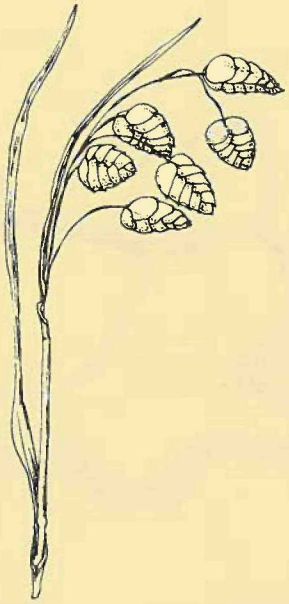
DAVIDSONIA

VOLUME 8 *NUMBER 2* *Summer 1977*

Cover:

Picturesquely twisted specimens of *Arbutus menziesii* are often seen on the rocky knolls of the Gulf Islands.



Quaking Grass (*Briza* sp.), a native of Europe, makes attractive dried bouquets.

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Spring Wild Flowers of the Gulf Islands

FRED R. GANDERS

Before I moved to British Columbia I once saw an advertisement that described the Gulf Islands of B.C. as "almost subtropical". This is about like describing Toronto as Canada's largest arctic metropolis. But there is no reason for the Gulf Islands to pretend to be something they are not. The Gulf Islands and the southeastern end of Vancouver Island have a climate unique in Canada, with mild, wet winters and dry summers. This climate is the northernmost extension in North America of the Mediterranean-type climate that is more pronounced further to the south. The flora of this small region, reflecting the climate, contains many plants found in no other part of Canada. Many species and genera of plants typical of California and Oregon reach their northern geographic limits here, in the specialized habitats of the Gulf Islands and Vancouver Island.

The flora of the Gulf Islands is a result of the interaction of climate, topography, history and soil. Storms come in from the west, bringing moisture from the Pacific Ocean. As the air is forced to rise over the mountains of Vancouver Island and the Olympic Peninsula, it cools, resulting in heavy precipitation on the windward side of the mountains. Depleted of much of its moisture, the air descends and warms on the lee side, so that the region just east of the mountains lies in a "rain shadow", and receives significantly less rain. Rainfall on the west coast of Vancouver Island may exceed 3800 mm per year, nourishing the mossy conifer rain forests for which coastal British Columbia is noted. Yet Victoria and the Gulf Islands may receive less than 750 mm of rain annually. Seasonal differences in rainfall are just as important to the vegetation as is the total amount of rain. In the Gulf Islands, rainfall is unevenly distributed throughout the year. In summer, the North Pacific high pressure system moves northward, diverting many of the rain-bringing storms. The result is an annual cycle with a pronounced wet season and a definite dry season in summer. In California the wet season is short, and confined to late fall and winter. As one moves north the wet season lengthens and the dry season shortens correspondingly. In B.C. the wet season includes fall, winter and spring. Summer, which is normally the season of most active plant growth, is a time of drought and stress for the plants of the Gulf Islands.

In some habitats the basic climatic pattern is accentuated by edaphic or soil factors. The islands were completely covered with ice by the Vashon glaciation as recently as 13,000 years ago. The lobes of glacial ice moved south into the Puget lowland of Washington and west through Juan de Fuca Strait like a giant file, rasping away the land surface down to the bedrock. After the Pleistocene glaciers melted, they left bare, scoured rock in many places. Soil has not completely developed in some of these areas in the short time since the glaciation. Rocky ledges and hills, covered by only an

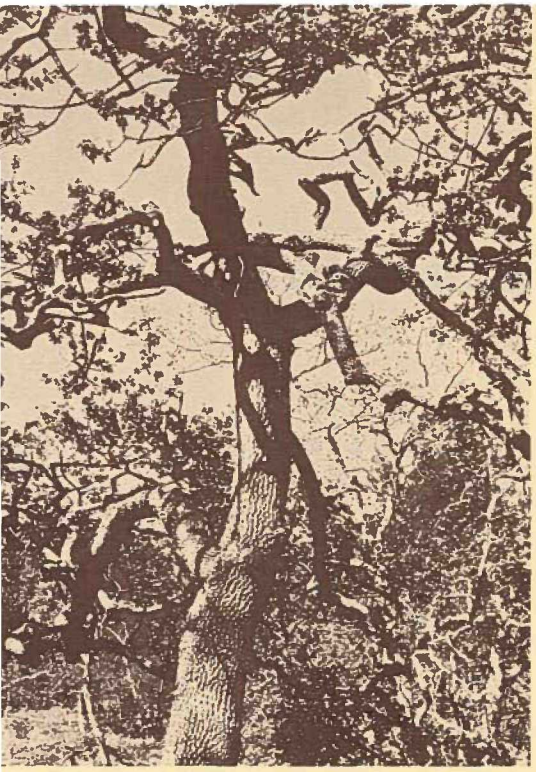


FIGURE 1. Garry Oak (*Quercus garryana*) is a characteristic species in dry sites on Vancouver Island and the Gulf Islands.

FIGURE 2. Rocky Mountain Juniper (*Juniperus scopulorum*) is widespread in interior western North America, but occurs near the coast only in the protected rain shadow region of the Gulf Islands and San Juan Islands. Wave action frequently erodes the Cretaceous sandstone of the Gulf Islands into baroque designs.

inch or two of soil or by mats of moss, are a prominent feature of the landscape. Woody plants are unable to colonize these well-drained, rocky sites. Although these natural clearings are wet in winter and spring, they can dry out completely in summer because the shallow soil is incapable of holding subsurface moisture. They are left to those plants which have special adaptations to endure or escape the dry summer, but they also allow a place in the sun for those small plants that cannot survive in the shade of the conifer forests found on deeper soils.

Climate is the major factor that determines the dominant vegetation of a geographical region. The Gulf Islands and adjacent Vancouver Island lie in the dry subzone of the Coastal Douglas Fir Biogeoclimatic Zone, according to Dr. Vladimir Krajina's classification of the vegetation of British Columbia. In this zone the dominant tree in climax forests is Coast Douglas Fir (*Pseudotsuga menziesii* var. *menziesii*), and in drier sites Garry Oak (*Quercus garryana*) and Arbutus or Pacific Madrone (*Arbutus menziesii*) are prominent as well.

Garry Oak occurs from California to British Columbia, reaching its northern geographical limit in the Gulf Islands region. This slow-growing, picturesque white oak is the most drought-tolerant of the major tree species in the region. It is our only native oak west of the Prairies. Arbutus also occurs from California to B.C., and has relatives in the American Southwest, the Caribbean, and the Mediterranean region. It is Canada's only native evergreen broadleaf tree, immediately recognizable by its smooth cinnamon-colored bark and shiny dark green leaves. Arbutus is sometimes referred to as the tree that sheds its bark instead of its leaves. This is not true, of course, for evergreen trees shed dead leaves just as deciduous trees do. But in evergreens the leaves may live for more than one year and they are not all shed at once, so that the trees are never leafless. The outer layers of Arbutus bark peel off in papery flakes, so that trunks and branches remain smooth and bright. Only on the trunks of very large trees does the bark build up enough to become checkered, scaly, and rough.

FIGURE 3. Slimleaf Onion (*Allium amplectens*) has no need for pollination, since despite its showy flowers it produces its seeds asexually. This species ranges from northern California, sporadically northward to the Gulf Islands.

FIGURE 4. *Brodiaea coronaria* ssp. *coronaria*, the Harvest Brodiaea, flowers in June in the dry grass after its leaves have withered.

FIGURE 5. Fool's-onion (*Triteleia hyacinthina*) is another typically Californian species that reaches its northern geographical limit in the Gulf Island region.

A shrubby relative of Arbutus is the Bristly Manzanita (*Arctostaphylos columbiana*), which also has smooth reddish bark but has small gray-green leaves. Low, mat-forming species of *Arctostaphylos* such as Kinnikinnick have a wide distribution in British Columbia. However, the shrubby members of the genus which are so plentiful in California are represented in the Gulf Islands region by this single species which is confined to the specialized habitats of the Coastal Douglas Fir Zone.

Though the trees and shrubs are interesting, it is in the rocky clearings that the most impressive displays of spring wildflowers are found. They are at their best from March through June, depending on how cold and wet the spring has been in any particular year. These natural flower gardens rival in color and variety the subalpine meadows of higher elevations. The ecological strategies of the Gulf Island plants are completely different from the strategies of subalpine plants, however. Subalpine plants must adapt to a short growing season in summer and long, cold winters. Gulf Island plants must cope with a partial reversal of dormant season, and endure or escape the dry summer. Three different life forms have been particularly successful at this.

Some perennial plants, called succulents, have fleshy stems or leaves capable of storing water which they use during the summer drought. There are not many succulents in the Gulf Islands. The commonest one is Broad-leaved Stonecrop, *Sedum spathulifolium*, and the most unusual one is the Brittle Prickly-pear Cactus *Opuntia fragilis*. The islands of B.C. and adjacent Washington are the only place north of southern California where cacti occur on the Pacific coast.

Perennial geophytes represent another successful life form in the islands. Geophytes are plants that survive their dormant season underground as bulbs or corms, modified leaves or stems that serve as food storage organs. These bulbous plants, many of which are in the lily family, make their vegetative growth in early spring. Some flower in spring, but others flower in early summer after their leaves have already shrivelled and died. After flowering and fruiting they dry up and disappear underground for the rest of the year.

These bulbous plants produce some of the most elegant spring flowers. Chocolate Lilies, *Fritillaria lanceolata*, have unusual mottled brown flowers with a semen-like odor, an adaptation for pollination by flies. Others include the deep blue Common Camas (*Camassia quamash*), Great Camas *(Camassia leichtlinii)*, several species of wild onion *(Allium* spp.) and the cluster lilies *Brodiaea coronaria* and *Triteleia hyacinthina*. The nutritious and tasty bulbs of all of these, especially Camas, were important foods for western Indians. Another bulbous lily, the Death Camas (*Zigadenus venenosus*) sometimes turned out to be one's last meal if eaten by mistake.

Lilies are not the only plants to survive the dry season with modified storage roots or rhizomes. The rocky clearings are also the haunts of the spectacularly beautiful Satinflower, *Sisyrinchium douglasii*, of the Iris family, whose inappropriate scientific name means "hog's snout". Many dicotyledonous plants also occur, such as Shooting Stars (*Dodecatheon* spp.) in the Primrose family, Fine-leaved Lomatium (*Lomatium utriculatum*) in the Carrot family, Delphiniums, Saxifrages, and the Small-flowered Woodlandstar (*Lithophragma parviflora*).

The third life form particularly well represented among Gulf Island plants is the winter annual. Seeds of winter annuals germinate in the fall or winter after the rainy season has begun, form a rosette of a few leaves, and begin vigorous growth as soon as the temperature warms up a little in late winter. They flower in late winter or early spring, set seed, and die, completing their entire life cycle before the summer drought begins. The seeds lie dormant over the dry summer, and germinate after the rains come again in the fall. If the seeds germinated as soon as they were ripe in the warmth of summer, the young seedlings would begin growing just as their environment was drying up, and the whole population would perish. Therefore these plants have evolved seeds which contain inhibitors that prevent germination at warm temperatures. The seeds require both moisture and cool temperatures to germinate, so that the plants do not begin to grow until November or later, when abundant moisture is a certainty in British Columbia. It is possible to coax most of these plants into germinating at any time if you can start them at about 5° or 10°C. In my laboratory I germinate the seeds in a refrigerator.

FIGURE 6. Farewell-to-Spring (*Clarkia amoena* ssp. *caurina*) is one of the last spring flowers to bloom.

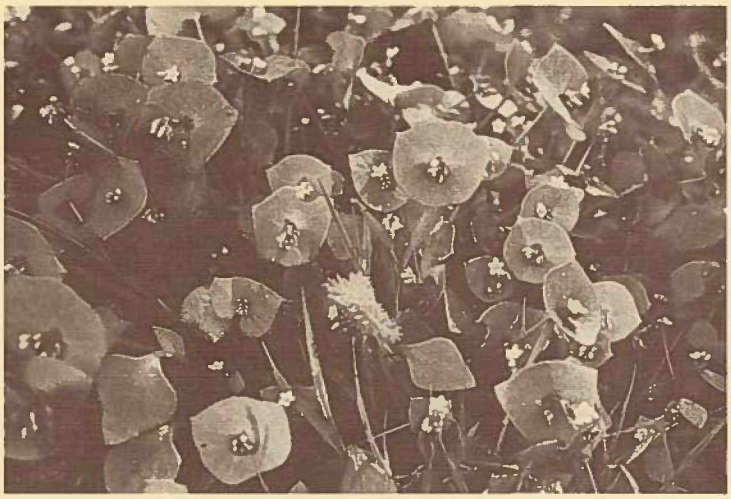


FIGURE 7. Miner's-lettuce (*Montia perfoliata*) was eaten by the Forty-niners, who were too busy to plant vegetable gardens, during the California gold rush.

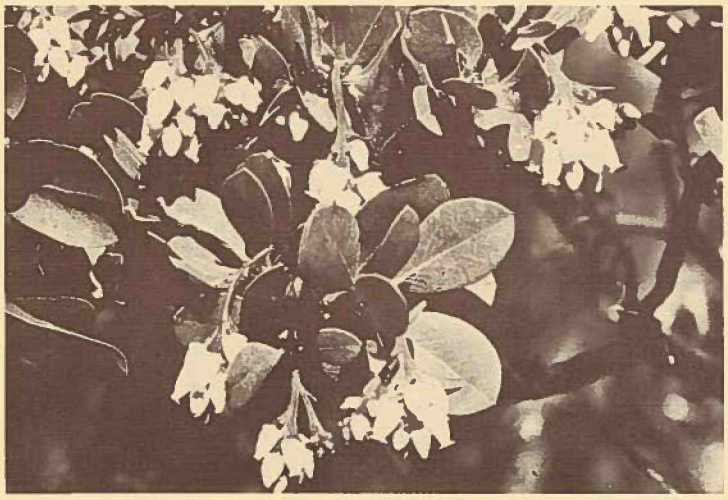


FIGURE 8. Bristly Manzanita (*Arctostaphylos columbiana*) is an evergreen shrub with gray-green drought-resisting leaves.

The winter annuals are often tiny plants, and incredibly abundant in numbers. For example, in some places I have seen more than 5,000 seedlings of the Large-flowered Blue-eyed Mary, *Collinsia grandiflora*, occupying less than one square foot of ground. The diversity of different species of winter annuals is also high; one might find up to 20 different kinds in an area of a few square meters.

Many winter annuals have tiny flowers only a few millimeters across, and are habitually self-pollinated rather than cross-pollinated by insects. Self-pollination is usually disadvantageous in the long run, for it leads to genetic uniformity and the resulting lack of variation lowers the possibility of evolutionary change should the population find itself in a changed environment. In some environments, however, self-pollination has compensating advantages. With no need to expend energy on nectar production or to produce large attractive flowers, and no need to rely on the vagaries of pollinating insects, these plants can get reproduction over quickly and shorten their life cycle. Living in a habitat with impending drought and death, a short life cycle and the certainty of automatic self-pollination is selectively advantageous for the perpetuation of the population. The result is that many of the annual wildflowers are belly plants — so small that you have to lie on your belly to see them — and they may entirely escape the notice of a casual hiker. These days, escaping the notice of humans might be an additional selective advantage.

There are many species of small-flowered winter annuals in the Gulf Islands, most without common names. A high proportion of them, such as *Meconella, Myosurus, Nemophila, Plagiobothrys, Linanthus,* and *Orthocarpus,* are northern cousins of typical Californian plants. In many cases their Californian relatives have larger flowers and are insect-pollinated. It seems to be a general rule that the self-pollinated species of a genus have a wider geographical distribution than their cross-pollinated relatives, because their colonizing populations do not need to rely on insect pollinators to get them established.

Interesting as they are to botanists, these self-pollinated annuals are not responsible for spectacular floral displays. The annuals with larger flowers designed to attract insects are the ones that lead to my increased consumption of color film in spring. Perhaps the most spectacular of these are Sea Blush (*Plectritis congesta*), Blue-eyed Mary (*Collinsia grandiflora*), and Common Monkeyflower (*Mimulus guttatus*). These three species are abundant, colorful, and characteristically occur together. Common Monkeyflower is really capable of being a perennial, but in habitats where it dries out in summer this adaptable species can behave perfectly well as an annual. Another smaller monkeyflower, *Mimulus alsinoides*, often occurs with the Common Monkeyflower; they may be completely intermixed in the same clump. Monkeyflowers have an unusual adaptation to prevent self-pollination. The stigma, where pollen is deposited by insects, is sensitive to touch. It has two flat lobes that are spread apart widely. When an insect first enters the flower its back scrapes across the stigma lobes, depositing pollen grains picked up from previously visited flowers. Then the stigma lobes quickly close, just like a miniature Venus-flytrap. Deeper in the flower the insect picks up a new load of pollen, but the stigma lobes are closed as the insect exits from the flower, so self-pollination does not occur.

Blue-eyed Mary flowers are quite variable in color, combining blue, white and magenta. Occasionally, plants with pure magenta or pure white flowers are found. Flower size also differs considerably in different populations. There seems to be a complete range from flowers two centimeters long to flowers only two millimeters long. The small-flowered plants are usually called a different species, *Collinsia parviflora*, but they may just represent populations adapted for self-pollination.

Sea Blush also varies in color, ranging from pale pink to deep pink. Pure white flowers are also fairly common. Unlike many of our annuals with Californian relatives, our *Plectritis* has the showiest flowers of them all. The one-seeded fruits are even more variable than the flowers. They may have widespread ear-like wings or be completely wingless, may vary from pale straw-color through golden brown to dark brown, and may be hairy or hairless. A very closely related species, *Plectritis brachystemon*, often occurs together with Sea Blush. Its flowers are very small, whitish, and self-pollinating.

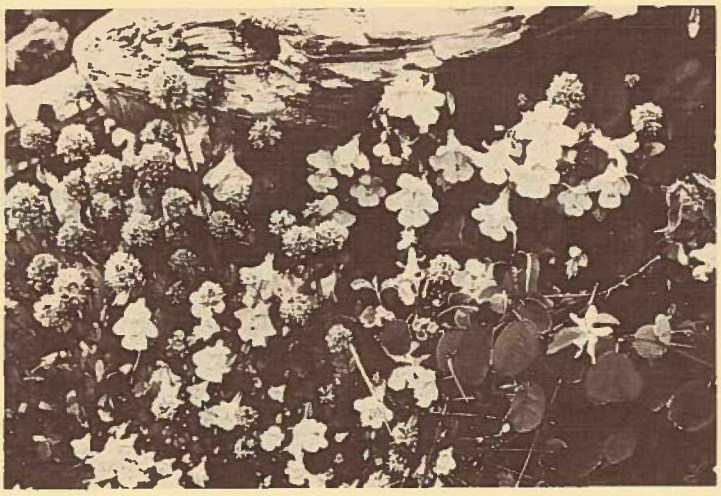


FIGURE 9. Sea Blush *(Plectritis congesta)*, Yellow Monkey Flower *(Mimulus guttatus)* and a dwarfed Saskatoon Berry *(Amelanchier alnifolia* var. *semiintegrifolia)* growing among the driftwood.

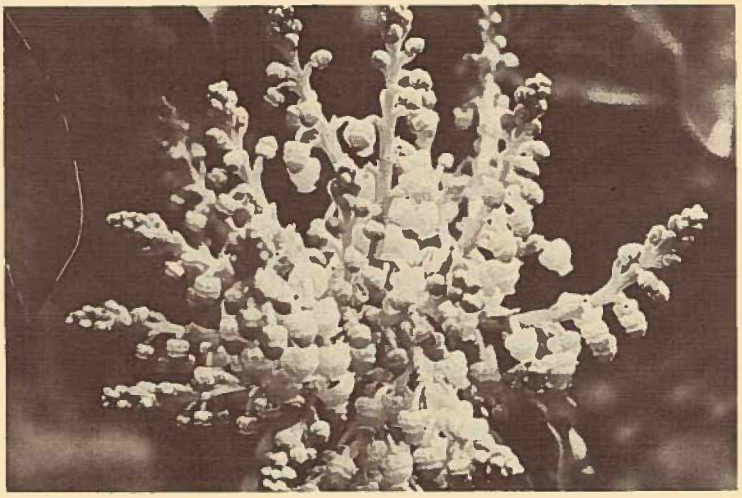


FIGURE 10. Madrone (*Arbutus menziesii*) is very commonly found on the Gulf Islands. It has the urn-shaped flowers typical of many ericaceous genera.

One of the earliest annual plants to flower is Spring-gold, *Crocidium multicaule.* These little yellow daisies begin blooming in February. Their seeds are unusual in that when they are moistened, they exude a sticky mucilage that glues them to the soil, or to the feet of birds or other animals, which aids in their dispersal.

By June most of the annuals are fading and setting seed. An exception is the Farewell-to-Spring, *Clarkia amoena.* Like its numerous California relatives it survives longer than the other winter annuals, and flowers in early summer when the grasses have dried to golden brown. By July, there is not much left to see in the island clearings. But then it's time to head up the mountains anyway, where spring is just beginning at the edge of the snowfields.

Endangered Plants in British Columbia

GERALDINE A. GUPPY

Man is gradually occupying, and altering to suit his own needs, an increasing portion of the earth's surface. As a result of this intervention, a number of plant species are becoming rarer as their native habitats disappear. A growing concern over the preservation of the natural environment has made many people more aware of these plants and of the necessity of protecting them.

What is an endangered plant? When we label a plant "endangered", we are making a value judgment; we are implying that the plant may become extinct and vanish forever, due to the destructive actions of humans. A plant may be naturally rare and yet not be considered endangered. According to the definition used by the Flora North America Program and by the Flora British Columbia Program, an endangered species is "in immediate danger of extinction, its continued survival unlikely without implementation of special protective measures; ordinarily occurring in small numbers in a limited range". In this category are those plants that are in the most serious need of protection. Other categories (e.g. depleted, threatened) have also been used, to describe plant species in less immediate danger of disappearing. A given plant occurring over a wide range may have a different endangered status in different parts of its range; protection of selected populations is justified by the need to preserve the natural variation within the species.

The depletion and extinction of rare plant species is commonly a result of the activities of man — for example the expansion of suburban areas, grazing, logging and mining, and flooding or draining of land. However, natural causes, such as long-term climatic changes or succession of plant communities, may also be responsible. Man may, however, have an indirect effect even here, since his control and regulation of catastrophic natural phenomena such as forest fires or floods may influence the occurrence of many species.

Why should endangered species be protected? Mankind has frequently been guilty of assuming that only those plant and animal species of obvious usefulness to humans are justified in existing. This is particularly true if their continued existence conflicts with any of man's activities. However, rare and endangered species may be of use to mankind in many ways we have not yet explored. They may indicate the presence of minerals and metal ores, they may contain chemicals of commercial or medicinal value, and they are often adapted to growth in unstable or unusual habitats. In addition many endangered or rare plants are of obvious agricultural or horticultural value, and some are among our most attractive wildflowers. Perhaps the most important reason for preserving endangered plant species, however, is that they contribute to the diversity of the environment, and thus ultimately to the ecological stability of the earth. Each plant species represents a distinct and unique gene pool which, once destroyed, cannot be replaced. We have an obligation to preserve such genetic resources, not only to maintain the stability of ecological systems, but also because we do not know which of them may one day turn out to be of value to humans.

The only effective way to protect endangered species is to preserve the habitats where they occur, by means of carefully planned, enforceable legislation. Such legislation is gradually being brought into existence in Canada and the United States. In Canada, various provinces have for some time given legal protection to selected individual species. In British Columbia, for example, protected species include *Cornus nuttallii* (Western Flowering Dogwood), *Trillium ovatum* (Western White Trillium) and *Rhododendron macrophyllum* (Pacific Rhododendron). These species have been given protection for various reasons, and not necessarily because they are rare. The Western Flowering Dogwood, for example, is protected because it is our provincial flower. The Provincial Government has also introduced legislation to permit the setting aside of selected areas of land as Ecological Reserves. These reserves may consist of representative samples of particular vegetation types, or they may be created to preserve some unique feature of our natural environment. In effect, therefore, they may be used as a means of protecting rare and endangered species.

Canada is a party to the Convention on International Trade in Endangered Species of Wild Fauna and Flora, a document which came into existence in 1975 and has now been signed and ratified by 34 countries. The Convention restricts trade in specified endangered species between these countries. Legislation of this type has little impact upon species which are of no commercial value or species which occur wholly within a country, but it provides a means of imposing control on the economic exploitation of many endangered species.

The United States is also a party to the above Convention. In addition, the U.S.A. has created an Office of Endangered Species, and is in the process of compiling a list (to be made as accurate as possible, and updated as necessary) of all endangered or threatened animal and plant species in the United States. Taxa on this list are given substantial legal protection, including protection of habitat.

FIGURE 11. A Queen Charlotte Islands endemic, *Senecio cymbalarioides* ssp. *moresbiensis*.

In British Columbia there are perhaps two dozen species of plants that could be considered endangered within our area. Many of these are endemic, and most are very rare or very local in their occurrence. The degree to which they are threatened varies, as some of these taxa are found in remote and thus far undeveloped parts of the province, and so are not in such immediate danger of extinction. On the following pages, a selection of B.C.'s rare and endangered plants is discussed.

Bidens amplissima is a yellow-flowered, annual composite that grows in wet places. It is often tall and robust. The plant has curiously hooked seeds, hence its common name, Vancouver Island Beggarticks. This species is thought to be a naturally occurring hybrid between *Bidens cernua* and either *B. frondosa* or *B. vulgata*, all of which are fairly widely distributed. *Bidens amplissima*, however, is known only from scattered locations on Vancouver Island, and remains a rarity.

Another rare member of the family Asteraceae is *Luina nardosmia* var. *glabrata*, the Silvercrown Luina. This plant is tall, with yellow rayless flower heads, and large, palmately lobed leaves that resemble those of the Coltsfoot *Petasites palmatum*. It occurs relatively frequently in the Cascades of Washington and Oregon, but is very seldom seen in British Columbia, being reported only by Boivin in his *Enumération des Plantes du Canada* (1966).

Senecio cymbalarioides ssp. *moresbiensis* is the Queen Charlotte Islands race of the Ivy-leaved Ragwort, which belongs to a variable and closely related group of species whose relationships have been the subject of some debate. It is a yellow-flowered, rather showy plant. The plants found on the Queen Charlotte Islands differ in a number of morphological details from mainland populations, and consequently are recognized as the subspecies *moresbiensis*.

Two little-known members of the Brassicaceae are the Whitlow-grasses *Draba ruaxes* and *D. ventosa*. These two closely related species are described in a well-known flora as "poorly understood and infrequently collected". Both are low, caespitose, yellow-flowered alpines, found at high altitudes in the mountains of western North America. *Draba ruaxes* is hairy throughout with simple and forked (sometimes stellate) hairs; in British Columbia it is known only from Mt. Waddington. *Draba ventosa* differs from *D. ruaxes* in the relatively greater abundance of stellate hairs on its foliage, and in B.C. is known from a single collection near Banff National Park. Both species are rare throughout their range.

Atriplex alaskensis, the Alaskan Orache, is a rare coastal species that is seldom seen, although the genus *Atriplex* is common and widespread. This plant occurs mainly in Alaska; in British Columbia, it is known only from the Queen Charlotte Islands. It is a stout, erect plant with angular green leaves. The Alaskan Orache has been considered by some botanists as a variety of *Atriplex patula*; however, it differs from this species in various morphological details, as well as in chromosome number.

Rhododendron macrophyllum, the Pacific Rhododendron, is probably the best-known of all the rare and endangered plant species found in British Columbia, and is protected by law. It is a large shrub with leathery evergreen leaves, and produces attractive clusters of large, showy pink flowers in spring. It is regarded by many as one of our most beautiful native plants. The range of this rhododendron extends from southern British Columbia to northern California, but in B.C. it is very rare and occurs only in Manning Park, in the Skagit Valley (south of Hope) and in one locality on Vancouver Island. The stand of rhododendrons in Manning Park is a popular roadside stopping place for tourists, and is spectacular during the blooming season in June.

The Seaside Bird's-foot Trefoil (*Lotus formosissimus*) is a pea-like yellow- and purple-flowered herb that occurs in moist habitats west of the Cascades, from southwestern British Columbia to central California. It has a very small range in British Columbia, being found only in open grassy places in the vicinity of Victoria. It is locally abundant in these areas, though becoming less common owing to the high population density of the area.

Ligusticum calderi, Calder's Lovage, is another endemic of the Queen Charlotte Islands. It is a small umbellifer with white to pinkish flowers and feathery, finely dissected foliage. It is distinguished from the Pacific Hemlock Parsley *(Conioselinum pacificum)*, which it resembles, by the fibrous root crown. *Ligusticum calderi* is of interest among the lovages because of its geographical remoteness from other members of the genus. It grows in boggy or rocky places at subalpine and alpine elevations, and has been found in scattered localities throughout the Queen Charlotte Islands.

FIGURE 12. *Rhododendron macrophyllum*, the Pacific Rhododendron.

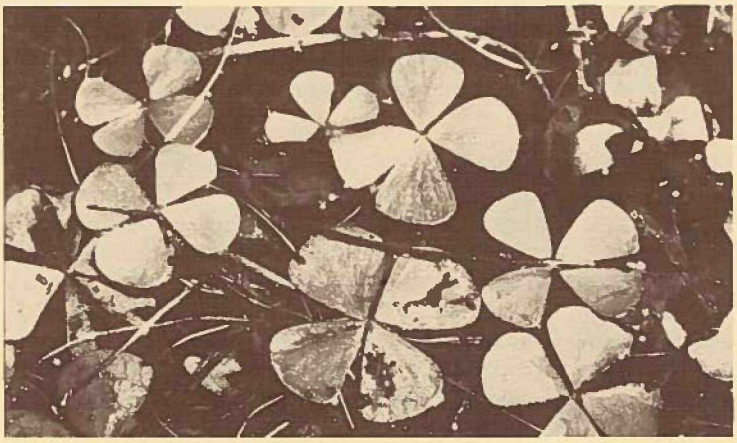


FIGURE 13. *Marsilea vestita* (Hairy Pepperwort), probably B.C.'s most unusual fern.

FIGURE 14. The graceful Phantom Orchid, *Eburophyton austiniae*.

Hibberson's Trillium, *Trillium ovatum* f. *hibbersonii*, has long been an object of both interest and confusion for botanists and gardeners alike. Recently it was given official botanical status as a form of the common Western White Trillium *T. ovatum*, though there is still not complete agreement on its proper rank. It is a diminutive plant which resembles *T. ovatum* in many ways, differing mainly in the pale pink of the newly-opened flowers. Hibberson's Trillium has been propagated by gardeners and is becoming increasingly common in cultivation. It is very rare in the wild, however, being best known from three localities on the west coast of Vancouver Island.

Limnanthes macounii, Macoun's Meadow-foam, belongs to the Limnanthaceae, a small North American family of annual herbs. The genus *Limnanthes* is centered in Oregon and California; however, *L. macounii* is endemic to British Columbia. Although members of the genus have been grown as ornamentals, this species is small and inconspicuous, with minute four-petalled flowers. It is an extremely rare plant, and is known only from the type locality on Vancouver Island.

The Hairy Pepperwort, *Marsilea vestita*, is a most interesting little plant. It is a fern, though most unfernlike in appearance, having small four-parted leaves like those of a shamrock. The spores are produced in a hard seedlike body called a sporocarp. The Hairy Pepperwort occurs from southern British Columbia to Mexico, and eastward to Saskatchewan, Minnesota and Arkansas. Its preferred habitat is mud or shallow water, and it produces its sporocarps in summer when the conditions are driest. In B.C. this curious fern was collected near Kamloops in 1889, and was only recently rediscovered there. It has also been found near Vernon. These are the only two localities known for the province.

Ophioglossum vulgatum, the Common Adder's-tongue, is another unusual fern. It belongs to the family Ophioglossaceae, and is related to the moonworts (the genus *Botrychium*). At first glance it resembles a member of the lily family, though on close examination the fertile frond is unmistakeably that of a fern. The sterile frond, which emerges at the base of the fertile frond, is leaflike and entire-margined. This little fern is commonly encountered in eastern North America, but occurs very sporadically in the western part of the continent. It has been found in two or three places in Washington State, and once in the western Aleutian Islands. In B.C. it is known from a single locality on Vancouver Island, which has been proposed as an Ecological Reserve. From a purely biological viewpoint, outlying populations of this kind are well worth preserving, since they are often significantly different from other populations in areas where the species is more common.

Eburophyton austiniae is the Phantom Orchid, one of the most beautiful orchids found in British Columbia. The entire plant is cream-colored to white, and each flower has a yellow spot on the lip. Like several of our other native wild orchids, this species is saprophytic. Very little is known of the growth requirements of such plants; very often their survival depends on a delicately balanced relationship with a fungus, and thus our only means of preserving them is to give complete protection to their habitat. The Phantom Orchid is known from two or three locations in the Fraser Valley. Its abundance in any given location varies from year to year, and in some years the plants do not appear at all, so the continued existence of the species in B.C. is always somewhat uncertain.

Another orchid still rarer than the Phantom Orchid is *Liparis loeselii*, a small and inconspicuous plant, with a pair of elliptic leaves from which rises a slender flower stem with white to greenish flowers. This species is found across the northern part of North America, but is rare throughout. It usually occurs in bogs or near springs. In British Columbia this orchid is found only in a bog near Vernon.

Isopyrum savilei is an attractive, anemone-like perennial of the family Ranunculaceae, with delicate leaves and showy white flowers. It is endemic to the mountains of the Queen Charlotte Islands, where it occurs in moist shady rock runnels and cliff crevices. This plant is found usually at high elevations, but sometimes descends almost to sea level, and is locally abundant in some areas.

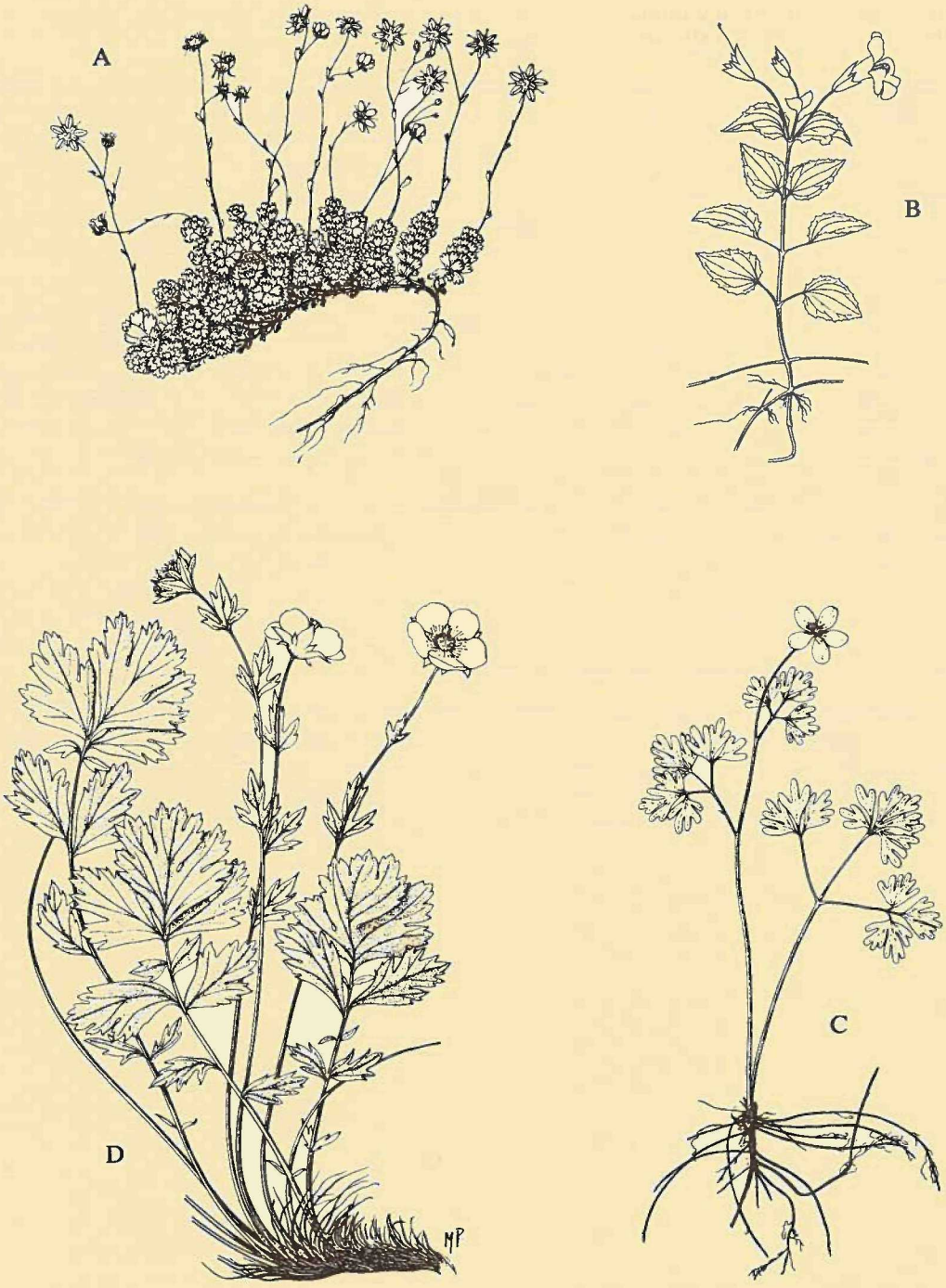


FIGURE 15. A selection of rare B.C. plants that are endemic to the Queen Charlotte Islands. A. *Saxifraga taylori,* B. *Mimulus guttatus* ssp. *haidensis,* C. *Isopyrum savilei,* D. *Geum schofieldii.*

Geum schofieldii, Queen Charlotte Avens, is a yellow-flowered species with the ragged-edged leaves typical of the genus. It closely resembles the more widely distributed species *G. rossii* and *G. calthifolium*, to which it is related. This plant is another of the dozen or so species in B.C. which are endemic to the Queen Charlotte Islands. It grows in the mountains of these islands, where it is restricted to rocky outcrops and cliff faces.

Raup's Willow, *Salix raupii*, is a shrubby dwarf willow which grows in northern British Columbia. Shrubby willows are a common element of the vegetation in the northern part of the province. This species is closely related to the frequently encountered *S. glauca*, and was first discovered in 1966. It was formally named in 1974. Raup's Willow is one of the few endemics in B.C. which are not found on the Queen Charlottes, and is known only from gravel flats in the vicinity of MacDonald Creek (Mile 409, Alaska Highway). This remote part of the province is so sparsely populated and so infrequently botanized, however, that it is likely other localities will be found for this species.

Taylor's Saxifrage, *Saxifraga taylori*, was until 1957 known only from a single pressed collection made on Moresby Island in the Queen Charlottes. It has since been found in several other places on both Moresby and Graham Islands, and in some of these localities it forms extensive colonies. This plant is alpine, seldom occurring at elevations lower than 500 m. It is a mat-forming species of talus slopes and rocky places, and bears attractive white flowers held well above the leaves on slender stems. It is closely related to *Saxifraga vespertina* of Washington and Oregon.

The Common Monkeyflower, *Mimulus guttatus*, is a very widespread and variable species that occurs throughout western North America. It has yellow, snapdragon-like flowers with red spots in the throat. A distinct race of this species, *M. guttatus* ssp. *haidensis*, differs from the typical subspecies in being hairy rather than glandular on the stems, and is endemic to the mountains of the Queen Charlotte Islands. It grows along creek edges and in other damp spots in alpine and subalpine habitats, and is much less common in the Queen Charlottes than ssp. *guttatus*, which is a common element of lowland coastal vegetation in this area.

Viola maccabeiana is a rare blue-flowered violet which is known only from Columbia Lake in the Kootenays (southeastern B.C.) It occurs in wet meadows or along streams. MacCabe's Violet closely resembles the widespread *V. nephrophylla*, and is considered a part of this species by some botanists. The similarity between these two violets may have led to confusion between them, with the result that *V. maccabeiana* may be less uncommon than it presently appears to be.

Botanical Garden News and Notes

Gardening Courses — This fall the Botanical Garden, in conjunction with the Centre for Continuing Education, will again be offering a variety of gardening and horticultural classes for the general public. A number of one-day workshops on such topics as basic houseplant care, fruit tree pruning, the home greenhouse, bulbs for the home and garden, and gardening for apartment dwellers, will be offered. Several workshops of special interest are also planned, including one on advanced houseplant care, another on decorating with houseplants, and a third (to be held 2 weeks before Christmas) on garlands and table centrepieces. Two four-week evening courses, on apartment gardening and on houseplants respectively, will also be offered. These two courses will meet at Kitsilano Public Library; all other classes will be held on the U.B.C. campus. For complete information, call the Centre for Continuing Education (telephone 228-2181 local 219 or 257).

Horticultural Tours — A two-week horticultural tour to Hawaii, led by David Tarrant, is planned for the Christmas season. The tour will leave Vancouver on December 26, and will visit Oahu, Maui and Kauai. Anyone with an interest in houseplants would find this tour most educational. Visits will be made to various Botanical Gardens, privately owned gardens and nature reserves. Further information may be obtained from the Centre for Continuing Education at the number given above.

Youth Employment Program — Three students (Mrs. Maria House, Miss Susan Munro and Mr. Colin Varner) have joined the staff of the Botanical Garden for the summer, through the support of the provincial government's Youth Employment Program. Mrs. House is coordinating plans for the projected exhibition of botanical illustrations of the B.C. flora, to open in the U.B.C. Fine Arts Gallery in May 1979. The exhibit is designed to travel throughout the Province and to other major centres in Canada, and will include the various art media which have been used in illustrating and documenting British Columbia plants. An accompanying catalogue will detail the history and development of botanical art in B.C. Miss Munroe is compiling information for a series of trail guides for the trails in the B.C. Native Garden. Each of these small booklets will be keyed to a specific trail, and will give a complete outline of the points of interest and the plants to be seen along it. Inquiries regarding availability and cost of these pamphlets should be directed to the Office of the Botanical Garden. Mr. Varner is working on an inventory of botanical garden collections, to provide documentation on the growth and development of woody plant materials.

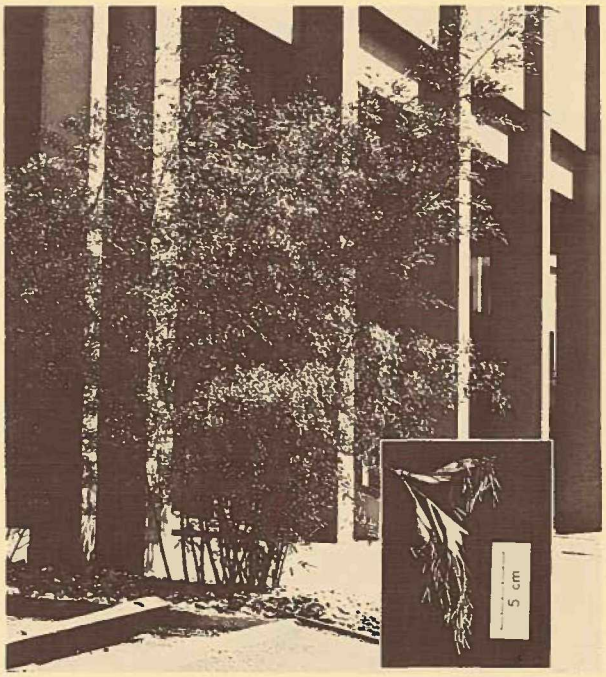
Visitors of Note — Two recent visitors to the Botanical Garden were Mrs. Kate Taylor of Valdivia, Chile, who has for many years supervised campus landscaping at the Universidad Austral de Chile; and Dr. Theodore Niehaus, author of the new Peterson Field Guide to Pacific States Wildflowers. On June 10, a performance of music and dance in honor of the Japanese Centennial in British Columbia was held in the Nitobe Memorial Garden, and was followed by a reception and dinner at the Office of the Botanical Garden. On June 27, a group of exchange visitors from the Academy of Sciences of the U.S.S.R. visited the Botanical Garden. Among these were Dr. Petr I. Lapin, Deputy Director of the Academy of Sciences Main Botanic Garden in Moscow, and Dr. L.N. Andreev, Head of the Laboratory of Physiology of Plants at the same institution.

Hasty Notes — Four attractive new hasty notes depicting scenes from the Nitobe Memorial Garden, drawn by Mrs. Rachel MacKenzie of the Friends of the Garden, are now available. They are priced at $1.00 for four or $3.00 for a package of twelve, and may be obtained from the Botanical Garden Office or at the gate of the Nitobe Garden.

New Cultivars for the Rose Garden — More than thirty new rose varieties have been obtained during the past year for the Rose Garden, including the new All-America Rose Selections 'Double Delight' and 'First Edition'.

1976 Annual Report — The 1976 Annual Report of the Botanical Garden, detailing the progress made in the various areas of the Garden during the last year, has now been published. Copies are available to interested persons, and may be obtained on request from the Office of the Botanical Garden.

Endangered Species Poster — A full-color poster showing some of B.C.'s rare wildflowers is now available to individuals and organizations interested in the conservation of our native plant resources. This project is the result of a joint effort by the Alpine Garden Club of B.C., the Vancouver Natural History Society, and the B.C. Federation of Naturalists.



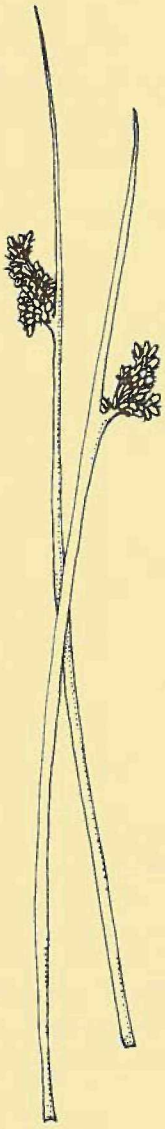
FLOWERING BAMBOOS

Bamboos are the only woody members of the grass family. They are mostly native to the Orient, and are grown for ornamental purposes in the milder parts of North America. One of the curious things about bamboos is that they very seldom bloom. Their flowers resemble those of other grasses, but are much larger. An investigation of the botanical literature shows that many bamboo species flower at very infrequent, but remarkably regular intervals. The intervals range from 15 to 20 years, the particular span being nearly constant for a given species. The plants grow without flowering for many years and then flower simultaneously, often over an enormous area. There are numerous examples of plants brought into cultivation far from their country of origin, which have flowered in the garden in the same year as in their native habitat. Having reproduced, the plants that have flowered then die. The bamboo shown here, *Phyllostachys aurea*, has a flowering cycle of about 15 years. The photograph was taken in June of this year on the U.B.C. campus. The unusual flowering pattern of these bamboos has been explained as follows: The very long periods between bamboo seed crops discourage large numbers of seed-eating creatures. Those that do live in the bamboo forests must find other food sources. In a flowering year, the existing seed-eaters cannot eat more than a part of the large crop produced, and thus the chances of seed survival are much greater than if a crop were produced every year.

Climatological Summary*

Data 1977	APRIL	MAY	JUNE
Average maximum temperature	13.3°C	14.2°C	18.4°C
Average minimum temperature	5.9°C	7.8°C	11.2°C
Highest maximum temperature	21.1°C	18.3°C	25.0°C
Lowest minimum temperature	2.2°C	4.4°C	7.2°C
Lowest grass minimum temperature	-5.0°C	-1.7°C	0.6°C
Rainfall/no. days with rain	58.4 mm/11	96.5 mm/16	20.3 mm/9
Total rainfall since January 1, 1977	317.5 mm	414.0 mm	434.3 mm
Snowfall/no. days with snowfall	—	—	—
Total snowfall since October 1, 1976	11.0 cm	11.0 cm	11.0 cm
Hours bright sunshine/possible	199.0/404.0	201.3/468.0	294.2/482.2
Ave. daily sunshine/no. days total overcast	6.6 hr/1	6.4 hr/5	9.8 hr/1

**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



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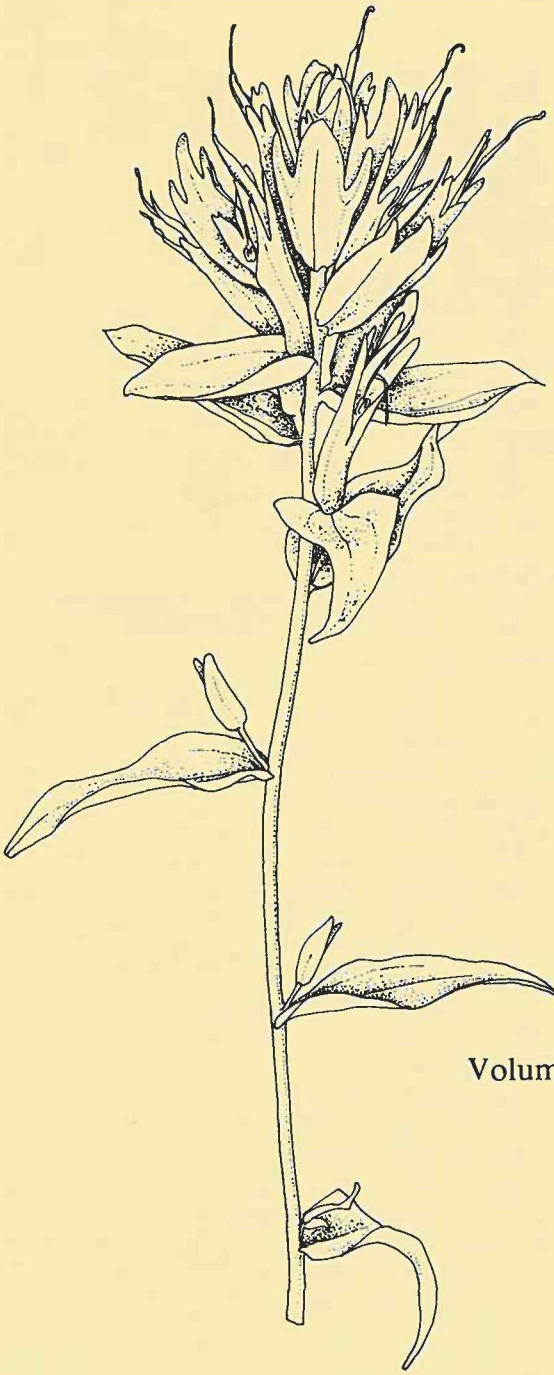

The bright red *Castilleja miniata* is one of the commonest species of Indian Paintbrush in B.C.

DAVIDSONIA

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