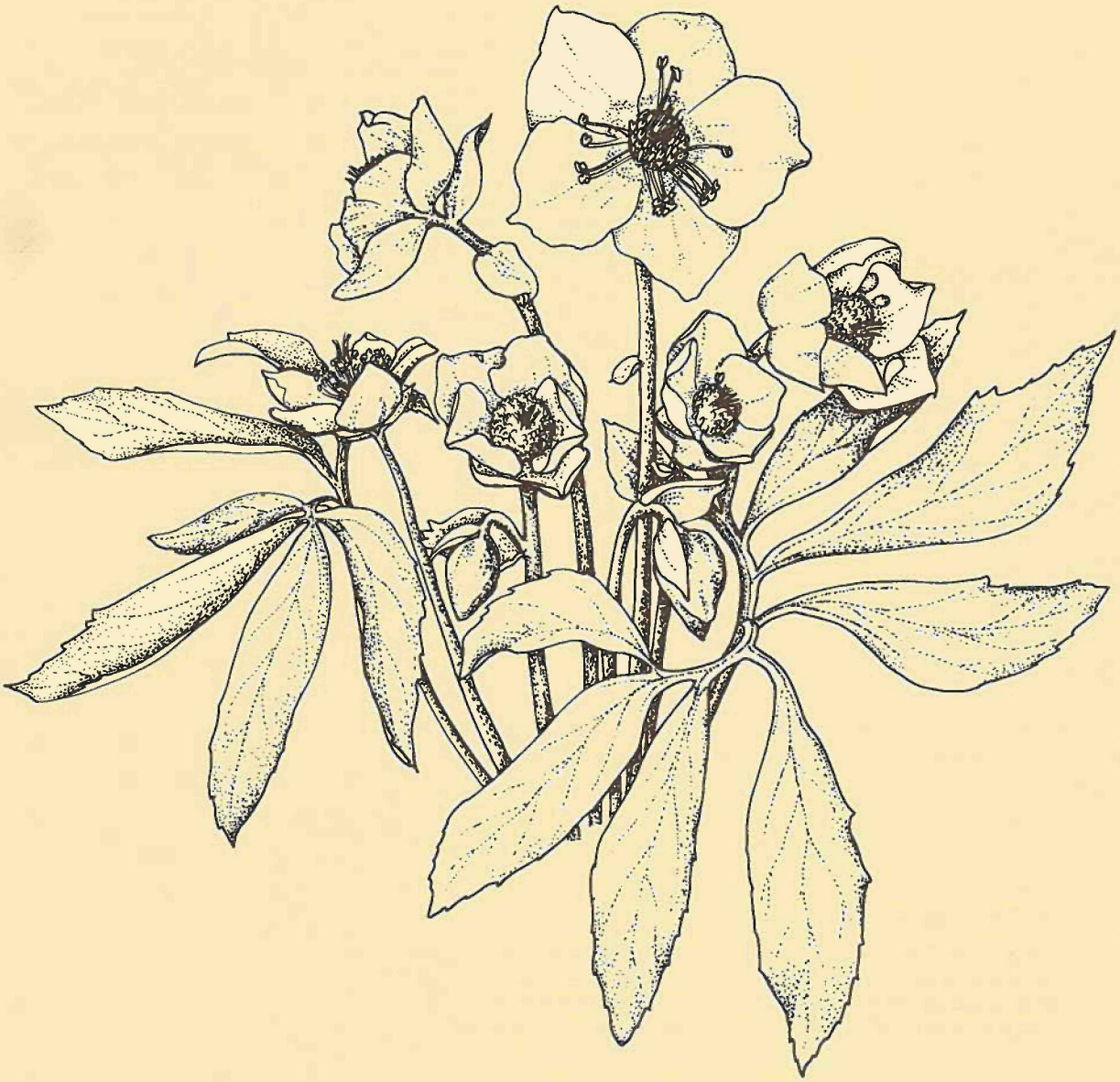
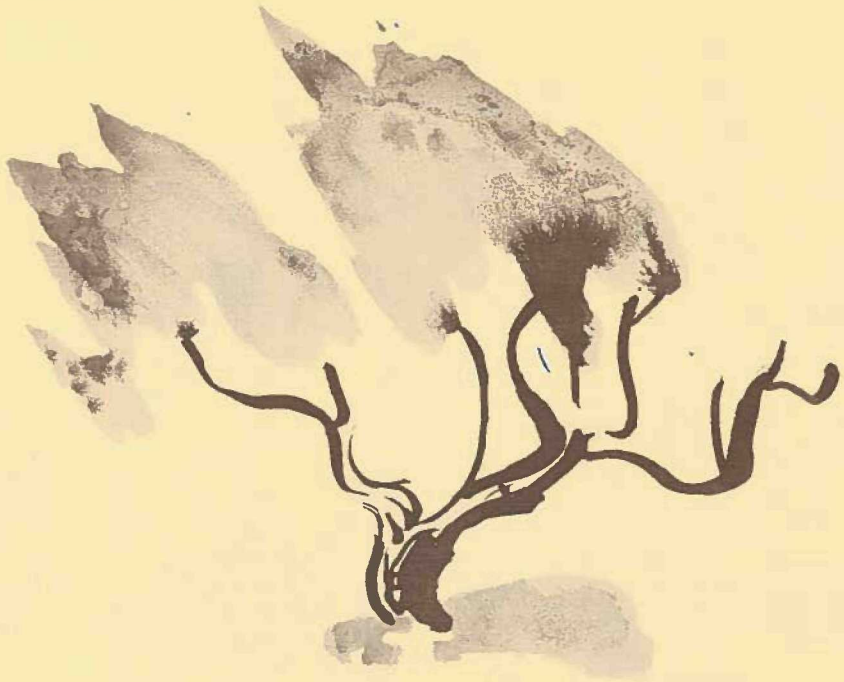
DAVIDSONIA

VOLUME 8 *NUMBER 4* *Winter 1977*



Cover:

Helleborus niger or the Christmas Rose.
A member of the Ranunculaceae, this species has durable and cold resistant flowers which often appear just before Christmas.



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Davidsonia is published quarterly by The Botanical Garden of The University of British Columbia, Vancouver, British Columbia, Canada V6T 1W5. Annual subscription, six dollars. Single numbers, one dollar and fifty cents. All information concerning subscriptions should be addressed to the Director of The Botanical Garden. Potential contributors are invited to submit articles and/or illustrative material for review by the Editorial Board.

Acknowledgements

The pen and ink illustrations are by Mrs. Lesley Bohm. The photograph on the inside back cover was taken by Dr. R. L. Taylor; all other photographs were taken by Cathie Lester. The article on *Abies* was researched by Mrs. Sylvia Taylor. Editorial and layout assistance was provided by Mrs. Sylvia Taylor and Mrs. Jean Marchant.

ISSN 0045-9739

Second Class Mail Registration Number 3313

Hortitherapy: An Expanding Role for Botanical Gardens

VIRGINIA G. FEARING, OTR.*

Many of us find working with plants a satisfying and relaxing experience. In that sense horticulture as therapy is not new. What is new has been the slow evolution over the past 30 years of the use of horticulture as one of many activities which rehabilitation therapists use to achieve treatment goals.

In general, rehabilitation programs are aimed at helping each person function as independently and with as much dignity as possible. Since people vary considerably in their ability it is important to work through a medium which can be graded to suit each person's needs. This flexibility makes it possible for a person who is deteriorating or one who is improving to continue with the same activity, but at a different level.

Horticulture as therapy can be useful to a wide range of people including ambulant disabled, retarded children, and "cerebral" gardeners, people who enjoy watching and learning about plants although they are unable to use their hands. Mixing soil may increase gross motor skills, although a headstick with a spoon attached is amazingly useful. Planting seeds requires fine hand coordination if the seeds are carefully placed but they can be spread broadside. In this way, each person is encouraged to do as much as possible because it is fun, while at the same time, perhaps, increasing muscle strength, range of motion, dexterity and self-confidence.

It appears that much of the early work involving the use of plant materials was done by individual hospitals in an effort to meet the needs of their patients. For example, the Menninger Foundation had a greenhouse in the 1940's which was used by psychiatric patients.

In the 1960's, The Nuffield Orthopaedic Centre, Oxford, started to study the problems of wheelchair gardeners. A group of raised gardens were built, suitable tools were purchased and a trained horticulturist was hired. At Ingo Simon House, Mount Vernon Hospital, Northwood, a garden was established to study the problem of ambulant disabled. A lean-to greenhouse, raised beds and a prototype potting shed were built. The Wolfson Medical Rehabilitation Centre, Wimbledon, began studying the use of gardening as a means of therapy for people with head injuries.

So far as it is possible to tell from available literature, these were the first joint ventures by horticulturists and rehabilitation therapists which produced not only the theory for 'hortitherapy' but also attempted to document the range of practical knowledge necessary to implement the theory.

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Canada

The development of hortitherapy in Canada appears to be a recent development and documentation has been almost non existent. In the fall of 1975, a special symposium entitled, "Horticulture as a Tool in Therapy" was organized by the Royal Botanical Gardens at Hamilton. The proceedings of this symposium have been published as a Technical Bulletin from the Royal Botanic Gardens (1975). The emphasis during this symposium was an evaluation of the use of horticultural practices and techniques as part of job retraining and placement of the handicapped in the job market. Little attention was focused on the utilization of horticulture as therapy for individual growth and development. The program should provide an opportunity for the participation of an individual in a normal activity which is an everyday experience for most people.

In 1976, the University of British Columbia Botanical Garden, in an effort to expand its role in the community, initiated a special project for handicapped people. This project, which is one of many at the Garden, provides an opportunity for a number of Friends of the Garden to participate in a Garden outreach program. The Friends are a group of people who volunteer one day a week to work on various projects in support of the Botanical Garden activities.

With the guidance of Botanical Garden staff, several Friends offered to present a plant class at Pearson Hospital, an extended care unit in Vancouver geared toward younger adults. The objective of the project was to gain practical experience in utilizing plant material with programs for handicapped people, to determine how best the Botanical Garden could participate in a patient program, and to stimulate an interest in plants and their uses within a hospital environment.

In October, Margaret Coxon, Curator of the Botanical Garden Greenhouse, and several Friends presented a plant propagation class to a far larger group than had been expected. Everyone involved had a grand time. Clearly, an ongoing plant class would be well received.

At about this time I began working as an occupational therapist at Pearson Hospital and therefore was in a position to begin a pilot project there with the purpose of learning as much as possible about organizing and carrying on a successful plant program in an institution.

Much of what was learned from this project with severely disabled people, such as optimum group size, use of volunteers and other requirements which are unique to hospitals, could be extrapolated to fit other types of patient groups. Nevertheless, each group has its own unique characteristics and the group at Pearson was no exception. For example, the pilot group included one person who could not speak, several who were difficult to understand, and a few who could not use their hands at all. Except for one person who was face down on a stretcher, everyone was in a wheelchair. Most of the group were poorly coordinated or lacked hand strength.

This group, who named themselves "The Greeneries", met once a week for an hour or so and although roughly twelve people were loyal members, the group tended to become a focus of activity which attracted other people in the area.

The therapeutic goals for this groups were:

1. to have fun;
2. to enjoy the textures and fragrances of soils and plants;
3. to stimulate intellectual growth;
4. to encourage involvement in the community;
5. to form a group with a common interest;
6. to increase attention span for some people.

The therapist and an activity aide cooperated in leading this group. Each meeting included background material and instruction for the project of that day. Every member did as much as possible, which sometimes meant only telling a volunteer exactly what to do. The work area was set up so that it didn't matter if soil or plants were spilled. Although there was a deliberate attempt to introduce new and interesting material to this group, the atmosphere was not that of a classroom but of an informal workshop.

FIGURE 1. Margaret Coxon of the Botanical Garden Staff talks about cacti to members of 'The Greeneries' from the Pearson Hospital.

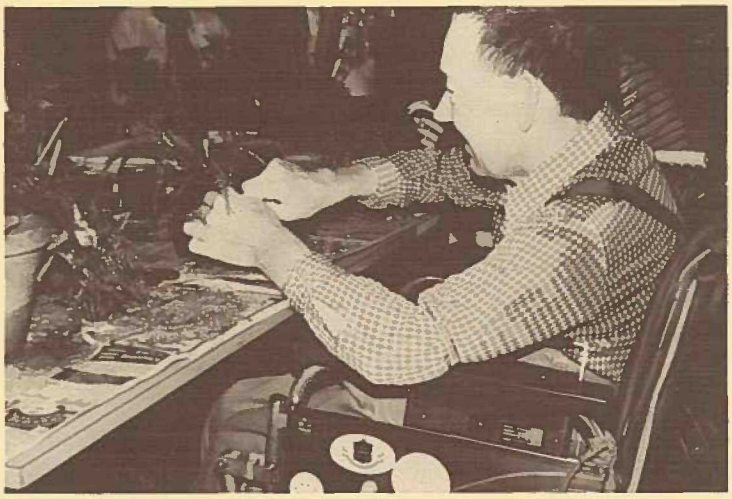

FIGURE 2. Roy Zufelt potting up a fern during a meeting of 'The Greeneries'.

FIGURE 3. Raymond Lanyon filling pots for planting up new plants.

A few programs failed and several had to be modified, but most were successful. Examples were the herb sale which helped raise enough money to cover operating costs, and the development of hanging baskets that graced the hospital all summer long.

About every eight weeks, there was an outing into the community. For example, after Dr. John Neill, from the Botanical Garden, had shown his slides on the development of Nitobe Garden, the group was eager to visit this Garden. They returned to Nitobe later in the season and they agreed that it was a good place to get a feeling for seasonal changes, something missing in any institution. It would be interesting to bring a group like this to Nitobe Garden every two months all year round.

There were several trips to the Botanical Garden greenhouse which proved to be most popular. The group always returned from the greenhouse with an assortment of cuttings, often enough material for several subsequent meetings.

The new B.C. Native Garden in the Botanical Garden with its tall trees and narrow paths seemed a natural place to take people from an institution. To make certain that the Garden was wheelchair-accessible, two people from Pearson, one on a stretcher and one in a wheelchair, were taken on a test trip through the Garden by Alan Rose, Curator of the Garden and David Tarrant, Educational Coordinator of the Botanical Garden.

As a result of this trial assessment, a few obstacles were removed, one corner was widened and additional bark mulch was spread on the paths. Also, it became obvious that to avoid having to push visitors in wheelchairs uphill, one simply had to start at the north end of the Garden and proceed to the south end, as the Garden is accessible to cars at both ends. In rough terrain, when a front wheel of a wheelchair gets caught, it is necessary for the pusher to lift the wheelchair in front to free the wheels. As a result of these experiences, a universal yoke which could be attached to the front of any standard wheelchair allowing even the heaviest person to be transported safely and easily over rough terrain was developed. The special yoke, which is described more completely in DAVIDSONIA (1977), is now available for public use at the U.B.C. Botanical Garden.

Several Friends, who served as expert guides, came along with the group each time we visited a component of the Garden and their knowledge and general good spirits added greatly to the experience. Also, it meant that rather than being bunched together in a tour group, people could spread out through the Garden in a more relaxed manner.

The pilot project ended in June, with many achievements and much new information including: optimum group size, and an indication of how to best use volunteers. It became obvious that people with a wide range of physical abilities could work with plants. "Cerebral Gardeners" were especially attracted to this group. They enjoyed watching, learning, smelling, and touching even though they could not use their hands or might not be able to speak. Trips outside the hospital to Gardens were always popular. Many natural and healthy contacts were made through this group.

One unexpected result occurred when a member who had refused for years to leave the hospital in an attempt to avoid embarrassment, gathered courage to visit the greenhouse because she was eager to see the cacti. After her first trip, other trips followed and new ones are eagerly anticipated. It is a pleasure to note that the original group at Pearson continues to meet, although the therapists who supervise it have changed.

A teaching manual would have been very helpful. I found it very time consuming to choose a topic, gather material, and prepare the lesson, especially when I was not familiar with the material. Also, every contact I made within the community made it easier to gather information and to find resources.

During the summer, the Friends contacted other institutions in the Vancouver area to learn what other plant programs were being offered, and what problems therapists might have in conducting a plant group. A few therapists had gardening projects underway and all were eager to learn more

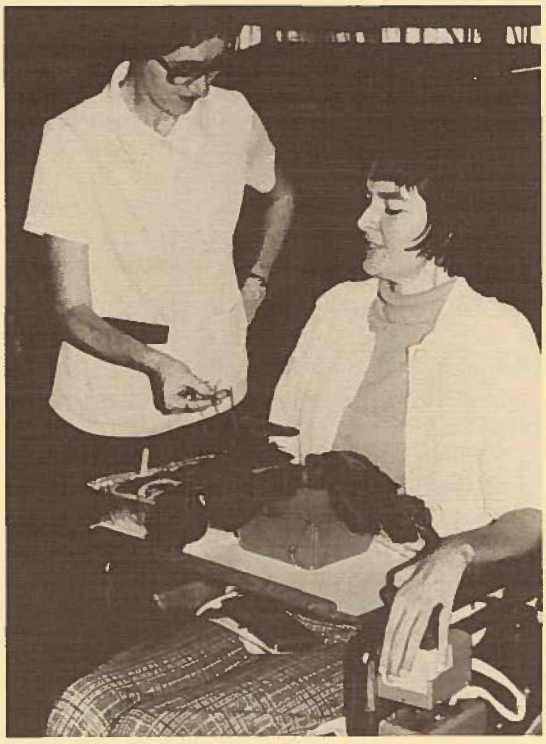

FIGURE 4. Ginny Fearing, OTR, discusses unusual features of a Prayer Plant with Jeanette Andersen of 'The Greeneries'.

FIGURE 5. Bev Kot, another member of 'The Greeneries', potting up new plants for their program.

about using horticulture as a therapeutic tool. Common concerns were the best use of volunteers, time involved in preparation, and the resources for supplies and information.

The result of the 1976-77 U.B.C. Botanical Garden program experience has been the realization of the need for a resource manual for future programs. Such a manual should be organized by seasons, provide sources of materials, give examples of actual projects, and provide an introduction to horticultural therapy. Consequently, a resource manual is now being produced by the Friends in cooperation with Margaret Coxon, Curator of the Greenhouse. It is our hope that new groups can be initiated through the use of the resource manual, and an idea will have been converted into a practical program for the handicapped.

Our experience during the past 18 months has also indicated that initiation of professional therapists to the potential of plants as part of their therapy programs should be part of our educational goals. An effective way to answer the questions about horticultural therapy posed by the therapists was to organize a conference for therapists, volunteers, and other interested professionals and administrators so that they could gather the information necessary to start and carry on their own plant groups. Therefore, a symposium, "Horticulture as Therapy", has been organized for March 9 and 10, 1978, at the U.B.C. Botanical Garden Office. It is sponsored jointly by the Botanical Garden and the Division of Continuing Education in Rehabilitation Medicine. The guest lecturer will be Mr. A. S. White, Research Gardener at the Nuffield Orthopaedic Centre, Oxford, and an internationally known authority on Horticulture as a Therapeutic Tool. Mr. White will give a public lecture at 8:00 pm on March 8, 1978, in Lecture Room 2 of the P.A. Woodward Instructional Resource Centre, The University of British Columbia. The Botanical Garden intends to publish the contents of the symposium as part of their continuing Technical Bulletin series.

The introduction and development of new ideas in hortitherapy is an exciting field for rehabilitation medicine working cooperatively with botanical garden personnel. Much is to be gained from this new association for our hospitalized citizenry.

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Abies grandis (Douglas ex D. Don) Lindley

Grand Fir

Member of Family Pinaceae

Natural Distribution

Abies grandis occurs from southern British Columbia southwards near the coast to Sonoma County in northern California, eastwards to southeastern British Columbia, northern and western Idaho and western Montana, and westwards from Idaho to extreme southeastern Washington and to northeastern Oregon. There is a gap in the distribution in central Washington and in central southern British Columbia resulting in disjunct interior and coastal populations. The approximate latitude/longitude of the general distributional range is 39° to 51° N and 114° to 125° W.

The species reaches its northern limit in southern British Columbia. It is common on Vancouver Island, especially the eastern side, and on the lower slopes and valleys of the south Coastal Range around Vancouver and as far north as Johnstone Strait (50°30'N 126°00'W) extending as far east as the Upper Skagit River (approximately 49°N 121°40'W). There is then an interruption in the distribution with the species reappearing in the Kootenay and Arrow Lakes region, specifically in the basins of the Kootenay, Columbia, and Okanagan rivers (approximately 49°N 117°-119°W).

Habitat

Abies grandis grows in coniferous forests in valleys and on the lower slopes of mountains from 0-1500(-2100) m. It is present on alluvial stream banks and their border valleys, gentle lower mountain slopes, depressions and gulches. It reaches the best and most abundant growth on stream banks at low elevations in the coastal regions of Washington and British Columbia. The species prefers fairly deep, preferably moist but porous and well drained alluvial soils. The climate can be characterised as subhumid to humid with cool dry summers and wet winters. The annual precipitation varies from 360-2800 mm over the range with snow forming 1-50% of the total. The temperature extremes are -47° to 43°C with a long vegetative season of approximately 100 to 200 days (the number of frost-free days varies from 72-250 days over the range). The tree is rarely found in pure stands, but is usually mixed with Douglas Fir, Western Red Cedar, Western Hemlock and Pacific Yew, or with Redwoods in California where it rarely extends more than 10 miles inland.

In British Columbia the species is usually found from 0-300 m on Vancouver Island and the adjacent mainland, and at low elevations in the Interior. It prefers rich alluvial soil on the coast, but grows well on rich mineral soils in the valley bottoms of the Interior. It is usually present as part of the Douglas Fir-Hemlock-Red Cedar forest.

Description

A stately, monoecious, evergreen tree, (12)25-90(-100) m tall with a DBH of (50)60-150(-180) cm and a conical to pyramidal outline. Young trees have a pointed to rather spire-like, rather open to dense crown which becomes somewhat rounded or cylindrical with a domelike top and dense with age. The crown often appears widest in the middle because of the strong drooping of the lower branches. The trunk is simple, rarely forked, and tapers evenly to 1 or 2 slender straight leaders. A mature tree growing alone or in open forest has a trunk which rapidly decreases in girth, retains the branches almost to the ground, and the crown has a more pointed top. In a dense forest situation, the trunk tapers very gradually, may be clear of branches for up to half its height (18-30 m or more), and the crown is irregular in outline. The trunk is usually free of dead branches even in this situation. The branches are in regular whorls of 4-6 with each whorl usually representing one year's growth. The branches are long and slender with all but the upper ones having a distinct downward and upward swing. The upper branches are the cone-bearing ones and are usually stiffly ascending. The branches fork repeatedly in one plane and this forking, together with the forking of the lateral branchlets, forms flat sprays of foliage. The tree is smaller in the Interior than on the Coast, reaching a maximum height of 25-35 m and a DBH of 20-75 cm. It is also often much stunted at higher elevations or on shallow or very porous soils.

The root system consists of a relatively deep taproot with wide spreading lateral roots. In a dry situation the taproot will penetrate even deeper into the soil to reach ground water and the lateral roots may be very small or even absent, while in a very moist situation there may be no taproot and only the smaller lateral roots develop. There is a mycorrhizal association present.

The bark on young trees is ashy brown with whitish or chalky areas, thin, smooth, and has numerous, horizontal, elongate (up to 2.5 cm or more in length) resin blisters or vesicles. With maturity it gradually becomes pale reddish brown with grayish white splashes giving an ashen tinge, up to 5 cm thick (less than 2.5 cm in trees less than 51 cm DBH), very hard, close, horny, and deeply but narrowly furrowed, especially at the base. The oblong plates or ridges thus formed are roughened by closely appressed scales. The resin blisters, which contain a thin, clear yellowish, aromatic resin, become obscured by the scales. The bark seems to be thicker on trees growing on dry hillsides than on moist creek bottoms. It contains a small amount of tannin.

The twigs are pale russet-brown, minutely hairy, and marked at the base by persistent bud scales throughout the first year, becoming dark orange-brown, glabrous, slender, and somewhat brittle. The upper side is bare except for the twisted leaf bases. The comparatively slender branchlets are two-ranked laterally and are regularly paired and opposite in a very uniform branching system, only an occasional one being unpaired. They are pale yellow-green or olive-green and puberulent at first, becoming light reddish-brown or orange-brown and glabrous in the second year.

The wood varies in colour from whitish to pale yellowish-brown or pale brown with little contrast in colour between the heartwood and sapwood. The summer wood, however, frequently has a roseate, reddish or lavender tinge. It is moderately coarse- but straight-grained, usually brittle, light, moderately soft, and not durable or strong, but it is odourless and easily worked, taking a good finish with either paint or polish.

The mature winter buds are 0.3-0.6 cm long, subglobose to globose, blunt, pale russet-brown to yellow-brown, and are usually thickly covered with resin. The terminal bud of the main branches is solitary and surrounded by 4 or 5 secondary buds, while there are 3 buds terminating the other branches.

The mature needles are single, linear to occasionally narrowly ovate, flexible, and sessile but narrowed to a stout petiole-like base. The upper surface is a dark shiny green and is usually grooved in the centre, while the lower surface appears silvery-white and keeled because of the presence of 2 broad whitish bands of stomata separated by a channel with a median ridge. Those of the lower branches are 2-5(-6) cm long, 0.16-0.3 cm wide, thin, and have a blunt to usually notched apex. The needles of the upper cone-bearing branches are 2-3(-3.8) cm long, stouter, and are often pointed and notched at the apex. They are more erect, strongly curved upward, and are more crowded. The needles of the leader are scattered and distinctly pointed. There is a difference in the size of the needles with alternate long and short, the shorter ones growing from the upper side. The needles on all branches are spirally arranged but are twisted at the base to lie in one plane and thus appear two-ranked, spreading horizontally to form flat sprays which do not conceal either the upper or lower side of the branch. In cross-section, each needle contains 2 small marginal resin canals near the lower surface. They are aromatic when bruised, with a turpentiney odor which may be disagreeable to some people. The new season's growth is a lush light green. The needles are persistent (2)5-7(-10) years, leaving small, circular, reddish, smooth leaf scars which are flat or slightly depressed.

The cones or strobili appear in late March to mid-June over the range depending on the altitude, from May to June in British Columbia. They are axillary from buds formed the previous year on branchlets of that year's growth and are surrounded at the base by the enlarged bud scales. Male and female strobili are on separate parts of the same tree (monoecious). The male or staminate strobili are single, numerous, and pendent on short peduncles (ca. 3 mm long) from the lower side of branchlets in the middle section of the tree. They are oblong-cylindrical, 7-12(-20) mm long, yellowish (sometimes tinged purplish), and contain numerous, spirally arranged sporophylls, each of which bears 2 elongate pollen-sacs with expanded knob-like tips. They fall immediately after pollen release leaving the woody cup-like budscales which are persistent for 10-15(-25) years and have the appearance of a gall-like scar. The ovulate or female strobili are single, woody, numerous, and stiffly erect on the upper side of branchlets near the top of the tree. They are narrowly cylindrical, 2-2.5 cm long, 6-7 mm wide, and yellowish-green to greenish or reddish-purple. The numerous spirally arranged scales are imbricate, obovate and rounded above, stipitate at the base, and large. Each bears two inverted ovules on the upper surface. The bracts are prominently 3-lobed, emarginate, and are shorter than the scales and thus are concealed by them. Trees begin to bear ovulate strobili at about 20 years of age, staminate ones at about 35 years.

The cones are yellowish-green to greenish-brown becoming brown with maturity. At maturity they are (5)6-15(-18) cm long, 2.5-4(-4.5) cm broad, puberulous, roughly cylindrical and slightly narrowed to the

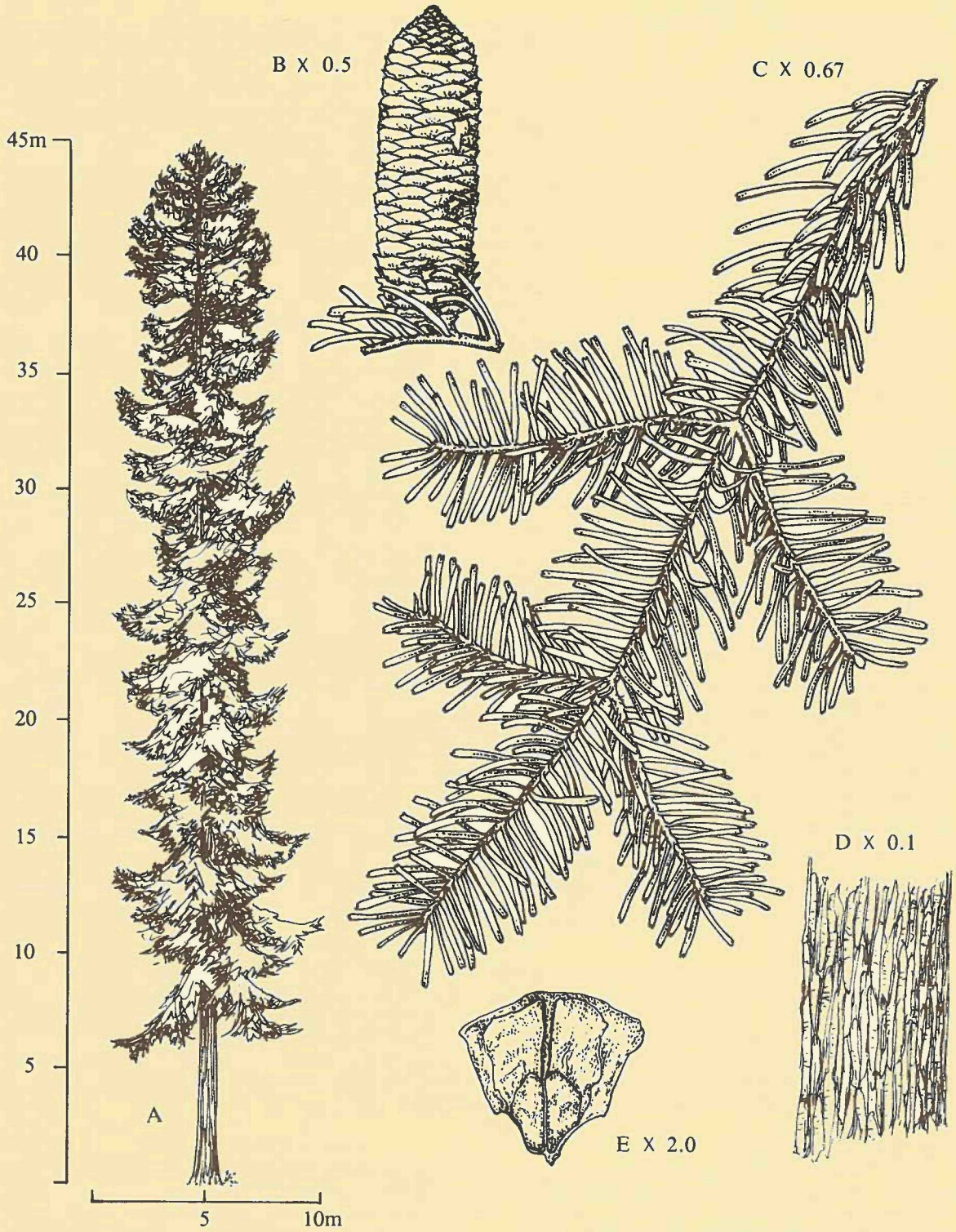

FIGURE 6. *Abies grandis*. A. Habit, B. cone, C. branchlet, D. a portion of the trunk showing the bark, E. seeds attached to scale.

rounded or sometimes retuse apex. They are erect and single at the tips of branchlets in the upper part of the tree. When young they are often resin-covered. The scales are numerous, closely overlapping, puberulent and woody. They are greenish becoming brown with age, 2-3 cm long, 2.5-3 cm broad (usually broader than long), more or less wedge-shaped, incurved at the broad rounded apex, and narrowed at the base, giving the impression of a short stalk. They decrease in size and are sterile towards the ends of the cone, all other scales bear two seeds on the upper side. The bracts are pale green tinged with blackish-purple at the edges, 10-12(-15) mm long, irregularly toothed, broad, and with an obcordate to almost truncate base. The apex is roundish with broad shoulders sloping inwards to the base of the central tip which is little more than a tooth no higher than the tops of the shoulders. The bracts are completely concealed by the scales. The cone matures in one season and rapidly disintegrates, the scales with their attached bracts being shed singly during the fall. The erect peg-like cone axis is persistent on the tree at least into the following spring and sometimes for several years. Seed dispersal is usually complete by October.

The seeds are 8-9(-10) mm long, pale brown to yellowish-brown, ovoid or oblong, acute at the base, and are winged. The wing is 10-16 mm long, 9-10 mm wide, light purple, lustrous, thin, very oblique and wedge-shaped, and covers the upper surface of the seed. The seeds are very resinous with large conspicuous resin ducts. Trees begin to bear cones at about 20 years of age, with production increasing as the tree ages. Good cone crops are produced at intervals of about 2-4 years, but a large amount of mature seed is empty.

Propagation

The seeds of *Abies grandis* are considered to have transient viability and should not be kept for longer than one year in a sealed container in controlled cold storage (-18°C). There is a low percentage of fertile seeds and germination is variable with often only about 30(-50)% success. Seeds may be sown without stratification in the fall immediately after shedding, or in the spring after stratification. Stratification should be in a moist medium at 1-5°C for 14-21 days (or up to 3 months). This is followed by a germination period of 28 days at diurnally altering temperatures of 30°C in the light for 8 hours and 20°C dark for 16 hours. This regime should result in an average germination rate of 50%. Tests have shown that there is little difference in germination rate with and without stratification, and that chipping the seedcoat may be as effective. Seeds should be sown in carefully prepared seedbeds containing humous soil, and covered with soil to a depth equal to the thickness of the seed. Germination should occur in 1-3 weeks after sowing.

Seedlings should be protected from direct sun by lath or brush screens, and require a moist atmosphere as well as moist soil. In nature up to 50% of seedlings may be lost during the first two years, with damping-off and insolation being a major cause during the first year and drought becoming more important in the second year, especially in moist shady conditions where the initial root penetration is slower than in full sun. They show slow initial growth until the taproots are well established, and should be planted out either as 2-3 year seedlings or as 3-4 year old transplants.

Cuttings should be taken only from straight leading shoots and rooted in small pots of sandy soil with gentle bottom heat. Lateral branches rarely produce either erect or shapely trees.

Grafting, using only leading shoots, is sometimes used for propagating rarer forms, but it is generally not recommended because it is a slow and expensive process, and good specimens are rarely obtained.

Transplantation

Trees up to 1.5 m height may be moved successfully provided they have been transplanted biennially in the nursery. Conifers in general should be moved during open weather in early spring just before active new growth starts, or in early autumn provided there is sufficient water available to allow the development of new roots before the winter. The roots must be kept as intact as possible and should not be allowed to dry out during the move. The tree should be well-guyed until it has become established. Taller specimens are difficult to transplant because of the deep root system which develops. Note that there are regulations at present prohibiting the movement of all *Abies* species within and into British Columbia.

Conditions for Cultivation

The growth rate is rapid at all stages averaging 30 cm annually, although early growth may be delayed on dry sites until the taproot reaches ground water. There is rapid early growth of up to 75-89 cm annually in optimum conditions, and then between 20-30 years of age there is another considerable impetus in growth with annual increases of 50-90 cm becoming common. Trees may reach 43 m at 50 years of age under good conditions. The girth continues to increase after height growth ceases. The species is considered to be moderately long-lived, attaining ages of 200-250(-280) years. The recommended hardiness zone for Canada is Zone 7.

The tree thrives in areas with medium humidity on deep, moist, porous, well-drained good soils or sandy loam, with a pH of about 5.5. The soil should be rich in calcium and magnesium, and nitrogen should be available in the form of nitrates as the tree is quickly and strongly affected by shortages of these minerals. The tree will grow on rather poorer thin soils provided there is ample soil and atmospheric moisture. The species is considered to be moderately tolerant to shade, although growth is slower in dense shade. It responds well to release from rather dense shade, with rapid growth in the crown partly due to epicornic branching.

Pruning should be done in the spring but is not normally necessary or desirable. Straggly branches may be trimmed back to just in front of well-developed buds, being careful not to cut back into leafless wood or the whole branch is likely to die. Any seriously damaged or dying branch should be pruned out at the trunk. If the leader dies or becomes damaged, it is possible to replace it by staking and tying the longest branch in the uppermost whorl into an upright position. The stake may be removed after 2 or 3 years and it will then be difficult to determine where the damage occurred.

Landscape Value

Abies grandis is a beautifully symmetrical, stately, easily grown tree which unfortunately is rather too large and rapid growing for the average garden. In a large garden or park it forms a handsome specimen tree or focal point in moist areas in full sun or light shade. It has been suggested that a young tree could be used in an average garden to provide a striking focal point, with the understanding that it has to be removed when it becomes too large. Young plants also make fine tub speciments for some years before permanent planting is necessary.

Availability

Abies grandis is not presently available in British Columbia because of government regulations prohibiting the propagation and movement of all *Abies* species, either living or as cut trees, due to Balsam Woolly Aphid infestations. However, the regulations are in the process of modification and nurseries are beginning to propagate trees so that they should be available in 2 or 3 years time.

Varieties and Ornamental Cultivars

Abies grandis has a wide distribution and there appears to be some geographic variation with five ecological races or provinces recognised by foresters but not given formal status. In British Columbia the Coastal and Interior populations show slight differences — the foliage is lighter and the cones smaller in the Coastal population than in the Interior. There is also some evidence that the Coastal form may be less frost resistant than the Interior one.

Den Ouden (1965) lists only three cultivars. The cv. Aurea has golden yellow leaves, cv. Pendula has strongly weeping branches but is considered to be of little value, while the dwarf cv. Compacta may no longer be available.

Hybridization between *Abies grandis* and *A. concolor* (Gord. & Glend.) Lindley ex Hildebrand occurs where the ranges overlap in southwestern Oregon and northwestern California. Although tending more towards *A. grandis* the hybrids are more or less intermediate between the parents and there is complete intergradation between them. Natural hybrids between *A. grandis* and *A. concolor* var. *lowiana* (the coastal form of White Fir) have been found in some European gardens which more closely resemble the var. *lowiana*. So far these hybrids are not known in the wild.

Other Uses

The wood is of rather poor quality and not durable, but is used for boxes, props, wooden ware, sashes and doors, rough construction lumber and pulpwood where it is in sufficient supply. Because it is inodorous it has been used to make boxes for butter, lard and other groceries, and for refrigerators because it also has a high thermal insulating value.

Young trees are in demand in certain areas as Christmas trees, partly because of the symmetrical shape but also because a cut tree retains its needles for longer than most other conifers.

One of the most important uses for *Abies grandis* is in watershed and environmental forestry. The trees often occupy sites critical to the maintenance of high quality and well-regulated streams, and some of these sites are also important recreation areas. It is also important as food for wildlife — squirrels remove and store the cones for winter food.

An oleoresin from the bark blisters has been used in the same way as Canada balsam (from *A. balsamea*) for varnishes, mounting microscopic specimens, etc. Woodsmen have placed great faith in the healing properties of the resin, and it makes a useful gum in emergencies.

The Indian tribes in British Columbia and Washington had many uses for this species, both medicinally and in mythology. Resin from the bark blisters was mixed with water (with or without the addition of pieces of bark), boiled and taken as a tonic, laxative, or for coughs and tuberculosis. When mixed with oulachen grease it was eaten, rubbed on the chest and back for tuberculosis, or rubbed on sores and boils. It was warmed, mixed with mountain goat tallow, and drawn on a hair across sore eyes, or drunk for a sore throat. When heated and mixed with catfish oil it could be taken twice a day for constipation.

The bark was used to cover lodges and for making canoes, as well as for medicine. A decoction of bark was used either as an eyewash or drunk as a tonic. It was mixed with the large round green rootstocks of an unidentified fern, Devil's Club, gum from Scrub Pine or Tideland Spruce, and Skunk Cabbage root, then warmed. This mixture was applied to a boil or ulcer to bring it to a head, as a treatment for rheumatism, or as a plaster on the chest for lung hemorrhages.

The Kitimat and Bella Coola tribes made a hair perfume using the young green leaves of *Abies* mixed with dried and roasted fruit or buds of Skunk Cabbage, a small quantity of slightly roasted Cow Parsnip roots, one or two cupfuls of the gummy buds of Black Cottonwood, and 4 or 5 cupfuls of fresh oulachen oil. The mixture was allowed to stand for 24 hours and was then boiled and put into a box until needed.

Branches of *Abies grandis* were sometimes used as bedding or as temporary flooring in lodges, but were of much more importance in ceremonials and in purification rites. A young girl of the Thompson Indians would stroke her head and back every morning with branches while praying that these parts would never tire of carrying burdens, and her legs and feet praying that they would never tire of walking long distances. She also stroked her moccasin laces so that they would never break. During her period of training, 2 large branches were put on the roof of her hut and she had to remove the needles one by one, praying that she would never be lazy. Four large branches were so placed in front of the hut that she had to step over them every time she entered or left the place. For the first four times she had to say "If I ever step into trouble or step unknowingly into the magical spell of some person, may you help me, O fir branches, with your power!"

The Cannibal Dancer of the Wolves of the Southern Kwakiutl Indians rubbed Grand Fir pollen all over his body in winter ceremonials. Certain shamans of this tribe wore head and neck rings of Grand Fir wood.

Diseases and Problems of Cultivation

Like all members of the genus, *Abies grandis* is injured by an impure atmosphere and is unsuitable for use in the vicinity of manufacturing towns. It is very sensitive to changes in the environment in general. Sudden extreme drops of temperature in the fall may damage the needles although they are rarely killed, and they are quite resistant to severe cold in the winter. Heavy snow, however, may damage the brittle branches. Trees taller than 24-30 m are susceptible to blow-out of the top, particularly if they are taller than the surrounding trees, but the missing part is quickly replaced by several new leaders which grow as rapidly as the old one.

The species is susceptible to butt and heart rots from about middle age, rather earlier than most trees. The fungi responsible enter through dead lower branches and injuries such as frost cracks, fire scars, and mechanical damage. *Echinodontium tinctorium*, 'Indian Paint Fungus', is very destructive east of the Cascades but does not occur to the west where the summers tend to be cooler. *Fomes annosus* and *Stereum* species are the most important fungi west of the Coast Ranges, while *Armillaria mellea* and *Poria weirii* are important in the Interior.

The species is susceptible to a number of rusts, being the alternate host in all cases, but most do insignificant damage. *Milesina laeviuscula*, 'Fern Rust' or 'Fir-Polypody Rust', has been discovered near Victoria and is to be expected in other parts of the Pacific Northwest where the alternate host *Polypodium glycyrrhiza* is also present. *Melampsorella caryophyllacearum*, 'Fir Broom Rust', causes Witches Brooms in nature. The alternate hosts are *Cerastium* species and *Stellaria* species. It is of scattered occurrrence and causes light damage in British Columbia, but severe growth loss and mortality in the western United States.

Several species of insects feed on the buds, conelets and seeds, sometimes destroying a large percentage of the seed crop. Most are secondary and of only minor economic importance, except for *Adelges piceae*, 'Balsam Woolly Aphid', which poses a serious threat to natural timber stands of true firs. For this reason there have been regulations prohibiting the propagation and movement of all *Abies* species, whether living or as cut Christmas trees, within and into British Columbia, to prevent the spread of the aphid. However, these regulations are now

in the process of modification to allow nursery propagation and the planting of nursery grown trees in gardens once more. *Halisidota argentata*, 'Silver-spotted Tiger Moth' or 'Douglas-fir Webworm', is found in western British Columbia. The larvae form tents or webs around themselves as they eat last year's needles. The bark beetle *Scolytus ventralis* attacks Grand Fir leading to damage by the fungus *Trichosporium symbioticum* which is transmitted by the beetle. Because the response of the tree to attack is to produce a slightly changed resin, damage is usually confined to a small area, unless there has been a massive attack by the beetle.

Origin of the name

The generic name *Abies* is derived from the Latin *abeo*, 'to rise' or 'arising', referring to the great height of some of the species. It was the classical name for the Silver Fir, *Abies alba* Mill. The specific name *grandis* is the Latin for 'large' or 'big', referring to the large size of this species. The common name 'Fir' is derived from the Old English *furh* or *fyrh*.

The type locality is variously described as "low moist valleys in northern California" and "on the Columbia River". It was discovered in 1825 by David Douglas (1798-1834), a Scottish botanist and collector in western North America for the Royal Horticultural Society of Great Britain. He introduced the tree into Great Britain about 1832 but these introductions did not survive. All the trees presently in cultivation are derived from a re-introduction of seeds from northern California in 1852 by William Lobb (1809?-1857), a Cornish gardener who later collected plants for the horticultural firm of James Veitch and Sons of London. Lobb collected numerous plants in North and South America during the period 1840 to 1857, travelling extensively in the western United States from 1849 until his death in San Francisco.

Rafinesque named the tree *Abies aromatica* in 1832 because of the aromatic resin and crushed leaves. It is sometimes called 'Stinking Fir' by lumbermen.

Abies grandis is probably the largest Silver Fir in the world, and is certainly the largest of the Canadian species.

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Climatological Summary for 1977*

1977 should be remembered as one of the drier and sunnier years in the Vancouver area. Many shallow rooted plants, including Rhododendrons, suffered from a long period of heat and drought during July and August. From July 17 until August 21 only 1.52 mm rain was recorded, there was an average of 12.7 hours of bright sunshine daily, and the temperature was over 25°C on several occasions. Yet no records were broken. For instance, the total rainfall for the year of 1065.5 mm was below average, but not as low as the total for either 1970 or 1971. Maximum and minimum temperatures throughout the year were generally average for the month. The total sunshine for each month was above average, but only the December total of 79.6 hours broke a twenty year record.

However, even if we fail to recall the kind of summer weather which we enjoyed, we shall always remember the traffic chaos caused by the first snowfall in November.

Data 1977	OCTOBER	NOVEMBER	DECEMBER
Average maximum temperature	12.6°C	7.9°C	5.8°C
Average minimum temperature	6.9°C	2.3°C	0.8°C
Highest maximum temperature	17.2°C	13.3°C	11.9°C
Lowest minimum temperature	2.2°C	0.0°C	-4.5°C
Lowest grass minimum temperature	-2.2°C	-12.2°C	-10.5°C
Rainfall/no. days with rain	106.7 mm/18	205.7 mm/20	148.6 mm/19
Total rainfall since January 1, 1977	711.2 mm	916.9 mm	1065.5 mm
Snowfall/no. days with snowfall	0	6.3 cm/1	2.4 cm/2
Total snowfall since October 1, 1977	0	6.3 cm	8.7 cm
Hours bright sunshine/possible	123.1/318.4	89.9/268.2	79.6/253.1
Average daily sunshine/no. days total overcast	4.0/6	3.0/11	2.5/12

**Site: The University of British Columbia, Vancouver, B.C., Canada*
Position: lat. 49° 15′29″ N; long. 123° 14′58″ W. Elevation: 104.4 m

Botanical Garden News and Notes

Plant Introduction Advisory Council — In the fall of 1977, the Botanical Garden established a new Plant Introduction Advisory Council. This Council is designed to provide a positive link between the horticultural industry and the Botanical Garden, and between the Landscape Architectural Society and the Botanical Garden. The Council will review and provide an external assessment of new plants grown by the Garden for possible introduction to the trade, and, through the activities of the Council, the Garden hopes to expand and promote new plants for the horticultural industry in B.C. The Council will also provide advice on the best way of equitably distributing new introductions to the commercial trade. The Council is composed of four members from the Botanical Garden, three members from the B.C. Nursery Trades Association, and one representative from the B.C. Society of Landscape Architects. One of the first activities of the Council has been an attempt to contact each member of the B.C. Nursery Trades Association and the Landscape Architects of British Columbia to determine the type of material which they would like to see used in their particular programs for new and potential projects.

New Technical Bulletin — Technical Bulletin No. 3 on the UBC Botanical Garden Plant Labelling System is now available. Requests for this Technical Bulletin may be sent directly to the Botanical Garden Office. The cost of the publication is $4.00 plus postage.

Education — A flyer advertising new educational courses for the spring is attached in the centre of the journal. It can be simply removed and application for attendance at the courses made through the Centre for Continuing Education at the University of British Columbia. In addition to the programs listed, two field study programs involving Dr. Taylor, Director of the Garden, will cover the Gulf and San Juan Islands from June 18-24, 1978, and the British Columbia and Alaska Coast region from July 18-23, 1978. Additional information and a brochure describing these study programs in more detail may be obtained from the Botanical Garden Office.

Horticultural Therapy Symposium — A two-day Symposium on Horticultural Therapy, sponsored jointly by the Botanical Garden and the Division of Continuing Education in Rehabilitation Medicine at the University, will be held at the Botanical Garden on March 9 and 10, 1978. Registration will be limited to 50 participants. The course is designed to provide a new insight for professionals and administrators concerned with the care and treatment of handicapped people. Mr. A.S. White, Research Gardener with the Nuffield Orthopaedic Centre at Oxford, England, will be our keynote speaker with a public lecture given on the evening of March 8 in the Instructional Resources Centre.

Endangered, Threatened and Rare Species Workshop — The Federal Government has recently increased activity in establishing the definition of endangered, threatened, and rare species in Canada. The Botanical Garden has convened a meeting of interested amateurs and professionals in late January to review a proposed list of taxa that has been circulated from the Federal Government to professional and amateur groups in British Columbia. The workshops will provide a comprehensive review of the plants contained on the proposed list, and will make recommendations to the Federal Government through the National Museums of Natural Sciences for a revised and accurate list of rare, endangered and threatened species for B.C. Readers are requested to send any specific information they may have regarding special aspects of rare or endangered plants for B.C. to the Botanical Garden Office for incorporation at these workshops.

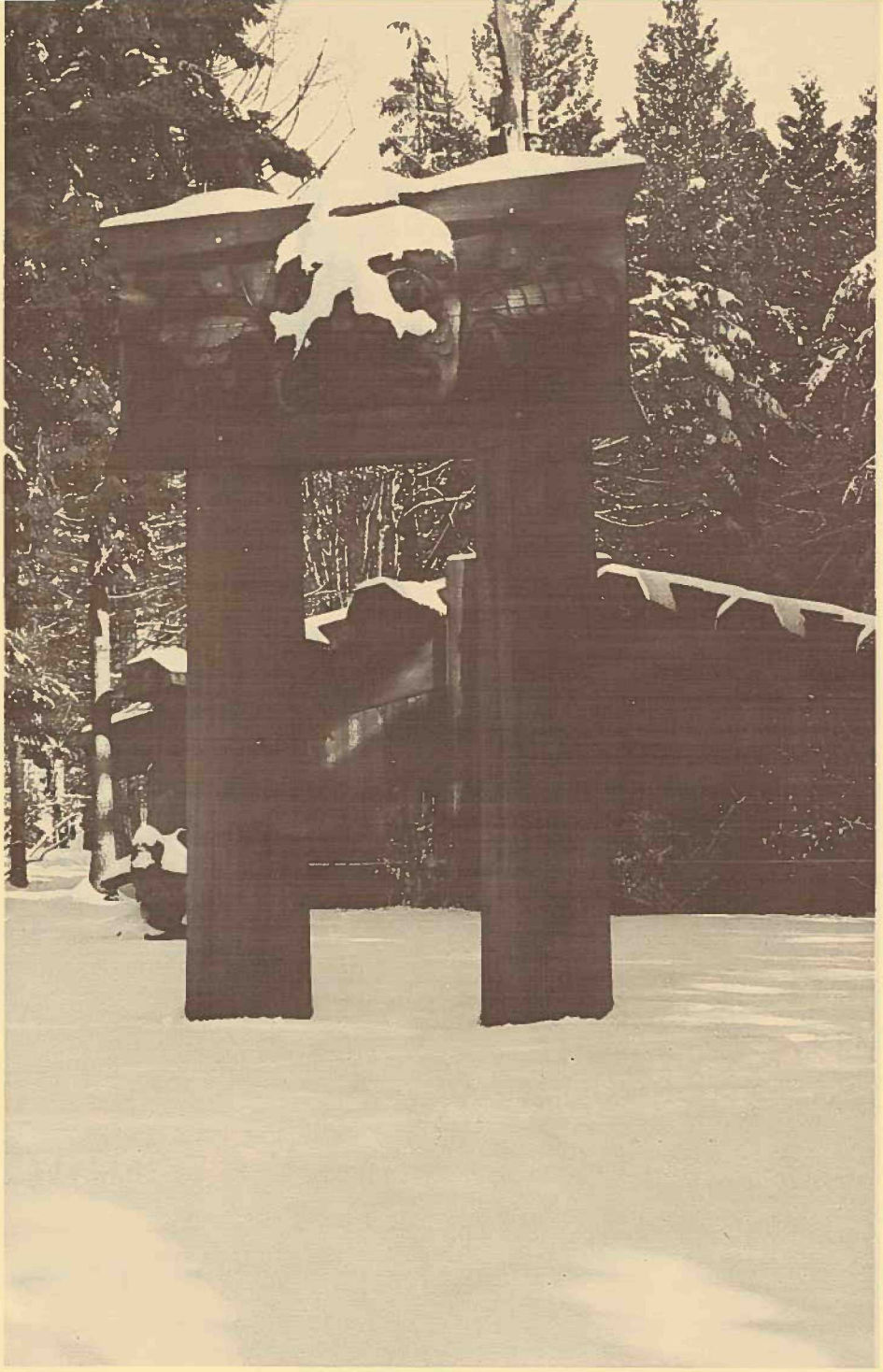
Index Seminum

The Index Seminum or Seed List is published annually in mid-winter, and is the means by which the Botanical Garden offers seeds for exchange with other institutions. The world-wide exchange of Index Semina and their contents is one of the principal ways by which Botanical Gardens (and research institutions) acquire new and often rare plants.

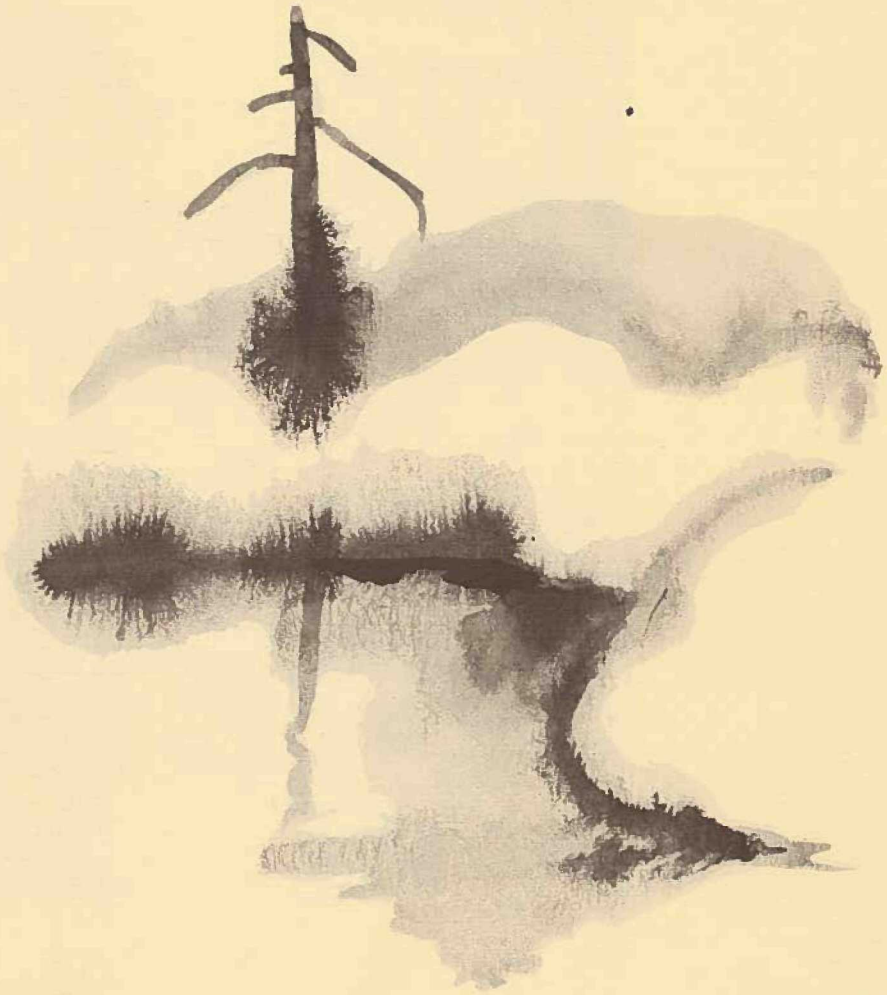
The Index Seminum for the 1976 collection year was distributed world-wide to a total of 535 institutions or individuals engaged in research projects in 52 different countries. The list contained 172 taxa in 35 families, mainly seeds of native plants of British Columbia. Of the 5,478 requests received, we were able to fill 4,896 from 308 institutions (in 37 countries). The policy of the Seed Exchange is to list in the Index Seminum all seed of which we have enough for 10 or more packets. The ten most frequently requested taxa were:— *Abies amabilis* (119 requests), *Abies lasiocarpa* (104), *Tsuga heterophylla* (86), *Larix occidentalis* (82), *Picea engelmanii* (81), *Lilium columbianum* (81), *Picea sitchensis* (75), *Cornus nuttallii* (75), *Pinus ponderosa* (71), and *Diapensia lapponica* (67). The following are the 10 countries in which our native seed was in most demand last year:— U.S.S.R. (41 requests), United Kingdom (33), West Germany (29), Czechoslovakia (23), France (17), U.S.A. (16), Hungary (15), Poland (14), East Germany (14), and Switzerland (11).

We acknowledge with gratitude the assistance received from members of the 'Friends of the Garden' who spent many long hours cleaning seeds and dispatching orders. The 1977 Index Seminum has been sent out, and requests for seed are now being received.

"Snow-scene" lantern near the south end of the main lake in the Nitobe Memorial Garden.



The Double Mortuary Pole and Dwelling House in Totem Pole Park. These structures were moved during November 1977 to the Haida Village Site in the grounds of the Museum of Anthropology which is next door to the Botanical Garden Office and Educational Centre.



DAVIDSONIA

Volume 8 Number 4 *Winter 1977*

Contents

Hortitherapy: An Expanding Role for Botanical Gardens 53

Abies grandis, Grand Fir 59

Climatological Summary for 1977 66

Botanical Garden News and Notes 67

Index Seminum 68