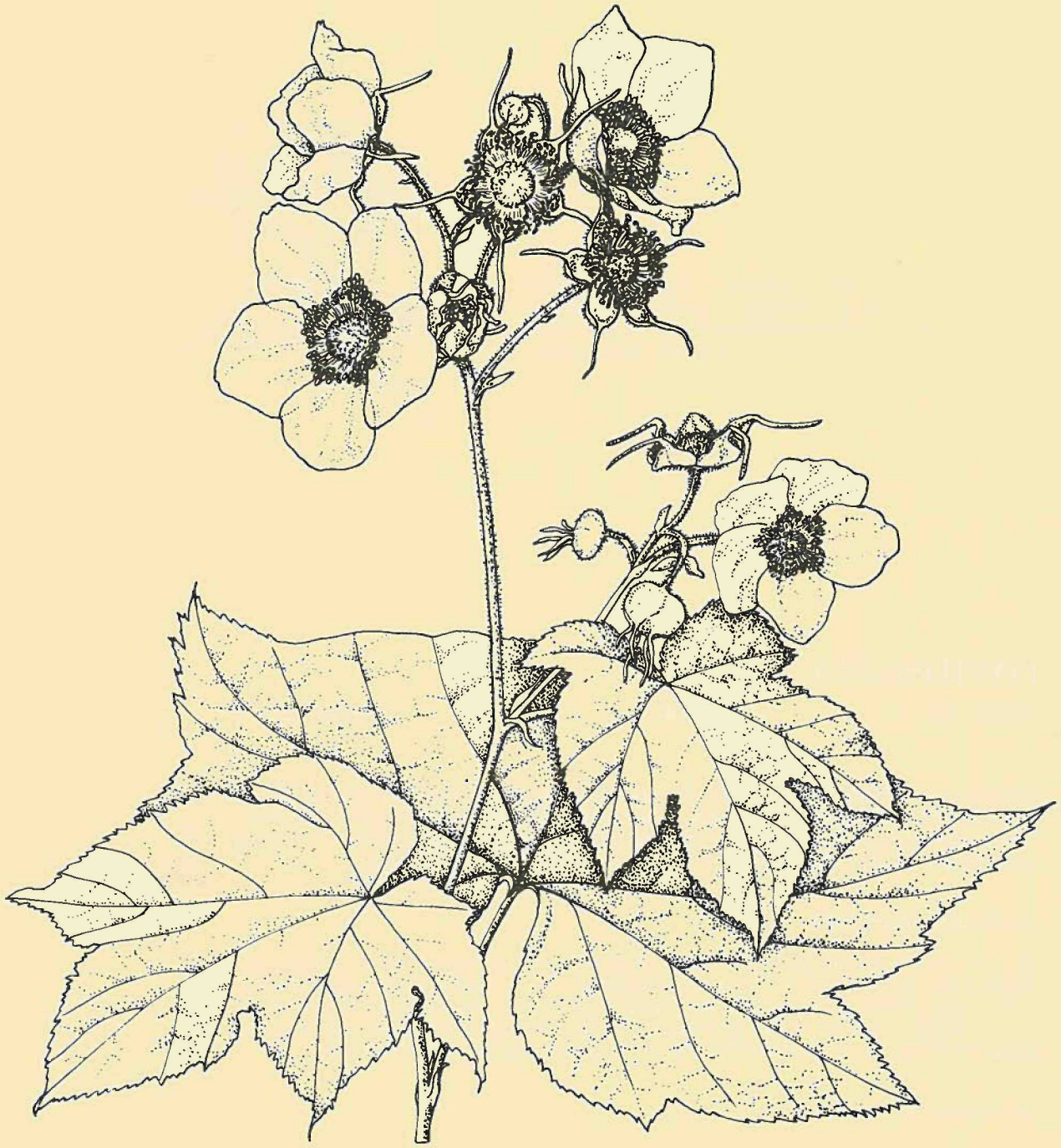
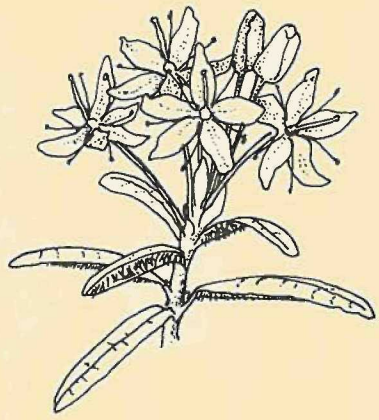
DAVIDSONIA

VOLUME 7 *NUMBER 2* *Summer 1976*



Cover:
Rubus parviflorus, the Thimbleberry, is a common shrub in Pacific coastal forests. It is a near relative of the raspberries and blackberries, and its fruits are edible.



Ledum groenlandicum or Common Labrador Tea is a member of the family Ericaceae. It is readily distinguished by the rusty hairs on the undersides of the leaves.

DAVIDSONIA

VOLUME 7 *NUMBER 2* *Summer 1976*

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 editorial matters or information concerning subscriptions should be addressed to The Director of The Botanical Garden.

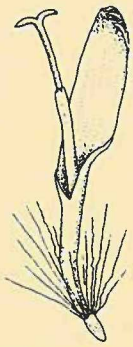
Acknowledgements

The pen-and-ink illustrations on the front and back covers and inside covers are by Mrs. Lesley Bohm, and those on p. 13 and pp. 19-22 are by Ms. Geraldine Guppy. Photographic credits are as follows: p.15 (top), Mr. Art Guppy; p.15 (others), Ms. Geraldine Guppy; p. 18, Mr. Colin Price, courtesy of The Province; p. 23, Dr. Christopher Marchant. Editorial and layout assistance was provided by Ms. Geraldine Guppy and Mrs. Jean Marchant.

ISSN 0045-9739

The Hawkweeds of British Columbia

GERALDINE A. GUPPY



The hawkweeds, genus *Hieracium*, are a group of herbaceous perennials belonging to the Asteraceae or Aster family. They are related to *Taraxacum* (the Dandelion) and to *Hypochoeris* (the Cat's-ear or Summer-dandelion), both of which commonly invade Vancouver gardens.

The family Asteraceae is a large, widely distributed and highly evolved plant family which is easily recognized by its characteristic flower heads. Each head is a composite of numerous individual flowers, hence the family's alternate name, the Compositae. The individual flowers are of two types: disk flowers (with tubular corollas) and ray flowers (with strap-shaped corollas). Flower heads made up entirely of disk flowers (as in thistles, for example) are called discoid, those containing only ray flowers are called ligulate, and those having flowers of both types are called radiate. The genera making up the tribe Cichorieae (of which the hawkweeds are one) all have ligulate flower heads. A single ray flower of *Hieracium cynoglossoides* is shown at left. The pappus, one of the most highly specialized structures in the flower, aids in dispersal of the seed and is thought to be a modified, much reduced calyx. The anthers are joined together into a tube or ring, a morphological feature which is characteristic of the family.

The genus *Hieracium* is a very large and complex group, particularly in the Old World where weedy species are numerous. At a conservative estimate there are 750 species altogether, on a world-wide basis; these fall into four groups or subgenera. The first and largest of these is the subgenus *Euhieracium*, containing many large and vigorous species. It is a predominantly European group, though it also occurs on this continent. Next is the subgenus *Pilosella*, also native to the Old World. The plants of this group are usually stoloniferous and often scapose (i.e., having basal leaves and a leafless flowering stem). Third is the subgenus *Stenotheca*, which occurs more typically in the New World, and last is the subgenus *Mandonia*, a small group of species found only at high elevations in the Andes of South America.

The hawkweeds that are found in British Columbia come from three of these four subgenera. There are 14 species altogether, of which half are native to the province and the remaining half are introduced. The introduced species belong to *Euhieracium* (two species) or to *Pilosella* (five); the native taxa belong to *Euhieracium* (one) or to *Stenotheca* (six). We will first look at the introduced hawkweeds.

Not all introduced plant species are weeds, but a very large number of them are. Introduced plants are plants that have established themselves in a new and foreign environment, and weeds are the ultimate example. A successful weed has a number of characteristics that are responsible for its success. Almost all weedy plants are ready colonizers, adapted to successional or disturbed habitats. Usually they are able to set abundant seed without the aid of a pollinator, either by self-pollination or by special mechanisms such as apomixis (setting seed in the complete absence of pollen, by a sort of "budding" process). Many hawkweeds, especially some of the European species, are apomictic. This makes them independent of external factors which might otherwise restrict their success in new areas. Weeds frequently reproduce by vegetative means and readily regenerate after vegetative damage. Most readers are familiar with the ease and speed with which dandelions regrow after their tops have been pulled off. Finally, a common characteristic of weeds is phenotypic (morphological) plasticity — the ability of a given individual plant of a species, with a given genetic constitution, to develop a growth habit suitable to the conditions in which it finds itself.

All of the introduced hawkweeds in British Columbia are apomictic or thought to be so. They are often annoyingly weedy, but several of them are quite showy. They are as follows:

Hieracium aurantiacum Linnaeus (Orange Hawkweed). This species is an attractive plant, with a rosette of basal leaves and a slender, usually leafless flowering stem covered with dark bristle-like hairs. The plant produces abundant stolons. Its bright orange-red flowers are of a color rarely seen amongst hawkweeds and unique amongst those occurring in our area. This hawkweed would make a good garden plant if it were not so invasive. In fact, it has long been a garden flower in Europe, and this is the reason it was introduced on this continent. It is an aggressive weed, however, and those who are attracted by the flame-colored heads should consider carefully before allowing it into the garden. It might well be useful as a ground cover for erosion control, where aggressiveness is an asset. It is found quite frequently in the Vancouver area. Two or three years ago there was an attractive small stand of it along University Boulevard on the University of British Columbia campus, but it was gradually eliminated by repeated mowing. It has also established itself in several places in the Interior of the province, for example the Slocan Valley. This hawkweed was probably the first introduced species to appear in British Columbia.

Hieracium piloselloides Villars (Tall Hawkweed). This species has a compact cluster of slender basal leaves and a long, slender flowering stem a foot or so high. The stem is topped with a cluster of yellow flower heads. This plant somewhat resembles *H. aurantiacum* in general appearance but is taller and more slender. Though it belongs to the subgenus *Pilosella*, it is not stoloniferous. However, it is apomictic and sets abundant seed, so it often occurs in large stands containing many thousands of plants. A pretty sight, providing that it is not one's own cow pasture where it has chosen to grow! This hawkweed has established itself in vacant fields and along roadsides near a number of places in the Interior. Among these are Hazelton, Terrace, Prince George, Nelson and portions of the Yellowhead Highway.

Hieracium floribundum Wimmer & Grabowski (Yellow Devil Hawkweed) and *H. caespitosum* Dumortier (Meadow Hawkweed). These two species are closely related to *H. piloselloides*, being distinguished from it by the fact that they are stoloniferous. Both are infrequently encountered in British Columbia, but they can be expected to occur in the same type of habitat as does *H. piloselloides*. The leaves of *H. caespitosum* are densely to moderately hairy, whereas those of *H. floribundum* are sparsely hairy to glabrous. Apart from this the two species are very similar — so much so, that a good case could be made for considering them as different phases of a single species. They belong to a taxonomically difficult group of hawkweeds, however, and a final decision on their classification is best made by European botanists.

Hieracium pilosella Linnaeus (Mouse-ear Hawkweed). This is a small, creeping plant whose leaves are covered on the underside with a silvery wool of stellate hairs. If left to grow undisturbed it will form a dense leafy mat. It is the only species in our area in which the flower heads almost always occur singly. The outermost ray flowers of each flower head are often tinged with red on the outer side, giving the plant an extra touch of color. It is an attractive though persistent little plant. It is widely established in Ontario and eastward, but is relatively rare in British Columbia. This, of course, may be only a temporary state of affairs.

Hieracium lachenalii Gmelin (Common Hawkweed) and *H. murorum* Linnaeus (Wall Hawkweed). These are large robust plants, perhaps the most strongly growing of the introduced species found in British Columbia. The two species are very much alike, their main difference being in leaf shape. They have big, broad, often coarsely toothed leaves, rounded at the base in *H. murorum* and tapering in *H. lachenalli*, and large yellow flower heads. *Hieracium murorum* has seldom been collected in the province. However, *H. lachenalii* is very abundant along the shoulders of Highway 3 immediately east of Hope. The proximity of the railroad may have something to do with its occurrence there, railroads being a common means of dispersal for weed seeds.

The native hawkweeds are much more shy and retiring than the introduced species, and their reproductive patterns are also different. Only one of the seven native species is apomictic. Two are somewhat weedy in appearance, but neither of these is invasive. The native taxa are as follows:

Hieracium umbellatum Linnaeus (Narrow-leaved Hawkweed). This is a tall, large-flowered, somewhat weedy-looking species found in fields and along roadsides in the drier regions of the

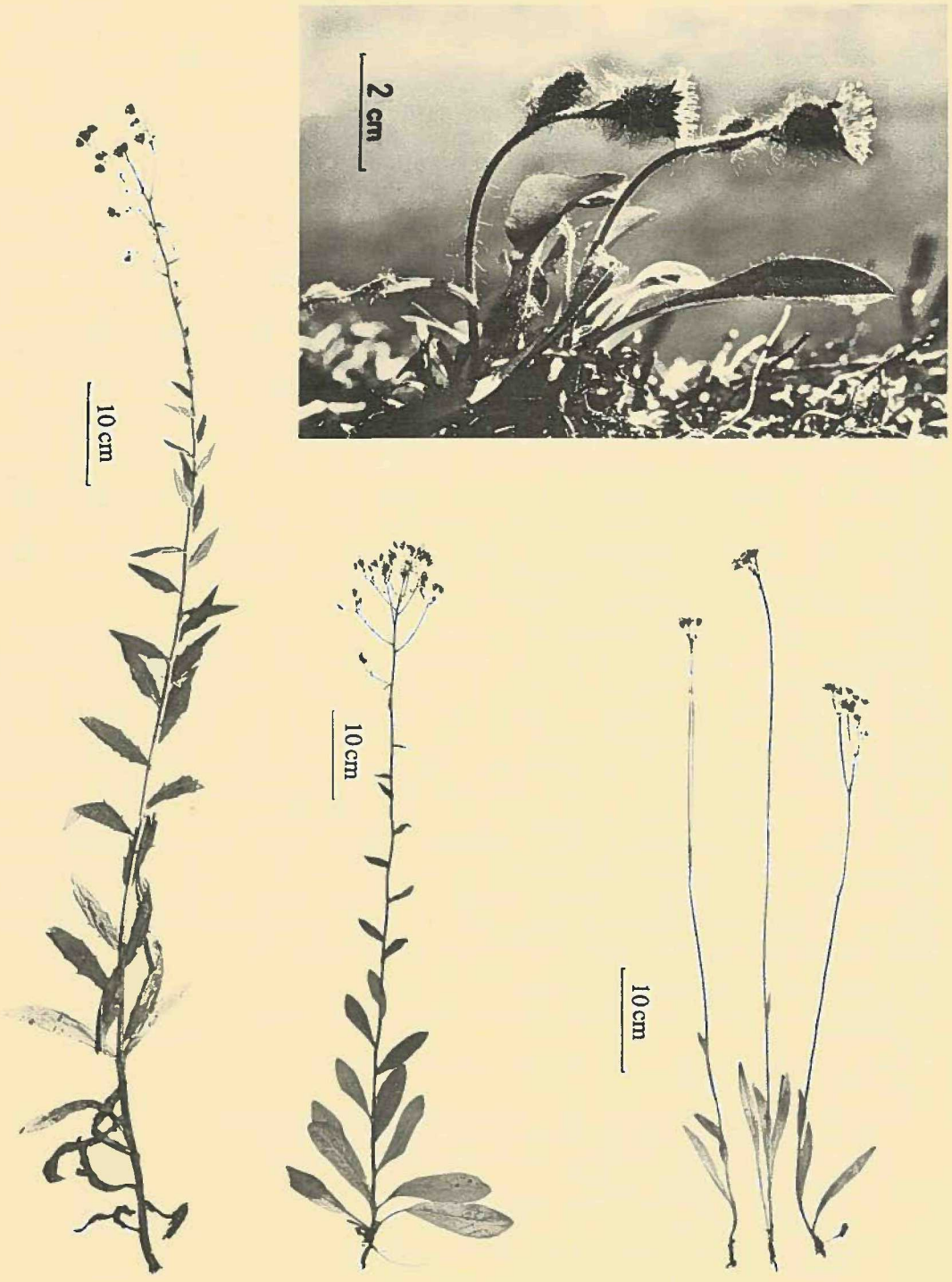


FIGURE 1. Some of the *Hieracium* species occurring in British Columbia (clockwise from top): *H. triste, H. piloselloides, H. scouleri* and *H. umbellatum.*

province. It differs from our other hawkweeds in that its leaves are more or less evenly distributed up the stem, rather than clustered toward the base. The basal leaves are often dry and dead by flowering time. This plant is also our only native apomictic species. Since apomixis is of adaptive value to weedy species, this is consistent with the type of habitat in which this plant is found. The Narrow-leaved Hawkweed is often attacked by a rust, which covers the leaves and stem with small brown spots and which may become quite pronounced as the growing season progresses. However, this organism appears to have little effect on the overall vigor of the plants.

Hieracium albiflorum Hooker (White Hawkweed). This is our only white-flowered species. The flower heads, though numerous, are small and inconspicuous, and they usually set seed by self-pollination. This species is common throughout the province, along roadsides and field edges, but is seldom a troublesome weed. It is the least decorative of the hawkweeds found in British Columbia.

Hieracium albertinum Farr (Western Hawkweed), *H. cynoglossoides* Arvet-Touvet (Hound's-tongue Hawkweed) and *H. scouleri* Hooker (Scouler's Hawkweed). These three closely related species differ from one another only in the hairiness of their foliage, and there is good evidence for considering them varieties of a single species. The yellow flowers are quite large and showy as *Hieracium* flowers go, and they produce abundant pollen. Though not spectacular, the plants are an attractive sight in their native haunts. One good place to find them is the Botanie Valley near Lytton, B.C. *Hieracium albertinum*, in particular, can be quite showy, with the long silver-white hairs on its involucre. Far from being weedy, all three of these species are quite difficult to maintain in cultivation, and do not like to have their roots disturbed during the flowering period. They all prefer a dry climate, but their preferences vary slightly in degree: *H. albertinum* (the hairiest species) tends to grow in the driest spots and *H. scouleri* (the least hairy species) in the dampest sites. It is likely that the hairs aid in the conservation of moisture.

Hieracium gracile Hooker (Slender Hawkweed) and *H. triste* Willdenow ex Sprengel (Woolly Hawkweed). The hawkweeds so far mentioned are all of low to middle elevations, whereas these two species are alpine. They may be found at moderate to high elevations throughout the province. Generally, *H. gracile* is the more common of the two species in the southern parts of the province, and *H. triste* is more commonly found in the north. Together they have a range extending from California to Siberia. They are inconspicuous little plants, in nature sometimes consisting of a single small flower head on a stem 5 cm high. Often they grow singly rather than in stands. Like many small natural objects, however, these little plants are worth a detailed inspection. The involucres and upper stems are abundantly dotted with silvery stellate hairs, and *H. triste*, the more northerly species, has a dense woolly layer of long soft gray hairs on the involucre. In many specimens these hairs exceed the ray flowers in length. These two species display considerable phenotypic plasticity, and when grown in the garden they may become tall plants with a hundred flower heads or more. This aids them in adapting more readily to the harsh environment in which they live.

Key to the genus Hieracium of British Columbia

1a Flower heads pale cream-color to white; involucre, stem and leaves lacking stellate hairs ..... *H. albiflorum*

1b Flower heads yellow or orange-red; small white stellate hairs present, especially on the involucre

2a Slender alpine species; involucre with soft gray to black villose hairs 1-5 mm in length, often mixed with black glandular hairs and white stellate hairs; leaves narrowly elliptical to spatulate, often obtuse, all basal except for (sometimes) one small leaf on stem

3a Involucre lacking glandular hairs; villose hairs grayish, generally 3-5 mm long ..... *H. triste*

3b Involucre with black glandular hairs; villose hairs blackish, generally 1-3 mm long ..... *H. gracile*

2b Plants not alpine; involucre lacking villose hairs (though sometimes with long bristle-like hairs); leaves narrowly to broadly elliptical, acute, often not all basal

4a Leaves densely stellate beneath; stolons present; flower heads one per stem, yellow, the outermost ray flowers often red-tinged on the back; plants introduced ..... *H. pilosella*

4b Leaves not densely stellate beneath; stolons present or absent; flower heads several to many, yellow (not visibly red-tinged on the back) or red-orange; plants introduced or native

5a Flowers red-orange (darker on drying); stolons present; plant an introduced weed ..... *H. aurantiacum*

5b Flowers yellow; stolons present or absent; plants introduced or native

6a Leaf margins with short stiff subconic hairs; stem leafy, leaves alike in size except for the much reduced upper ones; basal leaves usually few or absent by flowering time; setose hairs lacking on stem (except sometimes at very base) and on involucre ..... *H. umbellatum*

6b Plants lacking subconic hairs; stem leafy or scapose, leaves progressively reduced upward; basal leaves generally present at flowering time; involucre and stem often with setose hairs

7a Leaves narrowly elliptical, seldom wider than 3 cm; entire or nearly so

8a Plants introduced and weedy, developing stolons by flowering time; rhizomes usually long and slender; setose hairs on involucre and upper stem (if present) having blackish bases

9a Leaves moderately to densely setose on both sides, not glaucous ..... *H. caespitosum*

9b Leaves glabrous to sparsely setose on both sides, glaucous ..... *H. floribundum*

8b Plants native or introduced, not stoloniferous; rhizomes shortened into a caudex; setose hairs various

10a Leaves all basal except for a single greatly reduced leaf on the stem; setose hairs on involucre and upper stem having blackish bases; plants introduced and often invasive ..... *H. piloselloides*

10b At least some of the cauline leaves well-developed (though reduced in size upward); setose hairs (if present) white; plants native, not at all invasive

11a Leaves moderately to abundantly setose on both sides; involucre sometimes with white setose hairs

12a Involucre covered with long white setose hairs ..... *H. albertinum*

12b Involucre lacking setose hairs ..... *H. cynoglossoides*

11b Leaves glabrous to very sparsely setose on both sides, often glaucous; involucre lacking setose hairs ..... *H. scouleri*

7b Leaves broader (ovate to elliptical), sometimes purple-blotched, often wider than 3 cm; at least some leaves broadly toothed near the base

13a Leaf blades tapering gradually to the base ..... *H. lachenalii*

13b Leaf blades rounded, truncate or cordate at the base. ..... *H. murorum*

REFERENCES

Baker, H. G. and G. L. Stebbins (eds). 1965. The Genetics of Colonizing Species. Academic Press, New York.

Gleason, H. A. 1963. The New Britton and Brown Illustrated Flora. Vol. III. Hafner Publishing Co. Inc., New York.

Guppy, G.A. 1975. The systematics of indigenous species of *Hieracium* (Asteraceae) in British Columbia. M.Sc. Thesis, University of British Columbia.

Gustafson, Å. 1946-1947. Apomixis in higher plants. Parts I-III. Acta Univ. Lund N.F. 42, 43.

Hitchcock, C. L., A. Cronquist, M. Ownbey and J. Thompson. 1955. Vascular Plants of the Pacific Northwest. Part V. Compositae. University of Washington Press, Seattle.

Hultén, E. 1968. Flora of Alaska and Neighboring Territories. Stanford University Press, Stanford.

Stebbins, G. L. 1953. A new classification of the tribe Cichorieae, family Compositae. Madroño 12: 33-64.

Fruit Tree Training for the Home Garden

DOUGLAS G. SMYTHE

The growing of fruit trees is one of the most satisfying forms of gardening. However, standard fruit trees may grow too large for the average city lot. An alternative to growing fruit in the conventional way is to adapt the plants to your location by training them. In this way they will take up less space, and their reduced size makes routine maintenance, treatment of disease, and picking of the fruit much easier. Various forms may be obtained by training, and each of these is better suited to some kinds of fruit trees than others. The training of these plants need not be unduly difficult if some basic rules are followed.

One-year-old trees must be used. These are not easily obtained in B.C. as there has been no demand for them. The trees generally available in nurseries are two-year-old trees. However, these are not suitable for training, and an effort should be made to obtain one-year-old stock if at all possible. Use certified virus-tested stock. A number of reputable nurseries in the Greater Vancouver area sell virus-free material. Dwarfing understocks should be used for all fruit trees for which they are available, otherwise difficulties will be encountered in maintaining the size and shape of the tree.

FIGURE 2. Mr. Ken Wilson with a group of cordoned apple trees being grown at the Botanical Garden.

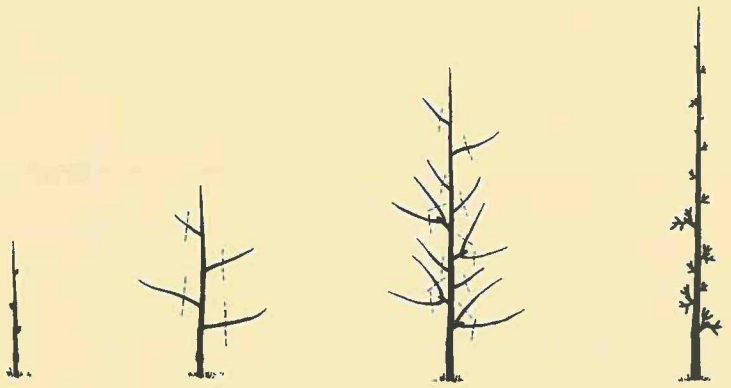


FIGURE 3. A cordon, shown (left to right) at time of planting; the first summer after planting; the second summer after planting; at maturity.

Plant the young trees during their dormant period, November to March, whenever weather conditions permit. The form in which they are to be trained should be decided on before planting, so that a suitable location can be prepared and (where necessary) a supporting framework built.

Apples and Pears

For both apples and pears a dwarfing rootstock should be used. The smallest dwarf stock available for apples is M-9, but this understock has poor root development and the tree must be staked from the time it is very young. The rootstock M-26, which produces trees almost as small, is much used in western Canada but also may need staking. Other less dwarf rootstocks that are suitable for training are also available in B.C. These include M-7, MM-106, MM-111, and even the relatively vigorous M-2, which may be used in areas where the soil is poor. For pears, Quince C (moderately dwarfing) and Quince A (semi-vigorous) rootstocks are best.

Apples and pears may be trained as cordons, espaliers or pyramid trees.

Cordons

A cordon tree consists essentially of a single main stem on which the side branches are pruned back to fruiting spurs. Cordons may also be grown with multiple stems. The main stem is allowed to grow to whatever height is desired, usually 2.5 to 3 m, then pruned back to maintain it at this height. Single cordons are usually grown at an angle of 45° (see Figure 2) in order to get the maximum length of stem into a given height. However, they may be also be grown vertically. Multiple cordons are more difficult to train and require more space than single cordons, but they may be grown by those who wish to take on the challenge.

A permanent system of wiring is necessary for growing cordons. Posts of iron, concrete or treated wood may be placed 3.5 m apart, and should extend 2.5 m above the ground. Three parallel wires are then stretched tightly between the posts, and fastened with adjustable straining bolts. The bottom wire should be about 75 cm above the ground, with the other wires at 50-60 cm intervals. Bamboo canes 2.5 to 3.5 m long are attached to the wires so that the cordons may be trained along them.

For single cordons the trees should be planted slightly less than 1 m apart. If they are to be trained as oblique cordons they should be set at an angle of 45° to the ground. The graft must be about 15 cm above soil level, with the scion uppermost. If the tree is planted with the point of union at or below ground level, rooting will eventually occur above the graft and the dwarfing effect of the understock will be lost. The plants are then tied to their supporting canes with soft string. At the time of planting,

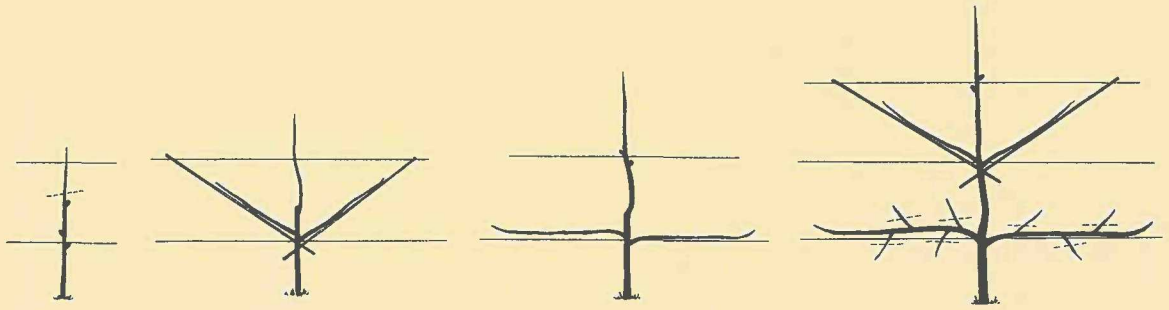


FIGURE 4. An espalier, shown (left to right) at time of planting; the first summer after planting; the next spring before growth starts; the second summer after planting.

side shoots more than 10 cm long should be cut back to three buds. After this only summer pruning should be necessary; this is usually done in late July. A good system of summer pruning (based on the method known as the "Modified Lorette System") consists of cutting back all mature lateral shoots from the main stem to three leaves beyond the basal cluster. Side shoots from these laterals are then cut back to one leaf. If there are a few immature shoots, treat them in the same way as the side shoots. The main stem is allowed to elongate until it reaches the desired height. If it is an oblique cordon, the new growth must be tied in each year to keep it at the proper angle. Once the leader has reached the required length, it should be pruned back each year in May. The training process for cordons is illustrated in Figure 3.

To make a double cordon, cut back the young tree to about 30 cm above ground level, just above a bud. Two shoots are allowed to grow, one on either side of the stem. Each of these is trained horizontally for 15 cm, then grown vertically. Pruning of the two stems is subsequently carried out in the same manner as for single cordons.

Espaliers

Espaliered trees (see Figure 4) are trained so that the branches lie in a single plane. They should be grown against a supporting fence or wall. Many kinds of woody plants may be trained as espaliers and there are a number of variations on the basic design. The form traditionally used for apples and pears consists of a single main stem, with the branches extending out horizontally on either side.

If several espaliers are to be grown, the trees should be planted 3 to 6 m apart. The exact spacing depends upon the final size of the tree, which will be regulated by the particular understock on which it is grown.

For training and support, the branches are tied to wires stretched horizontally on the wall or fence. There should be a wire for each tier of branches on the finished tree. The tiers are approximately 30 cm apart. During the first winter after planting the tree, cut it back to a good bud about 5 cm above the bottom wire. There must also be two other good buds near the wire, one on the left and one on the right hand side of the stem. Growth from these buds will produce the first tier of branches. Allow the top bud to grow vertically, training it against a cane. Remove any buds other than these three. During the following summer, tie the two new side shoots to canes which are arranged at a 45° angle to the main stem. If one becomes more vigorous than the other, raise the weaker shoot to a more vertical position. During the next winter, lower the canes and shoots, securing them to the bottom wire. Side shoots from these main laterals are cut back to 10 or 12 cm. As the leader continues to elongate, repeat the above process at each wire until the top wire is reached. At this point the leader is removed and only two buds are left. The growing tips of each lateral branch should not be pruned unless they have made poor growth. If this is the case, they should be winter-pruned to stimulate new growth. This is done by cutting back the previous summer's growth by one-quarter. When the

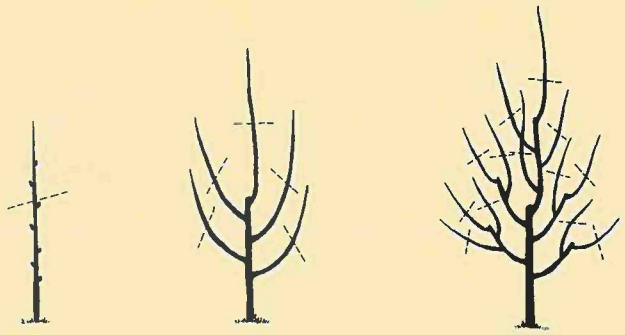


FIGURE 5. A pyramid apple or pear tree, shown (left to right) in the early spring soon after planting; in the following winter; in the second winter.

branches of each tier have reached the desired length, the leaders should be pruned back to 1 cm of new growth each May. The sub-laterals (side shoots from the lateral branches) are pruned back to one leaf in the same way as described for cordons.

Pyramid Trees

These trees (see figure 5) have a central main stem from which side branches radiate outwards, the general shape being very much like that of a Christmas tree. This training method gives a more natural, less stylized form than those already discussed. Most kinds of fruit trees may be trained as pyramids. A dwarfing rootstock should be used, but it should have a sturdy rooting system so that the tree will not have to be staked.

The tree is planted during the winter but pruning is started in the spring, just before new growth begins. At this time, the leader should be cut back to 50 cm above the ground and the side shoots back to about five buds. During the following winter, shorten the leader back to 20 or 25 cm of new growth. Cut the lateral branches back to a bud on the lower side, so that the branches will grow out at a wide angle. During the latter part of July each year, prune the main branches back to 5 or 6 leaves and cut out any competing central leader. Each winter the central leader should be pruned back to 20 or 25 cm of new growth, and any secondary growth that has appeared since the summer should be cut back to one good bud. Any thinning out of branches should also be done at this time. Once the tree has attained a height of 2 m, prune the new growth hard back every May to a length of about 1 cm in order to keep the tree to the required height.

Peaches, Apricots, Plums and Cherries

For peaches and plums, a good rootstock is the semi-dwarfing St. Julien A. In the case of peaches, since they are not exceptionally large trees, ordinary vigorous stock could also be used. No dwarfing stock is available for apricots or for sweet cherries, so if these trees are to be trained a large amount of space must be allowed. Sour cherries, however, have a less vigorous growth habit and produce smaller trees.

These trees are suitable for training as fans or as pyramids.

Fan Training

Fan training (see Figure 6) is the best method to adopt with trees which are to be planted against a south- or west-facing wall or fence. The branches are all in one plane, and are trained to radiate out from the tree starting a short distance above the ground. This allows each branch the maximum amount of light and air.

Plums and peaches on semi-dwarfing rootstock, as well as sour cherries, should be planted 4.5 to 5.5 m apart if more than one tree is being planted. Apricots, sweet cherries, and peaches on a vigorous rootstock should be planted 5.5 to 7.5 m apart if more than one is to be planted. For most city gardens, a single tree will suffice. It should be kept in mind, however, that both sweet cherries and plums

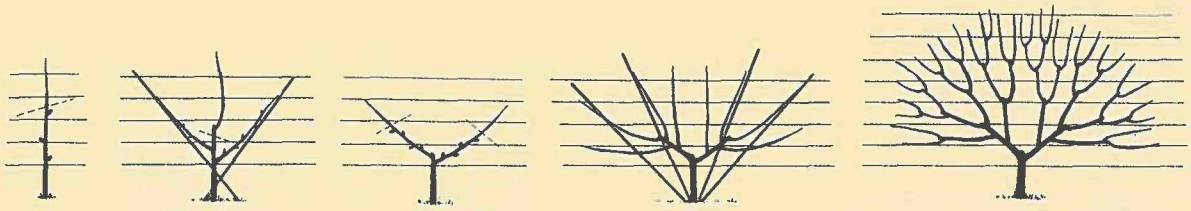


FIGURE 6. A fan-trained tree, shown (left to right) at time of planting; the first summer after planting; the following winter; the second summer after planting; at maturity.

must be cross-pollinated. This is achieved usually by growing another tree of a compatible variety nearby (possibly in the neighbour's garden!) Another solution to this problem is to graft onto your tree a branch from a different variety.

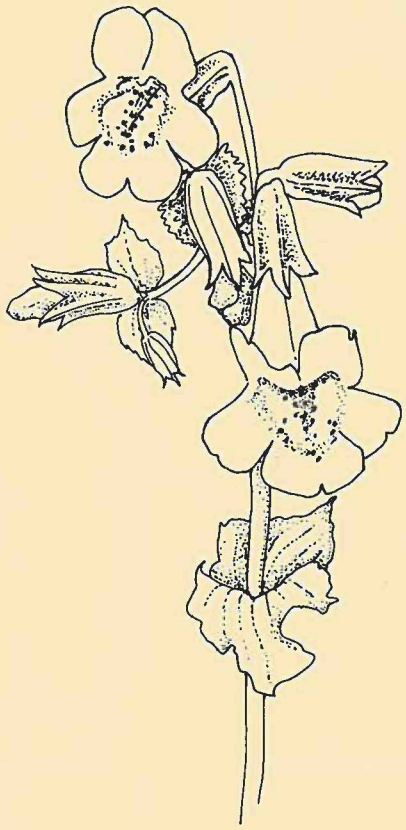
Plant the one-year-old trees 15 to 25 cm away from the wall or fence against which they are to grow, sloping the stems slightly towards it. Training wires to which the branches can be attached should be stretched horizontally on the wall, about 15 cm apart.

During the first spring after planting, cut the tree back to 60 cm above the ground, preferably to a lateral branch or a good bud which has a couple of other buds below it. All other laterals should be removed. In the following summer select two good shoots, one on either side, about 30 cm above the ground. Remove all buds except those at the top of the stem and on the lateral shoots themselves. When the two side shoots have reached 45 cm in length, tie them to canes at approximately a 45° angle. The main stem above these shoots may then be cut out and the wound treated with a tree paint. The next February, cut back each of the two shoots to a bud 30 to 45 cm from the main stem. During the second summer after planting, allow the shoots from these end buds to grow, and tie them in as before. In addition, two well-placed shoots on the upper side and one on the lower side of each branch should be allowed to grow on, and should also be tied in; this gives a total of eight branches. During February of the third year, cut back each of the branches to leave about 50 cm of ripened wood from the previous summer.

Space permitting, repeat this summer and winter pruning for one more year. Once the final size of the tree has been attained, the only operations that need to be carried out are the pinching back of unwanted shoots to about four leaves, and the removal of those that would otherwise compete with fruiting wood. When needed, well-placed buds may be allowed to develop in order to produce replacement shoots. These operations should be done during the summer months, starting at the top of the tree and working down it, and spreading the work over a period of one to two weeks.

Pyramids

Plums are commonly trained as pyramid trees. Peaches and sour cherries may also be grown in this fashion, though this is less usual. Plants grown on a dwarfing rootstock should be used whenever obtainable. The basic method of training is somewhat similar to that for apples and pears. At the time of planting, cut back the leader to 1.5 m above the ground and reduce the side shoots to half their length. Remove any side shoots within 45 cm of the ground. The following summer, during late July, shorten the new growth to 20 cm in length. Cut it back to a bud on the lower side of the shoot, in the same way as for apples and pears. Sub-laterals should be pruned back to 15 cm. Do not prune the central leader until the following winter, at which time the previous year's growth should be reduced by two-thirds. Once the tree has reached a height of 2.5 to 3 m, prune the new growth back each May to a length of about 2 cm. During the third week of July each year, prune in the same manner as for apples.

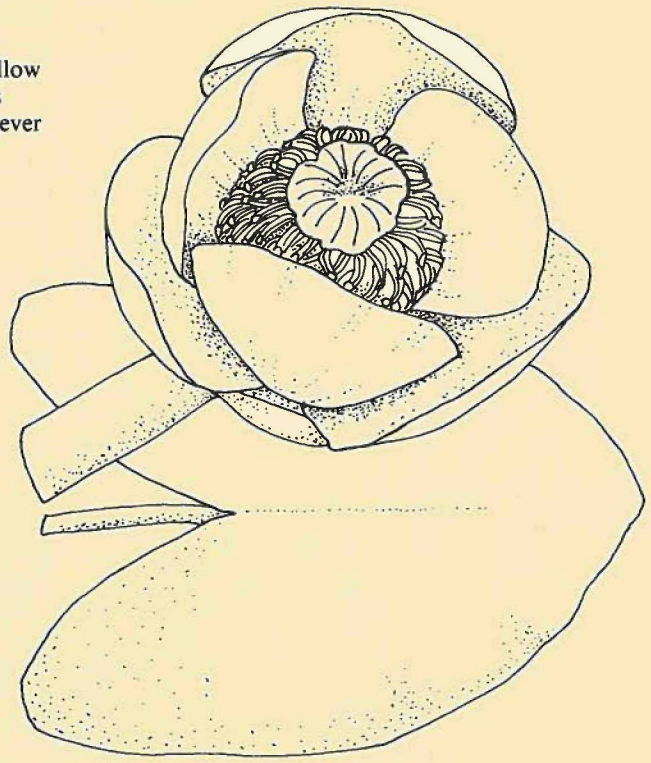


Mimulus lewisii, one of our most brightly colored monkeyflowers. It is common in damp alpine meadows in midsummer.

Botanical Garden Staff

Director
Dr. Roy L. Taylor
Supervisor of Operations
Mr. Kenneth Wilson
Research Scientist (Cytogenetics)
Dr. Christopher J. Marchant
Research Scientist (Horticulture)
Dr. John W. Neill
Research Technicians
Miss Andrea M. Adamovich
Mrs. Sylvia Taylor
Secretary to the Office
Miss Ellen O. Campbell
Plant Accession System
Mrs. Annie Y. M. Cheng
Mrs. Marie Shaflik
Education Coordinator
Mr. David A. Tarrant
Horticulturists
Mr. A. James MacPhail (Alpine Garden)
Mr. Gordon J. Ramsdale (Nursery)
Gardeners
Mr. Pierre Rykuiter
(Area Manager, South Campus)
Mr. Helmut Koblischke
(Area Manager, Upper Campus)
Miss Margaret E. Coxon
Mr. Harold Duffill
Mr. Leonard Gibbs
Mr. Robert E. Kantymir
Mr. Murray J. Kereluk
Mr. Paul Kupec
Mrs. Bodil Leamy
Mrs. Elaine V. Le Marquand
Miss Elaine F. Mascali
Mr. Sam M. Oyama
Mr. Ronald S. Rollo
Mr. Allan A. Rose
Mr. Douglas G. Smythe
Mr. Isao Watanabe
Mr. Peter A. Wharton
Mr. Thomas R. Wheeler
Flora of British Columbia Program
Dr. Roy L. Taylor (Editor)
Ms. Geraldine A. Guppy (Research Assistant)
Research Associates
Dr. Charles E. Beil
Dr. L. Keith Wade

Nuphar lutea ssp. *polysepala*, the Yellow Pond Lily. This vigorous water lily is widespread in British Columbia wherever suitable habitats occur.



DAVIDSONIA

Volume 7 Number 2 *Summer 1976*

Contents

The Hawkweeds of British Columbia 13
Fruit Tree Training for the Home Garden 18
A Rhododendron Phenology Study Program 23
Local Initiatives Program 1975-76 24
Climatology 24