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Autor: Parks, Clifford R.

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Woody plants commonly cultivated in Central North Carolina

by

Clifford R. PARKS

Contents

1. Introduction
2. Broad leaf shade trees
3. Flowering trees
4. Fruit and nut trees
5. Deciduous shrubs
6. Evergreen shrubs
7. The hollies
8. The conifers

Summary - Zusammenfassung

References

1. Introduction

The cultivated plants of a region are usually a mixture of exotic and native species. As a rule the most successful exotics originate in regions which have climates similar to the region into which the species is being introduced (see introduction to this volume by H. LIETH). It will be clear from the tables presented in this paper that the majority of common cultivated species in North Carolina are either natives or introduced from mesic, warm-temperate, southeast Asia while relatively few species have been introduced from drier Mediterranean regions of the world.

Since North Carolina has a broader spectrum of climates than any

other state or province in eastern North America, the preparation of a complete list of cultivated materials for this state would be a very large task. One private collection near Chapel Hill currently has over a thousand woody species established.

We have therefore restricted ourselves to brief horticultural descriptions of the commonly cultivated plants of North Carolina, with emphasis on the cultivated materials of the central Piedmont Region of the state. Common materials are the primary concern; however, some less frequently seen species growing on the campus of the University of North Carolina are included. The distribution of species in cultivation across the state is mentioned, but those limited to coastal plain or mountain zones are mostly omitted.

While the list presented here indicates what is found, it is a worthwhile task to find the new species worthy of introduction. Several small arboreta and private collections are in the process of testing new species in this area.

The plants are presented here in seven sections according to horticultural usage:

- Section 1: Broad leaf shade trees
- Section 2: Flowering trees
- Section 3: Fruit and nut trees
- Section 4: Deciduous shrubs
- Section 5: Evergreen shrubs
- Section 6: Hollies
- Section 7: Conifers

For each plant species, the native location, date of introduction and frequency of cultivation are presented in tabular form at the beginning of each section and horticultural descriptions follow. A figure with leaf outlines for the species in each section is placed at the end of each grouping.

2. Broad leaf shade trees

These, along with the conifers (presented in a separate list), make up the landscape in our inhabited areas, and to a large degree the trees listed here are the backbone of the North Carolina landscape. In any region the cultivated shade trees, more so than any other horticultural grouping of plants, are usually species native to that region. Since it takes two or more human generations for many tree species to mature, the psychological investment in an established tree is so great exotic species that might not enjoy long term adaption are usually avoided. Note that only six species of shade trees not native to the eastern United States are included on the list of broad-leaved trees, and none of these are very common in cultivation. A summary of species discussed in this section is presented in Table 1.

A relatively unique situation is observed concerning some species in North Carolina as well as in some other parts of the United States. Many newer suburban areas have been carved from woodlands and native tree species persist and thrive, although these same species are rarely planted or volunteer in cultivation. Presumably these species will be seen much less frequently in cultivation as areas undergo long-term inhabitation.

The horticultural descriptions that follow are mostly based on my observations of these plants growing in the State of North Carolina. Numerous manuals (see list at the end of this article) have been consulted in preparing this listing, and it is clear from comparisons of the descriptions that a large number of species of woody plants vary greatly in size and habit as a function of climate; thus the description presented here may vary considerably from those prepared in the northeastern United States or England. Unless otherwise indicated, flowering dates are for the central piedmont area of the State of North Carolina.

Brief horticultural descriptions of broad leaf shade trees: The maples are among our most common native and planted trees. They are attractive in all seasons, and most species are well known for their fall coloration. They are not difficult to cultivate, but many species are sensitive to urban-related root disturbance and high salt concentrations. There are a large

Table 1. Parameters of cultivation of broad leaf shade trees grown in North Carolina

Species	Date brought into cultivation	Place of origin	Frequency* of cultivation
<i>Acer campestre</i>	long cultivated in U.S.A.	Europe, W. Asia	rare
<i>A. negundo</i>	native	North America	infrequent
<i>A. rubrum</i>	native	North America	common
<i>A. saccharum</i>	native	E. North America	occasional
ssp. <i>saccharum</i>	native	Southeastern U.S.A.	common
ssp. <i>floridanum</i>	native	E. North America	occasional
<i>A. saccharinum</i>	native	Eastern U.S.A.	occasional
<i>Betula nigra</i>	native	E. North America	rare
<i>Carpinus caroliniana</i>	native	Eastern U.S.A.	infrequent
<i>Carya tomentosa</i>	native	Eastern U.S.A.	infrequent
<i>Celtis</i> species	native	E. North America	infrequent
<i>Fagus grandifolia</i>	native	E. North America	infrequent
<i>Fraxinus americana</i>	native	E. North America	common
<i>Ginkgo biloba</i>	1784	E. China	occasional
<i>Gleditsia triacanthos</i>	native	E. North America	rare
<i>Liquidambar styraciflua</i>	native	Eastern U.S.A., Mexico	common
<i>Liriodendron tulipifera</i>	native	Eastern U.S.A.	common
<i>Nyssa sylvatica</i>	native	E. North America	rare
<i>Ostrya virginiana</i>	native	E. North America	rare
<i>Platanus occidentalis</i>	native	E. North America	common
<i>Populus alba</i>	long cultivated in U.S.A.	Eurasia	occasional
<i>Quercus acutissima</i>	1862	Southeastern Asia	infrequent
<i>Q. alba</i>	native	E. North America	common
<i>Q. coccinea</i>	native	E. North America	occasional
<i>Q. falcata</i>	native	Southeastern U.S.A.	occasional
<i>Q. glauca</i>	about 1900	Japan	rare
<i>Q. laurifolia</i>	native	Southeastern U.S.A.	common
<i>Q. lyrata</i>	native	Southeastern U.S.A.	infrequent
<i>Q. phellos</i>	native	Eastern U.S.A.	very common
<i>Q. rubra</i>	native	E. North America	occasional
<i>Q. stellata</i>	native	E. North America	occasional
<i>Q. velutina</i>	native	E. North America	occasional
<i>Q. virginiana</i>	native	Southeastern U.S.A., Mexico	common
<i>Salix babylonica</i>	about 1730	China	occasional
<i>Tilia</i> species	native	E. North America	rare
<i>Ulmus alata</i>	native	Eastern U.S.A.	common
<i>U. americana</i>	native	E. North America	occasional

* Some of these species are more common than the frequency indicates because they are prone to volunteer.

number of potentially ornamental species which are very rarely grown in this area, and their increased use might add to the available horticultural fare.

Acer campestre L., Hedge Maple. A rather slow growing tree that might reach (about) 30 feet at maturity. The habit is usually spreading, but some more erect-growing specimens can be found. The small, deeply lobed leaves give a medium-fine texture. The autumn coloration is pale yellow, and the bloom is conspicuous. Several older specimens on the University of North Carolina Campus have maintained good health under a variety of growing conditions.

Acer negundo L., Box Elder. A fast-growing, ultimately spreading tree, occasionally reaching 50 feet at maturity. In some older specimens the trunk often twists and curves far from the vertical. The leaflets of the large, pinnately compound leaves give a medium-fine texture. The deciduous leaves do not color conspicuously in the autumn, but the flower and seed tassels are attractive in some cultivated clones. Although rapid-growing and sometimes weedy, some older specimens have been observed to decline prematurely, possibly from over-shading by taller trees.

Acer rubrum L., Red Maple. A rapidly growing tree that is naturally subdivided into a wide range of ecological races differing considerably in ultimate size and texture (leaf size and shape). This species is said to occur in a wider range of habitats and climates than any other woody species in eastern North America. The upland forms that often are cultivated may reach about 80 feet at maturity, and usually maintain a more erect than spreading habit; however, some selections and wetland types seem to be typically more spreading. The deeply lobed, and often glaucous-backed, leaves of the commonly cultivated forms give a medium texture, but more finely textured specimens are often observed. The deciduous foliage is typically brilliant yellow, red or a mix of the two, and provides some of our best autumn scenery. Some clones have been selected and propagated for their particularly brilliant hues. Individually inconspicuous, the abundant deep red female flowers and young fruits are produced before foliation and can be very showy. Individual specimens may produce spectacular spring coloration while others produce only tan male flowers. (Technically monoecious, maples, particularly *A. rubrum* and *A. saccharinum*, are often, for all practical purposes, dioecious). The red maple

is fast-growing, soft-wooded, desirably shaped and often a very colorful tree in the spring and autumn. Old specimens are often seen in mature plantings, but it, like *A. saccharinum*, seems intolerant of highly disturbed urban conditions or root disturbance; consequently, it often declines prematurely in roadside plantings.

Acer saccharum Marshall ssp. *saccharum*, Sugar Maple. A large tree of moderate growth rate which, under favorable conditions, may reach 80 feet in height at maturity. Typically, it remains more erect than spreading and develops an oval outline in adult habit. The rather large, thin leaves are deeply lobed and give the tree a medium texture. The deciduous foliage typically colors in the autumn to a brilliant hue of orange or orange-yellow. The pale green and inconspicuous flowers occur at the time of foliation at the end of March.

Acer saccharum Marshall ssp. *floridanum* (Chapman) Desmarais, Southern Sugar Maple. This variety of the species is much like *A. s. ssp. saccharum* in all regards except that it is smaller in stature and has a slightly finer texture due to its smaller leaves. In practice, individual sugar maples planted in piedmont North Carolina are often variously intermediate between the two subspecies.

The sugar maples are strong-wooded, clean and well-shaped trees that are frequently planted for their famous fall coloration. They can usually be readily cultured except in excessively dry areas; however they are intolerant of root disturbance and sensitive to salt. In the colder parts of the United States one can see roads lined with rows of declining sugar maples, probably a result of over-salting of icy roads.

Acer saccharinum L., Silver Maple. Grows rapidly into a large specimen that may reach 100 feet in height in cooler parts of North Carolina. Perhaps the largest of the maples in cooler zones, but in warmer parts of the state it grows less rapidly and remains a small tree that appears at best to be poorly adapted. The habit is usually more erect than spreading, with occasional spreading individuals. The leaves are very deeply cut and more silvery-white beneath than the red maple. The texture is medium, but some named clones with several separated lobes have a distinctly finer texture than the

normal forms. The pale yellow autumn coloration of the deciduous foliage is not showy, but while the tan or reddish-tan flowers are relatively inconspicuous, they occur so early that they are the very earliest sign of spring where the tree is native. This species is native to deep alluvial soils on flood plains, and its problems in adapting to the North Carolina piedmont may be due as much to the heavy clay soils as to the milder climate, since it is used with some success for tree plantings in southern California.

Betula nigra L., River Birch. A rapidly growing, medium-sized tree that may reach 50 feet at maturity. Young trunks or scaffolds in older trees are shaggy with interesting golden-tan, peeling bark. Usually specimens are taller than broad at maturity, but since trees with curving and multiple trunks are common, the overall effect of solitary mature specimens may be widely spreading. The rather small leaves give the tree a medium-fine texture. The deciduous foliage may take on a pleasing yellow coloration in favorable autumn seasons, while the flowers are inconspicuous except to the dedicated tree lover. Although a river bottom tree in the wild state, it adapts to a variety of situations in cultivation. Specimens are very susceptible to ice and storm damage, but trees regenerate after proper pruning.

The white-barked species from the cooler parts of the United States and Europe are rarely planted here, and those that have been observed on the piedmont are developing very slowly; however, well-formed adults occur in the mountains where these trees are more common. The common native Appalachian species, *Betula lenta* and *B. lutea*, are occasionally cultivated in the mountains, but they are never seen on the piedmont.

Carpinus caroliniana Walter, Iron Wood. A small, fine-textured tree that may persist in cultivation after an area is developed. While it is an attractive tree with some potential for the landscape, it is rarely cultivated.

Carya species. Mostly trees of medium to medium-fine texture that become large and reach 80 or more feet in height. The growth rate is moderate, and most species have a habit that is more erect than spreading. The deciduous, pinnately compound leaves may have from 3 to 21 leaflets depending on the species. Most of them produce an intense golden-yellow autumn colora-

tion and have inconspicuous flowers. As an example of this genus the leaves of the Mockernut Hickory, *Carya tomentosa* (Poiret) Nuttal, are illustrated.

As was the case with *Carpinus*, the several native species of hickory may persist after an area is developed or volunteer in cultivated areas; however, with the exception of the pecan (see Chapter 4), a very small number of hickory trees are planted. Those seen in cultivation seem to perform well in a variety of situations.

Celtis species, Hackberries. Potentially very large trees of rapid growth rate and usually erect but sometimes spreading habit. Fine texture is coupled with interesting pale-gray scaffold branches. The autumn coloration of the deciduous foliage and the flowers are not conspicuous. In North Carolina the somewhat weedy and very easily grown hackberry is present in cultivation mostly as volunteer. Although it has many attributes that make it attractive and suitable for a shade tree, large specimens of hackberry occasionally break under the stress of wind or ice. As an example of this genus, the foliage of *Celtis occidentalis* L. is illustrated.

Fagus grandifolia Erhardt, American Beech. A large, but slow-growing tree that may attain 80 feet in cultivation after a long period. It is dome-shaped at maturity with specimens ranging from taller than broad to about as tall as broad. The small, serrate leaves and the lacy branch system give this species a relatively fine texture. The deciduous foliage takes on a gold to copper-gold color which can be very attractive in a favorable autumn season. The bloom is inconspicuous.

Both in Europe and America, the beech with its smooth gray limbs and tangled branches is one of our most beautiful trees. But while the American beech can be readily cultivated, particularly in rich moist sites, once established it is highly intolerant of any site disturbance. The European species, an even larger tree in favorable climates, is occasionally planted, but may decline before reaching maturity in central North Carolina.

Fraxinus americana L., American or White Ash. A tree of moderate growth rate, with a more erect than spreading habit, that may reach about 80 feet in height in cultivation. While the branch texture is coarse, the large, pinnately compound leaves have relatively small leaflets, and thus the texture

appears medium-fine. The autumn coloration of the deciduous foliage ranges from pale yellow on shade leaves to magenta-purple on the sun leaves, often producing an excellent display. The flowers are inconspicuous.

The white ash is our most commonly planted *Fraxinus* species, but the very similar green ash, *F. pennsylvanica* Marshall, is also planted and like other members of this genus freely volunteers. The two species are very similar in all respects and can only be distinguished by an experienced observer. The native ash species, particularly the white ash, are tolerant of a wide variety of growing conditions, but like most trees decline after severe root disturbance in urban environments.

Ginkgo biloba L., Gingko, Maiden-hair Tree. A large tree of moderate growth rate under favorable conditions, eventually reaching 80 feet in height. The Gingko is usually an erect tree, and often has an irregular branch system. The unusual, small leaves are centrally cleft into two prominent lobes and give the tree a medium-fine texture. The deciduous foliage turns a brilliant yellow, and some clones have been selected that are particularly superior in this respect. The Gingko with its unique aspect is widely cultivated in both the West and the Orient. It tolerates a wide variety of growing conditions and climates and may live to a great age. Female trees produce smelly berry-like structures that offend the delicate gardener and fascinate the botanist; however, the seeds are edible. Most commercially available trees are male selections.

Gleditsia triacanthos L., Honey Locust. A rapidly growing tree reaching 80 or more feet in height; however, most locally observed specimens are much smaller, not more than 50 feet. The adult trees are usually taller than broad, with large, singly or doubly pinnately compound leaves giving a fine texture. The deciduous foliage does not produce an autumn display, but the large seed pods persist on the tree into the winter. The flowers are inconspicuous. The honey locust with its thorny armour is a very important shade tree in the center of the continent, but here it does not compete aesthetically with many other species. A number of cultivars are available that lack thorns and have golden leaf coloration in various patterns.

Liquidambar styraciflua L., Sweet Gum. A large, fast-growing tree that may reach 100 feet in height. It is distinctly columnar in youth, but the crown becomes dome-shaped with age; however, its form almost always remains taller than broad. The rather large and very characteristic star-shaped palmately lobed leaves give a medium texture to this tree. The deciduous autumn foliage ranges in color from yellow through red, to purple often on the same tree. The coloration is so striking and long-lasting that this species is often planted for its fall coloration in distant places like southern California. The flowers which occur at the time of foliation in March are inconspicuous. The sweet gum is one of the most common trees in the piedmont section of North Carolina, and it is widely planted across the North American continent. As a short-lived specimen it thrives in a great diversity of situations, but it only becomes a great tree in deep moist soils. It is somewhat weak-wooded and thus susceptible to wind and ice breakage, but younger specimens have great regenerative capacity.

Liriodendron tulipifera L., Tulip Tree. One of our largest and fastest growing trees, it may reach 100 feet in height in cultivation, and much more in the wild state. The habit is very distinctive with young trees having an erect conical shape that develops into a rounded crown with age. The erect habit is nearly always apparent, even trees grown in the open are taller than broad. The large four-lobed leaves of the *Liriodendron* which cannot be confused with those of any other tree provide a moderately coarse texture. Under favorable conditions the leaves turn a brilliant yellow, but unfortunately, the proper meteorological conditions do not develop every season. The large magnolia-like flowers are brightly marked and very showy individually, but their coloration blends with the foliage when the tree is viewed in full bloom. The tulip tree is one of our largest and most graceful trees. It tolerates a wide range of cultural conditions, but probably it is at its best in moist, rich soils. This is both one of our largest native species, and also one of the most frequently cultivated.

Nyssa sylvatica Marshall, Black Gum. Slowly growing into a large shrub, or developing more rapidly into a tree that may reach 80 feet in height. The shrub form produces long horizontal branches while the tree form

is usually more erect than spreading in habit (smaller branches may develop horizontally). The elongate entire leaves give a medium-fine texture to this tree. The deciduous foliage turns rich shades of red in the autumn. The flowers are inconspicuous. This common native tree is easily grown, despite the fact that it is not frequently cultivated. It is worthy of inclusion in a landscape for its excellent autumn coloration, and in fact, it is sometimes grown in Europe for this purpose.

Ostrya virginiana (Miller) K. Koch, Hop Hornbeam. A small fine-textured tree that occasionally persists from the wild state after an area has been developed. Although it is an attractive small tree with landscaping potential, there seem to be few cases where it has been deliberately planted.

Platanus occidentalis L., Sycamore. A fast-growing tree that may reach 100 feet in cultivation (more in the wild state). Young trees have an erect conical shape, but while overall habit remains distinctly erect the upper part of the tree broadens with age. The characteristic large acerifoliolate leaves produce a coarse texture. The deciduous foliage does not produce an autumn display. The bloom is inconspicuous. This is one of the most widely planted and easily cultured tree genera in urban areas in both Europe and America. Its mottled trunk and nearly white limbs make this tree equally handsome in winter or summer stance. In central North Carolina many specimens gradually succumb to a fungal canker disease.

Populus alba L., White Poplar. A fast-growing, small tree that may reach 50 feet in height. The habit is erect-conical in youth, but may become more spreading with maturity. The rather small ovate leaves are conspicuously white underneath, and the texture is medium-fine. The autumn coloration of the deciduous foliage and the bloom are not conspicuous. Once established, this species rapidly reproduces from root suckers, producing a thicket, and older specimens often decline prematurely.

Species of *Populus* are native to North Carolina, but are only cultivated occasionally in the mountain region of the state. The Lombardy poplar (*P. nigra italicica* Muench.) is occasionally planted on the piedmont, but it becomes infested with canker dieback at an early age, declines, and dies before reaching maturity.

The oaks are one of the most widely planted woody genera over much of the temperate zone with each region having its own local species. North Carolina has a very rich collection of native oaks, and a large number of these species are commonly cultivated. In the higher elevations of our mountains red and white oaks are usually planted, while on the piedmont a number of drought-tolerant species are added to the standard fare of white and willow oak. On the coastal plain the evergreen live oaks are important, as they are in all mild coastal and Mediterranean zones in the United States. We will consider several species seen in cultivation in North Carolina.

Quercus acutissima Carruth. A tree of moderate growth rate and a generally erect habit. (I have not observed the final height and form of a mature specimen.) A medium texture is produced by the long, glossy, chestnut-like leaves. The autumn coloration of this deciduous species is yellowish-brown, and a proportion of the dead leaves persist on the twigs throughout the winter. Like all the oaks, the bloom is relatively inconspicuous. The youthful specimens of this species seem to be adapting well to a variety of sites, so this species shows promise of enriching the cultivated oak flora of the Carolinas.

Quercus alba L., White Oak. A large tree of moderate growth rate that may reach a height of up to 80 feet in cultivation. In youth, its shape can be strikingly symmetrical, and it matures into great spreading individuals. The foliage, like that of all the large-leaved oaks, is moderate to moderately coarse. The white oak leaf with its linear arrangement of rounded lobes cannot be confused with those from any other local tree species. The autumn coloration of the deciduous foliage is highly variable, with some individuals turning an inconspicuous yellow-brown and others turning a spectacular purple-red color. Generally, this species provides an autumn show if the weather conditions are favorable. The bloom is inconspicuous. The white oak is one of North America's grandest trees. With pale gray scaffolds in the winter and excellent foliage in the summer and autumn, it is a tree for all seasons. It is one of the most common native and cultivated trees on the piedmont, and it is tolerant of a wide range of conditions in cultivation. It needs room to develop and, like most oaks, is intolerant of root disturbance, thus not

fully suitable for confined street plantings.

Quercus coccinia Muench., Scarlet Oak. A large tree of moderate growth rate that is usually more erect than spreading, becoming dome-shaped at maturity, and reaching about 80 feet in height. Moderately coarse texture and deeply dissected leaves are characteristic of this species, but the leaves of the scarlet oak are somewhat similar to those of several other species, and thus experience in identification is necessary. At its best the deciduous foliage of the scarlet oak provides a late autumn show in deep red and red-brown. The flowers are inconspicuous. In nature, the common scarlet oak occurs in a variety of sites, and as might be anticipated, it is easily cultivated, but like the other adult oaks, it is intolerant of root disturbance.

Quercus falcata Michaux, Southern Red Oak. A large tree of moderate growth rate that may reach about 80 feet in cultivation. The habit is usually more erect than spreading, but old specimens in the open may develop great size and branch spread greater than the height of the tree. The texture is much like the scarlet oak, but the fall coloration is not showy. As with most of the oaks, the bloom is not conspicuous. This species is easily grown and may be slightly more tolerant of disturbance than the previous two species. Under favorable circumstances, it may become very large.

Quercus glauca Thunberg, Japanese Evergreen Oak. A small tree of moderately slow growth rate that takes on a somewhat erect to globe-shaped habit and reaches 40 or more feet in height. (No aged specimens are available in our area for observation). The rather small, evergreen, chestnut-like leaves impart a moderately fine texture. The bloom is inconspicuous. Although only occasionally planted, this very beautiful small evergreen tree is easily grown and deserves to be used more widely.

Quercus laurifolia Michaux, Laurel and Darlington Oak. The laurel oak is very similar in growth rate, general appearance and adaptation to the willow oak (see entry for *Q. phellos*), except that the foliage of the laurel oak is somewhat larger, giving it a medium-fine texture rather than the fine texture of willow oak. The Darlington oak is a finer-textured selection of the laurel oak with a bushier branch system and smaller leaves. In central North Carolina the typical form of *Q. laurifolia* is deciduous without conspicuous

autumn coloration, while the Darlington oak is semi-evergreen. The forms of the laurel oak have the capacity to withstand urban conditions better than most oaks, and they grow fairly rapidly to rather great size.

Quercus lyrata Walter, Overcup Oak. A medium-sized tree with some mature specimens about 70 feet in height and slightly taller than broad in habit. The growth rate seems to be similar to that of the white oak. Although the specific arrangement of the foliar lobes are somewhat different from that of the white oak, the texture is similar. The deciduous foliage takes on shades of yellow and brown in the autumn, and the flowers are inconspicuous. Although only occasionally planted, the overcup oak with its large cup covering most of the acorn is a handsome, well-shaped tree that deserves to be more widely planted.

Quercus phellos L., Willow Oak. A large tree that is one of the fastest growing oaks, reaching up to 80 or more feet in height in cultivation. Often slightly more erect than spreading, in the open the total maximum lateral branch extension may approximately equal the height. This is a fine-textured tree with small willow-like leaves. The deciduous foliage is often inconspicuous or at best yellowish in the late autumn, and the bloom is inconspicuous. The fast-growing and ultimately massive willow oak is our most widely planted street tree because of its rapid growth and its tolerance of a wide variety of cultural conditions and disturbances. Its massive dark grey limbs contrast with the fine willowy foliage making it a very attractive tree.

Quercus rubra L., Red Oak. A large tree of moderate growth rate with a mature habit that is usually taller than broad; however, occasionally specimens in the open may have a total branch spread that may equal the height of the tree. Old specimens may reach 80 to occasionally 100 feet in height. Although the specific lobe pattern of the leaves is characteristic of this species, the overall texture and appearance of the red oak is similar to the southern red oak, the scarlet oak and the black oak. Autumn colors of the deciduous foliage include yellow, yellow-orange and orange-brown shades. The bloom, as with most of the oaks, is not showy. Further north and in our mountains the red oak is widely planted; however, while it is rarely planted here,

our local red oak is readily cultivated and grows into a handsome tree.

Quercus stellata Wang., Post Oak. Normally a medium-sized tree with occasional large specimens. It is similar in many respects to the white oak although the post oak usually has more erect habit, and the autumn coloration of the deciduous foliage is only a golden-brown. This species is very common in the wild conditions and persists or volunteers in cultivation; and thus, while it is probably rarely planted, it is nevertheless common in cultivation. Also it is easily cultured, it is intolerant of disturbance at maturity; and it fails as a specimen to match the grandeur of white oak.

Quercus velutina Lam., Black Oak. Normally a medium-sized tree similar to, and in some cases difficult to distinguish from, the red oak. It has a moderate growth rate, and its habit is usually distinctly erect, rarely widely spreading, and it may reach the height of about 70 feet. It rarely grows as large as the red oak at maturity. The leaf size, shape, and texture of the foliage closely resemble that of the red oak. The deciduous foliage is golden-brown or orange-brown in the autumn, and the bloom is inconspicuous. Like the post oak this is common on dry sites on the North Carolina piedmont, and it persists and volunteers in cultivated areas; however, it is only very occasionally planted. It is easily grown and moderately tolerant of disturbance when compared to some other oak species.

Quercus virginiana Miller, Live Oak. A great spreading tree that has a moderate growth rate and may reach a height of about 70 feet. The habit at maturity is characteristically spreading, such that the branch spread of an-

Figure 1a. Typical leaves of broadleaf shade trees listed in chapter 2.

1. <i>Acer campestre</i>	13. <i>Ginkgo biloba</i>
2. <i>A. negundo</i>	14. <i>Gleditsia triacanthos</i>
3. <i>A. rubrum</i>	15. <i>Liquidambar styraciflua</i>
4. <i>A. saccharum</i> ssp. <i>saccharum</i>	16. <i>Liriodendron tulipifera</i>
5. <i>A. saccharum</i> ssp. <i>floridanum</i>	17. <i>Nyssa sylvatica</i>
6. <i>A. saccharinum</i>	18. <i>Ostrya virginiana</i>
7. <i>Betula nigra</i>	19. <i>Platanus occidentalis</i>
8. <i>Carpinus caroliniana</i>	20. <i>Populus alba</i>
9. <i>Carya tomentosa</i>	21. <i>Salix babylonica</i>
10. <i>Celtis occidentalis</i>	22. <i>Tilia</i>
11. <i>Fagus grandifolia</i>	23. <i>Ulmus alata</i>
12. <i>Fraxinus americana</i>	24. <i>U. americana</i>



1 inch

cient specimens is far greater than the height. The small, entire evergreen leaves are responsible for a fine textural aspect. The bloom is inconspicuous. Although live oaks are not frequently cultivated on the piedmont, there seems to be no difficulty in their cultivation. They have not been severely damaged in recent severe winter storms. Considering the appeal of evergreen trees in the winter landscape, the live oak might be more extensively planted. A member of this species is the largest broad-leaved tree in the United States.

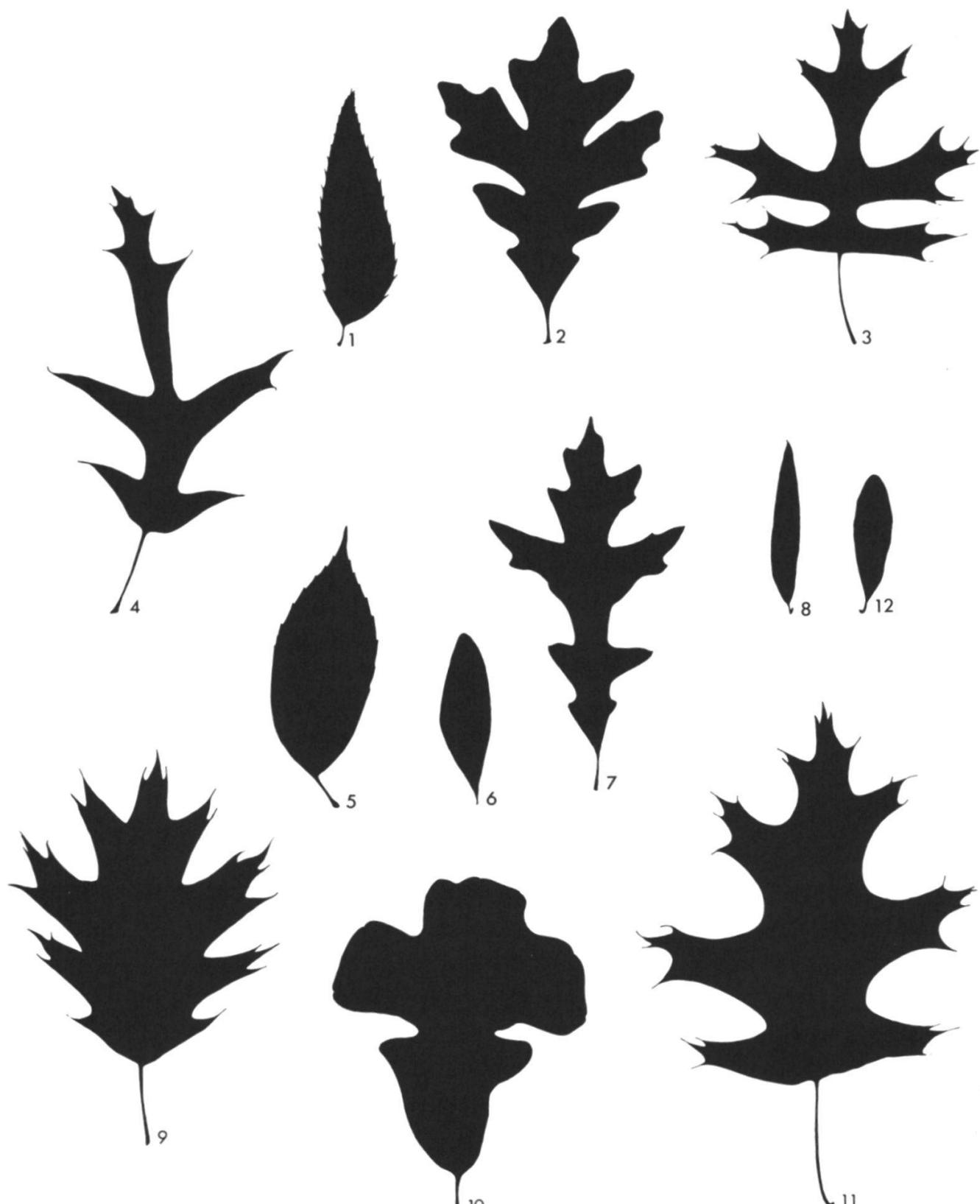
Salix babylonica L., Weeping Willow. A very fast-growing tree with pendulous branchlets that takes on a globular to slightly spreading habit at maturity and reaches heights of 60 to 70 feet in favorable habitats in the North Carolina mountains. The small elongate leaves give a fine texture to the appearance of the plant. The deciduous foliage remains green until early winter and then fades yellowish as it is torn by the winter winds. The bloom is inconspicuous. Large weeping willows are commonly seen in the foothills and in the mountains of North Carolina, but on the piedmont this species often declines prematurely after a few years of initial vigorous growth. This decline may be due, at least in part, to an intolerance of the heavy clay soils that characterize the Piedmont Plateau.

Salix, other species. The native willows are common large shrubs to small trees that only occur in cultivation as persistents from the wild condition or volunteers in wet areas.

The pussywillow, *Salix discolor* Muhl., is rarely planted in our area, and observed specimens have slowly developed into large shrubs (no mature specimens observed in this area). Although the specimens seen appear in good health, the slow growth rate and lower vigor prevent a conspicuous show of male catkins for which the species is cultivated in colder areas.

Figure 1b. Typical leaves of broadleaf shade trees listed in chapter 2
(continued from Figure 1a).

1. <i>Quercus acutissima</i>	7. <i>Q. lyrata</i>
2. <i>Q. alba</i>	8. <i>Q. phellos</i>
3. <i>Q. coccinia</i>	9. <i>Q. rubra</i>
4. <i>Q. falcata</i>	10. <i>Q. stellata</i>
5. <i>Q. glauca</i>	11. <i>Q. velutina</i>
6. <i>Q. laurifolia</i>	12. <i>Q. virginiana</i>



1 inch

Tilia species. Native species of basswood planted in the Coker Arboretum on the campus of the University of North Carolina have matured into medium-large, erect-growing trees. While in the mountains basswoods are occasionally seen in cultivated plantings, very few specimens have been observed in plantings on the piedmont. In recent years some individuals of the European basswood have been planted; however, it is too soon to comment in performance of these trees.

Ulmus alata Michaux, Winged Elm. A tree of medium size and rapid growth rate that typically is erect in habit in youth but becomes somewhat more spreading with age. While it is usually not more than about 60 feet in height, larger specimens are occasionally seen. Fine texture is provided by the small serrate leaves. When weather conditions are favorable the deciduous leaves uniformly turn yellow, but in some years there is little display. The bloom, which occurs in late February, is not showy, but it is one of our first signs of spring locally. This is one of our common weed-trees; however, with its fine texture and well-shaped crown, it often develops into a handsome tree. The winged elm is weak-wooded and is often damaged in wind or ice storms; however, it may have some resistance to the diseases which are ruining the grander white elm. Younger specimens have conspicuous corky out-growths (wings) on the twigs, thus the common name.

Ulmus americana L., White or American Elm. Rapid-growing, in our area usually a medium-sized tree reaching a height of up to about 80 feet but often much less. Specimens growing on the piedmont often have a branch spread equalling their height, but overall, the highly variable American elm may take on any of the basic tree shapes ranging from fastigiate to broadly spreading. The medium-sized serrate leaves give a medium-fine texture. In favorable seasons the deciduous foliage changes to gold. As with the other spring-blooming elms, the relatively inconspicuous bloom occurs so early in the season (February-March) that it is a conspicuous sign of spring. This species is widely tolerant of a variety of conditions in urban cultivation, but unfortunately it is virtually being removed from some localities by the Dutch elm disease. Since the disease is spread by a small bark beetle, the disease spreads less rapidly where individuals are less frequent; consequently, the disease is moving less rapidly in our area than it has in the eastern or mid-western parts of the United States.

3. Flowering trees

North Carolina is famous for its assemblage of spring-flowering trees. The most abundant species in the wild and in cultivation are the flowering dogwood, *Cornus florida*, and the redbud, *Cercis canadensis*, which account for much the display. In addition, several introduced species, mostly native to the moist warm-temperate zones in southeast Asia, are also common. An even larger spectrum of smaller ornamental trees will survive and prosper in this climate, but they are rarely seen outside of private collections. The species included here are those seen more or less commonly in the yards and gardens of the central part of the state.

Albizia julibrissin Durazzini, Mimosa. A rapidly growing small tree that may reach 35 feet in height. Its flat-topped and spreading habit creates a strongly horizontal impression at all stages of development. A fine-textured appearance is produced by the tiny leaflets on the large, doubly-compound pinnate leaves. The autumn coloration of the deciduous foliage is not showy. Foamy pink flower clusters are produced in quantity from early to mid summer. In full bloom the mimosa is an impressive sight. A few years ago the showy, fast-growing and rather weedy mimosa was widely planted and volunteered over much of North Carolina, but a fungal disease, mimosa wilt, which reached epidemic proportions has killed the majority of the trees in this species. Some partially resistant selections are available, but in our area planting mimosa may lead to disappointment in few years.

Aesculus hippocastanum L., Horse Chestnut. An erect-growing tree of medium size and moderate growth rate. The outline of the mature tree is roughly oval-shaped, and the height is up to about 50 feet in our area. A coarse-textured appearance is produced by the large palmately compound leaves, and the fall coloration is not showy. Large, erect racemes of candle-like white flower clusters are produced in late spring. Further north and in Europe this is a very large and widely planted flowering tree. In our area it may prematurely defoliate and remain a rather small specimen over a long period; however, some local specimens have been observed to hold healthy foliage into the autumn.

Another species, *Aesculus octandra* Marshall, is a massive tree native to the coves of the southern Appalachian Mountains, but it is rarely cultivated on the piedmont. One specimen of this species that has been observed to be growing locally is a very large tree in good health and vigor.

Catalpa speciosa Warder ex Engelm., Catalpa, Indian Cigar Tree, Catawba Tree. An erect tree of moderately rapid growth rate that usually matures into a round-topped specimen of 60 feet or occasionally more. A very coarse appearance is created by the large cordate leaves, but the fall coloration is not showy. Large terminal clusters of white flowers are produced in late spring, with open-grown trees producing a very showy floral effect. This is an easily grown and rather weedy tree that is grown for shade, floral display and fishing worms ("Catawba worms"). The caterpillars, while possibly useful for fishing, strip the tree of its leaves and contributes nothing to the aesthetic value of the plant.

Cercis canadensis L., Redbud, Judas Tree. A small tree of moderately rapid growth rate that may reach up to 30 feet in height. It is a spreading tree, often with several trunks, which often has a branch spread equal to, or greater than, the height. As a result of its rather large cordate leaves, this species creates an impression of medium coarseness. In favorable seasons, the deciduous foliage turns to bright yellow, but in some years the color is inconspicuous. Clusters of small magenta-pink flowers are produced on wood of all ages over the tree just before foliation. The redbud is capable of producing a striking floral display, but it is not at its best in the shade of larger trees. The "Canada" redbud is best known as a weed tree that lines old meadows and roadsides in the southern piedmont regions. Since the tree is widely planted and easily grown both in and adjacent to its native area, spectacular displays of redbud are part of our spring scene. Although it is generally easy to culture, the best results are achieved with full sun exposure on rich, moist and well drained soils.

Cercis chinensis Bge., Chinese Redbud. A large shrub to small tree of moderately rapid growth rate not observed to be over 15 feet in height, and developing a rounded shape with maturity. This species branches more freely from the base than the native species, but the leaf shape, texture and autumn

Table 2. Parameters of cultivation of flowering trees grown in North Carolina

Species	Date brought into cultivation	Place of origin	Frequency of cultivation
<i>Albizia julibrissin</i>	before 1800	Warm temperate Asia	common
<i>Aesculus hippocastanum</i>	long cultivated	Balkan Peninsula	rare
<i>Catalpa speciosa</i>	native	Central U.S.A.	occasional
<i>Cercis canadensis</i>	native	East, southeast U.S.A.	common
<i>C. chinensis</i>	before 1850	China	rare
<i>Cladrastis lutea</i>	native	Southern Appalachians	rare
<i>Cornus florida</i>	native	East, southeast U.S.A.	common
<i>C. kousa</i>	1875	China, Japan, Korea	rare
<i>C. mas</i>	long cultivated	Europe, West Asia	rare
<i>Franklinia alatamaha</i>	native?	Georgia	rare
<i>Koelreuteria paniculata</i>	1763	China, Japan, Korea	infrequent
<i>Lagerstroemia indica</i>	before 1800	China	common
<i>Magnolia grandiflora</i>	native	Southeastern U.S.A.	common
<i>M. liliiflora</i>	1790	China	infrequent
<i>M. stellata</i>	1862	Japan	rare
<i>M. X soulangeana</i>	1820	Orig. in cultivation	occasional
<i>Malus</i> species	-	Mostly Old World	common
<i>Melia azedarach</i>	long cultivated	India, China	common
<i>Oxydendrum arboreum</i>	native	East, southeast U.S.A.	rare *
<i>Paulownia tomentosa</i>	1834	China	occasional*
<i>Prunus mume</i>	1844	China, Japan	rare
<i>P. serrulata</i>	1900	China, Japan, Korea	occasional
<i>P. subhirtella</i>	1894	Japan	occasional
<i>Pyrus calleryana</i>	1908	China	infrequent
<i>Sassafras albidum</i>	native	Eastern U.S.A.	rare *

* Some of these species are more common than the frequency indicates because they are prone to volunteer.

coloration are much like the native plant. Abundant clusters of small magenta-pink flowers are produced on wood of all ages over the tree just before foliation. The bloom is a few days earlier (late March), heavier and the color is slightly warmer in tone in comparison with the native redbud. While this species is very easily cultured, it seems to have requirements similar to those of *C. canadensis*.

Cladrastis lutea (Michaux f.) K. Koch, Yellowwood. A small tree of moderate growth rate sometimes reaching 50 feet in cultivation. The adult habit is rounded to more or less spreading. The small leaflets on the pin-

nately compound leaves give a moderately fine texture, and the coloration of the deciduous foliage is reported to be orange to yellow. *Wisteria*-like clusters of hanging white, pea-like flowers cover the tree in late spring or early summer, depending on locality. The yellowwood is one of our native endangered species. In the southern Appalachian Mountains it only occurs in a few rich coves, otherwise it is limited to cultivation. Although it is rarely planted in central North Carolina, it is a well shaped small tree with attractive smooth gray bark. Specimens observed here are in good health, and there is no indication of obvious cultural difficulties. This is a tree that deserves to be more widely planted.

Cornus florida L., Flowering Dogwood. A small tree of moderate growth rate reaching 40 feet, but usually only about one half that height. Initially, it is more erect than spreading, but mature specimens assume a more or less rounded habit. The entire, oval leaves are similar to those of a number of other tree species, and the texture of the tree is medium. The red shades of the deciduous foliage can make a contribution to the landscape as spectacular as the spring bloom. The coloration is long-lasting, as it begins with a purpling of the sun leaves in early autumn, and becomes progressively redder until the time of defoliation. This autumn display is augmented by the red berry-like fruits that persist until early winter. The horizontally arranged sheets of white dogwood inflorescences cover the tree in early April just before foliation. Pink, light red and double-flowered forms are occasionally grown also. The flowering dogwood, both as a common woodland tree in our piedmont woods and as part of our horticultural plantings, is undoubtedly our best known and most widely planted flowering tree. The combination of excellent plant shape, dependable bloom and good fall color make the flowering dogwood one of our best all-around landscape ornamentals; however, it is not the easiest of our native trees to cultivate. It has a shallow root system and specimens growing on dry sites develop poorly and often decline or die during prolonged dry periods. It is at its best in moist, but well drained soils with a mulch layer around its base.

Cornus kousa Hance., Japanese Dogwood. The tree is similar to *C. florida* in size, shape and growth rate. The texture of the tree is also similar

though the leaves of the Japanese dogwood are a little smaller. Autumn coloration of the deciduous foliage and the fruit display are much like our native species. The sterile bracts surrounding the inflorescence are similar to *C. florida* except that the bracts are more pointed in *C. kousa*, and appear a few weeks after the foliage has developed. This tree is occasionally planted in the North Carolina mountains but is rarely seen in the piedmont. The small number of younger specimens that have been observed are in good vigor and growing well.

Cornus mas L., Cornelian Cherry. A large shrub or small tree of moderate or moderately slow growth rate that takes on a rounded habit at maturity and reaches about 20 feet in height. The leaves are similar in shape to the previous two species, but are a little smaller and produce a medium-fine texture. The autumn coloration of the deciduous foliage is usually red, and the purplish fruits are sometimes colorful. A dense mass of small yellow flowers is produced before foliation in March. A few older specimens of this species observed locally show some decline, but adjacent trees of *Cornus florida* are in equally poor condition. At the very least the Cornelian cherry requires conditions that are favorable for the growth of the flowering dogwoods, and perhaps it is only well suited to the cooler climates of our mountains.

Franklinia alatamaha Marsh., Franklinia. A small upright-growing tree of moderately slow growth rate not observed to be over 12 feet tall in North Carolina. The elongate entire leaves give a medium-fine texture, and the deciduous foliage turns to shades of orange-red in the autumn. The large white flowers are produced in the late summer when few trees or shrubs are in bloom. Specimens have been seen in the North Carolina mountains and some individuals have been recently planted on the piedmont; however, no mature specimens have been observed in central North Carolina.

Koelreuteria paniculata Laxm., Golden Raintree. A small medium-sized tree of rounded habit and medium growth rate that may reach about 40 feet in height. The large pinnately compound leaves give a medium texture, and the autumn color is not conspicuous. Small yellow flowers are produced in large terminal clusters in early summer at a time when few other trees are in bloom,

and the display is quite striking. The bladderlike seed pods are also ornamental in the autumn and early winter. This tree seems to be tolerant of a wide variety of cultural conditions.

Lagerstroemia indica L., Crepe Myrtle, Southern Lilac. A large shrub to small tree that is slightly more erect in habit than spreading, often with several trunks from the base. It may grow rapidly under favorable conditions, and reach up to about 30 feet height. The fine texture of the plant is produced by the very small entire leaves. The fall coloration of the deciduous foliage is highly variable, ranging from inconspicuous on vigorous specimens to brilliant shades of red, orange and yellow on starved trees growing on poor sites. The crepe myrtle is primarily grown for its showy clusters of red, pink, lavender or white flowers. It blooms in mid to late summer and may be pruned to stimulate the production of very large inflorescences. Unpruned, it produces a larger number of flower clusters, but each cluster is usually much smaller. This is justifiably one of our most widely planted flowering trees in the southeast. Like the flowering dogwood, it has something for every season. In age, the trunks and the major branches take on a white-mottled appearance which is striking in the winter landscape. Although heading back improves the size of flower cluster, it detracts from the winter appearance of the tree. Unlike the flowering dogwood, it is tolerant of a wide variety of growing conditions, but in very poor or dry sites, it grows slowly and flowers sparingly. In moist shaded areas it sometimes becomes infected with mildew, so best results are achieved with full-sun culture.

Magnolia grandiflora L., Bull Bay or Southern Magnolia. A large tree of moderate growth rate that may reach to 80 feet or more in height at maturity. It is a pyramidal or columnar-shaped tree in youth that becomes more dome-like in habit at maturity. On unpruned individuals the lower branches often reach to the ground. The coarse texture of this tree is produced by the large, leathery, entire evergreen leaves. The great, white, lemon-scented blooms are known to all. In the autumn cone-shaped fruits release bright red seeds that are very attractive but only for a very short period. The southern magnolia is one of our grandest and probably our largest flowering trees. It adapts to a fantastic range of soils and climates, being cultivated widely in

Asia, Europe and western North America. It can be controlled by pruning or even trained into exotic espaliers. Central North Carolina is about as far north as it can be grown without winter damage to the foliage, although some clones have been selected that do passably well in somewhat cooler areas.

Several other native *Magnolia* species are very rarely cultivated including the cucumber tree, *M. acuminata* L., Fraser's magnolia, *M. fraseri* Walter, and the umbrella tree, *M. tripetala* L.

Magnolia liliflora Desrouss. A large shrub of moderate growth rate and of somewhat spreading habit that produces many stems from the base and reaches about 12 feet in height. The elongate entire leaves give the plant a medium texture. The deciduous foliage is not colorful in the autumn. Large elongate purple to magenta flowers cover the tree just before the leaves are produced, but the flowers do not open as widely as *M. X soulangeana*, and they appear about a week later than the hybrid species (early April). In many years the flowers of *M. liliflora* are ruined by spring frost. The form *nigra* is most commonly offered by nurseries in our area.

Magnolia stellata (Sieb. and Zucc.) Maxim., Star Magnolia. A moderately slow-growing large shrub to small tree that may reach 15 feet or more in height. The habit is usually slightly taller than spreading, but some cultivars are most distinctly spreading. The foliage is smaller and more finely textured than the more commonly planted *M. X soulangeana*. The autumn coloration of the deciduous foliage is not showy. While the star magnolia flowers even earlier (early March or even mild periods in January or February in mild winters) than the other commonly planted deciduous species, the unopened buds on the star magnolia are not injured by cold as the case with *M. X soulangeana*, so some show is produced after the cold weather passes (only the open flowers are killed); thus the smaller *M. stellata* is the better choice for our area. The cultural requirements seem similar for the common deciduous species from Asia. These are all easily cultivated in a variety of situations, but they can decline during severe drought.

Magnolia X soulangeana Soul. (*M. denudata* X *M. liliflora*), Tulip Magnolia. A small tree of moderate growth rate that may reach 30 feet or more in height, often developing several trunks. Specimens mature into small trees

of rounded or oval habit. The medium texture of the tree is produced by the elongate entire leaves. The deciduous foliage does not produce a show in the autumn. Large cream-colored flowers with magenta markings (colors vary greatly from clone to clone) cover the tree during March before the foliage is produced. Unfortunately, in our area in about three out of four years the floral display is damaged or ruined by spring frosts. While this hybrid is easily cultivated in any reasonably good horticultural environment (except excessively dry sites), the floral display is so frequently ruined by spring frost that it often is a great disappointment. Further north, where it remains dormant longer, the bloom is somewhat more dependable.

Malus species, Flowering crab. A large highly variable group of species and hybrids of moderately rapid growth rate that usually have a spreading habit at maturity and reach 15 to 30 (or more) feet in height. Small ovate to trilobate leaves give these trees a moderately fine texture. The deciduous foliage turns pale yellow or is inconspicuous in the autumn. In earliest spring (middle March) before the leaves are developed, the flowering crabs open into a mass of color ranging from white through shades of pink to light red depending on cultivar. In cases more than one shade of color may be present on a single tree. The crabs are tolerant of a wide variety of cultural conditions and thus are among our most easily cultivated spring-flowering trees. They have a few pests, but they seem to satisfactorily withstand our typical spring freezes. There are a great number of clones, representing several species, available, and some produce a much showier bloom than others. The fruit from the larger-fruited cultivars is tart but edible and is often used for preserves. On many cultivars the fruit is very ornamental in the autumn and early winter. There will be no attempt to enumerate the large number of clones that may be seen locally.

Melia azedarach L., Chinaberry Tree. A small or medium size tree of relatively rapid growth rate that takes on a rounded to slightly erect habit with maturity and reaches about 30 feet in height. Small serrate leaflets on the large, twice pinnately compound leaves give the tree a fine texture. The deciduous foliage does not produce showy coloration in the autumn. The small pinkish-lavender flowers are produced in the early summer, but the bloom is

not conspicuous in the landscape; however, the tan fruit clusters are of some interest in the winter landscape. Although only occasionally planted, this species is readily cultivated and is somewhat weedy.

The related tree *M. a. umbraculiformis* Berckmans., the Umbrella Tree, has crowded branches that produce a flattened head, the total height of which is much less than that for the normal form of the species. The crowded branches resemble a witch's broom growth pattern, and the scaffolds tend to decay prematurely. The singularly unattractive abnormality is occasionally seen around poor country houses.

Oxydendrum arboreum (L.) DC., Sourwood. A small tree of erect-growing habit and relatively rapid growth rate that may reach 50 feet in height, usually less. The medium texture of the tree results from the elongate, entire leaves. The deciduous foliage turns brilliant shades of red in the autumn. In summer, racemes of tiny bell-like flowers are produced, and on an open-grown tree may be very showy. Although not often cultivated, this common woodland tree can be a rather attractive ornamental, particularly as the leaves redden in the autumn. It requires rich sites with well-drained soils and like many other heaths is intolerant of root disturbance after it has become established.

Paulownia tomentosa (Thunberg) Steudel, Princess Tree. A tree of medium size and very rapid growth rate that may reach 40 feet or more in height. The adult habit is usually more or less rounded, with a coarse texture due to the very large cordate leaves. The autumn coloration of the deciduous foliage is not of interest. In early April, just before the leaves are produced, large clusters of blue-violet flowers appear with some trees producing a striking display while others are less impressive. The princess tree at its best is a striking specimen in the landscape with its immense leaves and colorful bloom. It is also very fast growing and produces very weak wood that is subject to decay (in the piedmont area), especially in older specimens. This species commonly escapes onto roadsides and other areas of disturbed vegetation.

Prunus mume (Sieb.) Sieb. and Zucc., Japanese Apricot. A small tree of moderately rapid growth rate and spreading habit that grows to a height of

about 20 feet. The tree has a medium-fine texture produced by the small ovate leaves. The autumn coloration is inconspicuous. The bloom is much like the cultivated apricot but occurs much earlier, often in midwinter (January to early March). It is of potential importance for the landscape because of its tendency to winter bloom, often in January in our areas. The fruits are apparently of little value, even if they could survive spring frost, and the tree is grown strictly for its ornamental value. Indications are that it is easily cultivated.

Prunus serrulata Lindl., Flowering Cherry. A small tree of moderately rapid growth occasionally reaching 30 feet in height but usually less. A large number of clones of this species are available, and while most of them have a moderate to strongly spreading habit, a few are distinctly erect in stance. Rather large serrate leaves give the tree an appearance of medium texture. The deciduous foliage turns yellowish or is inconspicuous in the autumn. Many forms of this species that produce a striking floral display in late March to early April are available. The one most commonly seen in our area is the deep pink-flowered 'Kwanzen' flowering cherry (doubled-flowered). Our climate is a bit too warm for a good performance from this species. Younger plants bloom well, but many older trees decline prematurely.

Prunus subhirtella Miq., Higan Cherry, Weeping Cherry (the form of this species most commonly grown in our area). A small to medium-sized tree of moderate growth rate that may reach 30 or more feet in height. The habit

Figure 2. Typical leaves of flowering trees listed in chapter 3.

1. <i>Aesculus hippocastanum</i>	14. <i>M. liliiflora</i>
2. <i>Albizia julibrissin</i>	15. <i>M. stellata</i>
3. <i>Catalpa speciosa</i>	16. <i>M. X soulangeana</i>
4. <i>Cercis canadensis</i>	17. <i>Malus</i> species
5. <i>C. chinensis</i>	18. <i>Melia azedarach</i>
6. <i>Cladrastis lutea</i>	19. <i>Oxydendrum arboreum</i>
7. <i>Cornus florida</i>	20. <i>Paulownia tomentosa</i>
8. <i>C. kousa</i>	21. <i>Prunus mume</i>
9. <i>C. mas</i>	22. <i>P. serrulata</i>
10. <i>Franklinia alatamaha</i>	23. <i>P. subhirtella</i>
11. <i>Koelreuteria paniculata</i>	24. <i>Pyrus calleryana</i>
12. <i>Lagerstroemia indica</i>	25. <i>Sassafras albidum</i>
13. <i>Magnolia grandiflora</i>	



is usually broadly pyramidal, and rather small serrate leaves give the tree a medium-fine texture. The deciduous foliage is not particularly showy in the autumn. The single pale pink flowers are produced in profusion before the foliage appears in late March. With its early, prolific bloom, this species is very popular in plantings. The vigorous pendulous clone commonly grown in our area seems tolerant of a wide variety of soil conditions and is better adapted and longer lived here than the clones of *Prunus serrulata*.

Pyrus calleryana Dcne., Callery Pear. A fast-growing tree of medium (or larger?) size reaching 40 feet or more in height. The shape is fastigiate in youth becoming more elliptic in habit with maturity. The medium-fine texture of the tree is produced by the rather small ovate leaves. The late autumn display of deep red coloration on a yellow background can be spectacular. The somewhat short-lived white flowers appear before the leaves come out in late March and make a considerable display. In the last few years this species has been planted widely in North Carolina (particularly the 'Bradford' selection), and all specimens observed are in excellent vigor. One older tree (twenty or so years) on the North Carolina State University campus is already a large tree. With the combination of spring bloom, good fall color and ease of culture, it can be anticipated that this species will become very common.

Sassafras albidum (Nuttall) Nees., Sassafras. A shrub or small tree of distinctly erect growth habit and moderate growth rate that may grow to 20 or 30 feet in height; however, much larger specimens are sometimes encountered. A tree of medium texture with leaves that are variously one, two or three lobed. The deciduous foliage turns shades of yellow in the autumn. Clusters of small yellow flowers are produced in late March before the leaves expand, but a showy effect is produced only when the flowers are in quantity. An easily but rarely cultivated common native tree, which is also aromatic and of use as an herb.

4. Fruit and nut trees

The common temperate species cultivated for their fruits and seeds (see Table 3) are for the most part easily grown in this region; however, harvesting satisfactory crops from these plants is quite another matter. Along with the usual insects and diseases, the central piedmont region is plagued by late spring freezes. Typically, these cold periods follow the early "false spring" during which time the early-blooming fruit trees flower and set fruit. Frequently, these freezing periods completely destroy the fruit crop. While orchards are not practical in this area, many gardeners grow these trees, hoping for the favorable season which does come from time to time.

Carya illinoensis (Wang.) K. Koch, Pecan. A large, long-lived tree of moderate growth rate that may reach about 80 feet in height at maturity. The habit is finally broadly spreading, but the branch spread of the tree does not exceed the height. A moderately fine-textured and airy appearance is produced by the numerous small leaflets pinnately arranged on the compound leaves. The open airy appearance is further augmented by the open arrangement of the long and remarkably slender branches. The deciduous foliage does not color in the autumn, and the flowers are also inconspicuous. The pecan is not only the producer of one of our most popular edible nuts, but it is also a handsome and easily cultured shade tree throughout North Carolina and the rest of the southeast. The wild form is a fine shade tree but has smaller thick-shelled nuts. Among the cultivated forms, the nuts on some of the older varieties are damaged by disease in our area, but disease resistant varieties are available. As is the case with many of our fruiting trees, good fruit set requires co-planting of two different clones for pollination purposes.

Castanea mollissima Bl., Chinese Chestnut. A medium-sized tree of moderately rapid growth rate reaching about 50 feet in height, usually less. Unlike our native species, the habit of the Chinese Chestnut is distinctly spreading even as a young tree. The tree has a moderately coarse-textured appearance that is produced by the long dentate leaves. The deciduous foliage turns to rich shades of yellow and brown in autumn, and particularly on

Table 3. Parameters of cultivation of fruit and nut trees grown in North Carolina

Species	Date brought into cultivation	Place of origin	Frequency of cultivation
<i>Carya illinoensis</i>	native	Central U.S.A.	common
<i>Castanea mollissima</i>	1853	China, Korea	occasional
<i>Diospyros virginiana</i>	native	Eastern U.S.A.	rare
<i>Ficus carica</i>	long cultivated	Western Asia	common wild
<i>Juglans nigra</i>	native	Eastern and Central U.S.A.	occasional
<i>Malus pumila</i>	long cultivated	Europe, Western Asia	common
<i>Prunus armeniaca</i>	long cultivated	Western Asia	rare
<i>P. domestica</i>	long cultivated	Southwestern Asia	occasional
<i>P. persica</i>	long cultivated	China	common
<i>Pyrus communis</i>	long cultivated	Europe, Western Asia	common

younger trees, some of the dry leaves persist throughout the winter. Somewhat conspicuous racemes of small white flowers are produced in late spring (June). The Chinese chestnut is a very easily grown shade tree that produces edible nuts at an early age. For reasons of cross pollination, it is essential that at least two trees be planted in the same general area if nuts are desired. (Solitary trees produce parthenocarpic fruits.) This species is largely resistant, in our area, to the fungal blight which ruined the grander American chestnut, *Castanea dentata* Borkh.; however, cankers have been seen on the cultivated Chinese species in the North Carolina mountains.

Diospyros virginiana L., Persimmon. A small to medium-sized tree of erect habit and moderate growth rate that may reach 60 feet in height. The tree has a medium texture that is produced by the entire elongate leaves. The deciduous autumn foliage and the bloom are not showy, and while the orange fruits may have some ornamental value in autumn, they are unpleasant underfoot. The persimmon is a very common wild tree that is rarely planted; however, the edible fruits are collected and prepared by those interested in folk foods. The trees are often bothered by a number of insect pests which detract from their appearance but probably do not inflict long-term damage.

The large fruited oriental species of cultivated persimmon, *Diospyros*

kaki L.f., is hardy in our area, and some gardeners have had success with it. The failures result not from winter cold but from the inherent difficulties in transplanting *Dyospyros*. In a high percentage of cases bare-root specimens from nurseries fail to establish; however, once established in a well drained soil, the cultivars of *D. kaki* are easily cultivated and fruit freely if pollination patterns are properly considered. The less astringent apple-size fruits of the oriental species are more interesting to fruit growers than the grape-size fruits of American species, but they are probably not more flavorful.

Ficus carica L., Fig Tree. A large shrub or small tree of rounded or spreading habit and moderately rapid growth rate that may reach about 20 feet in height. The large, palmately lobed leaves of the fig tree give it a coarse-textured appearance. The autumn color of the deciduous foliage and the flowers are not conspicuous. The fig with its large, almost tropical-looking leaves can be a very interesting landscape specimen; however, it is usually grown for its fruits. While the tree, or its fruits, is not seriously harmed by insects or disease, we are just north and west of the region in which figs are fully hardy; however, the hardiest figs can be successfully grown in Chapel Hill in protected localities (with luck!). From a practical point of view, the hardier selections seem to effectively define the cooler limit of zone 8 in our area.

Juglans nigra L., Black Walnut. A large tree of moderate growth rate that reaches 70 feet in height or occasionally more. A large, long-lived and broad-topped tree at maturity which is usually more erect in habit than spreading. The leaflet arrangement and texture are similar to that of the pecan; however, the overall impression is slightly more coarse, compact and less airy. The deciduous leaves often drop prematurely without any significant coloration, and the bloom is inconspicuous. Very easily grown, the native black walnut is occasionally cultivated for shade, its oily nuts or its fine hard wood. It can be a grand tree, but it is a messy plant (always dropping something), and thus not recommended for those preoccupied with neatness. The tendency for premature defoliation can detract from the late summer appearance of the tree.

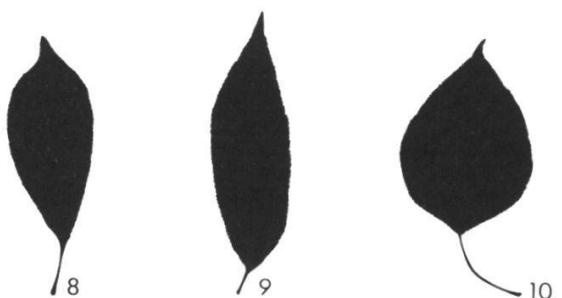
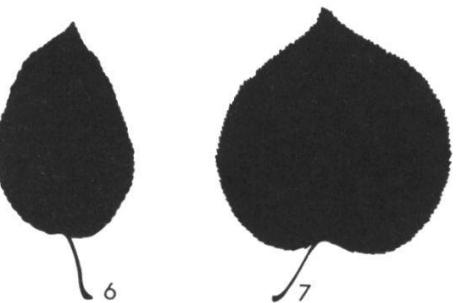
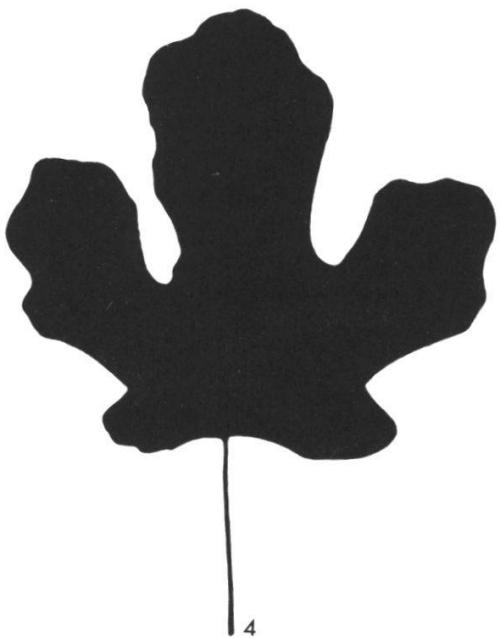
The Carpathian strain of the English or Persian Walnut is certainly hardy in central or coastal North Carolina, but it is rarely cultivated. Perhaps there is a disease or cultural problem, or merely the fact that this species has not been adequately tried.

Malus pumila Mill., Common Apple. A small to medium-sized tree of moderate growth rate that may reach 45 feet in height but is usually much smaller in our area. It is a tree of spreading habit that develops a rounded top and may become quite large in time, particularly in cooler climates. The small ovate leaves give the tree an appearance of moderately fine texture, while the autumn coloration of the deciduous foliage is not colorful. The apple is probably the most widely cultivated fruit tree in North America; indeed, the apple in bloom is a familiar site in all temperate countries. It is at its best in somewhat cooler climates, but with care satisfactory crops can be harvested in central North Carolina. The flowers and young fruits are sometimes damaged by spring frosts, and usually satisfactory fruits can only be obtained with assistance of pesticides. Many summer-fruiting varieties are severely injured by canker disease.

Prunus armeniaca L., Apricot. A small to medium-sized tree of distinctly spreading habit and moderately rapid growth rate. Under favorable conditions it may reach 30 feet in height, and may become the largest of the domestic *Prunus* species grown in our area. The small ovate leaves give the tree a medium-fine texture. The autumn coloration of the deciduous foliage is not conspicuous. In early March the apricot is the first of the domestic fruit trees to bloom and has the most striking floral display. It is easily cultured in our area; however, it is best treated as a flowering tree since it virtually always flowers before the last spring freeze has occurred, and consequently, rarely sets fruits.

Figure 3. Typical leaves of fruit and nut trees listed in chapter 4.

1. <i>Carya illinoensis</i>	6. <i>Malus pumila</i>
2. <i>Castanea mollissima</i>	7. <i>Prunus armeniaca</i>
3. <i>Diospyros virginiana</i>	8. <i>P. domestica</i>
4. <i>Ficus carica</i>	9. <i>P. persica</i>
5. <i>Juglans nigra</i>	10. <i>Pyrus communis</i>



1 inch

Prunus domestica L., Garden Plum. A non-homogeneous grouping of small erect-growing trees (prune plum and Damson) and spreading clones (Japanese varieties) rarely reaching 30 feet in height. The growth rate is moderately rapid in most of these cultivars. The tree has a moderately fine texture which results from the small ovate leaves. The autumn coloration of the deciduous foliage is not noteworthy. In mid-March before the leaves unfold, every twig produces a quantity of small white flowers making a striking floral effect. Many cultivars of plum are cultivated solely for the floral display which comes in several shades of color. The plums are easily cultivated, and like most of the fruiting *Prunus* species, they are reasonably tolerant of our climate. The domestic plums flower so early that the flower buds are often injured by spring freezes, and as is the case with the apple, satisfactory fruit may require the use of pesticides. The prune plum and the Damson (sometimes placed in species *P. insititia* L.) flower are a few weeks later than the Japanese varieties, so they are less likely to be injured by cold; however, Japanese types are most commonly planted.

Prunus persica (L.) Batsch., Peach. A moderately rapidly growing tree of distinctly spreading growth habit that may reach 20 feet in height, but usually much less. Very long, but narrow, entire leaves give the tree a medium texture. The autumn coloration of the deciduous foliage does not add to the autumn landscape. Pink flowers on cultivated types range from noticeable to very showy, and double-flowered types in several colors are also often grown. In the central piedmont the peach is difficult to cultivate. It is tolerant of our rainfall patterns and soils but is attacked by borers and bacterial diseases. The bloom is often damaged by spring freezes, and the fruits are desired by a number of animals in addition to humans. Genetic resistance and pesticides are helpful in overcoming all of these problems except the spring freezes. In the North Carolina sandhills, peaches are commercially grown, but in the central piedmont, successful cultivation is difficult but possible.

Pyrus communis L. Common Pear. A small tree of moderate to moderately slow growth rate that is broadly pyramidal to almost fastigiate in some clones and may reach about 40 feet in height, usually much less. The medium-fine to medium texture of the tree depends on the leaf size, which varies

from cultivar to cultivar. The autumn coloration ranges from inconspicuous in some clones to brilliant red in others. The clusters of white flowers that appear in middle March are very attractive. Pears are among the most easily cultivated fruit trees for our area. Being long-lived and reasonably well adapted to our climate, they often survive long after cultivation has ceased. Some pear varieties are susceptible to a bacterial disease, fire blight, which often kills the entire tree, but other varieties are largely resistant. Some satisfactory fruit can usually be harvested without the use of pesticides.

5. Deciduous shrubs

These plants are primarily used for their floral display or for accents in the landscape, but in our area with its rich supply of evergreens, these are not usually used for foundation plantings. The size of most of these species can be controlled by pruning, but the necessity of pruning should be considered before planting because pruning limits flowering and fruit set. Furthermore, if pruning is necessary, evergreens should be used since most heavily pruned deciduous shrubs are unsightly in the winter season. Several of the plants in this grouping have ornamental fruits as well as flowers.

Acer palmatum Thunb., Japanese Maple. The numerous cultivars of the rather small and slow-growing Japanese maple are treasured plants wherever they are grown in the United States. The shapes and final size vary from clone to clone, but the larger forms mature into large (up to 15 feet), spreading shrubs or small trees with interesting scaffold and branch arrangements. The small, palmately lobed leaves vary greatly in dissection from clone to clone, but the texture of the tree is always fine. The foliage matured into shades of red, orange and yellow in the autumn with the varieties having red summer pigmentation making the most brilliant show. The flowers are inconspicuous. The species is only occasionally planted in North Carolina, but specimens observed in a variety of habitats appear to be in good health and vigor. Possibly the availability or cost of transplants has limited the distribution of this species in our area.

Table 4. Parameters of cultivation of deciduous shrubs grown in North Carolina

Species	Date brought into cultivation	Place of origin	Frequency of cultivation
<i>Acer palmatum</i>	1820	Japan	occasional
<i>Aesculus pavia</i>	-	native	rare
<i>Aralia spinosa</i>	-	native	rare
<i>Callicarpa americana</i>	-	native	rare (in central N.C.)
<i>Chaenomeles japonica</i>	1879	Japan	common
<i>Chionanthus virginicus</i>	-	native	infrequent
<i>Elaeagnus umbellata</i>	1830	China, Japan, Korea	rare*
<i>Euonymus americanus</i>	-	native	rare
<i>E. alatus</i>	1860	N.E. Asia to C. China	occasional
<i>Forsythia viridissima</i>	1844	China	common
<i>Hibiscus syriacus</i>	before 1790	China, India	common
<i>Hydrangea macrophylla</i>	1790	Japan	occasional
<i>Jasminum nudiflorum</i>	1844	China	common
<i>Poncirus trifoliata</i>	1850	N. China, Korea	occasional
<i>Rosa</i> species	very early	worldwide	common
<i>Spiraea prunifolia</i>	1864	China	common
<i>Viburnum plicatum</i>	1814	China, Japan	rare
<i>Vitex agnus-castus</i>	1750	S. Europe, W. Asia	infrequent
<i>Wisteria sinensis</i>	1816	China	common (weedy)

*(common escape)

Aesculus pavia L., Red Buckeye. A large shrub of spreading habit and moderate growth rate that may reach about 10 feet in height. The large palmately compound leaves give the plant a coarse texture. The autumn coloration is not showy. Spikes of quite ornamental red flowers are produced about the first of May. This is an easily cultivated native shrub that is only rarely planted in our areas.

A hybrid between this species and *A. hippocastanum*, *A. X carnea*, is widely planted in Europe and other parts of the United States, but it has not been observed in local plantings.

Aralia spinosa L., Devil's Walkingstick. A spiny, large shrub to small tree of erect habit that reaches 20 or more feet in height in maturity. The sparse branch formation and the large leaflets on the bipinnately compound leaves give this plant a very coarse texture. The display of autumn foliage is in shades of red and orange, and attractive large clusters of

small white flowers are produced in late summer. The clusters of black berries are effective in the autumn, but they are readily harvested by the birds. This is an unusual, almost tropical-appearing, tree that is easily cultivated but, due to its coarseness, is out of place in many gardens.

A closely related species, *Aralia elata* from Japan, is very similar in appearance; in fact, it is somewhat difficult to distinguish the two species. Apparently, most of the specimens cultivated in our area are the native species, *A. spinosa*.

Callicarpa americana L., Beauty-berry, French Mulberry. A shrub of rounded or spreading habit and of moderate growth rate that may reach a height of about 10 feet. Rather large serrate leaves give the bush a moderately coarse texture. The yellowish leaf coloration in the autumn is not showy, but the heavy set of purple to lavender berries that persist into the early winter is most unusual and very ornamental. The bloom which occurs in June and July is not conspicuous. This is a very common native shrub of our coastal plain that is occasionally cultivated in other parts of the state. As an ornamental, it is mostly grown for its unusual colored fruits.

Chaenomeles japonica (Thunb.) Lindl., Flowering Quince. A large spreading shrub of nicely rounded habit and moderate growth rate that reaches a maximum height of about 8 feet. The elongate, dark green leaves create an impression of medium texture similar in appearance to that of the pear. There is no autumn coloration of note since the leaves often drop without coloring in late summer. Before the leaves unfold the plant produces red (usually), shades of pink or white flowers. The floral display is produced in late February or early March and is one of the hallmarks of the North Carolina spring. Large, more or less edible fruits are used for the making of jellies. The best flower set occurs in unpruned, or sparsely pruned, specimens. This is one of our most easily grown and common ornamental shrubs. It has few pests, but its premature defoliation can detract from its appearance in the late summer.

Chionanthus virginicus L., Fringe-tree. A large shrub or small tree of moderate growth rate and rounded to slightly spreading habit that may reach 20 feet in height. Long leaves give this plant a medium-coarse texture.

The foliage turns to a bright yellow in the autumn, and the dark blue fruits may also be ornamental. The airy flowers are produced in loose panicles in late April or early May, and the floral display of a mature specimen can be quite spectacular. This is a widely distributed native species that is readily grown, but not often seen in cultivation. When it is grown in the full sun, the floral display is at its best. This species is worthy of greater use in the landscape.

Elaeagnus umbellata Thunb., Elaeagnus or Silverberry. A rapidly growing shrub that may reach a height of about 10 feet at maturity. This species is more erect in habit and is not as large as *E. pungens*. Small and rather silvery ovate leaves give the bush a medium-fine texture. The autumn coloration is not showy. Inconspicuous, but extremely fragrant, flowers are produced in middle May, and fruits mature in the early autumn. This species is rarely cultivated, but has escaped and become weedy in many piedmont areas.

Euonymus americanus L., Strawberry Bush. A shrub of small to medium size with moderate growth rate that may reach about 6 feet or occasionally more. Some specimens are somewhat erect in habit, but it can be vine-like and have straggling branches. Small elongate leaves give the shrub the impression of moderately fine texture. Plant habit in the shade is open and irregular but when grown in full sun the plant has a better shape. The autumn foliage is weakly evergreen to slowly deciduous without noteworthy coloration of the leaves. Trailing plants tend to be more evergreen while fruiting individuals (adult phase?) seem more prone to be deciduous. The flowers, while interesting in detail, are not conspicuous. Fruits with the color and shape of a strawberry open to expose large orange-red seeds which produce a very ornamental effect in the autumn. This is a very common native plant of rich woods in our area that reaches fruiting size in a few years; however, it is only occasionally cultivated. It requires a rich, or at least a reasonably moist site, but in other respects it is easily grown.

Euonymus alatus (Thunb.) Sieb., Winged Spindle-tree. A large shrub of moderate growth rate and rounded to spreading habit that reaches about 10 feet in height at maturity. The small serrate leaves give this plant a medium-fine texture. It has long-lasting autumn coloration in shades of

crimson and rosy-scarlet. The autumn is the period of the greatest display for this species, and this is the reason for which it is usually planted. The brightly colored fruits add to the autumn show, but the flowers are relatively inconspicuous. The winged spindle-tree is an attractive and well-formed shrub that has an offering for each season, with good summer foliage, excellent autumn coloration and interesting corky outgrowths on the twigs (wings) for the winter. It is more commonly planted in cooler climates, but specimens observed in our area are well formed and in good health.

Forsythia viridissima Lindl., Forsythia. A medium to large shrub of rapid growth rate and rounded to spreading habit that may reach 10 feet in height, but usually less. Medium-size serrate leaves give this species an appearance of moderately fine texture. The fall coloration is often inconspicuous, but under favorable conditions, an interesting mixture of yellow and magenta-purple shades develop in autumn. The branches are lined with numerous yellow bell-like flowers before the leaves are produced in March. The intensity of the yellow pigmentation, flower size and the freeness of bloom vary greatly from clone to clone. A variety of kinds of forsythia is cultivated in North Carolina, but a check of local specimens shows *F. viridissima* to be most frequent. Some of these are easily grown here while others show a high level of susceptibility to certain soil fungi. In our area the plant is usually smaller than those grown in the north, but the bloom is very dependable here. A test planting of species and varieties of forsythia to determine which types are best adapted to the North Carolina climate would be a worthwhile undertaking.

Hibiscus syriacus L., Shrubby Althea, Rose-of-sharon. A large shrub or small tree of moderately rapid growth rate and distinctly erect habit, usually with several trunks and reaching about 20 feet in height. The entire toothed leaves give the tree a medium texture. The pale yellow autumn coloration is not conspicuous. Throughout the summer, large 2 to 3 inch blooms are produced in shades of pink, lavender or white, and cultivars with double flowers are common. This plant is usually grown for its showy summer bloom. It is very easy to cultivate as long as dry sites are avoided. It is a large plant that has few pests and is at its best in the unpruned condition.

Hydrangea macrophylla (Thunb.) DC., House Hydrangea. A small shrub of moderate growth rate and rounded habit reaching about 4 feet in height in our area. Its coarse texture results from the large glossy leaves. The autumn coloration is not conspicuous. Very large and long-lasting inflorescences in pale blue or pink (depending in part on the acidity of the soil) are produced in early summer and slowly fade to a greenish color as autumn approaches. Although generally tolerant of a variety of cultural conditions, the branches are somewhat cold tender and die back as a result of winter cold in some seasons. With care it can be satisfactorily cultivated in our area. It is also widely cultivated as a pot plant.

A number of other *Hydrangea* species can be cultivated in our area. *Hydrangea quercifolia* Bartr., the very coarse oak-leaf hydrangea is rarely seen; however, specimens observed seemed well adapted and in a good state of vigor. The Peegee hydrangea, *H. paniculata grandiflora* Sieb., so very common in the north, is occasionally cultivated in the North Carolina mountains. Other species are encountered on rare occasions.

Jasminum nudiflorum Lindl., Winter Jasmine. A small shrub of moderately rapid growth rate that reaches about 3 to 4 feet in height. The habit is spreading, and the long arching branches bend to the ground or trail and layer at their tips, thus producing colonies. The small trifoliate leaves give the plant a fine texture. The autumn coloration is not conspicuous. The small yellow flowers are produced during warm periods in January, February or March. This is a very easily grown and almost weedy shrub that is distinctly homely, but any little bush that can produce showers of little yellow flowers in midwinter is worthy of a place in the landscape.

Poncirus trifoliata Raf., Trifoliate Orange. A thorny shrub of moderate growth rate and erect-growing habit that reaches about 10 feet in height, occasionally more. The small leaflets give the shrub a fine texture. The autumn coloration of the foliage is not worthy of note. The flowers, produced in April, are noticeable in a planting. This is an easily grown, but homely, shrub of rather irregular habit. It is very useful where an impenetrable large hedge or hedgerow is desired. This species is placed in the genus *Citrus* by some authorities, and that is likely correct since the tri-

foliate orange is readily grafted and hybridized with *Citrus* species. Some of these hybrids offer promise of cultivating edible *Citrus* clones in zone 7 and 8.

Rosa species and cultivars. A wide variety of cultivars, many variously hybrid in origin, are grown in this region. The large-flowered hybrid teas and related forms are the most commonly planted, but these can only be successfully managed in our area with the use of pesticides. Many "minor" taxa which are more pest and disease resistant are only infrequently seen in local gardens. No attempt will be made here to enumerate and discuss the great variety of materials in this genus variously grown in North Carolina.

Spiraea prunifolia Sieb. and Zucc., Bridle Wreath Spiraea. A shrub of medium size and moderate growth rate that may reach a height of about 8 feet at maturity. The habit is erect at first, but it takes on a well rounded form in time. Small leaves, elliptic in shape, give this shrub a fine texture. The foliage turns to shades of orange in the autumn, and can be quite striking. Copious quantities of small, double white flowers are produced before the leaves appear in early March on the form *plena*, the one commonly cultivated in our area. This easily grown and rather small shrub is planted for its long-lasting, early spring bloom. Since it is deciduous, pruning results in an unsightly winter appearance and limits the floral display; so it is best used where it has the space to develop naturally.

Viburnum plicatum Thunb., Doublefile Viburnum. A large shrub of rapid growth rate that reaches about 10 feet in height at maturity. The habit is erect in youth, but in time the branch spread about equals the height, and the branches take on a layered horizontal arrangement. The rather large leaves have a rough surface and give this plant a moderately coarse texture. In the late autumn the foliage turns an assortment of shades of orange-tan and red-tan before falling. Large flat flower clusters are produced in early May, followed by clusters of red berries in the early autumn that eventually fade to black. Although this species is easily cultured and very attractive, it is only infrequently cultivated in our area.

Other deciduous species of *Viburnum* are only very rarely seen in North Carolina gardens.

Vitex agnus-castus L., Chaste-tree. A large shrub or small tree of rapid growth rate that has an irregular rounded to oval-erect habit in time and reaches about 15 feet in height. Large, palmately compound leaves have long slender tapering leaflets which give this shrub a moderately fine texture. The fall coloration is not conspicuous. During midsummer, clusters of blue, lavender or white flowers are produced. *Vitex* is a fast-growing deciduous shrub which produces flowers in unusual colors in a season when few shrubs are in bloom. It is a large and easily grown plant which regenerates rapidly after pruning. It is a fine plant for large screens or hedges; however, it is deciduous and best enjoyed as a large specimen.

Wisteria sinensis (Sims) Sweet, Wisteria. A very fast-growing woody vine that may climb to the uppermost branches of large trees. Although it is normally trailing, forms of this species are sometimes maintained as a shrub, "tree wisteria", by careful pruning. Pinnately compound leaves with small leaflets give this vine a fine-textured appearance. The fall coloration is not showy. Long full racemes of blue-violet or white flowers are produced at the time the foliage appears, and the bloom can be spectacular in effect. However, like many Asiatic exotics, wisteria opens its flower buds too soon, and the bloom is often ruined by frost in March. It is an easily cultured, fast-growing and often weedy vine that is capable of growing to great size. Weediness and frost sensitivity are problems that limit the culture of this plant in central North Carolina.

Both the Japanese species, *W. floribunda*, and a native species, *W. frutescens*, are found in cultivation in North Carolina, but a brief check of specimens in our area showed them all to be *W. sinensis*.

Figure 4. Typical leaves of deciduous shrubs listed in chapter 5.

1. <i>Acer palmatum</i>	10. <i>Forsythia viridissima</i>
2. <i>Aesculus pavia</i>	11. <i>Hibiscus syriacus</i>
3. <i>Aralia spinosa</i>	12. <i>Hydrangea macrophylla</i>
4. <i>Callicarpa americana</i>	13. <i>Jasminum nudiflorum</i>
5. <i>Chaenomeles japonica</i>	14. <i>Poncirus trifoliata</i>
6. <i>Chionanthus virginicus</i>	15. <i>Spiraea prunifolia</i>
7. <i>Elaeagnus umbellata</i>	16. <i>Viburnum plicatum</i>
8. <i>Euonymus americanus</i>	17. <i>Vitex agnus-castus</i>
9. <i>E. elatus</i>	18. <i>Wisteria sinensis</i>



6. Evergreen shrubs

This grouping is essentially a continuation of the last, excepting that all the entries are evergreen. Although the deciduous shrubs are most commonly planted in the cooler parts of the United States, in the milder southeast a large number of hardy evergreen species are more common in the landscape. Since the foliage is held continuously, they are far better subjects for controlling in a foundation planting, and in general their contribution to the landscape over the year is greater than deciduous species, particularly during the winter.

Abelia X grandiflora (André) Rehd. (*A. chinensis* X *A. uniflora*), Glossy Abelia. A shrub of medium size and rapid growth rate with rounded habit at maturity which grows to about 8 feet in height. The very fine-textured appearance of this plant is produced by the small ovate leaves. Small creamy pink flowers are produced in abundance throughout the summer and into the autumn. The abelia is a very easy plant to cultivate, roots easily from cuttings and flowers soon after rooting. It responds to pruning and can be kept to a size much smaller than the maximum. Because it is so easily grown, it may be too common in some plantings; however, its great popularity may simply reflect the fondness growers have for its glossy green foliage and long season of bloom.

Aucuba japonica Thunb., Gold-dust Tree or Japanese Aucuba. A shrub of moderate size and growth rate that may reach about 8 feet (or more) in height, and takes on a rounded to spreading-rounded habit. Large, coarsely serrate leaves give this plant a coarse texture. The foliage is either a uniform deep green or a lighter green and mottled with cream-colored markings on some clones. Inconspicuous magenta-black flowers are produced in late winter. Large, very showy, red or white berries mature in the autumn and persist into the winter on some clones (dioecious). This very full shrub is widely used in foundation plantings in which it is easily trained and maintained. It is at its best in good soil with adequate water under light shade. The name, gold-dust tree, refers to the cultivars with white markings on the foliage (*A. japonica variegata* D'Ombr.), but there are many clones available which vary

Table 5. Parameters of cultivation of broad leaf evergreen shrubs in North Carolina

Species	Date brought into cultivation	Place of origin	Frequency of cultivation
<i>Abelia X grandiflora</i>	1800	cultivation, parental species from China	common
<i>Aucuba japonica</i>	1861	Japan	common
<i>Berberis sargentiana</i>	1907	China	rare
<i>Buxus sempervirens</i>	early colonial times	S.Europe, W.Asia	occasional
<i>Camellia japonica</i>	1800	Japan	common
<i>C. sasanqua</i>	1850	Japan	common
<i>C. sinensis</i>	1850	China, India	rare
<i>Cleyera japonica</i>	-	India to Japan	occasional
<i>Cotoneaster</i> species	-	Old World	infrequent
<i>Danae racemosa</i>	1739	Asia Minor	rare
<i>Elaeagnus pungens</i>	1830	Japan	common
<i>Euonymus fortunei</i>	1876	China	occasional
<i>Gardenia jasminoides</i>	colonial times	China	occasional
<i>Jasminum floridum</i>	1850	China	occasional
<i>Leucothoe axillaris</i>	-	native	rare
<i>Ligustrum japonicum</i>	1845	Japan, Korea	very common
<i>L. lucidum</i>	1794	China, Japan, Korea	occasional
<i>Lonicera fragrantissima</i>	1845	China	common
<i>Mahonia bealei</i>	1845	China	occasional
<i>Nandina domestica</i>	1804	China to Japan	common
<i>Osmanthus americana</i>	-	native	rare
<i>O. fragrans</i>	-	China, Japan	rare
<i>O. heterophyllum</i>	1856	Japan	common
<i>O. X fortunei</i>	1856	Japan	occasional
<i>Photinia serrulata</i>	1804	China	common
<i>Pieris japonica</i>	1870	Japan	rare
<i>Pittosporum tobira</i>	1804	China, Japan	rare
<i>Prunus caroliniana</i>	native	Southeast U.S.A.	infrequent
<i>Pyracantha</i> species	-	S.E. Europe to China	common
<i>Rhododendron obtusum</i>	1844	Japan	very common
<i>R. indicum</i>	1850	Japan	common
<i>Viburnum rhytidophyllum</i>	1900	China	rare
<i>Yucca filamentosa</i>	-	Southeast U.S.A.	common

in plant size, fruit color, fruitfulness and leaf markings. Properly used and cared for, *Aucuba* can be a striking addition in a planting.

Berberis sargentiana Schneid., Barberry. A shrub of moderate size and growth rate that may reach about 6 feet in height, and matures into an

erect-rounded or rounded habit. This bush has fine-textured appearance which is produced by the small elongate leaves with spiny teeth. While it is mostly evergreen, the leaves become somewhat red-colored in the winter season. The small yellow flowers are apparent, but not showy, in April. The black fruits are somewhat effective in the autumn, but this plant does not compete in its display with a large number of other berry-producing plants that are cultivated in this area. Sargent's barberry and a very similar species, *B. julianae* Schneid., are relatively fine-textured spiny plants suitable for landscaping, but they are most valuable for large protective hedges. Heavy pruning combined with shading results in sparse specimens in low vigor, and thus over shading should be avoided.

Buxus sempervirens L., Boxwood. A very compact and broadly spreading shrub of slow to moderately slow growth rate that may reach 10 or more feet in height after a long period. The very fine texture of the boxwoods is produced by the very small oblong leaves. The bloom is inconspicuous. The boxwood is grown for its deep green, fine-textured foliage, long life span and slow rate of growth. A number of cultivars are available that vary in growth rate, fineness of texture and habit. Although tolerant of a wide range of growing conditions, the summers in central North Carolina are too warm for best results with this species, and specimens often decline before reaching maturity; however, many older plants in this area are in good form and vigor. Apparently, moist, rich cool sites are required for success with the boxwoods here.

Camellia japonica L., Camellia. A small tree, often trained as a shrub, that has a moderate growth rate and becomes 20 feet or more in height. (Very old specimens may be more than twice that tall.) It is usually a more erect than spreading small tree; however, some clones are characteristically more spreading in habit. Rather large, shiny, deep green serrate leaves give this plant a medium texture. While this is one of our finest evergreens, *Camellia japonica* is grown primarily for its spectacular bloom over the warm temperate zones of both hemispheres. It has, perhaps, more floral forms than any other single species, and flowers 2 to 6 inches in diameter come in all shades of red, pink and white. The bloom season ranges from late fall until early spring depending on area. This is one of the few exotic species to

become an American state flower (Alabama). Different clones of *C. japonica* vary greatly in their ability to produce normal blooms out-of-doors, but those selected for cold resistance will grow and bloom quite satisfactorily in central North Carolina. Camellias are generally easier to grow than azaleas, requiring only partial shade and moderate soil moisture with good drainage.

The *C. X williamsii* hybrids, *C. japonica X C. saluenensis*, are locally hardy although as a group they are not as hardy or disease resistant as *C. japonica*. A species of much finer texture, *C. cuspidata*, which produces small white flowers is relatively hardy in this area, but it also does not match *C. japonica* for hardiness.

A Chinese species, *C. reticulata*, has even larger, more spectacular flowers than *C. japonica*, but it is not adequately hardy here, and thus satisfactory culture is restricted to greenhouses.

Camellia sasanqua Thunb., Sasanqua. A small tree, often trained as a shrub, that has a moderate growth rate (slightly greater than that of *C. japonica*) and becomes 20 feet in height, or much more over a long period of time. The sasanquas are erect growing while young, but become more rounded or even spreading in habit with age. They are capable of large size and very long life. The elliptic-serrate leaves give the sasanqua a moderately fine texture. The foliage is a deep green color in all seasons but is not as shiny as that of *C. japonica*. Two to three inch blooms are produced, depending on variety, from late September until hard freezes occur in early winter. There are many forms, and colors include magenta-reds, all shades of pink, pink-white bicolors and white. Sasanquas have been cultivated for a very long period of time in their native Japan, and they have great significance in that culture. It is, without a doubt, our most spectacular fall-blooming shrub (or tree). Hundreds of clones which vary in earliness of bloom, flower size and color and even plant form and texture are potentially available. The sasanqua has few pests, but it can become infested with tea scale, and some clones are susceptible to a fungus which causes dieback of twigs and branches. It is dependably hardy in central North Carolina, but on an absolute scale it is not as cold hardy as *C. japonica*; however, it is more tolerant of varied soil conditions than *C. japonica*.

Camellia sinensis (L.), Kuntze, Tea Plant. A large shrub or small tree with moderate growth rate that may reach about 20 feet in height. The habit is distinctly spreading to rounded. Clones range in texture from that of *C. sasanqua* to *C. japonica*, but those cultivated in this area are usually of finer texture similar to that of *C. sasanqua*. The dull, deep green foliage is similar in general aspect to other *Camellia* species. Small white flowers are produced in the autumn. Although not widely cultivated in this area, the tea plant is an easily cultured evergreen that responds to any amount of pruning. It can be grown for tea production in this area, and a tea plantation was once established in South Carolina. Although tea growing did not prove economically feasible, the tea plant, I am told, has escaped and naturalized in the area of the old plantation.

Cleyera japonica Thunb., Cleyera or Sakakia. An erect growing shrub of medium size and moderate growth rate that may reach about 10 feet in height. Small variably elliptic leaves produce a moderately fine texture for this shrub. The flowers are not conspicuous, but the fruits open to display showy orange seeds in the autumn. *Cleyera* is a very handsome evergreen shrub with a distinctly erect habit. The glossy, evergreen foliage is striking, and the plant form is very unusual. Without pruning, small dense twig clusters develop throughout the plant with more open connecting branch areas between.

Cotoneaster species. A large and variable group of evergreen plants that range from nearly prostrate shrubs to small trees. They are mostly moderately rapid in growth rate and have a fine to very fine texture which is produced by the small to very small, deep green leaves. While the flowers are small but attractive, the show of red berries in the autumn is the chief ornamental importance of the species in this genus. Several different species have been observed rarely in plantings in this area, but none of them are even occasionally in distribution. They may decline in excessively wet areas and are reported to be susceptible to spider mites and fire blight of pear, but some plants in good vigor and of ornamental importance have been observed in piedmont gardens. It would be a worthwhile undertaking to set out a variety trial in central North Carolina to determine which species and cultivars might be satisfactorily cultivated here.

Danae racemosa (L.) Moench., Alexandrian Laurel. A small erect shrub of moderate growth rate that may reach 3 feet in height. A medium-fine texture is produced by the long, deep green leaves (cladodes). The bloom is inconspicuous, but the red fruits have ornamental significance in the autumn. This rarely planted, bamboo-like shrub, is apparently very easily cultivated and deserving of more widespread use.

Elaeagnus pungens Thunb., Elaeagnus or Silverberry. A large shrub of very rapid growth rate that may obtain a height of about 12 feet with branches that may "climb" into trees. The silverberry takes on an irregular spreading to rounded habit in the open, but it is very straggling in the shade. The elliptic leaves give the shrub a medium-fine texture, and scales on the leaves give it a gray cast. In September and October small, inconspicuous, cream-colored flowers are produced in abundance, and they are exceedingly fragrant. The species name, "pungens", probably relates to the sweet fragrance which can scent an entire area when the bush is in full bloom. The red drupes mature in the spring, and provide food for wild birds, but the flesh is sweet and makes good jelly. Erect growing branches with short, recurved lateral shoots hook these very fast-growing branches into other vegetation in late summer, a most unusual climbing mechanism. *Elaeagnus* is very useful as a fast-growing screen or hedge plant or for its scent and fruit; but while it can be pruned, it is a large plant that requires ample space. It occasionally escapes from cultivation.

Euonymus fortunei (Turcz.) Hand.-Mazz., Euonymus. A climbing or trailing plant of moderately rapid growth rate, or in some forms a shrub that may reach about 7 feet in height. This variable species is a ground cover or a climbing plant if supported, particularly on tree trunks, or in form *vegeta*, a spreading shrub that will climb if supported. Weakly toothed, ovate leaves vary in size from clone to clone so that the textural effect of this species ranges from medium-fine to medium. Although evergreen, the leaves on some forms, such as *colorata*, turn a dark purplish color during the winter (not deciduous). The bloom is inconspicuous, but showy fruits open to expose orange berries in October on the shrubby form *vegeta*. (Ground cover cultivars have been observed not to be fruitful.) This is an easily

grown ground, wall, or tree trunk cover, or even a shrub of medium size. It is sometimes damaged by scale insects and defoliated by severe winter freezes. The shrubby cultivars bear handsome fruit, but while the plant responds to pruning, best fruit displays are found on unpruned specimens.

Gardenia jasminoides Ellis, Cape-jasmine or Gardenia. A shrub of medium size and moderately slow growth rate that attains about 5 feet at maturity. The habit becomes rounded to spreading, and the long shiny leaves give this shrub a medium texture. The large white flowers with their strong fragrance are well known. The commonly cultivated form has a double flower that is similar in appearance to the "formal" camellia. The gardenia is well known as a garden shrub in the south and equally well known as a pot plant in the north. Although we (Chapel Hill area) are more or less on its northern-most range for out-of-doors cultivation, it usually is adequately hardy in our area. Aside from its sensitivity to severe cold, the gardenia can be grown in most garden sites that do not become excessively dry.

Jasminum floridum Bge., Summer Jasmine. A small spreading shrub with pendulous branches and moderately rapid growth rate that reaches a height of about 4 feet. Small trifoliate leaves give this shrub a fine texture. Clusters of small yellow flowers are produced throughout a large portion of the summer. The summer jasmine is very useful where a small and easily grown shrub is required.

Leucothoe axillaris (Lam.) D. Don., Leucothoe. A spreading shrub with drooping branches and moderate growth rate, reaching a height of about 6 feet at maturity. The deep green lance-like leaves give this shrub a moderately coarse appearance and often take on a deep red color in the winter. Racemes of small white flowers are produced in April. The native *Leucothoe* species are occasionally cultivated in central North Carolina, and make attractive evergreens when grown on rich moist soils.

An Asian member of this genus, *L. keiskei*, and our native deciduous species, *L. racemosa* and *L. recurva*, are also rarely seen in cultivations.

Ligustrum japonicum Thunb., Japanese Privet. A large shrub of rapid growth rate that has a rounded habit in time and reaches a height of 12 or more feet. Large entire leaves give this shrub a moderately coarse texture.

Both the bloom and the small cluster of purple-black berries are rather inconspicuous, but both contribute a much more noticeable effect on unpruned specimens. This homely, fast-growing and rather coarse evergreen is widely planted in foundation plantings in new subdivisions. It is so planted because it will grow almost anywhere, and it is very easy to propagate. In a foundation planting it must be regularly pruned, and this practice results in a very open and "leggy" appearance; however, when allowed to develop with adequate space, it will become a handsome specimen shrub.

Ligustrum lucidum Ait., Glossy Privet or Giant Privet. A large shrub or small tree with many trunks that has a rapid to very rapid growth rate and may reach up to about 30 feet in height. The habit is more erect than spreading, and the crown becomes rounded in time. The texture and foliage are much like that of *L. japonicum*. The flower clusters are noticeably effective in late June, and large clusters of ornamental purple-black berries mature and persist throughout the winter. This is a very easily grown specimen plant that is very handsome in heavy fruit set; however, after heavy pruning, this species makes a fantastic regrowth that is unsightly. It is a fine plant for a large hedgerow, but it is much too coarse and open in habit for a pruned hedge. Foliage may be damaged in severe winter freezes, but in our area the wood does not seem too harmed.

Several forms of the finer-textured species of *Ligustrum* are occasionally used for hedging throughout the state, and one of these, *Ligustrum sinense* Lour., has widely escaped and made a nuisance of itself in low moist area.

Lonicera fragrantissima Lindl. and Paxt., Sweet-breath-of-spring. A large shrub of rapid growth rate with a somewhat irregular rounded to spreading form that attains a height of about 10 feet. Small ovate leaves give this plant a medium-fine texture. It is only partially evergreen with the leaves being gradually lost in late autumn and winter without noticeable coloration. Large quantities of very fragrant, small cream-colored flowers are produced in late winter. This shrubby honeysuckle is so easily grown that it is almost weedy. It was widely planted in the area of Chapel Hill, North Carolina, some years ago, and now its fragrance is considered

one of the hallmarks of early spring. It is much too ragged and fast-growing to be used in a foundation planting, but in a lightly wooded or open area where it can grow freely, it makes a pleasant contribution to the spring landscape.

Mahonia bealei (Fort.) Carr., Oregon Grape Holly. An erect growing shrub of moderate growth rate that develops an irregular, rounded habit in age, and attains a height of about 6 feet. Large leathery, pinnately compound leaves give this shrub a moderately coarse texture. Racemes of noticeable small yellow flowers are produced in late winter, and blue-black berries mature in late spring. Except in excessively dry sites, the grape holly is an easily grown small shrub that has very attractive shiny evergreen foliage when it is in good vigor. Although the flowers are not very showy, they are produced at a time when few plants are blooming; and thus the flowers are a distinct contribution to the early spring garden.

Nandina domestica Thunb., Nandina. A small erect-growing shrub of moderate growth rate which takes on a rather irregular form, and reaches a height of about 6 feet. Small leaflets on large, doubly compound leaves give this shrub a fine texture. Small white flowers that are produced in large clusters are followed in the autumn by very showy large clusters of red berries that are persistent into the winter. *Nandina* is a shrub that has long been cultivated and had religious significance in Japan. It takes on an interesting shape, spreading slowly from root sprouts but makes few lateral branches from the stiff erect stems. It does not respond well to pruning, and in any case the terminal fruit clusters that would be prevented by pruning are one of the most ornamental features of this species. Dwarf forms and clones with foliage that becomes much redder in the winter are available.

Osmanthus americana (L.) Gray, Wild Olive. A somewhat spreading large shrub to small tree of moderate growth rate that reaches about 40 feet in height. Large, lance-like leaves give this plant a moderately coarse texture, somewhat more coarse than the *Osmanthus* species that follow. The small flowers that are produced in the spring are followed in the autumn by dark blue fruits that are somewhat effective in the landscape. Unlike the following species of *Osmanthus*, the native species has a very open habit, and conse-

quently, has much less value for the landscape. It is only rarely seen in cultivation.

Osmanthus fragrans Lour., Tea Olive. A large shrub to small tree of moderately slow growth rate with a somewhat more erect than spreading habit, that reaches a height of about 20 feet. The serrate leaves are somewhat larger and less leathery than the holly-leaved *Osmanthus* giving this shrub a medium textured-appearance. It is evergreen, but the foliage is usually damaged by the severe cold of middle winter in our area. Clusters of pale yellow flowers are produced in abundance even on young plants. The main bloom occurs in September, but occasional flowers are produced throughout the growing season. This is one of the most fragrant shrubs available. The tea olive is easily grown and widely cultivated in areas east and south of the North Carolina piedmont for its fragrant bloom and excellent qualities as a landscape specimen. When young it is susceptible to winter damage or outright winter-kill in our area, but established specimens in protected locations survive adequately.

Osmanthus heterophyllus P.S. Green, Holly-leaved *Osmanthus*. A large shrub to small multi-trunked tree of moderately slow growth rate that takes on a rounded habit in time and reaches a height of about 20 feet. Spine-tipped (holly-like), deep green leathery leaves give this plant a moderately fine texture. Clusters of very fragrant, small white flowers are produced in the late autumn but are usually not very conspicuous. The holly-leaved osmanthus is an easily grown shrub that can be easily trained or allowed to develop into a well shaped small tree; however, it does not flower as dependably as some other species of *Osmanthus*, and regularly pruned specimens are particularly reluctant to produce the fragrant bloom. Although the bloom is reduced by pruning, this species responds very well to regular training. This is the *Osmanthus* species that is available in most local nurseries.

Osmanthus X fortunei Carr., (*O. heterophyllus* X *O. fragrans*), Fortune's *Osmanthus*. A large shrub to small tree of moderately slow growth rate that develops into a well rounded or slightly spreading shape without pruning and reaches a maximum height of about 20 feet. The leaves are similar in size to those of the tea olive, but the teeth are coarser and the leaf has

a more leathery quality. The texture of the plant is medium. Clusters of small white flowers are freely produced in late September and October. The bloom is apparent, even showy at its peak, and the flowers are exceedingly fragrant. This hybrid combines the free bloom and fragrance of the tea olive with the hardiness of the holly-leaved osmanthus. It is easily cultured, but while it can be maintained as a pruned specimen, it flowers only sparingly after regular pruning, and thus the lovely scent is reduced.

Photinia serrulata Lindl., *Photinia*. A large erect shrub to small tree of moderately rapid growth rate becoming more spreading in mature habit, and reaching 20 feet or more in height. Rather large, serrate leaves give this plant a moderately coarse texture. The large flower clusters are moderately showy as are the red berries, but pruning limits flowering and fruiting. *Photinia* is a fine, large specimen plant, but if flowers and fruit are desired, it should be allowed to develop into a large shrub or small tree. The new foliage is conspicuously red, and a clone named 'Red Top', is available which has particularly red shoots in the spring. Some other species are cultivated, but hybridization in cultivation has made certain identification very difficult.

Pieris japonica (Thunb.) D. Don., Japanese Andromeda. A rounded to spreading shrub of moderate size and growth rate that reaches about 9 feet in height. The lustrous, long dark green leaves give this plant a medium texture. Large and very showy flower clusters are produced in late March. The Japanese andromeda is an easily grown and very handsome shrub with an early, exceptionally fine spring display. Both this and an American species of exceptional horticultural merit, *P. floribunda* (Pursh) Benth. and Hook., are rarely seen in gardens in central North Carolina.

Pittosporum tobira Ait., Japanese Pittosporum. A shrub of medium size and moderately growth rate that takes on a rounded to slightly spreading habit with maturity and reaches about 10 feet in height. The thick, leathery leaves give this species a medium texture. The small, fragrant flowers are produced in spring. Although this species is not difficult to propagate or grow, it is not fully hardy in central North Carolina; however, it is more widely used on the coastal plain. In protected localities in our area a few

good specimens of *Pittosporum* can be found.

Prunus caroliniana Aiton, Carolina Laurel Cherry. A large shrub or small tree of moderately rapid growth rate that has an erect habit at first but becomes rounded and spreading in age, and may attain a height of about 40 feet. Rather large elliptic leaves give this tree a medium-coarse texture. Racemes of small white flowers are produced in April and followed by somewhat persistent blue-black (more or less fleshless) fruits in the autumn. The Carolina laurel cherry is an excellent, large evergreen shrub that can be trained by pruning or allowed to develop into a tree. It is easily grown but susceptible to ice and snow breakage; however, this species usually regenerates rapidly after such damage.

A related evergreen *Prunus*, *P. laurocerasus* L., cherry laurel, is occasionally used in foundation plantings. It is large, spreading and fast-growing, and this should be considered in its use. It is also somewhat more coarse than *P. caroliniana*, and it sometimes declines abruptly.

Pyracantha species, Pyracantha or Firethorn. Large shrubs of rapid growth rate that take on an irregular rounded to spreading habit in time. Most types reach a height of about 10 feet. Small elliptic leaves give the pyracanthas a fine texture. Clusters of white flowers cover the shrub in the late spring, but the greatest display produced by these plants is the fruit crop which is effective from the autumn until well into the winter. The firethorn is easily grown and it is one of our most striking berry-producing ornamental shrubs. It is a large thorny plant which needs adequate space in which to develop. It responds well to pruning and even fruits well in confinement. One often sees it trained to cover walls. It is susceptible to winter injury when hard freezes follow extended warm periods in middle winter. A large percentage of the firethorns in Chapel Hill, North Carolina, were killed outright or severely damaged in the winter 1972. Many species are cultivated, and many, if not most, being planted are variously hybrid. Some older specimens of *Pyracantha* in Chapel Hill fit the description of *P. crenata-serrata* (Hance) Rehd.

Rhododendron species. A large number of species of this genus including the rhododendrons and azaleas are cultivated. The true rhododendrons and the deciduous azaleas are extensively grown in the mountains, but comments

here will be confined to the two groups commonly grown in piedmont gardens. No effect is made here to seriously explore this large, complex and very important group of shrubs and small trees.

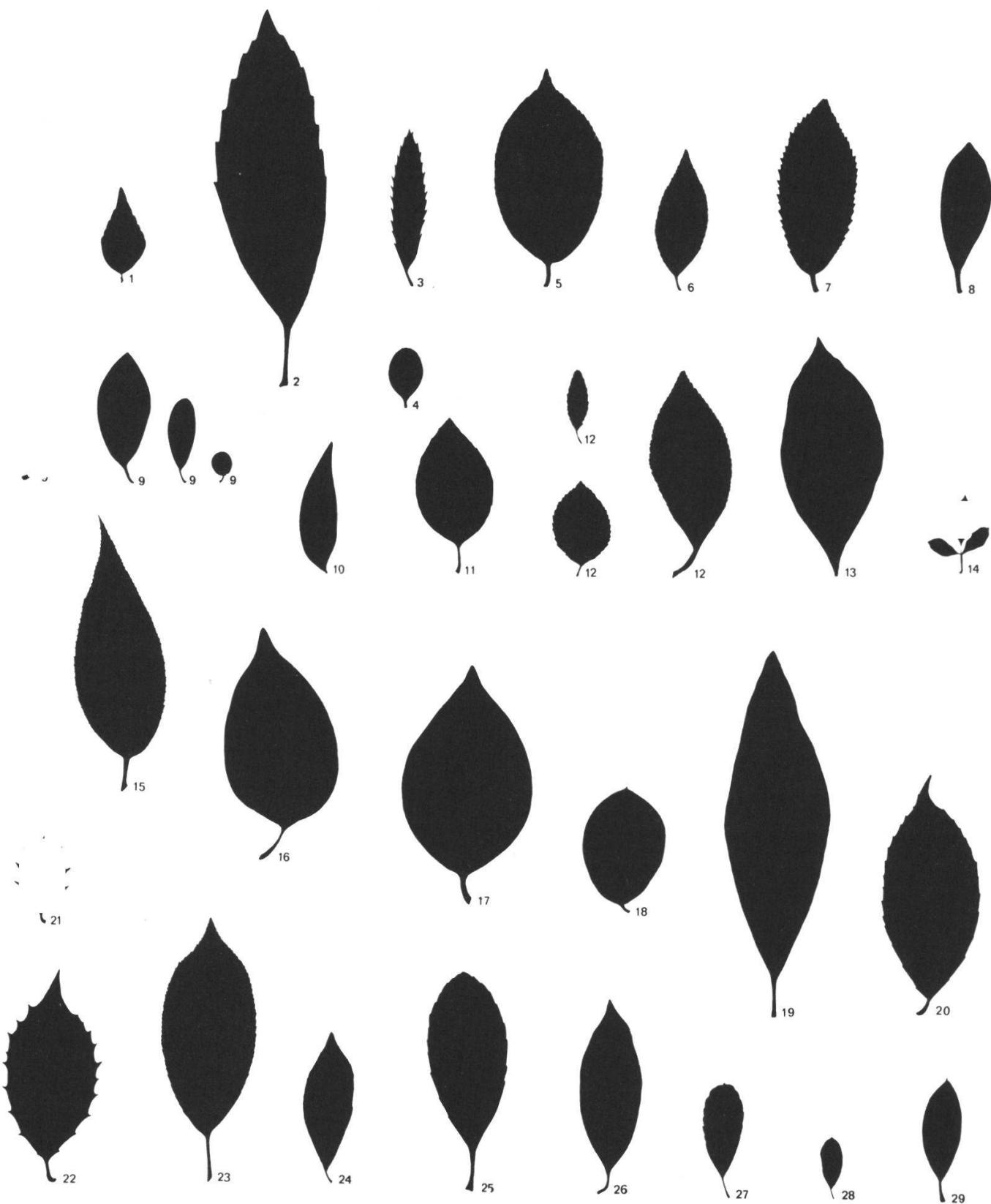
Rhododendron obtusum Planch., "Karume" Azaleas. Evergreen, spreading, fine-textured shrubs that may reach a height of about 6 feet in time. A spectacular floral display is produced in mid-spring in shades of red, pink and white, and this is the azalea of the North Carolina piedmont. Although easily cultured, it is only moderately tolerant of dry weather. The flowers often open too early in the spring, and the bloom is ruined by spring freezes. As is the case with the majority of the cultivars in this genus, clones that carry a particular species name are often in fact hybrids or advanced generation segregates.

Rhododendron indicum Sweet, Indian Azaleas. These are the larger, coarser and more drought-resistance, evergreen azaleas for which the coast of the Carolinas is famous. They can be easily cultured on the eastern piedmont with protection (and a little luck!). Again many, if not most, of our azalea clones are actually hybrid in origin. Some newer cultivars being introduced actually combine several species in their genetic background.

Viburnum rhytidophyllum Hemsl., Viburnum. A large shrub of moderate growth rate that is more erect than spreading in habit at first but becomes more rounded in time, and reaches a height of about 12 feet. Long, dark green wrinkled leaves give this plant a medium-coarse texture. The flower

Figure 5a. Typical leaves of broad leaf evergreen shrubs listed in chapter 6.

1. <i>Abelia X grandiflora</i>	16. <i>Ligustrum japonicum</i>
2. <i>Aucuba japonica</i>	17. <i>L. lucidum</i>
3. <i>Berberis sargentiana</i>	18. <i>Lonicera fragrantissima</i>
4. <i>Buxus sempervirens</i>	19. <i>Osmanthus americana</i>
5. <i>Camellia japonica</i>	20. <i>O. fragrans</i>
6. <i>C. sasanqua</i>	21. <i>O. heterophyllum</i>
7. <i>C. sinensis</i>	22. <i>O. X fortunei</i>
8. <i>Cleyera japonica</i>	23. <i>Photinia serrulata</i>
9. <i>Cotoneaster</i> species	24. <i>Pieris japonica</i>
10. <i>Danae racemosa</i>	25. <i>Pittosporum tobira</i>
11. <i>Elaeagnus pungens</i>	26. <i>Prunus caroliniana</i>
12. <i>Euonymus fortunei</i>	27. <i>Pyracantha</i> species
13. <i>Gardenia jasminoides</i>	28. <i>Rhododendron obtusum</i>
14. <i>Jasminum floridum</i>	29. <i>R. indicum</i>
15. <i>Leucothoe axillaris</i>	



1 inch

clusters produced in the autumn are only moderately showy. The evergreen has a texture that is somewhat more coarse than most of our evergreen shrubs. The deeply set veins give the leaves a three-dimensional appearance. Apparently this plant is not difficult to culture, but on poor and shaded sites it develops into a sparse, leggy specimen.

Yucca filamentosa L., Adam's Needle. A subshrub that spreads from the base by short stolons and reaches a maximum height of about 3 feet. The large linear leaves give this plant a rigid, coarse texture. Very large flower stalks with waxy white flowers are produced in early summer. This easily cultivated and hardy yucca is widely grown for its showy flower stalks and unusual rigid foliage.

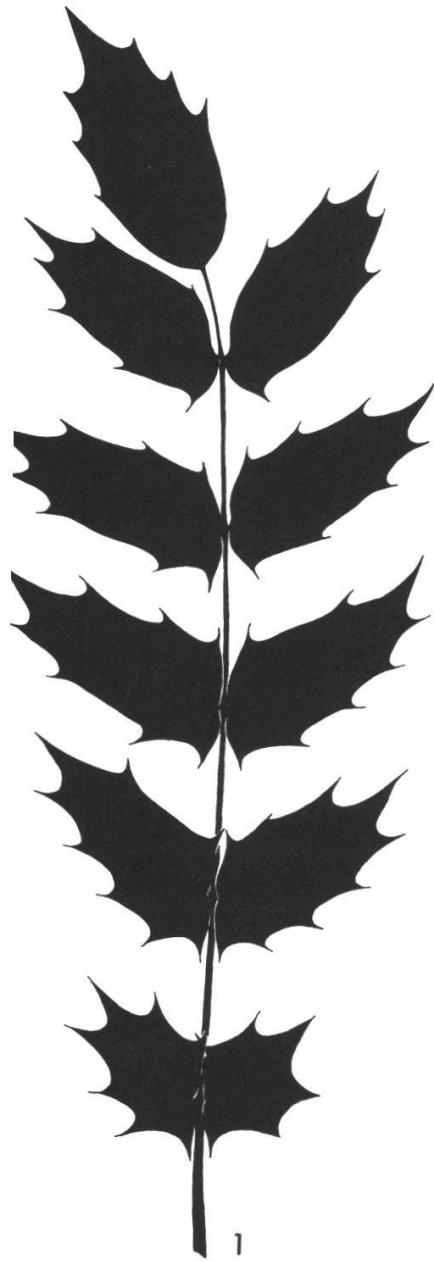
7. The hollies

A very large number of the known 300 or more species of the genus *Ilex* L. are cultivated in the warmer temperate regions of the world. Because hollies are so well-adapted and so commonly grown in our area, this section is completely dedicated to the locally grown species and hybrids of holly. The University of North Carolina has an excellent holly collection in the University plantings; however, many additional species, selections and hybrids could be successfully added. The cultivated forms of this genus are probably our single most important group of evergreen shrubs and small trees.

Ilex cornuta Lindl., Chinese Holly. A large shrub with a moderate to moderately rapid growth rate that may eventually mature into a small tree about 25 feet in height. The tree is dense and develops a broadly rounded top in time. The normal form of the glossy, deep green leaves has five or more major spines, but spine number varies from one to many in the cultivated selections of this species. The lustrous evergreen foliage gives this plant

Fig. 5b. Typical leaves of broad leaf evergreen shrubs listed in chapter 6
(continued from Figure 5a)

1. <i>Mahonia bealei</i>	3. <i>Viburnum rhytidophyllum</i>
2. <i>Nandina domestica</i>	4. <i>Yucca filamentosa</i>



1 inch

Table 6. Parameters of cultivation of *Ilex* species grown in North Carolina

Species	Date brought into cultivation	Place of origin	Frequency of cultivation
<i>Ilex cornuta</i>	1846	China	common
'Burfordii'	1895	U.S.A. cultivation	very common
<i>I. crenata</i>	1864	Japan	common
'Convexa'	1919	U.S.A. cultivation	common
'Helleri'	1936	U.S.A. cultivation	very common
<i>I. decidua</i>	native	Southeast U.S.A.	occasional
<i>I. latifolia</i>	1840	Japan	very rare
<i>I. opaca</i>	native	Eastern U.S.A.	occasional
The following clones are probably derived from hybridization events between <i>I. opaca</i> and <i>I. cassine</i> .			
'East Palatka'	1926	selected from wild state	occasional
'Hume No. 2'	1909	cultivation U.S.A.	occasional
'Savannah'	-	cultivation U.S.A.	common
<i>I. pernyi</i>	1900	China	rare
<i>I. vomitoria</i>	native	Southeastern U.S.A.	occasional

a medium texture. The pale yellow flower clusters are produced in early April but are rather inconspicuous. The red berry clusters are very attractive and may persist from the autumn throughout the winter (depending on whether or not the resident birds favor the berries). Cultivars that produce orange or yellow fruits are also available. The Chinese holly is one of our most widely planted landscape plants, and while it is a handsome shrub that is capable of fruiting while its size is contained by pruning, it rapidly becomes a small tree. Once overgrown, recovery from heavy pruning is slow. Many forms of this holly are grown, but the one most common in our area is the 'Buffordii' clone which normally only has a single terminal spine on the leaves.

Ilex crenata Thunb., Japanese Holly. A very small to large shrub, 2 to 15 feet in height at maturity, with a moderate to moderately rapid growth rate depending on environmental conditions. It is often more spreading than erect in habit, but the habit varies considerably from clone to clone. Small,

evergreen, more or less ovate leaves give this shrub a fine texture. Neither the bloom nor the purple-black fruits are effective in the landscape. Since the clones of this species are easily propagated, grown and well-adapted here, the Japanese holly has replaced boxwood in many landscape plantings. Despite its usefulness, this species has been over-planted in our area. It has few pests but is only moderately drought resistant. *Ilex crenata* can be controlled by pruning, but the best control is the selection of the proper clone for the area in which it is to be used.

Some common cultivars:

'Convexa' - A very fine-textured shrub which reaches a maximum height of about 6 feet, and has leaves with a convex shape.

'Helleri' - A dwarf, compact form, which is suitable for low hedges or ground covers.

'Rotundifolia' - A slightly more coarse form that makes large, rounded shrub in time.

Ilex decidua Walter, Possumhaw, Deciduous Holly. A large shrub or small tree, often with several trunks, that has a moderate growth rate and reaches about 30 feet in height. It is broadly topped at maturity, but the habit usually remains taller than broad. Small, spatulate-oblong leaves produce a fine texture. The deciduous autumn foliage is only a pale yellow, but when it is in heavy fruit, the effect of red berries on bare branches is striking. The bloom is inconspicuous. This is a handsome small tree that can produce a fine winter show (dioecious). As with most deciduous plants, pruning ruins the winter appearance. This native species is quite comfortable in a variety of local habitats.

A similar, somewhat more shrubby species, *I. verticillata* (L.) Gray, Winterberry, is the most widely planted of our native deciduous hollies, particularly further north. It is often noted that the dependable fruiting characteristic of the winterberry is an advantage; however, in our area both species are good, though *I. decidua* is the larger plant.

Ilex latifolia Thunb., Tarajo. A large shrub of moderate growth rate eventually becoming a large tree up to a height of about 70 feet. In youth it has an erect, columnar or pyramidal habit, but a mature specimen has not been observed. Large, thick, evergreen, more or less oblong, serrate leaves

produce a very coarse texture. Clusters of small pale yellow flowers are produced in late autumn or in early winter, followed by dense berry clusters on the female trees which are very effective in the autumn and winter landscape. Although rarely planted, *I. latifolia* is a grand coarse tree. There seem to be no cultural difficulties, but adequate space is often not available for proper development.

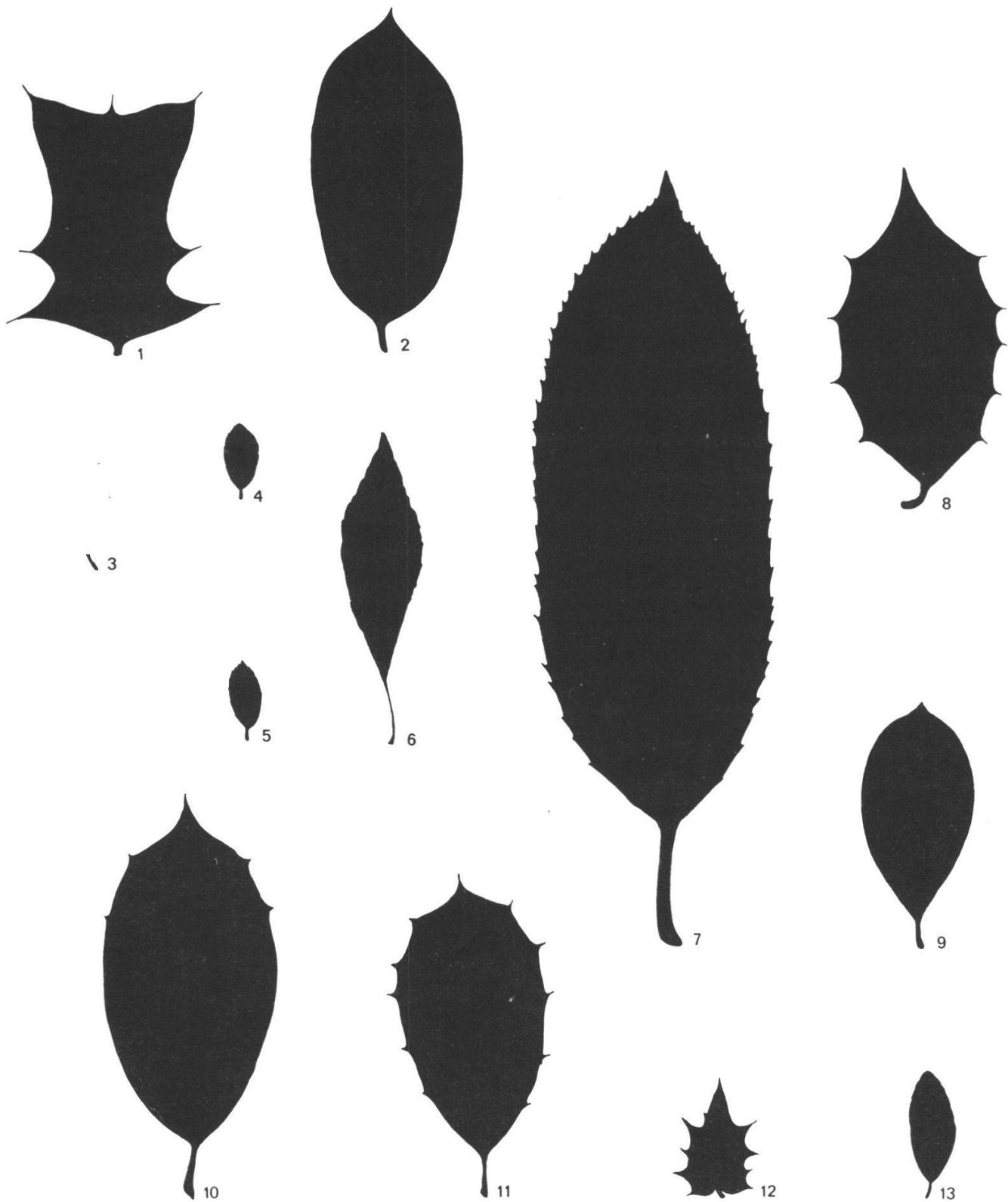
Ilex opaca Aiton, American Holly. A large shrub that grows moderately slowly (or moderately under favorable conditions) to a medium size tree that may become 50 or more feet in height. The habit is pyramidal in youth, but it becomes an erect columnar tree with a rounded head in time. The evergreen leaves are moderately large, mostly elliptic in shape with spine-tipped situations which give this tree a medium to medium-coarse texture. Yellowish-white flowers are borne in early April, but they are not conspicuous. The very effective bright red fruits persist throughout the winter. Orange and yellow-fruited selections are occasionally grown. The American holly is a common native tree here and in most of the milder portions of the eastern United States. It is a widely planted ornamental, and its fruiting branches are popular Christmas decorations. Like most of the hollies it is dioecious, and this must be taken into consideration in landscape planting. Native hollies vary greatly in leaf shape, fruitfulness and plant form. A large number of very ornamental forms have been selected which usually fruit more dependably than trees selected at random from the wild state. Two examples are mentioned below:

'Croonenberg' (selected by Thrasher) - A selection of American holly which fruits dependably and which has a good growth form and foliage.

'Foster' - This is a finer texture than standard *I. opaca*, but the leaves differ from the standard form only in that they are somewhat smaller.

Figure 6. Typical leaves of *Ilex* species and cultivars listed in chapter 7.

1. <i>Ilex cornuta</i>	8. <i>I. opaca</i>
2. 'Burfordii'	9. 'East Palatka'
3. <i>I. crenata</i>	10. 'Hume No. 2'
4. 'Convexa'	11. 'Savannah'
5. 'Helleri'	12. <i>I. pernyi</i>
6. <i>I. decidua</i>	13. <i>I. vomitoria</i>
7. <i>I. latifolia</i>	



1 inch

Without pruning, this fruitful selection develops a rather open habit and exposes its pale gray trunk.

Ilex opaca X *I. cassine* hybrids (or advanced generation segregates). The coastal plain holly, *I. cassine* L., which is not satisfactorily hardy in the central piedmont, sometimes hybridizes naturally with *I. opaca* in the zone where the two species are sympatric. A number of these hybrids have been selected and distributed by horticulturists and deserve the excellent reputation they have gained. They are easily grown and hardy in central North Carolina, but they cannot be grown satisfactorily in more northerly zones where pure *I. opaca* is common grown. Three of these clones are as follows:

'East Palatka' (selected by Hume) - The small leathery leaves usually have a single terminal spine. The texture is slightly finer than pure *I. opaca*, but it is otherwise similar. This is considered by Hume to be almost unsurpassed in fruitfulness.

'Hume No. 2' (selected by Hume) - The leaves are glossy, and the spine number is variable but usually less than in *I. opaca*. This clone normally bears a prolific load of fruit and has excellent plant form with medium texture. Some holly experts consider this the best in this hybrid grouping.

'Savannah' (selected by Robertson) - The rather dull thin leaves are similar in shape to *I. opaca*. It is very fruitful, and it has a distinctly columnar habit similar to *I. opaca*. Note: It is impossible to comment on the final adult habit of these three clones of holly because they have not been cultivated long enough to form adult specimens; however, the form of younger specimens seems to be mostly columnar to pyramidal.

Ilex pernyi Franchet, Perny Holly, Veitchii. An open, erect-growing shrub to small tree of slow to moderately slow growth that may reach a height of about 25 feet. The five long triangular spines give the leathery, evergreen leaves a rather quadrangular shape. The texture of this shrub is medium-fine. Small pale yellow flowers are produced in the spring, followed in the autumn by conspicuous, four-segmented red berries that persist into the winter. An unusual, but easily grown, large shrub that deserves to be more widely used. A number of handsome hybrids between this species and *I. cornuta* are now available that combine the finer texture of *I. pernyi* with the vigor and fruitfulness of *I. cornuta*.

Ilex vomitoria Aiton, Yaupon. A large shrub to small tree of moderate growth rate that usually has a columnar habit and may reach a height of about 30 feet. Small, evergreen, elliptic leaves with crenate margins give this plant a fine texture. The inconspicuous bloom is followed by a noticeable fruit load that can be effective in the landscape in the autumn and early winter, but which does not rival the show produced by the selected clones of *I. opaca*. This is an easily cultured, small native tree that is very useful for hedges and large screens because of its fine texture and dense branch structure, and several dwarf clones are available with even finer texture and slower growth rate. It is a good substitute for the more difficult to culture boxwood, and in fact, the yaupon may even be superior to *I. crenata* for this purpose.

8. The conifers

In nature and in cultivation, the conifers range from prostrate shrubs to very large trees. Indeed, the species in this group represent some of the largest and longest-lived trees in the world. In cultivation, some of these species reach great size and longevity; however, the forest heights are almost never achieved under conditions of domestication. In central North Carolina the native pines are probably our most common shade trees, but a large number of less frequently grown conifers offer a variety of forms and textures in the local landscape.

Calocedrus decurrens (Torr.) Florin, Incense Cedar (*Libocedrus*). A large tree of narrowly pyramidal habit, broadening slightly with age, with a slow to moderate growth rate. The tallest tree of this species observed in North Carolina is about 70 feet, but it may reach heights of 200 feet in its native habitat. The evergreen leaves are tiny scales which remain appressed to the thin twigs, giving the tree a very fine texture. Tiny cones are visible in the autumn. The incense cedar is rarely grown in the East, but in good sites it develops into a large, narrowly pyramidal tree. It remains a deep green color in the winter which makes it a striking addition to the winter landscape. At middle elevations in the southern California and Sierra

Table 7. Parameters of cultivation of conifers grown in North Carolina

Species	Date brought into cultivation	Place of origin	Frequency of cultivation
<i>Calocedrus decurrens</i>	1853	Western U.S.A.	very rare
<i>Cedrus deodara</i>	1831	Himalayas	occasional
<i>Cephalotaxus harringtonia</i>	1830	Japan	rare
<i>Cryptomeria japonica</i>	1861	Japan	rare
<i>Cunninghamia lanceolata</i>	1804	China	occasional
<i>Juniperus horizontalis</i>	1836	N. North America	common
<i>J. virginiana</i>	native	East and Central U.S.A.	very common
<i>Metasequoia glyptostroboides</i>	1950	China	rare
<i>Pinus echinata</i>	native	Southeast U.S.A.	common
<i>P. palustris</i>	native	Southeast U.S.A.	occasional
<i>P. strobus</i>	native	East and Central U.S.A.	occasional
<i>P. taeda</i>	native	Southeast U.S.A.	very common
<i>P. virginiana</i>	native	Southeast U.S.A.	common
<i>Taxodium distichum</i>	native	Southeast U.S.A.	rare
<i>Tsuga canadensis</i>	native	Eastern U.S.A.	occasional

Nevada Mountains, specimens of this species reach mammoth proportions and develop thick, orange bark on great towering trunks that survive for centuries.

Cedrus deodara (Roxb.) Loud., Deodar Cedar. A large tree of moderately rapid growth rate that may reach a height of 80 feet or more. It is pyramidal in youth, but it becomes somewhat more flat-topped and spreading in age; however, it usually remains taller than broad in outline. The bluish-green, evergreen needles, 1 to 2 inches in length, are borne in clusters on short shoots, producing a fine texture. Large erect cones are borne occasionally on older specimens. The deodar is a grand specimen tree with its thick trunk and long, massive, downcurving branches which sweep to the ground. It seems to grow well in our area in sites that are not excessively wet or dry.

Cedrus atlantica is a similar species that often has somewhat bluer foliage, and distinctly bluer selections of the Atlantic cedar are available.

Cephalotaxus harringtonia K. Koch, Japanese Plum Yew. A widely spreading shrub to small tree of moderate growth rate that may reach a height of about 20 feet. The flattened, evergreen needles, 1 to 2 inches in length, give this plant a medium-fine texture. The purple-black reproductive structures are drupe-like in appearance but are of little ornamental importance. The heat tolerant plum yew is similar in appearance to, but coarser in texture than, the species of true yew (*Taxus*) which are widely grown in cooler areas. While *Taxus* species can be grown in our area with some difficulty, *Cephalotaxus* occasionally replaces it here. This full and easily grown large shrub deserves to be more widely cultivated.

Cryptomeria japonica (L. f.) D. Don., Cryptomeria. A tree of moderate to moderately rapid growth rate that has been observed to reach about 50 feet in height in our area, but is known to be three times that height in Japan. Since all specimens observed in North Carolina are relatively young, our trees may grow the greater heights in time. This tree has an erect columnar habit in youth that becomes somewhat more spreading to pyramidal with maturity. Small, spine-like needles are densely arranged on the closely clustered twigs, and they impart a fine texture. Small cones with long-pointed bracts have a spiny appearance. *Cryptomeria* is a striking, erect-growing and very fine-textured tree. In good, well drained soils it develops into a large, handsome tree, but in poorer sites it is less attractive. It tolerates the shade of taller trees and there takes on a more open habit. It is surprising that this conifer is not more widely grown, in fact, it is not even listed in some landscape materials books. It has long been cultivated by the Japanese who have selected a great diversity of forms of this species, including a number of extremely dwarf types.

Cunninghamia lanceolata (Lamb.) Hook., Chinese Fir. A tree of erect pyramidal habit and moderate growth rate that may reach a height of about 75 feet in our area. The stiff, flattened needles are 1 1/2 to 2 1/2 inches in length, linear-lanceolate in shape and marked with two white bands on the underside. The texture of this tree is medium-fine. The small cones are persistent after the release of the seeds. The China fir is a slightly coarse evergreen that matures into a large tree with conspicuously orange-colored

bark. It is not difficult to grow, but better specimens are produced in good soils. It, like *Cryptomeria*, is not widely grown, but it deserves a wider landscape usage.

Juniperus horizontalis Moench., Creeping Juniper. A spreading ground cover of moderate to moderately rapid growth rate that may attain a height of 18 inches and reach out 3 to 5 feet. The tiny, spiny leaves are evergreen and bluish, closely arranged on small, much-branched twigs and turn purplish during the winter season. The texture is very fine. The tiny bluish cones are nearly berry-like in appearance. This low shrubby conifer is widely used as a ground cover since it is resistant to a variety of conditions including drought and most pests. A variety of cultivars with a range of foliar colors and textures are available.

Low spreading clones from several other *Juniperus* species are occasionally grown. Spreading forms of the needle-bearing common juniper, *J. communis* L., are occasionally used in central North Carolina.

Juniperus virginiana L., Red Cedar. A medium to large tree that grows at a moderate to moderately rapid rate in youth but much more slowly in age, and may reach a height of about 80 feet, often less. It is usually narrowly columnar in youth, becoming more pyramidal or broadly columnar in time. In habit the red cedar is highly variable, and numerous spreading and other variously dwarf selections are in cultivation. The very fine texture of this tree is produced by tiny scale leaves arranged on closely spaced twigs. The cones are very small, bluish and berry-like. The red cedar is a widely distributed native tree in eastern North America where it is widely planted as a shade or specimen tree. In time it becomes very twisted and picturesque, and it is capable of great longevity.

The Chinese juniper, *J. chinensis* L., is a superficially similar tree that is best known for its spreading forms in our area. The most commonly planted one is the large spreading "Pfitzer" juniper which reaches about 10 feet in height and spreads extensively. The foliage of the "Pfitzer" is bluish, but *J. chinensis* has many foliar color and growth forms.

Metasequoia glyptostroboides Hu and Cheng, Dawn Redwood. A tree of narrowly pyramidal habit and moderately rapid growth rate that probably

reaches about 150 in height in the wild state, but has not been cultivated long enough for us to know its height potential here. The small, flattened, hemlock-like needles are borne on deciduous short shoots that give this tree a very fine texture. The foliage has some effectiveness in the landscape as it turns yellow-brown in the autumn. The cones are small. The dawn redwood was first known from fossil specimens, but living specimens were discovered in remote canyons in southwestern China about 30 years ago. Since that time this species has been widely planted in many countries. It seems to be easily cultivated, but it may be damaged in our area by poorly drained soils. It makes a striking specimen in a planting with its erect growth pattern and feathery foliage.

Pinus palustris Miller, Long-leaf Pine. A moderately coarse-textured pine that grows rapidly and reaches a maximum height of 80 feet or more. Initially, it develops a grass-like phase, but it becomes pyramidal in habit after lateral branches develop, and finally becomes broadly columnar in age. The needles are very long, 10 to 15 inches in length, and the large cones are more than 6 inches in length. The clusters of very long needles create an interesting effect in the landscape.

Pinus strobus L., White Pine. A large tree of moderately rapid growth rate that may reach a height of 150 feet, but usually much less in cultivation. The habit is pyramidal in youth, but it becomes broadly columnar with age. The greenish gray needles are about four inches in length and occur in groups of five. Despite the length of the needles the textural appearance of the tree is fine. The long, slender cones are 4 to 6 inches in length. While white pine is the most widely grown pine species in the North Carolina mountains, where the species is native, it is only occasionally cultivated in the piedmont area. It is potentially a large, well-formed tree in either locality, but in the warmer lowland zones it can only be grown successfully in well-drained soils since the roots are susceptible to fungal attack when grown in soils saturated with water for long periods.

Pinus taeda L., Loblolly Pine. A large, rapidly growing tree that may reach a height of about 100 feet. The tree is broadly pyramidal in youth (with adequate space) and becomes more rounded to broadly columnar with age.

The six inch needles are borne in clusters of three, and the texture of the tree is moderately coarse compared to other conifers. The large cones are 4 to 5 inches in length. The loblolly pine is a large, fast-growing and somewhat weedy tree, and locally, it is one of the most abundant shade and lumber species. It grows anywhere. Old stands, particularly those damaged by human disturbance, are often susceptible to the ravages of the southern pine-bark beetle.

The short-leaf pine, *P. echinata* Miller, is like the loblolly pine in most respects except that the leaves are shorter (3 to 4 inches in length) and the cones are smaller (2 to 3 inches in length). The size, habit and requirements are similar to loblolly, but the texture of the tree is somewhat less coarse. While the two species occur naturally in our area, the short-leaf pine has a more westerly distribution on the piedmont region while the loblolly is more abundant on the eastern piedmont and coastal plain.

Another similar pine, Walter's Pine, *P. glabra* Walter, is native to the coastal plain of South Carolina, but is only planted rarely in our area.

Pinus virginiana Miller, Virginia or Scrub Pine. A tree of medium size and rapid growth rate that may reach a height of 80 feet, but it is often much smaller. In good sites it develops into a form similar to *P. taeda*, but in poorer sites its habit is stunted and variably rounded to columnar. A fine texture is produced by the small needles that are about 1 1/2 inches in length and arranged in pairs. The small cones are also about 1 1/2 inches in length. This is a fast-growing and somewhat weedy tree that is considered by many to be less attractive than the native pines with longer needles; however, in favorable sites the Virginia pine can develop into a large, well formed tree. Apparently, this species is bothered less by the bark beetle than

Figure 7. Typical leaves of conifers listed in chapter 8.

1. <i>Calocedrus decurrens</i> (twig)	9. <i>Pinus echinata</i>
2. <i>Cedrus deodara</i>	10. <i>P. palustris</i>
3. <i>Cephalotaxus harringtonia</i>	11. <i>P. strobus</i>
4. <i>Cryptomeria japonica</i> (twig)	12. <i>P. taeda</i>
5. <i>Cunninghamia lanceolata</i>	13. <i>P. virginiana</i>
6. <i>Juniperus horizontalis</i> (twig)	14. <i>Taxodium distichum</i> (twig)
7. <i>J. virginiana</i> (twig)	15. <i>Tsuga canadensis</i>
8. <i>Metasequoia glyptostroboides</i> (twig)	



either the short-leaf or the loblolly pine.

Taxodium distichum (L.) Richard, Bald Cypress. A tree of moderately rapid growth rate that may reach a height of 150 feet, probably much less in cultivation. It is pyramidal in youth and becomes columnar and round-headed with age. A fine texture is produced by the small, flattened needles that are arranged on short, deciduous twigs. The yellow-brown deciduous foliage is somewhat effective in the autumn. The small cones are nearly round in shape. This grand, long-lived tree is associated with the swamps of the southeastern coastal plain but grows very well (minus its "knees") in upland sites. The bald cypress is a fine, large shade tree with few pests that deserves to be planted much more widely.

Another member of this family of conifers that is rarely seen in our area is the coast redwood of California, *Sequoia sempervirens* (Lamb.) Endl. The tree is easy to propagate and grow in our area, but specimens vary in winter hardiness with some large individuals remaining in good health and vigor while others decline at an early age from cold injury. Obviously, fully hardy selections can be made.

Tsuga canadensis (L.) Carr., Canada or Eastern Hemlock. An ultimately very large tree of moderately slow growth rate that may finally reach a height of 150 feet, but usually less in cultivation. It is always pyramidal to columnar in habit, but specimens developing in open areas can spread considerably. A very fine texture is produced by the evergreen, small flattened needles that are mostly arranged in a single plane on finely branched twigs. The small, persistent cones are less than one inch in length. It is a very commonly cultivated tree, particularly in the mountain region. Except in excessively dry localities, it is easily cultivated on the piedmont, and since it can be controlled by pruning, it has many uses in the landscape.

A similar, rarely cultivated, species, *T. caroliniana* Engelm., has non-planar leaf arrangement and cones that are more than one inch in length.

Summary

A list of the commonly cultivated woody plants of the central part of the state of North Carolina is presented with a brief horticultural description for each species included. The list is divided into seven chapters according to the traditional classification of horticultural usage as follows:

Broad Leaf shade trees	Evergreen shrubs
Flowering trees	The hollies
Fruit and nut trees	The conifers
Deciduous shrubs	

For each plant species, the native location, date of introduction and frequency in cultivation are presented in tabular form at the beginning of each section and horticultural descriptions follow. A figure with leaf outlines for the species in each chapter is placed at the end of each section. It is pointed out that since North Carolina has a moist temperate climate which ranges from warm temperate in the coastal region to cool temperate in the Appalachian Mountains in the western part of the state, the majority of the most successful exotic species come from zones with similar climatic regimes in Japan and China (southeast Asia).

Zusammenfassung

Die im zentralen Teil von North Carolina häufig kultivierten Holzpflanzen werden aufgezählt und mit ihren gärtnerisch wichtigen Eigenschaften kurz beschrieben. Die Liste ist gemäss der üblichen Einteilung nach Verwendung der Arten in die folgenden sieben Kapitel gegliedert:

Breitblättrige Schattenbäume	Immergrüne Sträucher
Blütenbäume	Stechpalmen
Frucht- und Nussbäume	Nadelgehölze
Laubwerfende Sträucher	

Für jede Pflanzenart wird die ursprüngliche Verbreitung, das Datum der ersten Einführung und die Häufigkeit der Kultur in Tabellenform zu Beginn jedes Kapitels zusammengestellt. Anschliessend folgt die Beschreibung der einzelnen Arten. Für die Arten jedes Kapitels werden am Ende die Umrisse der Blätter abgebildet. Da North Carolina ein feucht gemässigtes Klima aufweist, das von warm gemässigt der Küstenregion bis zu kühl gemässigt des Appalachen-Gebirges im Westen des Staates reicht, ergibt sich, dass der grösste Teil der erfolgreichen exotischen Arten aus Gebieten mit ähnlichem Klima in Japan und China (Südostasien) stammt.

References (Works used in the preparation of the list)

BAILEY, L.H., 1949: Manual of cultivated plants. Mcmillan Co., New York. 851 pp.

FERNALD, M.L., 1950: Gray's manual of botany (8th ed.). Van Nostrand Reinhold Co., New York. 1632 pp.

HILLIER, H.G., 1973: Hillier's manual of trees and shrubs. A.S. Barnes and Co., New York. 575 pp.

HUME, H.H., 1953: Hollies. Mcmillan Co., New York. 242 pp.

RADFORD, A.E., AHLES, H.E., and BELL, C.R., 1968: Manual of vascular flora of North Carolinas. Univ. of North Carolina Press, Chapel Hill, N.C. 1183 pp.

REHDER, A., 1940: Manual of cultivated trees and shrubs. Mcmillan Co., New York. 996 pp.

WESTCOTT, C., 1971: Plant disease handbook (3rd ed.). Van Nostrand Reinhold Co., New York. 746 pp.

WYMAN, D., 1965: Trees of American gardens. Mcmillan Co., New York. 502 pp.

- 1969: Shrubs and vines for American Gardens. Mcmillan Co., New York. 613 pp.

- 1971: Wyman's gardening encyclopedia. Mcmillan Co., New York. 1222 pp.

Address of the author: Dr. C. Parks
Department of Botany
University of North Carolina
Chapel Hill, N.C. 27514, U.S.A.