



ECOLOGY OF ALPINE VEGETATION IN THE NATIONAL PARKS OF WESTERN CANADA

Project Number 382-5206

Progress Report No. 1

George W. Scotter

May 20, 1970

The following is to serve as a progress report for Project No. 382-5206 which is entitled "Ecology of Alpine Vegetation in the National Parks of Western Canada."

Literature Review

An intensive review of alpine and sub-alpine literature was made during the late winter and spring in preparation for writing a project plan. Over 200 references were read and indexed for future use and a number of the more important references were included in the project plan.

Project Plan

Following completion of the literature review, a project plan covering details of the research project was prepared (Appendix A). During May 1969, copies of the plan were submitted to Waterton Lakes; Banff; Jasper; Yoho; Kootenay; Glacier; Revelstoke; and Mount Revelstoke National Parks; Western Regional Director, National and Historic Parks Branch, Calgary; Canadian Wildlife Service, Edmonton and Ottawa; and the Steering Committee on Ecological Research, Ottawa. The Regional Offices of National and Historic Parks and Canadian Wildlife Service and the individual National Parks replied with comments and suggestions immediately following receipt of the project plan. Their comments were generally very favourable and the project appeared to have a high priority with most of the responding individuals. Unfortunately, no comments have been received from the Steering Committee on Ecological Research or the Canadian Wildlife Service, Ottawa, although Dr. J. S. Tener acknowledged receipt of copies of

the project plan and promised to forward documented comments (see memorandum dated June 27th, 1969, WLU 200 Scotter).

After one field season, it is apparent that the project plan contains too broad a scope for completion within the six years that were projected. However, it would appear wise to leave the termination date as it now stands and thoroughly review progress at that time and complete any unfinished phases under a new project plan.

Vegetation study

Twenty-seven stands of vegetation were studied in detail in the Sunshine area of Banff National Park and adjacent British Columbia during the summer of 1969. Frequency and cover data obtained from each of the sites have been summarized and will be subjected to statistical treatment as soon as sampling in the Sunshine area is completed. If the weather is reasonably good during the 1970 summer field season, I hope to complete the sampling by September and have the statistical analyses of the data completed in time for the second progress report.

Plant Identification

Several hundred vascular plants (Appendix B), lichens (Appendix C), and bryophytes (Appendix D) were collected from sub-alpine and alpine regions of the study area. All unknown plants within the 27 vegetation stands studied in detail were collected. These plants have been identified and determination lists were submitted to the National and Historic Parks Branch.

Soils

Preliminary soils work was carried out at each of the 27 vegetation stands analyzed. More detailed studies on structure, texture, and chemical composition of the soils were made at five sites covered by patterned ground.

A contract with the Alberta Institute of Pedology to carry out soils research in the Sunshine area is being negotiated at the present time. It is projected that that study will be completed by March 31st, 1972.

Micro-environmental measures

Mr. F. W. Anderka, Canadian Wildlife Service, Ottawa, was to set up an automatic recording device for monitoring soil moisture, soil temperatures, and air temperature during the summer field season of 1969. His equipment was to have been tested in the Gatineau Hills in the winter of 1968-69 and the station was to be fully operable in the alpine areas by July 1st, 1969. Although several thousand dollars have been spent on materials and salaries for construction of such equipment, no data have been received up to the time of writing this report. A second station is proposed for the Sunshine area and is to be operable by June 1st, 1970. However, recent communication from Mr. Anderka suggested that this may be delayed.

Damage to alpine environments

Subjective assessments of damage to alpine communities were made at each of the 27 vegetation stands studied. This data will be summarized as soon as sampling is finished in the Sunshine area.

In addition, black and white and color photographs showing the impairment resulting from the construction of a ski lift in the fall of 1968 and other damages resulting from the skiing operation at Sunshine Village were taken for illustrating a final report.

At the request of the Warden Service, a preliminary assessment of the carrying capacity of adjacent alpine and sub-alpine areas for horses was carried out in early September. The study was requested since the region will be used by the Trail Riders of the Canadian Rockies during July and August of 1970. Possible damages from such an operation were discussed with the Warden Service.

Visitors to the Study Site

A number of botanists visited the study site during the summer field season. These included Dr. L. C. Bliss, University of Alberta, Edmonton; Dr. Tyge W. Böcher, University of Copenhagen, Denmark; Dr. Olaf I. Rønning, Botanical Institute, University of Trondheim, Norway; Mr. G. A. Mulligan, Plant Research Institute, Canada Department of Agriculture, Ottawa; Dr. R. Wein and graduate students, University of Alberta, Edmonton; Dr. R. T. Ogilvie, University of Calgary, and graduate students; and Eileen Harman, Naturalist, Banff.

Acknowledgements

I would like to acknowledge the assistance of several individuals during the field season. Mr. Gary C. Trottier provided capable field assistance throughout the summer, members of the Warden Service of Banff National Park provided assistance on a number of occasions as did the operators of Sunshine Village.

PROJECT PLAN

Title: ECOLOGY OF ALPINE VEGETATION IN THE NATIONAL PARKS
OF WESTERN CANADA.

Project No:

Investigator: George W. Scotter

1. Objectives:

- (1) To describe the composition and structure of plant community types within alpine zones.
- (2) To describe the soils within all plant community types that are recognized.
- (3) To determine the major environmental factors controlling plant and soil distribution and development.
- (4) To determine the distribution and to compare major plant community types over a broad geographic region.
- (5) To learn the nature and effects of man-made factors damaging or destroying alpine communities.
- (6) To formulate recommendations on park planning and practices to provide adequately for the preservation of alpine communities.

2. Justification:

Few studies on the alpine ecosystems of western Canada have been made and their scope and treatment are limited. Detailed information on alpine ecosystems is required to facilitate wise

planning and management of such areas. In certain areas of the National Parks, management decisions have been made without the benefit of such knowledge and marked deterioration of fragile alpine ecosystems has resulted.

In addition, alpine ecosystems are interesting features to park visitors. Knowledge obtained from such a study should be valuable in developing a worthwhile interpretive program. Such a program in alpine regions is highly desirable since the relationships among plants, soils, and environment are simpler than in many other regions and easier, therefore, for visitors to understand.

3. Literature Review:

Ecological studies on alpine regions of western Canada are notably lacking. Moss (1955) described the alpine zone of Alberta in general terms and considered it to be poorly known. The alpine vegetation of the Snow Creek region of Banff National Park has been studied by Eder (1967). Studies of alpine vegetation in Jasper National Park by Julie O. Hrapko in the Signal Mountain region and Peter Kuchar in the Bald Hills region are currently underway. Choate (1963) applied ordination techniques to alpine vegetation in Glacier National Park, Montana, which is adjacent to Waterton Lakes National Park.

Krajina (1965) has classified the various biogeoclimatic zones in British Columbia. Brink (1959, 1964) and Archer (1963, 1964)

worked in alpine regions of Garibaldi Park and Tisdale, Fosberg, and Poulton (1966) described the vegetation and soil development on recently glaciated areas near Mount Robson.

Alpine regions in Western United States have been the focus of considerably more attention. Alpine regions of Colorado, in particular, but also of Wyoming, Montana, and California have been studied by a number of workers. Much of the recent attention has been on the relationships between plants and the environment (Bliss 1956, 1962, 1963, 1966; Churchill and Hanson 1958; Hadley and Bliss 1964; Johnson and Billings 1962; Langenheim 1962; Bamberg and Major 1968).

Snow cover and duration is considered as one of the most important ecological factors determining alpine plant distribution (Dahl 1956; Gjaerrevoll 1950, 1956; Billings and Bliss 1959; Ellenberg 1963; Marr 1961; Holway and Ward 1963; Bamberg and Major 1968). Other important factors may include temperature (Sørensen 1941; Dahl 1951, 1956; Nimlos et al. 1965; Salisbury et al. 1968), moisture (Dahl 1956; Holway and Ward 1963; Nimlos et al. 1965, Salisbury et al. 1968), and wind (Wilson 1959; Salisbury et al. 1968).

Soils of the alpine region have received scant attention in most regions. The morphology, chemistry, and genesis of alpine soils in Montana were described by Nimlos (1963), Nimlos and McConnell (1962, 1965), Nimlos, McConnell and Pattie (1965), and by Bamberg and Major (1968). Johnson and Billings (1962) studied

the soils of the Beartooth Plateau of Montana and Wyoming. In Colorado, alpine soils have been investigated by Retzer (1956, 1962, 1965), Marr (1961) and Johnson and Cline (1965).

Little attention has been given to alpine soils in western Canada. Baple (1968), working in the Snow Creek region of Banff National Park, described alpine soils. Archer (1964) and Brooke (1965) commented on alpine soils in British Columbia.

Studies of alpine community types have concentrated on general vegetation characteristics of a restricted area. Few attempts have been made to study alpine vegetation over a fairly broad geographic region. Once the major community types in the Sunshine area are delineated, community types along a north-south gradient (Jasper to Waterton Lakes National Parks) and an east-west gradient (Banff to Mount Revelstoke National Parks) will be analyzed to determine variations in geographic distribution.

Little has been published on the effects of visitor activities such as walking, rock removal, littering, flower picking, plant removal, skiing, and driving cars on alpine communities. In Rocky Mountain National Park, Colorado, Williams and Marr (1969) observed that alteration of alpine communities occurred rapidly, but recovery was slow following some of these activities.

4. Location and Description of Study Areas:

The major study will be in the Sunshine area of Banff Park and the Ehippus Lake area of British Columbia, which is to be

added to Kootenay Park. Approximately 17-square miles of the area is above timberline, with an average elevation of about 7,300 feet. The area straddles the Continental Divide between Simpson and Fatigue Pass. It is located about 18 miles southwest of Banff townsite and a gravel road to Sunshine Lodge can be used for access to the eastern base of the area.

Community types within alpine regions of Waterton Lakes, Jasper, Yoho, Kootenay, Glacier, and Mount Revelstoke National Parks will be studied for comparative purposes.

5. Methods:

A reconnaissance of the Sunshine area will be made to determine the kind and extent of communities present. From this reconnaissance provisional community types will be established for stand analysis. Only areas representative of specific community types will be chosen. An area 4 by 10 m will be marked off and the 10 m side will be subdivided into 20 rows, eight of which will be randomly selected for sampling. Four quadrats (20 by 50 cm) spaced .5 m apart in the row will be selected and analyzed for species presence, percent cover, and density. On even-numbered rows the first plot will be placed contiguous with the tape. On odd-numbered rows the first quadrat will be placed .5 m from the tape [See Bliss (1963), Fig. 2, for a diagram of a similar design]. The plot size of 1/10 m² was found to be suitable for alpine vegetation by Cain (1943), Daubenmire (1959), and Bliss (1963).

Relative density, relative frequency, and relative cover will be calculated for the vascular plants and combined to obtain importance values and then relative importance values (Curtis and McIntosh 1951). Species within each plot will be grouped by relative importance values to determine community types. Only cover data will be gathered for lichens and mosses because identifications are difficult and determination of density would be time consuming.

Coefficients of similarity between community types will be computed using the formula $\frac{2W}{A+B} \times 100$, where A is the sum of all measures (frequency, cover, and density) for one community, B is the sum of all measures for another community, and W is the sum of the lower values for each species which the two communities have in common. To determine the degree of affinity and relative hiatus points between community types, cluster analysis using the weighted pair-group method (Sokal and Sneath 1963) will be employed. A two-dimensional dendrogram will be used to illustrate the individual plots and succeeding clusters (Sokal and Sneath 1963; West 1966).

Once the major community types are identified, black and white and color aerial photographs will be used to determine if photography could be successfully used to map alpine types within National Parks.

Major community types occurring in other National Parks will be analyzed using the same procedures as already described to determine geographic variations.

A study of the major environmental factors will allow a greater understanding of community occurrence and distribution in the alpine region. After the major plant communities are delineated from the first year's data, stations will be established to obtain quantitative and qualitative data on air and soil temperatures, precipitation, soil moisture, relative humidity, wind, and snow depth. Mr. F. W. Anderka, Canadian Wildlife Service, Ottawa, is working on an automatic recording device for monitoring soil moisture, soil temperature, and air temperature with soil moisture blocks and thermistors. Soil moisture and temperature will be recorded from three depths and temperature at three heights above ground. If possible, soil and air temperature will be monitored throughout the year and soil moisture throughout the growing season. Summer precipitation will be determined by using rain gauges, wind with anemometers, and relative humidity with hygrographs. Snow depths will be measured at weekly intervals during the winter.

Soil profiles from each of the plant communities that are sampled will be described in detail in the field, and soil samples will be taken for laboratory analyses. Field observations will include color, depth of rooting, lime reaction with HCl, moisture, stoniness, structure, texture, and thickness and depth of horizons. Chemical analyses of the soil samples will include pH, organic matter content, total nitrogen, absorbed phosphorus, cation exchange capacity and exchangeable calcium, magnesium, potassium, and sodium. Carbon/Nitrogen ratios will be calculated from these data. Other laboratory analyses will include mechanical analysis to

determine the percentage of each soil fraction and moisture equivalent determinations. It is proposed that all laboratory analyses will be carried out under contract.

The influence of various visitor activities on alpine communities will largely be determined by observation. Visitor impact will be determined for each community type studied by applying the degree scale suggested by Williams and Marr (1969). In some areas the vegetation in permanently staked plots will be re-examined in subsequent seasons to determine the effects of certain activities.

6. Materials and Equipment Required:

Metal plot markers

Sampling frames

Aerial photographs

(1) black and white

(2) color

Vehicle for transport

Horses with pack and riding saddles

Plant collection supplies

Color and black and white film

Tapes

Anemometers

Hygrothermographs

Thermographs

Rain gauges

Thermometers
Sling psychrometers
Instrument shelters
Pyrheliograph
Fiberglass soil cells
Moisture meter
Computer rental
Soil moisture cans
Pack sacks
Munsell Color Chart
Skis, poles, and bindings
Snowshoes
Thermistors

7. Personnel and Co-operation Required:

It is anticipated that the National and Historic Park Branch will provide a cabin for accommodation in the Sunshine area. It is also hoped that Park Wardens will assist in measuring snow depths and monitoring weather stations during the winter months and at other intervals when the researcher is absent from the area.

When the study of geographic variation within the plant community types is started in other parks (4th and 5th years), the advice of Park Wardens and Park Naturalists will be solicited in selecting sites. In remote areas some assistance with transportation will be required.

A field assistant will be required each summer. This could be a Canadian Wildlife Service technician or a student. The services of a technician will be required on a half-time basis from mid-September to mid-May of each year.

The assistance of consultants in computer science, statistics, and soils will be required. Departmental staff may be able to act as advisors in the computer and statistics areas. The laboratory analyses connected with soil properties should be contracted to a university or government agency.

Taxonomic determinations of plants from the alpine regions will be undertaken in co-operation with the Plant Research Institute, University of Calgary, and the National Museum of Canada.

8. Duration of Project:

This project will cover a period of six years (1969 through 1974). Some preliminary work was carried out on this project during 1968. Field work will continue in the Sunshine region of Banff National Park during 1969, 1970, and 1971. Field work is projected for Waterton Lakes, Jasper, Yoho, Kootenay, Glacier and Mount Revelstoke National Parks during 1972 and 1973. During 1974, data analyses will be completed and a final report with recommendations will be prepared. Annual progress reports will include recommendations in so far as justified by data.

9. Estimated Total Cost:

Estimated cost of the project is \$56,000, excluding the salaries of the research scientist, summer assistant and/or technician. The projected expenses by categories are as follows:

	<u>1969-70</u>	<u>1970-71</u>	<u>1971-72</u>	<u>1972-73</u>	<u>1973-74</u>	<u>1974-75</u>
Casual wages	925	300	300	300	300	300
Professional services	250	8,000	6,000	1,200	1,200	2,000
Travel	1,200	1,200	1,200	1,400	1,400	800
Freight	75	100	100	100	100	100
Supplies	1,560	1,200	1,200	1,000	1,000	800
Equipment maintenance	50	300	300	400	400	300
Equipment rental	625	750	800	2,400	2,400	-
Equipment purchase	<u>2,850</u>	<u>6,915</u>	<u>900</u>	<u>500</u>	<u>500</u>	<u>-</u>
	7,535	18,765	10,800	7,300	7,300	4,300

Some meteorological equipment is to be supplied by the Canadian Wildlife Service, Ottawa, through the participation of F. W. Anderka.

10. Literature Cited:

- Archer, A. C. 1963. Some synecological problems in the alpine zone of Garibaldi Park. Unpubl. M. S. Thesis, Dept. of Biology and Botany, Univ. of British Columbia.
- Archer, A. C. 1964. Some synecological problems in the alpine zone of Garibaldi Park. In: Ecology of the Forests of the Pacific Northwest, Dept. of Biology and Botany, Univ. of British Columbia.
- Baumberg, S. A. and J. Major. 1968. Ecology of the vegetation and soils associated with calcareous parent materials in three alpine regions of Montana. *Ecol. Monogr.* 38: 127-167.
- Baptie, B. 1968. Ecology of the alpine soils of Snow Creek valley, Banff National Park, Alberta. Unpubl. M. S. thesis, Dept. of Biology, Univ. of Calgary.
- Beder, K. 1967. Ecology of the alpine vegetation of Snow Creek valley, Banff National Park, Alberta. Unpubl. M. S. thesis, Univ. of Calgary.
- Billings, W. D. and L. C. Bliss. 1959. An alpine snowbank environment and its effects on vegetation, plant development and productivity. *Ecology* 40: 388-397.
- Bliss, L. C. 1956. A comparison of plant development in micro-environments of arctic and alpine tundras. *Ecol. Monog.* 26: 303-337.
- Bliss, L. C. 1962. Caloric and lipid content in alpine tundra plants. *Ecology* 43: 753-757.
- Bliss, L. C. 1962. Adaptations of arctic and alpine plants to environmental conditions. *Arctic* 15: 117-144.
- Bliss, L. C. 1963. Alpine plant communities of the Presidential Range, New Hampshire. *Ecology* 44: 678-697.
- Bliss, L. C. 1966. Plant productivity in alpine micro-environments on Mt. Washington, New Hampshire. *Ecol. Monog.* 36: 125-155.
- Brink, V. C. 1964. Plant establishment in the high snowfall alpine and subalpine regions of British Columbia. *Ecology* 45: 431-438.
- Brink, V. C. 1959. A directional change in the subalpine forest - heath ecotone in Garibaldi Park, British Columbia. *Ecology* 40: 10-16.

- Brooke, R. G. 1965. The subalpine mountain hemlock zone. Part II: Ecotopes and biogeocoenotic units. In: Ecology of Western North America, Dept. of Botany, Univ. of British Columbia. pp. 79-101.
- Cain, S. A. 1943. Sample-plot technique applied to alpine vegetation in Wyoming. *Am. J. Botany* 30: 240-247.
- Churchill, E. D. and H. C. Hanson. 1958. The concept of climax in arctic and alpine vegetation. *Bot. Rev.* 24: 127-191.
- Choate, C. M. 1963. Ordination of the alpine plant communities at Logan Pass, Glacier National Park, Montana. Unpubl. M.A. Thesis, Univ. of Montana, Missoula.
- Curtis, J. T. and R. P. McIntosh. 1951. An upland forest continuum in the prairie-forest border region of Wisconsin. *Ecology* 32: 476-496.
- Dahl, E. 1956. Rondane - Mountain vegetation in South Norway and its relation to the environment. *Skrifter Utgitt av Det Norske Videnskaps - Akademi i Oslo I. Mat.-Naturv. Klasse.* No. 3. 374 pp.
- Dahl, E. 1951. On the relation between summer temperature and the distribution of alpine vascular plants in the lowlands of Fennoscandia. *Oikos* 3: 22-52.
- Daubenmire, R. 1959. A canopy-coverage method of vegetational analysis. *Northwest Sci.* 33: 43-64.
- Ellenberg, H. 1963. Vegetation Mitteleuropas mit den Alpen, in Kausaler, dynamischer und historischer Sicht. 945 pp. Ed. 4, Teil 2 of H. Walter's Einführung in die Phytologie. Ulmer, Stuttgart.
- Gjaerrevoll, O. 1950. The snow-bed vegetation in the surroundings of Lake Tornetrask, Swedish Lapland. *Svensk Bot. Tidskr.* 44: 387-440.
- Gjaerrevoll, O. 1956. The plant communities of the Scandinavian alpine snow-beds. *Kgl. Norske Vidensk. Selsk. Skr.* 1: 1-405.
- Hadley, E. B. and L. C. Bliss. 1964. Energy relationships of alpine plants on Mt. Washington, New Hampshire. *Ecological Monographs* 34: 331-357.
- Holway, J. G. and R. T. Ward. 1963. Snow and melt-water effects on an area of Colorado alpine. *Amer. Midl. Natur.* 69: 129-197.
- Johnson, D. D. and A. J. Cline. 1965. Colorado Mountain Soils. In: *Advances in Agronomy* 17: 233-281.

- Johnson, P. J. and Billings, W. D. 1962. The alpine vegetation of the Beartooth Plateau in relation to cryopedogenic processes and patterns. *Ecol. Monogr.* 32: 105-135.
- Krajina, V. L. 1965. Biogeoclimatic zones and biogeocoenoses of British Columbia. In: *Ecology of Western North America*, Dept. of Botany, Univ. of British Columbia. pp. 1-17.
- Langenheim, H. 1962. Vegetation and environmental patterns in the Crested Butte area, Gunnison County, Colorado. *Ecol. Monogr.* 32: 249-285.
- Marr, J. W. 1961. Ecosystems of the East Slope of the Front Range in Colorado. Institute of Arctic and Alpine Research, Univ. of Colorado Press, Cont. 4, 134 pp.
- Moss, E. H. 1955. The vegetation of Alberta. *Bot. Rev.* 21: 493-567.
- Nimlos, T. J. 1963. Zonal great soils groups in western Montana. *Proceedings of the Mont. Acad. Sci.* 23: 3-13.
- Nimlos, T. J. and R. C. McConnell. 1965. Alpine soils in Montana. *Soil Sci.* 99: 310-321.
- Nimlos, T. J., R. C. McConnell and D. L. Pattie. 1965. Soil temperature and moisture regimes in Montana alpine soils. *Northwest Sci.* 39(4): 129-138.
- Nimlos, T. J. and R. C. McConnell. 1962. The morphology of alpine soils in Montana. *Northwest Sci.* 36(4): 99-112.
- Retzer, J. L. 1956. Alpine soils of the Rocky Mountains. *J. Soil Sci.* 7(1): 22-32.
- Retzer, J. L. 1962. Soil survey of Fraser alpine area, Colorado. U. S. Dept. of Agriculture. Series 1956, No. 20.
- Retzer, J. L. 1965. Present soil forming factors and processes in arctic and alpine regions. *Soil Sci.* 99: 38-44.
- Salisbury, F. B., G. G. Spomer, M. Sobral, and Richard T. Ward. 1968. Analysis of an alpine environment. *Bot. Gaz.* 129: 16-32.
- Sokal, R. R. and P. H. A. Sneath. 1963. Principles of numerical taxonomy. Freeman, San Francisco, California. 359 pp.
- Sorenson, T. 1943. Temperature relations and phenology of the Northeast Greenland flowering plants. *Meddel. om Gryland* 125: 305 p.

- Misdale, E. W., M. A. Fosberg and C. E. Poulton. 1966. Vegetation and soil development on a recently glaciated area near Mount Robson, British Columbia. *Ecology* 47: 517-523.
- West, N. E. 1966. Matrix cluster analysis of montane forest vegetation of the Oregon Cascades. *Ecology* 47: 975-980.
- Williams, B. E. and J. W. Marr. 1969. Effects of visitor use on alpine tundra ecosystems, Trail Ridge, Rocky Mountain National Park, Colorado. *Biol. Conserv.* 2: (In press).
- Wilson, J. W. 1959. Notes on wind and its effect in arctic-alpine vegetation. *J. Ecol.* 415-427.

Appendix B

Plants of Banff National Park and adjacent regions of British Columbia,
collected by George W. Scotter, 1968.

- Asplenium viride* Huds. 12012, 11000, 11025, 12053.
Cryptogramma crista (L.) R. Br. 10964, 10972.
C. stelleri (Gmel.) Prantl. 12012, 11280.
Cystopteris fragilis (L.) Bernh. 11996, 10743, 12020, 10686, 10432,
 10377, 10765, 10760, 10997, 10999, 11281, 11282, 11325, 11396, 11952.
Polystichum lonchitis (L.) Roth 110256, 10975, 10790.
Woodsia scopulina D.C. Eat. 10995, 10967.
Botrychium lunaria (L.) Sw. var. *minganense* (Viel.) Dale 12145, 11536.
Equisetum arvense L. 10426, 12240.
E. variegatum Schlecht. 11340, 11377, 12157, 12239.
Lycopodium alpinum L. 10433, 11789.
L. selago L. 11696.
Selaginella densa Rydb. 11524, 11515, 11466, 11442, 11093, 10736, 10664.
Juniperus communis L. var. *montana* Ait. 11028.
J. horizontalis Moench 12041.
Agropyron latiglume (Scribn. & Sm.) Rydb. 10962, 11365, 11623, 11803,
 11988, 12082, 12160, 12213, 12223.
Agrostis humilis Vasey 12031, 12167.
A. variabilis Rydb. 11403, 11811, 11812, 12227,
Calamagrostis purpurascens R.Br. 11364, 11371, 11800.
Danthonia intermedia Vasey 12054, 12208.
Deschampsia caespitosa (L.) Beauv. 11390, 11622, 12024, 12028, 12063,
 12194, 12210, 12230.
Elymus glaucus Buckl. 12229.
Festuca baffinensis Polunin 11957, 11950.
F. brachyphylla Schuller 11327, 11356, 11443, 11479, 11810, 12117.
F. saximontana Rydb. 11370, 11371, 11464, 11639, 11813, 11814, 12195.
F. rubra L. 12216, 12219.
Hierochloa odorata (L.) Beauv. 11709.
Phleum commutatum Gaud. (*P. alpinum*) 11539.
Poa alpina L. 11145, 11328, 11393, 11468, 11494, 11502, 11514,
 11586, 11640, 11663, 11693, 11723, 11892, 11985, 12109, 12064, 12139,
 12152, 12156, 12174, 12197, 12221, 12228.
P. arctica R. Br. 11608, 11692, 11799, 12138, 11795.
P. epilix Scribn. 11245, 11410, 11472, 11537, 11557, 11633, 11796, 11801,
 11803, 12001, 12065, 12102.
P. glauca M. Vahl 10751, 11250, 11320, 11367, 11440, 11797, 11793, 11805,
 11806, 11807, 12224.
P. gracillima Vasey 11987.
P. lettermani Vasey 11894, 11899.
P. paucispicula Scribn. & Merr. 11637, 11725, 12113, 12150.
P. stenantha Trin. 12009, 12011.
P. sp. 11804, 12172, 12207
Stipa columbiana Macoun. 11169.
Trisetum spicatum (L.) Richt. 10961, 11360, 11376, 11463, 11506, 11534,
 11585, 11637, 11809, 12036, 12225.

Vahlodea atropurpurea (Wahlenb.) Fries ssp. *latifolia* (Hook.) Persild - 12214, 12222, 11538, 11722, 12035, 12129, 12137, 12170, 12175, 12199.
Eriophorum angustifolium Roth. - 11389A.
E. scheuchzeri Hoppe - 11408, 11985.
Kobresia myosuroides (Vill.) Fiori & Paol. - 10761A, 11415A, 12033.
Carex albo-nigra Mack. 11694A, 11694B, 11791.
C. atrata L. 11388B, 11435, 11460, 11493, 11616, 11661, 11958, 12046, 12051, 12153, 12205, 12205, 12220.
C. bipartita All. - 11387.
C. capillaris L. var. *elongata* Olney - 12152B.
C. deflexa Hornem - 11355.
C. eurystachya Horn. - 12237.
C. haydeniana Olney - 11588, 11772, 12049, 12052, 12110, 12196B.
C. maritima Gunn. - 10665, 11900, 11901.
C. nardina Fr. var. *Hepburnii* (Boott) Kuk. - 10662, 10675, 11415, 11437, 11476, 11503, 11516, 11947.
C. nigricans C. A. Mey. - 11461, 11525, 11554, 11589, 11604, 11652, 11719, 11720, 11721, 12103, 12140, 12141, 12166, 12169, 12171, 12175, 12177, 12191, 12200.
C. petricosa Dew. - 12090.
C. phaeocephala Piper - 11794, 11656A.
C. pyrenaica Wahlenb. - 11691, 11594A, 11793, 12217.
C. rossii Boott - 12225.
C. rupestris All. - 10761B, 11421A, 11517A, 1194E, 12088, 12089A.
C. saxatilis L. var. *rhomalea* Fern. - 12027, 12190, 12192, 12202, 12203A.
C. scirpoidea Michx. - 11397, 11417, 11418, 11421B, 11473, 11501, 11513, 11517B, 11662A, 11989, 12047, 12089B, 12091, 12154, 12194, 12204.
C. spectabilis Dew. - 11775, 12022, 12135, 12196A, 12201.
Juncus castaneus Sm. - 12025, 12206.
J. drummondii E. Mey. - 12101, 12193, 12198, 11582, 12029, 11727, 12173, 12134, 11660.
J. mertensianus Bong. - 11792, 11590, 11626, 11404.
J. triglumis L. 12023, 12238, 11398.
Luzula parviflora (Ehrh.) Desv. - 11653, 11625, 12007, 11583, 12142.
L. glabrata (Hoppe) Desv. 10763, 11556, 11465.
L. spicata (L.) DC. - 11773, 11323, 11339.
Erythronium grandiflorum Pursh - 10786.
Smilacina stellata (L.) Desf. 10991.
Zygadenus elegans Pursh - 12039
Salix barrattiana Hook. - 10419, 10757, 10759, 10760, 11183, 11184, 11569, 11570, 11627, 12165.
S. glauca L. var. *acutifolia* Schneid. - 10766, 10775.
S. nivalis Hook. - 11409, 11441, 11507, 11962.
S. vestita Pursh var. *erecta* Anderss. - 10547, 11991.
Eriogonum ovalifolium Nutt. - 12179.
Oxyria digyna (L.) Mill - 11358.
Rumex alpestris (Scop) Low 11780, 11249, 11334, 10783.
Polygonum viviparum L. - 11336.
Claytonia sp. - 11533.
C. lanceolata Pursh - 10731.

- Arenaria capillaris* Poeret subsp. *Americana* Maquire - 11027, 10959, 11603, 11467, 11524, 11531.
Minuartia rossii (R. BR.) ex. Richardson subsp. *columbiana* (Raup) Maquire var. *apetala* Maquire. = *Arenaria rossii* R. BR. - 10735, 11955, 12019, 11021.
M. rubella (Wahlenb.) Graebner = *Arenaria rubella* (Wahlenb.) Sm. - 10996, 103788.
M. obtusiloba (Rydb.) House = *Arenaria obtusiloba* (Rydb) Fern - 11462, 11535, 11552, 11503, 11176, 11695, 11606, 10734, 10685, 10561, 10485, 10418, 10410, 10381, 10374.
Cerastium fontanum Baring. subsp. *triveali* (Link) Talas = *C. vulgatum* Antl. - 12158.
C. beeringianum Cham & Select - 11992, 11897, 10740, 118978, 10551, 11087.
Melandrium apetalum (L.) Fenzl. = *Silene Wahlbergella chardum* - 11950, 11510, 11896, 11089, 10733.
Sagina sagenoedes (L.) Kant. (= *S. linnaei* Presl.) - 12116, 12032.
Stellaria calycantha (Ledeb.) Bong. 11659, 12111, 11581, 12164.
S. monantha Hulten - 10769, 11092, 11322, 11687, 11474, 11897C, 11444, 103788.
S. umbellata Turcz. - 12021, 11618, 12164.
Anemone drummondii Wats. - 11425, 11579.
A. lyallii Britt 10799.
A. oregana Gray 10671, 11182.
A. occidentalis Wats. 11543, 10785.
Aquilegia flavescens Wats. - 10977.
Caltha biflora D.C. 10793.
Delphinium menziesii D.C. - 10792, 11400.
Ranunculus aquatilis L. 12189.
R. eschscholtzii Schlecht. - 12034, 12105, 10797, 10578.
R. nivalis L. 10673, 10746.
R. pygmaeus Wahlenb. - 10555, 10788.
Thalictrum occidentale Gray - 10781.
Trollius laxus Salis 11573.
Arabis divaricarpa 104438, 10774.
A. lemmonii Wats. - 10405.
A. Lyallii - 10727.
A. lyrata - 11405.
A. sp. - 10411.
Braya humilis (Meyer) - 11994.
Descurainia sp. 10413.
Draba aurea M. Vahl 10357, 10433, 10439, 11995.
D. crassifolia Grah. 10412, 10440, 12072.
D. incerta Payson 10373, 10376, 10416C, 10436, 10438, 10558, 10565, 10567, 10728, 11175, 11177, 11707, 11708, 11944, 121328, 12044.
D. lanceolata Royle 10566, 10568, 10989, 11982.
D. lonchocarpa Rydb. 10379, 10407, 10409, 10426, 10557, 10566B, 10668, 10730, 11024, 11094, 11414, 11505, 11891, 11945, 12043, 12187.
D. macounii Schutz. 10548, 10559, 10564, 10566, 10666A, 10729, 11038A, 11038B, 11992.

- D. paysonii* McBride - 10550, 10573.
D. praealta Greene - 10437, 10567, 12058.
D. stenoloba Ledeb. - 10378A, 10414, 10415, 10416, 10434, 10441, 11392, 11523, 11665, 11731.
D. ventosa Gray var. *ruaxos* Payson & St. John - 10416B, 10569, 11029, 11893.
Erysimum cheventhoides - 12014.
Rorippa islandica (Ded. ex Murr.) Borbas - 11593, 12056.
Smelowskia calycina (Steph.) C. A. Mey. var. *americana* (Regel & Herder) Drury & Rollins - 10360, 10563, 10575, 11439.
Sedum stenopetalum Pursh. - 10771, 10934, 11033.
Heuchera cylindrica Dougl. - 10978.
Leptarrhena pyrolifolia (D. Don.) Ser. - 10971.
Lithophragma glabrum Nutt. = (*L. bulbifera* Rydb.) - 10660.
Mitella breweri A. Gray - 10782.
Mitella pentandra Hook. - 12136, 11575.
Parnassia fimbriata Koenig - 11572, 11783, 12103.
Saxifraga adscendens L. - 11396, 10553, 10554, 11091.
S. aizoides L. - 12056, 12013.
S. bronchialis L. ssp. *austromontana* (Wieg.) Piper - 11777, 12131, 11226, 11706.
S. caespitosa L. s. lat. - 11893, 10576, 10732.
S. flagellaris Willd. ssp. *flagellaris* - 10549.
S. lyallii Engler - 11577, 12115, 10800, 10747.
S. occidentalis Watson subsp. *occidentalis* - 10661.
S. oppositifolia L. - 10577, 11422.
S. rivalaris L. 10965.
Dryas Hookeriana Juz. 11419.
Fragaria glauca (Wats.) Rydb. 11528.
Potentilla anserina L. - 12062.
P. diversifolia Lehm. - 11642, 11526, 12114, 12067, 11181, 11470, 11685, 11023, 11420, 11187, 10674, 10748, 11230, 10762.
P. fruticosa L. - 11333.
P. nivea L. - 11229, 10753, 10724, 11029B.
Sibbaldia procumbens L. - 10726, 11555.
Astragalus aboriginorum Richards. - 11369.
A. alpinus L. - 10574, 11227, 10417, 11953.
A. bourgovii Gray - 11022, 11106, 11332.
Hedysarum mackenzii Richards. - 10756, 11035, 11990, 12092.
H. sulphurescens Rydb. - 10672, 11242.
Oxytropis podocarpa Gray - 10749, 11231, 10375.
O. sericea Nutt. v. *spicata* (Hook) Barneby - 10750, 11243.
Viola adunca J. E. Sm. 10973.
V. glabella 10429, 11391.
V. mackowskyi Lloyd - 10430.
Moneses uniflora (L.) Gray - 12037.
Pyrola virens Schweigg. - 10725.
Cassiope tetragona (L.) D. Don esp. *saximontana* (Small) Porsild - 11697, 11496.
Kalmia microphylla (Hook.) Heller - 10798, 11179.

- Phyllodoce empetrifolia* (Sm.) G. Don - 10427.
Rhododendron albiflorum Hook. - 10993.
Arctostaphylos uva-ursi Spreng. - 11247.
Vaccinium scoparium Leiberg - 11540, 10769.
Androsace septentrionalis L. - 12112, 10380.
Gentianella prostrata Haenk. - 11325, 10745, 10552.
G. propingua (Richards) Gillatt - 11240, 11477, 11651, 12038, 11954, 11318, 11338.
G. amarella - L. Börner - 12038, 12132.
Phacelia sericea Gray - 10404.
Cryptantha - 10657.
Hackella americana (A. Gray) Fern. - 12008.
Myosotis alpestris F. W. Schmidt. ssp. *asiatica* Vestergr. - 10487.
Prunella vulgaris L. var. *lanceolata* (Barton) Fern. 109908.
Castilleja miniata Dougl. - 12036, 11785, 10770, 10787.
Collinsia parviflora Dougl. - 10431.
Pedicularis bracteosa Benth. - 11536.
P. groenlandica Retz - 10998.
Penstemon ellipticus Coult and Fish - 11026, 11790, 11983, 10932.
Veronica wormskjoldii R. & S. - 11574, 10773, 10406.
Pinguicula vulgaris L. - 10990A.
Lonicera involucrata Banks - 11402, 10994.
Valeriana sitchensis Bong. - 11542.
Campanula uniflora L. - 10744.
Achillea millefolium L. - 12075.
Agoseris aurantiaca (Hook.) Greene - 11999, 10980, 11784, 11511, 11389.
A. glauca (Pursh) Greene - 11787, 12050.
Antennaria parvifolia Nutt. - 12178.
A. rosea - 10970, 121788.
A. racemosa Hook. - 11108.
A. unbrinella Rydb. - 11406.
A. alpina (L.) Gaertn. 11436, 11480, 11423, 11688, 11951, 10739, 10560, 12168, 11239, 11504, 11621, 11774.
A. lanata (Hook) Greene. 11469, 11553, 11639, 11541, 11724, 10764.
Arnica alpina (L.) Olin ssp. *angustifolia* (J.Vahl) Maguire - 12026, 11997.
A. cordifolia Hook. ssp. var. *pumila* (Rydb.) Maguire - 11337, 12146, 10981.
A. diversifolia Greene - 10983.
A. latifolia Bong. - 12076, 11395, 11357, 11529, 10791, 12077.
A. mollis Hook. - 12079, 12081, 12144, 11576, 11624, 11652, 11664.
A. rydbergii Greene - 11984.
Cirsium hookerianum Nutt. - 12040.
Crepis nana Richards. - 11321
Erigeron aureus Greene - 11241, 11104, 10572, 10742, 11232.
E. acris L. - 12030, 12055, 10974.
E. compositus Pursh - 11066, 11961, 10559.
E. humilis Graham - 10656, 10737, 10738, 11090, 10659, 11946, 11511, 12107.
E. lanatus Hook. - 10755, 10609,
E. pallens Cronq. - 11317
E. peregrinus (Pursh) Greene (*E. salsuginosus*) - 11107, 11329, 10979.

E. sp. 12121, 12180, 10965, 10570, 10435.

Haplopappus lyallii (Gray) Piper - 10670, 11778, 11949, 11782, 11590, 11228.

Hieracium gracile Hook. - 11527, 11607.

Petasites frigidus L. Fries. 11180, 10768.

Saussurea densa (Hook.) Rydb. - 11779, 11957.

Senecio fremontii T. & G. - 11786.

S. lugens Richards. - 11655, 10741, 11185, 11246, 11335, 12073, 10663, 11959, 10767, 11419.

S. pseudaurens Rydb. - 12042.

S. sp. 12073, 12143, 11554, 11658.

Solidago multiradiata Ait. - 11963, 10658, 11643, 11424, 11475, 11375, 12074.

Teraxacum ceratophorum (Ledeb.) D.C. - 10571, 10408, 11781, 11356, 12048, 12118, 11998, 10795.

Plants of Waterton Lakes National Park, collected by George W. Scotter,
1968.

Dodecatheon conjugens. Greene. 10356
Draba aurea M. Vahl. 10357
Polemonium viscosum Nutt. 10358
Lupinus sericeus Pursh. 10359
Smelowskia calycina (Steph) Mey. 10360
Erigeron ochroleucus Nutt. 10361
Synthesis wyomingensis (A. Nels.) Heller (Bessya wyomingensis (A. Nels.)
Rydb.) 10362
Lomatium sandbergii Coult & Rose 10363

Appendix C

DETERMINATIONS OF ROCKY MOUNTAIN LICHENS COLLECTED BY
G.W. SCOTTER

WATERTON LAKES NATIONAL PARK, Vimy Ridge region, elev.
7100-7800 ft., 49°02'30", 113°51', S-1. June 30, 1969.

- 10321* - Sporastatia testudinea (Ach.) Mass.
- 10322 - Rhizocarpon riparium R#s.
- 10323* - Lecidea atrobrunnea (Ram.) Schaer.
- 10324* - Omphalodiscus krascheninnikovii (Sav.) Schol.
- 10325 - Lecanora caesiocinerea Nyl.
- 10326* - Omphalodiscus virginis (Schaer.) Schol.
- 10327 - Lecanora cfr. arctica Lynge
- 10328 - Lecanora cfr. alpina Somm.
- 10329 - added to 10332 as both the same species.
- 10330 - Lecidea crustulata (Ach.) Spreng.
- 10331 - Rhizocarpon macrosporum R#s.
- 10332 - Lecanora caesiocinerea Nyl.
- 10333* - Lecanora novomexicana (B. de Lesd.) Magn.
- 10334 - Lecanora polytropa (Ehrh.) Rabenh.
- 10335 - added to 10326 as both the same species.
- 10336 - Lecidea auriculata Th. Fr.
- 10337* - Xanthoria elegans (Link) Th. Fr.
- 10338* - Lecidea elata Schaer.
- 10339 - added to 10337 as both the same species.
- 10340* - Lecanora melanophthalma (Ram.) Ram.

- 10341* - Umbilicaria vellea (L.) Ach.
- 10342* - Cornicularia aculeata (Schreb.) Ach.
- 10343* - Umbilicaria hyperborea (Ach.) Ach.
- 10344 - added to 10326 as both the same species.
- 10345* - Stereocaulon alpinum Laur.
- 10346 - added to 10343 as both the same species.
- 10347 - Lecanora verrucosa Ach.
- 10348* - Lecidea granulosa (Hoffm.) Ach.
- 10349 - Physcia muscigena (Ach.) Nyl.
- 10350 - Caloplaca jungermanniae (Vahl) Th. Fr.
- 10351* - Parmelia saxatilis (L.) Ach.
- 10352* - Lecanora epibryon (Ach.) Ach.
- 10353* - Thamnotia subuliformis (Ehrh.) W.Culb.
- 10354 - added to 10345 as both the same species.
- 10355 - added to 10342 as both the same species.

BANFF NATIONAL PARK, Sunshine area, Standish Hump, elev.
7700 ft., 51°04'20", 115°47', S-2. July 5, 1969.

- 10364 - Staurothele perradiata Lynge
- 10365 - Polyblastia obsoleta Arn.
- 10366* - Xanthoria elegans (Link) Th. Fr.
- 10367 - Lecanora cfr. alphoplaca (Wahlenb.) Ach.
- 10368 - Lecidea crustulata (Ach.) Spreng.
- 10368A - Lecidea plana Lahm ex Körb.
- 10369 - Caloplaca jungermanniae (Vahl) Th. Fr.
- 10370 - Physcia muscigena (Ach.) Nyl.
Lecanora epibryon (Ach.) Ach.
- 10371 - Lecidea decipiens (Hedw.) Ach.
- 10372 - Cladonia chlorophaea (Flörke) Spreng.

BANFF NATIONAL PARK, Sunshine area, Wa Wa Ridge, elev. 7700-8000 ft., 51°05'45", 115°47'30", S-3. July 5, 1969.

- 10383 - Rhizocarpon macrosporum R#s.
- 10384* - Hypogymnia intestiniformis (Vill.) R#s.
- 10385 - Lecanora alpina Somm.
Rhizocarpon sphaerosporum R#s.
Lecidea atrobrunnea (Ram.) Schaer.
- 10386* - Alectoria pubescens (L.) R.H.Howe
- 10387 - Lecanora beringii Nyl.
- 10388 - added to 10393 as both the same species.
- 10389 - Rhizocarpon geographicum (L.) DC.
- 10390 - Lecidea sp.
- 10391 - sterile crustose lichen.
- 10392 - Buellia punctata (Hoffm.) Mass.
- 10393* - Lecidea atrobrunnea (Ram.) Schaer.
- 10394 - Peltigera aphthosa (L.) Willd.
- 10395 - Psoroma hypnorum (Vahl) S.Gray
- 10395A - Caloplaca jungermanniae (Vahl) Th. Fr.
- 10395B - Buellia papillata (Somm.) Tuck.
- 10396 - Cetraria ericetorum Opiz
- 10397* - Stereocaulon paschale (L.) Hoffm.
- 10398* - Cetraria cucullata (Bell.) Ach.
- 10399* - Umbilicaria hyperborea (Ach.) Ach.
- 10400* - Cetraria nivalis (L.) Ach.

BRITISH COLUMBIA, beside Banff National Park, Sunshine area, Grizzly Lake, area along lake and on rock outcrops, elev. 7250 ft., 51°03', 115°48', S-5. July 6, 1969.

- 10420 - Caloplaca jungermanniae (Vahl) Th. Fr.
- 10421 - Lecidea berengeriana (Mass.) Nyl.
- 10422* - Cetraria subalpina Imsh.

BANFF NATIONAL PARK, Sunshine area, bordering B.C. border,
elev. 7400-7900 ft., alpine community, 51°03', 115°46', S-6.
July 7, 1969.

- 10444* - Lecidea tessellata (Ach.) Flörke
- 10445* - Xanthoria elegans (Link) Th. Fr.
- 10446 - Lecidea albosuffusa Th. Fr.
- 10447 - Lecanora contractula Nyl.
- 10448 - Rhizocarpon sphaerosporum Räs.
- 10449* - Peltigera canina (L.) Willd.
- 10450 - Lecidea sp. ?
- 10451* - Physcia muscigena (Ach.) Nyl.
- 10452* - Cetraria tilesii Ach.
- 10453* - Solorina crocea (L.) Ach.
- 10454 - Psoroma hypnorum (Vahl) S.Gray
- 10455 - Ochrolechia cfr. inaequatula Nyl.
- 10456 - Lecanora epibryon (Ach.) Ach.
- 10457 - Lecidea decipiens (Hedw.) Ach.
- 10458* - Stereocaulon alpinum Laur.
- 10459* - Peltigera aphthosa var. leucophlebia Nyl.
- 10460* - Rinodina nimbose var. nuda Lynge
- 10461 - Dermatocarpon miniatum var. complicatum (Lightf.) Hellb.
- 10462* - Alectoria pubescens (L.) R.H.Howe
- 10463* - Alectoria chalybeiformis (L.) S.Gray
- 10464* - Cladonia ecmocyna (Ach.) Nyl.
- 10465 - Physcia sciastra (Ach.) Du Rietz
- 10466* - Umbilicaria hyperborea (Ach.) Ach.
- 10467* - Xanthoria elegans (Link) Th. Fr.
- 10468 - added to 10466 as both the same species.
- 10469* - Lepraria neglecta (Nyl.) Lett.

BANFF NATIONAL PARK, Quartz Ridge and Quartz Hill, elev. 7900-8464 ft., alpine community, 51°02', 115°46', S-7. July 7, 1969.

- 10489* - Cetraria commixta (Nyl.) Th. Fr.
- 10490* - Hypogymnia intestiniformis (Vill.) Räs.
- 10491* - Sporastatia testudinea (Ach.) Mass.
- 10491A - Hypogymnia intestiniformis (Vill.) Räs.
Alectoria pubescens (L.) R.H.Hoøe
- 10492 - Lecanora alpina Somm.
Rhizocarpon geographicum (L.) DC.
- 10493 - Rhizocarpon geographicum (L.) DC.
- 10494 - Rhizocarpon riparium Räs.
- 10495 - Rhizocarpon polycarpum (Hepp) Th.
- 10496 - Umbilicaria hyperborea (Ach.) Ach.
- 10497* - Alectoria pubescens (L.) R.H.Howe
- 10498 - Omphalodiscus decussatus (Vill.) Schol.
- 10498A - Omphalodiscus virginis (Schaer.) Schol.

BANFF NATIONAL PARK, Windy Point, elev. 7935 ft., Dryas - Carex community, 51°03'40", 115°44'35", T-1. July 15, 1969.

- 11411 -- Lecidea crustulata (Ach.) Spreng.
- 11412* - Lecanora verrucosa Ach.
- 11413 - Peltigera canina var. rufescens (Weis) Mudd

BRITISH COLUMBIA, near Banff National Park, Quartz Hill, Saddle area, elev. 8000 ft., 51°02'15", 115°45'55", T-2. July 22, 1969.

- 11426* - Cetraria islandica (L.) Ach.
- 11427 - Collema tenax (Sw.) Ach. em Degel.
Cladonia pocillum (Ach.) O.Rich.
- 11428* - Peltigera canina var. rufescens (Weis) Mudd
Cladonia pocillum (Ach.) O.Rich.

BANFF NATIONAL PARK, south of Lookout Mountain, Phyllodoce
empetriformis community, elev. 7400 ft., 51°03'45", 115°45'01",
T-3. July 23, 1969.

- 11446* - Lecanora polytropa (Ehrh.) Rabenh.
- 11447 - Rhizocarpon polycarpum (Hepp) Th. Fr.
Lecanora polytropa (Ehrh.) Rabenh.
- 11448 - Lecidea stigmatea Ach.
- 11449 - Lecidea granulosa (Hoffm.) Ach.
- 11450* - Lepraria neglecta (Nyl.) Lett.
- 11451 - Cetraria islandica (L.) Ach.
- 11452* - Peltigera apthosa (L.) Willd.
- 11453* - Cladonia ecmocyna (Ach.) Nyl.
- 11454 - added to 11452 as both the same species.
- 11455 - added to 11450 as both the same species.

BANFF NATIONAL PARK, west of Lookout Mountain, elev. 7540 ft.,
51°04'40", 115°45'05", T-5. July 29, 1969.

- 11481* - Lecanora polytropa (Ehrh.) Rabenh.

BRITISH COLUMBIA, beside Banff National Park, south of Larix
Lake, elev. 7800 ft., 51°02'40", 115°47'02", T-5. July 25, 1969.

- 11482 - Lecidea macrocarpa (DC.) Steud.
- 11483 - Solorina octospora Arn.
- 11484* - Peltigera canina var. rufescens (Weis) Mudd
- 11485 - added to 11484 as both the same species.

BANFF NATIONAL PARK, Lookout Mountain, elev. 7950 ft., Dryas
community, 51°04'40", 115°46', T-6. July 28, 1969.

- 11497* - Caloplaca holocarpa (Hoffm.) Wade
- 11498* - Acarospora arenacea Magn.
- 11499 - added to 11498 as both the same species.

BANFF NATIONAL PARK, west of Lookout Mountain, elev. 7540 ft.,
Vaccinium - Salix community, 51°04'40", 115°45'05", T-8.
July 29, 1969.

11518* - Stereocaulon ^{tomentosum Fr.} ~~paschale (L.) Hoffm.~~

BANFF NATIONAL PARK, south of Lookout Mountain, elev. 7370 ft.,
Antennaria community, 51°03'45", 115°45'01", T-9. July 30, 1969.

11544 - Rhizocarpon macrosporum Räs.
Rhizocarpon polycarpum (Hepp) Th. Fr.

11545 - Lecidea leucothallina Arn.

11546 - Lepraria neglecta (Nyl.) Lett.

11547* - Cladonia chlorophaea (Flörke) Spreng.

11548* - Peltigera canina var. rufescens (Weis) Mudd

BANFF NATIONAL PARK, west of Sunshine Village, elev. 7380 ft.,
Salix barrattiana community, 51°04'25", 115°47'20", T-10.
July 31, 1969.

11559* = Peltigera canina var. rufescens (Weis) Mudd

BANFF NATIONAL PARK, east of Wa Wa Ridge, elev. 7700 ft.,
51°05'25", 115°47'40", T-11. August 8, 1969.

11594* - Lepraria neglecta (Nyl.) Lett.

11595* - Lecidea granulosa (Hoffm.) Ach.

11596 - added to 11595 as both the same species.

11597* - Cladonia ecmocyna (Ach.) Nyl.

BANFF NATIONAL PARK, NE of trail to Wa Wa Ridge, elev. 7400 ft.,
Salix barrattiana community, 51°05'23", 115°47'15", T-12.
August 8, 1969

11609* - Peltigera canina var. rufescens (Weis) Mudd

BRITISH COLUMBIA, beside Banff National Park, west of Quartz Hill, elev. 7750 ft., Phyllodoce glanduliflora community, 51°02'20, 115°47'10, T-13. August 12, 1969.

- 11628* - Cladonia ecmocyna (Ach.) Nyl.
- 11629* - Peltigera canina var. rufescens (Weis) Mudd
- 11630* - Lepraria neglecta (Nyl.) Lett.
- 11631 - added to 11629 as both the same species.

BANFF NATIONAL PARK, north of Wa Wa Ridge, elev. 7650 ft., Cassiope community, 51°05'59, 115°47'45, T-15. August 13, 1969.

- 11666* - Ochrolechia cfr. inaequatula Nyl.
- 11667* - Cladonia coccifera (L.) Willd.
- 11668* - Lecidea granulosa (Hoffm.) Ach.
- 11669* - Nephroma expallidum (Nyl.) Nyl.
- 11670 - added to 11667 as both the same species.
- 11671* - Dactylina arctica (Hook.) Nyl.
- 11672* - Cladonia degenerans (Flörke) Spreng.
- 11673* - Cladonia gracilis var. dilatata (Hoffm.) Schaer.
- 11674* - Stereocaulon ^{saxatile Magn} ~~paschalis (L.) Hoffm~~

BANFF NATIONAL PARK, east of Wa Wa Ridge, elev. 7650 ft., Cassiope community, 51°05'45, 115°47'15, T-16. August 13, 1969.

- 11698* - Peltigera canina var. rufescens (Weis) Mudd
- 11699* - Solorina octospora Arn.
- 11700 - Psoroma hypnorum (Vahl) S.Gray
- 11701 - Umbilicaria hyperborea (Ach.) Ach.
- 11702 - Lepraria sp.
- 11703* - Cladonia coccifera (L.) Willd.

BANFF NATIONAL PARK, Eagle Mountain, elev. 8100 ft.,
51°05'50, 115°45'40, T-19. August 18, 1969.

12083* - Lecanora epibryon (Ach.) Ach.

BANFF NATIONAL PARK, elev. 7475 ft., Saxifraga lyallii
community, 51°04'25, 115°47'30, T-20. August 20, 1969.

12093* - Peltigera canina var. rufescens (Weis) Mudd

BANFF NATIONAL PARK, elev. 7275 ft., Pulsatilla
occidentalis community, 51°04'35, 115°47'10, T-21.
August 20, 1969.

12119 - Peltigera cfr. polydactyla (Neck.) Hoffm.

12120 - Bacidia sp.

12121 - Cladonia chlorophaea (Flörke) Spreng.

12122* - Peltigera aphthosa (L.) Willd.

12122A - Peltigera venosa (L.) Baumg.

BANFF NATIONAL PARK, elev. 7400 ft., Carex meadow
community, 51°03'25, 115°46'10, T-23. August 26, 1969.

12152* - Cladonia coccifera (L.) Willd.

12153* - Lecidea granulosa (Hoffm.) Ach.

12154 - Peltigera canina var. rufescens (Weis) Mudd

12155* - Cladonia ecmocyna (Ach.) Nyl.

12156* - Cetraria islandica (L.) Ach.

BANFF NATIONAL PARK, elev. 7275 ft., Carex meadow
community, 51°04'25, 115°46'50, T-24. August 26, 1969.

12166* - Peltigera aphthosa (L.) Willd.

12167 - Lecidea sp. ?

12168 - added to 12166 as both the same species.

BRITISH COLUMBIA, beside Banff National Park, near Rock Isle
Lake, elev. 7500 ft., Carex meadow community, 51°03'45,
115°46'50, T-25. September 3, 1969.

12231 - Cladonia chlorophaea (Flörke) Spreng.

BANFF NATIONAL PARK, Quartz Ridge and Quartz Hill, elev.
7900-8464 feet, 51°02', 115°46', alpine community, S-7.
July 7, 1969.

- 10499* - Omphalodiscus decussatus (Vill.) Schol.
- 10500* - Umbilicaria hyperborea (Ach.) Ach.
- 10501 - Cetraria commixta (Nyl.) Th. Fr.
- 10502* - Omphalodiscus virginis (Schaer.) Schol.
- 10503* - Alectoria vexillifera (Nyl.) Stizenb.
- 10504* - Dactylina ramulosa (Hook.) Tuck.
- 10505* - Ochrolechia upsaliensis (L.) Mass.
- 10506* - Buellia papillata (Somm.) Tuck.
- 10507* - Solorina crocea (L.) Ach.
- 10508* - Lecidea decipiens (Hedw.) Ach.
- 10509 - Lecidea rubiformis (Wahlenb. ex Ach.) Wahlenb.
- 10510* - Lecanora epibryon (Ach.) Ach.
- 10511 - Lecanora pringlei (Tuck.) Lamb
- 10512 - Lecidea heppii R.Anderson & W.Web.
- 10513 - Xanthoria elegans (Link) Th. Fr.
- 10514 - Lecanora melanophthalma (Ram.) Ram.
- 10515 - Cetraria tilesii Ach.
- 10516 - Cetraria ericetorum Opiz
- 10517 - added to 10510 as both the same species.
- 10518 - Buellia semitensis Tuck.
- 10519* - Dactylina arctica (Hook.) Tuck.
- 10520 - Lepraria neglecta Auct.
- 10521* - Peltigera canina var. rufescens (Weis) Mudd

BANFF NATIONAL PARK, Sunshine area, elev. 7500-7800 ft.,
51°02'30", 115°45', Dryas community with bare ground, S-8.
July 7, 1969.

- 10579 - discarded as too scrappy.
- 10580 - Lecidea auriculata Th. Fr.
- 10581 - Alectoria minuscula Nyl.
- 10582* - Lecidea atrobrunnea (Ram.) Schaer.
- 10583* - Lecidea tessellata (Ach.) Flörke
- 10584 - Lecanora gibbosula Magn.
Sarcogyne regularis Körb.
- 10585* - Lecidea tessellata (Ach.) Flörke
- 10586 - Lecanora badia (Hoffm.) Ach.
- 10587* - Lecanora cfr. gibbosula Magn.
- 10588* - Lecidea atrobrunnea (Ram.) Schaer.
- 10589* - Lecanora gibbosula Magn.
- 10590* - Lecidea tessellata (Ach.) Flörke
- 10591 - Lecanora polytropa (Ehrh.) Rabenh.
- 10592 - Lecidea atrobrunnea (Ram.) Schaer.
- 10593* - Lecidea crustulata (Ach.) Spreng.
- 10594 - Lecidea atrobrunnea (Ram.) Schaer.
Lecanora alpina Somm.
Lecidea crustulata (Ach.) Spreng.
- 10595* - Acarospora strigata (Nyl.) Jatta
- 10596 - Lecanora polytropa (Ehrh.) Rabenh.
- 10597* - Rhizocarpon chioneum (Norm.) Th. Fr.
- 10598* - Lecanora gibbosula Magn.
- 10599* - Cetraria ericetorum Opiz
- 10600 - Lecidea berengeriana (Mass.) Nyl.
- 10601* - Solorina crocea (L.) Ach.
- 10602* - Thamnia subuliformis (Ehrh.) W.Culb.
- 10603* - Cetraria cucullata (Bell.) Ach.
- 10604* - Lecidea decipiens (Hedw.) Ach.

BANFF NATIONAL PARK, Sunshine area, elev. 7500-7800 ft.,
51°02'30", 115°45', Dryas community with bare ground, S-9.
July 7, 1969

- 10610* - Lecidea stigmatea Ach.
- 10611 - Lecidea macrocarpa (DC.) Steud.
- 10612 - discarded as too scrappy
- 10613* - Lecanora alpina Somm.
- 10614* - Verrucaria nigrescens Pers.
- 10615* - Xanthoria elegans (Link) Th. Fr.
- 10616* - Xanthoria elegans (Link) Th. Fr.
- 10617 - Acarospora strigata (Nyl.) Jatta
- 10618* - Sporastatia testudinea (Ach.) Mass.
- 10619* - Lecidea elata Schaer.
- 10620 - Lecanora polytropa (Ehrh.) Rabenh.
- 10621 - Rhizocarpon macrosporum Räs.
- 10622 - Rhizocarpon geographicum (L.) DC.
- 10623 - discarded as too scrappy
- 10624 - Alectoria minuscula Nyl.
- 10625* - Collema polycarpon Hoffm.
- 10626* - Lecanora alpina Somm.
- 10627 - Lecidea elata Schaer.
Lecanora gibbosula Magn.
- 10628* - Lecanora epibryon (Ach.) Ach.
- 10629 - Collema polycarpon Hoffm.
- 10630 - Solorina bispora Nyl.
- 10631* - Buellia papillata (Somm.) Tuck.
- 10632 - discarded as too scrappy
- 10633 - Xanthoria elegans (Link) Th. Fr.
- 10634 - discarded as too scrappy

- 10635* - Cetraria tilesii Ach.
- 10636 - Lecidea decipiens (Hedw.) Ach.
- 10637 - Lecidea tornoensis Nyl.
- 10638 - added to 10631 as both the same species

BANFF NATIONAL PARK, near Sunshine Village, elev. 7500 ft.,
51°05', 115°47', tree line area, S-11. July 8, 1969.

- 10676* - Cladonia ecmocyna (Ach.) Nyl.
- 10677* - Cladonia carneola (Fr.) Fr.
- 10678 - missing
- 10679* - Cladonia gonecha (Ach.) Asah.
- 10680* - Pannaria pezizoides (G.Web.) Trev.

BANFF NATIONAL PARK, Fatigue Pass, elev. 7500-8500 ft.,
51°01'30, 115°41', alpine community, S-12. July 9, 1969.

- 10687* - Lecidea elata Schaer.
- 10688* - Rhizocarpon macrosporum Räs.
- 10689* - Rhizocarpon geographicum (L.) DC.
- 10690 - added to 10689 as both the same species
- 10691* - Lecidea elata Schaer.
- 10692 - added to 10691 as both the same species
- 10693* - Lecidea armeniaca (DC.) Fr.
- 10694 - added to 10689 as both the same species
- 10695 - Lecidea atrobrunnea (Ram.) Schaer.
Rhizocarpon macrosporum Räs.
- 10696* - Lecidea elata Schaer.
- 10697* - Lecidea tessellata (Ach.) Flörke
- 10698 - Lecidea atrobrunnea (Ram.) Schaer.
- 10699 - added to 10697 as both the same species

- 10700 - added to 10693 as both the same species
- 10701 - Lecidea armeniaca (DC.) Fr.
- 10702 - Sporastatia testudinea (Ach.) Mass.
- 10703 - added to 10697 as both the same species
- 10704 - Lecidea armeniaca (DC.) Fr.
Alectoria minuscula Nyl.
- 10705 - Lecanora alpina Somm.
- 10706 - Cetraria commixta (Nyl.) Th. Fr.
- 10707* - Lecidea stigmatea Ach.
- 10708* - Lecidea tessellata (Ach.) Flörke
- 10709* - Lecanora caesiocinerea Nyl.
- 10710 - Lecanora badia (Hoffm.) Ach.
- 10711 - Xanthoria elegans (Link) Th. Fr.
- 10712 - Rhizocaroon chioneum (Norm.) Th. Fr.
- 10713 - added to 10708 as both the same species
- 10714 - ~~added to 10708~~ discarded as too scrappy
- 10715 - Lecidea atrobrunnea (Ram.) Schaer.
- 10716 - added to 10708 as both the same species
- 10717 - Sporastatia testudinea (Ach.) Mass.
Xanthoria elegans (Link) Th. Fr.
- 10718 - added to 10719 as both the same species
- 10719* - Lecanora rupicola (L.) Zahlbr.
- 10720* - Umbilicaria hyperborea (Ach.) Ach.
- 10721 - added to 10709 as both the same species
- 10722* - Sporastatia testudinea (Ach.) Mass.
- 10723* - Hypogymnia intestiniformis (Vill.) Räs.
- 10801 - Lecidea armeniaca (DC.) Fr.
- 10802* - Peltigera malacea (Ach.) Funck
- 10803* - Cladonia pleurota (Flörke) Schaer.

- 10804* - Physcia muscigena (Ach.) Nyl.
10805 - Lecidea sp.
10806 - discarded as too scrappy
10807* - Stereocaulon rivulorum Magn.
10808 - Rinodina nimbose var. nuda Lynge
Lecidea cfr. vernalis (L.) Ach.
10809 - Lecidea decipiens (Hedw.) Ach.
10810 - Lecanora verrucosa Ach.
10811 - Solorina bispora Nyl.
10812 - discarded as too scrappy
10813 - Physcia muscigena (Ach.) Nyl.
10814 - Toninia ruginosa (Tuck.) Herre
10815* - Omphalodiscus virginis (Schaer.) Schol.
10816* - Lepraria neglecta (Nyl.) Lett.
10817 - Dermatocarpon miniatum var. complicatum (Lightf.) Hellb.
10818 - Lecidea assimilata Nyl.
10819* - Alectoria chalybeiformis (L.) S.Gray
10820* - Omphalodiscus decussatus (Vill.) Schol.
10821 - added to 10822 as both the same species

BANFF NATIONAL PARK, Citadell Pass, elev. 7500 ft.,
51°01'30", 115°42'30", alpine community, S-13. July 9, 1969.

- 10860* - Solorina crocea (L.) Ach.
10861 - Lecidea auriculata Th. Fr.
10862* - Lecidea granulosa (Hoffm.) Ach.
10863 - Agyrophora rigida (DR.) Llano
10864 - Umbilicaria deusta (L.) Baumg.
10865 - Lepraria neglecta (Nyl.) Lett.

BANFF NATIONAL PARK, Wa Wa Ridge area, elev. 7600-7800 ft.,
51°05', 115°48', alpine community, S-16. July 10, 1969.

- 10880* - Lecanora alpina Somm.
- 10881* - Lecanora polytropa (Ehrh.) Rabenh.
- 10882* - Lecanora caesiocinerea Nyl.
- 10883* - Lecanora badia (Hoffm.) Ach.
- 10884 - Lecidea lapicida (Ach.) Ach.
- 10885 - Xanthoria cfr. sorediata (Vain.) Poelt
- 10886 - Lecidea armeniaca (DC.) Fr.
- 10887 - added to 10882 as both the same species
- 10888* - Lecidea tessellata (Ach.) Flörke
- 10889 - Xanthoria elegans (Link) Th. Fr.
- 10890 - added to 10880 as both the same species
- 10891 - added to 10880 as both the same species
- 10892 - added to 10880 as both the same species
- 10893 - added to 10880 as both the same species
- 10894* - Rhizocarpon sublucidum Räs.
- 10895* - Rhizocarpon macrosporum Räs.
- 10896 - added to 10895 as both the same species
- 10897 - Rhizocarpon sublucidum Räs.
Lecanora alpina Somm.
- 10898* - Rhizocarpon geographicum (L.) DC.
- 10899 - added to 10904 as both the same species
- 10900* - Umbilicaria hyperborea (Ach.) Ach.
- 10901 - added to 10883 as both the same species
- 10902 - added to 10888 as both the same species
- 10903* - Lecanora gibbosula Magn.
- 10904* - Lecanora alpina Somm.
- 10905 - Lecanora cfr. cenisea Ach.
- 10906 - Lecidea stigmataea Ach.

- 10907 - added to 10904 as both the same species
- 10908 - Lecidea leucothallina Arn.
- 10909 - discarded as too scrappy
- 10910 - added to 10904 as both the same species
- 10911* - Peltigera polydactyla (Neck.) Hoffm. or
Peltigera horizontalis (Huds.) Baumg.
- 10912* - Lepraria neglecta (Nyl.) Lett.
- 10913* - Solorina crocea (L.) Ach.
- 10914 - Lecidea granulosa (Hoffm.) Ach.
- 10915 - Lepraria neglecta (Nyl.) Lett.
- 10916 - fungus
- 10917* - Lecidea granulosa (Hoffm.) Ach.

BANFF NATIONAL PARK, Lake Agnes, elev. 7200 ft., alpine region above lake, 51°24'58", 116°14'58", S-17. July 11, 1969.

- 10934 - Lecanora cfr. caesiocinerea Nyl.
- 10935 - Lecidea atrobrunnea (Ram.) Schaer.
- 10936 - Lecanora alpina Somm.
- 10937* - Lecanora alpina Somm.
- 10938 - added to 10937 as both the same species
- 10939* - Rhizocarpon macrosporum Räs.
- 10940 - added to 10939 as both the same species
- 10941 - Rhizocarpon geographicum (L.) DC.
- 10942* - Nephroma parile (Ach.) Ach.
- 10943 - Dermatocarpon reticulatum Magn.
- 10944 - Peltigera cfr. malacea (Ach.) Funck
- 10945 - Cladonia verticillata (Hoffm.) Schaer.
- 10946 - Cladonia carneola (Fr.) Fr.

BANFF NATIONAL PARK, along trail to the Plain of the Six
Glaciers, elev. 6000-7000 ft., 51°23'40", 116°15'58", S-18.
July 11, 1969.

- 10986 - Lecidea berengeriana (Mass.) Nyl.
- 10987 - Peltigera apthosa (L.) Willd.
- 10988* - Stereocaulon tomentosum Fr.

BANFF NATIONAL PARK, Eagle Mountain, elev. 8000-8500 ft.,
51°05'30", 115°44'30", alpine community, S-19. July 13, 1969.

- 11001 - Lecanora alpina Somm.
- 11002* - Xanthoria elegans (Link) Th. Fr.
- 11003 - Lecanora novomexicana (B. de Lesd.) Magn.
- 11004 - Lecanora cerisea Ach.
- 11005 - Sporastatia testudinea (Ach.) Mass.
- 11006 - discarded as too scrappy
- 11007* - Peltigera canina (L.) Willd.
- 11008 - Umbilicaria hyperborea (Ach.) Ach.
- 11009 - Cetraria tilesii Ach.
- 11000 - Omphalodiscus virginis (Schaer.) Schol.
- 11011* - Dermatocarpon miniatum var. complicatum (Lightf.) Hellb.
- 11012* - Fulgensia bracteata (Hoffm.) Räs.
- 11013 - added to 11007 as both the same species
- 11014 - Physcia muscigena (Ach.) Nyl.
- 11015 - Nephroma parile (Ach.) Ach.
- 11016* - Omphalodiscus decussatus (Vill.) Schol.

BANFF NATIONAL PARK, Eagle Mountain, elev. 7700-8200 ft.,
51°05', 115°45'30", alpine community, S-20. July 13, 1969.

- 11030* - Collema polycarpon Hoffm.
- 11031* - Collema auriculatum Hoffm.

- 11032 - Rhizocarpon geographicum (L.) DC.
Umbilicaria hyperborea (Ach.) Ach.
- 11033* - Lecidea tessellata (Ach.) Flörke
- 11034 - added to 11033 as both the same species
- 11035* - Lecidea atrobrunnea (Ram.) Schaer.
- 11036 - Physcia endococcinea (Körb.) Th. Fr.
- 11037 - Acarospora strigata (Nyl.) Jatta
- 11038 - Lecanora gibbosula Magn.
- 11039 - added to 11035 as both the same species
- 11040 - added to 11035 as both the same species
- 11041 - Lecidea elata Schaer.
- 11042 - Acarospora strigata (Nyl.) Jatta
- 11043 - Lecidea armeniaca (DC.) Fr.
- 11044 - Lecidea lapicida (Ach.) Ach.
- 11045* - Lecanora novomexicana (B. de Lesd.) Magn.
- 11046 - Rhizocarpon geographicum (L.) DC.
- 11047 - added to 11045 as both the same species
- 11048* - Lecanora arctica Lyngé
- 11049 - Lecanora badia (Hoffm.) Ach.
- 11050 - Rhizocarpon disporum (Naeg.) Müll. Arg.
- 11051 - added to 11062 as both the same species
- 11052 - Sporastatia testudinea (Ach.) Mass.
- 11053* - Physcia muscigena (Ach.) Nyl.
- 11054* - Collema auriculatum Hoffm.
- 11055 - added to 11054 as both the same species
- 11056 - Cetraria tilesii Ach.
- 11057* - Cladonia pocillum (Ach.) O. Rich.
- 11058* - Cetraria islandica (L.) Ach.
- 11059* - Cetraria cucullata (Bell.) Ach.

- 11060* - Cornicularia aculeata (Schreb.) Ach.
- 11061* - Thamnolia subuliformis (Ehrh.) W.Culb.
- 11062* - Xanthoria elegans (Link) Th. Fr.
- 11063 . - added to 11039 as both the same species
- 11064* - Omphalodiscus decussatus (Vill.) Schol.
- 11065 - Solorina saccata (L.) Ach.
- 11066 - Peltigera canina var. rufescens (Weis) Mudd
- 11067 - added to 11060 as both the same species
- 11068 - added to 11053 as both the same species
- 11069 - Lecidea assimilata Nyl.
- 11070* - Dermatocarpon miniatum var. complicatum (Lightf.) Hellb.
- 11071 - Peltigera canina var. spuria (Ach.) Schaer.
- 11072 - Cetraria ericetorum Opiz
- 11073* - Lecanora rubina (Vill.) Ach.
- 11074* - Physcia muscigena (Ach.) Nyl.

BANFF NATIONAL PARK, Eagle Mountain, elev. 6800-7500 ft.,
51°06', 115°46', mature Engelmann spruce community, S-21.
July 13, 1969.

- 11095 - Peltigera canina var. spuria (Ach.) Schaer.
- 11096 - Alectoria glabra Mct.
- 11097* - Cladonia cenotea (Ach.) Schaer.
- 11098* - Cladonia gonecha (Ach.) Asah.
- 11099 - Icmadophila ericetorum (L.) Zahlbr.
- 11100 - Lecidea berengeriana (Mass.) Nyl.
- 11101* - Cladonia ecmocyna (Ach.) Nyl.
- 11102 - Cladonia deformis (L.) Hoffm.
- 11103* - Cladonia subulata (L.) Wigg.

BANFF NATIONAL PARK, base of Twin Cairn Mountain, elev. 7700-8000 ft., 54°04'30", 115°48', alpine community, S-22. July 14, 1969.

- 11109 - Alectoria pubescens (L.) R.H.Howe .
- 11110* - Lecanora badia (Hoffm.) Ach.
- 11111 - Sporastatia testudinea (Ach.) Mass.
- 11112* - Lecanora alpina Somm.
- 11113 - Lecidea atrobrunnea (Ram.) Schaer.
Lecanora polytropa (Ehrh.) Rabenh.
- 11114 - Rhizocarpon disporum (Naeg.) Müll. Arg.
- 11115* - Lecanora rupicola (L.) Zahlbr.
- 11116* - Lecidea tessellata (Ach.) Flörke
- 11117 - added to 11110 as both the same species
- 11118* - Lecanora pringlei (Tuck.) Lamb
- 11119 - added to 11110 as both the same species
- 11120 - Lecidea plana Lahm ex Körb.
- 11121* - Umbilicaria deusta (L.) Baumg.
- 11122 - Umbilicaria hyperborea (Ach.) Ach.
- 11123 - discarded as too scrappy
- 11124 - added to 11112 as both the same species
- 11125 - discarded as too scrappy
- 11126 - Lecanora alpina Somm.
- 11127 - added to 11112 as both the same species
- 11128* - Rhizocarpon sublucidum Räs.
- 11129* - Lecanora alpina Somm.
- 11130 - Rhizocarpon geographicum (L.) DC.
- 11131 - Pannaria pezizoides (G.Web.) Trev.
- 11132 - added to 11118 as both the same species
- 11133* - Omphalodiscus virginis (Schaer.) Schol.

- 11134* - Umbilicaria deusta (L.) Baumg.
- 11135 - added to 11133 as both the same species
- 11136* - Omphalodiscus decussatus (Vill.) Schol.
- 11137* - Omphalodiscus virginis (Schaer.) Schol.
- 11138* - Solorina crocea (L.) Ach.
- 11139 - Parmeliella praetermissa (Nyl.) P. James
- 11140 - Lecidea novomexicana (B. de Lesd.) W. Web.
- 11141* - Lecidea granulosa (Hoffm.) Ach.
- 11142* - Lepraria neglecta (Nyl.) Lett.
- 11143* - Stereocaulon alpinum Laur.
- 11144* - Peltigera aphthosa (L.) Willd.
- 11145* - Cladonia mitis Sandst.
- 11146 - added to 11144 as both the same species
- 11147 - Cladonia cfr. pleurota (Flörke) Schaer.

BANFF NATIONAL PARK, base of Twin Cairn Mountain, elev.
7700-8000 ft., 54°04'30", 115°48', alpine community, S-23.
July 14, 1969.

- 11188* - Lecanora rupicola (L.) Zahlbr.
- 11189 - added to 11188 as both the same species.
- 11190 - Lecidea leucothallina Arn.
- 11191 - Buellia semitensis Tuck.
- 11192 - Lecanora rupicola (L.) Zahlbr.
- 11193* - Lecanora alpina Somm.
- 11194 - added to 11193 as both the same species.
- 11195* - Xanthoria elegans (Link) Th. Fr.
- 11196 - discarded as too scrappy.
- 11197* - Lecidea tessellata (Sm.) Flörke
- 11198* - Lecanora badia (Hoffm.) Ach.

- 11199 - added to 11198 as both the same species.
- 11200 - Alectoria pubescens (L.) R.H.Howe
Acarospora chlorophana (Wahlenb. ex Ach.) Mass.
- 11201* - Lecidea atrobrunnea (Ram.) Schaer.
- 11202 - added to 11197 as both the same species.
- 11203 - added to 11193 as both the same species.
- 11204* - Acarospora chlorophana (Wahlenb. ex Ach.) Mass.
- 11205* - Alectoria pubescens (L.) R.H.Howe
- 11206 - Rhizocarpon geographicum (L.) DC.
Lecidea atrobrunnea (Ram.) Schaer.
- 11207 - added to 11201 as both the same species.
- 11208 - Peltigera canina var. spuria (Ach.) Schaer.
- 11209 - Lecanora verrucosa Ach.
- 11210 - Solorina crocea (L.) Ach.
- 11211* - Haematomma lapponicum Räs.
- 11212* - Parmelia wyomingica Gyeln.
- 11213 - Lecanora pringlei (Tuck.) Lamb

BANFF NATIONAL PARK, EAST OF Rock Isle Lake, elev.
7200-7500 ft., 51°03'30, 115°45'05, alpine community,
S-24. July 15, 1969.

- 11233* - Letharia vulpina (L.) Hue
- 11234 - Lecanora caesiocinerea Nyl.
- 11235* - Phycia muscigena (Ach.) Nyl.
- 11236 - Lecidea tessellata (Sm.) Flörke
- 11237 - added to 11235 as both the same species.
- 11238* - Lecidea granulosa (Hoffm.) Ach.

BRITISH COLUMBIA, near Banff National Park, bog near south end of Grizzly Lake, elev. 7250 ft., 51°03'30", 115°47'40", S-25. July 17, 1969.

- 11251* - Peltigera canina var. rufescens (Weis) Mudd
- 11252 - Ochrolechia inaequatula (Nyl.) Zahlbr.
- 11253* - Lecidea granulosa (Hoffm.) Ach.
- 11254* - Xanthoria elegans (Link) Th. Fr.
- 11255* - Cladonia gonecha (Ach.) Asah.
- 11256* - Cladonia ecmocyna (Ach.) Nyl.
- 11257* - Cetraria ericetorum Opiz
- 11258* - Letharia vulpina (L.) Hue
- 11258A* - Letharia columbiana (Nutt.) Thomson
- 11259 - Lecanora polytropa (Ehrh.) Rabenh.
- 11260* - Parmeliopsis ambigua (Wulf.) Nyl.
- 11261* - Parmeliopsis hyperopta (Ach.) Arn.
- 11262* - Alectoria glabra Mot.

BRITISH COLUMBIA, near Banff National Park, Larix Lake, elev. 7250 ft., 51°03'10", 115°47'10", open Larix lyallii forest, S-26. July 17, 1969.

- ~~11282~~ - ~~Alectoria glabra~~
- 11283* - Cladonia gonecha (Ach.) Asah.
- 11284 - Dermatocarpon miniatum var. complicatum (Lightf.) Hellb.
- 11285 - Lepraria membranacea (Dicks.) Vain.
- 11286* - Alectoria glabra Mot.
- 11287 - Letharia columbiana (Nutt.) Thomson

BANFF NATIONAL PARK, Quartz Ridge area, elev. 7400-8300 ft., 51°03', 115°46', alpine community, S-27. July 22, 1969.

- 11296 - Cetraria ericetorum Opiz
- 11297* - Lecanora epibryon (Ach.) Ach.
- 11298 - Solorina saccata (L.) Ach.

- 11299 - fungus
11300* - Lecanora rupicola (L.) Zahlbr.
11301 - Lecidea tessellata (Sm.) Flörke
11302 - added to 11297 as both the same species.
11303* - Sporastatia testudinea (Ach.) Mass.
11304* - Peltigera polydactyla (Neck.) Hoffm. or
P. horizontalis (Huds.) Baumg.
11305 - Buellia papillata (Somm.) Tuck.
11306 - added to 11303 as both the same species.
11307 - Ochrolechia upsaliensis (L.) Mass.
11308 - Thrombium epigaeum (Pers.) Wallr.
11309 - added to 11304 as both the same species.

BANFF NATIONAL PARK, east of Twin Cairn Mountain, elev.
7600 ft., 51°05', 115°47'30, alpine community, S-29.
July 24, 1969.

- 11341* - Lecanora rupicola (L.) Zahlbr.
11342 - Alectoria pubescens (L.) R.H.Howe
11343 - Diploschistes scruposus (Schreb.) Norm.
11344* - Lecidea saxosa R.Anderson
11345* - Solorina crocea (L.) Ach.

BRITISH COLUMBIA, south of Larix Lake, elev. 7600 ft.,
51°03', 115°46'50, alpine community, S-30. July 25, 1969.

- 11359* - Cladonia pleurota (Flörke) Schaer.
11360* - Cetraria cucullata (Bell.) Ach.

BRITISH COLUMBIA, beside Banff National Park, south of
Larix Lake, elev. 7000 ft., 51°03', 115°47'30, bog area
with rock outcrops, S-31. July 25, 1969.

- 11373* - Cetraria commixta (Nyl.) Th. Fr.

BANFF NATIONAL PARK, Simpson Pass region, elev. 7000-7300 ft., 51°04'45", 115°50', open area along stream and lake shore, S-32. July 26, 1969.

11378 - Dermatocarpon fluviatile (G.Web.) Th. Fr.

11379 - Lepraria membranacea (Dicks.) Vain.

11380* - Physcia muscigena (Ach.) Nyl.

11381* - Peltigera canina (L.) Willd.

BANFF NATIONAL PARK, Mummy Lake, elev. 7400 ft., 51°05'45", 115°54'45", small pond surrounded by lichen covered rock, S-34. July 27, 1969.

11407 - Microthelia sp.

BANFF NATIONAL PARK, area above Sunshine Village Reservoir, elev. 7380 ft., 51°04'25", 115°47'20", near rock outcrop, S-36. July 31, 1969.

11558* - Stereocaulon tomentosum Fr.

BANFF NATIONAL PARK, south of Lookout Mountain, elev. 7400 ft., 51°03'45", 115°45'01", Carex community, T-17. August 15, 1969.

11710 - Cladonia chlorophaea (Flörke) Spreng.

BANFF NATIONAL PARK, Sunshine Village, near ski trail, elev. 7400 ft., 51°05', 115°47', S-37. August 7, 1969.

11728 - Lecanora polytropa (Ehrh.) Rabenh.

BANFF NATIONAL PARK, Wa Wa Ridge, elev. 7500-8000 ft., 51°05'45", 115°46'30", S-38. August 7, 1969.

11732* - Lecanora alpina Somm.

11733* - Xanthoria elegans (Link) Th. Fr.

11734* - Lecanora alpina Somm.

11735 - Rhizocarpon geographicum (L.) DC.
Lecanora caesiocinerea Nyl.

11736 - Lecidea crustulata (Ach.) Spreng.
Lecidea atrobrunnea (Ram.) Schaer.

- 11737 - added to 11734 as both the same species.
- 11738* - Umbilicaria hyperborea (Ach.) Ach.
- 11739* - Omphalodiscus krascheninnikovii (Sav.) Schol.
- 11740* - Lecidea crustulata (Ach.) Spreng.
- 11741 - added to 11745 as both the same species.
- 11742 - added to 11743 as both the same species.
- 11743* - Rhizocarpon geographicum (L.) DC.
- 11744 - Lecidea atrobrunnea (Ram.) Schaer.
- 11745* - Lecanora alpina Somm.
- 11746 - Rhizocarpon macrosporum Räs.
Lecanora alpina Somm.
Lecidea atrobrunnea (Ram.) Schaer.
- 11747 - Alectoria minuscula Nyl.
Lecanora polytropa (Ehrh.) Rabenh.
- 11748 - added to 11738 as both the same species.
- 11749 - Lecanora cfr. alpina Somm. (sorediate)
- 11750 - Lecanora badia (Hoffm.) Ach.
- 11751 - Peltigera apthosa (L.) Willd.
- 11752* - Stereocaulon alpinum Laur.
- 11753* - Umbilicaria hyperborea (Ach.) Ach.
- 11754 - added to 11753 as both the same species.
- 11755 - Peltigera canina (L.) Willd.
- 11756* - Ochrolechia inaequatula (Nyl.) Zahlbr.
- 11757* - Solorina crocea (L.) Ach.
- 11758* - Lecidea granulosa (Hoffm.) Ach.
- 11759 - added to 11752 as both the same species.
- 11760* - Alectoria vexillifera (Nyl.) Stizenb.
- 11761* - Cladonia mitis Sandst.
- 11762 - fungus
- 11763* - Stereocaulon tomentosum Fr.

BANFF NATIONAL PARK, Mt. Bourgeau, elev. 9100-9615 ft.,
51°07'50", 115°46'55", rocky slope, S-39. August 11, 1969.

- 11815 - added to 11825 as both the same species.
- 11816* - Rhizocarpon geographicum (L.) DC.
- 11817* - Lecidea tessellata (Sm.) Flörke
- 11818 - Rhizocarpon sphaerosporum Räs.
- 11819 - added to 11825 as both the same species.
- 11820* - Lecanora novomexicana (B. de Lesd.) Magn.
- 11821* - Rhizocarpon chioneum (Norm.) Th. Fr.
- 11822* - Lecanora gibbosula Magn.
- 11823 - added to 11816 as both the same species.
- 11824 - Lecanora gibbosula Magn.
- 11825* - Rhizocarpon chioneum (Norm.) Th. Fr.
- 11826* - Rhizocarpon macrosporum Räs.
- 11827* - Lecidea atrobrunnea (Ram.) Schaer.
- 11828 - Acarospora strigata (Nyl.) Jatta
- 11829 - Alectoria minuscula Nyl.
- 11830* - Lecanora melanophthalma (Ram.) Ram.
- 11831 - Lecidea pantherina Ach.
- 11832 - Rhizocarpon chioneum (Norm.) Th. Fr.
- 11833 - Lecidea confluens (G.Web.) Ach.
- 11834 - added to 11827 as both the same species.
- 11835 - added to 11816 as both the same species.
- 11836 - Sporastatia testudinea (Ach.) Mass.
- 11837 - added to 11846 as both the same species.
- 11838 - added to 11826 as both the same species.
- 11839 - Rhizocarpon disporum (Naeg.) Müll. Arg.
- 11840 - Lecidea tessellata (Sm.) Flörke
Rhizocarpon chioneum (Norm.) Th. Fr.

- 11841 - Collema auriculatum Hoffm.
- 11842* - Omphalodiscus virginis (Schaer.) Schol.
- 11843 - added to 11854 as both the same species.
- 11844 - Lecanora beringii Nyl.
- 11845 - Cetraria islandica (L.) Ach.
- 11846* - Xanthoria elegans (Link) Th. Fr.
- 11847 - added to 11842 as both the same species.
- 11848 - Sacidia muscorum (Ach.) Mudd
- 11849* - Dactylina ramulosa (Hook.) Tuck.
- 11850* - Cetraria ericetorum Opiz
- 11851* - Thamnia subuliformis (Ehrh.) W.Culb.
- 11852* - Cetraria tilesii Ach.
- 11853* - Lecanora verrucosa Ach.
- 11854* - Cornicularia aculeata (Schreb.) Ach.
- 11855 - Peltigera canina (L.) Willd.
Physcia muscigena (Ach.) Nyl.
- 11856* - Physcia muscigena (Ach.) Nyl.
- 11857 - Rinodina nimbosea var. nuda Lynge

BANFF NATIONAL PARK, Mt. Bourgeau, elev. 8000-9000 ft.,
51°07'40", 115°47'45", rocky slope, S-40. August 11~~8~~, 1969

- 11903 - discarded as too scrappy
- 11904 - discarded as too scrappy
- 11905 - added to 11906 as both the same species.
- 11906* - Rhizocarpon geographicum (L.) DC.
- 11907 - added to 11906 as both the same species.
- 11908* - Rhizocarpon macrosporum R#s.
- 11909* - Lecidea elata Schaer.
- 11910 - added to 11909 as both the same species.

- 11911 - Lecanora caesiocinerea Nyl.
- 11912* - Lecidea atrobrunnea (Ram.) Schaer.
- 11913* - Sporastatia testudinea (Ach.) Mass.
- 11914* - Rhizocarpon disporum (Naeg.) Müll. Arg.
- 11915* - Lecidea tessellata (Sm.) Flörke
Lecidea elata Schaer.
- 11916* - Lecanora caesiocinerea Nyl.
- 11917 - Lecanora gibbosula Magn.
- 11918 - added to 11912 as both the same species.
- 11919 - Lecidea stigmatea Ach.
- 11920 - added to 11930 as both the same species.
- 11921* - Xanthoria elegans (Link) Th. Fr.
- 11922* - Omphalodiscus virginis (Schaer.) Schol.
- 11923 - added to 11916 as both the same species.
- 11924 - Lecanora caesiocinerea Nyl.
Alectoria minuscula Nyl.
- 11925 - Lecanora cenisea Ach.
- 11926* - Lecanora cfr. caesiocinerea Nyl.
- 11927* - Lecanora rupicola (L.) Zahlbr.
- 11928* - Lecanora novomexicana (B. de Lesd.) Magn.
- 11929* - Lecidea tessellata (Sm.) Flörke
- 11930* - Lecanora novomexicana (B. de Lesd.) Magn.
- 11931 - Lecidea tessellata (Sm.) Flörke
- 11932* - Lecidea tessellata (Sm.) Flörke
- 11933 - Dermatocarpon miniatum var. complicatum (Lightf.) Hellb.
- 11934 - fossil
- 11935 - Omphalodiscus virginis (Schaer.) Schol.

BANFF NATIONAL PARK, Mt. Bourgeau, elev. 7700 ft.,
51°08'12", 115°48'15", stream bed vordered by rocky slope,
S-41. August 11, 1969.

11964* - Lecidea atrobrunnea (Ram.) Schaer.

11965 - Lecidea elata Schaer.

11966* - Rhizocarpon macrosporum Räs.

11967 - added to 11966 as both the same species.

BANFF NATIONAL PARK, drainage area west of Sunshine Village,
elev. 7650 ft., 51°04'25", 115°47'40", S-44. August 14, 1969.

12015 - Lecidea atrobrunnea (Ram.) Schaer.

12016 - discarded as too scrappy.

BANFF NATIONAL PARK, Eagle Mountain, elev. 7600-8000 ft.,
51°05'55", 115°45'50", alpine community, S-47. August 18, 1969.

12057 - Collema auriculatum Hoffm.

BRITISH COLUMBIA, beside Banff National Park, near Eohippus
Lake, elev. 7000 ft., 51°03'15", 115°49'40", growing on rock
covered by water for a portion of the growing season,
S-51. August 31, 1969.

12182* - Dermatocarpon fluviatile (G.Web.) Th. Fr.

BANFF NATIONAL PARK, east of Twin Cairn Mountain, elev.
7600-7800 ft., 51°04'40", 115°48'10", alpine community, S-52.
September 3, 1969.

12211* - Cladonia mitis Sandst.

Appendix D

DETERMINATIONS OF ROCKY MOUNTAIN BRYOPHYTES COLLECTED BY
G.W. SCOTTER

BANFF NATIONAL PARK, Sunshine area, Wa Wa Ridge, elev.
7700-8000 ft., 51°05'45", 115°47'30", S-3. July 5, 1969.

10401 - Orthocaulis quadrilobus (Lindb.) Buch

10402* - Ceratodon purpureus Brid.

10403* - Pohlia nutans (Hedw.) Lindb.

BRITISH COLUMBIA, near Banff National Park, Sunshine
area, Grizzly Lake, elev. 7250 ft., along lake and on rock
outcrops, 51°03', 115°48', S-5. July 6, 1969.

10423* - Sphagnum robustum (Russ.) Röll

10424 - added to 10423 as both the same species.

10425* - Bryum pseudotriquetrum (Hedw.) Gaertn., Meyer & Scherb.

10426* - Aulacomnium palustre (Hedw.) Schwægr.

BANFF NATIONAL PARK, beside B.C. border, Sunshine area,
elev. 7400-7900 ft., 51°03', 115°46', alpine community,
S-6. July 7, 1969.

10470* - Distichium capillaceum (Hedw.) B.S.G.

10471 - Tortella inclinata (Hedw. f.) Limpr.

10472* - Hypnum revolutum (Mitt.) Lindb.

10473* - Brachythecium salebrosum (Web. & Mohr) B.S.G.

10474 - Tortula ruralis (Hedw.) Gaertn., Meyer & Scherb.

10475* - Dicranum fuscescens Turn.

10476* - Lescurea incurvata (Hedw.) Lawt.

10477* - Tortula norvegica (Web.) Wahlenb. ex Lindb.

10478 - Lescurea radicata (Mitt.) Mönk.

10479 - added to 10473 as both the same species.

10480 - Dicranoweisia crispula (Hedw.) Lindb. ex Milde

- 10481* - Orthotrichum jamesianum Sull. ex James
10482 - added to 10481 as both the same species.
10483 - added to 10472 as both the same species.
10484* - Stegonia latifolia var. pilifera (Brid.) Broth.

BANFF NATIONAL PARK, Quartz Ridge and Quartz Hill, elev.
7900-8464 ft., 51°02', 115°46', alpine community, S-7.
July 7, 1969.

- 10522 - Grimmia sp. (poor material)
10523* - Ditrichum flexicaule (Schwaegr.) Hampe
10524 - Bryum caespiticium Hedw.
10525 - added to 10529 as both the same species.
10526 - Myurella julacea (Schwaegr.) B.S.G.
Bryum sp. (poor material)
10527* - Dicranum fuscescens Turn.
10528 - Lescuraea radicata (Mitt.) Mönk.
10529* - Distichum capillaceum (Hedw.) B.S.G.
10530* - Dicranoweisia crispula (Hedw.) Lindb. ex Milde
10531* - Bryum pseudotriquetrum (Hedw.) Gaertn., Meyer & Scherb.
10532 - added to 10544 as both the same species.
10533* - Drepanocladus uncinatus (Hedw.) Warnst.
10534 - Pohlia cruda (Hedw.) Lindb.
10535* - Hypnum revolutum (Mitt.) Lindb.
10536 - Hylocomium splendens (Hedw.) B.S.G.
Timmia austriaca Hedw.
10537 - added to 10530 as both the same species.
10538 - added to 10523 as both the same species.
10539 - Tortula ruralis (Hedw.) Gaertn., Meyer & Scherb.
10540 - Brachythecium turgidum (Hertm.) Kindb.
10541 - added to 10535 as both the same species.
10542* - Racomitrium canescens (Hedw.) Brid.

- 10543 - added to 10531 as both the same species.
10544* - Dicranum fuscescens Turn.
10545 - Dicranoweisia crispula (Hedw.) Lindb. ex Milde
10546 - added to 10531 as both the same species.

BANFF NATIONAL PARK, Sunshine area, elev. 7500-7800 ft.,
51°02'30", 115°45', Dryas community with bare ground, S-8.
July 7, 1969.

- 10605 - Dicranoweisia crispula (Hedw.) Lindb. ex Milde
10606 - Brachythecium salebrosum (Web. & Mohr) B.S.G.
10607 - Grimmia alpicola Hedw.

BANFF NATIONAL PARK, Lookout Mountain, elev. 7700-8800 ft.,
51°04'35", 115°45', steep slope with lots of bare rock,
Dryas and Salix communities, S-9. July 8, 1969.

- 10639* - Hypnum revolutum (Mitt.) Lindb.
10640 - Brachythecium salebrosum (Web. & Mohr) B.S.G.
10641 - Abietinella abietina (Hedw.) Fleisch.
Hypnum revolutum (Mitt.) Lindb.
10641A* - Ditrichum flexicaule (Schwaegr.) Hampe
10642 - added to 10639 as both the same species.
10643* - Tortula ruralis (Hedw.) Gaertn., Meyer & Scherb.
10644* - Distichium capillaceum (Hedw.) B.S.G.
10645* - Bryum pseudotriquetrum (Hedw.) Gaertn., Meyer & Scherb.
10646 - added to 10645 as both the same species.
10647 - added to 10639 as both the same species.
10648* - Orthotrichum speciosum Nees ex Sturm
10649 - added to 10648 as both the same species.
10650 - added to 10645 as both the same species.
10651 - added to 10645 as both the same species.
10652 - added to 10644 as both the same species.

- 10653 - added to 10639 as both the same species.
- 10654 - added to 10648 as both the same species.
- 10655 - Bryum sp. (sterile)-discarded.

BANFF NATIONAL PARK, near Sunshine Village, elev. 7500 ft.,
51°05', 115°47', tree line area, S-11. July 8, 1969.

- 10681* - Oncophorus virens (Hedw.) Brid.
- 10682 - discarded as too scrappy
- 10683 - Dicranum scoparium Hedw.
- 10684* - Barbilophozia hatcheri (Evans) Loeske

BANFF NATIONAL PARK, Fatigue Pass, elev. 7500-8500 ft.,
51°01'30", 115°41', alpine community, S-12. July 9, 1969.

- 10822* - Hypnum revolutum (Mitt.) Lindb.
- 10823* - Pohlia cruda (Hedw.) Lindb.
- 10824* - Bryum pseudotriquetrum (Hedw.) Gaertn., Meyer & Scherb.
- 10825 - added to 10824 as both the same species.
- 10826 - added to 10824 as both the same species.
- 10827* - Bryum pseudotriquetrum (Hedw.) Gaertn., Meyer & Scherb.
- 10828 - added to 10827 as both the same species.
- 10829 - added to 10822 as both the same species.
- 10830 - Grimmia sp. (sterile)
- 10831* - Ditrichum flexicaule (Schwaegr.) Hampe
- 10832 - added to 10831 as both the same species.
- 10833 - Encalypta rhytocarpa Schwaegr.
- 10834* - Distichium capillaceum (Hedw.) B.S.G.
- 10835* - Pohlia nutans (Hedw.) Lindb.
- 10836* - Mnium orthorrhynchum Brid.
- 10837 - Tortella tortuosa (Hedw.) Limpr.
- 10838 - added to 10834 as both the same species.

- 10839 - Tortula norvegica (Web.) Wahlenb. ex Lindb.
10840* - Encalypta sp. (sterile)
10841 - discarded as too scrappy
10842 - Orthotrichum sp. (Sterile)
10843* - Hypnum revolutum (Mitt.) Lindb.
10844* - Tortula ruralis (Hedw.) Gaertn., Meyer & Scherb.
10845* - Polytrichum piliferum Hedw.
10846 - added to 10843 as both the same species.
10847* - Distichium capillaceum (Hedw.) B.S.G.
10848 - Grimmia donniana Sm.
10849* - Pogonatum alpinum (Hedw.) Rühl.
10850 - added to 10831 as both the same species.
10851 - added to 10840 as both the same species.
10852 - added to 10847 as both the same species.
10853 - discarded as too scrappy
10854 - Cynodontium sp. ?
10855 - Grimmia anodon B.S.G.
10856 - added to 10827 as both the same species.
10857* - Blepharostoma trichophyllum ssp. brevirete
(Bryhn & Kaal.) Schust.
10858 - Distichium capillaceum (Hedw.) B.S.G.
Encalypta procera Bruch
10859 - Grimmia affinis Hornsch.

BANFF NATIONAL PARK, Citadell Pass, elev. 7500 ft.,
51°01'30, 115°42'30, alpine community, S-13. July 9, 1969.

- 10866* - Bryum pseudotriquetrum (Hedw.) Gaertn., Meyer & Scherb.
10867 - Bryum sp. (sterile) - discarded

BANFF NATIONAL PARK, head of Howard Douglas Creek, elev. 7500 ft., 51°02'15", 115°44'45", alpine community, S-14. July 9, 1969.

- 10868* - Hypnum revolutum (Mitt.) Lindb.
- 10869 - Campylium stellatum (Hedw.) C.Jens.

BANFF NATIONAL PARK, area north of Sunshine Village, elev. 7500 ft., 51°05', 115°47', S-15. July 10, 1969.

- 10870* - Bryum pseudotriquetrum (Hedw.) Gaertn., Meyer & Scherb.
- 10871 - Distichium capillaceum (Hedw.) B.S.G.
- 10872* - Bryum pseudotriquetrum (Hedw.) Gaertn., Meyer & Scherb.
- 10873 - Scapania irrigua (Nees) Dum.
- 10874 - Philonotis fontana (Hedw.) Brid.
- 10875 - added to 10872 as both the same species.
- 10876* - Ceratodon purpureus Brid.
- 10877* - Marchantia polymorpha L.
- 10878 - added to 10876 as both the same species.
- 10879* - Aulacomnium palustre (Hedw.) Schwaegr.

BANFF NATIONAL PARK, Wa Wa Ridge area, elev. 7600-7800 ft., 51°05', 115°48', alpine community, S-16. July 10, 1969.

- 10918 - discarded as too scrappy
- 10919 - Bryum stenotrichum C.Müll.
- 10920 - discarded as too scrappy
- 10921 - discarded as too scrappy
- 10922 - Orthotrichum sp. (sterile)
- 10923* - Drepanocladus uncinatus (Hedw.) Warnst.
- 10924* - Oncophorus virens (Hedw.) Brid.
- 10925* - Aulacomnium palustre (Hedw.) Schwaegr.
- 10926 - added to 10927 as both the same species.
- 10927* - Bryum pseudotriquetrum (Hedw.) Gaertn., Meyer & Scherb.

- 10928* - Tomenthypnum nitens (Hedw.) Loeske
- 10929 - Dicranoweisia crispula (Hedw.) Lindb. ex Milde
- 10930* - Rhacomitrium canescens (Hedw.) Brid.
- 10931* - Distichium capillaceum (Hedw.) B.S.G.
- 10932* - Philonotis fontana (Hedw.) Brid.
- 10933 - Tortula ruralis (Hedw.) Gaertn., Meyer & Scherb.

BANFF NATIONAL PARK, Lake Agnes, elev. 7200 ft., 51°24'58", 116°14'58", alpine region above lake, S-17. July 11, 1969.

- 10947* - Bryum pseudotriquetrum (Hedw.) Gaertn., Meyer & Scherb.
- 10948 - Tortula ruralis (Hedw.) Gaertn., Meyer & Scherb.
- 10949 - Tortella tortuosa (Hedw.) Limpr.
- 10950 - Blepharostoma trichophyllum (L.) Dum.
- 10951* - Cratoneuron commutatum var. falcatum (Brid.) Mönk.
- 10952 - added to 10951 as both the same species.
- 10953 - Grimmia sp. (sterile)
- 10954 - discarded as too scrappy
- 10955 - added to 10947 as both the same species.
- 10956 - Bryum sp. (sterile)
- 10957 - Campylium stellatum (Hedw.) C.Jens.
Philonotis fontana (Hedw.) Brid.
- 10958 - Barbilophozia hatcheri (Evans) Loeske
- 10959* - Eurhynchium pulchellum (Hedw.) Jenn.
- 10960 - added to 10947 as both the same species.

BANFF NATIONAL PARK, Eagle Mountain, elev. 7700-8200 ft., 51°06', 115°44'30", alpine community, S-19. July 13, 1969.

- 11017* - Hypnum revolutum (Mitt.) Lindb.
- 11018 - Dicranoweisia crispula (Hedw.) Lindb. ex Milde
- 11019 - Bryum sp. (sterile)
- 11020 - Distichium sp. (sterile) - discarded

BANFF NATIONAL PARK, Eagle Mountain, elev. 7700--8200 ft.,
51°06', 115°45'30, alpine community, S-20. July 13, 1969.

- 11075 - Distichium capillaceum (Hedw.) B.S.G.
- 11076* - Ditrichum flexicaule (Schwaegr.) Hampe
- 11077* - Tortula ruralis (Hedw.) Gaertn., Meyer & Scherb.
- 11078 - Brachythecium cfr. nelsonii Grout
- 11079* - Drepanocladus uncinatus (Hedw.) Warnst.
- 11080* - Orthothecium chryseum (Schwaegr. ex Schultes) B.S.G.
- 11081* - Bryum pseudotriquetrum (Hedw.) Gaertn., Meyer & Scherb.
- 11082* - Hypnum revolutum (Mitt.) Lindb.

BANFF NATIONAL PARK, base of Twin Cairn Mountain, elev.
7700-8000 ft., 54°04'30, 115°48', alpine community, S-22.
July 14, 1969.

- 11148* - Jungermannia cordifolia Hook.
- 11149* - Aulacomnium palustre (Hedw.) Schwaegr.
- 11150* - Leiocolea bantriensis (Hook.) Joerg.
- 11151* - Campylium stellatum (Hedw.) C.Jens.
- 11152* - Lescuraea incurvata (Hedw.) Lawt.
- 11153* - Bryum pseudotriquetrum (Hedw.) Gaertn., Meyer & Scherb.
- 11154* - Dicranoweisia crispula (Hedw.) Lindb. ex Milde
- 11155 - Oncophorus virens (Hedw.) Brid.
Campylium stellatum (Hedw.) C.Jens.
- 11156 - added to 11152 as both the same species.
- 11157 - added to 11149 as both the same species.
- 11158 - Polytrichum piliferum Hedw.
- 11159* - Cratoneuron commutatum var. falcatum (Brid.) Mönk.
- 11160* - Drepanocladus exannulatus (B.S.G.) Warnst.
- 11161* - Tomenthypnum nitens (Hedw.) Loeske
- 11162* - Philonotis fontana (Hedw.) Brid.

- 11163 - added to 11160 as both the same species.
- 11164 - Meesea uliginosa var. alpina (Funck ex Bruch) Hampe
- 11165* - Hypnum revolutum (Mitt.) Lindb.
- 11166 - added to 11159 as both the same species.
- 11167 - Bryum sp. (poor material) - discarded
- 11168 - Orthotrichum speciosum Nees ex Sturm.
- 11169 - added to 11165 as both the same species.
- 11170 - added to 11165 as both the same species.
- 11171 - added to 11154 as both the same species.
- 11172 - added to 11165 as both the same species.
- 11173* - Dichodontium pellucidum (Hedw.) Schimp.
- 11174 - Dicranum bonjeanii De Not. ex Lisa

BANFF NATIONAL PARK, ridge of Twin Cairn Mountain, elev. 8000-8300 ft., 54°04'15", 115°48'05", S-23. July 14, 1969.

- 11214 - Grimmia donniana Sm.
- 11215* - Dicranoweisia crispula (Hedw.) Lindb. ex Milde
- 11216 - added to 11215 as both the same species.
- 11217* - Bryum pseudotriquetrum (Hedw.) Gaertn., Meyer & Scherb.
- 11218 - Polytrichum norvegicum Hedw.
Polytrichum piliferum Hedw.
- 11219* - Rhacomitrium lanuginosum (Hedw.) Brid.
- 11220* - Distichium capillaceum (Hedw.) B.S.G.
- 11221* - Ditrichum flexicaule (Schwægr.) Hampe
- 11222 - Tritomaria scitula (Tayl.) Joerg.
- 11223* - Grimmia affinis Hornsch.
- 11224* - Orthotrichum speciosum Nees ex Sturm.
- 11225 - Dicranum fuscescens Turn.

BRITISH COLUMBIA, beside Banff National Park, near south end of Grizzly Lake, elev. 7250 ft., 51°03'15", 115°47'40", bog, S-25. July 17, 1969.

- 11263* - Barbilophozia hatcheri (Evans) Loeske
- 11264 - Grimmia donniana Sm.
- 11265* - Drepanocladus vernicosus (Lindb. ex C.Hartm.) Warnst.
- 11266* - Hypnum revolutum (Mitt.) Lindb.
- 11267* - Aulacomnium palustre (Hedw.) Schwaegr.
- 11268 - Brachythecium cfr. rivulare B.S.G.
- 11269* - Bryum pseudotriquetrum (Hedw.) Gaertn., Meyer & Scherb.
- 11270 - Pseudoleskeela tectorum (Funck ex Brid.)
Kindb. ex Broth.
- 11271 - Grimmia sp. (sterile)
- 11272* - Distichium capillaceum (Hedw.) B.S.G.
- 11273* - Ditrichum flexicaule (Schwaegr.) Hampe
- 11274 - Pohlia nutans (Hedw.) Lindb.
- 11275 - Brachythecium cfr. rivulare B.S.G.
- 11276* - Mnium orthorrhynchum Brid.
- 11277 - discarded as too scrappy
- 11278 - Bryum sp. (sterile)
- 11279 - discarded as too scrappy

BRITISH COLUMBIA, beside Banff National Park, Larix Lake, elev. 7250 ft., 51°03'10", 115°47'10", open Larix lyallii forest, S-26. July 17, 1969.

- 11288* - Dicranum bonjeanii De Not. ex Lisa
- 11289* - Barbilophozia hatcheri (Evans) Loeske
- 11290 - Ditrichum flexicaule (Schwaegr.) Hampe
- 11291* - Lescuræa incurvata (Hedw.) Lawt.
- 11292* - Pohlia nutans (Hedw.) Lindb.
- 11293 - added to 11291 as both the same species.
- 11294 - Lophozia ascendens (Warnst. Schust.
- 11295* - Eurhynchium pulchellum (Hedw.) Jenn.

BANFF NATIONAL PARK, Quartz Ridge area, elev. 7400-8300 ft., 51°03', 115°46', alpine community, S-27. July 22, 1969.

- 11310 - Bryum sp. (poor material) - discarded
- 11311 - Polytrichum juniperinum Hedw.
- 11312. - Encalypta sp. (immature)
- 11313 - Bryum sp. (poor material) - discarded
- 11314 - Tortula norvegica (Web.) Wahlenb. ex Lindb.
- 11315* - Bryum pseudotriquetrum (Hedw.) Gaertn., Meyer & Scherb.
- 11316* - Pogonatum alpinum (Hedw.) Röhrl.

BRITISH COLUMBIA, near Banff National Park, west of Grizzly Lake, elev. 7800 ft., 51°03'35", 115°48'15", alpine community, S-28. July 24, 1969.

- 11330 - Bryum sp. (sterile)
- 11331* - Rhytidium rugosum (Hedw.) Kindb.

BANFF NATIONAL PARK, east of Twin Cairn Mountain, elev. 7600 ft., 51°05', 115°47'30", alpine community, S-29. July 24, 1969.

- 11346* - Tayloria lingulata (Dicks.) Lindb.
- 11347 - Hypnum revolutum (Mitt.) Lindb.
- 11348* - Cratoneuron commutatum var. falcatum (Brid.) Mönk.
- 11349* - Ditrichum flexicaule (Schwaeagr.) Hampe
- 11350* - Jungermannia cordifolia Hook.
- 11351 - discarded as too scrappy
- 11352* - Dicranum scoparium Hedw.
- 11353* - Desmatodon latifolius (Hedw.) Brid.
- 11354* - Dicranoweisia crispula (Hedw.) Lindb. ex Milde

BRITISH COLUMBIA, beside Banff National Park, south of Larix Lake, elev. 7600 ft., 51°03', 115°46'50", alpine community, S-30. July 25, 1969.

- 11361* - Tortula ruralis (Hedw.) Gaertn., Meyer & Scherb.
- 11362 - added to 11361 as both the same species.
- 11363* - Desmatodon latifolius (Hedw.) Brid.

BRITISH COLUMBIA, beside Banff National Park, south of Larix Lake, elev. 7000 ft., 51°03', 115°47'30, bog area with rock outcrops, S-31. July 25, 1969.

11374* - Philonotis fontana (Hedw.) Brid.

BANFF NATIONAL PARK, Simpson Pass region, elev. 7000-7300 ft., 51°04'45, 115°50', open area along stream and lake shore, S-32. July 26, 1969.

11382* - Sphagnum girgensohnii Russ.

11383 - Cratoneuron commutatum var. falcatum (Brid.) Mdnk.

11384 - Hypnum revolutum (Mitt.) Lindb.

11385 - Bryum sp. (sterile)

BANFF NATIONAL PARK, near ski trail, Sunshine Village, elev. 7400 ft., 51°05', 115°47', S-37. August 7, 1969.

11729* - Philonotis fontana (Hedw.) Brid.

11730 - Preissia quadrata (Scop.) Nees

BANFF NATIONAL PARK, Wa Wa Ridge, elev. 7500-8000 ft., 51°05'45, 115°47'30, S-38. August 7, 1969.

11764 - Hypnum revolutum (Mitt.) Lindb.

11765* - Barbilophozia hatcheri (Evans) Loeske

11766 - Dicranum fuscescens Turn.

11767 - Stegonia latifolia var. pilifera (Brid.) Broth.

11768 - discarded as too scrappy

11769* - Rhacomitrium canescens (Hedw.) Brid.

11770 - added to 11765 as both the same species.

11771* - Tortula norvegica (Web.) Wahlenb. ex Lindb.

BANFF NATIONAL PARK, Mt. Bourgeau, elev. 9100-9615 ft., 51°07'50, 115°46'55, rocky slope, S-39. August 11, 1969.

11858 - added to 11880 as both the same species.

11859* - Distichium sp. (sterile)

11860* - Orthotrichum speciosum Nees ex Sturm.

- 11861 - added to 11880 as both the same species.
- 11862* Tortella fragilis (Hook. ex Drumm.) Limpr.
- 11863* - Hypnum revolutum (Mitt.) Lindb.
- 11864 - Encalypta raptocarpa Schwaeagr.
- 11865* - Bryum stenotrichum C.Müll.
- 11866* - Tortula ruralis (Hedw.) Gaertn., Meyer & Scherb.
- 11867 - added to 11865 as both the same species.
- 11868 - Bryum sp. (poor material) - discarded
- 11869 - Bryum sp. (poor material) - discarded
- 11870 - added to 11865 as both the same species.
- 11871 - added to 11881 as both the same species.
- 11872 - Distichium sp. (sterile)
Myurella julacea (Schwaegr.) B.S.G.
Grimmia anodon B.S.G.
- 11873* - Orthothecium chryseum (Schwaegr. ex Schultes) B.S.G.
- 11874 - added to 11873 as both the same species.
- 11875* - Ditrichum flexicaule (Schwaegr.) Hampe
- 11876 - added to 11875 as both the same species.
- 11877 - added to 11880 as both the same species.
- 11878 - added to 11863 as both the same species.
- 11879* - Hypnum revolutum (Mitt.) Lindb.
- 11880* - Bryum pseudotriquetrum (Hedw.) Gaertn., Meyer & Scherb.
- 11881* - Brachythecium cfr. nelsonii Grout
- 11882 - added to 11879 as both the same species.
- 11883 - added to 11879 as both the same species.
- 11884 - added to 11860 as both the same species.
- 11885 - added to 11866 as both the same species.
- 11886 - Hypnum procerrimum Mol.
- 11887 - added to 11862 as both the same species.

- 11888 - Bryum sp. (poor material) - discarded
- 11889 - added to 11880 as both the same species.
- 11890 - added to 11879 as both the same species

BANFF NATIONAL PARK, Mt. Bourgeau, elev. 8000-9000 ft.,
51°07'40", 115°47'45", rocky slope, S-40. August 11, 1969.

- 11936 - Ditrichum flexicaule (Schwaegr.) Hampe
Tortella fragilis (Hook. ex Drumm.) Limpr.
- 11937 - Hypnum vaucheri Lesq.
- 11938 - Hypnum revolutum (Mitt.) Lindb.
- 11939 - Orthotrichum speciosum Nees ex Sturm.
- 11940 - Tortella tortuosa (Hedw.) Limpr.
- 11941* - Ditrichum flexicaule (Schwaegr.) Hampe
- 11942 - Distichium capillaceum (Hedw.) B.S.G.
- 11943 - Stegonia latifolia (Schwaegr. ex Schultes) Vent. ex Broth.

BANFF NATIONAL PARK, Mt. Bourgeau, elev. 7700 ft., 51°08'12",
115°48'15", stream bed bordered by rocky slopes, S-41.
August 11, 1969.

- 11968* - Bryum pseudotriquetrum (Hedw.) Gaertn., Meyer & Scherb.
- 11969 - Blepharostoma trichophyllum ssp. brevirete
(Bryhn & Kaal.) Schust.
- 11970* - Cratoneuron commutatum var. falcatum (Brid.) Mnk.
- 11971 - added to 11970 as both the same species.
- 11972* - Oncophorus virens (Hedw.) Brid.
- 11973 - Campylium stellatum (Hedw.) C.Jens.
- 11974 - Tayloria lingulata (Dicks.) Lindb.
- 11975* - Scorpidium turgescens (T.Jens.) Loeske
- 11976 - added to 11970 as both the same species.
- 11977* - Brachythecium cfr. nelsonii Crout

- 11978 - Paludella squarrosa (Hedw.) Brid.
11979* - Philonotis fontana (Hedw.) Brid.
11980 - added to 11969 as both the same species.
11981 - added to 11979 as both the same species.

BANFF NATIONAL PARK, forest below Bourgeau Lake, elev. 7000 ft., 51°08'20", 115°47'20", S-42. August 11, 1969.

- 12002 - Funaria hygrometrica Hedw.
12003* - Leptobryum pyriforme (Hedw.) Wils.
12004* - Pohlia nutans (Hedw.) Lindb.
12005 - added to 12003 as both the same species.

BANFF NATIONAL PARK, drainage area west of Sunshine Village, elev. 7650 ft., 51°04'25", 115°47'40", S-44. August 14, 1969.

- 12017 - Campylium stellatum (Hedw.) C.Jens.
12018 - discarded as too scrappy

BANFF NATIONAL PARK, eagle Mountain, elev. 7600-8000 ft., 51°05'55", 115°45'50", alpine community, S-47. August 18, 1969.

- 12058 - Brachythecium salebrosum (Web. & Mohr) B.S.G.
12059* - Hypnum revolutum (Mitt.) Lindb.
12060* - Distichium capillaceum (Hedw.) B.S.G.
12061 - discarded as too scrappy

BANFF NATIONAL PARK, Eagle Mountain, elev. 7600-8000 ft., 51°05'55", 115°45'50", alpine community, S-47. August 18, 1969.

- 12069* - Distichium capillaceum (Hedw.) B.S.G.
12070* - Mnium blyttii B.S.G.
12071 - Desmatodon latifolius (Hedw.) Brid.

BRITISH COLUMBIA, near Banff National Park, near Echippos Lake, elev. 7000 ft., 51°03'15", 115°49'40", S-51. August 31, 1969.

- 12183* - Sphagnum balticum Russ. ex C.Jens.
12184 - Sphagnum cfr. recurvum P.Beauv.

12185 - added to 12186 as both the same species.

12186* - Jungermannia cordifolia Hook.

BANFF NATIONAL PARK, east of Twin Cairn Mountain, elev.
7600-7800 ft., 51°04'40", 115°48'10", alpine community, S-52.
September 3, 1969.

12212* - Sphagnum warnstorffianum Du Rietz

12212 - Brachythecium cfr. nelsonii Grout

BRITISH COLUMBIA, beside Banff National Park, Quartz Hill, elev. 8000 ft., 51°02'15", 115°45'55", saddle area, Salix nivalis community, T-2. July 22, 1969

- 11429* - Hypnum revolutum (Mitt.) Lindb.
- 11430 - added to 11429 as both the same species.
- 11431 - Dicranum fuscescens Turn.
- 11432 - Bryum sp. (poor material) - discarded.

BANFF NATIONAL PARK, south of Lookout Mountain, elev. 7400 ft., 51°03'45", 115°45'01", Phyllodoce empetrifomis community, T-3. July 23, 1969

- 11456* - Dicranum bonjeanii De Not. ex Lisa
- 11457 - added to 11456 as both the same species.
- 11458* - Lescuraea incurvata (Hedw.) Lawt.
- 11459 - Dicranum fuscescens Turn.

BRITISH COLUMBIA, beside Banff National Park, south of Larix Lake, elev. 7800 ft., 51°02'40", 115°47'02", T-5. July 25, 1969.

- 11486 - Bryum sp. (poor material) - discarded.
- 11487* - Dicranum cfr. fuscescens Turn.
- 11488 - Bryum sp. (sterile) - discarded.
- 11489* - Brachythecium salebrosum (Web. & Mohr) B.S.G.
- 11490* - Distichium capillaceum (Hedw.) B.S.G.
- 11491* - Hylocomium splendens (Hedw.) B.S.G.
- 11492 - Cephalozia pleniceps (Aust.) Lindb.

BANFF NATIONAL PARK, Lookout Mountain, elev. 7950 ft., 51°04'40", 115°46', Dryas community, T-6. July 28, 1969.

- 11500 - Clevea hyalina (Somm.) Lindb.

BANFF NATIONAL PARK, west of Lookout Mountain, elev. 7540 ft., 51°04'40", 115°45'05", Vaccinium - Salix community, T-8. July 29, 1969.

- 11519* - Lescuraea incurvata (Hedw.) Lawt.
- 11520* - Barbilophozia hatcheri (Evans) Loeske
- 11521 - Lescuraea radicata (Mitt.) Mdnk.
- 11522 - Desmatodon latifolius (Hedw.) Brid.

BANFF NATIONAL PARK, south of Lookout Mountain, elev. 7370 ft., 51°03'45", 115°45'01", Antennaria community, T-9. July 30, 1969

- 11549* - Pogonatum alpinum (Hedw.) Rðhl.
- 11550 - Barbilophozia hatcheri (Evans) Loeske
- 11551 - Bryum sp. (poor material) - discarded.

BANFF NATIONAL PARK, west of Sunshine Village, elev. 7380 ft., 51°04'25", 115°47'20", T-10. July 31, 1969.

- 11560 - Bryum sp. (sterile) - discarded.
- 11561* - Brachythecium cfr. nelsonii Grout
- 11562* - Aulacomnium palustre (Hedw.) Schaegr.
- 11563 - added to 11561 as both the same species.
- 11564 - added to 11562 as both the same species
- 11565* - Bryum pseudotriquetrum (Hedw.) Gaertn., Meyer & Scherb.
- 11566* - Pohlia nutans (Hedw.) Lindb.
- 11567 - Mnium blyttii B.S.G.

BANFF NATIONAL PARK, east of Wa Wa Ridge, elev. 7700 ft., Phyllodoce glanduliflora community, 51°05'25", 115°47'40", T-11. August 8, 1969.

- 11598 - Bryum sp. (sterile) - discarded.
- 11599 - Polytrichum piliferum Hedw.
- 11600* - Dicranum bonjeanii De Not. ex Lisa
- 11601 - Lophozia alpestris (Schleich.) Evans
- 11602 - Pogonatum alpinum (Hedw.) Rðhl.

BANFF NATIONAL PARK, NE of trail to Wa Wa Ridge, elev. 7400 ft., *Salix barrattiana* community, 51°05'23, 115°47'15, T-12. August 8, 1969.

- 11610* - Bryum pseudotsiquetrum (Hedw.) Gaertn., Meyer & Scherb.
- 11611* - Campylium stellatum (Hedw.) C.Jens.
- 11612* - Aulacomnium palustre (Hedw.) Schwæagr.
- 11613* - Distichium capillaceum (Hedw.) B.S.G.
- 11614* - Tortella tortuosa (Hedw.) Limpr.
- 11615 - Bryum pseudotriquetrum (Hedw.) Gaertn., Meyer & Scherb.
Brachythecium salebrosum (Web. & Mohr) B.S.G.

BRITISH COLUMBIA, beside Banff National Park, west of Quartz Hill, elev. 7750 ft., 51°02'20, 115°47'10, *Phyllodoce glanduliflora* community, T-13. August 12, 1969.

- 11632 - Brachythecium salebrosum (Web. & Mohr) B.S.G.
- 11633* - Tortula norvegica (Web.) Wahlenb. ex Lindb.
- 11634 - Desmatodon latifolius (Hedw.) Brid.
- 11635* - Barbilophozia hatcheri (Evans) Loeske

BRITISH COLUMBIA, beside Banff National Park, south of Larix Lake, elev. 7600 ft., 51°02'50, 115°47', *Salix barrattiana* community, T-14. August 12, 1969.

- 11645 - Myurella julacea (Schwæagr.) B.S.G.
Pohlia cruda (Hedw.) Lindb.
- 11646 - Bryum sp. (sterile) - discarded.
- 11647* - Lescuraea incurvata (Hedw.) Lawt.
- 11648* - Tortula norvegica (Web.) Wahlenb. ex Lindb.
- 11649 - Polytrichum juniperinum Hedw.
- 11650 - added to 11648 as both the same species.

BANFF NATIONAL PARK, north of Wa Wa Ridge, elev. 7650 ft., 51°05'59, 115°47'45, *Cassiope* community, T-15. August 13, 1969.

- 11675 - Cephalozia pleniceps (Aust.) Lindb.
- 11676 - Conostomum tetragonum (Hedw.) Lindb.

- 11677 - Pogonatum alpinum (Hedw.) Rðhl.
11678* - Dicranum scoparium Hedw.
11679* - Dicranum scoparium Hedw.
11680* - Hylocomium splendens (Hedw.) B.S.G.
11681 - Pohlia nutans (Hedw.) Lindb.
11682 - Barbilophozia hatcheri (Evans) Loeske
11683 - Paraleucobryum enerve (Thed. ex C.J.Hartm.) Loeske
Pohlia nutans (Hedw.) Lindb.
11684 - added to 11678 as both the same species.

BANFF NATIONAL PARK, east of Wa Wa Ridge, elev. 7650 ft.,
51°05'45, 115°47'15, Cassiope community, T-16. August 13,
1969.

- 11704 - Stegonia latifolia var. pilifera (Brid.) Broth.
11705* - Hypnum revolutum (Mitt.) Lindb.

BANFF NATIONAL PARK, south of Lookout Mountain, elev. 7400
ft., 51°03'45, 115°45'01, Carex community, T-17. August 15,
1969.

- 11711 - discarded as too scrappy.
11712 - Scapania irriqua (Nees) & Dum.
11713* - Lescurea radicata (Mitt.) Mðnk.
11714 - Barbilophozia hatcheri (Evans) Loeske
11715 - added to 11713 as both the same species.
11716* - Ceratodon purpureus Brid.
11717 - Pogonatum alpinum (Hedw.) Rðhl.
11718* - Polytrichadelphus lyallii Mitt.

BANFF NATIONAL PARK, Eagle Mountain, elev. 8100 ft., 51°05'50,
115°45'40, Carex - Dr, as community, T-19. August 18, 1969.

- 12084 - Tortella fragilis (Hook. ex Drumm.) Limpr.
Distichium sp. (Sterile)
12085 - Encalypta raptocarpa Schwæegr.
Myurella julacea (Schwæegr.) B.S.G.
Tortella fragilis (Hook. ex Drumm.) Limpr.

12086 - Tortella tortuosa (Hedw.) Limpr.

12087 - Bryum stenotrichum C.Müll.

BANFF NATIONAL PARK, elev. 7475 ft., 51°04'25, 115°47'30,
Saxifraga lyallii community, T-20. August 20, 1969.

12094*) - Mnium blyttii B.S.G.

12095* - Drepanocladus uncinatus (Hedw.) Warnst.

12096* - Moerckia hibernica (Hook.) Gottsche

12097* - Pohlia cruda (Hedw.) Lindb.

12098 - added to 12095 as both the same species.

12099 - added to 12095 as both the same species.

12100 - Bryum sp. (sterile) - discarded.

BANFF NATIONAL PARK, elev. 7275 ft., 51°04'35, 115°47'10,
Pulsatilla occidentalis community, T-21. August 20, 1969.

12123* - Lescurea radicata (Mitt.) Mönk.

12124 - Tortula norvegica (Web.) Wahlenb. ex Lindb.

12125 - Pogonatum alpinum (Hedw.) Röhl.

12126* - Desmatodon latifolius (Hedw.) Brid.

12127* - Lescurea incurvata (Hedw.) Lawt.

12128* - Barbilophozia hatcheri (Evans) Loeske

BANFF NATIONAL PARK, elev. 7360 ft., 51°05'10, 115°45'01,
Salix barrattiana community, T-22. August 21, 1969.

12147* - Bryum pseudotriquetrum (Hedw.) Gaertn., Meyer & Scherb.

12148* - Campylium stellatum (Hedw.) C.Jens.

12149 - Distichium sp. (sterile) - discarded.

12150 - Campylium stellatum (Hedw.) C.Jens.
Brachythecium rivulare B.S.G.

12151 - Campylium stellatum (Hedw.) C.Jens.
Amblyodon dealbatus (Hedw.) B.S.G.

BANFF NATIONAL PARK, elev. 7400 ft., 51°03'25, 115°46'10,
Carex meadow community, T-23. August 26, 1969.

- 12157 - discarded as too scrappy.
- 12158 - discarded as too scrappy.
- 12159* - Lescuraea radicata (Mitt.) Mönk.
- 12160 - Pogonatum alpinum (Hedw.) Röh1.
- 12161 - Dicranum fuscescens Turn.
- 12162 - discarded as too scrappy.
- 12163 - discarded as too scrappy.
- 12164 - Pohlia cruda (Hedw.) Lindb.
- 12165 - added to 12159 as both the same species.

BANFF NATIONAL PARK, elev. 7275 ft., 51°05'25, 115°46'50,
Carex meadow community, T-24. August 26, 1969.

- 12169* - Lescuraea radicata (Mitt.) Mönk.
- 12170* - Lescuraea incurvata (Hedw.) Lawt.
- 12171 - Bryum sp. (sterile) - discarded.

BRITISH COLUMBIA, beside Banff National Park, near Rock Isle
Lake, elev. 7500 ft., 51°03'45, 115°46'50, Carex meadow
community, T-25. September 3, 1969.

- 12232 - Pohlia cruda (Hedw.) Lindb.
- 12233* - Lescuraea radicata (Mitt.) Mönk.

BANFF NATIONAL PARK, base of Twin Cairn Mountain, elev. 7800
ft., 51°04'40, 115°48'10, Eriophorum scheuchzeri community,
T-26. September 3, 1969.

- 12234 - Tayloria sp. (sterile).
- 12235* - Drepanocladus revolvens var. intermedius
(Lindb. ex C.J.Hartm.) Richs.
- 12236* - Oncophorus virens (Hedw.) Brid.

BANFF NATIONAL PARK, east of Wa Wa Ridge, elev. 7700 ft.,
51°05'01", 115°47'40", Eriophorum angustifolium community,
T-27. September 3, 1969.

12241 - Tayloria lingulata (Dicks.) Lindb.

12242* - Scorpidium turgescens (T. Jens.) Loeske

12243* - Tomenthypnum nitens (Hedw.) Loeske