ramidal English oak, the columnar sugar maple, and the vegetatively propagated male ginkgo tree. Until cities all over the country, by their purchases, encourage the propagation of these and other desirable but little-used varieties, the growers will be forced by hard economics to confine their efforts to the more common and, in many cases, less desirable kinds.

In summary, several fundamentals are to be borne in mind if our cities are to have good trees.

First: Hire a competent landscape architect or arborist, one who knows the esthetic and practical problems of city tree planting. He is the key man in a successful program: He knows what varieties will or will not grow in any given location, how they will look at maturity, how far apart to plant the trees, and what soils will sustain them. He will use tree forms to create the desired effect.

Second: Select only those varieties adapted to your local conditions.

Third: Buy only the best obtainable materials; cheap, substandard trees are usually expensive in the end.

Fourth: Insist on proper planting to rigid specifications under the supervision of a competent plantsman.

Fifth: Spray, feed, water, and prune whenever necessary; perform these operations according to the latest scientific methods. Adequate maintenance is vital to the continuing survival and good health of trees and is as necessary as good original design and planting.

Sixth: Keep in sight the goal—beauty and livability. A city of trees is a better place in which to live.

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SHADE TREES FOR THE NORTHEAST
ALMA M. WATERMAN, R. U. SWINGLE, CLAYTON S. MOSES

Throughout the Northeastern States, the maples, the elms, and the oaks have long been preferred for shade trees. The elms in this region, however, are threatened by two serious diseases. In the northwestern part a wilt disease impairs the value of red oaks for shade-tree planting. Fortunately, there are still many kinds of beautiful native trees and some introduced kinds that make satisfactory shade trees.

Some of the outstanding deciduous shade trees that can be recommended for residential and suburban sections, primarily because of their tolerance of city conditions, are: Sugar maple, Norway maple, red maple, white oak, pin oak, northern red oak, scarlet oak, Texas oak or Shumard oak, thornless common honeylocust, sweetgum, ginkgo, American sycamore, London plane-tree, common hackberry, black tupelo, green ash, silver linden, littleleaf tupelo, Kentucky coffee-tree, yellow-poplar or tuliptree, the American yellowwood, Japanese pagodatree, and Amur corktree.

In heavily congested and industrial areas the following species may be used: The ginkgo, the thornless common honeylocust, London plane-tree, ailanthus or tree-of-Heaven, and the Amur corktree.

In the Northeastern States, a large
area, the climate and other conditions vary so much that not all the recommended kinds of shade trees will grow equally well throughout the region. The elevation above sea level, rainfall, the proximity of large bodies of water, river valleys, and other factors modify the natural distribution of plants and affect the growth of shade trees. For best growth, some kinds will be limited to the more northern or to the more southern sections. Some kinds that will grow in the southern border zone of the area may not grow at all in the most northerly parts. Some kinds of shade trees that grow best in New England may do well in the southern Appalachians, but very poorly on the Coastal Plain. On the other hand, some predominantly southern species may extend far north along the Atlantic coast.

The maples are widely planted as shade trees in the Northeast, but most of the native species are not entirely satisfactory for this purpose. They are short-lived, are subject to windbreak, and require moist, rich soil.

The Norway maple, introduced from Europe, and our native sugar maple are considered the most satisfactory for streets and lawns.

Sugar maple is one of the most common and attractive trees throughout the Northeast. It is a large tree, 50 to 90 feet in height. When it is grown in the open as a shade tree, it has a short trunk with a broadly egg-shaped or round-topped crown of stout, ascending branches. Horticultural varieties that have a narrow columnar head are especially adapted for planting along narrow streets. The leaves of the sugar maple are thin, bright, rich green, and in the North usually develop in May together with a profusion of yellowish-green flowers, from which bees obtain pollen and nectar. In the autumn the brilliant yellow, orange, and scarlet coloration of its foliage is attractive.

Sugar maple is readily transplanted, its rate of growth is moderate, and it is relatively long-lived, with a possible life span of more than 100 years. It is injured by city smoke and gas fumes and therefore is not suitable for planting in industrial or congested residential areas. It is valuable, however, on lawns, along suburban streets, or on farmsteads. It attains its best development when it is grown in well-drained, moist, rich soil, but it will survive in less favorable sites in gravelly soil. It is the source of maple sugar.

A wilt disease is sometimes serious, and several leaf diseases caused by fungi are common on sugar maple. Brown dead areas in or along the edge of the leaf blade often develop when drying winds or bright sunlight and high temperatures immediately follow a period of moist weather.

Norway maple is grown extensively from central New England and New York southward. It is usually about 30 to 60 feet tall at maturity, with a short trunk and numerous stout, ascending branches that form a low, round, spreading head. The greenish-yellow flowers appear in abundance in April and May before the leaves develop. The leaves are slightly larger than those of the sugar maple, deeper green, and firmer in texture. The dense foliage remains on the tree late in autumn and the leaves turn bright yellow before falling. Norway maple is easily transplanted, its rate of growth is moderate, and it tolerates a wide range of soil conditions. It stands unfavorable soil and atmospheric conditions in cities and therefore is widely used as a street tree. Its low, dense head, however, requires considerable pruning to adjust it to street conditions, and it is not adapted for planting along narrow streets.
A horticultural variety with a narrower, more upright crown is sometimes grown successfully under such conditions. Because the thick shade and mass of fine feeding roots of the Norway maple make it hard for grass to grow under the tree, Norway maple frequently is considered undesirable as a lawn tree.

The Schwedler maple, a variety of Norway maple, has a similar type of growth. When young, it has bright-red leaves that change to dark red and finally to green. It is planted on lawns and sometimes along suburban streets for ornament and for shade.

The Norway maple is subject to about the same pests as the sugar maple, but is less subject to leaf scorch. Red maple, a native, is less desirable for a shade tree than either the sugar maple or the Norway maple. It can be used when a fast-growing tree is needed. The red maple develops a conical or broad, rounded crown, with bright-green leaves that assume brilliant shades of orange, red, and scarlet in autumn. The foliage casts a moderately dense shade. In the spring, masses of red flowers make it attractive.

Red maple is easily transplanted. The wood is somewhat weak and subject to storm damage, and its roots often enter and clog sewers.

The elms are outstanding trees, but unfortunately the American elm cannot be recommended now except for limited planting, because of phloem necrosis and the Dutch elm disease, both of which are spreading rapidly and causing heavy losses. New public plantings of American elm should be delayed therefore until satisfactory control measures for the diseases have been developed, and the home owner will do well to consider carefully whether some other kind of shade tree cannot be planted instead.

In the Northeast, the Dutch elm disease extends from the Atlantic seaboard westward to Indiana. An isolated outbreak has been found in Colorado. It has not been found in Maine, New Hampshire, Michigan, Wisconsin, Minnesota, Illinois, Iowa, Missouri, or Arkansas.

Phloem necrosis is not known to occur in Pennsylvania, States east of the Appalachians, or in Michigan, Wisconsin, and Minnesota. The American elm is subject to several other pests.

The American elm grows to a height of 50 to 100 feet and has a tall, branching trunk. It develops numerous ascending or drooping branches that form various types of crowns, such as the typical vase or umbrella forms. The beauty of its various forms of growth and the arching of its branches above the streets of New England towns have made the American elm an outstanding characteristic of the landscape. None of the many introduced species of elm can equal it for ornament or shade. The greenish flowers appear in drooping clusters in April or May before the leaf buds open. The leaves are 4 to 6 inches long, rough, dark green, unequally rounded at the base; they turn yellow in autumn and usually fall rather early.

The American elm is easily transplanted, grows rapidly, and often lives between 70 and 100 years under city conditions. The American elm is tolerant of a wide range of soil conditions, except dry, sandy locations, but its best growth is developed in moist, well-drained soils. In its natural habitat it is found along streams or in low, moist ground. It grows well on streets and in yards. The growth habit of the branches is such that the crotches of old trees often have to be braced in order to withstand heavy wind or ice storms.

The rock elm might be used more for streets and lawns, as it is a large, strong, narrow-headed tree. This elm is more suited to the northern than to the southern part of the region, and should be considered particularly for the Lake States. Rock elm grows more slowly than American elm.

In this region two European species of elm are grown sometimes as shade trees. They are susceptible to the Dutch
elm disease and also are frequently affected by the elm leaf beetle. The English elm (Ulmus procera) is a large tree, sometimes reaching 100 feet in height. It has a straight trunk that extends into the tree crown, and branches that spread or ascend to form an oblong, rounded crown more like the oaks than the American elm. The leaves, 2 to 3 inches long, remain on the tree later in the autumn than those of the American elm. The English elm can be transplanted quite easily and is adaptable to the same types of soils as the American elm. It has the tendency to produce numerous shoots or suckers from the roots.

For that reason, another European species, the Scotch or Wych elm, which is similar to the English elm in form and growth habit but does not produce suckers, has often been preferred, both for lawn and street planting. The leaves of the Scotch elm are about 3 to 6 inches long. Several horticultural varieties of both these species are in cultivation.

The Chinese elm (Ulmus parvifolia) has small leaves, which turn bright yellow in the autumn before they fall. Its flowers are formed in August or September. It is easily transplanted and grows rapidly. It is hardy in southern parts of the region. The Morris Arboretum in Philadelphia has a beautiful, large specimen of this tree.

The Siberian elm is resistant to the Dutch elm disease, but it is subject to canker and leaf diseases. It is not recommended except for locations where better trees will not grow or for places where quick effects are wanted while the more durable species are getting started. It lives 25 to 40 years.

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Pin oak in this region usually reaches 40 to 80 feet in height at maturity. It makes a satisfactory shade tree in southern Maine, eastern Massachusetts, Rhode Island, Connecticut, central and western New York, central Pennsylvania, and southward. The straight trunk extends into the crown. Its numerous slender branches, long, horizontal or ascending above, shorter and drooping below, form a broadly pyramidal head. The branches bear many short, upright, and pinlike twigs. The leaves are 4 to 6 inches long, deeply cut with five to seven bristle-tipped lobes, and are thin, firm, dark green, and glossy. They turn dark red in the autumn and sometimes remain on the trees during the winter. The pin oak blooms in May when the leaves are about one-third grown. It is particularly adapted for use as a shade tree, even on city streets, because of its narrow symmetrical form, the ease of transplanting, and rapidity of growth. It is tolerant of a wide range of soil conditions and of city smoke. Pruning the lower drooping branches is necessary, particularly for trees planted along streets.

Pin oak is subject to a leaf yellowing—chlorosis—if alkaline soil conditions prevent the trees from obtaining sufficient iron, but the injured trees will usually respond to soil treatment, injections, or sprays. The fungus diseases common to many species of oak, such as the cankers and wood rots, may occur on pin oaks, but otherwise the species is free from serious diseases.

The northern red oak is among the largest of the northeastern oaks. It
grows well along the Atlantic coast close to the ocean, as well as inland in northern localities. It attains a height of 50 to 85 feet, occasionally up to 150 feet. The trunk is usually short. The widespread branches form a broad, open, symmetrical crown. The leaves are 5 to 9 inches long, thin, firm, dull dark green, 7- to 11-lobed, with bristles at the tips of the lobes. The northern red oak is rather slow in leafing in the spring but retains its leaves late in the autumn, when they turn a brilliant red. Its inconspicuous light-green flowers appear late in May or early in June when the leaves are about one-half developed. It is relatively easy to transplant in early spring. The tree is of moderately rapid growth. It sometimes reaches a height of 18 feet in 10 years, and 50 to 75 feet in 50 years. It may live two or three centuries. It grows well in any well-drained soil, particularly in gravelly or sandy loam. It is intolerant of shade and wet soils. Because of its spreading crown, it requires a relatively large area for its best development, and therefore it is adapted for planting on lawns and along wide streets. It is moderately tolerant of smoke and soot and may be used on wide streets in suburban and moderately congested districts.

The northern red oak is susceptible to the fungus disease, *Strumella canker*, which may attack shade trees but is much more serious in the forest. Like most of our northern oaks, northern red oak may be severely attacked by wound-decay fungi. Its most serious enemy at present is oak wilt.

The scarlet oak is native throughout most of the area and makes an excellent shade tree except in northern New England, the northern half of the upper Lake States, the edge of the Plains, and the Coastal Plain in Virginia. In the most northern part of the region it is of medium height, 30 to 50 feet, but under more favorable growing conditions southward it may grow to 60 or 80 feet. The trunk is tapering and usually continuous into the crown. The lateral branches are ascending above, horizontal and spreading below, and form an open, narrow, irregular, or rounded head. The leaves are 3 to 6 inches long, with five to nine bristle-tipped lobes, thin, firm, glossy, and dark green. They turn dark red to bright scarlet in autumn. The flowers develop in May and early June when the leaves are about one-half grown.

The scarlet oak is quite readily transplanted, grows rapidly, and prefers dry, sandy soil, but it is more tolerant of moist soils than the red oak. It is adapted for planting on lawns and the wide streets in suburban areas, for it requires slightly less room for development than the northern red oak. It also endures city conditions and resists drought and smoke, but it is subject to rot by wound-decay fungi and therefore may suffer from wind breakage. It is subject to oak wilt.

White oak is one of our best shade trees for lawn planting. It is native to all parts of the region except a small area in the northern part of Michigan and northern and western Minnesota. It is a slow-growing, sturdy tree that grows 60 to 90 feet tall and develops a broad, rounded, open crown. It bears light-green leaves that turn brown in autumn and cling to the twigs through the winter. Its large size makes it unsuitable for planting along most streets. Young white oaks can be transplanted readily if carefully handled, but large specimens are difficult to transplant successfully. White oak trees often live more than a century. White oak is affected by oak wilt but is said to be less severely injured by the disease than are red or black oaks.

The Texas, or Shumard, oak is an attractive tree not often seen in most parts of the Northeast. It is hardy in southern Illinois and Indiana, western Ohio, southeastern Iowa, and the Coastal Plain of Virginia. It is not native in the Appalachians or north of Maryland. It grows 50 to 75 feet high, develops an open crown, and has foliage like that of the scarlet oak.

Willow oak develops into a handsome, large tree, and is useful along
streets and in lawns. The leaves are an attractive light green and resemble willow leaves in shape. It is native in the Coastal Plain from Virginia to New York City and in the small area surrounding the junction of the Ohio and the Mississippi Rivers. In planting, 60 feet should be allowed between trees for full development.

**The Ginkgo** was introduced into America from China and Japan, where it has been grown for centuries in temple gardens. It has long been cultivated in northeastern United States as an ornamental and shade tree, particularly for street planting. It is hardy northward to southern Maine and may be grown near the seacoast. It reaches a height of 60 to 80 feet and has a single erect trunk continuous into the crown. The straight, slender branches are slightly ascending and form a broadly conical or pyramidal head.

The flowers appear in May; the male and female flowers are borne on separate trees. The female flowers develop into a stone fruit with a malodorous, fleshy outer layer, which, when the fruit falls, makes pavements slippery and disagreeable. For that reason, only trees that bear male flowers should be planted. The fan-shaped leaves, about 2 to 4 inches broad, resemble a leaflet of the maidenhair fern. In autumn they turn bright yellow and fall from the tree within a few days.

The ginkgo tolerates unfavorable city conditions and a wide range of soil conditions. It is relatively easy to transplant. It withstands wind and ice storms and is free from serious pests.

**Tuliptree**, also called yellow-poplar, is native in Indiana and southern Michigan south of a line that extends eastward along the south shore of Lake Ontario, eastward to Massachusetts, and then southeastward diagonally to Rhode Island. It is native also in the southern tip of Illinois and in southeastern Missouri. It is grown as a shade tree as far north as central Vermont. It reaches a height of 50 to 70 feet, with a tall, straight trunk that is continuous into the crown. The branches are ascending at the top and horizontal or slightly drooping at the base, but they have upcurved tips that form a low-branched, compact and pyramidal head when young. As the tree matures it develops an oblong and open crown. The leaves are light green, glossy, 5 to 6 inches long, and four-lobed, with petioles or stems as long as the leaves. They turn bright yellow before falling in the autumn. The large, tuliplike flowers are greenish yellow, 1½ to 2 inches deep, and 2 to 5 inches wide; they appear on older trees in May or June after the leaves develop.

The tuliptree is not easily transplanted, and its young fleshy roots must be carefully protected from drying during transplanting, which should be done in early spring. It requires a rather moist, well-drained soil and, once established, its growth is fairly rapid. In the forest it reaches maturity in about 200 years.

When soil conditions are favorable it may be used as a shade tree along wide streets in suburban areas. Its brittle wood, however, makes it rather susceptible to storm and ice damage and therefore it is sometimes considered undesirable for street planting. It is relatively free from fungus diseases, but a slight early leaf fall may occur as a result of dry summer weather. It is most satisfactory for planting in parks and around the home, where its attractive foliage and flowers make it valuable both for shade and ornament.

**Sweetgum** is native to the southern part of this region. Its northern range extends diagonally from southeastern Missouri to southern Connecticut. It has been used successfully in more northern locations but has not proved hardy in some localities of the Lake States. It usually attains a height of 50 to 75 feet and its straight trunk is continuous into the crown. The slender ascending or spreading branches form a narrow pyramidal or broad, rounded, and open crown. The leaves are 3 to 5
inches long, broader than long, star-shaped with five lobes, thin, smooth, bright green, and glossy. They turn bright red or dark red or scarlet in the autumn; the foliage is attractive and ornamental in summer and autumn. The greenish and rather inconspicuous flower clusters appear in April or May when the leaves are about one-third grown. The fruit ripens in the autumn in ball-like, tough, spiny heads about 1 to 1½ inches in diameter, which remain on the tree into the winter.

Sweetgum is not very readily transplanted in heavy soils and in its more northern limits, but otherwise it will become easily adjusted to a wide range of soil conditions. All through New England it should be transplanted in early spring. It prefers a moist, well-drained soil, has a moderate growth rate, and will thrive near the seacoast. It reaches maturity in 200 to 300 years in the forest. Sweetgum is adapted to planting in suburban areas both as a street and a lawn tree. It is relatively resistant to fungus diseases as well as to damage from wind or ice storms.

The American linden, or basswood, has been grown to some extent as a shade tree along roadsides, particularly in the suburban areas. Some of the European lindens, however, are usually preferred as lawn or street trees, because of their more ornamental, compact growth.

American linden is native throughout the Northeast, from the seacoast to altitudes of 1,000 feet. It may attain a height of 50 to 75 feet, sometimes even more than 100 feet, with a straight trunk that is continuous into the crown. The numerous and slender branches are ascending at the top, but tend to be slightly drooping below. They form a dense, broad, rounded crown. The leaves are unequal, heart-shaped, 5 or 6 inches long and almost as wide, thick and firm, dull dark green, and coarsely toothed along the margin. They remain on the trees late in the autumn and turn yellow before falling. The yellowish-white flowers, produced in loose clusters in late June or July after the leaves have developed, are well supplied with a fragrant nectar that attracts bees.

American linden is easily transplanted, comparatively fast growing, and in the forest reaches maturity in 90 to 140 years. It may be relatively short-lived on streets. It prefers a rich, well-drained, and loamy soil, and, like most species of linden, it is intolerant of dry locations or dry climate. It may be used as a shade tree on lawns or along wide streets in suburban areas, provided soil conditions are favorable.

American linden is susceptible to several leaf diseases but none is usually serious enough to cause lasting injury. A trunk rot, however, which occurs rather frequently, starts near the ground level and advances slowly upward. Affected trees are subject to breakage in windstorms and may become unsightly at an early age.

Several species of European linden have proved to be desirable and hardy shade trees in the Northeast. One, the European linden (*Tilia europaea*, sometimes sold under the name of *T. vulgaris*), forms a dense, pyramidal head, and its leaves are slightly smaller than those of the American linden. It is widely planted as a shade tree on lawns and along city streets and is relatively tolerant of city conditions. It is susceptible to trunk rot, which makes it subject to wind breakage.

Another species of similar growth habit is the littleleaf linden, whose leaves are 1½ to 2½ inches long and sometimes broader than long. It also grows successfully as a lawn or street tree in suburban areas.

The silver linden is considered one of the most satisfactory trees for street and lawn planting and is hardy from western Massachusetts and central New York southward. It may reach a height of 100 feet and has upright branches that form a dense, broad, pyramidal head. The leaves, about 2 to 4 inches long and almost as broad, are dark green on the upper surface and silvery white below. The small,
fragrant, cream-colored flowers appear in July or August and are said to be poisonous to bees. The silver linden tolerates heat and drought and therefore is suitable for planting along wide city streets. It may also be grown successfully near the seacoast.

The pendent, or silverpendent, linden has leaves like those of the silver linden, but it has slender, drooping branches and is adapted to planting as an ornamental shade tree on lawns. Well grown, it may reach 80 feet.

The American sycamore, or the planetree, is native in the region except in northern New England, northern Wisconsin, most of Minnesota, and northwestern Iowa. This tree has been planted rather extensively as a shade tree in its native range. It is susceptible to anthracnose, a fungus disease that attacks and kills the leaves when they are developing in the spring and also infects twigs, causing a disfiguring dieback. Therefore, it is not recommended for street or lawn planting.

The London planetree, which is more resistant to anthracnose, has been grown successfully along wide streets and around suburban homes. This species is considered a hybrid between the American sycamore and the Oriental planetree, and is hardy in the southern parts of Maine, New Hampshire, Vermont, in central New York, and southward.

In the past few years it has proved susceptible to canker stain, a disease caused by a fungus that may kill large branches and entire trees. The disease may be controlled by using certain precautionary methods in pruning and in the treatment of cut surfaces and wounds. Detailed information about the disease and its control can be obtained by writing to the Division of Forest Pathology, Plant Industry Station, Beltsville, Md.

The London planetree may attain a height of 100 feet. Usually it has a short trunk that divides into several stout ascending secondary trunks. Its head is irregularly rounded or pyramidal. The bark resembles that of the American planetree, except that it is slightly cream-colored. The brownish bark peels off in rather large, thin patches, and exposes the yellowish or greenish innermost bark. The leaves, which have three to five lobes, are bright green, glossy on the upper surface, broader than long, and 4 to 10 inches wide. The rather inconspicuous reddish-green flowers appear in May when the leaves are partly developed. The fruit matures in September or October in greenish-brown, bristly balls, about an inch in diameter. The balls hang on the trees during winter.

The London planetree is easily transplanted, grows rather rapidly, and prefers a rich, moist, well-drained soil. It is tolerant of a wide range of soil conditions, however, and may be planted as a lawn or street tree where there is enough room for the spread of its branches. It endures city fumes.

American yellowwood is native in the Southeastern States, but is hardy as a shade tree southward from eastern Massachusetts, Rhode Island and Connecticut, and southern New York. It is a small tree, usually not exceeding 30 to 45 feet, with a short trunk and several ascending or slightly spreading branches that form a broad, rounded head. The bark of the trunk is light gray or brown, usually smooth and attractive. The leaves are composed of seven to nine leaflets, bright green, smooth and firm, each leaflet 3 or 4 inches long. The leaves turn bright yellow in the autumn before they fall, in June, after the leaves have developed, the fragrant white flowers appear in loosely branched, drooping clusters, 10 to 16 inches long. In August or September, the fruit matures in pods about 4 inches long.

American yellowwood should be transplanted in the spring; it becomes established rather slowly. It prefers rich, moist, well-drained soil, but it is drought-resistant. The slender twigs are rather brittle and may break in
severe windstorms. It is free from any serious fungus disease but its low head makes it suitable for planting as a street tree only in suburban areas along wide streets. The falling of the mature pods may be objectionable in some locations. Its attractive flowers and bark are ornamental on the home grounds, and its abundant foliage provides adequate but open shade.

**European Beech**, an introduced species, is 40 to 65 feet high at maturity. It has a compact, oval crown and glossy, dark-green foliage. It prefers fertile, well-drained soil; it cannot stand soil compaction. The several good horticultural varieties that are available offer variation in growth habit, form, and color of foliage.

**The Thornless Common Honeylocust** has gained favor for use on streets and lawns. Its small leaflets cast a light shade that does not prevent good growth of grass beneath it. It is high-rectangular or round-topped. This tree is long-lived and a rapid grower. The large, purplish-black fruit pods of the thornless common honeylocust may be interesting—or just a nuisance when they fall to the ground.

**The Common Hackberry** is a slow-growing tree of wide spreading form that may reach 50 to 70 feet. Opinions differ on its desirability, but it seems to be gaining in popularity. Birds feed on the fruit. The interesting bark is formed into warts or narrow ridges. The leaves are a light green, and the foliage casts a moderately dense shade. It is easily transplanted.

In many places it is susceptible to a disease that causes an excessive production of small twigs, called brooms. This does not seem to be especially detrimental to the tree, however. During the growing season the brooms are inconspicuous; in winter they give a more massive effect to the tree. In habit it is something like the American elm, although not so graceful. It dislikes smoke and soot.

**Trees of limited use** include several species that are good in many situations or for special purposes.

The American mountain-ash is a small to medium tree, with a somewhat open to round-topped crown. It is short-lived, fairly slow in growth, and subject to attack by several pests. The white flowers in the spring and the bright-red fruits, which remain over winter and are eaten by birds, make it an attractive tree for suitable yard locations. In New England many beautiful specimens brighten the landscape.

The magnolias are not usually considered as shade trees, but the native cucumbertree magnolia has the necessary qualifications. It grows best in well-drained soil. It is native in the region from Pennsylvania southwestward in the mountains and in Ohio, Indiana, and Kentucky. The wide pyramidal crown reaches 50 to 90 feet in the forest. Its red fruits are conspicuous in the autumn. Its large leaves turn yellow before they fall. The sweetbay and the southern magnolia are sometimes used for shade in the southeastern part of the Northeast.

The black tupelo is native in all States in the region, except Minnesota, Wisconsin, and Iowa, and the most northern parts of New England, Michigan, and Missouri. It grows 50 to 70 feet tall and develops a pyramidal but irregular crown. The leaves, which are scarlet in autumn, are oval, leathery, and dark green. Black tupelo casts a moderately light shade. Large trees are difficult to transplant. The fruits are eaten by birds. Squirrels often cut off many young twigs in the spring. The black tupelo grows best in rich, moist soil.

Amur corktree, introduced from Asia, forms a low-branched, spreading, rounded crown, which may reach 40 to 50 feet in height. The leaflets are a shiny dark green above and light green below. The foliage casts light shade. It develops an attractive, corky bark. The low-branching habit limits its use on streets, but it is recommended for parks and lawns. It is smoke-toler-
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The Panicled goldenrain-tree, another Asiatic species, deserves consideration when some flowering tree of relatively quick growth is needed. It is hardy in central Ohio and in southern New England. The beautiful yellow panicles of flowers are produced in July.

The Japanese pagodatree, introduced from Asia, reaches 50 to 65 feet in height and has a rounded, spreading crown. The leaves are glossy and dark green on the upper surface and soft, hairy, and pale green on the lower surface. The tree has an intermediate rate of growth and casts light shade. The attractive, small, yellowish-white flowers are produced in loose, open clusters in midsummer. As far north as Ohio and southern New England the young trees are subject to winter injury but are hardy when mature.

The paper birch grows rapidly into a medium-sized tree, which is pyramidal in form at first and later becomes irregularly round. It is a fast grower. Its life expectancy in the forest is about 80 years, but it may be much less under shade-tree conditions. It is not adapted to street planting although it has been successfully used in parks. It is subject to attack by the bronze birch borer, which limits its use in some localities.

Silver maple is a large, widespread tree of rapid growth. The leaves are whitish underneath, and when the pendulous branches sway in the breeze the tree has a flowing, silvery appearance. The wood is brittle and easily broken, and its roots often clog drain pipes. The silver maple is not recommended except for quick effects or for places where better trees will not grow.

Green ash is a tall, fairly narrow tree of rapid growth. It gives moderate shade. In the Lake States it is a fairly reliable tree that lends variety along streets or on lawns.

Eastern hemlock is one of the most satisfactory evergreens for home planting throughout New England and southward in the highlands. It is a native and sometimes is called Canada hemlock. It is a large tree, 50 to 80 feet tall, with long, slender, horizontal branches, which ascend above and droop at the base, forming a broad, pyramidal head. The lowest branches very often extend to the ground. The terminal shoot of the straight trunk
is flexible, and the small twigs and foliage are arranged in graceful sprays. The inconspicuous flowers appear in May and cones develop in the summer and autumn. The latter are formed at the tips of the small twigs; they are about one-half to three-fourths of an inch long, green at first, gradually turning reddish to brown.

In planting hemlock, the site should be carefully selected so that the young tree may be sheltered from any drying winds. The hemlock grows slowly and prefers a shady or sheltered location with moist soil. It may be grown in various types of soil, however, but will not be successful in an exposed site with dry, poor soil.

**RED PINE** is native in northern New England and in the Lake States. It is also grown extensively in the area as a shade or ornamental tree. It may attain a height of 50 to 75 feet. The trunk is erect and continuous into the crown. The branches are stout, spreading, and slightly pendulous at the base of the tree. The tips of the branches usually turn upward. On young trees the branches extend to the ground and form a broad, pyramidal head. The bark of the trunk is reddish brown. The needle-shaped leaves are dark green, from 5 to 6 inches long, slender, brittle, and have sharply pointed tips. There are two in a cluster, in long, flexible tufts. They remain on the trees four or five seasons. The cones, about 2 inches long, are green when young; they gradually turn light brown and reach maturity the second autumn.

Red pine will grow best in light and sandy soil in sunny locations. It will not thrive in shady sites or in poorly drained soils. It is not readily transplanted but, when it is once established under favorable conditions, young trees will grow rapidly. The lifespan of the red pine in the forest is about 350 years.

**EASTERN WHITE PINE**, a native in much of the region, is valued highly both for shade and ornament. It may attain a height of 50 to 80 feet. Its straight and tapering trunk normally is continuous into the crown. The branches are spreading and horizontal and generally are arranged in whorls of five. In the young trees they extend to the ground and form a broad-based and pyramidal or conical head. The leaves are threesided, in clusters of five, and are bluish green, soft, slender, flexible, and about 3 to 5 inches long. They usually remain on the twigs for two seasons. White pine will grow in almost any location but nevertheless it likes best a rich, well-drained soil.

Under favorable conditions, white pine grows rapidly and reaches maturity in about 200 years, and in the forest its lifespan is about 450 years. As a shade tree it often becomes ragged after 40 to 60 years, particularly at low elevations or in the hotter and drier parts of the region.

Many fungus diseases attack the leaves, twigs, and trunk of the eastern white pine, but most of them cause only slight weakening or injury. Blister rust, a fungus disease, produces serious cankers on branches or trunk and may result in the death of the tree. Precautionary measures can usually be taken to prevent ornamental white pines from becoming infected.

**WHITE FIR** is native in the western part of the United States but is extensively and successfully grown as a shade or ornamental tree in the Northeast. It is hardy as far north as central Maine. It may attain a height of 60 to 70 feet. Its straight, tapering trunk and whorled, spreading branches usually extend to the ground and form a broad-based, pyramidal head. The leaves are narrow, flat, about 2 inches long, bluish green or silvery; they spread outward and curve upward from the twigs. They remain on the twigs for several years.

White fir will grow in a wide range
of soil conditions, but it is rather slow in becoming adjusted after it has been transplanted. It prefers a rich, moist, well-drained, gravelly or sandy loam. Even under the most favorable soil conditions, however, the growth of young trees is rather slow. Maturity is reached in 300 years in the forests.

White fir stands heat and drought well, but in the northern parts of the area late-spring frosts sometimes kill the tender new growth. A disease caused by a fungus that is native on northern balsam fir sometimes kills back the new growth and may seriously weaken the trees. For that reason it is usually inadvisable to plant the white fir near the balsam fir.

**Nikko fir**, native in Japan, is one of the most satisfactory firs for shade or ornament and is hardy in central and southern New England. It may reach a height of 50 to 60 feet. It has a straight and tapering trunk—with whorled, spreading branches, continuous to the ground. The leaves are narrow, flat, and about an inch long; closely set on the twigs, they spread outward and upward. They are shining, dark green on the upper surface and have two broad white bands on the lower surface, and remain on the twigs for several years.

Nikko fir may be rather slow in its growth for a few years after transplanting, but usually is slightly more rapid than the white fir. Although it prefers a rich, moist, and well-drained soil, it will also grow successfully in drier locations and is relatively tolerant of heat and drought.

No fungus diseases have been reported on Nikko fir in this country.

**Oriental spruce** is native in Asia Minor and is hardy in the central part of the region. It makes a graceful and attractive shade tree with a rather narrow, pyramidal head. The trunk, which may reach a height of 50 to 80 feet, is erect and tapering. It has dense and spreading branches, in whorls, horizontal or even slightly ascending above, somewhat pendulous below, and continuous to the ground. The leaves are from one-fourth to one-half inch long, closely set on the twigs, four-sided, shining dark green, and blunt at the tip. They remain on the twigs several years.

The Oriental spruce is slow growing and is most successful in rich, moist, well-drained soil. It is susceptible to a fungus disease that first attacks the lowest branches of old trees and gradually progresses upward. Cankers and dieback of these lowest branches sometimes disfigure the trees.

**Colorado blue spruce**, native in the western United States, is very well known as a lawn tree throughout the Northeast. It grows 50 to 80 feet in height. Its stout, horizontal branches extend the entire length of the straight, tapering trunk, and form a symmetrical, pyramidal head. The leaves are four-sided, sharp-pointed, and rigid and spread out from the twigs. They are about an inch long and vary from dull green to bluish green or silvery white. They remain on the twigs for several years, but they tend to lose their silvery color as they age.

The Colorado blue spruce is slow growing and is tolerant of a wide range of soil conditions. Most satisfactory growth is obtained in rich, moist, well-drained soil.

The lowest branches of older trees may be seriously injured by the previously mentioned fungus disease on Oriental spruce. The Colorado blue spruce is particularly susceptible to this disease, which causes large resinous cankers and dieback.

**The native white spruce** is most satisfactory for shade and ornament in the northern parts of the region. It develops into a symmetrical, pyramidal tree 50 to 60 feet tall, with dense, horizontal, spreading branches that extend to the ground. The leaves are about three-fourths of an inch long, four-sided, crowded on the twigs, slightly curved, light bluish green, and remain on the twigs for several seasons.
They give off a disagreeable, pungent odor when they are crushed.

The growth rate of white spruce is much slower in dry locations than in moist, well-drained soil. Its life span in the forest is 200 to 300 years.

It is slightly susceptible to the Oriental spruce fungus disease, but usually is not seriously injured.

Black Hills white spruce is compact and slow in growth, and is generally useful in the northern Lake States.

The common Douglas-fir is a large, pyramidal specimen, with branches growing well down to the ground.

Many other kinds of trees, both deciduous and evergreen, might have been mentioned here. This list tends to be conservative; it is based on the experience of many men who plant and take care of trees. But we compiled it with the thought that it could be a springboard from which you might take a deep plunge into the fascinating hobby of planting and growing shade trees around your home or develop an interest in the trees of your city streets and parks.

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SHADE TREES FOR THE SOUTHEAST
RALPH M. LINDGREN, R. P. TRUE, E. RICHARD TOOLE

Residents of the Southeastern States have a wide choice of trees for shade and ornamental purposes. They also have a difficulty in making their selection, for their section has variables in climate and altitude and other conditions that do affect tree growth. (Florida alone, for example, can be subdivided into at least three distinct zones in which climate and commonly used plants are likely to differ a good deal from each other.)

Furthermore, certain local conditions may sometimes prevent the successful use of a species within the recognized geographic range of the Southeast. For these reasons, the list of trees we present is not expected to be entirely acceptable throughout the region or adequate for specific localities.

The live oak, a tree of history and beauty, is long-lived and rather slow growing. It attains tremendous size with age. It branches low into massive and widespread limbs, and forms a broad, dense, round-topped crown of dark, glossy, evergreen leaves. It resists storm damage, insects, and diseases; the costs of care and maintenance therefore are relatively low.

Propagation from seed or transplants is not difficult. The live oak is used widely where enough space is available on lawns and along driveways and roads. Severe freezes injure it, but it is considered satisfactory in such inland cities as Shreveport.

Southern magnolia, with its beautiful flowers and evergreen foliage, is