqua, Penstemon fruticosus, Campanula lasiocarpa, Artemisia arctica, Antennaria media,* and *Arnica louiseana.*

Rich alpine meadows are found also on the upper and more gentle slopes and plateaus above timberline. Their composition is similar to those described above, but owing to the presence of more varied habitats, the number and variety of species is larger. Besides pure stands of *Luetkea pectinata* and large clumps of *Senecio triangularis,* up to three feet tall, the following additional species were noted here: *Antennaria lanata, Erigeron peregrinus, Salix commutata, Petasites hyperboreus, Luzula parviflora,* and *Pedicularis bracteosa.* Beyond these alpine meadows, scrub forest of alpine fir extends to about 7,200 feet elevation, beyond which are alpine heath, stony slopes, and cliffs, inhabited by a flora of high-alpine species.

From the chalet where we left the bus, a path leads across Cavell Creek to lateral moraines and talus slopes below Mount Edith Cavell. The vegetation on these unstable screes is sparse. Most of the species noted are the pioneer species seen earlier on the moraines in the valley flat. Some additional ones, not noted on the east side of the valley are: *Loiseleuria procumbens**

3. *Dryas Hookeriana* Juz.

(the only station known from Jasper and Banff Parks), *Cassiope tetragona* ssp. *saximontana, Dryas Hookeriana, Salix reticulata* var. *saximontana, Luzula spicata, Agrostis idahoensis, Carex supina* ssp. *spaniocarpa, Woodsia glabella, Anaphalis margaritacea, Potentilla Ledebouriana,* and *Empetrum nigrum.*

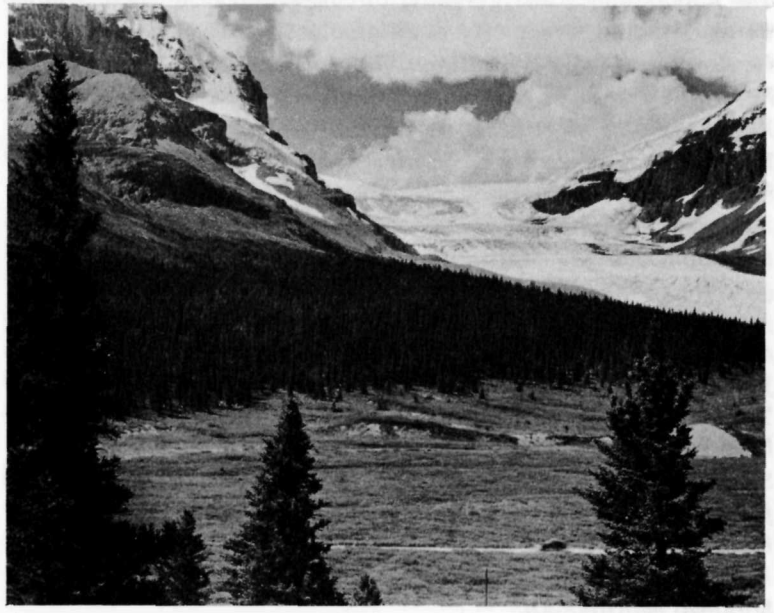
The soils in the Mount Cavell area are mainly derived from acid Precambrian and early Palæozoic sedimentary rocks. In consequence, we have noted a complete absence of obligate calcicoles and the presence of a comparatively large number of ericaceous plants besides several ferns and fern allies, whereas species of the *Umbelliferae, Leguminosae, Rosaceae,* and *Cruciferae* are either totally lacking or poorly represented.

The tiny rock rabbit or pika *(Ochotona princeps)* is common in the rock slides lining the valley where everywhere its small "haystacks" of drying winter food may be seen. Rock rabbits are timid animals and by their uniform grey colour blend so perfectly against the rocks among which they live that were it not for their occasional and repeated call "eek", they might easily escape notice altogether. Two species of the somewhat larger and prominently striped chipmunk *(Eutamias)* are common also. They are much bolder and near the footpath may often be seen "begging" for hand-outs. Most interesting of all is the much larger

hoary marmot or whistler *(Marmota caligata)* whose shrill whistle warns that intruders are approaching his territory. Commonly noted for their extreme wariness, the marmots of the Mount Cavell area seem unusually tame and, when not alarmed while feeding in the alpine meadows, may come to within a few feet of the observer. On rare occasions mountain caribou *(Rangifer fortidens)* may be seen near timberline, at the head of the valley.

EXCURSION NO. 3. JASPER TO BANFF (APPROX. 187 MILES, BY BUS). DEPARTURE FROM HOTEL ASTORIA THURSDAY, JULY 23 AT 9:00 A.M.

For the first 21 miles we follow the main highway along the west side of the Athabasca valley, mostly through lodgepole pine forest *(Pinus contorta* var. *latifolia)* growing on floodplains, boulder outwash slopes, and screes. First stop is at Mile 21 where the road crosses the Athabasca River just below Athabasca Falls (15 minutes stop). Half a mile beyond the falls is a fine example of young, even-aged pine forest which followed a fire. At Mile 27 we pass through black spruce *(Picea mariana)* forest growing on calcareous alluvium with a ground cover similar to that of the black spruce bog examined northeast of Jasper. One mile farther on we pass through aspen forest *(Populus tremuloides)* showing a uniform black "high water" line caused by elk *(Cervus canadensis)* chewing the bark during winters of heavy snows. From Mile 58 there is a fine view of the Sunwapta River flats showing early stages of floodplain succession in which the earliest pioneer species are *Epilobium latifolium* and *Dryas Drummondii.* Near Mile 66 still younger floodplains show extensive cover of pure *Dryas Drummondii.* From Mile 70 there is a fine view across the Sunwapta River valley to Dome Glacier flanked by Mount Kitchener and Stutfield Peaks, both well over 11,000 feet. From the chalet at Mile 65, there is a grand view of the even more spectacular Athabasca Glacier; these, and the Saskatchewan Glacier south of the divide, are glacier tongues flowing from the Columbia ice-field, the largest continuous ice-field in the southern Canadian Cordillera. Waters from the Columbia ice-field, through a tributary to the Columbia River, flow into the Pacific Ocean, to the Arctic Ocean through the Athabasca and the Mackenzie, and to Hudson Bay via the North Saskatchewan. Following a stop for lunch, we have time to study the alpine meadows and willow thickets that extend from the chalet to Sunwapta Pass (6,675 ft.) 2 miles south of the chalet (Fig. 4).



4. Treeless subalpine meadow in Sunwapta Pass. In background Athabasca glacier. Note alpine fir forest on mountain slope above meadow.

5. *Abies lasiocarpa* showing annular "candelabrum" growth due to layering.

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The soil is sandy and gravelly, circumneutral or somewhat acid. We again note the scarcity of calcicoles. Primary species in the meadows are: *Salix Barrattiana, Betula glandulosa, Salix nivalis, Potentilla fruticosa, Kobresia myosuroides, Danthonia intermedia, Arctostaphylos Uva-ursi, A. rubra, Kobresia simpliciuscula, Deschampsia caespitosa, Saxifraga aizoides, Equisetum variegatum.* Casual and less common are: *Selaginella selaginoides, Equisetum arvense, Triglochin palustre, Agropyron violaceum, Poa alpina, Carex capillaris, C. Lachenalii, C. stans, C. microglochin, C. saxatilis, C. gynocrates, C. physocarpa, Eleocharis pauciflora, Scirpus caespitosus* ssp. *austriacus, Eriophorum angustifolium, S. brachyantherum, Eriophorum Scheuchzeri, Juncus castaneus, J. balticus* var. *montanus, J. albescens, Tofieldia pusilla, Salix planifolia, S. glauca* var. *acutifolia, S. brachycarpa, S. myrtillifolia, S. reticulata, Polygonum viviparum, Silene acaulis, Cerastium Earlei, Anemone parviflora, Sibbaldia procumbens, Fragaria glauca, Dryas Hookeriana, D. integrifolia*, Empetrum nigrum, Pyrola asarifolia* var. *purpurea, P. minor, Pedicularis groenlandica, P. Oederi*, Senecio lugens,* and *Solidago multiradiata.*

On slightly higher and better-drained parts of the flat grow low but dense willow-birch thickets, composed mainly of *Salix Barrattiana, S. glauca* var. *acutifolia, Betula glandulosa, Potentilla fruticosa,* and *Elymus glaucus.* Growing among the willow we note: *Pinus contorta* var. *latifolia* (seedlings), *Danthonia intermedia, Elymus innovatus, Anemone parviflora, Fragaria glauca, Rubus acaulis, Astragalus frigidus* var. *americanus, Hedysarum americanum, Epilobium angustifolium, Campanula rotundifolia, Solidago multiradiata, Senecio lugens,* and *Achillea nigrescens.*

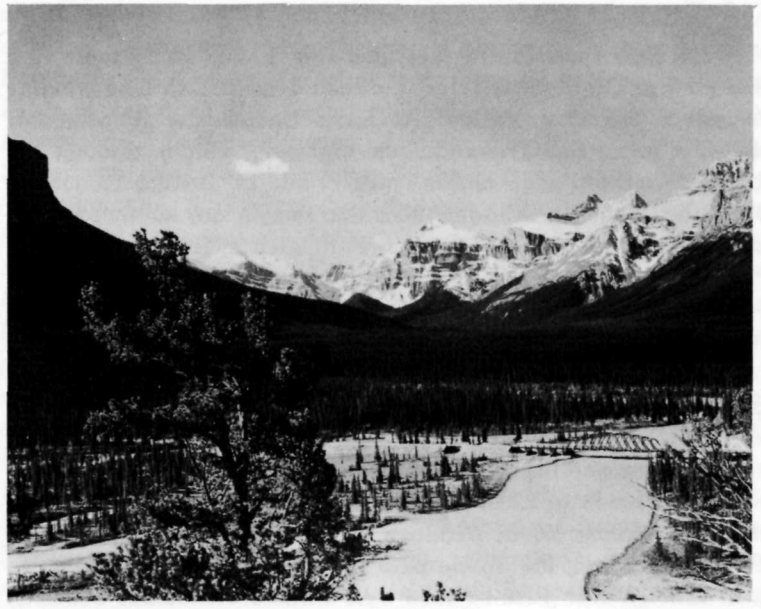
The pass itself is treeless owing to winter snow depth, but on the lower slopes of the mountains, alpine fir forest extends to true timberline about 500 feet above the valley bottom.

From Sunwapta Pass the road descends steeply into the valley of the North Saskatchewan River. Near Mile 80, just beyond Nigel Creek, which enters from the left, the road cuts through a mature stand of Engelmann spruce *(Picea Engelmanni).* From the road we have a fine view of Cirrus Mountain and Mount Coleman, both well over 10,000 feet. Near Mile 90, the Alexandra River, a large tributary to the Saskatchewan, enters from the west. The broad floodplain, between flat braided stream channels, is flooded for a short time in spring. We stop here for 30 minutes

to examine the succession of pioneer species. In 1945, the islands between river channels were almost completely covered by a mat of *Dryas Drummondii* with occasional clumps of *Epilobium latifolium.* While still common, *Dryas* is no longer dominant. Willow and conifers and a number of forest species have invaded the *Dryas* mat.

The road continues along the east bank of the North Saskatchewan which turns east at Mile 95 through a gap between Mount Wilson (10,631 feet) to the north and the almost 11,000 feet high Mount Murchison to the south. On the dry slope of the approach to the bridge across the Saskatchewan we pass a small grove of limber pine *(Pinus flexilis)* (Fig. 6). In the flat to the south of the river are found the rare *Carex Franklinii** and the single western station of *Salix calcicola*.*

The road now ascends the east side of the broadly U-shaped Mistaya Valley (Fig. 7). Through openings in the forest we have glimpses to the right of Waterfowl and Mistaya lakes. Moose *(Alces americana)* are often seen feeding on the shallow bottom of these lakes.



6. North Saskatchewan River Crossing looking south up the broad, U-shaped and densely forested Mistaya valley. In foreground *Pinus flexilis.*

7. View north across Peyto Lake down Mistaya valley.

From Bow Pass (6,878 feet) and Bow Lake, where there is a fine view of Crowfoot Glacier, the road descends in long winding curves to the Bow Valley. At Lake Louise the Jasper-Banff highway joins the Trans-Canada highway, which, through the Kicking Horse Pass, enters Yoho Park in British Columbia. Opposite Mount Eisenhower, 20 miles further on, another branch road leads south through Kootenay Park, also in British Columbia.

We stop at the bungalow camp at the mouth of Johnson Creek, 4 miles beyond Mount Eisenhower, which is to be our headquarters during the remainder of the excursion.

Excursion No. 4. To Lake Louise and Lake Agnes.

From the parking lot near Chateau Lake Louise (5,680 ft.) a footpath leads to Lake Agnes (6,885 ft.) nestling in a hanging valley between Mount Niblock (9,764 ft.) and Mount White (9,786 ft.). Along the 3-mile path to the head of Lake Agnes we pass through four more or less well-defined altitudinal zones of vegetation. (1) Mature Engelmann spruce forest. Forest floor is in deep shade, often with a thick carpet mainly of pleurocarpous mosses. In openings in the forest grow: *Menziesia ferruginea*, *Vaccinium scoparium*, *V. oreophilum*, *Linnaea borealis* var. *americana*, *Cornus canadensis*, *Aster conspicuus*, and stunted *Abies lasiocarpa*. Of more casual occurrence here are *Pyrola asarifolia*, *Spiraea lucida*, *Arnica cordifolia*, *Pyrola secunda*, and *Ribes lacustre*. (2) Halfway to Mirror Lake there is a gradual change in the composition of the forest, and alpine fir now dominates over Engelmann spruce. The species that dominated in the ground cover of the Engelmann spruce forest are gradually replaced by *Arctostaphylos Uva-ursi*, *Shepherdia canadensis*, *Rhododendron albiflorum*, *Juniperus communis*, and *Anemone multifida*. (3) At Mirror Lake (6,655 ft.) Engelmann spruce is almost entirely replaced by *Abies lasiocarpa* and *Larix Lyallii*, and alpine heath composed mainly of *Vaccinium membranaceum*, *Phyllodoce empetriformis*, *Parnassia fimbriata*, *Solidago multiradiata*, and low bushes of *Virburnum edule* now forms the ground cover. Growing in the heath, but less common, are *Antennaria racemosa*, *Arnica latifolia*, *Senecio lugens*, *Agropyron violaceum*, *Empetrum nigrum*, and *Stenanthium occidentale*. (4) Timberline: *Abies krumholz* on rock screes and moraines, with rich alpine herbmats below south-facing cliff. Among the species noted here are *Cryptogramma acrostichoides*, *Selaginella rupestris*, *Poa alpina*, *Deschampsia caespitosa*, *Calamagrostis canadensis*, *Danthonia intermedia*, *Trisetum spicatum*, *Phleum commutatum*, *Festuca brachyphylla*, *Carex spectabilis*, *C. petasata*, *Juncus Drummondii*, *J. Mertensianus*, *Luzula parviflora*, *L. spicata*, *Zygadenus elegans*, *Veratrum Eschscholtzii*, *Salix reticulata (saximontana)*, *S. Barrattiana*, *Arenaria (Minuartia) rubella*, *A. (Minuartia) sajanensis*, *Actaea arguta*, *Aquilegia flavescens*, *Pulsatilla occidentalis*, *Ranunculus Eschscholtzii*, *Parnassia fimbriata*, *Heuchera ovalifolia*, *Mitella pentandra*, *Saxifraga bronchialis* ssp. *austromontana*, *Fragaria glauca*, *Sibbaldia procumbens*, *Potentilla diversifolia* var. *glaucophylla*, *P. fruticosa*, *Phyllodoce empetriformis*, *Cassiope Mertensiana*, *Vaccinium scoparium*, *V. membranaceum*, *Gentiana acuta*, *Phacelia sericea*, *Penstemon fruticosus*, *Pedicularis contorta*, *Pinguicula vulgaris*, *Valeriana sitchensis*, *Campanula rotundifolia (latisepala)*, *Erigeron compositus*, *E. elatus*, *E. peregrinus*, *Circium foliosum*, *Senecio triangularis*, *S. Fremontii*, *Antennaria racemosa*, *A. media*, *Achillea nigrescens*, *Arnica louiseana*, *Artemisia Michauxiana*, and *Agoseris laciniata*.

Above the slope and just below the cliff wall, a narrowly limited eutrophic habitat owes its presence to the manuring effect

of pack rats *(Neotoma cinerea)* nesting in rock crevices and under rocks. *Heracleum lanatum, Ribes lacustre, Rubus strigosus, Stellaria calycantha, Epilobium angustifolium, Lappula floribunda,* and other coprophilous species occupy this plagiosere.

Primary species noted on steep snowbed slopes and terraces at the head of the cirque beyond the west end of Lake Agnes (7,200 ft.): *Salix nivalis, Equisetum variegatum, Carex pyrenaica, Cassiope tetragona* ssp. *saximontana, Carex capillaris, Saxifraga aizoides,* and *Equisetum scirpoidea.* Nowhere dominating, although common in rock crevices and on rock ledges: *Woodsia glabella, Cryptogramma acrostichoides, Polystichum Lonchitis, Equisetum arvense, Poa alpina, Carex aurea, C. nardina* var. *Hepburnii, C. scirpoides, C. nubicola, Kobresia myosuroides, Juncus albescens, J. castaneus, Tofieldia pusilla, Salix commutata, S. vestita, S. arctica, Oxyria digyna, Polygonum viviparum, Sagina Linnaei, Arenaria (Minuartia) sajanensis, Silene acaulis, Anemone parviflora, Ranunculus pygmaeus, Draba lonchocarpa, Cardamine bellidifolia, Saxifraga rivularis, S. punctata* ssp. *insularis, S. bronchialis* ssp. *austromontana, Leptarrhena pyrolifolia, Parnassia fimbriata, Dryas Hookeriana, Astragalus alpinus, Epilobium Hornemannii, E. anagallidifolium, Viola pallens, Phyllodoce empetriformis, Castilleja* sp., *Arnica louiseana,* and *A. latifolia.* Note again absence of pronounced calciphiles.

Hoary marmots and pikas are common in rockslides above timberline; along the trail through the forest and around the tea-house at Lake Agnes the mantled ground squirrel *(Citellus lateralis),* locally known as the "big chipmunk", is common and becomes very bold, loudly demanding a "toll" of peanuts from every passer-by; white-tailed ptarmigans *(Lagopus leucurus)* are often seen in the cirque.

EXCURSIONS NOS. 5 AND 6.

Two all-day excursions will be made from Banff to the high, alpine country south of Bow valley, locally known as "Sunshine".

This area was chosen because it offers an unusual variety of plant habitats. Most of the roughly 17-square-mile area is above timberline, with an average elevation of about 7,300 feet, and straddles the Continental Divide between Simpson and Fatigue Pass (Fig. 8). To the north Mount Bourgeau rises to 9,615 feet and to the south Fatigue Mountain is just over 9,700 feet.

8. The Continental Divide looking south from Brewster Rock. The divide shown here extends between Fatigue Pass and the steep north face of Citadel Peak in left centre and Quartz Ridge to the extreme right. On the centre skyline, the pyramidal Mt. Assiniboine, 15 miles away, with its 11,870 feet is the highest peak in the southern Canadian Rockies.

On all sides we see evidence of extreme folding and faulting. To the west, along the Continental Divide, the rocks are Palæozoic sandstones, while those to the east are formed of much tilted carbonates and calcareous shales. In weathering, the latter have produced mildly calcareous soils while those derived from the siliceous rocks to the west are neutral or acid.

In all mountain regions the total as well as seasonal precipitation varies greatly, and often from one range or valley to the next. The greatest annual precipitation of the "Sunshine" area is found along the Continental Divide, whereas the ranges some distance to the east are in the rain shadow, receiving progressively less precipitation as we travel eastward. Although no published data exist for this area, it can be safely stated that both annual and seasonal precipitation are adequate and that, owing to the deep snow cover in winter, no permafrost exists, except perhaps on exposed ridges and summits above elevations of 8,000 feet. Great masses of snow accumulate during winter on lee slopes, and even on level or slightly sloping ground the depth of snow at the end of the winter may, in some places, exceed three or four meters (12 feet) (Fig. 9). Remnants of such snow masses may frequently last until well into July and in exceptionally cold summers may not disappear altogether.

9. Brewster rock showing snow conditions. Note scrub forest of Alpine fir and larch almost completely covered by snow in March.

The flora of the "Sunshine" country is rich and varied. Approximately 350 species of vascular plants have been collected above the 7,000-foot level (See list at end).

Starting from camp at 9:00 a.m. by special buses or cars we first travel west along the Trans-Canada highway. Near Healy Creek ranger-cabin we leave the highway and follow a rough fire-road along the north bank of Healy Creek for a distance of 5 miles, first through lodgepole pine forest, soon followed by mature Engelmann spruce. Crossing the creek, the road climbs steeply up the east side of a gorge. Near 6,000 feet elevation the spruce forest gives way to alpine fir. The road ends at Sunshine lodge, near timberline at 7,000 feet elevation. An easy ascent will be made on each of the two visits, the first to Twin Cairn Mountain (8,400 ft.), the second to Quartz Ridge of approximately the same elevation.

TRIP TO TWIN CAIRN AND LARIX LAKE. A short climb brings us to the edge of the plateau above the lodge. Near the small water reservoir fed by a brook which drains the meadows above, there is open *Larix Lyallii* (Fig. 10) forest with a undergrowth of *Vaccinium scoparium, Pulsatilla occidentalis* (Fig. 11), and *Erythronium grandiflorum;* in the herbmat above we may see clumps of *Botrychium boreale* var. *obtusilobum,* and on wet cliffs along the brook, masses of *Saxifraga Lyallii and Oxyria digyna.* On the wet snowbed slope just above the reservoir are thickets of *Salix Barratiana,* dense

10. Mature *Larix Lyallii;* young *Abies lasiocarpa.* In foreground snowbed slopes with *Pulsatilla occidentalis.* In background Quartz Ridge.

11. Snowbed slope with flowering *Pulsatilla occidentalis.* On upper slope stunted *Larix* and *Abies.*

colonies of *Leptarrhena pyrolifolia*, and many other herbmat species. On north-facing cliffs to the left we may be fortunate enough still to find *Saxifraga oppositifolia* and the yellow-flowered tufted *Draba incerta* in bloom. From the head of the brook, near large and often perennating snow and ice masses, we cross a mile of flat country with wet but lush alpine meadows in which grow masses of *Trollius albiflorus, Caltha leptosepala, Ranunculus Eschscholtzii,* several species of *Arnica,* and large clumps of *Castilleja miniata* in shades varying from deep orange to pink or white. With them frequently grow the tall *Senecio triangularis* and the handsome, large-headed aster-like *Erigeron peregrinus.*

In the saddle near the north spur of Twin Cairn is an alpine bog, watered from a large snowbank near the foot of the mountain. In the wettest part of the bog is a large patch of *Eriophorum Scheuchzeri,* and on hummocks near the edge of the bog grows *Juncus biglumis*.* Conditions here are about perfect for *Koenigia islandica,* but repeated searches thus far have failed to add this interesting species to the "Sunshine" list.

The climb to the summit of Twin Cairn is easy near the northeast corner. In sliderock just below the summit grow *Agoseris villosa* and *Crepis nana.* From the cairn near the summit, where we eat our picnic lunch, there is a fine panoramic view to Simpson Pass and Egypt and Scarab lakes to the west, to Rock Isle and Larix lakes (Fig. 12) and to Mount Assiniboine far beyond

12. Larix Lake with open *Larix Lyallii* snowbed forest.

to the south. To the east and northeast are Goats-eye, Mount Brett, and Bourgeau. We descend on the southeast corner and continue down a gentle slope, one-mile long, toward Rock Isle and Larix lakes. On the way, in rich herbmats alternating with rocky ridges, grow large clumps of the handsome *Pedicularis contorta, Myosotis alpestris* ssp. *asiatica, Erigeron peregrinus, Zygadenus elegans,* and many others. On the slopes of the lake basin in which the two little lakes nestle, deep masses of snow accumulate in winter. We find here open stands of *Larix Lyallii* mixed with *Abies lasiocarpa* with a ground cover of *Vaccinium scoparium, Pulsatilla occidentalis, Antennaria lanata, Veronica*

13. Open *Larix Lyallii* forest in Simpson Pass.

alpina, Vahlodea atropurpurea var. *latifolia, Phleum commutatum,* and a number of other ubiquitous snowbed plants. Dead trees are often festooned with masses of the yellowish-green lichen, *Letharia vulpina.* The larch itself is a snowbed species tolerant of deep and late snow cover (Fig. 13). From the west end of Larix Lake we look down into the heavily timbered Simpson valley. Following the trail past Rock Isle lake we climb over the south and west slopes of Standish Hump. On dry, sunny cliff exposures along the trail we notice *Sedum lanceolatum, Potentilla Ledebouriana, Myosotis alpestris, Saxifraga bronchialis* ssp. *austromontana, Silene acaulis,* and many other cliff species. Back to the lodge and the bus at 4:00 p.m.

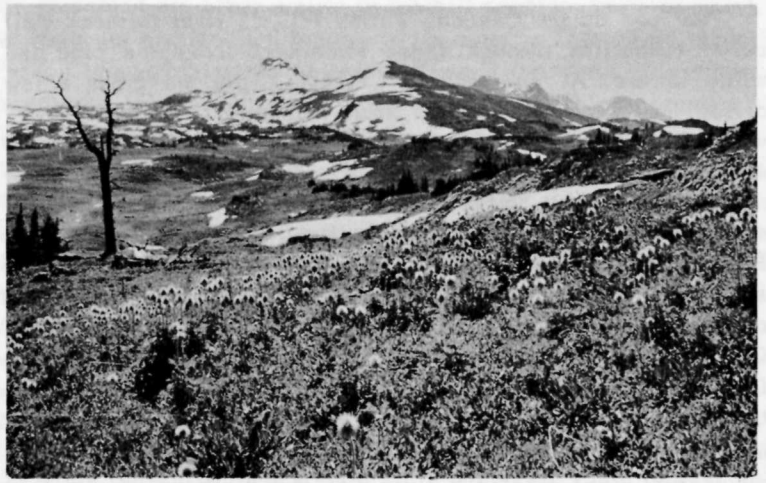
SECOND TRIP TO SUNSHINE. BUS LEAVES AT 8:00 A.M. OVER SAME ROUTE AS BEFORE.

TRIP TO QUARTZ RIDGE. Distance to summit (8,464 ft.) and back is 6 miles and involves no climbing. Those not wishing to walk quite so far will find much of interest on the alpine snowbed meadows of the lower slopes and the gently sloping plateau east of Quartz Ridge. From the saddle just below the peak there is a fine view into Simpson valley and from the summit above, a grand panoramic view of the Continental Divide and Mount Assiniboine. In turfy places in the saddle is the only Canadian Rocky Mountain station for *Saxifraga flagellaris*.* The colony is small, and the species is on the protected list. Among other species of interest here are: *Carex nardina* var. *Hepburnii, Luzula Piperi, Arenaria Rossii, Melandrium attenuata*, Smelowskia calycina, Draba densifolia, D. ventosa*, Oxytropis podocarpa, O. foliolosa, Phacelia sericea, Antennaria media, Erigeron compositus, E. uncialis* ssp. *conjugans*, E. lanatus*, E. aureus, Senecio Fremontii, Haplopappus Lyallii,* and *Crepis nana.*

Other species that in this area are found only on quartzite and sandstone rocks are: *Equisetum scirpoides, Woodsia scopulina, W. oregana, Polystichum Lonchitis, Dryopteris austriaca, Athyrium alpestre, Eriogonum subalpinum, E. ovalifolium, Ranunculus gelidus*, Cardamine bellidifolia, C. umbellata, Romanzoffia sitchensis*, Penstemon confertus,* and *Campanula uniflora*.* A few of these have been found on Quartz Ridge, most of the rest on Citadel Peak to the south. On a rocky slope below the saddle are several large clones of a double-flowered *Dryas Hookeriana.*

Perhaps the greatest accumulation of snow in the Sunshine area is on the east slope of Quartz Ridge, where in some years

there may still be good skiing well into July, and in the flat basin between Quartz Ridge and Brewster Rock. Descending from the ridge we follow a small gully which parallels the ridge. The rocky slopes to the west are treeless, whereas the low ridge to the east carries stunted alpine fir. The floor of the gully itself is treeless and in winter is buried under a deep mass of snow. Where the snow remains longest the plant cover on well-drained ground consists almost entirely of a sward of *Carex pyrenaica* and tussocks of *C. nigricans;* progressing toward slopes having a less deep cover we find *Vaccinium scoparium, Sibbaldia procumbens, Salix nivalis, S. arctica, Carex nubicola, Phleum commutatum, Phyllodoce glandulifera, Vahlodea atropurpurea* var. *latifolia, Pulsatilla occidentalis* (nearly always on sloping ground) (Fig. 14), *Arnica mollis, Veronica alpina, Valeriana sitchensis, Erigeron peregrinus, Antennaria lanata,* and *Fragaria glauca.* The latter has great amplitude in regard to snow tolerance and is one of the most ubiquitous species on well-drained alpine snowbeds where its reproduction is entirely vegetative, although mature fruits have been noted a few times on favourable exposures above timberline. Curiously enough, the species is equally adapted to open places in intermontane prairies as well as to places of still lower elevations and of much less snow cover, where it fruits abundantly.



14. Slope with fruiting *Pulsatilla occidentalis.* In background note large snow masses on Quartz Ridge, on July 21.

On wetter sites, near brooks and where standing water remains until well into the summer, the ubiquitous snowbed species include *Saxifraga Lyallii, Epilobium Hornemanni, E. anagallidifolium, Salix Barrattiana, Equisetum variegatum, Parnassia fimbriata, Leptarrhena pyrolifolia, Juncus Drummondii,* and *J. Mertensianus.* On the wettest sites we find *Trollius albiflorus* and *Caltha leptosepala.*

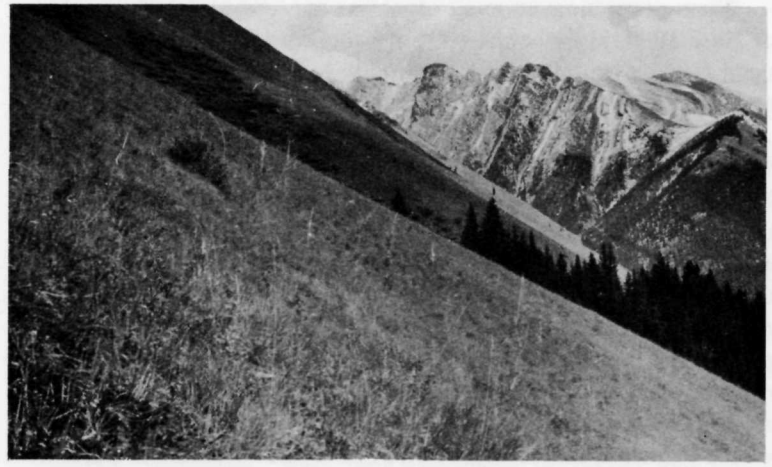
The few analyses made of snowbed soils in the Sunshine area show mildly to distinctly acid conditions extending down to at least a depth of 35 cm with pH readings from 5.2 to 6.8, notwithstanding that the water of a nearby brook gave a pH reading of 8.4. This may indicate a leaching of calcium due to CO_2 derived from the melting snow. However, no soil zonation could be noticed. Return to the bus and camp at 4:00 p.m.

EXCURSION No. 7

All-day trip by bus up the Cascade Valley to Snow Creek Pass (7,341 ft.). Distance from Banff approximately 40 miles. A number of stops will be made en route and in the pass, but time will not allow for extended walks.

Near Bankhead, between Banff townsite and Lake Minnewanka, we pass an abandoned mining town where Cretaceous coal was formerly mined. Before entering the gate to the Cascade Valley fire-road we stop for a view of the 12-mile-long Lake Minnewanka and the dam across the valley which has raised the waters of the lake by some 30 feet.

The road up the Cascade Valley follows river terraces well below timberline through dense forests of lodgepole pine and white spruce. At the head of Cuthead Creek we cross a low divide into Wigmore Creek, a small tributary to Panther Creek which, again, is a tributary to the Red Deer; a short distance above its junction, Snow Creek enters from the north. Where the road climbs steeply to the east slope of the Palliser Range, we stop to examine rich grassland on steep, subalpine slopes. The Palliser, the most easterly of the great Rocky Mountain ranges, is in the rain shadow of the Continental Divide and receives much less precipitation than does the Bow Valley, near Banff. On steep slopes above timberline and often at lower elevations in intermontane valleys, we find distinctly arid types of vegetation mainly of grassland (Fig. 15). The soils overlaying the glacial till of the lower slopes and the limestone screes above are typical black grassland soils (chernosem) with a pH value of 8.0 and give strong effervescence with HCl.



15. Rich subalpine grassland on west slope of Palliser Range.

Primary in the grass slope are: *Elymus glaucus, Bromus Pumpellianus, Koeleria cristata, Poa interior* with *Arctostaphylos Uva-ursi, Oxytropis gracilis, Fragaria glauca, Potentilla fruticosa, Juniperus horizontalis* and *Epilobium angustifolium.* In the grassland are "islands" of *Populus tremuloides,* from which root suckers appear everywhere in the turf but are kept in check by the grazing of elk and, to a lesser degree, of mountain sheep whose main ranges are on stony ledges and cliffs above these slopes. Of secondary and less importance in the composition of the grassland are other prairie or foothill species, some of which we have not encountered before, while some were seen in Jasper Park: *Calamagrostis montanensis, Elymus innovatus, Danthonia intermedia, Poa Canbyi* and other species of "bunch-grasses" (Sect. *Scabrellae), Stipa columbiana, Festuca scabrella, Carex heliophila, Allium cernuum, Eriogonum androsaceum, E. subalpinum, Melandrium Drummondii, Cerastium arvense, Stellaria longipes, Ranunculus cardiophyllus, Pulsatilla Ludoviciana, Anemone multifida* var. *hudsoniana, Hedysarum sulphurescens, Astragalus vexilliflexus, Oxytropis splendens, Shepherdia canadensis, Andromeda Chamaejasme, A. septentrionalis, Gentiana acuta, Polemonium pulchellum, Penstemon procerus, Castilleja* spp., *Phacelia sericea, Campanula rotundifolia (latisepala), Solidago multiradiata* var. *scopulorum, Antennaria rosea, Achillea nigrescens, Aster alpinus* ssp. *Vierhapperi, Erigeron compositus, Artemisia Michauxiana, A. frigida, Circium foliosum, Agoseris* sp., and *Townsendia Parryi.*

Time permitting, an easy climb can be made to the upper slopes of Bare Mountain where carbonate rocks and screes have a flora very similar to that noted on Standish Hump and Brewster Rock at Sunshine. Return to bus and departure for camp at 5:00.

A sight-seeing trip to the vicinity of Banff will include a visit to the sulphur springs on the lower slopes of Sulphur Mountain. In a rich calcareous bog, fed by cold springs, we notice the following interesting assembly: *Triglochin maritimum, Muhlenbergia Richardsonis, M. racemosa, Calamagrostis Suksdorfii, Carex Buxbaumii, C. flava, C. interior, Eriophorum viridicarinatum, Juncus ensifolius, J. alpinus* var. *insignis, Tofieldia glutinosa, Lilium montanum, Spiranthes Romanzoffiana, Listera convallarioides, Orchis rotundifolia, Betula pumila* var. *glandulifera, Geocaulon lividum, Delphinium glaucum, Nasturtium officinale, Parnassia montanensis, Saxifraga aizoides, Potentilla fruticosa, Ledum groenlandicum, Vaccinium Vitis-Idaea, Dodecatheon pauciflorum, Primula mistassinica, Gentiana Macounii, Utricularia vulgaris, Pinguicula vulgaris, Pedicularis groenlandica, Galium triflorum, Lobelia Kalmii, Aster laevis, Crepis glauca, Helianthus rigidus,* and *Petasites palmatus.*

Around the bog are clumps of tall *Picea glauca* var. *Porsildii,* and in the nearby lodgepole pine forest *Calypso bulbosa* is abundant but probably is past flowering in late July.

From the Upper Hot Springs an easy trail leads to the summit of Sulphur Mountain.

Seven full days are needed for the excursions outlined. Of the remaining three days, one day, probably Sunday, July 26, will be a day of rest and general recreation. One day will be devoted to general sight-seeing, and one day will be held in reserve.

The excursion ends on July 30.

Vascular Plants of the "Sunshine" Area

The following tentative list of the vascular plants of the "Sunshine" area is based on the writer's collections made mainly during the seasons of 1945, 1946, 1951, and 1956 as part of a botanical exploration of Jasper, Banff, and Waterton Lakes National Parks. Only a small part of the collection, which comprises more than 5,000 numbers, has as yet been critically studied, and several changes and additions will undoubtedly be made in the list before the results of the survey are published in the form of a manual on the flora of the Southern Canadian Rocky Mountains. The writer also is preparing a popular guide, "Rocky Mountain Alpine Flowers," which is to be illustrated in colour by drawings made in 1956 from live material by Mrs. Dagny T. Lid of Oslo, Norway.

In the "Sunshine" area and elsewhere in Jasper and Banff National Parks, a number of species are known only from small isolated populations, in some cases consisting only of a few individuals

Asplenium viride Huds. – Simpson Pass and Mt. Bourgeau; subalpine.

Cryptogramma acrostichoides R.Br. – Citadel Pk.; uncommon, 8,150 ft.

C. Stelleri (Gmel.) Prantl. – Mt. Bourgeau, Goat's Eye; rare.

Cystopteris fragilis (L.) Bernh. – Common.

Dryopteris austriaca (Jacq.) Woynar – Citadel Pk.; rare, 7,200 ft.

Polystichum Lonchitis (L.) Roth – Citadel Pk., Simpson Pass; occasional.

Woodsia scopulina D.C. Eat. – Citadel Pk.; rare.

Botrychium boreale (Fr.) Milde ssp. *obtusilobum* (Rupr.) Claus. – occasional, in alpine herbmats.

**B. lanceolatum* (Gmel.) Angstr. – Fatigue Pass; rare. New to Alta.

B. Lunaria (L.) Sw. var. *minganense* (Vict.) Dole – Occasional to common.

Equisetum arvense L. – Common.

E. scirpoides Michx. – Citadel Pk.; rare.

E. variegatum Schleich. – Common.

Lycopodium alpinum L. – Common.

L. annotinum L. var. *alpestre* Hartm. – Occasional.

L. Selago L. – Rare, alpine tundra.

Selaginella densa Rydb. – Common, dry cliffs.

S. selaginoides (L.) Link. – Occasional, in herbmats.

S. Standleyi Maxon – Occasional, dry cliffs.

Abies lasiocarpa (Hook.) Nutt. – Common, timberline tree, ascending to 7,200 ft.

*Species here and elsewhere marked by an asterisk are protected and may not be collected without a permit.

Juniperus communis L. var. *montana* Ait. – Common, ascending to 7,200 ft.
J. horizontalis Moench – Occasional, to 7,000 ft.
Larix Lyallii Parl. – Common, in alpine zone to 7,200 ft.
Picea glauca (Moench) Voss var. *albertiana* (S. Brown) Sarg. – Barely entering alpine zone.
Pinus contorta Loud. var. *latifolia* S. Wats. – Seedlings and young trees occasionally to 7,000 ft.
P. flexilis James – Citadel Pk.; 7,300 ft.
Sparganium hyberboreum Laest. – Simpson Pass; Rare, 7,000 ft.
Potamogeton filiformis Pers. var. *borealis* (Raf.) St. John – Occasionally ascending to 7,550 ft.
Agropyron latiglume (Scribn. & Sm.) Rydb. – Common.
A. trachycaulum (Link) Malte – Occasional.
A. violaceum Hornem. – Occasional.
Agrostis geminata Trin. – Head of Healy Cr.; rare, 7,200 ft.
A. humilis Vasey – Not uncommon to 7,500 ft.
A. Thurberiana Hitchc. – Simpson Pass; 6,900 ft.
A. variabilis Rydb. – Common locally to 8,600 ft.
Bromus Pumpellianus Scribn. – Occasional to 7,650 ft.
B. Richardsonii Link – Fatigue Pass; 7,600 ft.
Calamagrostis canadensis (Michx.) Beauv. var. *Langsdorffii* (Link) Trin. – Occasionally in thickets.
C. montanensis Scribn. – Citadel Pk; 8,100 ft.
C. purpurascens R.Br. – Common, to 8,600 ft.
C. rubescens Buckl. – Goat's Eye.
Danthonia intermedia Vasey – Occasional, ascending to 8,000 ft.
Deschampsia caespitosa (L.) Beauv. – Occasional, to 7,550 ft.
Elymus glaucus Buckl. – Occasional to timberline.
E. hirtiflorus Hitch. – Goat's Eye; 6,800 ft.
E. innovatus Beal – Ascending to 7,600 ft.
Festuca baffinensis Polunin – Common, ascending to 8,350 ft.
F. brachyphylla Schultes – Common, ascending to snowline.
F. saximontana Rydb. – Common, ascending to 8,700 ft.
Hierochloe odorata (L.) Beauv. – Fatigue Pass; local, 7,500 ft.
**Melica spectabilis* Scribn. – Standish Hump; 7,200 ft.
Phleum commutatum Gaud. *(P. alpinum)* – Common, to 7,650 ft.
Poa alpina L. – Common, ascending to 8,700 ft.
P. arctica R.Br. – Common, ascending to 8,600 ft.
P. Canbyi (Scribn.) Piper – Occasional
P. epilis Scribn. – Common, ascending to 8,700 ft.
P. glauca M. Vahl – Common, ascending to 8,000 ft.
P. interior Rydb. – Citadel Pk.; 8,600 ft.

P. lanata Scribn. & Merr. – Citadel Pk.
P. Lettermani Vasey – Mt. Bourgeau; common to 9,700 ft.
P. nemoralis L. – Occasional, to 7,600 ft.
P. nervosa (Hook.) Vasey – Occasional, to 8,000 ft.
P. Pattersoni Vasey – Occasional, to 8,300 ft.
P. paucispicula Scribn. & Merr. – Common, to 8,500 ft.
P. pratensis L. – Fatigue Pass; 7,200 ft.
P. rupicola Nash – Occasional, to 8,000 ft.
P. stenantha Trin. – Citadel Pk.; 8,600 ft.
Trisetum spicatum (L.) Richt. – Common, to 8,000 ft.
Vahlodea atropurpurea (Wahlenb.) Fries ssp. *latifolia* (Hook.) Porsild – Common, snowbed meadows to 8,000 ft.
Eriophorum angustifolium Roth. – Occasional, to 7,300 ft.
E. Scheuchzeri Hoppe – Occasional, and local, ascending to 7,800 ft.
Scirpus caespitosus L. ssp. *austriacus* (Palla) Asch. & Graebn. – Uncommon, 7,000 ft.
Kobresia myosuroides (Vill.) Fiori & Paol. – Occasional, ascending to 8,300 ft.
Carex albo-nigra Mack. – Not uncommon.
C. aquatilis Wahlenb. – Simpson Pass, etc.
C. atrosquama Mack. – Occasional, turfy slopes.
C. capillaris L. var. *elongata* Olney – Occasional.
C. concinna R.Br. – Goat's Eye, etc.; uncommon.
C. Drummondii E. Mey. – Very common, ascending to snowline.
C. eurystachya Herm. – Rare and local.
C. glacialis Mack. – Brewster Rock, etc.
C. gynocrates Wormskj. – Simpson and Fatigue Pass.
C. Hoodii Boott – Mt. Bourgeau, lower grassy slopes.
C. illota L.H. Bailey – Fatigue and Simpson Pass; rare.
C. incurviformis Mack. – Brewster Rock; 8,400 ft. etc.
C. Lachenalii Schk. – Simpson Pass; occasional.
C. macloviana d'Urv. – Common.
C. media R.Br. – Simpson Pass, etc.; occasional.
C. nardina Fr. var. *Hepburnii* (Boott) Kük. – Common, to 8,700 ft.
C. nigricans C.A. Mey. – Very common on snowbeds, to 8,400 ft. or more.
C. nubicola Mack. – Common, snowbeds.
C. petasata Dew. – Mt. Bourgeau, grassy lower slopes.
C. petricosa Dew. – Goat's Eye; very scarce.
C. phaeocephala Piper – Common, snowbed slopes to 8,600 ft.
C. praticola Rydb. – Mt. Bourgeau, grassy slopes.
C. pyrenaica Wahlenb. – Very common on snowbeds to 8,600 ft.
C. Richardsonii R.Br. – Mt. Bourgeau, grassy lower slopes.

C. Rossii Boott – Common.
C. rostrata Stokes – Fatigue Pass.
C. rupestris All. – Occasional to common.
C. saxatilis L. var. *rhomalea* Fern. – Fatigue Pass.
C. scirpoidea Michx. – Common, to 7,700 ft.
C. spectabilis Dew. – Occasional.
Juncus albescens (Lge.) Fern. – Occasional.
J. balticus Willd. var. *montanus* Engelm. – Fatigue Pass, etc.
**J. biglumis* L. – Twin Cairn saddle.
J. castaneus Sm. – Fatigue Pass.
J. Drummondii E. Mey. – Common.
J. Mertensianus Bong. – Common, ascending to 8,200 ft. or above.
Luzula parviflora (Ehrh.) Desv. – Common.
L. Piperi (Cov.) Jones – Quartz Ridge and Citadel Pk.
L. spicata (L.) DC. – Occasional.
Allium Schoenoprasum L. var. *sibiricum* (L.) Hartm. – Fatigue Pass.
A. ? cernuum Roth. – Mt. Bourgeau, lower slopes.
Erythronium grandiflorum Pursh – Common locally.
Stenanthium occidentale A. Gray – Goat's Eye, etc.
Streptopus amplexifolius (L.) DC. – Simpson Pass, etc.
Veratrum Eschscholtzii A. Gray – Simpson Pass.
Zygadenus elegans Pursh – Common.
Goodyera oblongifolia Raf. *(G. decipiens)* – Goat's Eye; subalpine.
Habenaria dilatata (Pursh) Hook. – Simpson Pass.
Listera cordata (L.) R.Br. – Simpson Pass; subalpine.
Salix arctica Pall. var. *(S. petrophila* Rydb.) – Common.
S. Barrattiana Hook. – Common locally.
S. commutata Bebb. – Simpson and Fatigue Pass.
S. Drummondiana Barratt – Rock Isle Lake.
S. Farrae Ball – Simpson Pass.
S. glauca L. var. *acutifolia* Schneid. – Common.
S. myrtillifolia Anderss. – Occasional.
S. nivalis Hook. – Common.
S. pseudocordata Rydb. – Wa-Wa Ridge.
S. reticulata L. – Common
S. vestita Pursh var. *erecta* Anderss. – Common.
Eriogonum ovalifolium Nutt. – Citadel Pk.
E. subalpinum Greene – Citadel Pk.
E. umbellatum Torr. – Mt. Bourgeau, lower slopes.
Oxyria digyna (L.) Hill – Common.
Rumex Acetocella L. – Fatigue Pass, Standish Hump.
R. Acetosa L. – Occasional.

Polygonum viviparum L. – Standish Hump, etc.
Claytonia lanceolata Pursh – Occasional, herbmats.
**C. megarrhiza* (A. Gray) Parry – Rare and local, high alpine to 8,400 ft.
Arenaria dawsonensis Britt. – Mt. Bourgeau, lower slopes.
A. formosa Fisch. – Standish Hump.
A. humifusa Wahlenb. – Twin Cairn.
A. Rossii R.Br. – Occasional.
A. rubella (Wahlenb.) Sm. – Common.
A. sajanensis Willd. – Common.
Cerastium Earlei Rydb. – Common
Melandrium affine (J. Vahl) Hartm. – Standish Hump; Brewster Rock.
**M. attenuatum* (Farr) Hara – Occasional, 7,800 ft. – 8,400 ft.
Sagina Linnaei Presl. – Occasional.
Silene acaulis L. var. *exscapa* (All.) DC. – Common.
S. Parryi (Wats.) Hitchc. & Maguire – Goat's Eye, etc.
Stellaria calycantha (Ledeb.) Bong. – Common.
S. crassifolia Ehrh. – Standish Hump.
S. longipes Goldie var. *(S. monantha* Hult.) – Occasional.
S. umbellata Turcz. – Standish Hump; Fatigue Pass.
Actaea arguta Nutt. – Occasional.
Anemone Drummondii Wats. – Common.
A. multifida Poir. var. *hudsoniana* DC. – Standish Hump.
A. parviflora Michx. – Common.
Aquilegia flavescens Wats. – Common.
Caltha leptosepala DC. – Common.
Clematis columbiana Gray – Mt. Bourgeau, lower slopes.
Delphinium depauperatum Nutt. – Fatigue Pass; 8,000 ft., etc.
D. glaucum Wats. – Rare or occasional.
Pulsatilla Ludoviciana (Nutt.) Heller – Mt. Bourgeau, lower slopes.
P. occidentalis (Wats.) Fern. – Common.
Ranunculus Eschscholtzii Schlecht. – Very common.
R. pygmaeus Wahlenb. – Goat's Eye; Fatigue Pass.
Thalictrum occidentale Gray – Occasional.
Trollius albiflorus (Gray) Rydb. – Common.
Papaver radicatum Rottb. – Goat's Eye; Bourgeau Mt.
Arabis Drummondii Gray var. *alpina* Wats. – Not uncommon.
A. Lemmonii Wats. – Not uncommon.
Cardamine bellidifolia L. – Occasional, to snowline.
C. umbellata Greene – Occasional.
Draba aurea M. Vahl – Occasional.
D. cinerea Adams – Not common.
D. crassifolia Grah. – Common, alpine herbmats.

D. densifolia Nutt. – Not uncommon, high alpine.
D. incerta Payson – Common.
D. lanceolata Royle – Common.
D. lonchocarpa Rydb. – Common.
**D. Paysonii* McBride – Citadel Pk., etc.
D. praealta Greene – Occasional.
D. stenoloba Ledeb. – Standish Hump.
**D. ventosa* Gray var. *ruaxes* Payson & St. John – Quartz Ridge, etc. New to Alta.
**Erysimum Pallasii* (Pursh) Fern. – Twin Cairn Mt.
Physaria didymocarpa Gray – Mt. Bourgeau, lower slopes.
Rorippa islandica (Oed. ex Murr.) Borbas – Fatigue Pass.
Smelowskia calycina (Steph.) C.A. Mey. var. *americana* (Regel & Herder) Drury & Rollins – Not uncommon, high-alpine.
Rhodiola integrifolia Raf. – Brewster Rock, etc.; uncommon.
Sedum lanceolatum Torr. – Not uncommon.
Heuchera ovalifolia T. & G. – Twin Cairn Mt; Citadel Pk.
Leptarrhena pyrolifolia (D.Don.) Ser. – Common locally.
Mitella pentrandra Hook. – Fairly common.
Parnassia fimbriata Koenig – Common.
P. Kotzebuei Cham. & Schlecht. – Common.
Ribes lacustre (Pers.) Poir. – Occasional.
Saxifraga adscendens L. – Infrequent.
S. aizoides L. – Occasional.
S. bronchialis L. ssp. *austromontana* (Wieg.) Piper – Common.
S. caespitosa L. s. lat. represented by one race: *Muscaria monticola* Small, which is fairly common; and another much rarer: *Muscaria micropetala* Small.
S. cernua L. – Common.
S. ferruginea Grah. var. *Macounii* Engler & Irmsch. – Citadel Pk.
**S. flagellaris* Willd. ssp. *flagellaris* – Very rare, high-alpine. New to southern Can. Rocky Mts.
S. Lyallii Engler – Common.
S. oppositifolia L. – Occasional.
S. rivularis L. – Occasional.
S. rhomboidea Greene – Wa-Wa Ridge; Citadel Pk., etc.
Amelanchier alnifolia Nutt. – Mt. Bourgeau.
Dryas Hookeriana Juz. – Common.
Fragaria glauca (Wats.) Rydb. – Common.
Potentilla decurrens Wats. – Occasional at high elevations.
P. diversifolia Lehm. – Common.
P. Drummondii Lehm. – Occasional.

P. fallax Porsild – Occasional.
P. fruticosa L. – Common.
P. hyparctica Malte – Common.
P. Ledebouriana Porsild – Common.
P. nivea L. – Common.
P. ovina J. M. Macoun – Goat's Eye.
P. pseudorupestris Rydb. – Citadel Pk.
Rubus strigosus Michx. – Occasional.
Sibbaldia procumbens L. – Common.
Spiraea lucida Dougl. – Fatigue Pass.
Astragalus aboriginorum Richards. – Citadel Mt., etc.
A. alpinus L. – Twin Cairn Mt., etc.
A. Bourgovii Gray – Rather common.
A. campestris Dougl. – Twin Cairn Mt., etc.
A. eucosmus Robins. – Twin Cairn Mt.; occasional.
A. frigidus (L.) Gray var. *americanus* (Hook.) Wats. – Mt. Bourgeau, lower slopes.
A. Macounii Rydb. – Twin Cairn Mt., etc.
Hedysarum Mackenzii Richards. – Goat's Eye.
H. sulphurescens Rydb. – Quartz Ridge and Twin Cairn Mt.
Oxytropis alpicola Rydb. – Quartz Ridge and Twin Cairn Mt., etc.
O. foliolosa Hook. – Twin Cairn Mt., etc.; occasional.
O. podocarpa Gray – Common.
O. splendens Dougl. – Mt. Bourgeau.
Geranium Richardsonii Fisch. & Trautv. – Mt. Bourgeau and Citadel Pk.
Empetrum nigrum L. – Simpson Pass and Healy Creek; rare.
Viola orbiculata Geyer – Simpson Pass, etc.; rare.
Epilobium anagallidifolium Lam. – Common.
E. angustifolium L. – Common.
E. Hornemannii Reichenb. – Common.
E. lactiflorum Hausskn. – Common.
E. latifolium L. – Common.
Heracleum lanatum Michx. – Occasional and local.
Leptotaemia purpurea C. & R. – Twin Cairn Mt., etc.
Lomatium simplex (Nutt.) McBride – Mt. Bourgeau.
Osmorhiza obtusa (C. & R.) Fern. – Simpson Pass.
Moneses uniflora (L.) Gray – Twin Cairn Mt.
Pyrola asarifolia Michx. var. *purpurea* (Bge.) Fern. – Common.
P. minor L. – Occasional.
P. secunda L. – Occasional.
Cassiope Mertensiana (Bong.) G. Don – Common.
C. tetragona (L.) D. Don ssp. *saximontana* (Small) Porsild – Occasional.

Kalmia microphylla (Hook.) Heller — Occasional.
Phyllodoce empetriformis (Sm.) G. Don — Common to timberline.
P. glanduliflora (Hook.) Coville — Common.
P. intermedia (Hook.) Rydb. — Occasional.
Rhododendron albiflorum Hook. — Occasional to timberline.
Arctostaphylos rubra (Rehd. & Wils.) Fern. — Goat's Eye; rare.
A. Uva-ursi Spreng. var. *adenotricha* Fern. — Common.
A. Uva-ursi Spreng. var. *coactilis* Fern. & McBr. — Common.
Vaccinium scoparium Leiberg — Common.
Androsace Chamaejasme Host s. lat. — Common.
A. septentrionalis L. — Common.
Gentiana acuta Michx. — Common.
G. arctophila Griseb. — Common.
G. prostrata Haenk. — Occasional.
Apocynum androsaemifolium L. — Mt. Bourgeau, lower slopes.
Polemonium pulcherrimum Hook. — Mt. Bourgeau, lower slopes.
Phacelia sericea Gray — Occasional.
**Romanzoffia sitchensis* Bong. — Citadel Pk.
Lappula floribunda (Lehm.) Greene — Citadel Pk.
Myosotis alpestris F. W. Schmidt. ssp. *asiatica* Vestergr. — Common.
Castilleja miniata Dougl. — Common.
C. occidentalis Torr. — Common.
Castilleja spp. — Four, or possibly more species are believed present in the writer's still unstudied material of *Castilleja* from the "Sunshine" area.
Collinsia parviflora Dougl. — Standish Hump.
**Pedicularis arctica* R.Br. — Standish Hump.
P. bracteosa Benth. — Twin Cairn Mt. and Standish Hump.
P. contorta Benth. — Standish Hump, etc.; common.
Penstemon confertus Dougl. — Fatigue Pass and Citadel Pk.
P. fruticosus (Pursh) Greene — Fatigue Pass, etc.
Rhinanthus groenlandicus Chab. — Mt. Bourgeau, lower slopes.
Veronica alpina L. var. *alterniflora* Fern. — Common.
V. alpina L. var. *unalaschcensis* Cham. & Schlecht. — Occasional.
Linnaea borealis L. var. *americana* (Rehd.) Forbes — Common.
Lonicera involucrata Banks — Simpson Pass.
Valeriana sitchensis Bong. — Common.
**Campanula lasiocarpa* Cham. — Very rare and local, alpine slopes.
C. rotundifolia L. — Goat's Eye.
**C. uniflora* L. — Fatigue Mt.
Achillea nigrescens (E. Mey.) Rydb. — Common.
Agoseris ? aspera Rydb. — Twin Cairn Mt., Quartz Ridge and Citadel Pk.

A. aurantiaca (Hook.) Greene — Occasional, herbmat slopes.
A. ? carnea Rydb. — Herbmat slopes.
A. ? glauca (Pursh) Greene — Herbmat slopes.
A. villosa Rydb. — High-alpine summits.
Antennaria media Greene — Common.
A. lanata (Hook.) Greene — Common.
A. racemosa Hook. — Common near timberline.
Antennaria spp. — In the writer's Rocky Mountain collections are well over 300 numbers of *Antennaria* still awaiting study. Although the largest number of species are found at low to medium elevations, half a dozen species in the sect. *Alpinae* and five in the sect. *Dioicae* have been identified tentatively in the material collected in the "Sunshine" area.
**Arnica alpina* (L.) Olin ssp. *angustifolia* (J. Vahl) Maguire — New to Alta. Rare, on high peaks.
A. cordifolia Hook. ssp. var. *pumila* (Rydb.) Maguire — Fatigue Pass, etc., near timberline.
A. diversifolia Greene — Fatigue Pass.
A. gracilis Rydb. — Occasional, alpine screes.
A. latifolia Bong. — Common, near timberline.
A. lonchophylla Greene — Citadel Pk., etc; new to Alta.
**A. longifolia* D.C. Eat. ssp. *myriadena* (Piper) Maguire — Citadel Pk. New to Canada.
A. louiseana Farr.
A. mollis Hook. — Twin Cairn Mt., Simpson Pass, etc.
A. Parryi A. Gray — Mt. Bourgeau, Fatigue Pass.
A. Rydbergii Greene — Citadel Mt., Wa-Wa Ridge, etc.
Artemisia Michauxiana Bess. — Occasional on cliffs and rock slide.
Aster conspicuus Lindl. — Occasional near timberline.
A. laevis L. var. *Geyeri* A. Gray — Occasional at timberline.
A. McCallae Rydb. — Fatigue Pass, etc.
A. sibiricus L. — Common.
Circium foliosum Gray — Goat's Eye, Fatigue Pass.
Crepis nana Richards. — Alpine summits.
Erigeron aureus Greene — Common.
A. compositus Pursh — Quartz Ridge, Citadel Pk., etc.
A. glabellus Nutt. ssp. *pubescens* (Hook.) Cronq. — Mt. Bourgeau, lower slopes.
A. jucundus Greene — Citadel Pk., Quartz Ridge, etc.
**A. lanatus* Hook. — Citadel Pk., Quartz Ridge, etc.
**A. pallens* Cronq. — Several collections from the "Sunshine" area from high-alpine sliderock. Also from Saskatchewan Glacier. Otherwise

known from one collection each from Glacier, B.C., and from Lake of the Hanging Glacier, Alta. Closely related to *E. vagus* Payson, collected in the Bow Pass and Mt. Temple but otherwise known only from high mountains of Colo., Utah, Ore., Nev., and Calif.

E *A. peregrinus* (Pursh) Greene *(E. salsuginosus)* – Common.

E* *A. uncialis* Blake ssp. *conjugans* (Blake) Cronq. – High alpine peaks. Also from Lake Louise and Bow Pass. New to the flora of Canada, otherwise known from Nevada.

E *A. unalaschkensis* (DC.) Vierh. – Occasional, alpine slopes.

Haplopappus Lyallii (Gray) Piper – Common.

Hieracium gracile Hook. – Occasional, alpine.

H. Scouleri Hook. – Mt. Bourgeau, etc.

Petasites hyperboreus Rydb. – Common.

Saussurea densa (Hook.) Rydb. – Quartz Ridge, Citadel Pk., high-alpine.

Senecio exalatus Nutt. – Citadel Pk., Twin Cairn Mt., Mt. Bourgeau.

S. Fremontii T. & G. – Quartz Ridge, Citadel Pk., etc.; high-alpine.

S. lugens Richards. – Common.

S. pauciflorus Pursh – Occasional near timberline.

S. triangularis Hook. – Common locally.

Solidago multiradiata Ait. – Common.

S. multiradiata Ait. var. *scopulorum* Gray – Mt. Bourgeau, lower slopes.

Taraxacum rupestre Greene – High-alpine.

T. scopulorum Rydb. – High-alpine.

Taraxacum spp. – Among the writer's still unstudied Rocky Mountain collections are half a dozen additional species of *Taraxacum* from the "Sunshine" area, three of them in the *Ceratophorum* group and three in the *Croceum* group.