In general, woody plants reproduce themselves most frequently by seed. Some however are propagated readily by root sprouts or suckers, and one of the easiest and most rapid methods of multiplying and extending the growth of certain trees, nearly all shrubs, many flowers, and some fruit plants, is by making and planting cuttings. Layerage, separation and division are also recognized as important methods of propagation.

**SEEDAGE**

Seeds usually consist of three very important parts; namely, the embryo, endosperm, and seed coat. In reality, the embryo is
the complete plant in miniature, the endosperm is made up of food storage materials, and the seed coats vary from structures containing thick walls to thin outer layers of cells. The seed coats protect the embryo from excessive drying, mechanical injury, and sudden changes in temperature. The endosperm often completely surrounds the embryo and its nature may influence germination and growth. Seeds possessing an immature or incomplete embryo are not fully developed; and seeds that are small, shriveled, or poorly developed usually do not possess sufficient stored food to bring about the development of the embryo and the growth of the seeding above the soil surface.

Selecting and Handling Seeds

The first essential of successful propagation by seeds is fresh seeds of good germinating quality. In collecting seeds from bearing trees, shrubs, or other plants, examination should be made to determine the size, color and plumpness of seed kernels. It is a good policy to collect your own seeds as far as local conditions allow. This is the best assurance of fresh seeds of true quality. When home collection of seeds is practiced, it is usually advisable to defer the operation until the majority of the seeds are mature.

Maturity of Seeds.—Good seeds should be fully mature. With most seeds maturity may be fairly readily determined by the color and nature of the pulp of the fruit, seed coat, or embryo itself. Usually inferior seeds with low germination appear shriveled, the kernels are brownish to black in color and the seeds show a general lack of vigor and normal development. Maturity may be determined by cracking or cutting the seeds and examining the embryo, which should appear fresh and of good color. Dead embryos exhibit a yellowish and water-soaked appearance, contrasted with the clear white color of live germs.

Mature seeds are frequently separated from immature seeds by placing the lot in water for a few days. The pulp and inferior seeds will come to the surface, while the good or viable seeds will settle to the bottom of the container.

Storage of Seeds.—The proper care and storage of seeds during the interval between collection in the fall and planting time is important. Conifer seeds from arbor-vitae, spruce, and pine may be stored in paper bags or tightly closed containers where they are kept dry, cool, and away from mice. Seeds of other conifers and from deciduous shade trees, shrubs, and fruit trees are usually injured by drying.
Consequently such seeds are generally placed in cool, moist storage as soon after gathering as possible.

**Seed Stratification.**—The most common method of providing constant and suitable moisture for seeds during the fall and winter is through seed stratification. In a shallow box with holes in the bottom for drainage, moist sand and seeds are placed in alternate layers from one-half to one inch deep. The box is then placed flat on the ground in the garden or other enclosure in a well drained place, or in a cool cellar, and held as nearly as possible at a temperature of 35 to 45 degrees Fahrenheit. When placed outdoors, to prevent damage from mice and rats, it is usually advisable to cover the box with screen wire.

Another method of keeping seeds moist and cool consists of placing them in flat containers made of galvanized screen wire. These seed packages may then be held in moist sand in shallow boxes or placed on the ground outside and covered with sand. Since some seeds like those of the apple start growth very early in the spring, it is important that plantings be made early, or before growth starts.
The following is a partial list of seeds that may be planted in the fall soon after being collected or held by means of stratification until early spring and then planted: Apple, apricot, ash, bittersweet, cherry hackberry, hawthorn, hazelnut, hickory nut, horse chestnut, red cedar, locust, maple (species that ripen in fall), pawpaw, peach, pear, pecan, persimmon, plum, Russian olive, sweet gum, tulip tree and black walnut.

Seeds of the following plants may be kept dry and planted in the early spring: American arbor-vitae, black cypress, catalpa, hemlock, larch, mock orange, mulberry, redbud, spruce, sycamore and wisteria. Seeds of the birch, elm, maple (species that ripen in spring) and oak may be planted as soon as ripe.

**Soil Preparation and Planting**

Deep, rich, friable and well drained soils are best for seed planting. Sometimes a plot in the vegetable garden will fill the needs for a seed planting in a very satisfactory manner.

Thorough preparation by deep plowing or spading is essential. Disking, harrowing, raking and leveling are also important. For horse cultivation, the rows are laid off 3½ to 4 feet apart and fairly large seeds such as peach, plum, cherry, pecan, and walnut are planted in the row 5 to 8 inches apart and covered with soil to a depth of 1½ to 2 inches. Late fall is usually a very satisfactory time for the planting of stone fruit and nut seeds, although injury may be done by rodents. Smaller seeds such as apple and pear are often planted in a row at the rate of 12 to 15 seeds per foot and covered to a depth equal to about twice the diameter of the seeds.

For hand cultivation and when the amount of land for seed plantings is limited, the rows may be placed closer together and the seeds planted in the rows a less distance apart. It is also true that small seeds may not require as wide spacing in planting as large ones.

**Cultivation, Irrigation and Fertilization**

Cultivation should start early in the spring, often before the seedlings push through the soil. Stirring the soil frequently conserves soil moisture by keeping down weed and grass growth. It also tends to keep the soil loose and mellow, which may facilitate seed germination and sprout growth. The cultivations should usually follow rains and be continued until about August 1.

Irrigation during dry periods will induce a stronger growth and often save many seedlings. Where facilities for applying water are available, it may be particularly important in late spring and early
summer. Through irrigation at critical dry periods the stand of seedlings may be increased as much as 25 to 50 per cent. More growthy and desirable plants for setting in the fall or spring may be produced by practicing irrigation when needed.

Fertilizer applications at the time of planting and after the seedlings start growth may be of value in the production of strong and vigorous plants. In general, however, it is better to select seed plots, if possible, where the soil fertility has already been built up sufficiently to grow satisfactory seedlings.

If manure is used it will generally give best results if incorporated in the soil the year before the seeds are planted. Commercial nitrogen fertilizers are usually applied after growth starts or when the seedlings have pushed through the soil. It is generally most economical and effective when placed in belts or strips about 2 inches wide at the depth of the seed and 4 to 6 inches from the seed. The rate of application is about 100 pounds per acre.

Transplanting

Some species like black walnut, pecan, and peach may under good growing condition be large enough after one season's growth for planting in permanent locations. With good growth, however, seedlings are frequently allowed to grow for 2 years before digging and setting in permanent locations.

Digging in the fall should be delayed until the leaves drop naturally. Full wood maturity cannot be secured if digging is performed before the leaves fall. After digging, the trees should be planted, heeled-in or stored properly.

Coniferous Seedlings

Seed beds for coniferous seedlings should be given special attention to see that they are fairly rich and consist of sandy or well-drained loamy soil. Seeds may be planted in the fall or spring. Some provision for watering the young seedlings should be made as great losses occur if the plants become dry.

Beds 4 feet wide with a 2-foot walk between are common. It is very essential that the soil be thoroughly prepared by good plowing or spading. The final preparation of the soil with harrow or rake to smooth and compact the soil is important.

Seeding.—Broadcast seeding is generally preferred, although the seed may be placed in rows. With good seed and careful sowing, only about one-half to two-thirds as many plants are produced on the
average as seeds sown. If broadcast, a rather thick stand of 75 to 150 plants per square foot may give good results.

After the seed is sown, a roller or packer is used to place it in close contact with the moist soil particles. A covering of soil equal to about twice the diameter of the seed is sufficient. For covering therefore, the bed is generally sprinkled with sandy soil. As a rule one is more likely to cover too deeply than too shallow.

The time between seeding and sprouting, which may require 30 to 50 days, is the most critical period in the starting of the plant. It is important that the soil be kept moist but not wet. Burlap coverings are sometimes placed over the beds but these should be removed as soon as sprouting occurs. After the seedlings push through the soil they are subject to an attack of "damping-off," which may cause great losses.

Shading.—Some method of shading the plants or protecting them from full sunlight is usually desirable for good results. Both high and low shading structures are in use. Lath frames 3 by 4 feet, with open spaces between 2 to 3 inches wide, generally prove satisfactory. Supports for the frames may be made by driving stakes and attaching to them wire or lath.

To keep the young plants healthy, fairly dry cool air should circulate beneath the lath screens. The soil should at all times be supplied with moisture but the surface if kept dry will be more effective in preventing the "damping-off" disease.

Transplanting.—When the seedlings have attained a height of from 3 to 6 inches, they are ready to be transplanted to a bed similar to the seed bed. Early spring usually gives the best results in transplanting. The plants may be set in rows 6 to 8 inches apart and in the row 1 to 2 inches from each other. Good care, paying particular attention to watering, should follow transplanting. Stirring the soil or cultivating at intervals is also essential for best results.

Setting in the Nursery.—After one or two years the seedlings should be large enough for transplanting to the nursery. Care should be exercised to prevent root drying. During dry periods irrigation after setting should be found helpful. Satisfactory growth in the nursery for one or two years should produce trees suitable for permanent plantings.

CUTTAGE

A cutting consists of a cut off or detached twig or portion of a plant placed in soil or in water for the purpose of producing a new plant. Hardwood cuttings are made from the matured or ripened wood
of trees or shrubs. Softwood cuttings however usually include all the cuttings handled in the outdoor planting or hotbed employed during the spring and summer. Forced cuttings grown in the home or in the greenhouse are also included. Evergreen cuttings may be classified as either softwood or hardwood.

**Hardwood Stem Cuttings**

Nearly all of the ornamental shrubs, such as spirea, tamarax, viburnum, hydrangea, species of barberry, cranberry, deutzia, roses, weigela, mock orange, and many others may be grown successfully from hardwood cuttings. Some trees like the willows, poplars and a few evergreens such as the arbor-vitae, yew and some species of junipers may also be grown by means of hardwood cuttings. Among the fruits the currant, gooseberry, grape, and fig may be propagated from hardwood cuttings.

**When to Make Cuttings.**—The wood of last season's growth may be taken in the fall, winter and early spring months. There is no advantage in procuring the cuttings in the fall except to avoid winter-kill. No matter when the cuttings are taken, it is important that they be examined carefully to see that the wood is alive, mature, and capable of making root and shoot growth. Moreover, if rather firm, vigorous wood of the past season's growth is used for cuttings, much stronger and larger growth is usually obtained.

**How to Make Cuttings.**—Cuttings are usually made from 6 to 8 inches long. A length of 4 or 5 inches may be very satisfactory for some plants including roses. A sharp knife or shears may be used and care should be taken to see that the lower ends of the cuttings lie the same way in the grouping or bunching. If the cuttings are planted upside down, that is, with the top part in the soil, growth will not take place.
It appears that the position of the cuts in relation to the buds or joints is of little importance. If the top cut, however, is made through or close to the bud, drying out may involve the bud and prevent growth. The lower cut is often made fairly near the joint. To make cuttings rapidly for commercial purposes, the branches are bunched on a chopping block and cut into desired lengths with an axe or hatchet.

Storing.—Good results in the late fall or early winter should follow storing the cuttings horizontally in moist soil, sand, sawdust, sphagnum peat, or a mixture of sand and peat. For the first three or four months the best storage temperature seems to be about 50° to 55° and the remainder of the storage period about 35° to 40° F.

By subjecting the cuttings in the beginning to a temperature of about 50° F, callus growth facilitating root development is likely to occur, while the later cold temperature retards growth and breaks the rest period of the buds. Under such conditions, the tops should be ready in the spring for a rapid leaf and shoot growth and the roots for a strong development from the basal regions.

Planting.—Plantings should be made in the spring as soon as soil and weather conditions will permit. Rows may be laid off with a plow or hoe at the distance desired. It is important that the soil be firmed about the base of the cutting to facilitate root development. One and one-half or two inches, including at least one bud, should be left above the surface of the soil.

Late fall or early winter preparation of the soil for spring planting usually produces the best results. The cuttings may then be planted early in the spring while the soil is too wet for stirring. If the
ground is fairly smooth, the rows may be marked off 24 to 36 inches apart by stretching a string from stakes driven into the soil. The cuttings may then be pushed into the soil by the side of the string at 6 to 10 or more inches apart, leaving only an inch or two above the surface of the soil. This method of planting is generally more rapid and since the cuttings are pushed into the soil, the bottom parts from which root development starts are likely to be in close contact with the soil particles, which tends to cause rapid root growth.

**Softwood Cuttings or Slips**

Softwood cuttings are often known as "slips" and many kinds of plants grown in the home and greenhouse are multiplied in this way. Examples of such plants are begonias, chrysanthemums, carnations, roses, geraniums, fuchsias, and many others. In the greenhouse or in the home this method of propagation may be followed in the winter time. Herbaceous or softwood cuttings may be made from leaves as well as from stems. This is especially true of begonia and other plants of this character which have thick, fleshy leaves.

**Preparing the Bed.**—Herbaceous cuttings generally do best in clean, sharp sand. Where the bed is made indoors, it should be at least three inches deep, with good drainage provided at the bottom to remove surplus water.

**Making the Cuttings.**—Softwood cuttings or "slips" usually consist of a piece of stem containing two or more "joints" or nodes.
Nearly all of the so-called bedding plants root readily within about 10 days from a softwood cutting made from strong, healthy plants making a normal growth.

Cutting wood should be kept in a moist, fresh, turgid condition. In preparing slips, they should be made from 4 to 6 inches long. The leaf area should be reduced materially, leaving only one small leaf and parts of about two other leaves, or parts of 3 or 4 leaves may constitute the remaining leaf surface. This is done to lessen evaporation of moisture from the cutting and prevent wilting. It is true, however, some investigators have shown that better rooting of herbaceous cuttings is secured if the leaf area is not reduced, provided some other means is used to prevent wilting.

**Planting.**—Cuttings of average size are planted about 2 inches deep. To induce rapid rooting, the sand or soil should be pressed down firmly about the base of the slip. To protect the newly planted cuttings from the sun and prevent drying, old newspapers may be spread over the bed and fastened down for a few days until the cuttings become established.

**Watering.**—The cuttings should be watered thoroughly after planting. Less water will be needed in cloudy damp weather than in bright, sunny, warm weather. The moisture and heat of a small cutting box in the house may be increased by placing a pane of glass over the box. This may have the effect of helping to imprison the heat of the sun and cause the temperature of the soil and plants to raise, in which case better growth may be procured. A few cuttings may be covered with inverted glass jars to increase humidity and maintain a more constant temperature.

**Bottom Heat.**—Heat applied beneath the plants or seeds is known as bottom heat. It may be obtained from fermenting manure, brewers grain, spent tan bark, or by hot water, steam and warm flues. Bottom heat is used extensively in starting the growth of plants and seeds in advance of the outdoor season. This often makes possible the production of vegetables, flowers and other plants several weeks ahead of their normal season.

The most general application of bottom heat is through the use of hotbeds. Brick or tile flues which carry heat beneath greenhouse benches or hotbeds is also of practical importance in many instances. In commercial production, however, iron pipes carrying hot water or steam beneath the benches or beds is in greater use. Propagators make use of glass sashes to confine the air and heat above the plant and
seed-beds. In a small way, glass jars and other utensils are used in promoting growth. Still another contrivance used in the home and elsewhere is the small propagating oven. Heat for such ovens is usually supplied by lamps or electricity.

Subsequent Care.—Syringing and careful attention to insect and disease attack are important. The amount of syringing or spraying the plants will depend upon local conditions. Usually one treatment in the morning, and if conditions are fairly dry, another one in the late afternoon will be found to be sufficient.

After the plants have rooted well and made some top-growth, they may be transplanted to outdoor coldframes to harden them off. They may also be placed in larger boxes provided for them in the home. The cuttings should be set in rich, well-drained soil and placed in rows 6 inches apart and 4 inches apart in the row. The temperature of the room or house for best results should be kept at approximately 65° F.

Propagating Roses

Most of the common garden types of roses are easily grown from either hard or softwood cuttings. For softwood cuttings, a large percentage will root readily if the wood is taken from a flowering shoot. Generally the wood is in the best condition for cuttings from the time the flower buds show color until the petals fall.

The cuttings are made about three to four inches long. They are trimmed to leave one joint or node at the bottom and two above. All but two small leaves or leaflets nearest the top are cut off.

For growing the rose cuttings, clean, sharp, medium coarse sand is best. If only a few cuttings are to be made, a box about four inches deep will be satisfactory. Holes or cracks in the bottom of the box should give water drainage.

It is well to place in the bottom of the box crushed rocks or cinders to a depth of about 2 inches. Then place about 2 inches of sand on this and thoroughly water it. It is important that the sand be very firmly tamped. If the sand is fairly coarse, two or more tampings may be needed as cuttings will not root in loose sand.

In planting the cuttings, a narrow slit about 1½ to 2 inches deep is made in the sand with an old knife. The cuttings are inserted up to the lower leaf and are placed 1½ to 2 inches apart in the row. The sand is then pressed firmly about the cutting.

The planting box should then be shaded until the plants start root growth. Unbleached muslin is very good for shading a planting bed.
The sand should never be allowed to become dry. In most cases, the bed will need sprinkling with clean water three to four times a day for the first 7 to 10 days.

In about three weeks the roots will begin to appear and the sand should be kept somewhat drier. When the roots are about one-fourth inch long, the cuttings should be removed to soil.

A bed of rather light well-drained soil is usually best and for the first two weeks after planting, shading the bed is suggested. The soil in the bed should be cultivated from time to time to keep the soil in good condition for the best growth of the plants. It is important that young plants be carefully protected the first winter.

**Propagating House Plants**

While many are familiar with the method of propagating house plants by placing a slip in a bottle or tumbler of water until it strikes root, yet a more satisfactory procedure may consist of the use of a large flower pot or small box. Coarse material like crushed stones or coarse gravel is placed in the bottom and covered with about three inches of sand. If the pot or box can be placed in damp sand or sawdust, it will be easier to maintain the proper moisture supply.

The cuttings should be made from recently developed wood. The hardest and oldest wood does not root readily and neither does wood which is too soft, sappy and succulent. Fairly well matured and firm wood will generally give the best results. As a rule, a cutting from 2 to 3 inches long will be satisfactory.

![Fig. 6.—Blackberry root cuttings. The lower cut is made planting, and the upper one square to prevent inverting when planting upright.](image)
Use a sharp knife and cut just below a node or joint if possible. Remove the bottom leaves and allow only one or two to remain at the top. Arrange to give the cuttings light but keep them away from the direct rays of the sun until they become established. Open a trench or hole in the sand deep enough to permit the setting of the cutting down nearly to the leaves. Press sand very firmly against the stems and water freely. From four to six weeks will be required for the cuttings to develop enough roots for resetting or potting. When transplanting lift the cuttings carefully, being careful to preserve all the roots possible.

**Root Cuttings**

Short cuttings of roots about 4 to 5 inches long may be used in the propagation of many kinds of plants. Some of the most common of these are horseradish, blackberry, and Johnson and Bermuda grass. In planting root cuttings the pieces should be placed horizontally or the lower end down. To prevent mistakes in placing root cuttings in the ground, the lower cut may be made slanting and the upper one square.

Plants like the apple, pear, cherry, plum, and hawthorn can be grown from root cuttings more easily than from the stem cuttings, but are usually propagated with less difficulty by grafting and budding.

**Tuber Cuttings**

A tuber is a thickened portion of a root as in the sweet potato, or a stem as in the Irish potato. In both cases large quantities of starch

![Fig. 7.—Sweet potato roots showing sprouts or slips ready for removal and transplanting. Large potatoes may be cut near the middle, from end to end, and planted in the hotbed with the cut or flat side down.](image-url)
are stored in the tubers. Good examples of tuber cuttings are Irish and sweet potatoes. Roots usually arise from the base of the young shoots or sprouts. When the sprouts are removed and planted, the tuber cutting will produce new sprouts. This practice is used in propagating sweet potatoes and sometimes Irish potatoes in order to secure a large number of plants from a small amount of seed stock.

![Fig. 8.—Showing correct method of cutting potatoes for seed. Irish Cobbler on the left, Early Ohio in the center, and Bliss Triumph on the right.](image)

With Irish potato cuttings at least one bud or eye is left on each piece, but in making sweet potato cuttings only a portion of the skin or epidermis is required on each piece as the sprouts develop from adventitious buds.

Tuber cuttings from the sweet potato produce an abundance of slips or plants when planted in hotbeds. After the slips have attained the desired size and root development they are removed and planted. The cuttings may continue to produce slips for a number of plantings. Irish potato cuttings should contain one or more healthy eyes and average from 1½ to 2 ounces in weight. Blocky seed pieces are preferred to wedge-shaped pieces. The cuttings are planted in the field or plot to a depth of 3 to 3½ inches as soon as possible after being made.

**LAYERAGE**

The method of rooting plants in the soil while still attached to the parent plant is known as layerage. New plants are formed by the cutting away and removal of the parts rooted. This constitutes one of the easiest and most successful means of propagation. The parent supplies food to the layer while it is becoming established in the soil. A form of tip layerage permits the black raspberry to propagate itself
naturally. Other fruit plants like the grape, currant, gooseberry, and fig, as well as plants that are difficult to graft or to root from cuttings, may be propagated successfully in this manner. The method is practiced from late spring until midsummer.

**Mound Layering**

Plants having stiff stems like currants, gooseberries, and others difficult to bend over and cover with soil, may be more readily propagated by mound layering, in which case the stem base is usually wounded slightly by scraping with a spade or knife to induce better rooting. Soil is then mounded around the plant. Roots develop from the basal portions of the stems which have been covered, and after one or two season’s growth, the branches may have made sufficient root development to permit severance from the parent plant. When this is done the plants may be set in the permanent location or nursery.

**Simple Layering**

Simple layering as applied to the black raspberry is most common. The branches produced may bend over until the ends or tips rest upon the soil. The part of the cane in contact with the moist soil may strike root without assistance, but if covered with soil leaving a small portion of the end protruding, more plants may be produced. To encourage root development of some hardwood plants, the under side of the branch covered with soil is frequently notched or ringed. If the branches are difficult to hold in place, they may be weighed down with soil, rocks, or pegged down with sticks. After one season’s growth, the branch should be established with roots and top. It is then cut from the parent and removed for transplanting in the nursery or to its permanent location.
Compound Layering

When the cane or branch is covered with soil intermittently and several plants are produced, the form is known as serpentine layering or compound layering. In this method the branch is covered with soil at the various places where there are buds, and buds are left uncovered between the covered portions. Roots develop along the branch in the soil, and leaves and shoots grow from the buds above the soil. After one or two season's growth, the branch may be cut into its several parts, each having stems and roots. These are then removed for setting in a new location.

Continuous Layering

In continuous layering the complete branch is covered. This method is used in propagating certain varieties of grapes and other vines which do not root readily when layered in the usual way. Rooting may often be hastened by ringing or notching the under side of the nodes. The branch is usually pegged down in a shallow trench and soil is drawn in around the plants from time to time. Finally the furrow is filled and level surface tillage is continued until late summer. In the fall or spring when the plants are large enough for transplanting, the branch is cut into as many parts as there are tops with good rooting. These are then planted in their permanent location or in the nursery row for further growth and development.

Fig. 10.—Strawberry plants rooted from runners.

Modified Layering

The strawberry is propagated by means of runners, which is a kind of modified layer method. From the runners produced, new plants are formed which may be cut off and planted. The parent plant may develop as many as four or five new plants. Two or three plants,
however, is the average. The most vigorous and productive are usually the first and second ones arising from the runner.

**SEPARATION AND DIVISION**

By separation is meant the multiplication of plants by means of naturally detachable vegetative parts such as bulbs and corms. Division includes multiplication by cutting or breaking into pieces such plant parts as tubers, crowns, and rhizomes.

**Separation**

Bulbs, corms, and tubers are specialized buds containing stored-up plant food. Layers of starchy tissues make up true bulbs and consist of overlapping scales as in the case of lily and onion bulbs. Bulbels, bulblets, and cormels are small bulbs or corms that have not developed into blooming size. Well-known bulbs consist of the onion, lily, hyacinth, tulip, etc. In fact, bulbs are really buds located on a short axis and encased in leaves or bud scales. They are propagated by wounding the basal portion and causing young bulbs to form, which are known as bulbels. With the lily these are found at the top of the bulbs, while in the case of the hyacinth they form at the base. The bulbels are removed when the bulbs are harvested. Bulbels may be planted again and if given proper attention for a few seasons should prove very satisfactory. After one season the larger ones may produce flowers although two years of growth are generally required.

Bulb scales can also be caused to produce bulbels. They are removed in the fall and planted perpendicularly in flats. Bulbels develop at the base of the scales. Mixed sand and leaf mold makes a good bedding for the plants.

Bulblets are small bulbs. In the case of the onion they form at the top in the flower parts. With some species the bulblets drop to the ground and reproduce naturally. In forming full grown bulblets, the treatment is similar to that given for bulbels.

A corm is a bulb except that it is solid throughout and it does not consist of scales and layers. Familiar examples of corms are Indian turnip, crocus, gladiolus, and caladium. They form vegetative organs about the mother plant and are known as cormels. Production is increased by wounding the base of old corms and the cormels are treated in general like bulbels.

**Division**

In the propagation of many herbaceous plants, division of clumps and clusters of crowns is a common practice. Perennials including
cannas, violets, zinnias, columbines, phlox, hollyhocks, and other simi-
lar flowering plants can be increased by division. When the roots
are removed from the soil in the fall or early spring the crown can be
divided with a spade into several parts or small clumps. These may
then be used in starting new plantings.

In the case of cannas, peonies, iris, etc., which produce few buds
on the crown, care should be taken to insure at least one good bud and
preferably two on each divided part. Furthermore, it is important
in setting that the parts be covered to no greater depth than about 1½
to 2 inches.

Rhubarb is propagated ordinarily by root division. A piece of
root containing a strong eye or bud will grow and under favorable con-
ditions produce a good plant in one season. The crop is often forced
in hotbeds or special buildings by lifting the roots from an old planting
in the fall and removing a sufficient number of eyes or buds to start
the new plantation in the spring. The large fleshy roots are forced
in late winter and early spring.

Asparagus may also be propagated by dividing the crowns. The
method is not very satisfactory, however, and it is not in general use
by producers.

An occasional division is beneficial to many perennial plants multi-
plied in this manner. If the division is too frequent it results in weak
plants. In general, phlox and iris can be divided and benefited about
every three years, while peonies usually do best if divided no oftener
than once in 5 to 10 years.