THE BURLAP CLOUD METHOD FOR ROOTING DECIDUOUS SHRUB CUTTINGS

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The method of propagation which I will present is one that has previously been described (1) by my grandfather, the late Leslie Hancock, in 1953 at the Third Plant Propagators' Society meeting. My intention is to outline the technique as it is being used now, including developments which have enhanced the system over the last 35 years and, moreover, to bring to the surface again a viable system of softwood cutting production.

Leslie Hancock, a recipient of the IPPS Eastern Region Award of Merit in 1968, developed the Burlap Cloud method of propagation as a result of experimentation in adapting a system of propagation he had witnessed in Nanking, China. The system he had observed there consisted of beds of soil which had raised lips of formed soil. These beds were flooded like miniature rice paddies and cuttings of suitable shrubs were plunged into the slurry of water and soil. Immediately following this process the beds were covered with dense reed mats which shaded the cuttings from direct sunlight and helped retain the humidity in the air chamber below the reed mats. In the evening the shades were removed to allow the cuttings to get more light and to air overnight.

The shades were replaced in the morning as the dew evaporated from the cuttings. This cycle was repeated until the cuttings were rooted and the shading was reduced until full exposure was possible.

Intrigued by this somewhat primitive but successful method of propagation, my grandfather experimented over many years adapting this method at his own Woodland Nurseries in Cooksville, Ontario which is near Toronto, Canada. After poor success with making beds with formed edges to retain water, he developed a system using lightweight frames of red cedar lumber (Figure 1). The frames are made 45 in. wide by 12 ft long and is an open bottomed box made from 1 × 10 in. lumber. The frame is fitted with a 1 × 3 in. wood crossbar halfway down the frame to allow rigidity and to make it easy for one person to carry the frame around. Along each top side edge of the frame is added a 1 × 3 in. strip of lumber 12 ft long which is used to later attach a burlap sheet over the top of the frame. We now, as well, add corner braces of inexpensive lightweight shelf brackets, 10 × 10 in. These frames, when partially filled with sifted soil and flooded with water approximated the

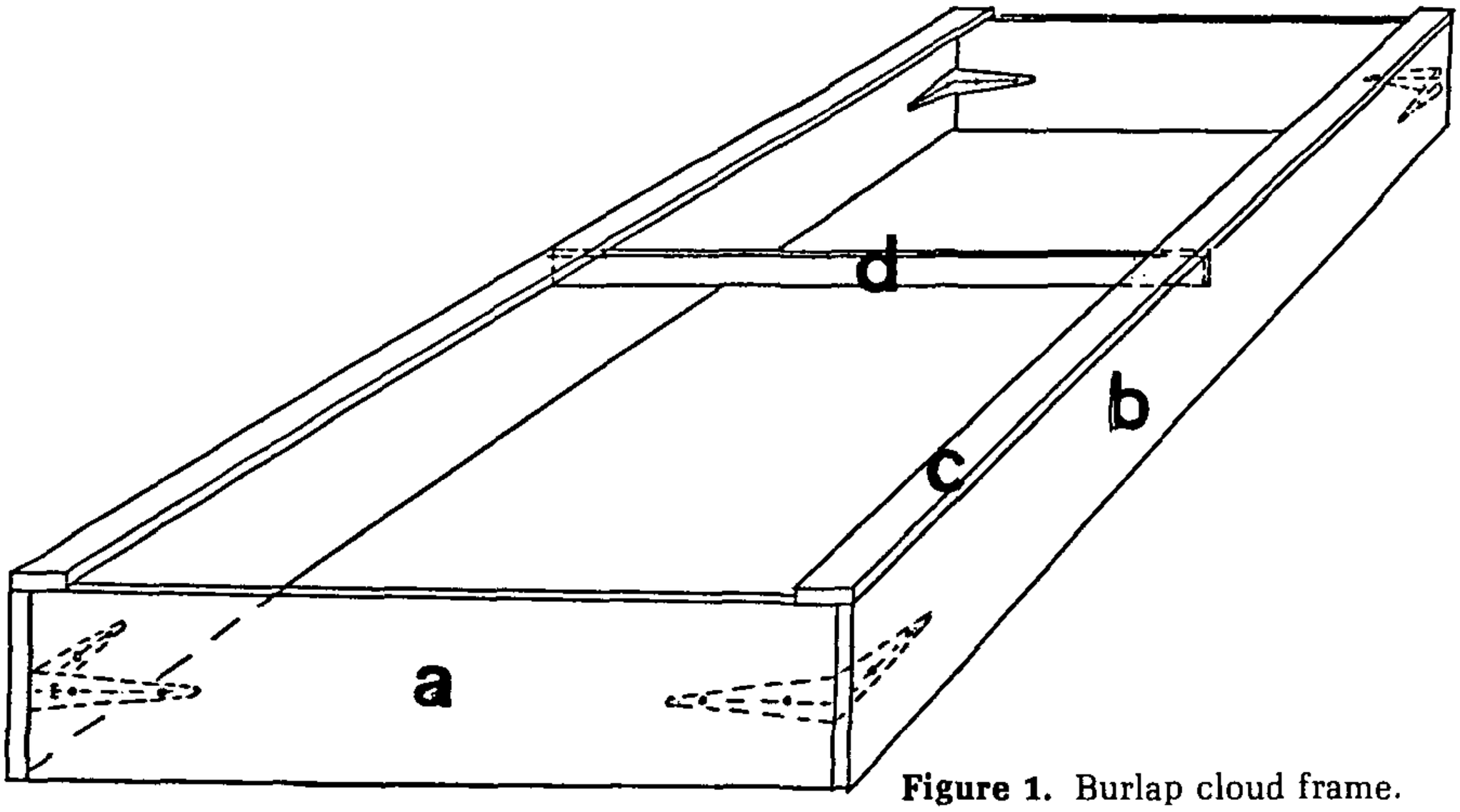


Figure 1. Burlap cloud frame.

MATERIAL KEY

1″ × 10″ Pressure-treated stock	C—12′
A—42½″	D—42½″
B—12′	E—10″ Grey shelf brackets
1″ × 3″* Pressure-treated stock	*—True 3″ wide—ripped from 1″ × 4″ stock

system he had seen work so well in China. Rather than reed mats, we use 10 oz. burlap, 40 in. wide to cover the frames.

Further experiments led to the practice of moistening the burlaps through the day to keep the humidity high in the growth chamber and to keep the cuttings from suffering under the harsh extremes of heat and dry air of the Canadian summers.

CURRENT METHODS

The current method of production has changed in many respects since my grandfather's initial paper, but some techniques have allowed even better results than previously published. As with his paper, I will attempt to detail the production now being used to produce high quality, strong liners of deciduous shrubs and some broadleafed evergreens with the "Burlap Cloud" technique.

Soil preparation. Because this method of propagation uses field soil as a rooting medium, I wish to preface this section by saying that my grandfather realized that particular soil conditions were necessary and crucial to success. A well-drained porous soil is needed so that raised beds can be formed, ensuring that natural and applied water will pass through the bed soil and migrate to the relatively lower pathways. Sitting water will not be tolerated by the rooting cuttings as they will rot before they root. I have witnessed this propagation system being used on several types of nursery soils such as silt loams, sandy loams, and both fine and coarse sandy soils. If allowances are undertaken to offer drainage from the

rooting beds, good results can be achieved with different soil types.

The area to be used for cutting production should be sloped slightly (1 foot fall per 100 feet) so surface water can be taken away via pathways. The soil should be clear of weed clumps and have reasonably clean subsurface of old roots and plant debris. The soil is rototilled with a rear-mounted tiller to break up the clumps of soil and to open up the soil for methyl bromide fumigation. Hoops or peat bales are put in place on the tilled surface to hold up a poly film so as to allow diffusion of the gas vapours to all areas of the beds. Canisters of methyl bromide are set in place on piercing tools just underneath the perimeter of the poly tarp. The edges are then buried in a trench 6 in. deep to trap the gas inside. By pressing down on the canister from outside of the poly, the canister is pierced and the gas is released. Methyl bromide has been found to be the most effective fumigant as it sterilizes the soil to the tilled depth, killing all pathogens, weed seeds, and insects which potentially could cut down on rooting percentages and interfere with subsequent cutting growth. Also with methyl bromide there is a short treatment period—two days under poly, followed by two days of aeration, so that in four days we can begin propagation.

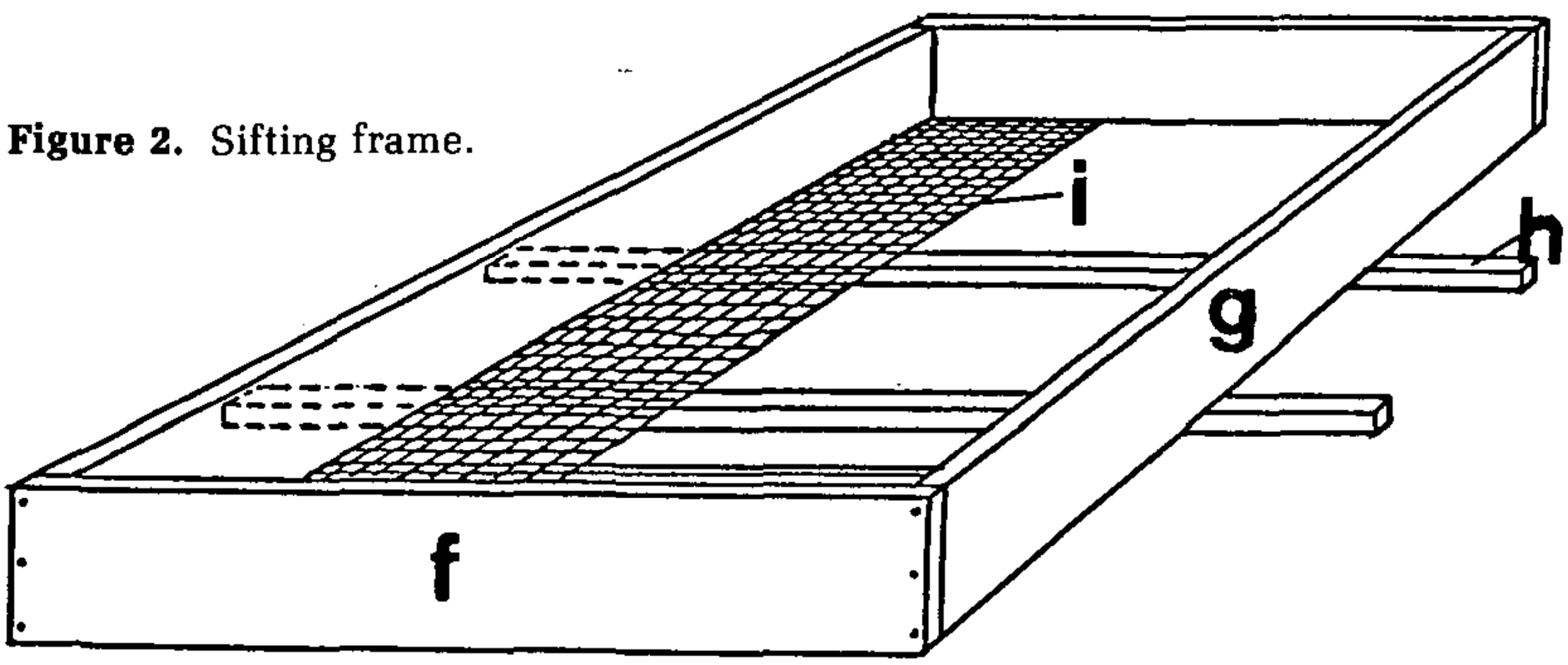
Frame setting. The area we normally use covered with frames is approximately 60 × 125 ft, allowing about 100 frames to be set out with 1½ to 2 ft pathways between them. The frames are set out end to end in rows with a string line to ensure straightness. Normally two sections of five frames are set out in the 125 ft bed, allowing a 5 ft gap between 60 ft runs. This is a convenient arrangement as a centrally located hose 75 ft long with good pressure is able to be pulled up and down the pathways easily.

The frames are sunken down into the tilled soil about 1½ to 2 in. by digging under the inside edges of the frame with a spade and settling them down in the soil. At this time they are levelled side to side with a 4 ft spirit level. End to end, sighting the tops of the frames will allow the frame setter to ensure that there is a uniform slope towards the draining ends of the beds along with the slope of the tilled area. Since the pathway soil will be lowered later this is important because it is easiest if the frames are uniformly graded so the pathways can be dug to a lower depth relative to the frames. Once one or two rows of frames are set out and graded, the soil can be prepared within the frames for cuttings.

Soil preparation. Starting at the beginning of a set of frames, soil is excavated from one half of the first frame to a depth of 1 to 1½ in. below the bottom edge of the frame inside and packed firm by pressing with the feet making the base firm and level. This will be a reference point for later cutting sticking. It is important for this base to be below the bottom edge of the frame so that excess water will be able to move laterally through the soil under the frame to a

depressed pathway. Once the half-frame is excavated, a soil screening frame is placed over the half-frame (Figure 2). This screen is a frame measuring 3 × 6 ft made of 2 × 6 in. lumber and has a hardware cloth bottom nailed on it with 1 in. openings. Soil is removed from the half-frame adjacent to the screen and is passed through the screen to partially fill the first half-frame. As a result, a mound of sifted soil is left which is clean of plant debris and stones and is of uniform consistency. The pathway soil immediately beside the frame being filled is then taken down to a uniform depth with a shovel making sure that its final elevation is below the level of the firmed excavated base inside of the frame. This is critical to allow for drainage from the frames, as previously mentioned. The soil which is taken from the pathway is also passed through the screen into the half-frame. The resulting amount of soil inside of the frame should, when leveled out, fill the frame to a depth of 3 to 4 in. above the firmed base. Several frames are prepared in this manner with the soil left in mounds right up until the cuttings are ready for sticking.

Figure 2. Sifting frame.



2″ × 6″ Pressure-treated stock
F—3′
G—6′
2′ × 2″ Pressure-treated stock
H—4′
1″ × 1″ Square wire mesh
I—3′ × 6′

Cutting preparation. Cuttings are collected from juvenile field-grown shrubs in active growth during June to mid-July. Cuttings of most cultivars can be 5 to 9 in. in length and should be firm but pliable, as normal for softwood cuttings. Pails with a holding capacity of approximately 200 cuttings are filled 2 in. deep with water for use in the field. As cuttings are taken from the shrubs they are stood with the cut ends into the water. When sufficient quantities are collected, they are brought into a cool shed or barn and removed from the water. They are then laid out on clean moist burlap and covered with the same to keep them turgid and cool. Leaves are removed from the basal portion of the cuttings to 3½ in., then they are dipped into a mixture of fungicides (benomyl and fer-

mate). The excess solution is shaken off, then bundles of cuttings are dipped into a hormone powder. For most cultivars 0.2% IBA is sufficient if they are done early enough, but others respond best to 0.4% IBA, or, occasionally 0.8% IBA, if they are woody or difficult to root.

Cultivars which we need in large numbers, we normally do at different dates through the month to avoid misjudgement of the state of maturity of the cuttings. Many times cuttings are taken from plants which were stripped of suitable cuttings perhaps two weeks earlier!

Cutting sticking. Prepared cuttings are taken to the field in plastic flats covered with wet, dense burlap to keep them moist and cool. At this stage the mound of sifted soil is leveled in the half-frame, ensuring that there are no depressions in the centre of the bed. These depressions result in pooling of water causing damage to the cuttings in the form of rotting in mild months or freezing in winter.

The sifted, leveled soil is drenched with water from a large watering can to saturation. This is done to the complete depth right to the firm base soil. A template made of 1 × 10 in. lumber with #10 screws almost fully screwed into it at set densities is pressed onto the moist soil to form indentations as marks for sticking the cuttings. The cuttings are immediately pressed into the slurry to a point where they are pushed down to the firm base (Figure 3).

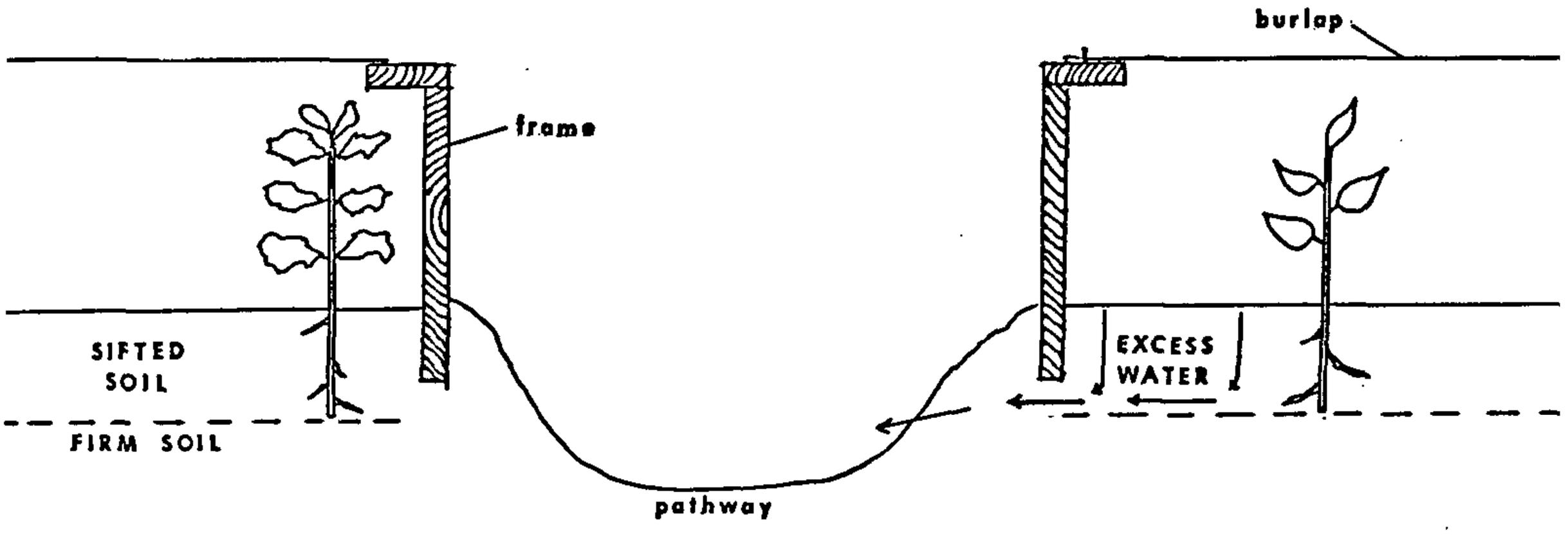


Figure 3. Pathway and frame cross-section.

Frame covering. The wood frames which are being filled with cuttings are covered along one edge of the frame with 40 in. wide, 10 oz. burlap which has been previously cut to lengths of 12 ft, 8 in. to allow for some shrinkage. This one edge is fastened using a construction staple gun at about 5 in. intervals along the 1 × 3 in. fastening strip, along the top edge of the frames. It is then drawn across, pulled taut and is pegged over 1 in. finishing nails which

have been hammered into the opposite fastening 1 × 3 strip on the frame. These nails are driven in halfway, about 1 ft apart.

Burlap maintenance. The burlaps are well watered just to saturation through the day. Drying of the burlaps is allowed but they should never become parched. If the burlaps are kept too wet, too frequently, the burlap cloud chamber does not heat up sufficiently and the cuttings are kept too damp, leading to rotting. The best determiner is to have a responsible member of the sticking crew keep an eye on the burlap's condition. Burlap watering frequency changes day to day, hour to hour, dependent on the wind and sun conditions. Average waterings are normally about 6 to 8 times, from the time the frames get covered in the mornings, until 5:00 pm. The frames are opened up to full exposure in the late evenings about 1 to 1½ hours before sundown unless there is a strong evening breeze which could desiccate the cuttings. Also the frames are left open in the mornings until the dew has almost evaporated from the leaves—usually about 8:30 am. It is for this reason that the burlaps are only pegged down on the one side of the frames. On foggy, rainy or very overcast days when there is little wind, the frames are left open so the cuttings can get extra light. Also, when the cuttings are seen to be rooting, the burlaps can be left open for longer durations to accustom them to more ambient light and moisture conditions.

Burlap removal and cutting care. In the mornings, after 3 to 4 weeks, the cuttings are checked for rooting by tugging on them. Cuttings often start regrowth when they are rooted. When most of the cuttings in the frame are rooted, the burlap is pulled off the frame and the frame is covered with double overlapping shades to initially give very indirect light and increased aeration. After 3 or 4 days, one layer of shades is removed to again increase light and to accustom the cuttings to ambient humidity. We are currently using synthetic snow fencing for our shading, cut from 100 ft rolls, 4 ft wide, which allows about 50% light. Most rooted cutting cultivars can be unshaded totally about 1½ weeks after removal of the burlaps. Because the frames are open bottomed, they are lifted off the beds about 2 to 3 weeks after the burlap removal, then the bed edges are firmed by packing them down by foot.

After the burlaps are removed, cuttings of most cultivars will put on a nice flush of growth throughout August and September. *Cornus, Hydrangea, Weigela, Kerria,* and others often reach heights of 12 to 15 in. with good calibre. *Spiraea, Potentilla,* and *Symphoricarpos* grow strongly and branch well, forming strong transplant material about 10 to 12 in. tall. Fertilization with a Cameron diluter and a garden sprinkler is done in the beds in late July and early August with a soluble 10-52-10 material to promote root development.

Winter storage. Normally, if reliable snow is common through the winter, cuttings can be left in the beds until spring. We usually

root cuttings of tender cultivars in common beds so that we can set up simple ridgepole structures of 2 × 2 in. lumber and erect a poly tunnel of opaque nursery film to moderate the extremes of winter weather. Mulching of the tender cultivars also helps protect them. If one has coolers or sufficient greenhouse storage, the liners can be lifted and overwintered there. We feel that if the cuttings are left undisturbed overwinter and moved before bud break in the spring, that we get the best transplanting success.

Pest control. Very few problems have been witnessed in the use of this propagation system. Fumigation of the soil has drastically reduced cutting losses, which were once due to harmful rooting medium pathogens. Also, the use of the fungicide dip and hormone treatments of the cuttings have been instrumental in dramatic rooting percentage increases. Both the fumigation and cutting preparation techniques have been added to the original "Burlap Cloud" technique since it was originally described to the IPPS members in 1953 (1).

Cuttings are sprayed while they are in the frames during the rooting stage with a fungicide/insecticide solution. This is done about every 1½ weeks unless spot treatments are necessary more frequently to control specific pests such as aphids on *Spiraea*.

Disadvantages. Criticisms of this technique are generally twofold: *Firstly,* the method is fairly labour-intensive in the soil preparation portion. We hope to mechanize the soil sifting in the near future as this is the only real step where we feel the labour is not being utilized effectively through the system.

Secondly, many question the manual application of water to moisten the burlaps through the day. We feel that the only system that could approach the thoroughness that a responsible cutting crew gives us would be a very good mist system governed by an electronic leaf sensor. This would allow the burlaps to get water consistent with the changing water demands of the burlaps through the day. But since there are reliable people around through the production cycle we have found it, to date, to be senselessly expensive and redundant to install a system like that.

Advantages of Burlap Cloud System. I feel that this propagation system is as viable now, if not moreso, as it was when introduced by Leslie Hancock. It can be used by small and large operations alike given soil conditions that are suitable. The beds which have been produced at Sheridan Nurseries in Georgetown, Ontario this year have drawn a lot of interest by visiting nurserymen who are intrigued by the percentage take and strong aftergrowth of the liners. I especially suggest that the system is a great way for new or expanding operations to markedly increase production with very little capital cost. The simplicity of the system is shocking when compared with more typical greenhouse or mist bed propagation structures. Tens of thousands of cuttings can be produced in a small

area of growing land which can be utilized very intensively with field soil as the rooting medium. Cutting storage right in the beds using mulch or simple tent structures of opaque poly also reduces the need for more elaborate cold storage facilities or greenhouse space. Undisturbed cuttings can put on strong growth through early fall, storing carbohydrate reserves to enable them to overwinter well and provides strong transplants the following spring.

Cultivars, such as those in *Prunus* and *Philadelphus,* which do not root well consistently under mist, do incredibly well in the "Burlap Cloud" system with reliable takes and regrowth.

SUMMARY

I encourage growers to look into this simple but effective method of softwood cutting propagation and not to dismiss it due to its basic approach. Elaborate facilities are not always the answer to increases in production. Time has proven this method to be an effective basis of production at Woodland Nurseries and has proven a valuable adjunct to other propagation systems used at Sheridan Nurseries.

LITERATURE CITED

1. Hancock, L. 1953. Shrubs from softwood cuttings. *Proc. Inter. Plant Prop. Soc.* 3:151–164.

CORNUS FLORIDA AND *CORNUS* 'EDDIE'S WHITE WONDER'—SOILS, ROOTSTOCKS, AND PROPAGATION FOR SHADE TREE PRODUCTION

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One of the most beautiful trees that can trace its "roots" to British Columbia is the 'Eddie's White Wonder' dogwood. The tree was bred and introduced by Mr. Henry M. Eddie, a pioneering nurseryman in British Columbia. Mr. Eddie grew mostly fruit trees and roses, subsequently supplying most of the fruit trees for the Okanagan orchards of B.C. in the late 20's and 30's.

During his life in Canada, one of his major interests was the breeding of dogwoods. His goal was to combine the best qualities of two dogwoods: *Cornus nuttalli* (Pacific flowering dogwood) and *Cornus florida* (Eastern flowering dogwood). He hoped to produce a