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# PECAN PROPAGATION IN TEXAS

BY

A. P. SWALLOW  
Horticulturist



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Address

T. O. WALTON, DIRECTOR  
College Station, Texas

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## I

### SOIL AND CLIMATIC REQUIREMENTS

The ideal condition for pecan production is to have the roots of the tree in perpetual, moderate moisture and the top in constant sunshine. Good pecan land should be fertile, deep, loose surface soil, containing some sand, underlaid by a porous clay subsoil. In general this condition is most nearly approximated in the deep filled valleys between hills. Most of the water, together with the mineral plant food materials in solution that are taken up by the hair roots, is taken from within four or five feet of the surface of the ground. In no case should the depth of this surface soil be less than two feet, so the lateral root system may fully develop. In areas of limited rainfall it should be much deeper. Shallow soils cannot be relied upon to produce regular crops. Tight land prevents the growth of an extended root system, and is too uneven in its moisture content.

The wood growing period of a pecan tree extends from the opening of spring to about June 15th—that is—the new growth continues to increase in size until about that time. The remainder of the season is required to properly mature the new growth. The bloom that produces the next crop of nuts is contained in the terminal bud of this new growth. The difference between a deep loose soil and a big root system on the one hand, and a shallow tight soil and a limited root system on the other, might easily prove to be the difference between success and failure in the crop, save in exceptional years.

It is not necessary to have a creek bank in order to grow pecans. There are many sandy flats, not crossed by any stream at all, that will grow them well.

There is some good pecan soil on most Texas farms.

## II

### VARIETIES

No factor in pecan culture is of greater importance than the selection of proper varieties for the orchard whether it be when planting budded trees or top-working the native growth. In each section of the pecan growing districts, there will be found those varieties which are especially favored there. Only a few of the best known standard varieties can be mentioned. There are many seedlings that are well worth propagating and the growers in every locality should be on the watch for these.

Native nuts and improved varieties can be scored according to the following table. Scoring of nuts, exclusive of the bearing habit of the tree, will be done for the growers by the Extension Service.

## SCORE CARD

Points

(1) Heaviness and regularity of bearing of tree.....	50
(2) Size of nuts.....	5
(3) Appearance of nuts; (shape 5), (color 5).....	10
(4) Cracking and separating quality .....	15
(5) Proportion of meat to shell and corky filler.....	15
(6) Richness and flavor.....	5

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100

It will be observed that this scale assigns fifty points of the hundred to the bearing habit of the tree. This is done on the ground that no variety is worthy of introduction that does not score high on this point.

Entirely too much value has been placed upon the size and appearance of pecans without consideration of the other and more important characteristics.

As a matter of fact the very large nuts are nearly always inferior to those of good medium size.

From this score, the varieties best suited for further propagation can be readily chosen.

Considerable difference exists between the varieties recommended for East Texas and those that do best in West Texas.

There is no clear line of demarkation between the section adapted to the two kinds, but a line from Denison to Houston would nowhere be far out of place. Along this line there is a belt some fifty miles wide in which either kind flourishes to some extent, one kind enjoying the ascendancy one year and the other kind another year, depending on varying climatic conditions, particularly rainfall. All territory east of the belt, together with a strip one hundred miles wide along the coast, extending as far west as Victoria, is better adapted to Eastern varieties.

For the Eastern Division and Coastal belt the following varieties have found favor: Success, Stuart, Moneymaker, Schley, Frotscher, Delmas.

For the Western Section: Halbert, Burkett, Texas Prolific, and Kincaid are the best known. Other standard varieties and some seedlings do exceptionally well in certain places.

Thorough study of the varieties being used in close proximity to the proposed new orchard is the most satisfactory method of deciding which will be the most profitable. Since different seasons affect the various kinds of trees in different ways, it is better to have several varieties in the orchard than to have only one.

### III

#### PLANTING PECANS AND TRANSPLANTING PECAN TREES

Orchards may be started by planting the seed where the trees are to grow permanently, or by setting trees that have been started and budded in the nursery.

No doubt, time can be saved by setting out nursery trees as they will

bear at least three years earlier than the trees from seed, but it would cost more than to establish the orchard by the other method. If a period of ten years be taken into consideration, the crops of the ninth and tenth years should much more than pay the additional cost of the plan. Planted seed, will require considerable time and attention to budding and care of the buds later.

If the owner of good pecan land, does not have the necessary money available for transplanting the grove, he should, by all means, plant pecans and afterwards bud the young trees when they have attained sufficient size.

#### **Planting the Seed—**

Pecans should either be planted in the fall where they are intended to grow, or should be stratified in boxes of sand and kept moderately moist during the winter. In the latter case they should be taken up just before germinating time and planted just as a single hill of corn or beans should be planted.

The first year when the young pecan tree is very small and tender it will die of sun-scald if it does not receive attention. If the ground around it is allowed to bake and become smooth, a black spot will appear on the southwest side of the trunk, just where the reflected rays of the sun and the direct rays converge. This spot is the result of an actual burn that kills the cells of the cambium layer. It can be prevented by stirring the ground frequently, or by placing a straw mulch around the tree, or by driving two short pieces of board into the ground, one on the south and the other on the west side of the tree.

#### **Requirements of Good Nursery Stock—**

There are three very important points in connection with the purchase of pecan trees from the nursery, namely, constitutional vigor, good lateral root system, and adaptation to the soil and climatic conditions where the trees are to be grown.

Examination of any row of nursery seedlings will show some large trees and some small ones, all of the same age. It has heretofore been the custom of some nurserymen to bud the larger trees as soon as they attain sufficient size and to leave the smaller trees until they, also, are large enough to bud at a more advanced age. The man who gets the first trees gets a good bargain, even though they cost him \$5.00 apiece, and the man who gets the last trees gets a bad bargain, no matter how little the price. A pecan bud, growing on a vigorous stock, will produce a greater growth and heavier crop. It is better to pay a good price and in return to insist on high quality, than to accept poor stock.

In order to get moisture and food in sufficient amount it is necessary for the tree to have an elaborate and extended system of lateral roots. Young trees that are deficient in this respect may continue the characteristic after transplanting, if they live, but the death rate among them is sure to be high.

### Setting the Trees—

The holes in which to set them should be three feet deep, and it is better to have them two feet wide and five feet long than to have them three feet square, as the former arrangement will permit free use of the shovel handle in the lower portion of the hole. The trees should be taken to the field in the original package and only one tree should be taken out at a time, care being exercised to keep the roots of the others covered with wet sacks to prevent drying out of the roots.

One man should get in the hole with the tree while another shovels in the dirt, using only good top soil. The man in the hole should press the soil around the roots of the tree with his hands, being careful to see that the lateral roots are straightened out horizontally, and not pressed down around the tap root. Continue in this manner until all lateral roots are covered. Then two or three buckets of water should be poured in to settle the soil to the roots. The hole should then be completely filled, and the soil packed down. All the top of the tree should then be cut off, leaving only five or six buds of the budded portion, and a cone shaped pile of dirt should be heaped up around the tree, nearly or quite to the top. Frequent stirring of the surface of this dirt will be necessary. Either a straw mulch or two boards will serve as indicated for young seedlings.

## IV

### CULTIVATION AND CARE OF THE ORCHARD

Doubtless transplanted trees, if they happen to survive, will bear a few more pecans and a little better ones than the native trees under like conditions, but regular and heavy crops cannot be raised without care and cultivation.

Cultivation that is good for other crops is also good for pecans. When an orchard has been set out the land should be planted to small crops and cultivated as usual for a number of years, being sure to leave the pecan rows wide enough to obviate skinning the trees with the single-tree when plowing.

Not much reduction in the farm crop will be sustained by the space left for the pecan rows, as the adjacent rows on either side will yield more abundantly than the others, being relieved of competition on one side.

By the time the trees are eight to ten years old they should be producing in commercial quantities and thereafter other crops on the land should be considered only incidental. The open space between the trees should then be planted to peanuts, peas, or other legumes, which should be hogged off, not harvested. The remains of these crops should be turned under in the fall and rye or other grain sowed for a cover crop and winter pasture—the trees now being large enough to permit of pasturage. This cover crop likewise should be turned under in the spring.

## Pruning—

Pecan trees require little pruning except the first two or three years after transplanting. The early pruning has in view the formation of the head of the tree, with special reference to height above the ground and arrangement of branches. Four or five feet above ground is the best height to head a tree. Two or more limbs should never be allowed to grow from the tree at the same height above ground.

Young pecan trees are likely to put out a number of branches near the ground the first season after transplanting. All these branches should be removed the following winter except the best one, so as to force the growth into it. If this branch should in turn put out other branches too near the ground, they should also be removed, and so on until the proper height is reached. If a young tree should fail to put out branches near enough the ground it can be made to do so by cutting off the top.

## V

### PROPAGATION

Native trees may be made to bear fine quality nuts of known characteristics by putting on to them buds or grafts from trees of improved varieties. There are several methods of budding and grafting these native trees. Chip budding and cleft grafting are done in the winter when the trees are dormant. Bark grafting and patch budding are carried on in the spring and early summer. Of these various methods of top-working, patch budding is the most important and is recommended for general use.

#### Selection of Trees to Be Worked—

**Constitutional Vigor:** In this connection the item of the greatest importance is constitutional vigor. There seems to be no other class of trees that varies so widely among its individual members in their fruit production as does the pecan. Of two trees near each other, budded to the same variety, of the same age, and growing in the same soil, one may produce only ten pounds of nuts, while the other produces a hundred pounds, all because of inherent weakness in one stock and inherent vigor in the other. Therefore, in the event of choice between a small tree and a larger one, or between a tree in exact position and one a little out of line, let the matter of constitutional vigor be the deciding factor.

**Position:** In any deep fertile soil pecan trees should not stand nearer together than sixty feet each way, while in deep alluvial valley land seventy feet each way is better. However, trees in a single row might stand much nearer together than sixty feet, as they would not be exposed to competition on all sides.

Of course, it will not be possible to arrange native trees already growing on the land into perfectly straight rows, but the field should be staked off into squares, and the tree nearest to a stake, size and constitutional

vigor being considered, should be chosen. This will fairly proportion the ground area and air space among the trees.

**Size:** From sprouts to trees a foot in diameter marks the practical range in size of trees for budding and grafting. The larger trees are more difficult to work, particularly by the inexperienced, and it would be better, perhaps, for beginners to choose the smaller ones.

It is possible to top-work trees that are more than a foot in diameter, but, since it is bad practice to cut back branches beyond four inches in diameter, the time and expense involved in cutting back, inserting buds, after care of buds, removing sprouts, etc., render the operation impractical.

**Shape or Form:** In case of choice between two otherwise equally desirable trees, the one heading high and the other branching five or six feet above the ground, choose the latter.

In case of choice between two otherwise equally desirable trees, the head of one being composed of two or three large limbs, and the head of the other of five or six smaller limbs, choose the latter, unless the size of the former tree is such that its two or three branches are under two inches in diameter. In that case, the former tree should be chosen, as requiring less work in budding or grafting.

The reason for choosing smaller limbs is that their ends heal over more quickly after being cut, but this does not enter as a deciding factor below two inches in diameter. The above remarks are intended to be applied to trees of considerable size.

### **Patch Budding**

Taken all-in-all this is by far the most important method of working pecan trees. Since the discovery that patch-buds can be successfully placed in the thick bark of large limbs and trees of considerable size, it has largely supplanted the use of the bark graft. It possesses, several distinct advantages over the bark-graft: (1) It brings the entire cambium surface of the scion into intimate contact with that of the stock; and, for this reason, a much higher percentage of success can be attained by its use than by any other. (2) It can be used from April to October, rainfall being sufficient. (3) It makes it possible throughout the season to take fresh buds, from one tree and place them on another—in fact, such buds are best—while only storage wood can be used for grafts. (4) A given number of buds will go much further by its use than by grafting. (5) It obviates the necessity of cutting back the tree until it can be seen that the buds are living. (6) It makes it possible to form the head of a young tree, at any height and in any shape desired. (7) Where only one graft can be placed at a cut, two or more buds can be placed without cutting, thus increasing the chance of success.

A patch-bud can be taken from a bud stick of any size and placed upon a stock without reference to their comparative sizes. The edges of the patch-bud, also present shoulders for the patch, which prevent its slipping



while being tied-in. This greatly facilitates and hastens the operation of budding.

Season: This work can be done at any time after the bark begins to

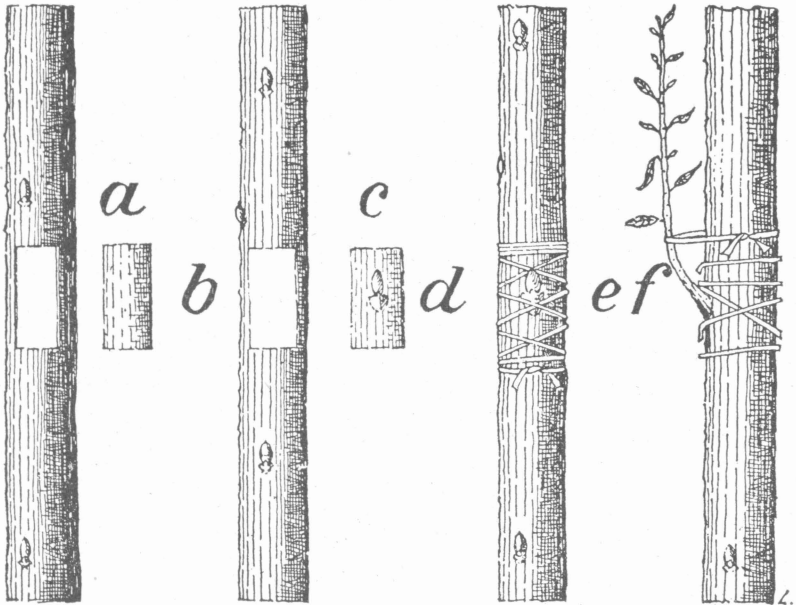


Figure 1

(a) Stock with section of bark removed; (b) the section removed; (c) bud stick with section of bark removed; (d) section of bark containing bud removed from bud stick; (e) fine bud in place on stock after having been wrapped, tied, and waxed; (f) new growth tied to stub of stock left for that purpose.

slip in the spring until it sets in the fall, though the best time is in early spring. After the first of July buds can be taken from the current season's growth, though such buds are not as good as either storage buds or buds from one and two year old wood on the trees. Buds put on after the first of July should not be forced, but left dormant during the season. This can be effected by leaving the top and all the branches on the stock until winter, when the branches should be removed and the top cut off just above the bud.

This rule of leaving the bud dormant after the first of July will admit of some slight variation to conform to seasonal conditions, principally rainfall. The reason for leaving the bud dormant arises from the danger that a sprout from it might not attain sufficient size and maturity to go through the winter. But if rainfall has been abundant, and the stock is in vigorous condition, an early July bud may be forced with reasonable assurance that it will get in condition to withstand the cold. However, it should be added that nothing will be gained by forcing even under these conditions. The cutting back of the tree in mid-summer sufficiently to cause the forc-

ing out of the bud will weaken the tree enough to more than counter-balance the temporary gain in the new sprout. In short, the dormant bud will overtake the forced bud the following season.

**Size of Stock:** "Patch-budding" can be done on young trees and small limbs from the size of a lead pencil up to an inch, or more, in diameter. The limiting factor in budding to large stocks is rather the condition and thickness of the bark than the size of the limb or tree.

A necessary condition in patch-budding is approximate equality in thickness of bark of stock and scion; but this is always so nearly the case within the limits of an inch to need little consideration.

Generally speaking, a patch-bud, may be placed at any good smooth spot where the bark is not too thick, though it is well to use buds from the oldest sticks in the collection for the large stocks, and buds from the young sticks for the small stocks.

Large limbs and trees of considerable size can be successfully budded by first paring the bark of the stock thin, and placing the bud in the middle of the pared place. Thickness of bark is under control by trimming. The only precaution necessary to observe is not to pare thin enough to cut through the bast cells in the inner portion of the white bark, through which the food supply comes.

The limiting factor in budding large stocks used to be thickness of bark. It is now the size of wound that will heal over after cutting-back to force out the buds. Two inches or under in diameter is not considered too large.

**Condition of Stock:** The very best time for patch-budding is when the buds begin to swell early in the spring, just as soon as the bark will slip. At this period the new bud has the advantage of being assisted in healing by the use of the reserved food carried through the winter, soon followed by the flow from the new leaves.

Subsequent to this time, that is, after the leaves are developed and the main process of healing depends upon the newly prepared plant food, the stock must be in the most active condition.

It would be useless to place buds on a tree when there was no "sap" to feed them. Cut a small section of bark from the tree to be budded. If the bark turns loose readily, and moisture is plentiful under it, the tree is in condition to be worked. If the bark does not slip readily, and moisture is scant or altogether wanting, a bud surely would die.

Avoid budding during long summer drouths and for some days thereafter, unless the stocks are strong, vigorous sprouts from the roots of old trees that have been cut down. Such sprouts have such an abundant root system to nourish them that they are generally in good condition long after young trees, depending upon their own roots, are unfit for budding.

**Position of Bud:** The proper position of the bud on the stock depends upon the size, development and shape of the tree to be budded.

In the growing of nursery stock for use in Texas, the bud should be placed close to the ground. Nursery trees should be severely cut back at the time of transplanting, and earth should be mounded-up nearly to the top

of the stub. This mounding above the budded portion would be rendered impractical by budding too high.

In case of budding to branches, the bud should be placed on the top side near the body of the tree. A bud near the end of a limb will grow another limb, and this will make the combined length too great.

By referring to Figure 1, it will be observed that the section of bark (b) from the stock (a) contains no bud. The bark was removed from an internode, that is, between buds. The wood in this position is smooth and even, while there is likely to occur a gnarl and slight projection under a bud, which might injure the new bud when forcibly pressed against it in tying.

The shape of the limb or sprout to be budded has much to do with the correct placing of the bud. A straight smooth round place should be chosen. A bud should never be placed in a curve of the stock.

**Good Buds:** The best buds are those on smooth round wood, near the beginning of a year's growth. Buds from near the tip of a limb should be rejected. They are usually on a ridge, which causes a hollow under the bud when it is removed. This hollow cannot be pressed down against the wood of the stock, and before it can be filled by new tissue the bud will die.

Good buds can be gotten from two and even three year old wood. On thrifty growing sprouts there are sometimes three and even as many as four buds at a node. The primary one of these buds puts out the first year and drops off; the secondary bud the second year, and so on. This character of bud-wood is very desirable for use on well matured stocks, even when cut from nearby trees and used in summer. However, care should be exercised to see that buds are alive, as some of them do not fall off for a long time after dying. If they are alive they will be flexible, and will give to pressure of the thumb nail. If they are dead they will be rigid and will break off when pressure is applied.

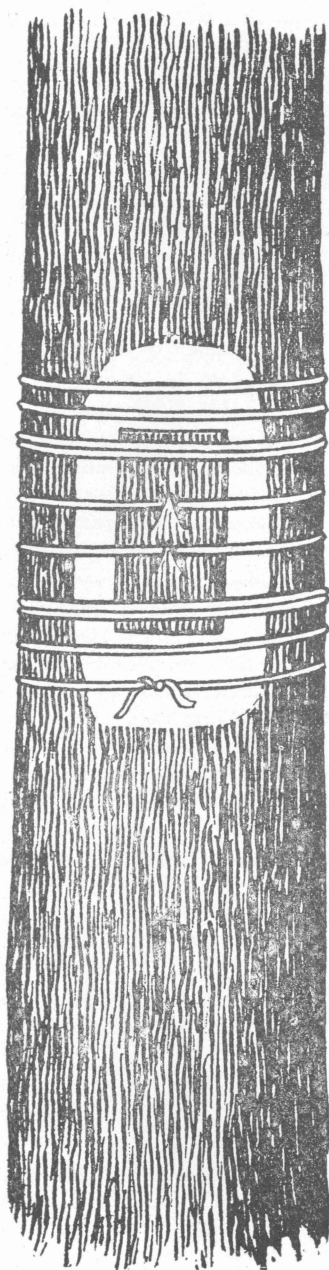
**Number of Buds:** The number of buds to use on a particular tree is largely a matter to be decided by the judgment of the operator. Every beginner wants to use too many buds. One bud is enough for any small tree, and is usually enough for any tree up to two inches in diameter, if judiciously placed.

Figures 3 and 4 will suggest some idea of how to take advantage of the various forms, and will tend toward the adoption of the sound motto, "Let the Tree do the Work."

However, it is not intended to convey the idea that only one bud should be used per tree under all circumstances. In case of larger trees several buds can sometimes be used to advantage, but do not use too many.

**Bud-wood, Size and Age:** Strictly speaking neither size nor age is a limiting factor, wood can be used for buds as long as live buds remain on it, which is usually two or three years. During this time it rarely attains any considerable size.

Commercial bud-wood is nearly always of the previous season's growth,



up of the bark around the bud segment in the drying out process after trimming. It is important to wax over all this pared portion.

and ranges from the size of a lead pencil to that of a small cigar.

**Condition, Ready for Use:** In patch-budding it is always more satisfactory to use buds freshly cut from the trees, when it is possible to do so.

When using stored wood the buds should be used just as soon as the bark on the bud sticks will slip freely. When put on at this stage considerable union has time to ensue while the bud is developing from its own food supply; if the bud is already developed at the putting on, it is likely to die before union can be effected and food supply established. A high percentage of success can not be accomplished with badly swollen or bursting buds. No doubt it would be better to perform the operation with dormant buds if it were possible.

If the buds on the stick will not slip when desired for use, they can be brought into condition by burying them several days in a shallow trench in a sunny spot of ground. If the ground is dry, water the trench with warm water.

**Keeping Bud-wood:** Wood for early patch-budding can be kept on cold storage or buried in a cool damp place.

For all except early work, bud-wood should be cut fresh from the tree.

**Length and Width of Bark:** The section of bark taken from the scion, in which the bud is imbedded, should be about an inch long and about half-inch wide. A somewhat wider bark may be used on a large stock. The exact length and width are not material.

**String:** Ordinary cotton wrapping-twine, not too large, but strong, possesses

Figure 2. A patch-bud in a trimmed spot on a pecan tree about one and one-half inches in diameter. Particular attention should be paid to the thickness of the bark of the stock along the sides of the bud-bark. If the bark of the stock be thicker there than is the bark of the bud segment, the strings cannot press the bud segment down as it should be.

Note the strings just above and below the bud segment. These strings are to prevent any lifting-

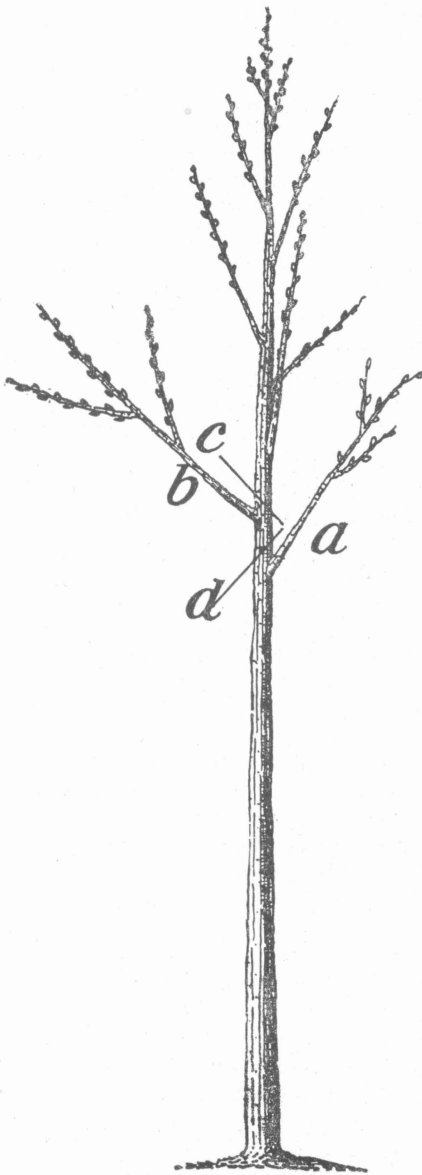


Figure 3—This Figure represents a pecan tree two inches in diameter at the ground with the limb (a) four feet above the ground. If several of the limbs were budded, the head of the tree would be formed too low to admit cultivation under it. By budding the limb (a) only; the head of the new growth resulting from the bud at (a) can, by pruning, be made to head at any desired height.

If the limb (a) were five or six feet above the ground, both it and the limb (b) should be budded, and the head of the tree thus formed.

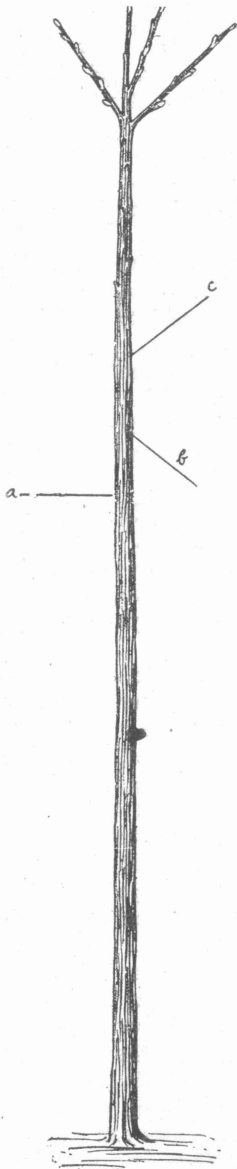
the advantage of convenience for tying-in buds. A ball of it can be carried in the pocket, and the desired length pulled out and cut off each time.

When tying-in, use only sufficient force to make sure that the bark segment of the bud is brought into contact with the wood of the stock, as there can be no doubt that many buds are killed by the cutting-in of the binding strings. One pecan tree may grow more rapidly than another, and the string on it would need cutting sooner. Failure to cut the string at the proper time will strangle the bud.

**Wax, How Much:** In sealing the cut made in budding, only a thin glaze of wax is necessary, just enough to make sure the cut is sealed. There is neither use nor excuse for piles and daubs of it, though if some wax get on the bud it will do no harm.

**Wax Cloth:** These may be used where preferred, small squares of thin cloth that have been dipped in hot paraffin (for hot weather) or in equal parts of melted rosin and beeswax (for cold weather) are easy to use and are just as effective. A hole should be cut in each cloth for the bud.

**Order of Tying and Waxing:** Patch-buds should first be tied-in and then waxed. It would be impractical to reverse the order. The buds would not stay in place while the waxing was being done. The small binding strings can easily be waxed over. When waxed cloth is



Formerly it would have been sawed off six feet above the ground and a bark graft inserted.

It is now recommended to place three patch buds at a, b, and c, first paring the bark. The bud at a, is on the west side, about five feet six inches above the ground; the one at b is on the south side about six inches above a; the one at c, is on the north side about six inches above b.

After the buds have formed unions with the stock, the top of the tree should be cut off and the buds forced out in accordance with directions given under patch-budding.

used, the cloth should be applied first. It will hold the patch in place for tying.

**Cutting the String:** The time between the operation of budding and the cutting of the strings varies with the rapidity of development and growth of the stock. It ranges from two to three weeks. A bud that has not set in three weeks will never do so.

Cut the strings by passing a sharp knife across them on the side of the stock opposite the bud. Do not attempt to remove the pieces of the string as that may cause openings in the wax.

**After-care of the Bud:** The attention necessary to force a bud out, and particularly to keep it growing after it is out, varies with the condition of the bud and stock at the time of budding.

The leaves are the food factories of the tree, where plant foods are manufactured to be distributed throughout its system.

Pecan bark will slip before the buds have swollen to any appreciable extent, and it is evident that, in case where a bud is put on just as soon as the bark of both stock and scion will slip, the healing will take place partially through the food reserve, as there are no leaves yet, and possibly will not be for another week or two. Manifestly, the portion of the stock above the bud would, under these circumstances play a less important part than it would had the operation been performed later in the season. However, the top will, even in this case, do no harm for some two or three weeks. As the leaf system develops and the circulation increases, the healing will depend to a greater and greater extent upon the portion of the tree above the bud. Where the leaves are already developed at the time of budding it is best to leave about half of the entire top to assist in healing the wound occasioned by the budding.

When union has fairly started, about three weeks after the date of budding, the top should be cut to the desired length and the native buds rubbed

Figure 4—This figure represents a pecan tree two inches in diameter at the ground, and ten feet high. It grew in a thicket in competition with other trees, reached up for light and air, and the limbs are too high to bud.

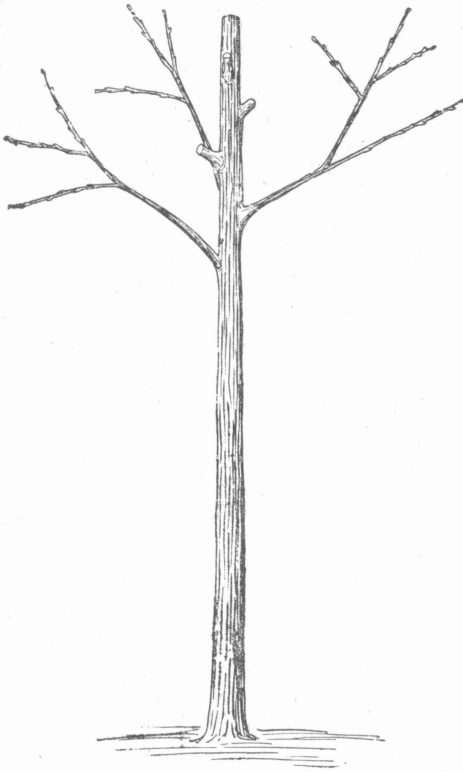


Fig. 5—A tree cut back ready for top-working early in the spring. It is about eight inches in diameter, and the lower branches are six or seven feet above ground. The lower branches will furnish leaves for first year, while the new top is being established. These lower branches can be cut back the following spring—or patch-budded according to Figure 2, and the buds carried over dormant till the following spring, when it will be necessary to do nothing further than cut the limbs to force out the buds.

**Transferring the Buds:** In the operation of patch-budding the bark of the stock should be cut first. The corners should be carefully cut so that the section of bark will not hang when being removed. Loosen the section to make sure it is clear, but push it back in place quickly to protect the cells under it from exposure while the patch is being cut from the bud stick in like manner. When the latter section has been cut and thoroughly loosened, flip out the section from the stock and make the transfer of the other as quickly as possible. It is well to have the string ready before starting to put in the bud; otherwise the bud is likely to fall out while getting the string ready for use.

**Budding Knives:** There are two general types of knives used in patch-budding. A four sided knife that is supposed to cut the same sized section from the bark of the stock and bud stick is used a good deal. These knives have their disadvantages and many experienced budders have discarded

off above the inserted bud in order to force it out. This pruning can be done at the time of cutting the strings, the union of bud and stock having been accomplished.

The object of leaving a foot of the stock above the bud is to use it as a support to which the new growth may be bound in the event it shows a disposition to grow horizontally.

All limbs below the bud should not be removed at one time but by degrees as the new growth increases its leaves and is thereby enabled to perform the full function of a top. If there are many limbs below the bud, cut half of them when the top is cut, and remove the others at two or three cuttings between that time and the middle of June.

When not budded before the middle of July, neither the top nor the branches of a stock should be cut off until the following winter. As soon as the bud is well set, cut the string and let both scion and stock alone until time for winter pruning.

In case of patch-budding limbs of large trees, cutting back for the purpose of forcing out the buds should be done according to directions just given; but, in addition, care should be taken to cut out enough above the buds to give air and sunlight to the new growth.

them for the home-made knife. It is essential that the top and bottom cut of the patch fit exactly with the top and bottom cuts of the section taken from the stock. This can be accomplished by the use of a knife that has two blades that are permanently parallel. Such a knife can be made out of a block of wood about an inch thick. The cutting parts may either be safety razor blades (these are better than knife blades because they make a keen sharp cut) bolted on to the sides of the block, or ordinary paring knife blades from which the handles have been removed. It is much better to do the cutting with sharp thin blades. Cutting with a dull, thick blade tends to close the cells of the cambium layer and delay healing over.

**Grafting Wax:** Any one of the three following formulas may be used. Each has its advantages and disadvantages.

1. Rosin ..... 4 parts  
    Beeswax ..... 2 parts  
    Tallow ..... 1 part

Melt the ingredients together. Pour into water and pull vigorously until of right texture. The hands should be oiled or greased to prevent the wax from sticking.

2. Rosin ..... 3 parts  
    Beeswax ..... 1 part  
    Raw Linseed Oil .....

Melt together and pour into water as above. Where three pounds of rosin and one pound of beeswax are used, about a half-pint of oil will be sufficient in warm weather. If the weather is cool, a large quantity of oil should be added to keep the wax soft.

3. Rosin ..... 2 pounds  
    Beeswax ..... 1 pound  
    Alcohol ..... From 1 to 3 ounces  
    (Grain alcohol is best, but wood alcohol or denatured alcohol may be used.)

Melt the rosin and beeswax together. When it cools on sides and top of pan, stir in alcohol very slowly. Stir vigorously until preparation becomes a golden brown color. Be careful not to use too much alcohol; this will make the wax grainy and unfit for use.

### OTHER METHODS OF TOP-WORKING

Chip-budding, bark grafting, cleft-grafting and whip grafting are sometimes used. These methods are seldom employed by the farmer who is re-working his native timber and are not worthy of description in this bulletin.

**Pecan Scions or Buds on Hickory Stock:** The method of budding pecan scions to pecan stock, herein described, will apply to budding pecan scions to hickory stocks, bitter pecans, and also to English Walnut scions to black walnut stocks, though the latter tree winter-kills so badly in Texas as to render the work useless.

The question is often asked, "Will it pay to use the hickory as a stock for the pecan?"

The pecan is a thrifty grower, and it will not pay to use pecan scion on dwarf hickories—the top will out-grow the stock—but there is little doubt that the pecan will do well on the larger and more thrifty-growing varieties of hickory.