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ELMS GROWN IN AMERICA

TWENTY-FIVE years ago, Professor Charles S. Sargent, Director of the Arnold Arboretum wrote the following statement concerning the European Elms—unfortunately just as true today as it was then—
“There is probably more confusion in the identification and proper naming of these trees (the European elms) in American parks and gardens than of any other group of trees, and it is only in very recent years that English botanists have been able to reach what appear to be sound conclusions in regard to them. The confusion started with Linnaeus, who believed that all European elms belonged to one species, and it has been increased by the appearance of natural hybrids of at least two of the species and by the tendency of seedlings to show much variation from the original types.”

Today, with six elm species native in the United State, five species native of Europe (including many varieties), and several more species native of Asia, the picture becomes even more confused. The elm is, and always has been, a standard shade tree, for even though it is threatened in certain sections by the Dutch elm disease, the gardening public will still plant elms. Approximately fifty elms will be mentioned in this bulletin. About thirty of them have been listed as available in the nurseries of this country during the past two years: all but five of them are growing in the Arnold Arboretum at Boston.

The Native American Elms

Of the six native American species, only three are of ornamental value—the American elm (*U. americana*) and its varieties, the slippery elm (*U. fulva*), and the winged elm (*U. alata*). The winged or wahoo

elm is hardy only in the southern United States, being native from Virginia to Florida and westward to the Mississippi River and Texas, while the other two are native throughout the East and Mid-west. These species are easily distinguishable and little reason exists for any confusion. A key based on foliage characters is appended to this paper.

Rich in references in the early history of the United States, the American elm is the most outstanding and the most deserving of all the elms. It is widely distributed throughout southern Canada, as well as the eastern and the mid-western parts of the United States. In early colonial times, it was under numerous stately specimens that important meetings and many important events took place. Some of these historic elms are still standing today and are well over a hundred feet in height. Many a community in the eastern and mid-western United States has its own local history closely tied to some huge elm which is yet living; and it is the consensus of opinion in hundreds of communities that it would be a dire calamity indeed if the use of the American elm were discontinued in landscape work.

There is no ornamental tree just like the American elm. Its wide, vase-shaped form is unique, making it an excellent specimen for lawn and for street planting. Its lofty branches allow much air circulation underneath and, though the tree supplies perfect shade, the widely arching branches do not hinder views from houses. This habit, characteristic of the American elm, is much more evident in mature specimens than in younger trees. Since the habit varies considerably when the trees are grown from seed, it is advisable to propagate vegetatively those individuals of outstanding form. Strange enough, it is, like the white oak, one of the few of our native trees that does not thrive well in Europe.

Several recognized varieties give clear evidence of the diverging habits of the American elm. There is, for instance, the variety *columnaris* with rather upright branches forming a wide columnar head. The variety *ascendens* is more narrow, distinctly columnar. Other columnar or narrow pyramidal forms would include the "Lake City" elm, the "Moline" elm, and the "Princeton" elm. Sometimes a variety "urni," or "vase-shaped form," is found listed in nursery catalogues; this is, in reality, the true *U. americana*. Then too, there is the variety *pendula*, which has all the good qualities of *U. americana* with the addition of drooping branchlets, making it decidedly graceful. These and other forms should, of course, be asexually propagated in order to perpetuate their characteristic forms.

The slippery elm (*U. fulva*) is usually found over the same range as

the American elm but is not such an excellent ornamental and only grows about sixty feet high. Its form is round; its head, broad and somewhat open; and the foliage, not so dense as that of the American elm. From the mucilaginous inner bark of this tree, very popular cough drops were made at one time. The slippery elm is slightly more susceptible to elm leaf beetle injury than the American elm, and need never be used as a substitute for that much better tree.

The winged, or wahoo elm (*U. alata*) of the South is a vigorous growing, small tree with a wide-topped head, reaching a height of about thirty feet. The leaves are smaller than those of either of the elms already described, and there are pronounced broad and opposite corky ridges along the vigorous young branches. Sometimes the winged elm will grow in protected places as far north as Boston, but it is not dependably hardy north of Philadelphia. Where it can be grown, it makes a vigorous growing, small tree, often with graceful arching branches. It should be given preference to the American elm, however, only where a small sized mature tree is desired.

Three other elms, native in the United States, are seen occasionally in cultivation but these are not offered by nurseries because the trees have little to offer as ornamentals when compared with the more beautiful *Ulmus americana*. One is the cedar elm (*U. crassifolia*) of Texas, Mississippi and Arkansas. It is very common in these states but has been found to be of little value elsewhere in the United States. It is a somewhat round-headed tree, growing about 75 feet tall and having, like *U. alata*, opposite corky ridges along the twigs. Closely related is the red elm (*U. serotina*) native to Kentucky, Alabama and Georgia but hardy as far north as Boston. It has spreading, somewhat pendulous branches, forming a broad head; and it, too, often develops corky wings along vigorous growing twigs. These two elms and *U. parvifolia*, the true Chinese elm, are unlike all other hardy members of the genus in that they develop their flowers and fruits in the fall and not in the spring.

The last native elm species is the rock elm, *U. thomasi*, (formerly called *U. racemosa*). Though at present it is rarely grown, the tree might be valuable because of its unique growth habit. About 90 feet tall at maturity, it usually has a central trunk and irregularly developed short, lateral branches, giving an outline which is oblong, rounded at the top, but not necessarily dense. Its slow growth and loosely borne branches are probably the reasons why it has not been much utilized as an ornamental, but its growth habit makes it easily distinguishable, even at a distance, from the rest of the elms. It, too, fre-

quently develops irregularly corky wings along its younger branches.

So much for the native elms. Some are seen everywhere in the East and the Mid-west; and some of the less desirable ones have been left standing where the surrounding land has been utilized for building purposes. As stated before, the last three species mentioned are probably not grown in nurseries nor used in landscape work, but are seen here and there simply because they have remained untouched in areas where man has "developed" Nature's handiwork. The American elm is the best—far superior to the others in every way.

Asiatic Elms

Of this group, the elm which has caught the public fancy more than any other is the Siberian elm (*U. pumila*). This plant is a native of northeastern Asia. It is unfortunately misnamed the Chinese elm in many nursery catalogues though this name belongs to *U. parvifolia*. It was first sent to this country in 1905 by Professor J. G. Jack, of the Arnold Arboretum, and later was introduced in large quantities through the efforts of Frank N. Meyer, of the U. S. Department of Agriculture. The name Dwarf Asiatic elm, given to the plant in the first edition of "Standardized Plant Names," is unfortunate since it is a standard tree 75 feet tall—anything but dwarf. This vigorous growing tree has found much use in the drier areas of the Mid-west, where it does better than most other trees. It withstands clipping very well and forms dense hedges and windbreaks when properly clipped.

But when we have noted its drought resistance and its fast growth, everything in its favor has been said. It is a weak-wooded tree, does not grow old gracefully, and if unpruned, becomes very loose and open. Where other trees are available for ornamental purposes, they should be grown. This is especially true in the eastern and northeastern United States. Reports are circulating of certain strains of this tree with good form and habit, which yield similar off-spring when propagated asexually. I have seen several of these trees, which, when young, admittedly make nice specimens; but it is questionable that they will maintain their good habit as they grow older. For dry soil planting, especially in the dry areas of the West, or for a quick screen which later may be replaced with one more permanent, this tree is admirable; but as a permanent specimen in areas where other trees are available, it is not to be desired.

An elm frequently confused with *U. pumila* is the true Chinese elm (*U. parvifolia*) native of northern and central China, Korea and Japan. Like *U. pumila*, it has small leaves, 1 to 2 inches long. There are sev-

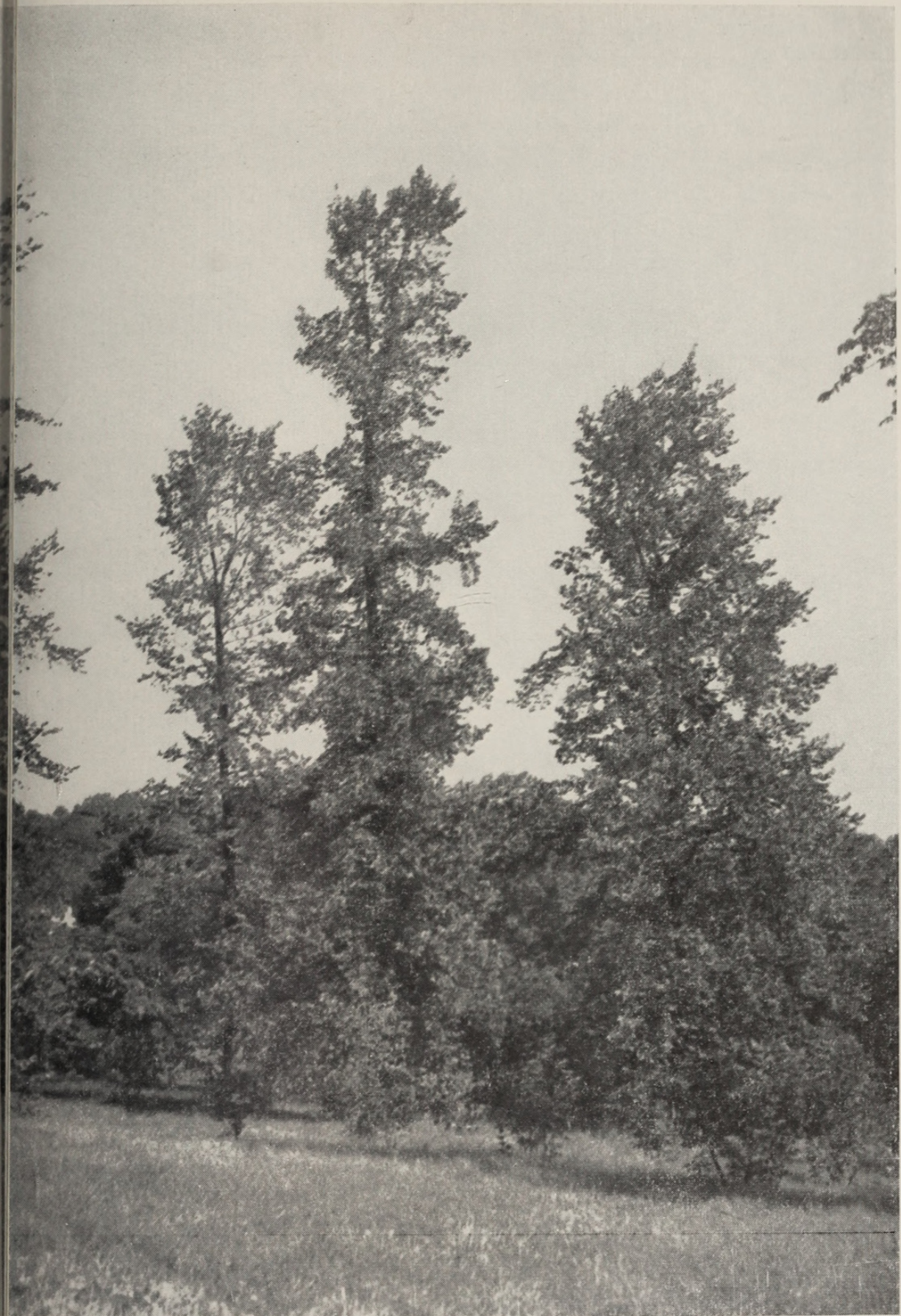


PLATE VIII

The native rock elm, *Ulmus thomasi*.

eral ways in which it differs from the taller growing Siberian elm, however. The true Chinese elm is a small tree, usually under fifty feet in height. It has thin scaling bark, and a round-topped crown, keeps its foliage green until late in fall and is half evergreen in the south. It bears its flowers in the fall while *U. pumila* has them in the spring. Usually, like the other elms, its autumn foliage is bright yellow; but two of the trees in the Arboretum have a bright red autumn coloration. It has been noted in the Japanese beetle area around Philadelphia, that where these two species were growing side by side, the beetles would practically defoliate *U. pumila* and scarcely touch *U. parvifolia*—an interesting observation well worth further investigation.

The Japanese elm (*U. japonica*) has long been a tree of importance to the Ainu, the aboriginal people of Japan. Many of these people believed that this was the first tree created, sent directly from heaven in full growth. This tree plays an important part in their economy. Fire is made by rubbing its dry roots together. When the inner bark of the tree is mashed and mixed with water, it is woven into a cloth from which wearing apparel is made. The outer bark is used in the roofing of houses and as covering for the outside (and the inside) walls. The Japanese elm is a handsome tree with good dark green foliage. It is as important ornamentally as the Scotch elm because of its similarity in general appearance. In the collection at the Arnold Arboretum, it is susceptible only to a very slight infestation of the elm leaf miner and the elm leaf beetle.

The fourth and last Asiatic elm, the Manchurian elm (*U. laciniata*) is of little importance ornamentally simply because it does not have a good habit of growth. All the trees in the collection at the Arboretum have a fan-shaped habit of branching, with a correspondingly rounded head, but the leaves are borne only at the tips of the long branches, which have very few side shoots. This plant has been offered in a few American nurseries but might well be replaced by some of the better elms.

European Elms

There are three elm species which, strictly speaking, are native of Europe only. They are the English elm *U. procera* (formerly called *U. campestris*), the Russian elm (*U. laevis*), and the lock elm (*U. plati*). Characteristic of the European elms as a group is the fact that they all assume their autumn color later in the fall than do the native American elms.

Of the three, the English elm is by far the most important in Amer-

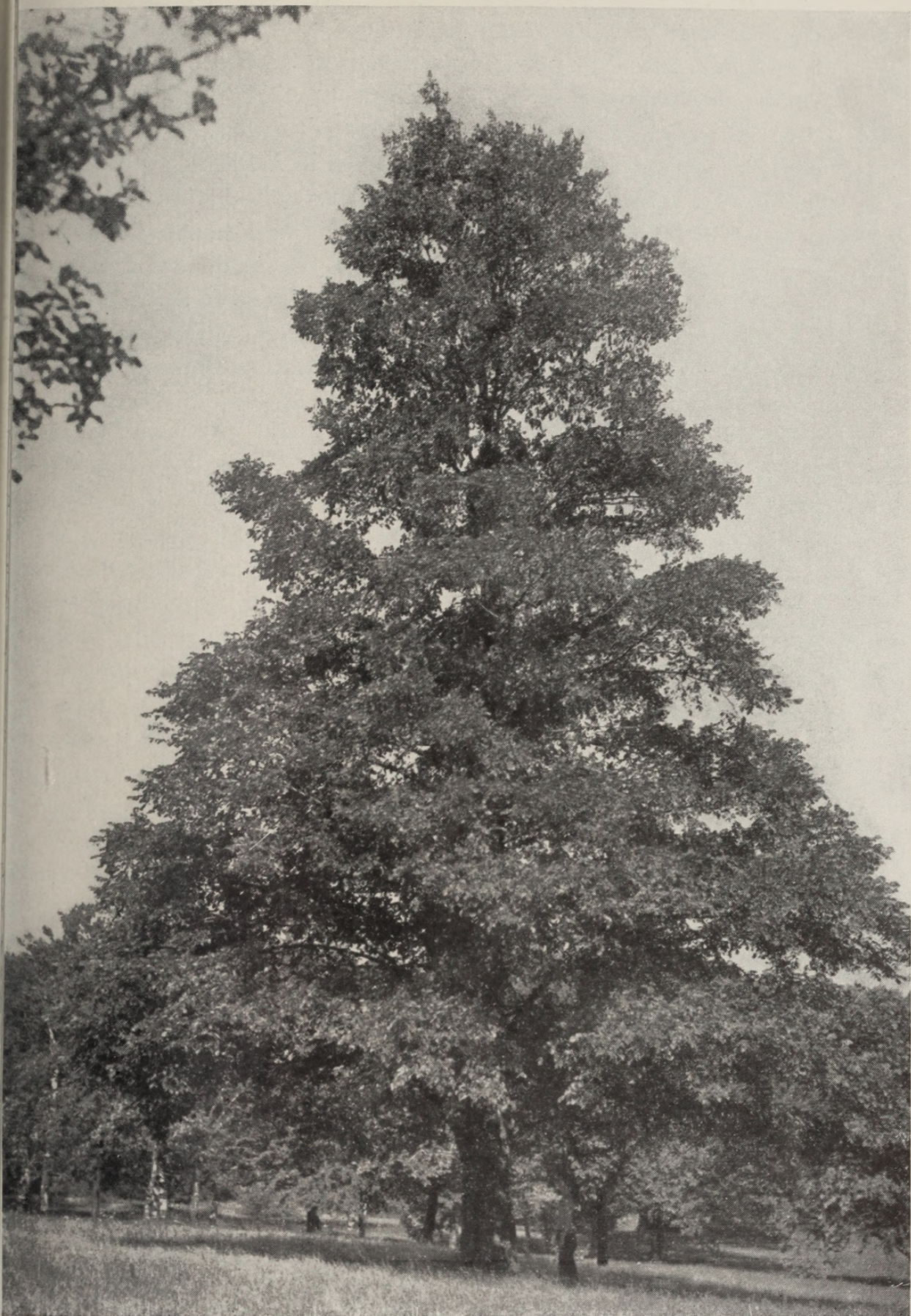


PLATE IX

The European white elm or Russian elm, *Ulmus laevis*.

ica. Many of these trees were planted in Massachusetts in the eighteenth century and since that time have been continually used as street trees and specimens throughout the East. E. H. Wilson strongly recommended this tree for city planting for he claimed that it withstood the smoke and obnoxious gases of the city better than any of the other elms, the American included. It does not have the queenly arching habit of the American elm, but it does have a grace and beauty all its own, with its numerous ascending and spreading branches. It has also been noted that in good seasons the leaves remain green several weeks longer than do those of the American elm. Unfortunately it is most susceptible to attacks of the elm leaf miner and of the elm leaf beetle. In Massachusetts during the past summer, these pests were unusually numerous, and trees which had not been sprayed were practically defoliated by the end of July. Although many other elms, including the American elm, were victims this season, the English elm suffered particularly.

Several varieties of the English elm are known, but none of them are grown in quantity by American nurseries. The variety *vanhouttei* has leaves tinged with yellow, and *aurea* actually has yellow leaves. The variety *purpurascens* has purplish leaves, and another variety, *marginata*, has leaves with a creamy-white margin. One form, *australis*, has leaves that are much thicker and firmer than those of the species. Perhaps the best ornamental variety is *myrtifolia*, which has the smallest leaves of any of the elms—scarcely one inch long.

The European white elm or Russian elm *U. laevis*, (formerly *U. pedunculata*) is common in some parts of the Scandinavian Peninsula and Russia. It is similar in size to our own native American elm and is as hardy. However, it differs because it has a much thicker coating of tomentum on the undersurface of the leaves, and longer, more sharply pointed buds. In England, it grows better than the American elm. It is apparently rare in American collections, but makes an excellent specimen tree.

Another European species is the East-Anglian or lock elm, *U. ploti*. The name lock elm was given to it in England because of the difficulty of working its tough wood. This tall growing tree, which reaches a height of 80-90 feet, is closely allied to the Scotch elm and is rarely found in American collections.

The next elm species to be mentioned is a hybrid, *U. hollandica*, apparently a hybrid of *U. glabra* and *U. carpinifolia*. There are a number of varieties but the one which well might represent this group is known as variety *major*, commonly called the Dutch elm. It is a tree of over

100 feet with a short trunk, wide-spreading branches, and lustrous dark green leaves. Other varieties have been planted to some extent in Europe as street trees, and a few have met with favor in America. The Belgian elm, *U. hollandica belgica*, is a tall, rough-barked tree with a straight trunk. Younger trees are dense and pyramidal in habit while older ones may be more or less cylindric. Trees of this variety in the Arnold Arboretum are apparently somewhat more hardy than typical *U. hollandica major*. The Klemmer elm (var. "Klemmer") has smooth bark, tall ascending branches, and a narrow pyramidal habit of growth. It originated in Belgium where it is planted a great deal. The Huntingdon elm (*vegeta*) originating about 1750 has been used in America and is valued for its height, its forked trunk, and its rough bark. A narrow pyramidal variety with smooth bark is *superba*, and still another variety, *pendula*, originating in England about 1830, has ascending branches but pendulous branchlets.

The elms, at least in the eastern part of the United States, are seriously threatened by the Dutch elm disease, about which every tree lover has read much. It is not my purpose to discuss this disease or its future potentialities, but I do want to plead for the cause of the elms. I believe that we should not stop planting elms simply because they may be subject to this disease. It is true that there are many other trees we can use in street tree planting, but none can compare with the American elm, and few have the distinctive forms characteristic of some of the varieties of the European elms. It is also true that they must be sprayed with lead arsenate to combat the elm leaf beetle. In very restricted areas, as around New York City, it may be advisable to discontinue the planting of elms, at least for the time being. However, I think the elms should be held in just as high regard as they always have been and that in New England, though adjacent to the Dutch elm disease area, we should continue to plant elms until that disease shows more pronounced signs of rapid spread.

Species Native of Both Europe and Asia

The last two species are native of Europe and western Asia, and are used a great deal in the United States because of their good ornamental characters and their several horticultural forms.

The first is the smoothleaf elm *U. carpinifolia*, (formerly called *U. foliacea* or *U. nitens*). Being used to a great extent in this country, it is constantly confused with the English elm, *U. procera*, (*U. campestris*), from which it may be distinguished by its less deeply furrowed bark, mostly glabrous branchlets, longer and often obovate leaves which are

lustrous and usually smooth on the upper surface with petioles from $\frac{1}{4}$ to $\frac{1}{2}$ inch long. Unfortunately, the seeds of this tree have been sold for years by European seedsmen as *U. campestris*; consequently, the resulting confusion in this country has been inevitable.

The smoothleaf elm, which may reach a height of 90 feet, and is quite variable in growth habit, has many horticultural forms, some of which are available from nurseries in this country. This tree usually is pyramidal in outline, having a single trunk and somewhat ascending branches, although sometimes the branches may be pendulous and the head more or less rounded. In the south of England, it is often referred to as the Herfordshire elm, and grows with a broad head and rather pendulous branches, surpassed in beauty only by the American elm as it grows in New England. The pendulous branched form (*pendula*) has been offered by American nurseries. An unusual variety is *webbiana*, of little horticultural value because, even though the tree is narrow and pyramidal with ascending branches, the leaves are folded longitudinally, giving the appearance of wilting. Another form, *variegata*, has its leaves blotched with two shades of green and with white; and though not particularly desirable, it is of interest to those who like trees with variegated leaves.

Eight other varieties of the smoothleaf elm have horticultural significance, six of them being offered in American nurseries. Both the Cornish elm (*cornubiensis*) and the Wheatley elm (*sarniensis*), incorrectly called *wheatleyi*, though also known as the Guernsey or Jersey elm, are narrow, pyramidal trees with dense, erect branches. The Wheatley elm, almost columnar in habit, has a slightly broader head and wider leaves than the Cornish elm, with branches more stiffly erect. The variety *dampieri* is a fastigate tree with a very narrow, pyramidal crown and deeply double-toothed leaves; *wredi* is similar but its leaves are yellowish. Another variety, named *suberosa*, is little more than a dense shrub, irregularly cylindric in outline, the young sucker branches of which frequently develop opposite corky wings. Somewhat similar to *suberosa* is the variety *propendens*, the branches of which are pendulous, however, and its leaves are very small, only being about one inch long. An outstanding elm was sent to Germany from Persia in 1878 and has since been named the variety *umbraculifera*. This is a dense growing, small tree with a globose, or sometimes flat top and erect branches. Closely associated to it is the variety *koopmanni*, which is definitely more globose in outline but just as dense. Trees of these two varieties in the collection at the Arnold Arboretum are well clothed with branches from top to bottom.



PLATE X

Two varieties of the smoothleaf elm, *Ulmus carpinifolia*. On the left var. *umbraculifera*, on the right var. *koopmannii*.

These unusual forms are not to be desired in preference to other more ornamental trees and shrubs in the landscape, but they do have a definite use. Sometimes there is a place in a large planted area for a small tree with a definite outline—something which does not require constant pruning to keep it in shape. These varieties of the smooth-leaf elm supply just such an accent point. Indiscriminate use of these trees, however, should be guarded against.

The other elm species which is native of Europe as well as certain parts of western Asia, is the Scotch, or Wych elm, *U. glabra*, sometimes formerly called *U. montana* or *U. scabra*. This tree, with wide-spreading branches and often flat-topped head, is used considerably in America as an ornamental. The dark green leaves, sometimes with two or three points near the apex, are broader beyond the middle, very rough above, and downy underneath. The petioles are about $\frac{1}{8}$ inch long. Unlike many of the other elms, this one does not produce suckers; and, on account of this good trait, it has been used much as an understock in grafting. Unfortunately, it is one of the first elms sought by the elm leaf beetle, and in locations where there are several varieties, the beetle does more injury to this tree than to most of the others.

This elm can always be distinguished from other European elms by the fact that the seed is in the middle of the fruit, the petioles are very short, the upper surface of the leaves is rough, and there is an absence of corky ridges on the two-year branches. The specific name *glabra* comes from the fact that the branches are very smooth, not rough like most of the other elms.

A number of varieties of this are grown. The most popular is the Camperdown elm (*camperdowni*) which, when grafted on an upright stem, has a wealth of pendulous branches forming a globose head. Many such trees can be seen even in this country, forming natural arbors under which chairs and tables are placed. Another form (*pendula*) has rather horizontal branches with pendulous branchlets and grows into a low flat-topped tree. There is a fastigiata variety, called the Exeter elm (*exoniensis*, formerly *U. montana fastigiata*), with rather small, often wrinkled leaves, but with branches rigidly upright. One variety (*purpurea*) has leaves which are purple in color when they are young; another variety (*atropurpurea*) retains the color in the leaves for a longer period. A compact shrub with smaller leaves is the variety *monstrosa*. A lower growing bush is *nana*, which seldom grows over 6 feet tall. Sometimes this bush elm is grafted 6 feet up on the trunk of *U. glabra*, resulting in a dense, compact, round-headed tree. A

curious, slow-growing form with leaves that are narrow and crinkled is called *crispa*—used sometimes because of its queer foliage.

The Key

The following key is offered as an aid to the identification of elm species on the basis of foliage characters. More exact keys have been made, in which the flowers and fruits are used, but many an amateur is confronted with the perplexing problem of identification when flowers and fruits are not available; hence this key. Every one of the elm species varies greatly, and to make a key using only one or two characters is not very satisfactory. Therefore, this key is not infallible, but it may serve its purpose to many who are perplexed concerning the identification of these elms.

To the individual not familiar with the use of keys, this may at first seem confusing, but careful study will prove its simplicity. For instance, all elm species fall into one of four groups (marked by the figure 1), because of corky ridges on the branches, or leaves with several points at the apex, or leaves simply serrate, or leaves doubly serrate. To place a plant in one of these four groups, these four characteristics should be used *in this sequence*. Once done, the remaining points should be taken up in the particular group, *in the sequence suggested in the key*. Identification will be aided materially if the habitat of a tree is known. For instance, in the first group (corky ridges on the branches) *Ulmus crassifolia* would not be found in northern Minnesota, nor would it be likely that *U. procera* and *U. japonica* would be found growing wild in the woods.

Be certain that the tree is examined carefully for all possible marks of identification, and that many leaves are examined since one alone would not tell the full story.

It should be noted that this key does not take into consideration the varieties of these species, many of which can be identified by their form alone. Also, and this is very important, it should be noted that the following species are not common in America except in botanical collections: *U. japonica*, *laevis*, *ploti*, and that other species, like *U. thomasi* and *serotina*, are used very little in landscape work. A knowledge of these facts should make this key much more usable.

The elms are so variable that it is likely they will continue to be difficult to identify for many years to come. These notes and suggestions are offered merely as aids to those interested in this group of trees.

ABBREVIATED FOLIAGE KEY TO COMMON ELM SPECIES

1. Corky ridges or wings on younger branches

2. Leaves simply serrate *Ulmus crassifolia*

2. Leaves doubly serrate

3. Young twigs glabrous or nearly so

4. Wings usually two and opposite *U. alata*

4. Wings several, not necessarily opposite, flowers
in spring, not native *U. carpinifolia suberosa*

4. Wings several, not necessarily opposite, flowers
in fall, native *U. serotina*

3. Young twigs pubescent

4. Tree irregularly columnar *U. thomasi*

4. Tree not irregularly columnar, oval or rounded in outline

5. Leaves 2-3'' long, wings occasionally *U. procera*

5. Leaves 3-4.75'' long, wings occasionally *U. japonica*

1. Leaves three pointed at tip or occasionally so, branches not corky

2. Mature branches reddish brown, hairy while young; leaves
occasionally with one or two extra points at apex *U. glabra*

2. Mature branches pale yellowish or grayish brown,
glabrous or nearly so when young; most of the
leaves three-pointed at apex *U. laciniata*

1. Leaves simply or nearly simply serrate, 0.75-2.75'' long

2. Leaves often nearly equal at base, many leaves showing
indications of double serration, young branches pubescent
or glabrous, stipules broad, flowers in spring *U. pumila*

2. Leaves usually unequally rounded at base, young
branches pubescent, stipules linear, flowers in fall *U. parvifolia*

1. Leaves doubly serrate

2. Young branches glabrous

3. Leaves 2.75-6'' long

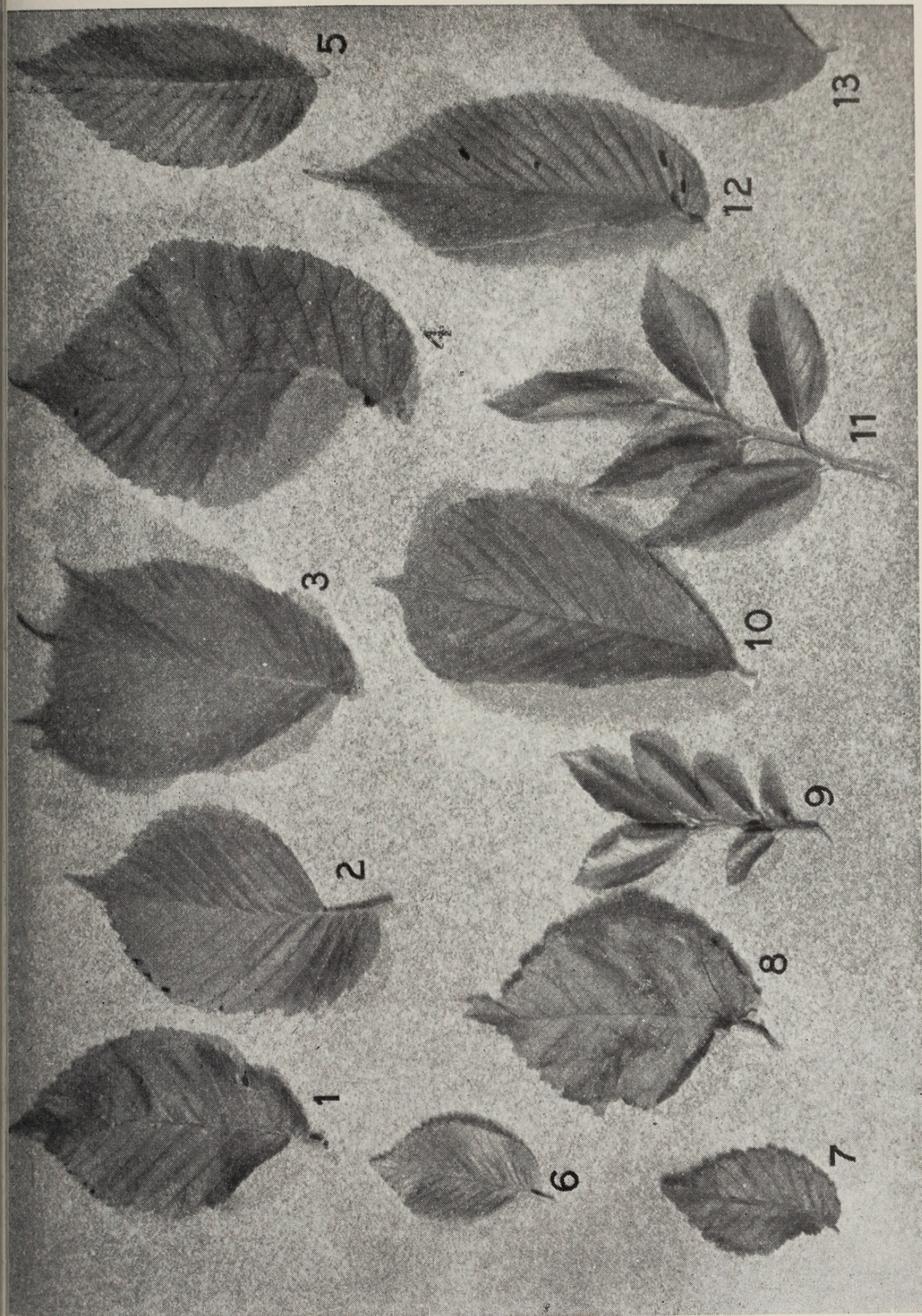


PLATE XI. Leaf specimens of various elm species showing the variation in size and form.

- | | | | | | |
|-------------------------------|---------------------|-------------------------|------------------------|------------------------|---------------------------|
| 1. <i>U. hollandica major</i> | 2. <i>U. laevis</i> | 3. <i>U. laciniata</i> | 4. <i>U. glabra</i> | 5. <i>U. americana</i> | 6. <i>U. carpinifolia</i> |
| 7. <i>U. procera</i> | 8. <i>U. plati</i> | 9. <i>U. parvifolia</i> | 10. <i>U. japonica</i> | 11. <i>U. pumila</i> | 12. <i>U. fulva</i> |
| | | | | | 13. <i>U. thomasi</i> |

- 4. Leaves usually twice as long as wide, no conspicuous axillary tufts of hair *U. americana*
- 4. Leaves less than $1\frac{1}{2}$ times as long as wide, usually with conspicuous tufts of hair in axils of veins on under surface of leaves, considerably variable *U. hollandica*
- 3. Leaves 1.25-3.25'' long
 - 4. Petioles 0.25-0.5'', leaves 2-3'', smooth above *U. carpinifolia*
 - 4. Petioles less than 0.25'', leaves 1.25-2.25'', slightly scabrous above *U. ploti*
- 2. Young branches pubescent
 - 3. Leaves often glabrous beneath *U. americana*
 - 3. Leaves pubescent beneath
 - 4. Leaves 2-3'' long *U. procera*
 - 4. Leaves longer
 - 5. Leaves often widest at middle, 4-8'' long
 - 6. Branchlets grey to light brown, buds covered with rusty brown hairs *U. fulva*
 - 6. Branchlets dark brown, buds without rusty brown hairs, leaves sometimes showing a tendency to be three pointed at tip *U. glabra*
 - 5. Leaves usually widest above middle, 2.5-4.75'' long
 - 6. Leaves scabrous and pubescent above, corky wings on branches occasionally *U. japonica*
 - 6. Leaves usually glabrous above, very unequal at base *U. laevis*

DONALD WYMAN



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