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Shade Trees

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Circular 36 Natural History Survey

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John J. Hallihan, Director

Planting and Care of Shade Trees

J. E. DAVIS



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NATURAL HISTORY SURVEY DIVISION

Theodore H. Frison, Chief

Circular 36

Urbana

March 1940

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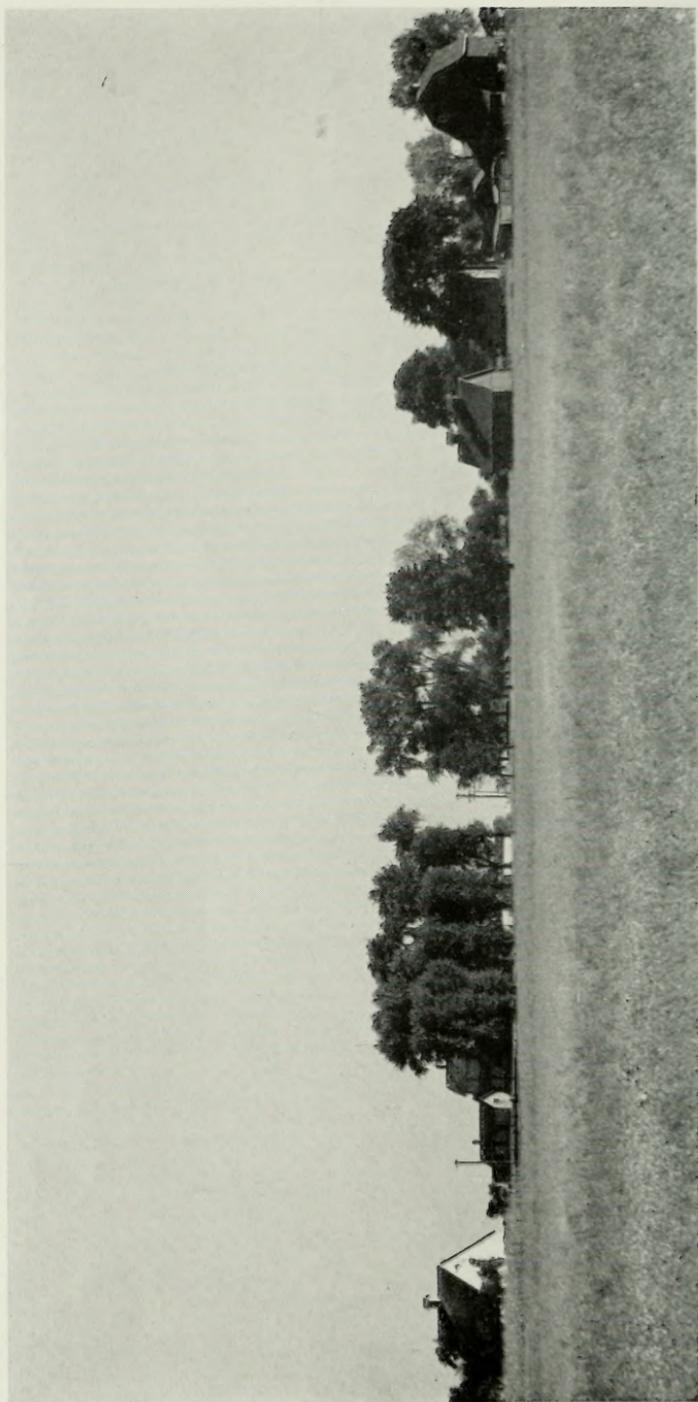
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Cover from an oil painting showing a shady road near Galena, Illinois, by J. William Kennedy, Associate in Art, the University of Illinois; drawings for figures 4 and 12 by Carl O. Mohr; photographs for figures 9 and 16 by George W. Bennett.



Cooling shade and protection from wind contribute to health and comfortable living. The early Illinois settlers realized these things when they planted sturdy, leafy protectors on the treeless prairie. We now have an obligation to pass on to the generations after us an even greater heritage in trees.

Planting and Care of Shade Trees

: : : : J. E. DAVIS*

EARLY settlers in building the farmsteads, the villages, and later the cities, of Illinois knew full well the comfort to be derived from shade trees. Many of the shade trees around Illinois farmsteads are older than the buildings for which they provide shade; native trees standing near sites selected for homes were spared the settler's axe, and, on the open prairie, trees were often planted even before permanent homes were built. Sometimes years in advance of home building, village streets were laid out with rows of trees, fig. 1.

Many of the early plantings of shade trees are from 75 to 100 years old. Because of the comparatively short life of some species of trees used and because of hard conditions under which shade trees often grow, we are now in a period in which the shade trees planted or left standing by early Illinois settlers are rapidly deteriorating and are dying in large numbers.

There is always an interest in the planting of new trees in new places, but we must not fail to recognize the heritage in trees left us by the early settlers. We have a definite obligation to care for the old trees to make them last as long as we can, to replant where old trees have died and to set out new trees as cities progress and as new farmsteads are built.

Shade trees are required to grow under conditions far different from their natural environment. In its natural forest condition the tree develops a long, narrow trunk and a small crown. On the ground beneath its crown is a heavy layer of leaf litter and humus that holds moisture and helps keep the soil in good condition. The shade tree, on the other hand, develops a large spreading crown that demands huge quantities of water; yet much of the water that should naturally be available to the tree is carried away by surface sewers and drainage tile, and the ground above the roots is often covered with sod which competes with the tree for water. Often, too, nearly half the root system of a tree must grow under pavements where no water can be received directly from rainfall. Also, the shade tree is usually

*Extension Forester, Illinois Natural History Survey and University of Illinois College of Agriculture, cooperating.

more exposed to mechanical injury and the attacks of diseases and insects than the forest tree.

Trees have a wonderful ability to adapt themselves to a wide variety of conditions. In spite of the difficulties to be met in dooryards and along city streets, trees can and do serve many decades for beauty and comfort, if they are given just a little help by man.

PLANNING FOR SHADE

Kinds of Trees to Use.—It is most important that careful thought be given to the kinds of trees to use so that the right tree may be selected for any particular purpose or situation. Too often failure to use the right kind of tree has caused keen disappointment when it is too late to make a change.

The desire to get shade in the shortest possible time is one of the most common causes of disappointment to shade tree



Fig. 1.—Shady, well-planted streets make for summer comfort and contribute to enjoyable living.

planters. Unfortunately, the most rapid-growing trees are not the most desirable shade trees. Rapid growth means weak wood, which is subject to serious storm damage and is more readily



Fig. 2.—Wide spacing gives trees an opportunity for full development of the natural beauty of the crown. These American elms are planted 75 feet apart.

attacked by diseases and insects than are the trees that grow less rapidly.

It will save trouble in the future to consider, before trees are planted, the space available for the trees and the possible effect of these trees on surrounding physical structures, both above and below ground. Crowding a large-growing type of tree into a small space may result in serious damage to buildings or to basement walls. The poplars, or cottonwoods, are not satisfactory for city planting, and in some cities their use is prohibited by law because of the tendency of their roots to clog drainage tile and sewers.

In selecting a shade tree it is wise first to observe the trees that are doing best in the neighborhood and then to decide on those that are best adapted to a particular situation. General information about the most common shade trees adapted to Illinois is given in the latter part of this circular.

Spacing.—The spacing of shade trees will be determined somewhat by the size to be reached by the mature tree, figs. 2 and 3. Distances of 50 to 60 feet between trees are usually used, and large-growing trees should not be planted nearer to houses than 30 feet. Where trees are to be planted in the parking along a street, these rules cannot always be followed.



Fig. 3.—Close planting prevents the natural development of crown as trees approach maturity. These young Moline elms are planted approximately 15 feet apart.

Sources of Planting Stock.—Small shade trees may be purchased from commercial nurseries, or dug as wild saplings in the field or woodland.* Nursery-grown trees can usually be transplanted more successfully than the wild saplings because root pruning in the nursery has developed a heavy root system close to the trunk of the tree, most of which is retained when the tree is moved. Wild trees have wide-spreading roots, many of which are bound to be lost when the tree is moved. The use of wild trees found growing in dense shade should be avoided since such trees have tender bark easily injured by strong sunlight.

Size of Planting Stock.—It is best for the amateur tree planter to use trees no larger than 8 to 12 feet tall and $1\frac{1}{2}$ to $2\frac{1}{2}$ inches in diameter at 1 foot from the ground. Larger trees can be transplanted successfully, but special equipment and skill are required. Where large trees are to be moved, the services of a professional tree mover should be obtained. Such men can usually be located through classified directories or city chambers of commerce.

Quality of Planting Stock.—Much can be done toward assuring the success of shade tree planting by selecting good quality

*Trees should not be removed from any public right of way nor from state or federal parks and preserves nor from private property without permission of the owner. Statutes provide severe penalties for such trespass.

planting stock, fig. 5. The tree should have an abundance of roots and a straight trunk free from scars and bruises. The crown should have a straight leader and three or four well-spaced side branches.

In Illinois it is required by law that all trees be inspected for evidence of diseases and insects before being moved. The nursery's inspection certificate assures the buyer of healthy trees. This law also applies to wild stock. Inspection is free and can be had by application to the Chief Plant Inspector, State Department of Agriculture, Springfield, Illinois.

Trees transplanted with a ball of earth on the roots have a much better chance of survival than those transplanted with bare roots. The ball of earth is usually wrapped in burlap. Such trees are designated as "B and B" or "balled and burlapped." Even wild trees should be balled and burlapped for transplanting. This is true especially of pin oak. If possible, the trees in the field or woodland should be selected a year in advance of being moved and then root pruned. This latter operation is done by digging a trench 3 feet deep about 18 inches to 2 feet from the tree, cutting all roots and replacing the soil. The next year a trench can be dug, preferably 6 to 8 inches outside the original trench, and the tree moved with a compact root system in a ball of earth.

PLANTING SHADE TREES*

When to Plant.—Shade trees may be planted at any time during the dormant period, that time between the shedding of the leaves in the fall and the opening of buds in the spring; but spring is preferred over fall. In the spring, planting should be delayed until the soil is in good, workable condition. Wet, soggy soil when packed around a newly planted tree may dry into a hard block through which it is almost impossible for roots to grow.

How to Plant.—All trees should be handled with the shortest possible elapsed time between digging and planting. Bare-root trees should be heeled in while waiting to be planted. To heel in trees, dig a trench in the garden or other suitable location, place the trees upright or slanting with the roots in the trench, and work soil firmly around the roots, the purpose being

*These suggestions are made principally with deciduous trees in mind, since they, more than evergreens, are considered shade producing. However, these directions apply also to the planting of evergreen trees.

to prevent the roots from drying out. *Never transport or leave trees with the roots exposed to the air.*

Preparing the hole is one of the most important steps in tree planting. For a bare-root tree the hole should be large enough to allow the roots to be spread as they were when the tree was dug up; for balled trees, the hole should be large enough to allow space for filling in with plenty of good soil. The hole should be deep enough to set the tree at the depth at which it grew before being moved—never any shallower and never more than 2 inches deeper. If the soil is of poor quality, enough good soil should be on hand to fill in the hole when the tree is planted.

Actual planting is simple, and good success can be had by following a few precautions. Be sure that the roots are well spread in a natural position, that the tree is at the proper depth and that it stands upright. Work the soil thoroughly and firmly around the roots and pack it down with a tamper. Set a balled and burlapped tree in the hole with the burlap left on the ball of dirt. After the hole is partly filled, cut the strings and loosen the burlap around the top of the ball. New roots will grow through this burlap, and the burlap will rot away in a short time. Do not put any fresh manure, straw or leaves into the hole when planting a tree. When the soil is of poor quality, use well-rotted compost, peat moss or commercial fertilizer to help supply plant food for the tree. Mix about 25 to 50 per cent of compost or peat moss, or about 5 pounds of 10-8-6 commercial fertilizer, with the soil which is to be placed in the hole with each tree.

Leave a slight depression around the tree to allow for watering. Water the tree immediately after planting it to settle the soil firmly around the roots. Take care, however, to use only as much water as the soil will readily absorb and not enough to form a puddle, which might cause the soil around the roots to dry into a hard block.

CARE OF NEWLY PLANTED TREES

Pruning.—The leaves of trees give off water by transpiration and, since this water is furnished by the roots, a natural balance is ordinarily maintained between root and top. When a tree is transplanted, some of the roots are lost and the top demands more water than can be furnished to it by the remaining roots; weakening of the tree, or even death, will result

unless the top of the tree is pruned to reduce water requirements. This pruning can also serve to improve the form of the tree. Parts of all branches should not be cut off, but rather

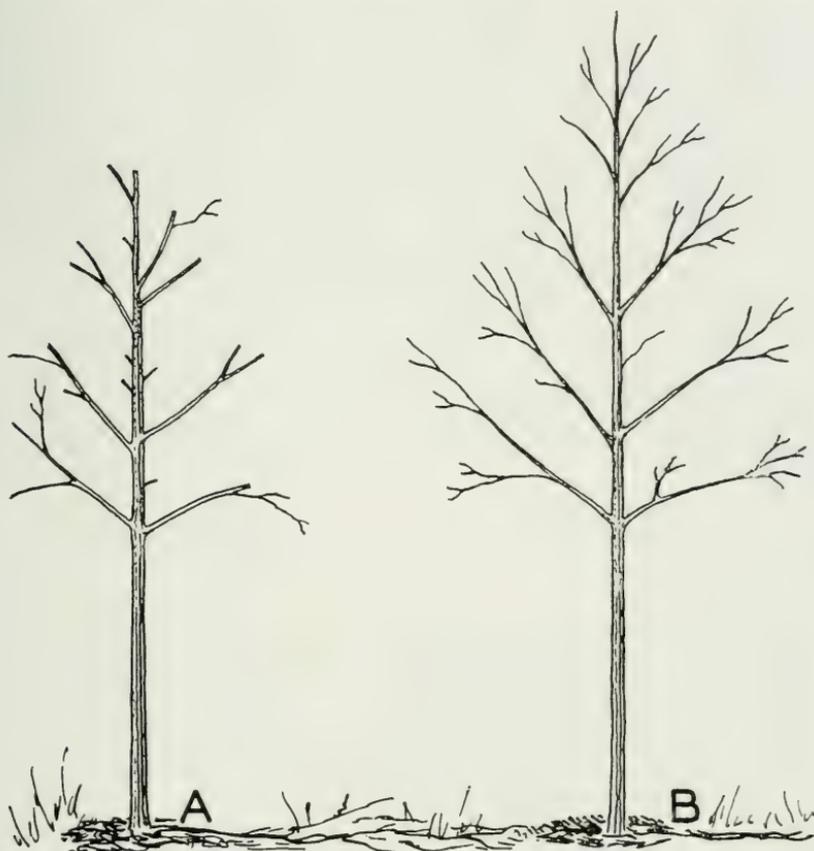


Fig. 4.—A, a newly set tree improperly pruned. The leader has been removed and stubs left. B, a tree of identical shape properly pruned. About 50 per cent of the branches have been removed, but good form has been retained and no stubs have been left.

the crown of the tree thinned out, leaving a good leader and side branches with uncut tips, fig. 4.

Wrapping and Bracing.—Newly planted trees will be weakened by the loss of roots and will become liable to injury by borers, which are common in Illinois. Protection of the trunk by wrapping is important for at least the first and second years, until the tree overcomes the shock of being transplanted and regains its vigor, figs. 5, 6 and 7. One of the several tree wrap-



Fig. 5.—Trees of good quality in temporary nursery rows. These trees are well wrapped for protection against borers.

pers on the market, burlap sacking or ordinary kraft wrapping paper may be used.

Kraft wrapping paper such as is used in hardware and department stores is one of the most satisfactory tree wrappers and at the same time is inexpensive and easy to use. The paper should be of at least 40-pound weight, since lighter paper tears too easily, and it should be at least 24 inches in width. To wrap a tree with this paper, cut a length of paper equal to the length of trunk to be covered. Then start by holding one long edge of the paper vertically against the tree and wrap the paper around the tree, fig. 6, left. The 24-inch width will go around a 2-inch tree three to four times. Tie the paper on with binder twine, fastening it at the top with a slipknot, and then carry the twine down the tree, making a half hitch about every 6 inches, fig. 6, right.

Another inexpensive wrapper, but more troublesome to prepare and apply, may be made from burlap sacks. Cut sacks into long strips 6 to 8 inches wide, starting at the top of the sack and cutting around it spirally. Use at least two layers of this material on the tree, wrapping each layer like a spiral bandage. Tie the ends securely so that the spiral layers will not loosen and separate.

Before the tree has developed new roots to hold it in the soil, it may be blown to a leaning position by the wind unless staked, or braced with guy wires, fig. 7. The guy wires, where they pass around the tree, should be run through a piece of rubber hose to prevent injury to the bark, or pieces of old inner tube may be wrapped around the wires where they contact the tree. The Illinois Division of Highways has found stakes more satisfactory than guy wires because grass around the trees can be more easily cut when the stakes are used. Two stakes are driven into the ground, about 3 feet apart, on opposite sides of the tree. The tree is secured to the stakes by wires, which are covered with a piece of rubber hose or inner tube where they contact the tree itself.

Other Protection.—In the northern part of Illinois, where snow may pile up around the tree, precaution may be taken to prevent mouse and rabbit injury by putting a fine woven-wire or screen guard around the lower part of the trunk, extending the guard upward to a point several inches above the probable



Fig. 6.—Left, wrapping a newly planted tree for borer protection with common wrapping paper. Right, method of tying wrapping paper securely with binder twine.

snow line. This protection will no longer be necessary after the bark grows heavy enough to become rough surfaced. Trees planted to provide shade for barn lots and pastures, and to soften



Fig. 7.—Guy wires wound tightly around a tree will cut off circulation and kill the tree. The wires should be incased in rubber and encircle the tree in a single loop. Illustrated also is a poorly applied spiral tree wrapper which has slipped, exposing the bark to borer attacks.

lines and enframe farm buildings, must of course be fenced to protect them from livestock.

Watering.—The newly planted tree will need an abundance of water and, during dry periods of spring and summer, should be watered frequently. Watering should be discontinued about September 1 to check the development of new growth and to give the tree a chance to harden off before freezing weather sets in. Trees watered throughout the fall are very susceptible to frost damage. In dry periods a heavy mulch of straw, peat moss or ground corncobs may be used to help hold moisture. Because such mulch may harbor mice, it should not be left close to the trunk of the tree during the winter.

CARE OF OLDER TREES

Pruning.—After trees have become established, it may be necessary to prune them to improve their form or to remove dead, injured or diseased branches. Trees should be checked over every 2 or 3 years, for delay in removing diseased or damaged

branches may allow decay to enter the trunk or large limbs where the tree can be helped only by resorting to costly tree surgery.

In pruning to improve the shape of a tree, give attention to forming a symmetrical crown and avoid leaving narrow crotches which might split easily. An ordinary hand saw may be used satisfactorily, but the special pruning saw with curved blade is easier to work with. Do not attempt to remove large limbs, those over about 2 inches, with one cut, or they will invariably split down from the base, causing an ugly wound which cannot heal properly. As indicated in fig. 8, first make an undercut, *a*, about 1½ feet out from the main stem; then make an overcut 2 to 3 inches farther out, *b*, carrying it through until the limb breaks off by its own weight. Complete the job by sawing the stub off flush



Fig. 8.—Correct method of cutting away a large limb. Cuts should be made in order at *a*, *b* and *c*.

with the bark of the trunk or parent limb, *c*, taking care to make a clean cut and to avoid tearing the bark down from the bottom of the cut.

Mature trees are harmed least if pruned during the dormant period, preferably from the first of January through March. Maples should be pruned in early January to prevent excessive bleeding. All wounds caused by pruning should be painted to prevent the entrance of insects and wood-rotting fungi. Asphaltum, orange shellac or one of the several good home-mixed or commercial tree paints that are available may be used. The asphaltum must be thin to make a coating that will adhere well; 10 per cent creosote by volume should be added for an insecticide and fungicide. Orange shellac tends to crack and should be retouched once or twice during the year following its application. A good fungicidal paint can be made by mixing equal weights of raw linseed oil and Bordeaux powder. This mixture is poisonous and should be used only out of the reach of children and animals.

The most detrimental practice of tree pruning common throughout Illinois is the topping of large trees, fig. 9. This

practice has very little in its favor. It produces unsightly trees, or kills the trees outright. In many species, topping produces thick crowns of slender, weak branches. Decay, in the wounds that do not heal over, weakens the trees and makes them a menace to life and property. Where the practice of tree topping



Fig. 9.—Soft maple trees ruined by topping. The beauty of these trees has been destroyed, and they are a serious menace because of the ease with which the new growth can be broken off by ice and wind. Shade trees may be shaped by correct pruning practices without damaging them and without producing such unsightly examples as are shown here.

started, and why, does not seem to have any reasonable explanation. Yet there are tree trimmers and self-styled tree surgeons who recommend this practice in spite of the unsightly examples of tree-butchery which can be seen almost anywhere in the prairie region.

The leaves are the food-manufacturing plants for the tree. Topping the tree removes the source of new food, and the tree must then try to build new branches on what little food is stored in the wood. Not many species of trees can replace the old branches, and the result is often fatal. Rather than top a tree, first see to it that dead, damaged and diseased wood is removed. Then, if the crown is too dense to suit, thin it out

by removing entire branches throughout the crown, fig. 10. If it grows too tall, bring it down by removing those branches which extend the farthest above the ground. Never remove a



Fig. 10.—Thinning the crown by proper pruning insures sound, well-formed trees. The wounds shown here are healing properly because cuts were made flush with the bark and a tree paint was used to prevent decay.



Fig. 11.—In the illustration at the left, careful pruning has allowed power wires to pass through the crown of the elm without harming the form and beauty of the tree. In the tree at the right, the power wires have been cleverly passed beneath the upper crown of the tree so that from the highway the pruning is not noticeable.

large proportion of the crown in any one year. It is far better to do a little careful pruning each year for several successive years.

Trees which interfere with power lines and telephone lines can be pruned in such a way as not to spoil the form of the tree. Interfering limbs may be cut back to the main stem so that wires can pass through a limited opening in the crown: there is no necessity of cutting off the entire top or even one side of the tree, fig. 11.

Tree Feeding.—Because of the impoverished soil conditions in which some shade trees are required to grow, it is often helpful to provide those food materials which are most needed by the trees. If the leaves appear small and poorly colored and the foliage is thin, feeding may help the trees regain their vigor. Trees which have been heavily pruned can be helped by being supplied with extra plant food.

The principal food elements needed by trees are nitrogen, phosphorus and potassium. These can be supplied most satisfactorily in a 10-8-6 commercial fertilizer. If you wish to prepare the fertilizer yourself, mix the following chemicals in the

quantities given: nitrate of soda, 20 per cent available, 50 pounds; superphosphate, 21 per cent available, 38 pounds; and muriate of potash, 50 per cent available, 12 pounds. These will make 100 pounds of fertilizer. Smaller quantities can be mixed by reducing the amounts of the chemicals proportionately.*

The amount of fertilizer required by any one tree will be determined by the size of the tree. Add the height of the tree in feet, the branch spread in feet and the circumference of the trunk in inches; the sum of these numbers will give the number of pounds of fertilizer required, fig. 12.

Fertilizer in this quantity spread over the surface may burn the grass and will be of doubtful benefit to the tree, as little of it will ever reach the tree roots. It should be put down into the ground below the roots of the grass. With a punch-bar, drive

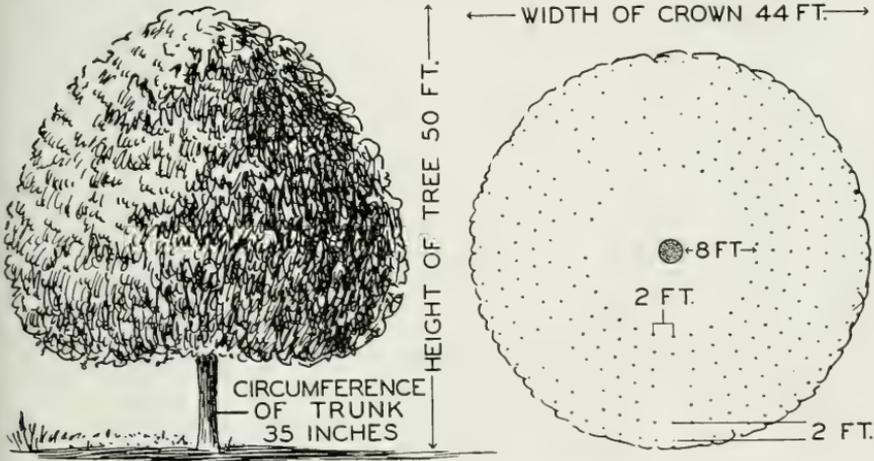


Fig. 12.—Diagram for estimating the number of pounds of 10-8-6 fertilizer required for a shade tree: circumference of trunk in inches (35) + height of tree in feet (50) + width of crown in feet (44) = 129. At the right is shown the pattern for spacing holes in which to supply fertilizer in soil beneath the tree. The distance from the trunk at which the circles should begin may vary between 6 and 8 feet for large trees. For small trees, the circles should begin closer to the trunk. The distance between circles and between holes in the circles may vary between 2 and 2½ feet.

1½- to 2-inch diameter holes into the soil to a depth of 18 to 24 inches, making these holes 2 to 2½ feet apart in concentric circles carried out to the edge of the crown of the tree, fig. 12. It is not necessary to make holes nearer than 6 or 8 feet to the

*This and the following four paragraphs condensed from "Shade Tree Feeding," mimeographed publication of the Section of Applied Botany and Plant Pathology, Illinois Natural History Survey.

trunk as there are few feeding roots within this distance. Distribute the fertilizer evenly among the holes; fill the holes with water and keep them filled for about 76 hours. Do not later fill these holes with soil, as they will facilitate both watering and aeration of the soil.

Tree feeding should be done between April 1 and July 1. The trees are most active during this period and can effectively use the tree food without much of its being lost by leaching. In cases of extremely poor soil, applying fertilizer at least twice during the growing season will be worth while.

The same fertilizer is satisfactory for evergreen trees, but it should be applied in different quantities. For evergreen trees, one-half pound of fertilizer should be used for each foot of tree height. Thus a 5-foot tree will require $2\frac{1}{2}$ pounds of fertilizer; a 20-foot tree, 10 pounds.

Watering.—Watering is often essential where tree foods are used, since the food elements can be taken up by the roots only in solution. Also, watering is helpful during drought periods and in situations where much of the rainfall is carried away by drainage.

Where regular watering is to be done for large trees, a definite system should be used which will carry the water down to the feeding roots. Surface watering is of little value except on level ground where a soil dike can be formed under the outer edge of the crown of the tree, permitting flooding of the entire area beneath the crown. One of the best systems, where flooding cannot be used, consists in placing single joints of tile in the ground at regular intervals and watering through these tiles. Four-inch drainage tiles, 12 to 24 inches long, are set upright in the soil, with the tops flush with the surface, and spaced approximately 10 feet apart to form a circle about two-thirds the distance from the trunk to the outer edge of the crown. If the tiles are given all the water that will be readily absorbed from them two or three times a week, trees can be economically watered during dry periods and the water will be distributed down where it can be used by the tree roots.

Grading Around Trees.—Appreciably lowering the grade around shade trees in most cases either kills or seriously damages them. If the grade is to be lowered over 12 inches, it is almost certain that most of the feeding roots will be removed from the tree. When it is possible to leave the normal grade over the space covered by the crown, even though the grade near it

is lowered considerably, the tree may be kept in good condition provided a system of watering is followed to compensate for a lowering of the water table.

In many cases shade trees are badly damaged by removal of the roots on one side when streets or driveways are graded, or when excavations for foundations are dug. In such cases trees need help until they can rebuild their root systems. First see that open grades are sodded or riprapped to prevent further loss of soil from the roots by erosion. Then thin out the crown of the tree to reduce water losses by transpiration, and apply fertilizer and an abundance of water for at least two growing seasons.

Raising the grade around a tree can be as harmful as lowering the grade. The feeding roots concentrate in a rather limited zone near the surface of the ground where they can get both moisture and air. Raising the grade as much as 12 to 18 inches will not do much harm, but a deeper layer of fill, especially of heavy soil, will exclude air and kill the feeding roots, unless provision is made to carry air down to these roots.

Before any fill is made, lay down four or five lines of 4-inch porous drainage tile on the surface of the ground radiating from the trunk of the tree, as spokes of a wheel, out to the edge of the crown of the tree. Then spread a layer of about 4 inches of coarse gravel or crushed stone over the area covered by the crown. On top of this spread about 2 inches of fine stone and 4 to 6 inches of straw or manure. Then, with soil, bring the fill to the level desired. Before the fill is made, or as it is being made, build a brick or stone wall around the trunk of the tree, leaving a space of from 1 to 2 feet between the trunk and the wall. A small tree will need more room than a large tree to allow for its ultimate growth.

Through the tile, which projects through the wall, air and water can reach the roots of the tree even with very deep fills. The well formed by the wall and the radiating tile make it easy to supply the tree with water and plant food during dry seasons. To supply plant food, determine by the usual method the amount of fertilizer required and then apply it in solution, which will be carried out to the tree roots through the tile.

Tree Surgery.—Trees which need attention to cavities, installation of drainage in cavities or crotches, or removal of large limbs, can best be cared for by persons trained in tree surgery work and having the proper equipment for such work.

Seldom does the amateur have either the experience or equipment to do tree surgery work competently. In some instances minor jobs of this nature can be taken care of by the tree owner, but he should be sure to be properly informed before proceeding. A good text for the layman for ordinary tree repair jobs is the U. S. Department of Agriculture Farmers' Bulletin 1726, *Treatment and Care of Tree Wounds*. This bulletin may be secured from the Superintendent of Documents, Washington, D. C., for 5 cents a copy.

Diseases and Insects.—Trees which are kept in good health by feeding, watering and proper pruning are not so susceptible to attacks by diseases and insects as are those that are neglected, but any tree, no matter how vigorous, may possibly be attacked. The diseases and insects that attack trees are so numerous that it is not possible to give detailed information about them here. Likewise, control measures are so varied that any general recommendations might be misleading.

The Illinois Natural History Survey, through its sections of Economic Entomology and of Applied Botany and Plant Pathology, is glad at any time to examine specimens to identify insects or diseases and make recommendations for their control. This service is offered without charge and should be used more frequently. Too often persons hesitate to ask advice on control of diseases and insects until the damage has gone beyond repair.

In submitting diseased leaves and twigs for inspection, send adequate samples of fresh specimens, well wrapped so that they will not dry out. Send insects, without crushing them, in mailing tubes or in tin boxes, but not in tightly stoppered bottles nor loosely in envelopes. Be sure to send specimens of the damage being done by the insects and give all information you can about the conditions involved. Mail specimens to the Illinois Natural History Survey, Urbana, Illinois, or to the Extension Forester, 220 New Agriculture Building, Urbana, Illinois.

SOME COMMON TREES USED FOR SHADE

American Elm (*Ulmus americana*).—This is the most popular and most satisfactory of all shade trees in Illinois, fig. 13. Its vasselike form and dense, dark green foliage make it both pleasing in appearance and a provider of good shade. The American elm may be used throughout the state. It is susceptible to the Dutch elm disease, but this disease has not as yet been



Fig. 13.—The American elm is the most popular of all shade trees in Illinois.

found in Illinois. The Moline elm is a form variation of the American elm and is equally satisfactory as a shade tree.

Sugar Maple, Hard Maple (*Acer saccharum*).—Not so fast growing as the American elm but a very useful shade tree



Fig. 14.—The sugar maple has a dense crown which affords heavy shade.

throughout the state, the sugar maple has a dense, symmetrical crown which affords heavy shade, fig. 14. The fall leaf colors vary from yellow to rich burnt orange. The hard maple is deep rooted and seems to withstand well the difficult growing conditions in cities.

Norway Maple (*Acer platanoides*).—This is not a native tree and cannot be found in local woodlands, but it is frequently used as a street tree and may be planted throughout Illinois. It has a low-branching, round crown with a very dense foliage. A disadvantage of this tree is that its heavy shade and its feeding roots very close to the surface make difficult the growing of grass underneath it.

The Oaks.—The white oak (*Quercus alba*), the red oak (*Quercus borealis maxima*) and the pin oak (*Quercus palustris*) are of special interest as shade trees because of their dense foliage and rich autumn colors. They are well adapted to the entire state of Illinois. The white oak and the red oak develop large, spreading crowns, and the pin oak develops a conical crown, narrow at the top and wide spreading at the base. The pin oak, fig. 15, is useful where a large upper crown is undesirable, but it is not adapted to a limited ground space, such as the parking between sidewalk and curb. The wood of the oaks is very strong and storm resistant, and not seriously susceptible to diseases, fig. 16.



Fig. 15.—The pin oak develops a shapely, conical crown. It is not adapted to a limited ground space, however.

Tulip Tree (*Liriodendron tulipifera*).—The tulip tree has a very unique foliage of light green color. It tends to grow tall and upright with a straight clean trunk and symmetrical crown. It is not hardy in the northern end of the state, nor is it adapted to dry sites.

Sycamore, Buttonball, Plane Tree (*Platanus occidentalis*).—

The sycamore is delightful as an occasional tree because of the appearance of the bark, which is shed annually, leaving a mottled



Fig. 16.—The wood of the oaks is strong and storm resistant. The autumn leaf colors vary from brilliant to deep reds.

effect of whitish and gray-green patches. This tree will grow large and tall but will not make dense shade. It can be used throughout the state but is not adapted to dry sites. The sycamore is susceptible to disease and storm damage and should, therefore, not be used extensively. The objection to its use in the yard is that it sheds its leaves over a long period of time.

Hackberry, Sugarberry (*Celtis occidentalis*).—The hackberry is similar to the elm in form but has finer foliage. It can be grown almost anywhere in Illinois and has been widely used as a street tree. It is not so resistant to decay as the elm. One disadvantage of the hackberry is its susceptibility to a disease which forms witches' brooms (dense clusters of short branches) throughout the crown and often makes the tree unsightly. The

fruit of the hackberry is readily eaten by both squirrels and birds.

Basswood, American Linden, Linn (*Tilia glabra*).—The basswood does not make so pleasing a shade tree as the European lindens, but where it can be readily obtained locally it is satisfactory. The leaves are large and heart shaped, and always present a fresh, cool appearance. The wood is weak and easily damaged by storms. The basswood is not adapted to the southern part of Illinois.

Black Walnut (*Juglans nigra*).—The black walnut differs from the trees previously described in that it has long compound leaves which give it a quite different appearance. It makes a tall, upright tree, providing fairly dense foliage, and is adapted for planting throughout the state. The special interest of the walnut lies in its fruit. Every city should have walnut trees scattered throughout its plantings to provide food for squirrels. However, it should not be planted where the walnuts will fall on sidewalks, as the hull when crushed makes an unsightly stain on stone or cement.

The Ashes.—The white ash (*Fraxinus americana*), the green ash (*Fraxinus pennsylvanica lanceolata*) and the blue ash (*Fraxinus quadrangulata*) are adapted to a wide variety of soils throughout Illinois. The ashes form tall, fairly narrow trees, with light foliage. They are not so useful for shade as the other trees described, but they have a definite place as an occasional tree to add variety.

Sweet Gum, Red Gum (*Liquidambar styraciflua*).—The sweet gum is an excellent shade tree well adapted to the central and southern parts of Illinois. The crown is usually symmetrical and not so wide spreading as that of elm or white oak. The leaves are star shaped and light green in color, turning to brilliant reds in the fall.

Chinese Elm (*Ulmus pumila*).—This is one fast-growing tree that can be used to a limited extent for shade planting, particularly for temporary shade. Its leaves are small and its foliage fairly thin, so that its shade is very light. Its wood is stronger than that of the objectionable trees listed below, but it is still very weak and easily damaged by storms. Apparently there are several strains of the Chinese elm, some of which are better adapted than others to Illinois climate, but as yet no intensive study has been made for the purpose of testing and selecting the better strains. The tree has not been planted in

this state long enough to allow the making of any predictions on its longevity.

Other Useful Trees.—The above brief descriptions include a few of the commonest native trees, which can ordinarily be collected as wild saplings or readily obtained from local nurseries. Of the trees described, only the Norway maple and the Chinese elm are not native. The list represents by no means the limit of varieties which can be successfully used for shade tree planting. Many other native trees are useful for shade. No attempt has been made to list the many highly desirable introduced trees which, of course, cannot be obtained from local fields or woodlands. Before doing any shade tree planting it is advisable to consult nursery catalogs to become acquainted with all types of trees which are suitable for planting in Illinois.

Trees to Avoid.—There is always a demand for trees that will grow rapidly, but, unfortunately, the fast-growing trees are weak wooded and very susceptible to diseases and storm damage. For these reasons, the following trees are objectionable and should generally be avoided in shade tree planting: Silver maple (*Acer saccharinum*), box elder (*Acer negundo*), tree of heaven (*Ailanthus altissima*), the catalpas (*Catalpa* species), the poplars (*Populus* species) and the willows (*Salix* species). The poplars and willows are objectionable also because of their habit of growing into sewers and drainage tile.

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