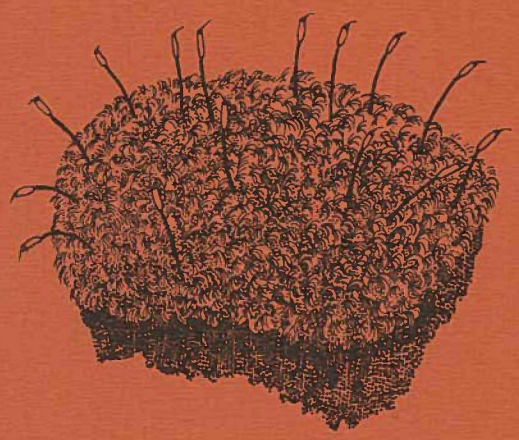
DAVIDSONIA

VOLUME 4 *NUMBER 3* *Fall 1973*

Cover

Late flowering, early fruiting branch of Sitka Mountain-ash, *Sorbus sitchensis*



2 cm

Typical tufted growth of *Dicranoweisia cirrhata*, a common rooftop moss.

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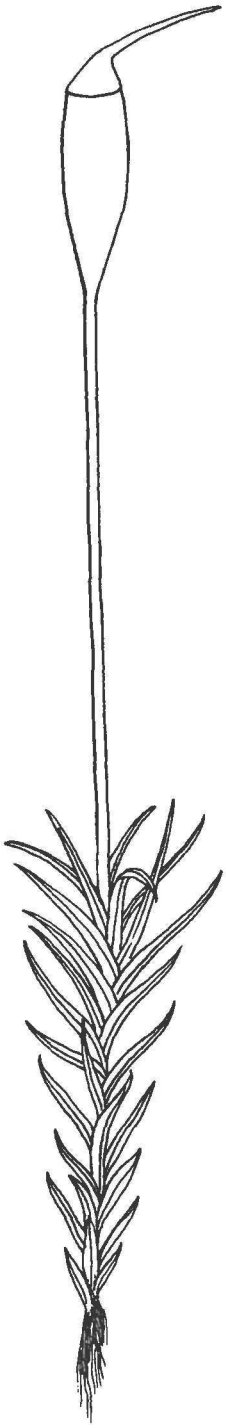
Mosses on Rooftops

W. B. SCHOFIELD



Habit of individual plant of *Dicranoweisia cirrhata* magnified approximately 8×.

Mosses are opportunists. Whenever a suitable site becomes available, they invade it and persist until crowded out or forcibly removed. Since readily available moisture and nutrients are the main requirements of mosses, the humid coast of British Columbia provides ideal conditions for their growth and development.

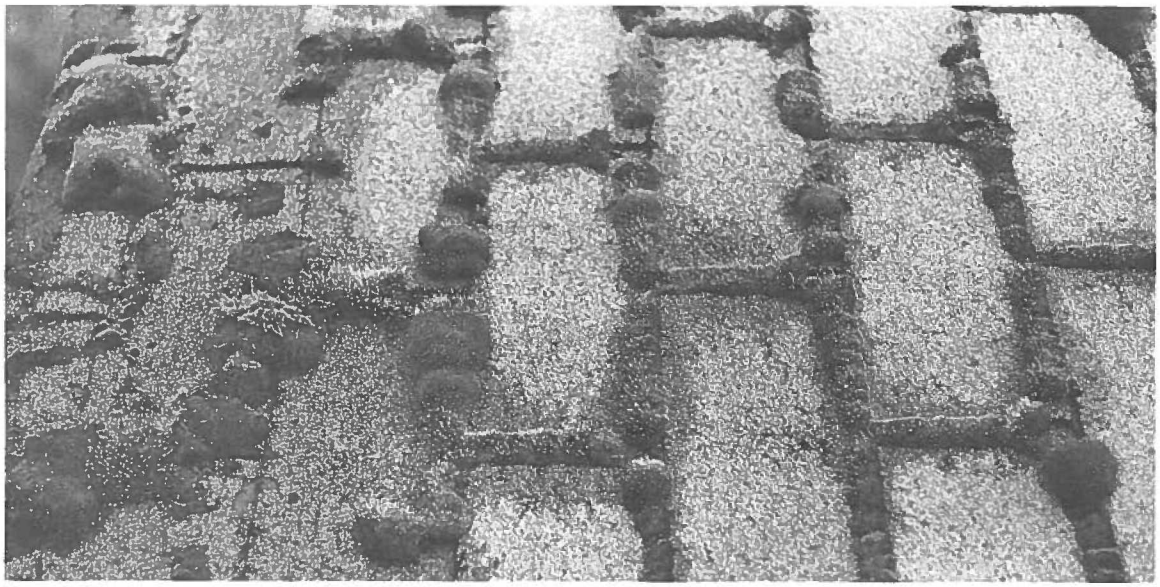
It is not surprising, then, that mosses occupy rooftops. The presence of shade trees nearby to keep the roof persistently moist even when rain is not falling, coupled with a rain of ash from a fireplace chimney, provides superlative conditions for moss growth. The only requisites that remain are a suitable substrate for establishment, and the arrival of the moss. Most types of shingle will permit mosses to become established, especially as the shingles become older. Thus composition shingles, asbestos shingles and wooden shingles all provide a favourable site. A metallic roof inhibits moss colonization and heavily tar-impregnated roofing will not permit mosses to colonize so long as the surface is smooth. In the latter case, however, in any joints and crevices where wind-borne fragments (plus moisture and nutrient minerals) can accumulate, a moss can establish itself and expand its colonies outward from such initial populations.

Mosses usually first occupy sites on the shingles directly above the eaves on detritus that has accumulated in the eaves trough, valleys or other depressions on the roof. Mosses tend to thrive well in the winter, when moisture is abundant and illumination and temperatures are low. During the summer these same mosses may remain dormant much of the time, either through desiccation or as a result of the natural cycle of growth in these plants.

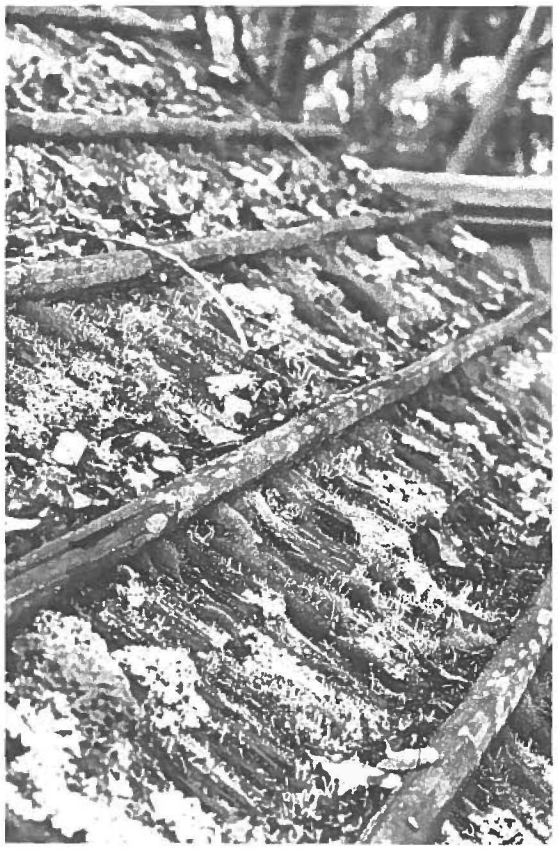
In winter or spring most of these mosses produce fruiting bodies. *Dicranoweisia cirrhata*, an extremely common moss of roofs, produces its fruiting bodies in winter and they mature and shed their millions of spores to the wind. This same moss also produces minute vegetative reproductive bodies, called gemmae. These, too, occur in great abundance and can be wind-blown to new sites. This moss is also common on roadside tree-trunks. It is this moss that often outlines the margins of composition shingles with narrow velvety turfs.

In the winter, too, the moss *Ceratodon purpureus* produces reddish spears that will become mature fruiting bodies in the spring. Dense colonies of these spears give a reddish pink flush to the vivid greenery of the turfs of moss. Some species of *Bryum* often grow associated with the *Ceratodon* and add to the colour.

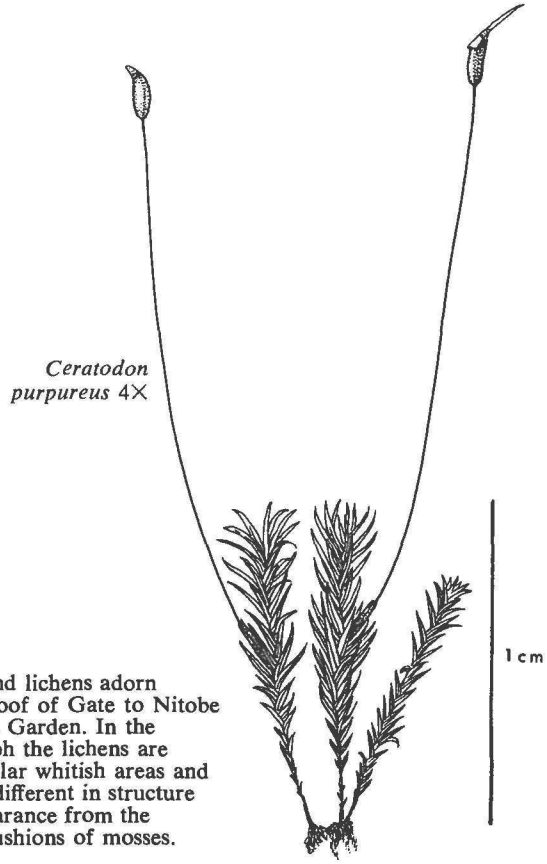
Variant colours of green and a change in texture are produced by the various species of *Rhacomitrium* that can become established on rooftops. *Rhacomitrium lanuginosum*, when dry, forms grayish rounded cushions, whereas *R. canescens* is whitish yellow in the same state. *Rhacomitrium heterostichum* usually forms darker, smaller tufts. When moist, these mosses produce patches of grayish green (*R. lanuginosum*, *R. heterostichum*) or bright yellow-green (*R. canescens*).



Typical growth of mosses on weathered asphalt composition shingled roof. Species illustrated include *Dicranoweisia cirrhata* and *Rhacomitrium canescens.*



Mosses and lichens adorn wooden roof of Gate to Nitobe Memorial Garden. In the photograph the lichens are the irregular whitish areas and are very different in structure and appearance from the velvety cushions of mosses.



An unusually large assemblage of mosses on the roof of the Waiting Arbour near the Teahouse in the Nitobe Memorial Garden. Many of the mosses occur rarely on rooftops. The dominant moss is *Hylocomium splendens*. Others are: *Dicranum howellii, Pohlia nutans, Polytrichum juniperinum, Rhytidiadelphus loreus, Plagiothecium undulatum, Dicranoweisia cirrhata* and *Aulacomnium androgynum*.

Finally, *Tortula ruralis* and *T. princeps* can form almost pure dense colonies on shaded rooftops, particularly garages where trees overhang, providing shade with associated persistence of moisture, and also an abundance of nutrients from rainwash through the leafy canopy.

These mosses enhance the beauty of a roof by contributing a richness of variable colours and textures. In other countries, as in Japan, they also flourish on thatched roofs. Naturally, opportunists from the indigenous flora are involved, but the resultant rich textures and interplay of colours are similar.

So far as I know, there has never been an attempt to exploit this natural enhancement of the beauty of a roof. The main problem would be to guarantee that the presence of the moss would not aid in the deterioration of the roof. Under normal conditions the expansion of the moss colony can result in pushing up the edges of the shingles, particularly if they are composition shingles. In wooden shingles, however, if a roof begins to leak, it is unlikely to be caused by the moss, but results from natural deterioration of the roof whether or not the moss is present.

Editors' note: Additional information concerning common mosses occurring in British Columbia can be found in a recent publication by Dr. Schofield entitled: 'Some Common Mosses of British Columbia'. This useful guide was published in 1969 as Handbook No. 28 by The British Columbia Provincial Museum with illustrations by Patricia Drukker-Brammall.

Sorbus sitchensis Roemer

WESTERN MOUNTAIN-ASH, PACIFIC MOUNTAIN-ASH, SITKA MOUNTAIN-ASH, ROWAN, CALIFORNIA MOUNTAIN-ASH

Member of the Family Rosaceae

Natural Distribution

Sorbus sitchensis occurs from the coastal region of Alaska south of 54°N, south through the Cascade and Olympic Mountains of Washington and the Cascades of Oregon to northern California, and east to eastern British Columbia, Waterton Lakes National Park in Alberta, northern Idaho and northwestern Montana. It has been reported from the Yukon Territory. It is widely distributed throughout British Columbia, very common on the high mountains between Grand Forks and Rossland and extending northward beyond McLeod Lake.

Habitat

Sorbus sitchensis is usually found at moderate-to-high altitudes in the mountains. In British Columbia it is most abundant above 3000′ near the coast, but above 4000′ in the Interior, in open areas such as the edge of a meadow or rockslide. Maximum development occurs about headwaters of small mountain streams, springy depressions, in moist, sandy and mucky soils.

Description

An erect, several-stemmed, nearly glabrous, deciduous shrub 1.2-2.5 m tall, or a small tree 4.5-6.0 m tall and 15 cm in diameter. If a tree, then with a handsome, roundtopped head. In rocky alpine situations at higher latitudes, *S. sitchensis* is usually a low shrub only 30-61 cm high. In poor situations, shrubs may have a few thin stems to 2.5 m tall with a few leaves and berries near the top.

The root system is taprooted with many fine feeder roots. Occasional suckering may occur.

The bark is reddish-purple, tardily glabrous, becoming grayish-red with age, occasionally becoming scaly and thin.

The twigs are stout and rusty pubescent when young, becoming brown and glabrous with age. The wood has the smell and bitter taste of cherry when broken. Conspicuous and elongated horizontal lenticels are present. The pith is five-angled, continuous and brownish.

The wood is moderately light, low in strength, close-grained. The heartwood is pale brown, the sapwood nearly white. The wood is of no commercial value.

Buds are subconical or oblong. Terminal buds up to 12 mm long, laterals often much reduced. Buds are solitary and sessile, dull reddish-brown, densely rusty to white hairy to nearly glabrous, with several imbricate bud scales, inner scales more or less pubescent with long hairs often matted in gum, leaf blade rudiments often occurring at tip. Many lateral buds remain undeveloped.

Leaf scars are alternate, scarcely raised, narrow, crescent shaped, half encircling the twig, bundle traces 3 or 5 or exceptionally 7, stipule scars lacking.

Leaves are alternate, pinnately compound, 10-20 cm long, stipules persistent or tardily deciduous. Leaflets 7-11(-15), elliptic ovate or narrowly ovate to elliptic or obovate, rather thick, glabrous and dark green above, paler beneath and often persistent pubescent with rufous hairs along the mid-vein, (1.5-) 2-5 (-7) cm long, 1/3-2/5 as broad, rounded to semi-truncate at apex, but may be acute. The leaflet margins are coarsely and sharply serrate from near the base to the apex or almost entire. The terminal leaflet is petiolate, lateral leaflets are mostly sessile.

Plants flower from May-June in British Columbia, May-August in other parts of the range. The inflorescence is a large terminal compound corymb, pubescent, 15-80 flowered, 5-10 cm across. The pedicels are rusty hairy or sparsely white hairy to nearly glabrous. Flowers about 6 mm across, sweet scented, although

FIGURE 1. *Sorbus sitchensis* Roemer. A. fruiting branch, B. inflorescence, C. habit, D. flower bud, E. single flower, F. single fruit.

the scent may be obnoxious to some people. Calyx turbinate-obconic, glabrous to sparsely pubescent, adnate almost to top of the ovary with a short free hypanthium, 5 lobes triangular, persistent. Petals 5, white to cream, (3-) 4-5 mm long, rhombic to elliptic, usually very short-clawed, sparsely pilose on the upper surface near the base, deciduous. Stamens 15-20, filaments broadened slightly near the base, usually shorter than the petals. Styles 2-5, distinct, (1.5-) 2-3 mm long, villous at base. Ovary compound, 1/2-4/5 inferior, 2-5 carpels (usually 3), hairy at least at the top. Ovules 2 in each locule.

Fruit a fleshy berry-like pome, 6-8 (-10) mm long, ellipsoid to subglobose, orange to coral red to purple red, glaucous, with a slight bluish cast, 2-5 celled, carpel wall thin-papery. Fruit is acid and matures July-September depending on location. The fruit may remain attached all winter if not eaten by birds. Seeds 1-2 to each locule, 3 mm long, brown, elliptic and somewhat flattened.

Propagation

Seed can be sown in the fall as soon as it is ripe or can be stratified for 3 months at 40°F and then sown. If germination has not occurred after 3-4 months, a further 3 months' cold treatment will usually result in success. Layering is also used. Varieties and rare forms are usually budded or grafted onto a related species, or onto *Sorbus aucuparia* (European Mountain-ash).

Transplantation

Easily transplanted and fairly quick to establish.

Conditions for Cultivation

The shrub is relatively fast growing. The recommended hardiness zone in Canada is zone 3. *Sorbus sitchensis* needs ordinary well-drained loamy soil with a pH of about 6.0. It prefers full sun rather than partial shade. No regular pruning is necessary.

Landscape Value

The genus *Sorbus* is widely planted as ornamental shade trees in sunny borders or as isolated lawn specimens because of their attractive white flowers, striking foliage which usually turns orange-red in the fall, and especially the ornamental fruits which often remain on the branches all winter. They are ideal for adding a colourful accent in the fall to almost any planting. *Sorbus sitchensis* itself is rather rare in cultivation although it is an extremely attractive native shrub or small tree which is well suited to planting on rocky slopes. It has occasionally been planted as a boulevard tree in Victoria (Szczawinski and Harrison 1973). The European Mountain-ash, *S. aucuparia,* is most commonly found in gardens and is even locally naturalised from Labrador to British Columbia. Birds are attracted by the berries.

Availability

Apparently not available from any nurseries in British Columbia.

Varieties and Ornamental Cultivars

Hybrids between *Sorbus sitchensis* and *S. scopulina* Greene (Greene's Mountain-ash) have been reported but otherwise there seem to be no natural or artificial hybrids.

There are two geographic races which have been recognised. The races differ mainly in the serration of the leaflets and there are considerable intermediate forms. *Sorbus sitchensis* ssp. *sitchensis* (or var. *sitchensis*) has the leaflets toothed (about 16-40 teeth) from the apex to usually 1/2-3/4 (-4/5) of their length, elliptic to occasionally oblong, acute to rounded at the apex and is found from Alaska and southern Yukon south to northwestern Montana and northern Idaho and to southwestern Alberta. It is not uncommon in the Cascades of Washington where it is often intermediate to *S. scopulina.* It is also sometimes transitional to the latter especially in the area between Mt. Rainier and Mt. Adams. *Sorbus sitchensis* ssp. *grayi* (Wenzig) Calder & Taylor (or var. *grayi* (Wenzig) C. L. Hitchc.) has the leaflets toothed (about 4-16 teeth) primarily only above the middle or is almost entire, oblong to elliptic-ovate, rounded or truncate at the apex and is found in the Cascades from southern British Columbia south through Washington (where also in the Olympics) to the Sisters in Oregon and perhaps intermittent to northern California. It is also found in the Queen Charlotte Islands where it is considered the subalpine phase which is found only at tree line at Takakia Lake and on north-facing open forested slopes at about 1800′ on Mosquito Mountain, whereas ssp. *sitchensis* is a lowland tree of open forests along the shores of saltwater inlets, lakes and rivers.

Other Uses

The wood is of no commercial value but the berries are suitable for making jelly although they have a sour, mealy taste when raw. The Thompson Indians of British Columbia occasionally ate the berries. The Bella Coola Indians collected the bark of the root and sometimes the inner bark of the stem at any time of year, boiled it for an hour, and the hot decoction, preferably strong, but also weak, was drunk for ailments of the stomach or rheumatism, but not taken for diarrhoea or vomiting. It was said to effect a cure in 1 to 7 days. For rheumatism the hot decoction was sometimes poured into a large box and used as a bath. It was also used as an eyewash. The berries were rubbed into the hair to remove lice. The Southern Carrier Indians chewed the bark as a treatment for colds whereas the Gitksan tribe ate the raw crushed fresh fruit as a strong purgative. The fruits of European species of Mountain-ash have been used to make jellies and preserves for centuries.

Diseases and Pests

It has proven difficult to find information on diseases and problems specific to *Sorbus sitchensis*, except for the two organisms discussed below. The genus as a whole is susceptible to most of the same diseases and insects common to other members of the Rosaceae, such as Crabapples, and Roses, and particularly to borer attacks at the base of the tree. These diseases and pests include: *Erwinia amplovora* 'Fire Blight'; *E. tumefaciens* 'Crown gall'; *Cytospora* spp. *'Canker'; Chrysobothris femorata* 'Flatheaded borer'; *C. mali* 'Pacific flatheaded borer'; *Eriophyes pyri* 'Pear leaf blister mite' and *Pristiphora eniculata* 'Mountain ash sawfly'. The majority of diseases can be prevented or at least minimized by keeping the tree in a healthy condition.

(a) Fungus Diseases

Gymnosporangium cornutum, G. tremelloides and *G. nootkatense* 'leaf rusts' have all been reported on wild *Sorbus sitchensis* (Toms 1964, Parmelee 1971). Circular light yellow thickened spots appear during the summer, orange cups develop later on the lower surface of these spots.

The rust may be controlled by using sprays recommended for rust control of Flowering Crabapples (*Malus*). If the Mountain-ash is highly prized, and it is practicable, it may be best to remove the alternate host (*Juniperus* and *Chamaecyparis* spp).

(b) Insect Pests

Anuraphis roseus 'Rosy apple aphid' and *Eriosoma lanigerum* 'Woolly apple aphid' frequently infest Mountain-ash. The former cause the leaves to curl around them thus protecting the aphids from natural enemies, sprays and dusts; whereas, the latter feed on wounds on the trunks and branches or migrate down to the roots where they cause the formation of knots resulting in the production of many fibrous roots and stunting.

Both pests are susceptible to natural enemies such as *Aphelinus mali*, a wasp-like parasite; ladybeetles; syrphid fly larvae and aphid lions. However, if the season is cold and wet the aphids will develop faster than the predators—in this case, spray with a dormant oil spray to kill the overwintering eggs.

The generic name *Sorbus* is from the ancient Latin *'sorbum'* for the fruit of the Service Tree (*Sorbus domestica*). The specific name *sitchensis* means "of Sitka"—the tree was first collected in Sitka, Alaska.

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Botanical Garden News and Notes

Garden Component Developments—During the past summer attention has been directed to the development of the B.C. Native Garden component. A field collection program in B.C. was initiated to gather native woody tree and shrub material for incorporation in the B.C. Native area. Construction of the Rock and Alpine Scree Garden commenced in mid-August and drainage, rock work, pathways and soil filling were substantially complete before fall rains commenced.

Local Initiatives Program 1973—During the period January to July, 17 persons were hired under the government-sponsored L.I.P. They formed the core of the labour force in the clean-up and preparation of the B.C. Native area. Some effort was also directed towards the care and maintenance of the woody material purchased from Lohbrunner Nurseries.

Visitors—On June 16th and October 13th the Alpine Garden Club of B.C. visited the Botanical Garden to inspect the expanding collections of alpine plants in the nursery and to see the B.C. Native area and the Rock and Alpine Scree Garden during the later stages of their development and construction.

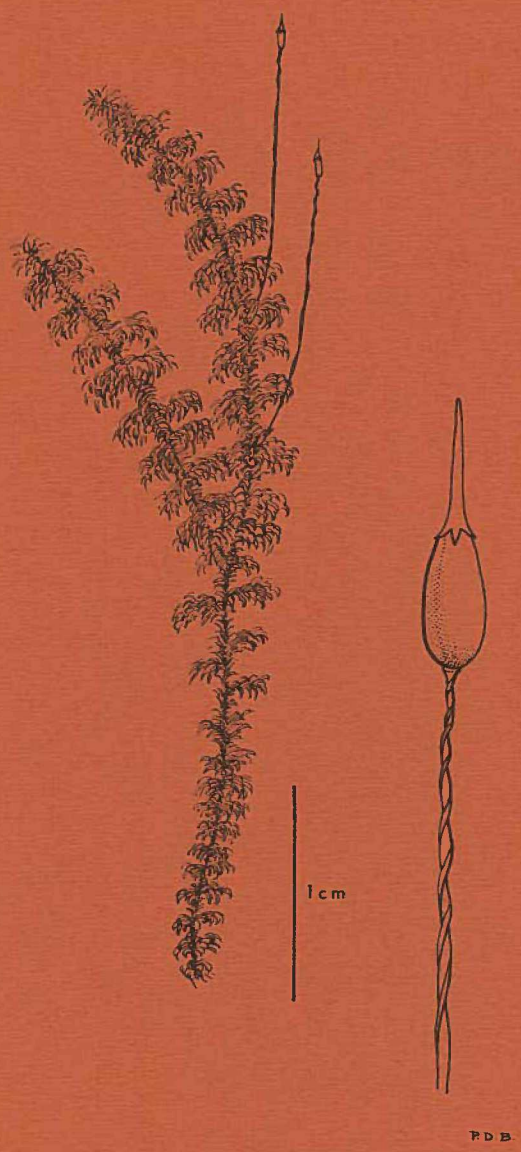
Staff Activities—Mr. James O'Friel attended the Western Regional meetings of the International Plant Propagators Society held this year in Honolulu, Hawaii. Dr. John Neill was elected a Fellow of the Canadian Society of Landscape Architects in May 1973. Dr. Roy L. Taylor, Dr. Bruce MacBryde and Dr. Christopher J. Marchant attended the first meeting of the International Conference for Systematics and Evolutionary Biology in Boulder, Colorado in August. Congratulations to Mrs. Nancy J. Turner on completion of her doctorate research in Ethnobotany and the attainment of her Ph.D. degree. She now holds a contract appointment at the Provincial Museum in Victoria. Dr. Chris Marchant continues to serve on the executive committees of the Canadian Botanical Association and the Alpine Garden Club of B.C. Mr. Kenneth Wilson and Mr. Leonard Gibbs are members of the executive committee of the Vancouver Rose Society.

National Botanical Garden System for Canada—1973 saw the development of a major proposal to the Federal Government concerning a plan for the establishment of a National Botanical Garden System. The proposal, funded by the Minister of State for Science and Technology, was prepared by Dr. Roy L. Taylor (Chairman), Dr. Leslie Laking and Dr. Leo A. Dionne and approved by the six-man Organizing Committee for A National Botanical Garden System for Canada. This latter body was established in October 1971 to further the development of a botanical system for Canada. The feasibility study was submitted to MOSST in April and has been subsequently sent to all participants of the October 1971 Symposium held at the Royal Botanical Gardens at Hamilton. Persons interested in adding support or obtaining information concerning this proposal can contact any member of the committee or write directly to the Minister of State for Science and Technology.

CLIMATOLOGICAL SUMMARY*

Data *1973*	*July*	*August*	*September*
Mean temperature	60.9°F	59.45°F	58.70°F
Highest temperature	79.0°F	73.0°F	86.0°F
Lowest temperature	47.0°F	43.0°F	45.0°F
Grass minimum temperature	39.0°F	35.0°F	34.0°F
Total rainfall/No. days with rainfall	0.51"/9	1.27"/6	1.34"/11
Total snowfall/No. days with snowfall	nil	nil	nil
Total hours bright sunshine/possible	266.5/482.51	261.4/439.03	189.9/372.22
Max. wind speed (m.p.h.) for 1 hour/ direction	14/NW	12/NW & E	13/E
Mean mileage of wind at 3′	80.8	70.6	67.4
Mean mileage of wind at 40′	119.5	107.4	104.9

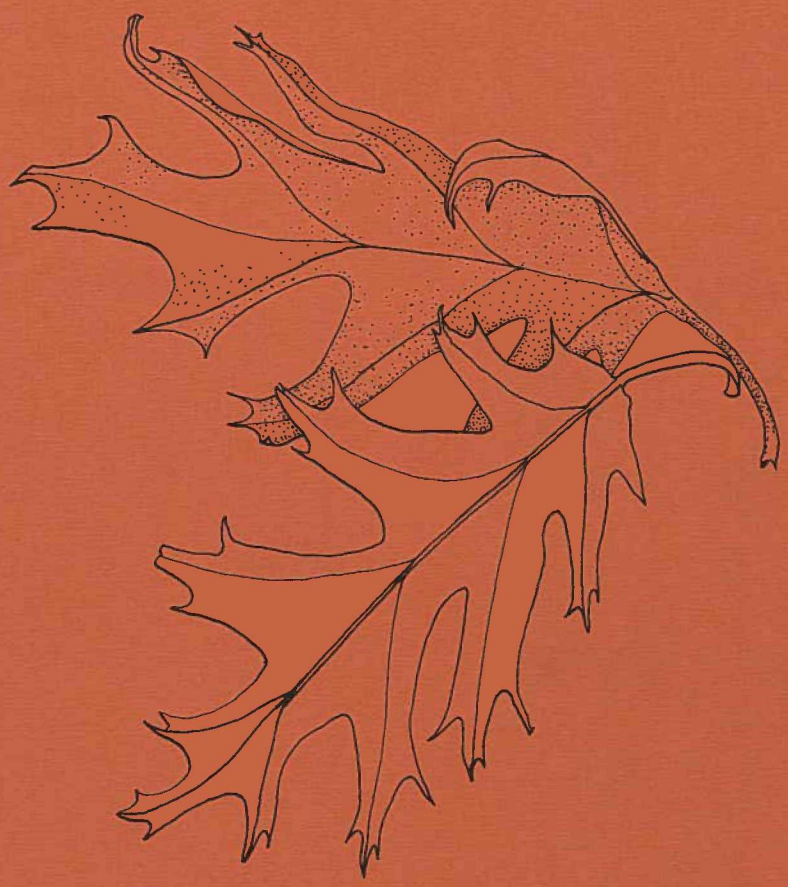
**Site: The University of British Columbia, Vancouver, B.C. Canada*
Position: lat. 49°15′29″N; long. 123°14′58″W. Elevation: 342.6′



Rhacomitrium canescens, a widely distributed species throughout the circumpolar regions of the Northern Hemisphere and a frequent visitor on roofs in the Vancouver area.

Rhacomitrium lanuginosum, a widespread moss species that occurs at all elevations except in arid regions of the Northern Hemisphere. The species is also found in the Southern Hemisphere.
A striking gray-green moss occasionally found on rooftops in coastal British Columbia.

Fall leaves of *Quercus coccinea*, the Scarlet Oak.
A striking tree often used as an attractive
ornamental in the lower mainland of British Columbia.



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