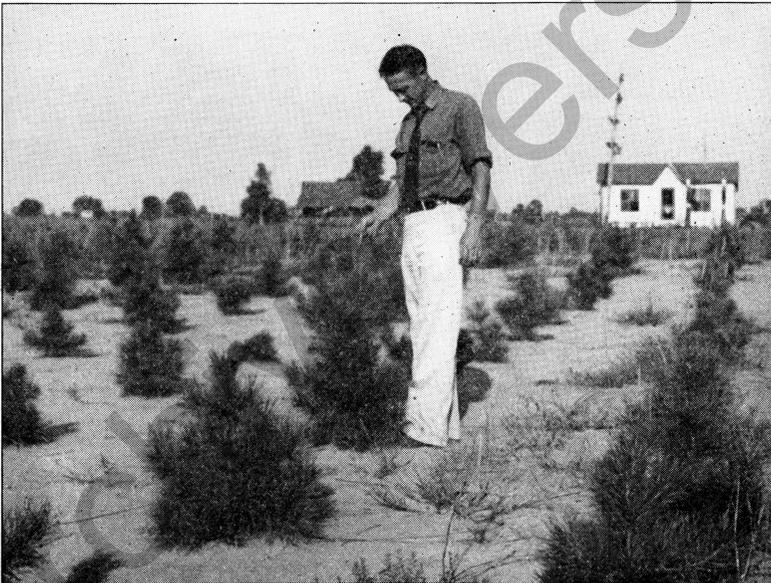


The Planting and Care of Forest Trees on Missouri Farms

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Disregarding adverse weather conditions and other influences over which the planter has no control, there are eight factors which are of primary importance to the survival and growth of trees in forest plantations. These factors, in the order in which they are usually considered when establishing plantations, are as follows: The selection of species; the planting seasons; care of the planting stock; preparation of the planting site; planting; protection; cultivation; and cultural treatment.

Selection of Species

When deciding upon the species of trees to be grown on the farm, it is necessary to consider not only the object in growing the trees but also the adaptability of the preferred species to the locality and site upon which they are to be planted. Trees which grow naturally on similar sites in the same sections of the state, or those which have already been introduced and proved successful, are the safest choices.

The following species are the principal ones which are recommended for Missouri at the present time. This list will change as forest planting in the state emerges from the experimental stage, because the value of new species will be proved and the species which have failed to meet farm requirements will be dropped.

Black Locust.—Very durable wood, ranking above all other native species except Osage orange for fence posts and poles. It is a legume, and consequently a soil builder, with an extensive root system which makes it one of the very best species for erosion control planting. Although it grows more rapidly on the better soils, it is capable of existing on a wide range of sites down to very thin, eroded land. It should not be planted in shade and is not recommended for windbreaks.

The term "site" as commonly used designates a location or area. This usage is illustrated in the section on "site preparation." However, the term also involves soil characteristics, climatic influences, direction of exposure, degree of slope, elevation, and other influences which are important in limiting the types of vegetation which will grow in a given area.

Catalpa.—Durable wood well suited and widely used for fence posts. It requires fair to good sites with plenty of moisture for maximum growth. May be planted in pure stands or in mixture with locust or other hardwoods. Fairly satisfactory for windbreak planting.

Osage Orange.—The most durable native post wood. Recommended for erosion control, post production, and windbreaks. Although it is frequently found on dry upland sites it is not well adapted to extremely dry ridges.

Black Walnut.—One of the most valuable timber species occurring naturally throughout the state. Although walnut is often found growing on good upland soils it prefers low, fertile, moist sites. It

is commonly planted in mixture with black locust and other short term crop species and is best established through planting the nuts directly in prepared seed spots.

Green Ash.—Valuable timber tree recommended for mixed planting with black walnut, black locust and other hardwoods. Used commercially for handles, ball bats, spokes, etc. Adaptable for windbreak planting either as a buffer strip or as interior rows to provide early height. Species prefers fair to good sites.

Yellow Poplar (Tulip Tree).—One of the most valuable timber species for southeastern Missouri but is not adapted to other sections of the state. Grows rapidly on low, moist, well drained sites or on fertile uplands with northern exposure.

Sweet Gum (Red Gum).—Lowland species valuable in southeastern Missouri for veneer, interior lumber, boxes, etc. Grows rapidly on sites ranging from poorly drained bottomlands to moist uplands.

Cypress.—Bottomland species suitable for planting only in southeastern Missouri. Requires fertile, moist sites—preferably overflow land. Grows relatively fast and makes durable, high grade lumber for boats, fencing, etc.

Red and White Oak.—Both slow-growing species capable of surviving on sites ranging from well drained, rather poor uplands to moist, fertile lowlands. Incapable of successful establishment on open sites without the aid of a nurse crop of black locust or other pioneer species. Plant acorns directly in prepared seed spots.

Red Cedar.—Valuable species for veneer, wood working, posts and numerous other uses. Makes excellent windbreaks and is used extensively for Christmas trees. Hardy species capable of growing well on poor to fair sites throughout the state. Somewhat difficult to establish. Not recommended for general planting in apple orchard sections since it is the host species for the well known apple rust.

Ponderosa Pine.—Desirable tree for windbreak planting in northern Missouri. Its use is not recommended in the southern part of the state or on excessively wet sites in the northern part of the state.

Shortleaf Pine.—Highly recommended for reforestation throughout the Ozark Region on sandy, acid soils marginal for cultivation. May be used for windbreaks in northern Missouri but has not been planted widely enough in that section to recommend extensive use.

Scotch Pine.—Drouth-resistant species suitable for windbreak planting in North and Central Missouri. Does well on poor to fair sites. One of the safest species for the average Christmas tree plantation.

Black Hills Spruce.—Very desirable Christmas tree species for experimental plantings. Has exacting site requirements in Missouri practically limiting its planting to shaded, northern slopes with abundant moisture.

Planting Seasons

The periods through which planting can safely extend vary slightly according to the year, but the following dates will serve as a guide.

South Missouri ----- February 15 to April 1

Central Missouri ----- March 15 to April 20

North Missouri ----- March 20 to May 1

Fall planting is not advisable with the deciduous species, and it is especially hazardous for the coniferous or evergreen species. Trees which are planted in the fall are subjected to periods of hard freezing and frost heaving, scarcity of soil moisture, danger of rabbit or rodent damage, and wind injury resulting from the lack of established, anchoring root systems. In case fall planting is undertaken, it should be postponed as long as the season will permit to insure complete dormancy in the seedlings. Fall planting should never be attempted on recently prepared areas because the settling of the soil and the winter freezing will invariably expose a large per cent of the roots.

Care of the Planting Stock

Nursery seedlings usually range from 6 to 18 inches in height above the root collar and are tied in bundles of 25, 50, or 100 depending upon the species and the size of the stock. In packing seedlings for shipment, nurseries make up bales from 10 to 20 inches in diameter and from 36 to 50 inches long which contain from 500 to 2,500 trees each.

Trees which have been properly packed for shipment will remain in good condition for three or four days without further attention. However, the time in transit approximates the "safe" period, and, therefore, it is advisable to heel the stock in as soon as possible after it reaches its destination.

Heeling-in Beds.—For convenience, heeling-in beds should be located on or near the planting site, preferably on sandy, light soils. Good air and water drainage are important, and natural shade is

desirable. With the average-sized seedlings, ten feet of trench is sufficient for approximately 1,000 trees.

In preparing a bed, the grass and vegetation should be scalped off and removed far enough to prevent its becoming mixed with the clean soil which will be used to refill the trenches.

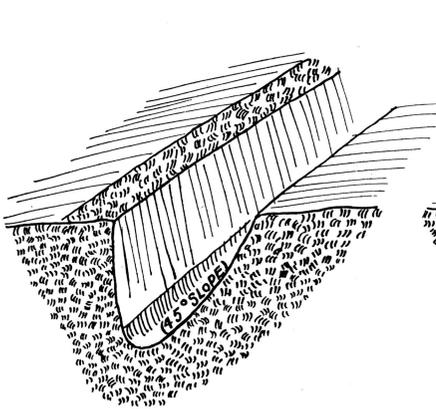


Fig. 1.—Dig trenches deep enough to allow trees to be heeled in at same depth as they stood in nursery bed. Back face of trench with 45° slope.

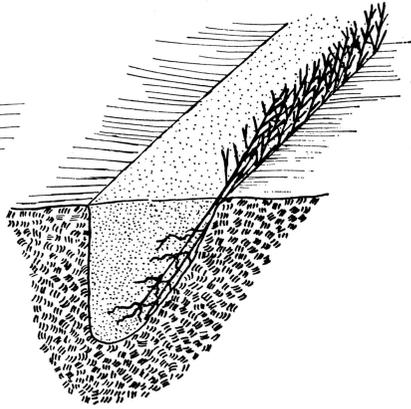


Fig. 2.—Cut strings on bundles and spread trees in thin layer along sloping face of trench. Refill trench and tamp firmly.

The trenches should be dug with a slope of approximately 45° on the back side. The depth is governed by the length of the roots since trees should be heeled in at the same depth as that at which they stood in the nursery seedbed. Special care with regard to depth must be exercised when heeling-in evergreen stock due to its tendency to mold if the soil is allowed to extend above the root collar and into the foliage. The bales of trees should not be opened until the trenches are completed, and, as the seedlings are removed from the bales, the bundle strings should be cut and the roots spread in a thin layer along the sloping face of the trenches. The trenches should be refilled with soil and firmly tamped immediately after the trees are in place.

If the site is dry, the bed should be watered thoroughly and as often as necessary to keep the soil moist and, in case the bed is in full sunlight, shade should be provided by constructing a brush or burlap roof two feet above the tops of the seedlings.

When the seedlings are removed from the heeling-in bed for planting, they should be placed immediately in a bucket half full of water and should remain in the water until planted. In case the heeling-in bed is too far from the planting site to allow transport-

ing the trees in buckets, they can be packed in tubs or boxes filled with wet moss or sawdust and covered with wet burlap. Trees remaining in the planting buckets or transporting containers at the end of the day's planting should be temporarily returned to the heeling-in bed, since overnight storage in water or excessively wet packing material may damage the roots.

Seedlings which are properly heeled-in, watered, and protected will remain in good condition for several weeks. However, early planting is always desirable, and especially so near the end of the planting season when there is danger of the new growth starting before the trees are set out.

Preparation of the Planting Site

Thorough planting site preparation is as important in raising trees as in producing any other type of farm crop. Regardless of the methods and the care used in lifting stock from the nursery seedbeds, parts of the root systems are either injured or destroyed, and, after planting, instead of being in a natural position, the side roots are somewhat compressed and hanging parallel to the main or tap root. Loose, cultivated soil aids the roots in re-establishing quickly after these shocks of transplanting and also eliminates the competitive vegetation which would utilize a large per cent of the available soil moisture and plant foods. Acceptable methods of site preparation are:

Complete Plowing.—Where the site will permit, complete plowing, particularly in the fall, insures the best results.

Plowing Beds on the Contour.—In case the slope is too steep to permit complete plowing without causing erosion, the most satisfactory planting beds are formed by plowing three deep furrows on the contour, throwing the soil down hill and leaving the dead-furrows on the upper side to serve as catch basins for water. Such beds should be well disced and harrowed just before planting, and the row of trees should be planted approximately in the second furrow.

Plowing Single Furrows.—A more rapid but less effective method of preparing steep sites consists of plowing one very shallow (2"-3") furrow with the soil thrown down hill. The trees are planted in the bottom of the furrow, and, although no loose soil is provided other than that removed in digging the planting hole, this method does eliminate some of the competing vegetation and saves the hand labor involved in scalping.

Hand Scalping.—Scalping is the common method of hand preparation and consists of skinning off the top two inches of sod from a

circle at least two feet in diameter at the point where each tree is to be planted. When it is impossible to use a plow, this method is the only alternative, and the benefit to the seedlings unquestionably justifies the labor involved. Scalping can be carried on as a part of the planting operation or can be completed before the planting is begun. Any type of planting tool can be used but a grub hoe is one of the most convenient.

Gully Bank Preparation.—Trees will make more rapid growth, and grass or other vegetative cover will become established more readily, on gully banks when the slope is reduced and the soil is loosened up by some form of tillage. Therefore, in erosion control planting, the ideal site preparation consists of working each vertical bank down to a slope of approximately 30° by plowing, dynamiting, or hand labor. Banks which have already become more or less stabilized and which are supporting full or partial vegetative cover should not be disturbed any more than is actually necessary in planting the trees. Low check dams or other mechanical aids, as well as vegetative cover, are important in erosion control.

Planting

Planting should not be attempted when the ground is frozen or excessively wet because, unless the soil can be pulverized and tamped firmly around the roots, the resulting air pockets will cause the loss of many trees. Clear, windy weather is not the most desirable for planting, and, when it is necessary to plant during such periods, extreme care must be taken to prevent the roots from drying out.

Regardless of the planting methods, species, or weather, seedlings should always be carried in a bucket half full of water and not removed until they are actually placed in the planting hole. Do not dig the planting holes, place a tree beside each, and then return later to complete the planting. It is neither practical nor often necessary to water forest tree seedlings as they are planted.

The choice of tools rests with the planter, however, the western grub hoe with a 3½- or 4-inch blade, from 8 to 12 inches in length, is commonly used. Tile spades, round pointed shovels, and sometimes post hole diggers are used with satisfactory results.

Planting Methods.—*The hole method of planting is the only method which can be successfully used in all sections of Missouri.* It consists of the following steps:

(1) Scalp the planting spot on unprepared sites. Pull the sod well away from the scalped area to prevent its becoming mixed with the clean soil which will be used to refill the hole.

(2) Dig the hole large enough and deep enough to accommodate the entire root system without crowding the side roots or bending back the long main or tap root. (Fig. 3)

(3) Remove a tree from the water and, holding it at the root collar, place it in the hole at the *same depth as it stood in the nursery bed*. (Fig. 4)

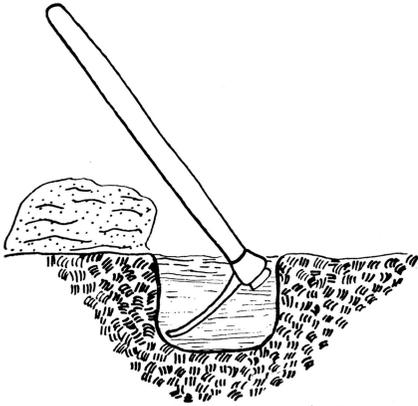


Fig. 3.—Dig hole large enough to accommodate entire root system.

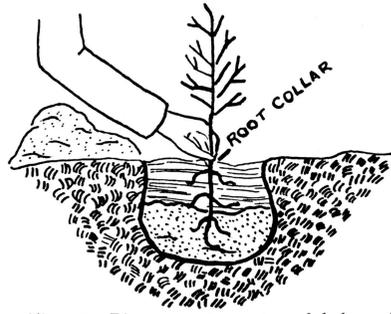


Fig. 4.—Place tree in center of hole and fill hole from $\frac{1}{3}$ to $\frac{1}{2}$ full of loose soil.

(4) Still holding the tree at the root collar, fill the hole from $\frac{1}{3}$ to $\frac{1}{2}$ full of clean, loose soil and tamp firmly with the fist. (Fig. 5)

(5) Check the tree for depth after the first tamping. If the root collar is below the ground level, correct the depth by pulling the

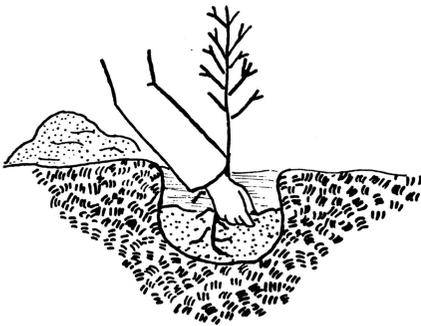


Fig. 5.—Tamp firmly with fist. Check tree for depth and correct if necessary.

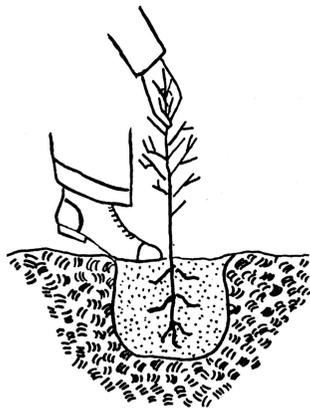


Fig. 6.—Complete filling hole and tamp with feet. Scrape loose soil over tamped spot for mulch. Check planting methods frequently by pulling upward on seedlings.

seedling upward. If the root collar is above the ground line, remove the tree and reopen the hole to the proper depth.

(6) Complete filling the hole and, holding to the top of the tree to prevent its being lowered with the soil, tamp firmly with the feet. (Fig. 6)

(7) Scrape loose soil over the tamped spot to serve as a mulch. Check planted seedlings frequently by pulling upwards. If they are loose, they have not been tamped well and should be replanted.

The slit method of planting can be used in the light, sandy soils of Scott, Mississippi, Stoddard, New Madrid, and Dunklin counties. This method is not adapted to other sections of the state. Occasionally, attempts are made to establish plantations by using straight bars, dibbles, and similar tools. These methods are not recommended under Missouri conditions or with any of the species of trees commonly planted in the state.

The grub-hoe slit method of planting consists of the following operations:

(1) Scalp unprepared sites.

(2) Strike the grub hoe the full length of the blade into the soil holding it so that after the blow is completed the handle will be parallel with the ground surface.

(3) Place one foot close beside the head of the hoe and raise the handle 45°. This causes the soil to shear or break vertically on the side of the hole under the foot.

(4) Draw the grub hoe straight backwards 6 or 8 inches without lifting it out of the hole and hold it in this position to prevent loose soil from falling into the hole.

(5) Remove the tree from the bucket and whip the roots into the hole along the vertical side.

(6) When the roots are hanging straight and the tree is standing at the same depth as it stood in the nursery bed, remove the hoe and use it to push the soil back into place.

(7) Complete the operation by tamping the soil firmly on all sides of the tree with the feet. Scrape loose soil over the tamped spot to serve as a mulch.

Spacing.—Except in certain cases for erosion control, forest tree seedlings should be spaced approximately 6½ feet apart each way for all types of farm planting. Occasionally in planting eroded areas, it may be desirable to decrease the spacing to 5 feet on the gully banks themselves and along the toes of the banks. The regular 6½ foot spacing in windbreak plantations tends to make the planting effective in a shorter time and, in addition, yields usable poles if crowding

later makes it necessary to thin the stand. When using a spacing of $6\frac{1}{2} \times 6\frac{1}{2}$ feet, 1,000 trees are required to plant one acre.

Protection

Grazing.—The most common and serious damage to farm plantations is from grazing. No kind of livestock can be given access to a planting without the trees suffering seriously from browsing, trampling, and uprooting. Black locust is a legume and is particularly attractive forage for cattle and horses. Practically all of the other hardwoods also have palatable foliage, and although the evergreens are seldom eaten, they are frequently bitten off and broken down.

Fire.—Site preparation and cultivation help to eliminate the danger of grass fires during the first season. However, fire lines should be plowed or disced around all plantations adjacent to woodlands or other types of cover which constitute fire hazards. These lines should be at least eight feet wide and well maintained during the spring and fall fire seasons.

Rabbits.—Clean cultivation is one of the greatest aids in controlling or decreasing rabbit damage among small trees. Various types of repellants are being tested, but no recommendations have been made to date.

Cultivation, Mulching, Fertilization

Cultivation.—Cultivation for at least the first year is beneficial to plantations in all sections of the state, and is essential in the sections with heavy soils where rank vegetative growth competes seriously with the trees.

Where the site will permit, horse cultivation is the most practical method. Either the rows and the spaces between the rows can be plowed with a corn cultivator, or a breaking plow can be used to throw furrows against the rows from both sides. During cultivation, it is very important that the trees not be covered any deeper than they were originally planted.

Areas which were prepared for planting by scalping should be hand cultivated by hoeing the vegetation out of the scalped spots and loosening the soil to a depth of one or two inches. Usually two or possibly three cultivations per year are sufficient.

Mulching.—A light straw mulch placed on the site immediately after planting or after the first cultivation aids in retaining soil moisture and reduces the growth of weeds and grass.

Fertilization.—Fertilization is not usually practical or necessary in forest plantations. However, where more rapid growth is desired,

a small amount of well rotted manure or one-half teacupful of complete chemical fertilizer can be worked into the soil around hardwood seedlings at a distance of *not less than 8 inches from the stems*.

Cultural Treatment

Pruning.—By using a relatively close spacing, the need for pruning in forest plantations is practically eliminated. After the trees are established, the crowns close and the resulting shade causes the lower limbs to die and natural pruning to take place. In some cases the operation may be justified, but whether or not it is undertaken should depend upon the probable effect on the plantation and upon the anticipated utilization of the mature trees.

The advantages of pruning are:

- (1) It improves the quality of the merchantable products and the form of the trees when valuable saw timber species are involved.
- (2) Through the removal of persistent dead limbs, the danger of damage by some types of insects and diseases is decreased.
- (3) By removing all except one prong from forked seedlings, the danger of wind damage is lessened.

The disadvantages of pruning are:

- (1) The operation is costly and provides no immediate returns.
- (2) If live wood is removed, the tree growth is temporarily retarded due to the loss of a part of the leaf surface. This is especially true with the evergreen species.
- (3) In black locust plantations, pruning favors the entrance of the locust borer by admitting more light to the trunks.
- (4) Through the admission of more light in the stand, the entrance of competitive vegetation is encouraged.

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