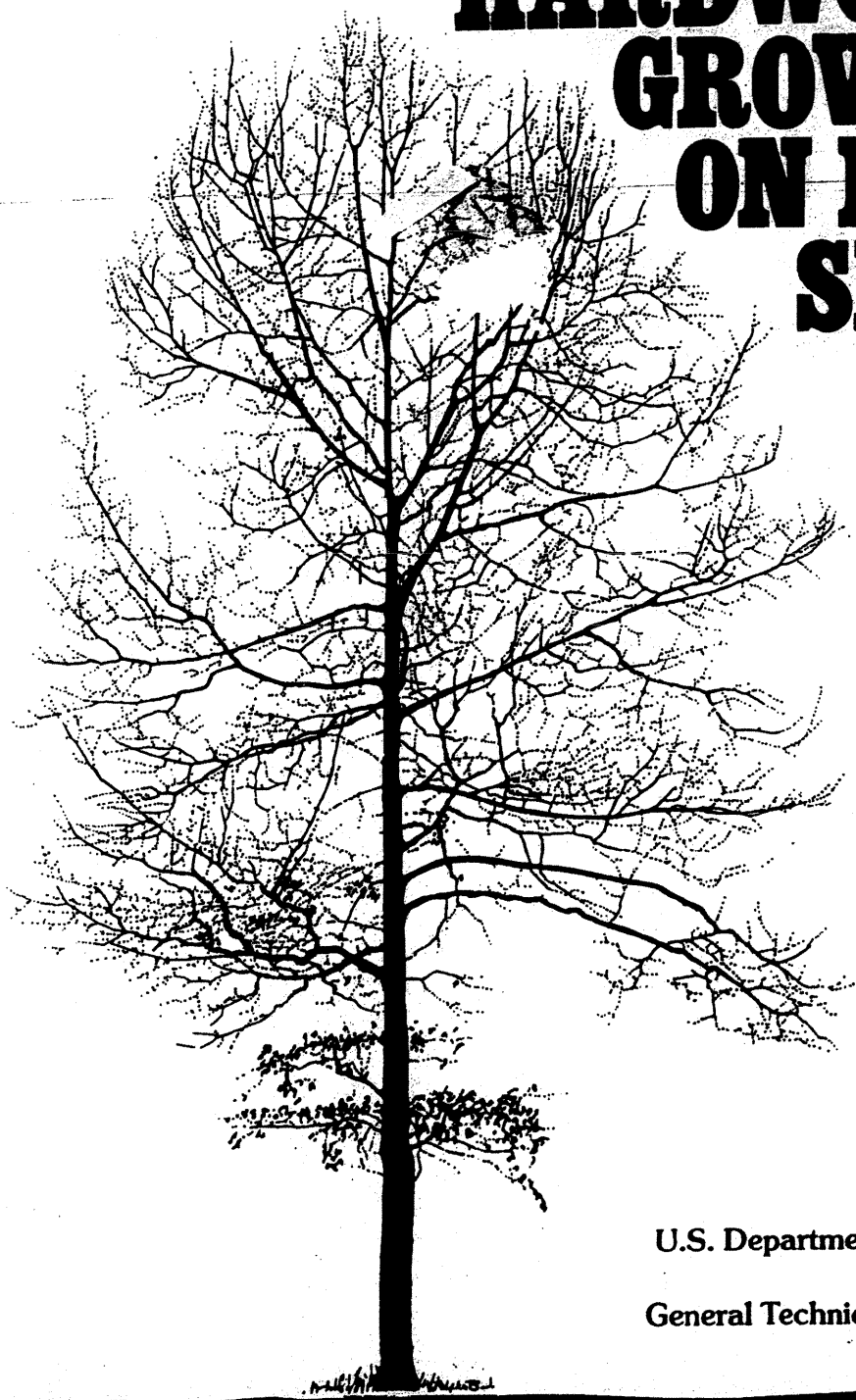
Clair A. Brown
Harold E. Grelen

IDENTIFYING HARDWOODS GROWING ON PINE SITES



Southern Forest Experiment Station

U.S. Department of Agriculture,
Forest Service
General Technical Report SO-15

Acknowledgments

The authors thank Bryan A. Jowers, Glendale, California, for the excellent winter silhouettes. For help in obtaining specimens or photographs of species not easily accessible to us, we thank the following: Roger W. Barbour, University of Kentucky; William Harlow, College of Environmental Science and Forestry, State University of New York; Richard Johnson, Caroline Dormon Nature Preserve; Betty E. Lemon, University of Southwestern Louisiana; R. Dale Thomas, Northeast Louisiana University; and Lino Della-Bianca and Edwin R. Lawson of the U.S. Forest Service.

Summary

This publication illustrates and describes 26 hardwood species or varieties, including 16 oaks and hickories, with photographs of leaves, bark, buds, flowers, and fruits. Line drawings feature the winter silhouette of each species and a key is included to assist in identification.

U.S. Department of Agriculture
Forest Service General Technical Report SO-15

Identifying Hardwoods Growing On Pine Sites

CLAIR A. BROWN
Professor Emeritus,
Department of Botany
Louisiana State University
Baton Rouge, Louisiana

HAROLD E. GRELEN
Principal Range Scientist
Southern Forest Experiment Station
Forest Service—USDA
Pineville, Louisiana

1977

Contents

Page

Overview of Southern Hardwoods . . . 1

Key to Hardwoods 6

Species Described and Illustrated

Mockernut hickory 10
Pignut hickory 12
Shagbark hickory 14
Bitternut hickory 16
Southern red oak 18
Cherrybark oak 20
Black oak 22
Scarlet oak 24
Northern red oak 26
Shumard oak 28
Blackjack oak 30
Laurel oak 32
Water oak 34
White oak 36
Post oak 38
Chestnut oak 40
Winged elm 42
American elm 44
Sugarberry 46
Yellow-poplar 48
Sweetbay 50
Sweetgum 52
Red maple 54
Black tupelo 56
White ash 58
Green ash 60

Selected References 63

Glossary 65

Index 69

Overview of Southern Hardwoods

Throughout the South some 49 billion cubic feet of small, low-quality hardwoods are growing on southern pine sites* (Staff, For. Resour. Res. Work Unit 1976). This material is usually wasted; if the site is prepared for regeneration to pine, the hardwoods there are destroyed. Research is underway to find economical methods of harvesting and utilizing these hardwoods. The descriptions, key, and illustrations in this book should help wood utilization researchers, especially those new to the South, to identify the most prevalent hardwood species on southern pine sites (Table 1).

*For the purposes of this paper, pine sites are defined as forested uplands, excluding those growing cove-type hardwoods, that are supporting southern pine or show evidence, such as stumps, of its former occurrence.

Table 1.—*Important hardwoods on southern pine sites, ranked according to percentage of total hardwood volume*[1]

Species		Percent
Sweetgum	*Liquidambar styraciflua* L.[2]	13.2
White oak	*Quercus alba* L.	12.3
Hickory	*Carya* spp.	8.5
Southern red oak	*Quercus falcata* Michx.	8.1
Post oak	*Quercus stellata* Wangenh.	7.0
Yellow-poplar	*Liriodendron tulipifera* L.	7.0
Black tupelo	*Nyssa sylvatica* Marsh.	5.5
Water oak	*Quercus nigra* L.	4.7
Black oak	*Quercus velutina* Lam.	4.0
Scarlet oak	*Quercus coccinea* Muenchh.	3.6
Red maple	*Acer rubrum* L.	3.6
Chestnut oak	*Quercus prinus* L.	2.9
Northern red oak	*Quercus rubra* L.	2.4
Laurel oak	*Quercus laurifolia* Michx.	1.4
Elm	*Ulmus* spp.	1.4
Cherrybark oak	*Quercus falcata* var. *pagodaefolia* Ell.	1.2
Ash	*Fraxinus* spp.	.9
Sweetbay	*Magnolia virginiana* L.	.6
Shumard oak	*Quercus shumardii* Buckl.	.2
Hackberry	*Celtis* spp.	.1
Other hardwoods	including blackjack oak (*Quercus marilandica* Muenchh.)	11.4
Total hardwoods		100.0

[1]Percentages were derived from Staff, For. Resour. Res. Work Unit (1976).
[2]Nomenclature used herein follows Little (1953).

Hickories have alternate compound leaves with 5 to 13 leaflets. They are monoecious; that is, the stamens and pistil are borne in separate flowers on the same plant. Flowers generally develop after the leaves are three-fourths to full grown. Staminate flowers are in catkins, which occur on last year's wood and usually have three branches. The stalkless pistillate flowers are in several-flowered spikes at the apex of the current season's growth. Catkins last from 10 days to 3 weeks and are usually not useful in distinguishing the species. The fruit, however, is widely used for identification. The husk may be very thin (about 1 mm), moderately thick (3 to 5 mm), or very thick (more than 5 mm). Similarly, the shell may be thin, moderately thick, or very thick. The meat varies from sweet to bitter. Upon drying, the husk usually separates along sutures and frees the nut. In some species the husk partly splits at the sutures but still encloses the nut when it falls. Such nuts are usually sterile, because the meat is seldom filled out.

For identification purposes use nuts from the ground with caution; if more than one species grows in the vicinity, the fruits could be mixed. Also some trees shed defective or sterile fruits early, and these fruits are often different in shape and size from typical fruit.

Hickories are generally divided into true hickories, which have overlapping (imbricate) bud scales, and pecan hickories, which have valvate bud scales. True hickories are divided into those with tight bark and those with loose bark. **Mockernut Hickory,** *Carya tomentosa* Nutt., a tight bark species, has very pubescent leaves, large buds, and a thick husk over a large nut. **Pignut Hickory,** *C. glabra* (Mill.) Sweet, also a tight bark hickory, has three to nine glabrous leaflets and a tardily dehiscing husk about 3 mm thick. **Shagbark Hickory,** *C. ovata* (Mill.) K. Koch, is one of the few species with bark in thin, loose plates. It has small buds and usually has five leaflets. **Bitternut Hickory,** *C. cordiformis* (Wangenh.) K. Koch, belongs to the pecan hickory group and has yellow buds with valvate scales. It also has tight bark, thin four-winged husks, thin shells, and bitter meat.

Oaks are also monoecious, and staminate flowers are in drooping catkins, which consist of a central, flexible axis with sessile, apetalous and pubescent flowers. They are most abundant on the developing new twigs. Although catkins vary among oaks, they are usually not used as distinguishing characteristics because they last only 2 to 3 weeks. Pistillate flowers occur on wood of the previous season and in leaf axils of twigs. In red oaks, however, pistillate flowers on current twigs do not mature until the second fall.

The fruit, a nut or acorn, consists of the seed enclosed in a shell. The nut is seated in a cup consisting of many scales. At maturity nuts are shed from the tree by shrinkage of the cup (dehydration). Considerable variation in mature acorn size occurs among trees of a species, notably in water oak, willow oak, and white oak.

Differences in foliage within a species also complicate identification.

Apparently because lower leaves receive less sunlight they differ in size and appearance from those in the middle or upper crown. Most taxonomists prefer a specimen from the upper half of the crown because they consider leaves from this area typical for the species. To get such specimens easily, use a tree pruner and take leaves from at least 20 to 30 feet off the ground or collect them from freshly felled trees. Moreover, foliage of seedlings and small saplings often differs from that of mature trees, and spring and summer growth flushes on the same branch often appear markedly different. This seasonal variation has been noted for many oaks, including laurel, post, blackjack, and especially water oak. For example, by late March or April, water oak leaves reach their normal size and shape—obovate with a wavy apex; the second flush of growth, which starts in late April or May, produces lobed leaves.

Identification is further complicated because hybrids commonly occur among the oaks.

The oaks are divided into two main groups: the white oaks and the red (or black) oaks. The white oaks have leaves with rounded lobes and no bristles; acorns mature the first fall, and the inner surface of the shell is glabrous. White oak, chestnut oak, and post oak belong to this group. The red oak group is characterized by bristle-tipped leaf lobes in such species as Shumard, southern red, northern red, cherrybark, and black oak. The red oak group also includes non-lobed species such as water, laurel, and willow oak, which usually have entire margins. Blackjack oak leaves usually lack lobes and bristles, but leaves with terminal lobes occasionally occur and may have one bristle per lobe. Acorns mature the second fall, and the inner surface of the shell is pubescent.

Southern Red Oak, *Quercus falcata* Michx., and its variety **Cherrybark Oak,** *Q. falcata* var. *pagodaefolia* Ell., have almost identical acorns, but they can be distinguished by other characteristics. The leaf base of southern red oak is somewhat bell-shaped, but that of cherrybark is not. Southern red oak forms heavy ridges of bark; cherrybark does not.

The distinctive feature of **Black Oak,** *Q. velutina* Lam., is its yellow-orange inner bark. Its leaves take three forms. Seedlings to small saplings have a "bear-paw" leaf with only a suggestion of lobing. Lower leaves on large trees also have little lobing, but leaves from the middle and upper crown are clearly lobed. The uppermost leaves, which have seven lobes and deep sinuses, are usually illustrated as typical.

Scarlet, *Q. coccinea* Muenchh., **Northern Red,** *Q. rubra* L., and **Shumard Oak,** *Q. shumardii* Buckl., are difficult to distinguish. Northern red oak leaves have shallow sinuses and a dull-green upper surface with little or no pubescence in the vein axils on the underside. Shumard oak leaves have a glossier surface, shallow to deep sinuses that are usually wider than the adjacent lobes, and definite hairiness at the vein axils. The sinuses of scarlet oak are also usually wider than their adjacent lobes, which are usually toothed. Both Shumard and scarlet oak have outstanding fall coloration.

Blackjack Oak, *Q. marilandica* Muenchh., can be recognized by its leathery, usually entire, broadly obovate leaf, which has a rusty undersurface. The branches are stout, irregular, gnarled, drooping to horizontal.

Laurel Oak, *Q. laurifolia* Michx., and **Water Oak,** *Q. nigra* L., are similar in size and shape, but water oak has oblong-obovate or spatula-shaped leaves gradually narrowed to a wedge-shaped base. Laurel oak leaves are elliptic to oblong-ovate. Laurel oaks tend to shed leaves late and thus may retain about 30 to 50 percent of their lower leaves after water oaks are bare. Some recent authors separate the laurel oaks into two species, upland laurel oak, *Q. hemisphaerica* Bartr., and swamp laurel oak, *Q. laurifolia* Michx.

White Oak, *Q. alba* L., has a thin, light green leaf with a light glaucous bloom at maturity; it is oblong or ovate, with rounded lobes and three to five narrow sinuses extending nearly to the mid-rib. The cup scales of the acorn-cup are heavy and distinct.

Post Oak, *Q. stellata* Wangenh., has stout, irregular branches. The leathery leaves are usually five-lobed; usually the two side lobes are at right angles to the central axis, thus forming a cross-shaped leaf.

Chestnut Oak, *Q. prinus* L., resembles swamp chestnut oak, *Q. michauxii* Nutt., a commercially important tree southwide. Chestnut oak is primarily a northeastern tree, extending into the South along the Appalachian highlands into northern Georgia and Alabama where its range overlaps that of swamp chestnut oak, and its leaves lack the dense pubescence found on those of swamp chestnut oak.

Common elms include **American Elm,** *Ulmus americana* L., and **Winged Elm,** *U. alata* Michx. Both bloom after a freeze breaks dormancy. For example, if a killing frost occurs in the last week of November or the first week of December, American elm will bloom the first week of January. If no killing frost occurs by early December, American elm may not bloom until the third week of January. Winged elm usually blooms 10 days to 2 weeks later than American elm. Small winged elm trees frequently have a corky outgrowth on opposite sides of twigs at least 3 years old. Mature trees often lack this characteristic. The American elm leaf has unequal basal lobing and pubescent or ciliate samaras about 12 mm in diameter; winged elm has a smaller leaf with round to acute leaf bases and a very ciliate samara about 8 mm long.

Young **Sugarberry,** *Celtis laevigata* Willd., and Hackberry, *C. occidentalis* L., trees are readily recognized by a whitish to light gray bark dotted with small corky warts. Older trees often have relatively smooth, light to medium gray bark. Leaf margins of sugarberry are usually entire or indistinctly toothed; the upper half of hackberry leaves are usually conspicuously serrate. Both species produce tiny flowers on the new growth when the leaves are about half normal size. The fruit of sugarberry is orange-red to black; that of hackberry is dark red to nearly black at maturity.

Yellow-poplar, *Liriodendron tulipifera* L., or tulip tree, has alter-

nate, four- to six-lobed leaves with truncate to distinctly notched apices, a unique feature among American trees. The flowers are tulip-like with red markings on a greenish-yellow background. The fruit is a cone-like aggregate of samaras.

Sweetbay, *Magnolia virginiana* L., produces moderate-sized trunks on uplands or numerous pole-like suckers in branch bottoms. It is evergreen in the southern part of its range and deciduous in the northern portion. A wind blowing in the crown will expose the silvery underside of the leaves. The white flowers, about 5 to 10 cm in diameter, open for the first time about 3 p.m. and close about 9 p.m. They reopen the next morning and shed their stamens. The fruit is a green pickle-like aggregate of follicles that splits open to reveal red seeds. Sweetbay and yellow-poplar, both members of the Magnolia family, have stipule scars circling the twigs.

Sweetgum, *Liquidambar styraciflua* L., or redgum, is easily recognized by its alternate, star-shaped, palmately lobed leaves. Some trees have corky outgrowths on the small branches. Its flower consists of several round clusters of stamens arranged in a raceme and a stalked pistillate head that develops into a spiny, woody fruit containing many seeds.

Red Maple, *Acer rubrum* L., has simple, opposite leaves that are usually glaucous and pubescent. The flowers appear in early February and the fruit is a double samara. The variety *A. rubrum* var. *drummondii* (Hook. and Arn.) Sarg., which has densely matted white hairs on the undersides of young leaves, grows in swamps throughout the South. Leaves may have three to five lobes, but southern trees are predominantly three-lobed. For this reason, some authors recognize the southern form as *A. rubrum* var. *tridens* Woods.

The leaves of **Black Tupelo** (blackgum) *Nyssa sylvatica* Marsh., are alternate, elliptical to obovate, and become spotted early in their development, turning purplish in September before their early shedding. The flowers are small, inconspicuous, and produce a blue-black fruit.

Two of the most common ashes are **White Ash,** *Fraxinus americana* L., and **Green Ash,** *F. pennsylvanica* Marsh. The most reliable distinction between the two species appears to be samara differences. White ash has a plump, short seed end with the wing practically terminal, whereas green ash has a slender seed end and the wing extends more than halfway down the seed end. White ash usually has a rounded leaflet base, but green ash has wedge-shaped leaflet bases. The undersurfaces of fresh white ash leaves are white, but the color is difficult to detect on dry specimens. Green ash leaves are green on both surfaces, although somewhat paler on undersurfaces.

Key To Hardwoods

The key is composed of paired statements, one true and one false for any given specimen. The guide numbers at the end of statements are used to locate the next pair. Follow the true statements until you come to a common name. If you have made no mistake in interpreting the paired statements, you should arrive at the correct identity of the specimen. Then check the text and illustration.

1. Leaves compound, with blades divided into leaflets **2**
1. Leaves simple, blades not divided into leaflets **7**
   2. Leaves with opposite arrangement on twigs **3**
   2. Leaves with alternate arrangement on twigs **4**
3. Leaflets with rounded bases, conspicuously whitish below when fresh; seed end of samara thickened, wing terminal only ..... **White Ash**
3. Leaflets with wedge-shaped bases, green below; wing terminal and extending about half the length of the seed ..... **Green Ash**
   4. Buds valvate; buds, fruits, and lower surface of leaflets covered with yellow glandular scales; fruit winged on upper half of husk suture, husk thin, shell thin, meat bitter ..... **Bitternut Hickory**
   4. Buds imbricate, composed of overlapping scales **5**
5. Leaflets typically 5, glabrous except for a few hairs on rachis and midribs; bark shaggy ..... **Shagbark Hickory**
5. Leaflets 7 ..... **6**
   6. Leaflets densely tomentose; bark tight, in diamond-shaped pattern; husk very thick, shell thick, meat sweet ..... **Mockernut Hickory**
   6. Leaflets usually glabrous; bark tight, in diamond-shaped pattern; husk moderately thick, shell thick, meat sweet, husk tardily dehiscent ..... **Pignut Hickory**
7. Leaves essentially evergreen, large percentage staying on trees until bud expansion, dark green above, silky white pubescent below; flowers white, about 5 to 8 cm in diameter ..... **Sweetbay**
7. Leaves typically deciduous, or trees retaining some dead leaves to bud expansion **8**
   8. Leaf margins entire **9**
   8. Leaf margins lobed or toothed **12**
9. Leaves with rusty pubescence below, broadly obovate, leathery bases tapering to cordate or cuneate ..... **Blackjack Oak**
9. Leaves essentially glabrous or with a few hairs in vein axils **10**
   10. Leaves shiny below, elliptic or rhombic to spatulate ..... **Laurel Oak**
   10. Leaves dull green below **11**

11. Leaves elliptic to obovate, strongly veined with purple spots and discoloration in summer; fruit a drupe .. **Black Tupelo**
11. Leaves abruptly obovate, bases wedge-shaped, few lateral veins; fruit an acorn .. **Water Oak**
12. Leaf margins toothed .. **13**
12. Leaf margins lobed .. **16**
13. Margins indistinctly toothed, blades narrowly to broadly ovate, base unequal, apex long acuminate .. **Sugarberry**
13. Margins distinctly toothed .. **14**
14. Teeth obtuse or rounded, leaf base wedge-shaped, stellate pubescent below .. **Chestnut Oak**
14. Teeth sharp .. **15**
15. Leaves normally elliptic, veins prominent below, bases rounded; corky outgrowths on older branches, often lacking on large trees .. **Winged Elm**
15. Leaves broadly oval, pinnate veins distinct, margins doubly toothed, bases oblique, unequally rounded .. **American Elm**
16. Leaves palmately lobed .. **17**
16. Leaves pinnately or apically lobed .. **18**
17. Leaves opposite, more or less glaucous and pubescent below; fruit a double samara .. **Red Maple**
17. Leaves alternate, glabrous below; fruit spherical, woody with spine-like projections; corky outgrowths on branches frequent .. **Sweetgum**
18. Blades truncate to notched at apex, 4-lobed; fruit an aggregate of samaras; flower conspicuous, greenish-yellow with red markings .. **Yellow-poplar**
18. Blades with acute to obtuse apices .. **19**
19. Blades apically 3-lobed .. **20**
19. Blades pinnately lobed .. **21**
20. Blades broadly obovate, base rounded, rusty pubescent below .. **Blackjack Oak**
20. Blades narrowly obovate, base wedge-shaped, mostly glabrous .. **Water Oak**
21. Leaves with rounded lobes .. **22**
21. Leaves with bristle tips to lobes and lateral teeth .. **23**
22. Leaves with 7 to 9 lobes, divided nearly to the midrib, whitish below .. **White Oak**
22. Leaves with 5 unequal lobes, upper lateral pair larger, squarish, at right angles to midrib, crosslike in appearance, pubescent below .. **Post Oak**
23. Leaves pubescent below, whitish to tawny .. **24**
23. Leaves glabrous below or with a few hairs on midrib and in vein axils .. **26**

24. Leaves with 7 to 9 lobes, terminal lobes long, strap-shaped, slightly curved, bases bell-shaped ..... **Southern Red Oak**
24. Leaves with 7 to 11 lobes **25**

25. Leaves oblong, 7 to 11 lobes, base broadly wedge-shaped to truncate, secondary lobes rare; inner bark reddish ... **Cherrybark Oak**
25. Leaves broadly oval, 7 to 9 lobes, each lobe with secondary bristle-tipped teeth; inner bark yellow-orange ..... **Black Oak**

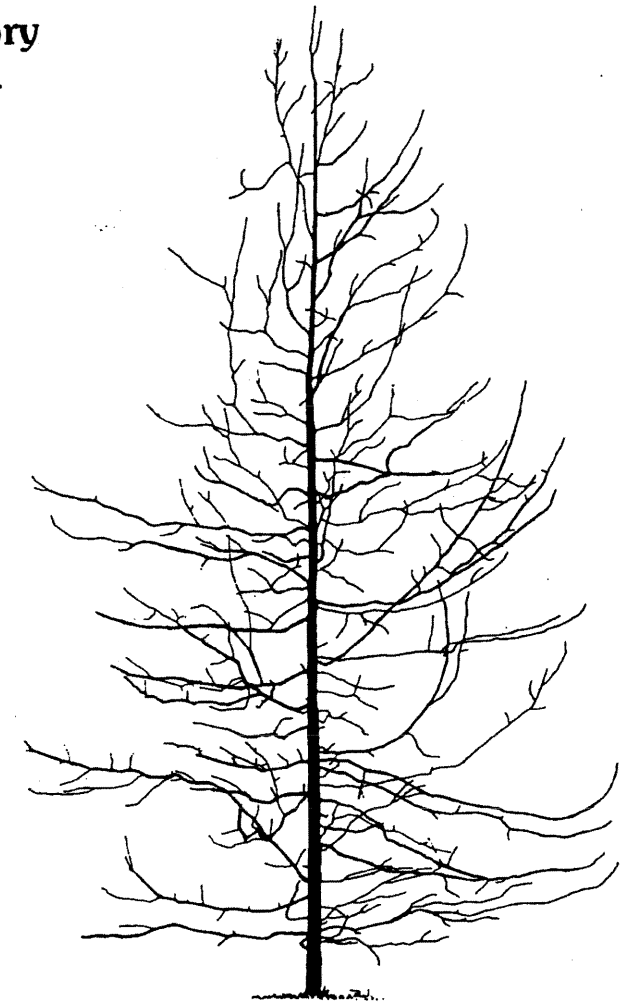
26. Upper leaf surface glossy green **27**
26. Upper leaf surface dull green, 7 to 9 lobes, 8 to 22 cm long, round sinuses extending less than half way to midrib ..... **Northern Red Oak**

27. Leaves with 7 to 9 narrow lobes, sinuses extending more than halfway to midrib ..... **Scarlet Oak**
27. Leaves with 5 to 7 narrow lobes, rounded sinuses, extending about three-fourths of way to midrib ..... **Shumard Oak**

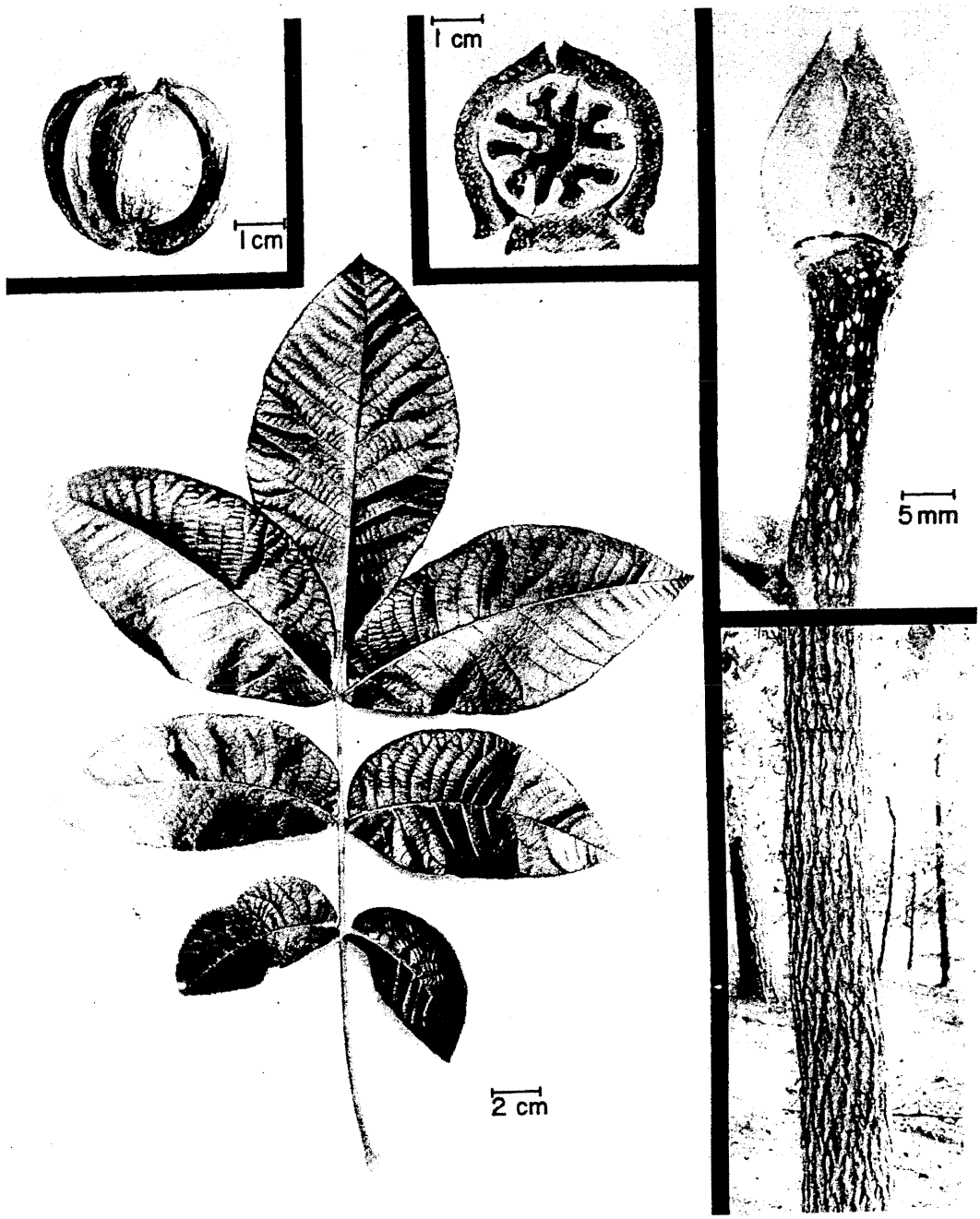
Species Described and Illustrated

Mockernut Hickory

Carya tomentosa Nutt.



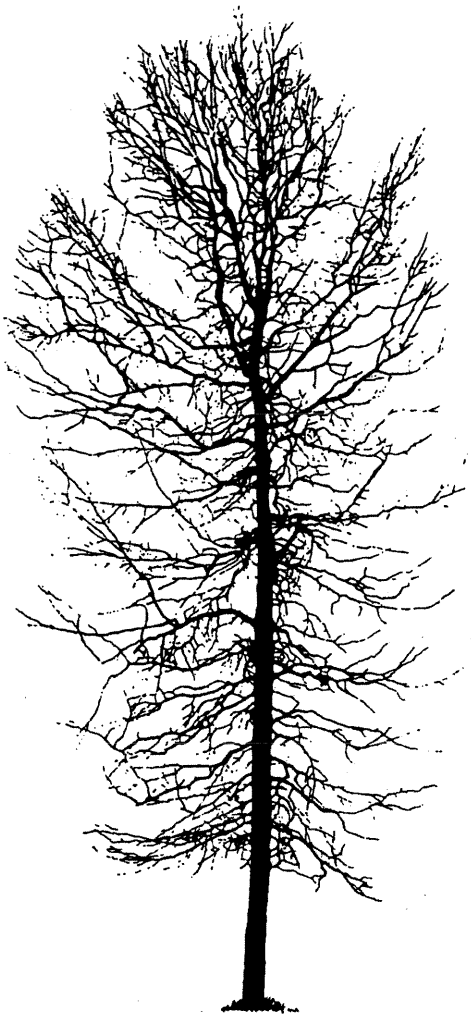
Bark grayish, tight, marked with distinct diamond-shaped ridges and furrows. **Branches** stout, drooping to spreading and ascending. **Twigs** 10 to 12 mm in diameter, conspicuous leaf scars. **Buds** (terminal) 10 to 15 mm long, 5 to 8 mm in diameter, scales imbricate. **Leaves** alternate, deciduous, odd-pinnately compound, 20 to 40 cm long with 5 to 7 drooping leaflets; yellow hairs and glandular hairs on lower leaflet surface, apex acuminate, margin finely serrate, base obtuse, on very short petiolules. **Flowers** unisexual, appearing in spring with developing leaves, staminate in 3-parted drooping catkins, pistillate terminal on new growth. **Fruit** subglobose to obovate, 3 to 5 cm in diameter, husk 1 cm thick, slow to open, shell of nut thick and hard, meat sweet.



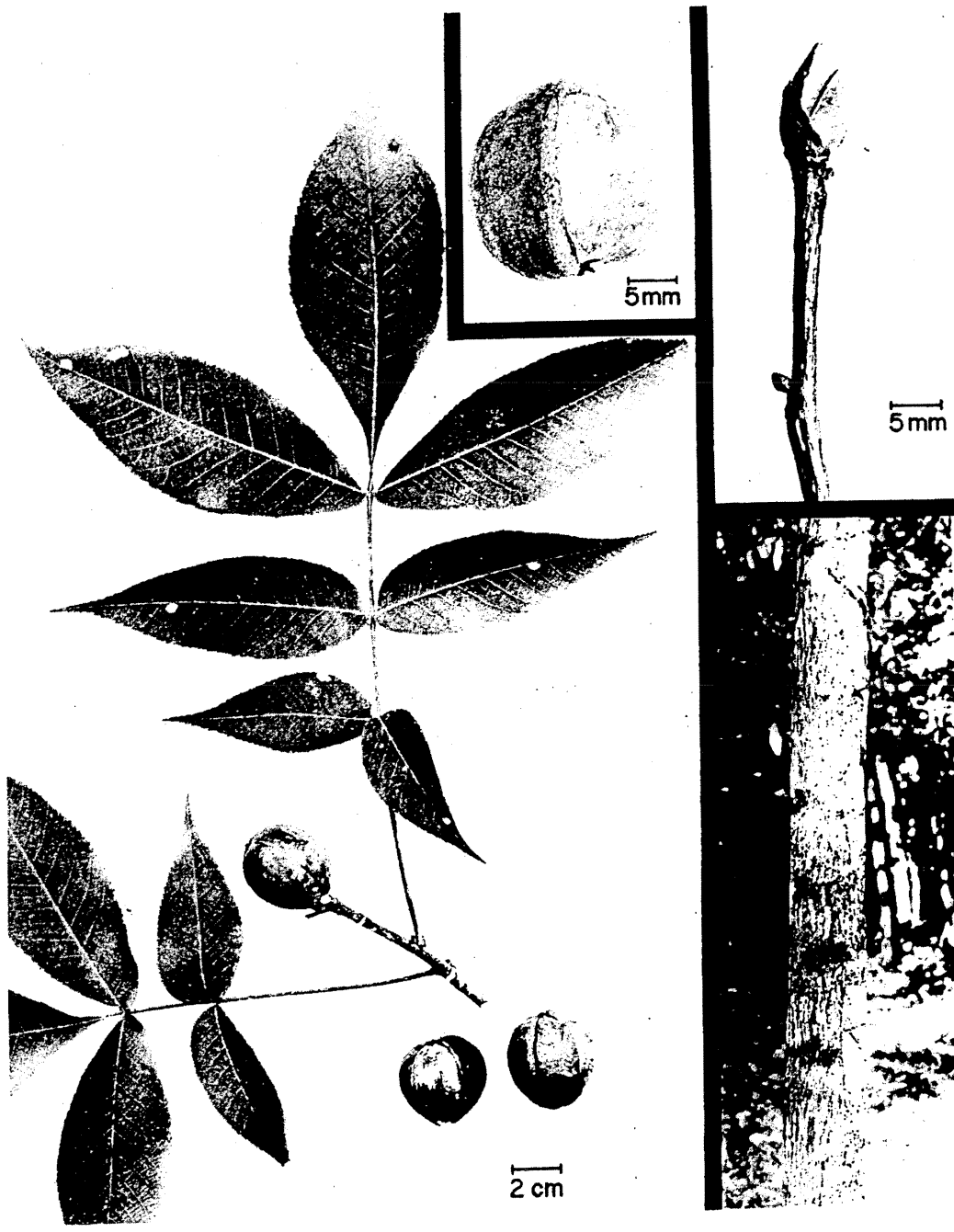
Mockernut Hickory/*Carya tomentosa*

Pignut Hickory

Carya glabra (Mill.) Sweet



Bark light to dark gray, often blackish, rough and deeply furrowed. **Branches** stout, drooping to spreading. **Twigs** 3 to 5 mm in diameter, reddish brown, smooth. **Buds** ovoid, acute, glabrous, 8 to 12 mm long, scales imbricate. **Leaves** alternate, deciduous, odd-pinnately compound, 20 to 40 cm long, usually with 7 leaflets: upper pair and terminal largest, 10 to 15 cm long by 4 to 6 cm wide, broadly oval to slightly obovate. **Flowers** unisexual, staminate in 3-branched catkins appearing about the time of leaf maturity; pistillate terminal on new growth. **Fruit** oblong to obovoid to obpyriform, 30 mm in diameter by 35 mm long, husk about 3 mm thick, tardily dehiscent, shell of nut thick, meat sweet.

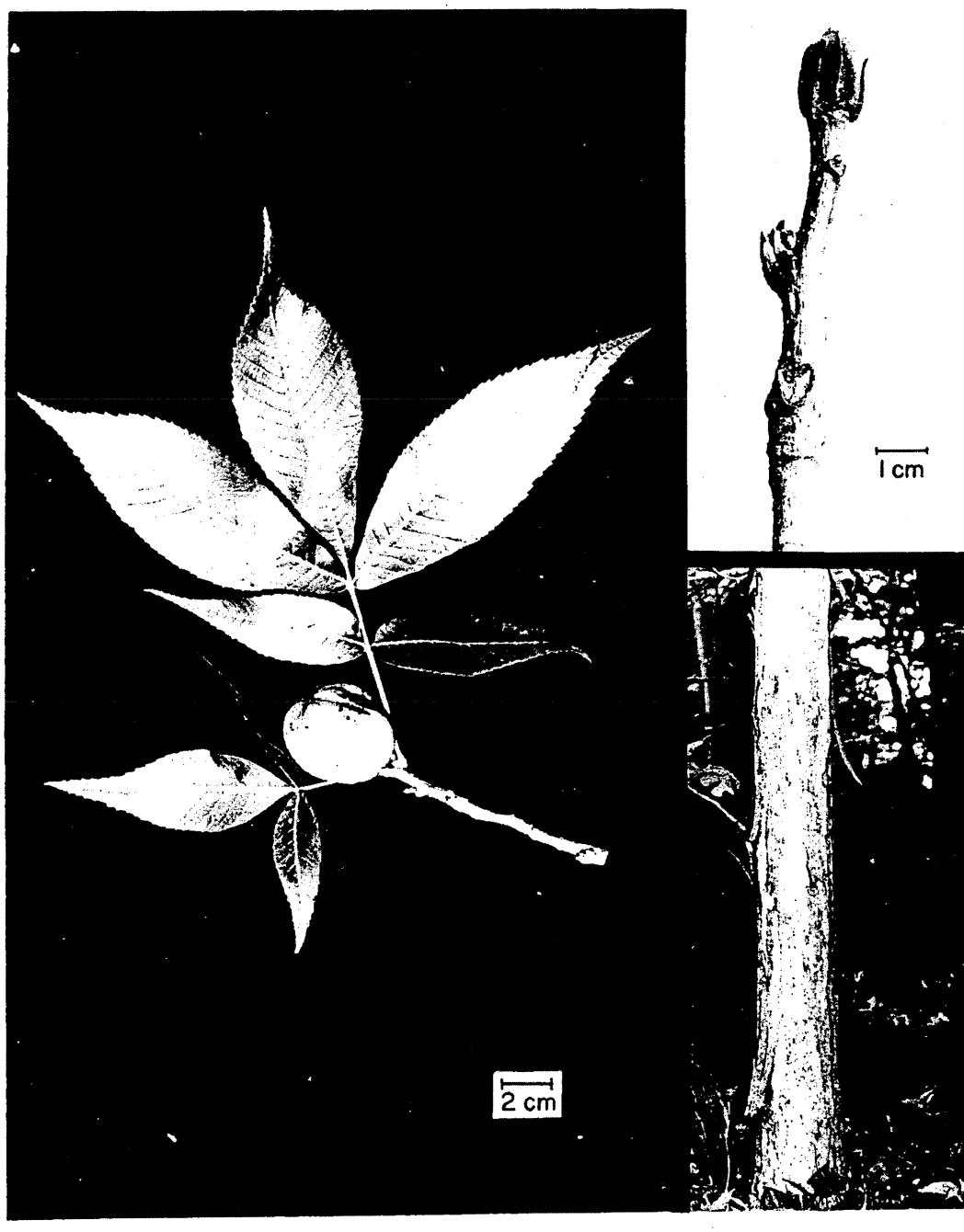


Pignut Hickory/*Carya glabra*

Shagbark Hickory

Carya ovata (Mill.) K. Koch

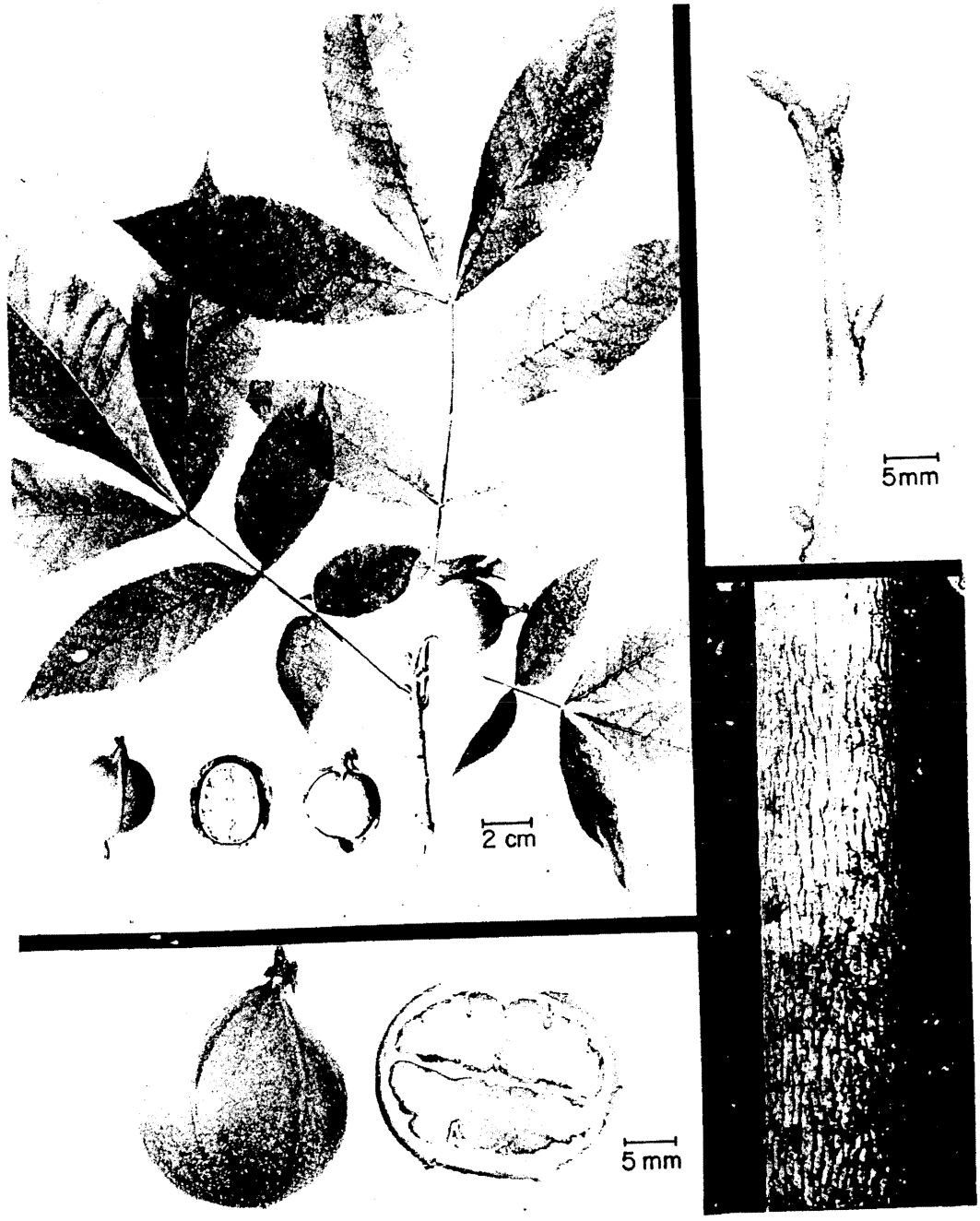
Bark smooth at first, then breaking into long, flat, irregular gray strips, to 5 mm thick, usually attached at the apex, free at the base. **Branches** stout, smooth, spreading to ascending. **Twigs** stout, orange-brown, leaf scars large. **Buds** (terminal), 10 to 20 mm long, 6 to 8 mm in diameter, scales imbricate. **Leaves** alternate, deciduous, odd-pinnately compound with 5 to 7 leaflets, usually 5 to 18 cm wide and 20 to 35 cm long; lateral leaflets ovate to ovate-lanceolate, terminal leaflet usually obovate, apices acute to acuminate, margins finely serrate, bases wedge-shaped, more or less yellow, pubescent below, gradually becoming glabrous with age. **Flowers** unisexual, appearing in spring with the developing leaves, staminate in 3-lobed catkins, pistillate on new growth. **Fruits** subglobose, 2.5 to 6 cm in diameter, husk 3 to 5 mm thick, shell of nut hard and moderately thin, meat sweet.



Shagbark Hickory/*Carya ovata*

Bitternut Hickory/
Carya cordiformis (Wangenh.) K. Koch

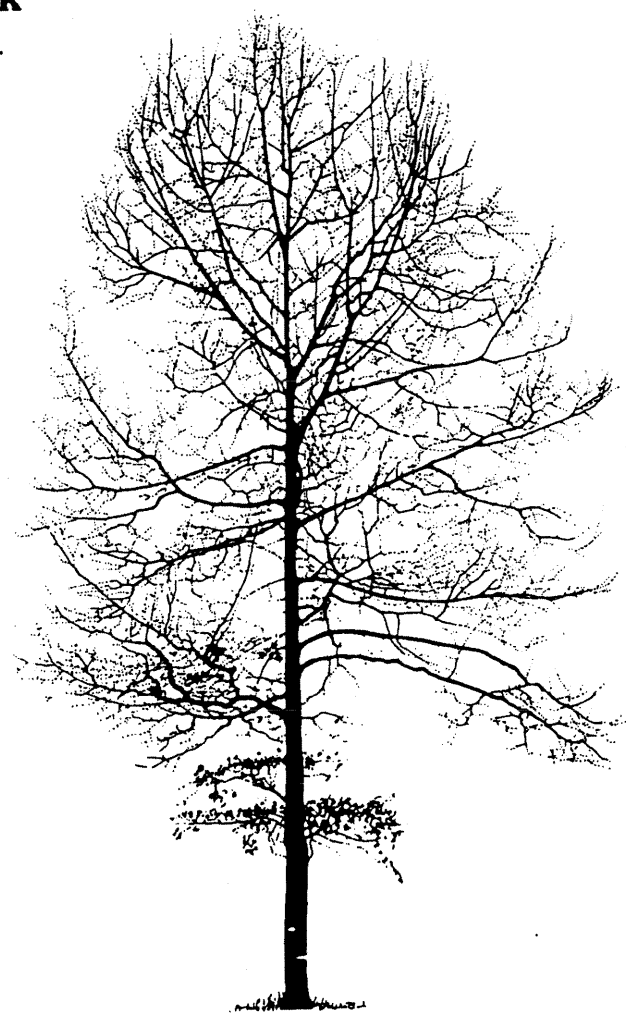
Bark brown to slate gray, smooth to lightly furrowed or with strongly interlaced ridges. **Branches** stiff, ascending, spreading. **Twigs** slender, glossy, often with yellow glands early in the season. **Buds** compressed, ovoid, 6 to 10 mm long, covered with yellow, valvate glandular scales. **Leaves** alternate, deciduous, odd-pinnately compound, 15 to 25 cm long with 7 to 9 leaflets, 7 to 15 cm long and 3 to 6 cm wide; lateral leaflets narrowly to broadly elliptic, terminal leaflet largest and usually obovate, apex acuminate, margin finely serrate, base wedge-shaped, with yellow glands on undersurfaces and on rachis. **Flowers** unisexual, staminate in 3-branched catkins appearing after leaves; pistillate terminal on new growth. **Fruit** ovate to subglobose, 2 to 3 cm in diameter, often slightly compressed, 4-winged on sutures from apex to middle of husk, husk thin, covered with yellow glandular scales, shell of nut thin, meat very bitter.



Bitternut Hickory/*Carya cordiformis*

Southern Red Oak

Quercus falcata Michx.



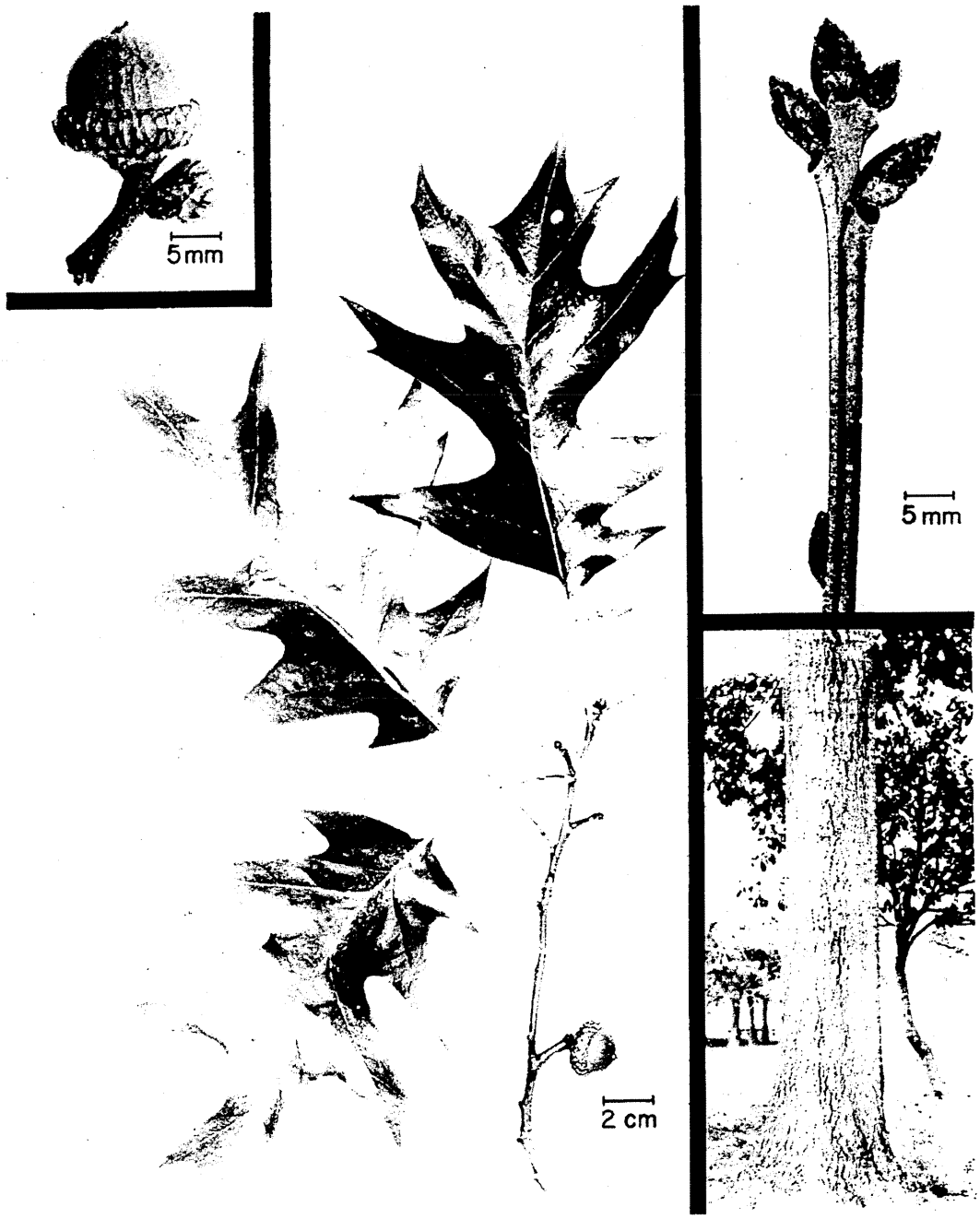
Bark dark brown to grayish black, divided by shallow, irregular fissures into broad ridges. **Branches** stout, spreading to ascending. **Twigs** 2 to 5 mm in diameter, dull reddish brown. **Buds** ovoid, angulate 8 to 13 mm long, apex acute. **Leaves** alternate, deciduous, simple, many remaining as dead foliage until spring, ovate to obovate with bell-shaped base, 10 to 28 cm long, 7 to 30 cm wide; with 3 to 9 lobes and margins with deep rounded sinuses; when 3-lobed, central lobe strap-shaped and toothed near the apex and side lobes acute to acuminate, somewhat falcate; permanently pubescent below, white at first, turning rust. **Flowers** unisexual, staminate in tomentose catkins as leaves unfold; pistillate in leaf axils on twigs. **Fruit** an acorn, small, spherical to hemispherical; cup 12 to 15 mm wide, shallow saucer-shaped, enclosing about one-fourth to one-half of the nut; nut 8 to 12 mm long.

Southern Red Oak/*Quercus falcata*

Cherrybark Oak

Quercus falcata
var. *pagodaefolia* Ell.

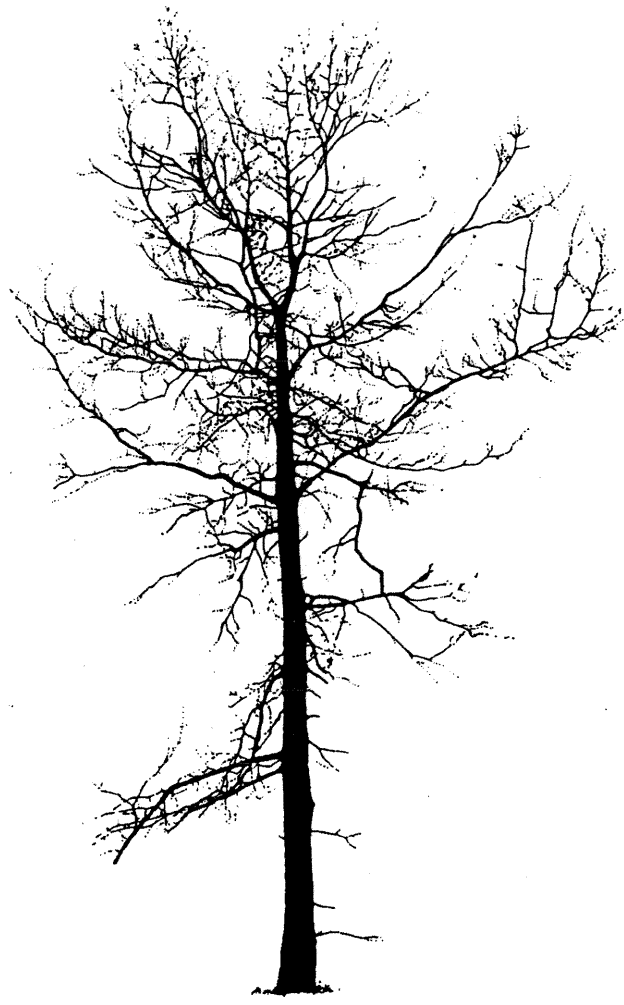
Bark dark gray to gray-black consisting of appressed scales in narrow flat ridges with shallow furrows. **Branches** stout, spreading to ascending. **Twigs** 2 to 4 mm in diameter, reddish, lightly fluted. **Buds** ovoid, 10 to 15 mm long, angled, scales pubescent with dark margins. **Leaves** alternate, tardily deciduous, persisting into December, simple, oval to oblong, 12 to 20 cm long, 7 to 8 cm wide; with 5 to 11 lobes, major lobes opposite each other, large rounded sinuses extending nearly to the midrib, margin entire with occasional bristle-tipped teeth near the apex of the lobes, dark green above, permanently pubescent below, sometimes thinly so, varying from white to rust color, especially on drying. **Flowers** as in *Q. falcata*. **Fruit** an acorn broader than tall; cups 12 to 15 mm wide; nut about 8 to 10 mm long, subglobose, flattened at base, rounded at apex.



Cherrybark Oak/*Quercus falcata* var. *pagodaefolia*

Black Oak

Quercus velutina Lam.

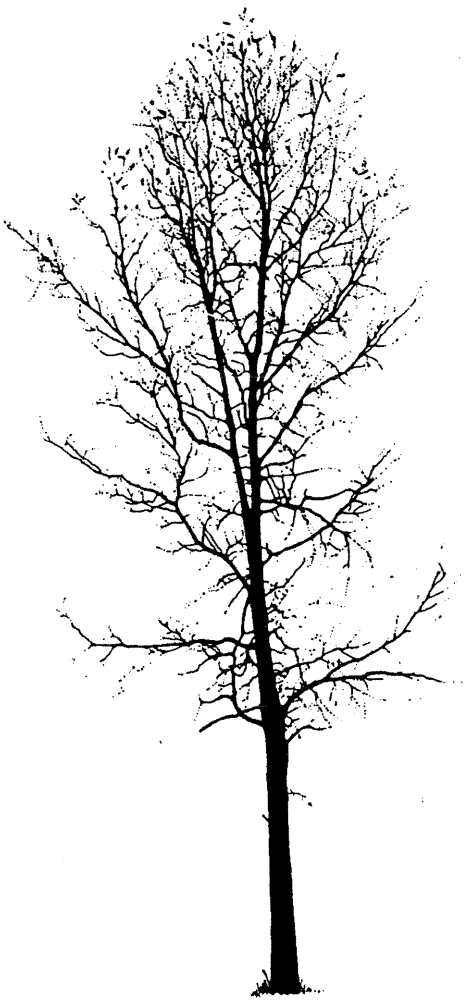


Bark brownish-black on older trees, with thick, broad scaly ridges and deep furrows; inner bark yellow-orange—the only American oak with this feature. **Branches** stout, spreading to ascending. **Twigs** about 5 mm in diameter, reddish brown to dark brown, lightly fluted. **Buds** ovoid, 10 to 15 mm long, lateral buds sharply angled, scales ciliate, margin dark. **Leaves** alternate, deciduous, simple; membranous in seedlings and saplings to somewhat leathery in the middle to upper crown; lower leaves broadly elliptic to obovate, 15 to 30 cm long, 10 to 15 cm wide, entire to faintly lobed; middle-crown leaves 10 to 20 cm long, 10 to 15 cm wide, distinctly 5 to 9 lobed with broad rounded sinuses with apical bristles on each lobe; upper-crown leaves oblong to obovate, 8 to 20 cm long, 8 to 15 cm wide; dark shiny green above, yellow scurfy pubescence on young leaves of middle and upper crown, petioles 4 to 6 cm long, yellow to reddish. **Flowers** unisexual; staminate catkins 7 to 15 cm long; pistillate on short tomentose peduncles. **Fruit** an oval to obovoid acorn 10 to 25 mm long; cup cup-shaped to conical enclosing about one-half of the nut.

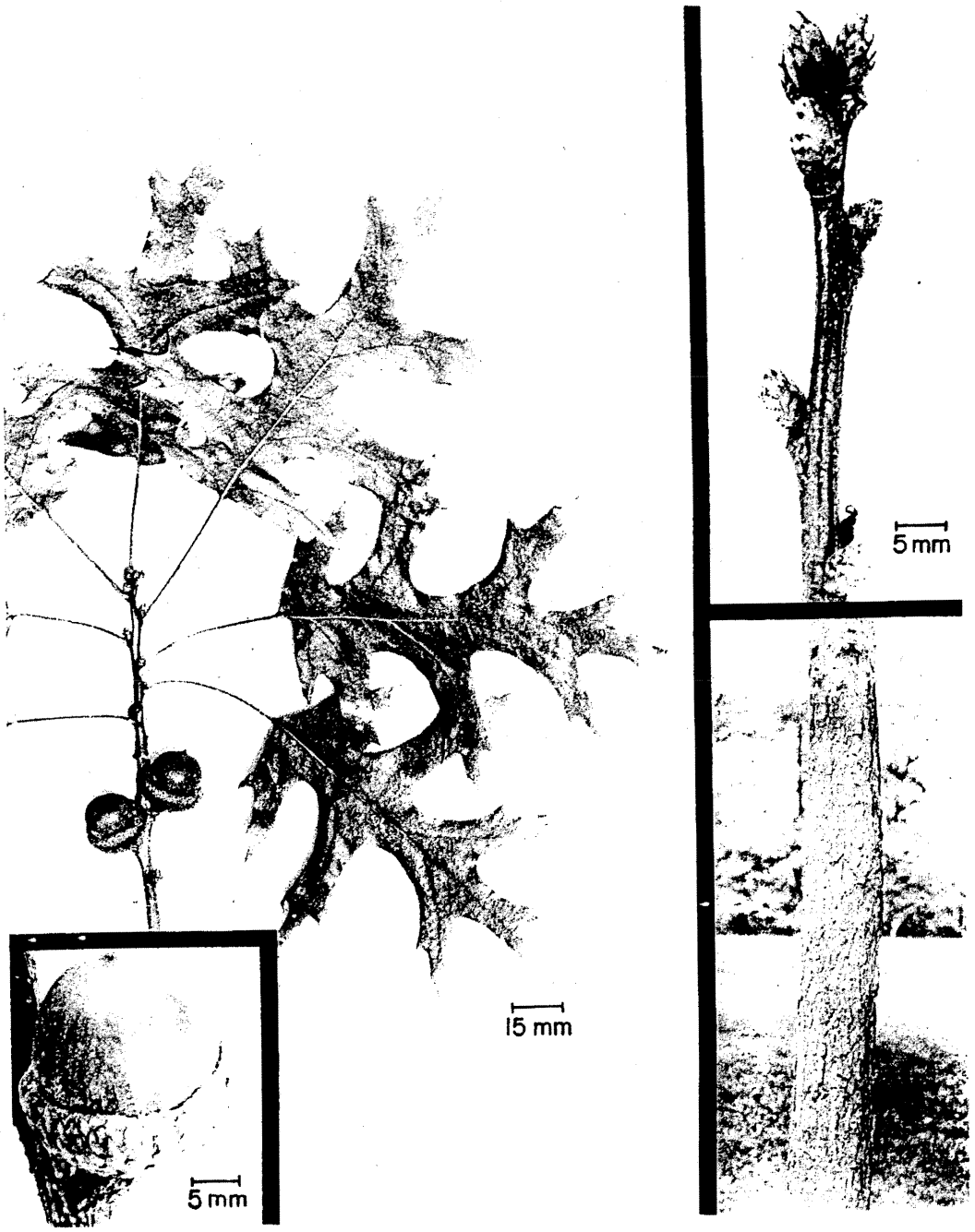
Black Oak/*Quercus velutina*

Scarlet Oak

Quercus coccinea Muenchh.



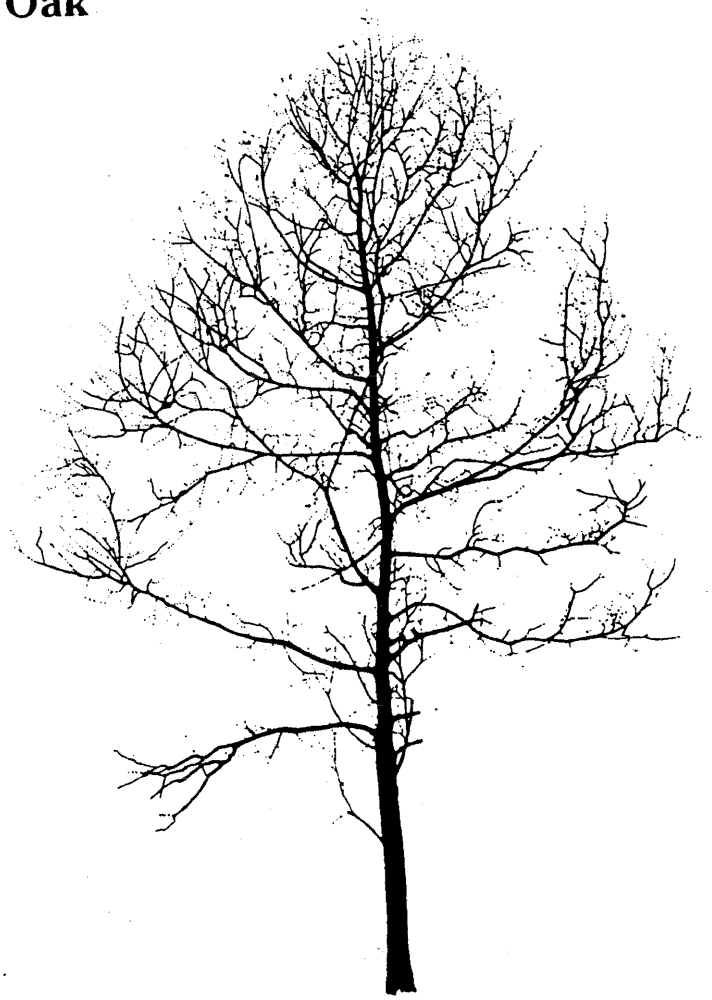
Bark dark grayish-black, divided into irregular fissures and scaly ridges. **Branches** stout, spreading to ascending. **Twigs** 3 to 4 mm in diameter, reddish, turning a dull red. **Buds** ovoid, acute, 5 to 7 mm long, covered with rounded, lightly pubescent scales. **Leaves** alternate, deciduous, simple; glabrous, except in axils of main veins on underside, oval to slightly obovate, 8 to 17 cm long, 5 to 13 cm wide, with 5 to 9 deep lobes often terminated by secondary lobes with bristle tips, sinuses usually deep, round, and wider than lobes; both surfaces pale green, upper surface shiny, bright scarlet in autumn, petioles about 4 cm long. **Flowers** unisexual; staminate in catkins with developing leaves; pistillate on pubescent peduncles. **Fruit** an acorn; cup 15 to 30 mm wide, covered with brown scales enclosing about one-third to one-half of the nut; nut ovoid, 10 to 20 mm long, occasionally with ring grooves near apical point at maturity.



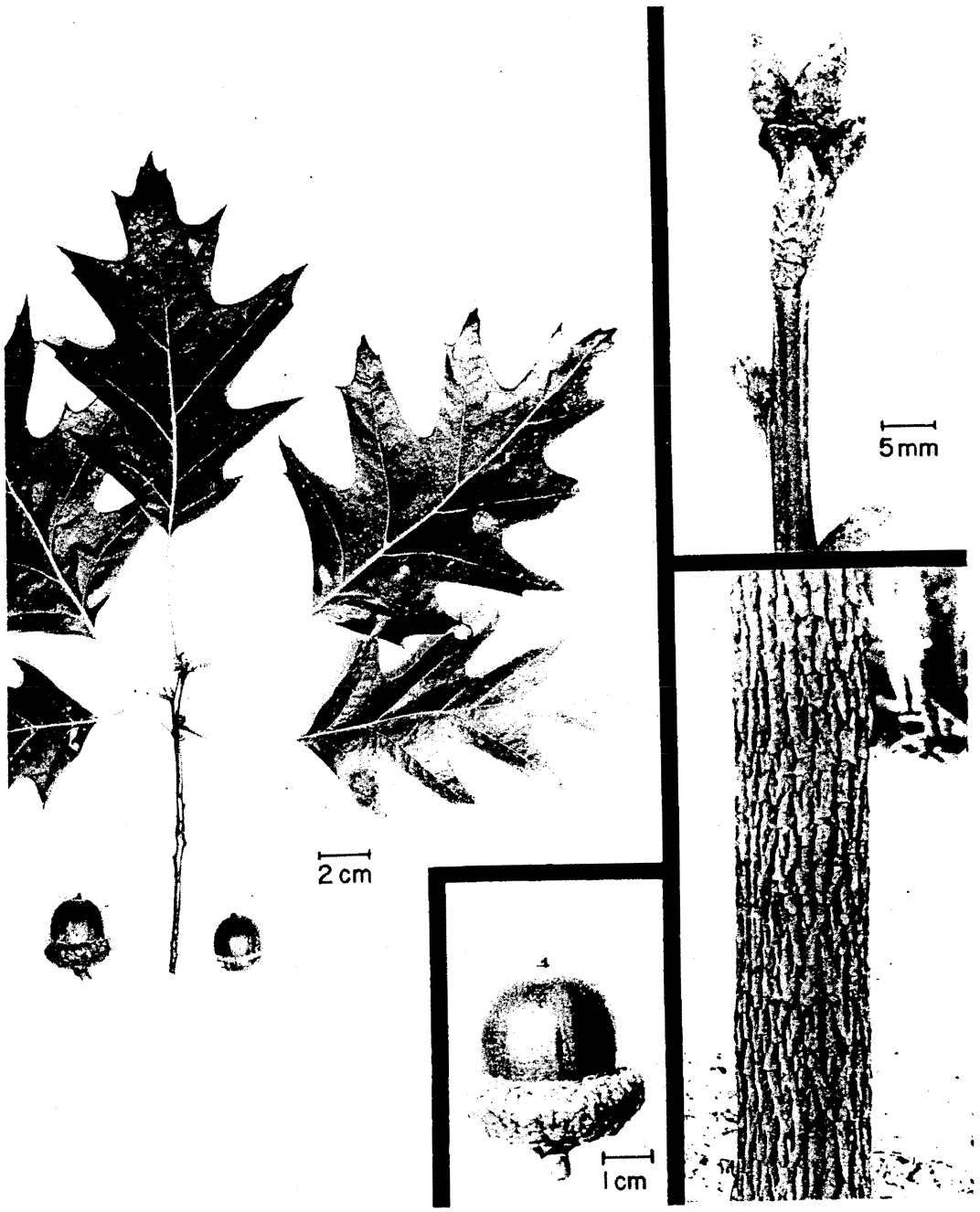
Scarlet Oak/*Quercus coccinea*

Northern Red Oak

Quercus rubra L.



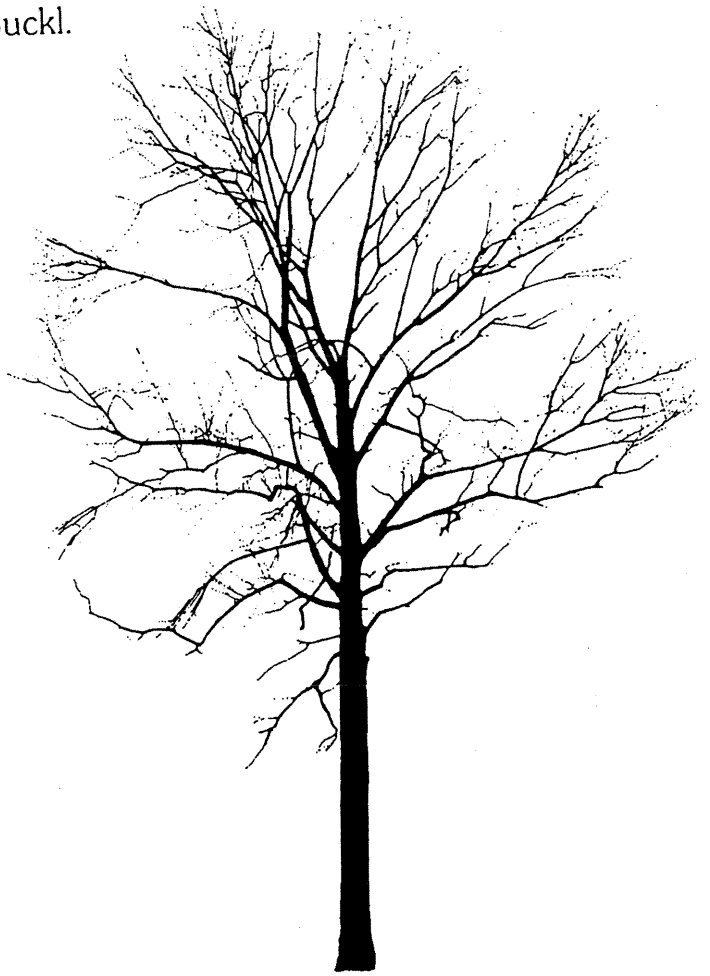
Bark dark brown, thick, divided by shallow furrows into long, flat-topped scaly ridges. **Branches** stout, spreading and ascending to form a round-topped crown. **Twigs** slender, reddish-brown to dark red. **Buds** ovate, acute, light brown, 8 to 10 mm long. **Leaves** alternate, deciduous, simple, oblong to oval to obovate, 12 to 22 cm long, 10 to 15 cm wide; 7 to 11 short lobes, lobes 3-toothed, bristle-tipped; upper surface dull green. **Flowers** unisexual; staminate in slender catkins appearing with the developing leaves, pistillate inconspicuous on last year's wood. **Fruit** an acorn, 15 to 30 mm long; cup saucer-shaped, enclosing about one-fourth of the nut.



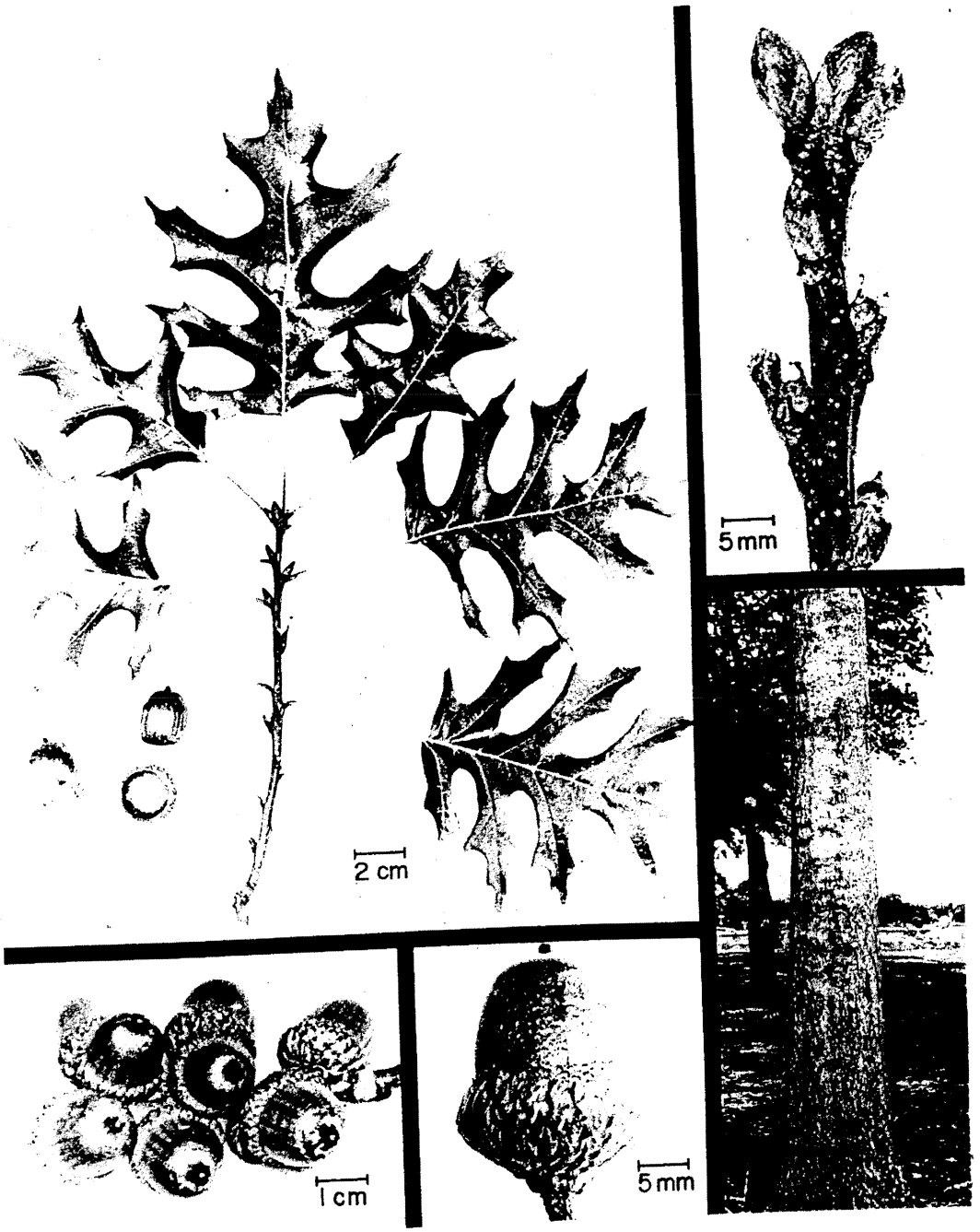
Northern Red Oak/*Quercus rubra*

Shumard Oak

Quercus shumardii Buckl.



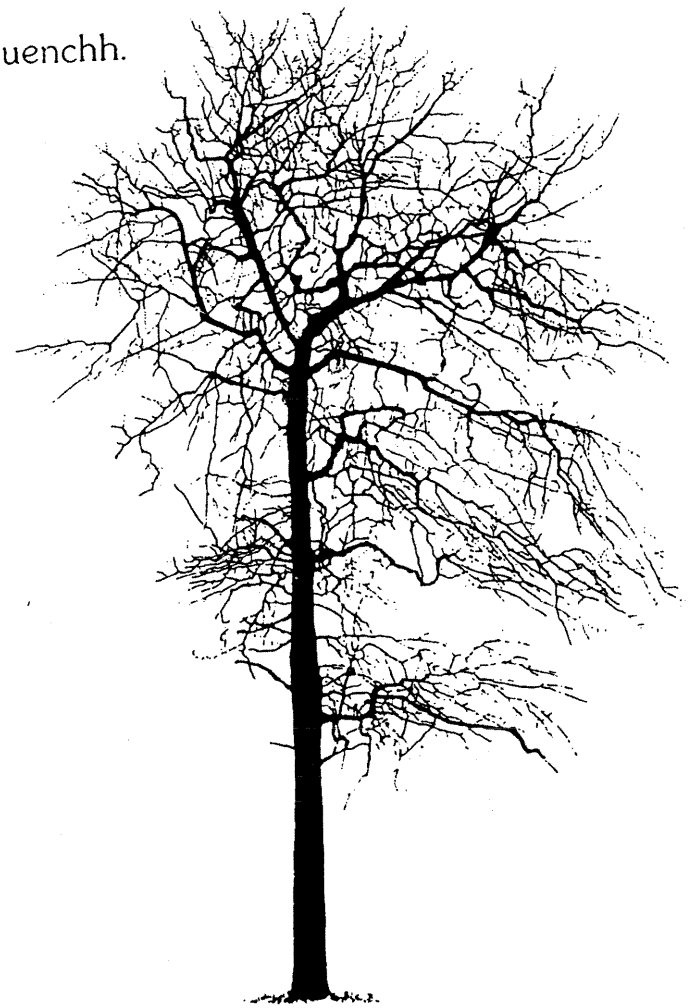
Bark dark gray to blackish, relatively smooth at first, then breaking into scaly ridges. **Branches** spreading to ascending. **Twigs** about 5 mm in diameter, olive green then turning dark reddish. **Buds** clustered at apex, 5 to 7 mm long, sharp pointed, strongly angled. **Leaves** alternate, deciduous, simple; oval to slightly obovate, 10 to 20 cm long, 6 to 15 cm wide; with 7 to 10 bristle-tipped lobes, lobes on upper crown leaves narrower to slightly wider than sinuses, lobes on lower crown leaves wider than sinuses; dark green above, paler below, glabrous except for vein axils on lower surface; petiole about 5 cm long. **Flowers** unisexual; staminate in yellow catkins appearing with the unfolding leaves; pistillate on pubescent peduncles. **Fruit** an acorn; cup 20 to 31 mm across, enclosing about one-fourth of the nut; nut about 25 mm long, 15 mm in diameter.



Shumard Oak/*Quercus shumardii*

Blackjack Oak

Quercus marilandica Muenchh.

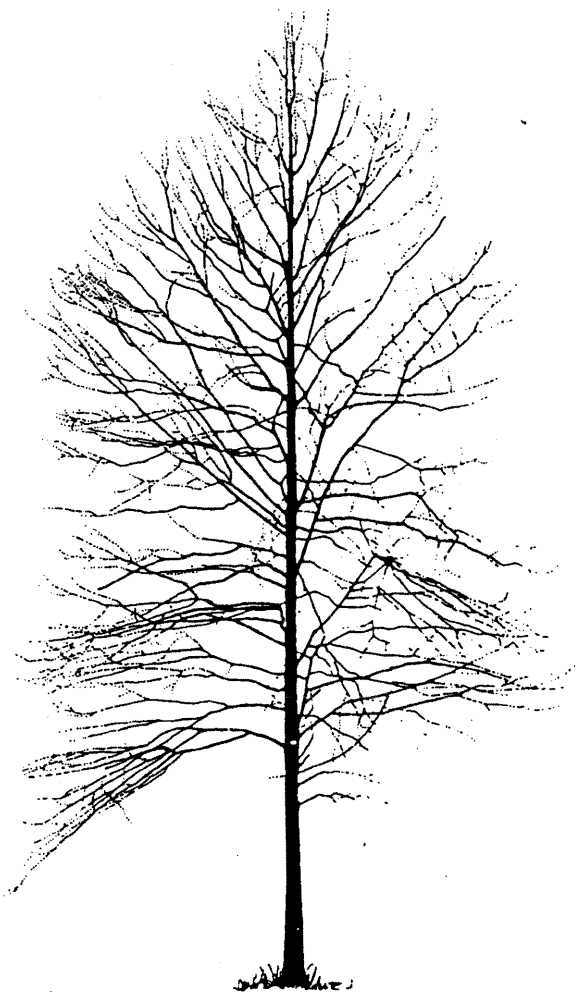


Bark black, very rough, consisting of thick blocky plates. **Branches** stout, spreading to drooping. **Twigs** stout, about 5 mm in diameter. **Buds** with rusty brown hairs, about 4 to 8 mm long. **Leaves** alternate, tardily deciduous, simple, 7 to 25 cm long, broadly obovate at apex (bear-paw shape) tapering to a narrow base, margin entire or with 3 bristle-tipped apical lobes, upper surface dark green, rusty pubescent on undersurfaces. **Flowers** unisexual; staminate in catkins, appearing with the leaves; pistillate solitary or paired. **Fruit** an acorn, cup enclosing one-half to two-thirds of the nut; nut nearly ovoid, 20 to 25 mm long by 15 to 20 mm in diameter.

Blackjack Oak/*Quercus marilandica*

Laurel Oak

Quercus laurifolia Michx.

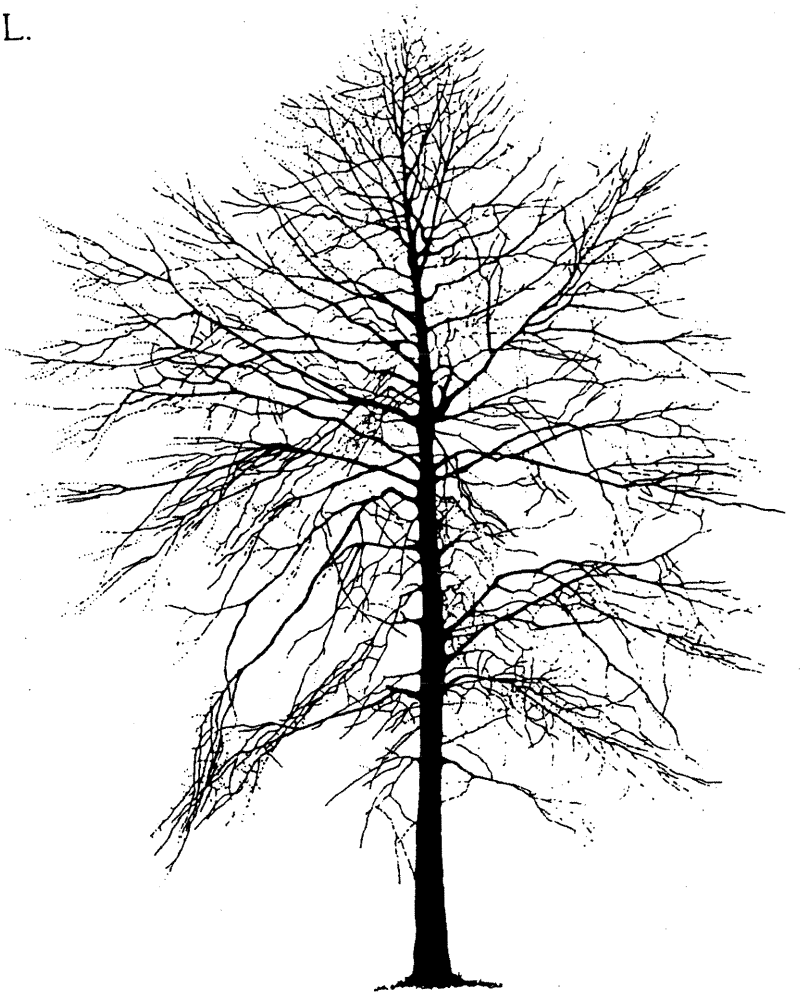


Bark nearly black, divided into broad flat ridges by deep fissures. **Twigs** 2 to 3 mm in diameter, usually reddish brown. **Buds** ovoid, reddish brown, 2 to 4 mm long. **Leaves** alternate, semi-deciduous, simple, a few shed in fall, a few persisting until spring; elliptic to spatulate, 7 to 15 cm long, 2 to 4 cm wide; apex acute or obtuse, margin entire, base cuneate; shiny green above, paler below; petioles 3 to 5 mm long, midrib conspicuous on underside. **Flowers** unisexual; staminate in catkins as leaves unfold; pistillate on twigs at leaf scars. **Fruit** an acorn, sessile to subsessile, cup 15 to 20 mm wide, enclosing about one-fourth of nut; nut hemispheric, rounded at apex and flattened at bottom, 15 mm long.

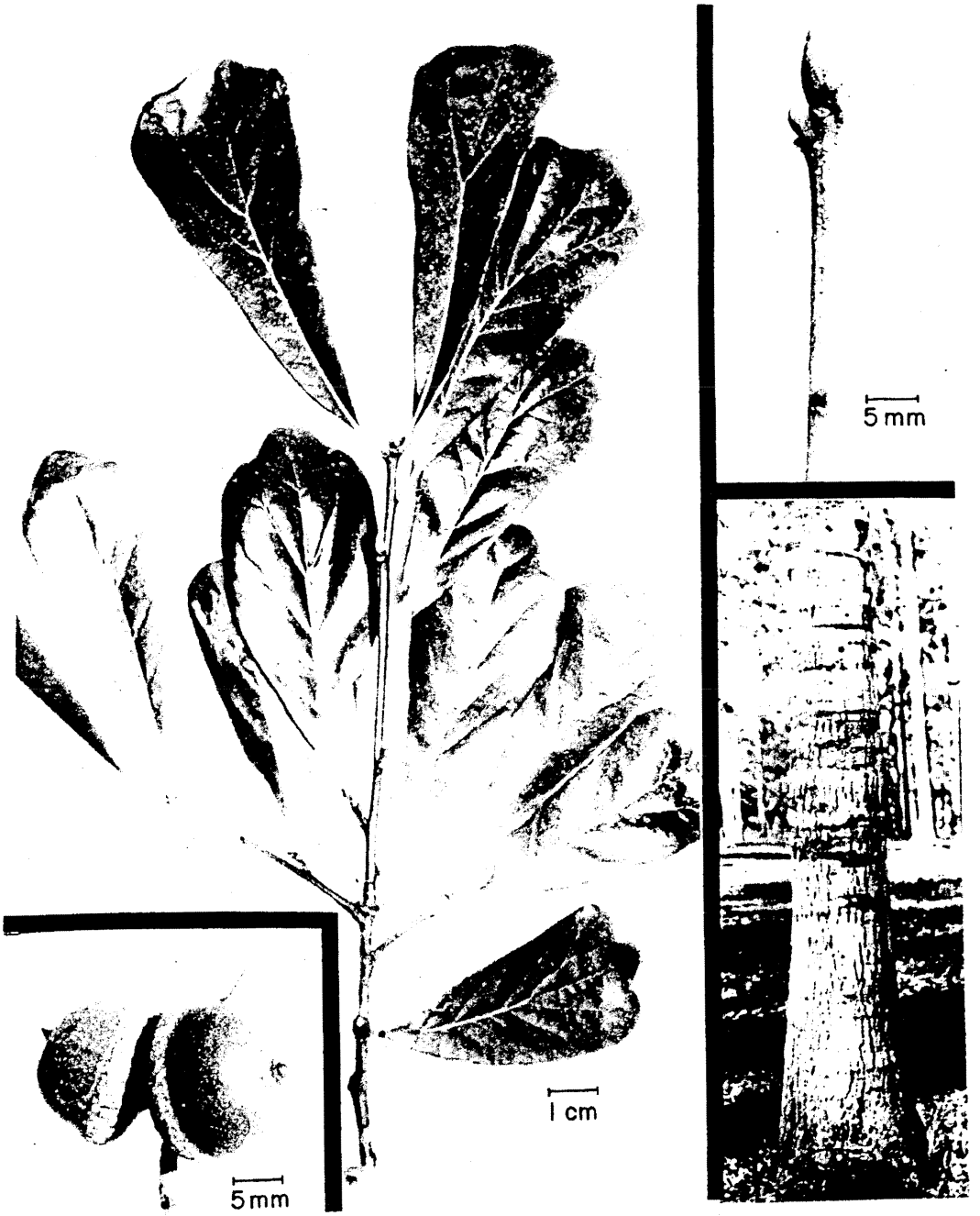
Laurel Oak/*Quercus laurifolia*

Water Oak

Quercus nigra L.



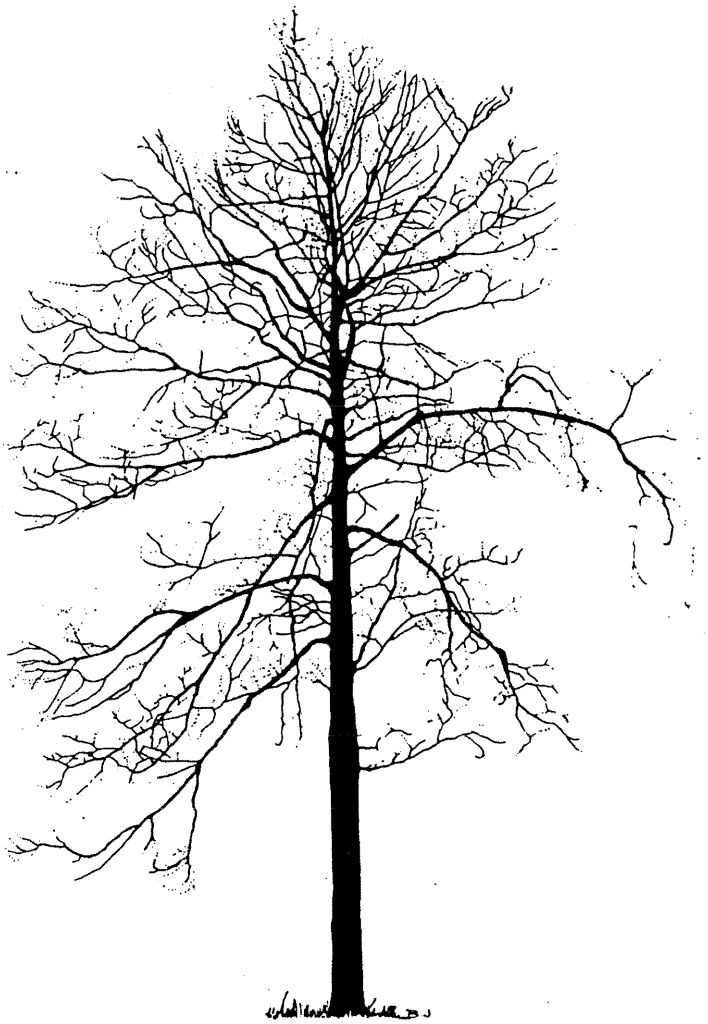
Bark smooth, grayish black, becoming scaly with age. **Branches** spreading to ascending, forming a round-topped crown in the open. **Twigs** 3 to 5 mm in diameter, gray. **Buds** ovoid, acute, reddish brown, 3 to 7 mm long. **Leaves** alternate, deciduous, simple; variable in shape and size, obovate to spatulate, 5 to 10 cm long, 2 to 5 cm wide; margin entire, wavy to distinctly lobed in juvenile specimens; sessile or with petiole to 1 cm long. **Flowers** unisexual; staminate catkins 5 to 8 cm long, pistillate catkins short-peduncled. **Fruit** an acorn about 15 mm wide, 10 mm high; cup thin, enclosing about one-fifth to one-third of the nut.



Water Oak/*Quercus nigra*

White Oak

Quercus alba L.

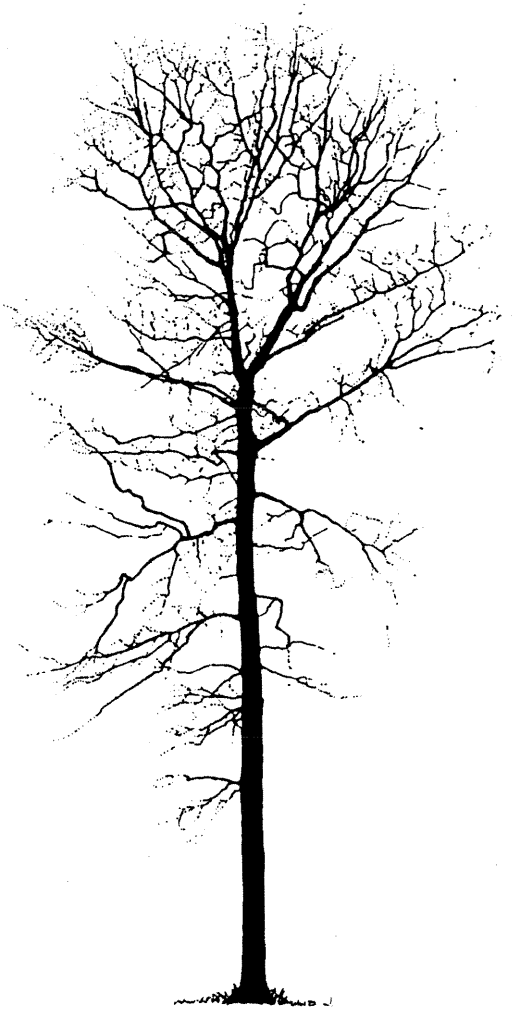


Bark light gray, separated by shallow furrows into flat ridges with loose appressed scales. **Branches** stout, drooping, spreading to ascending. **Twigs** 2 to 3 mm in diameter, reddish. **Buds** globose to ovoid, angulate, apex acute to obtuse, 3 to 5 mm. **Leaves** alternate, deciduous, simple, oblong to obovate, 7 to 20 cm long, 4 to 10 cm wide, with 7 to 11 uneven, rounded lobes and deep sinuses. **Flowers** unisexual, in catkins, preceding leaf expansion. **Fruit** an acorn, 15 to 35 mm long, 20 to 25 mm in diameter, cup 1.5 to 3 cm wide, usually cup-shaped, conspicuous with thickened scales, enclosing one-fourth to one-third of the nut.

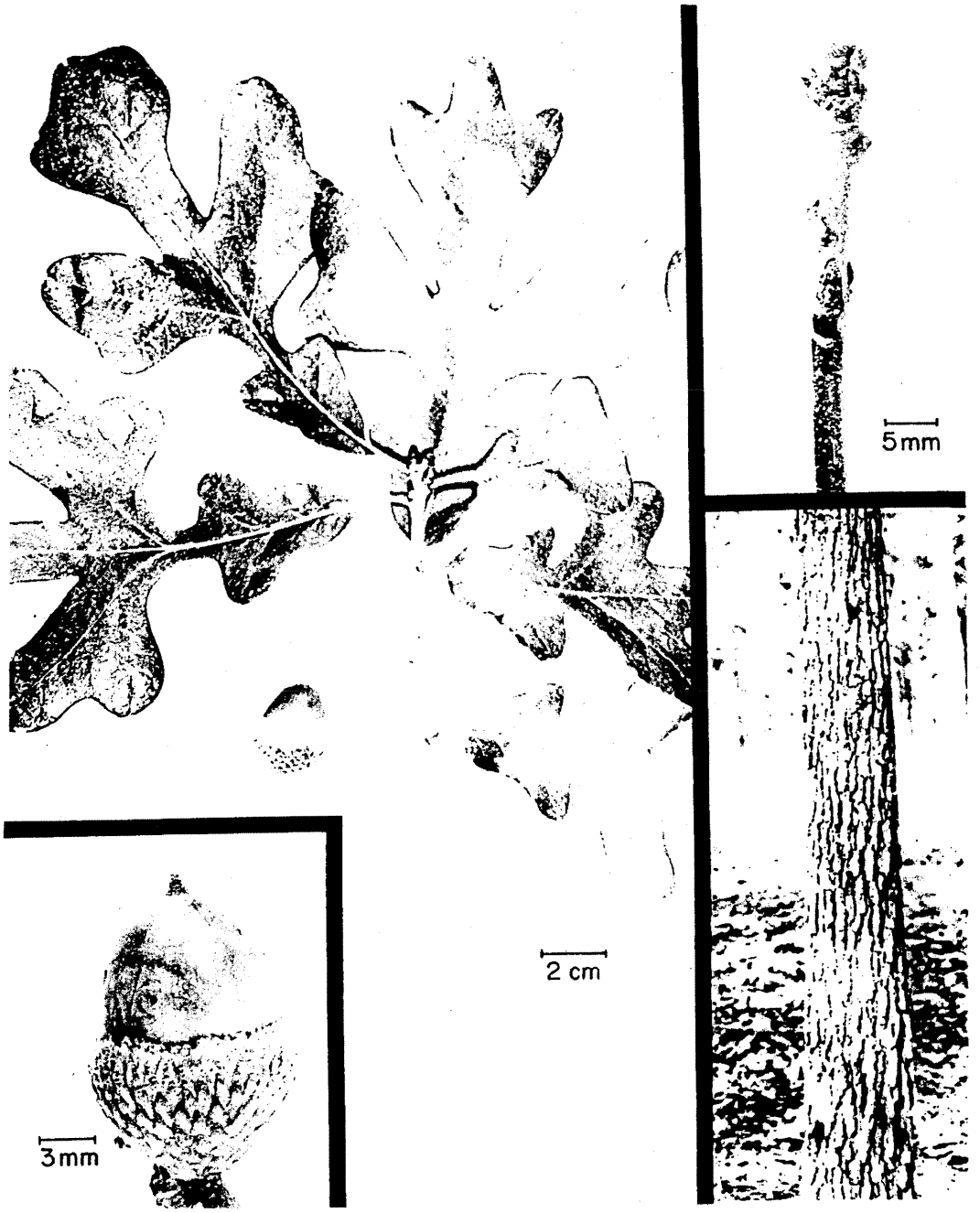
White Oak/*Quercus alba*

Post Oak

Quercus stellata Wangenh.



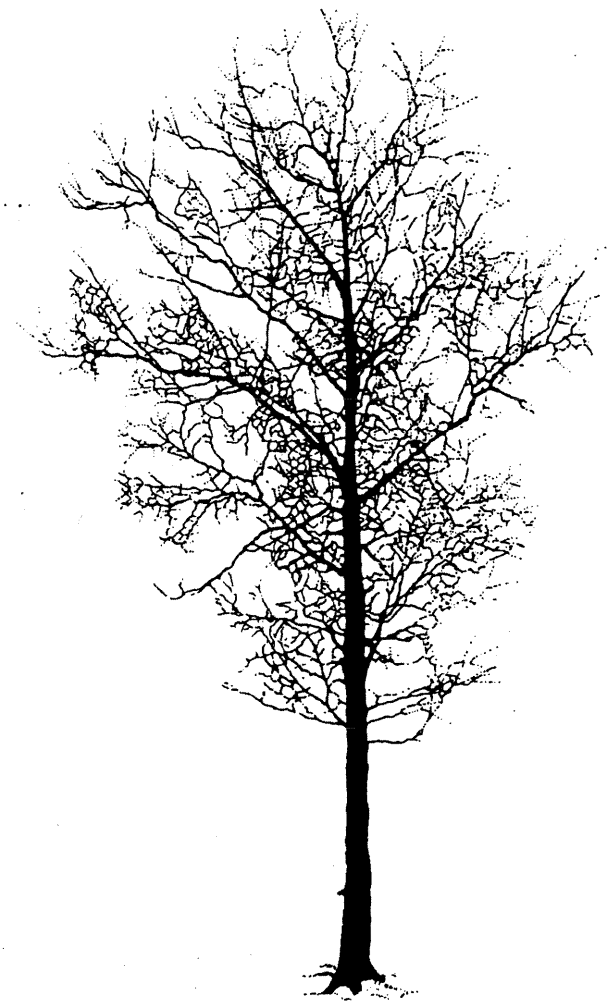
Bark medium to dark gray, with deep furrows, scaly ridges. **Branches** stout, irregular, drooping to horizontal and ascending. **Twigs** 3 to 5 mm in diameter, gray to brownish. **Buds** broadly ovate, blunt to acute, 5 mm long, clustered at apex of twig. **Leaves** alternate, deciduous, simple; obovate, to 18 cm long, 5 to 10 cm wide; divided into 5 to 7 sinuate rounded lobes, the two lower lobes smaller than the upper pair, upper lobes and the terminal lobe resembling a cross, dark, shiny green above, grayish to brownish below, leathery. **Flowers** unisexual; staminate in catkins appearing with the unfolding leaves; pistillate on last year's wood. **Fruit** an acorn, 13 to 25 mm long, 6 to 20 mm in diameter; cup hemispherical, enclosing about one-half of the nut, cup scales rusty-pubescent; nut ovate to ovate-oblong, about 15 mm long.



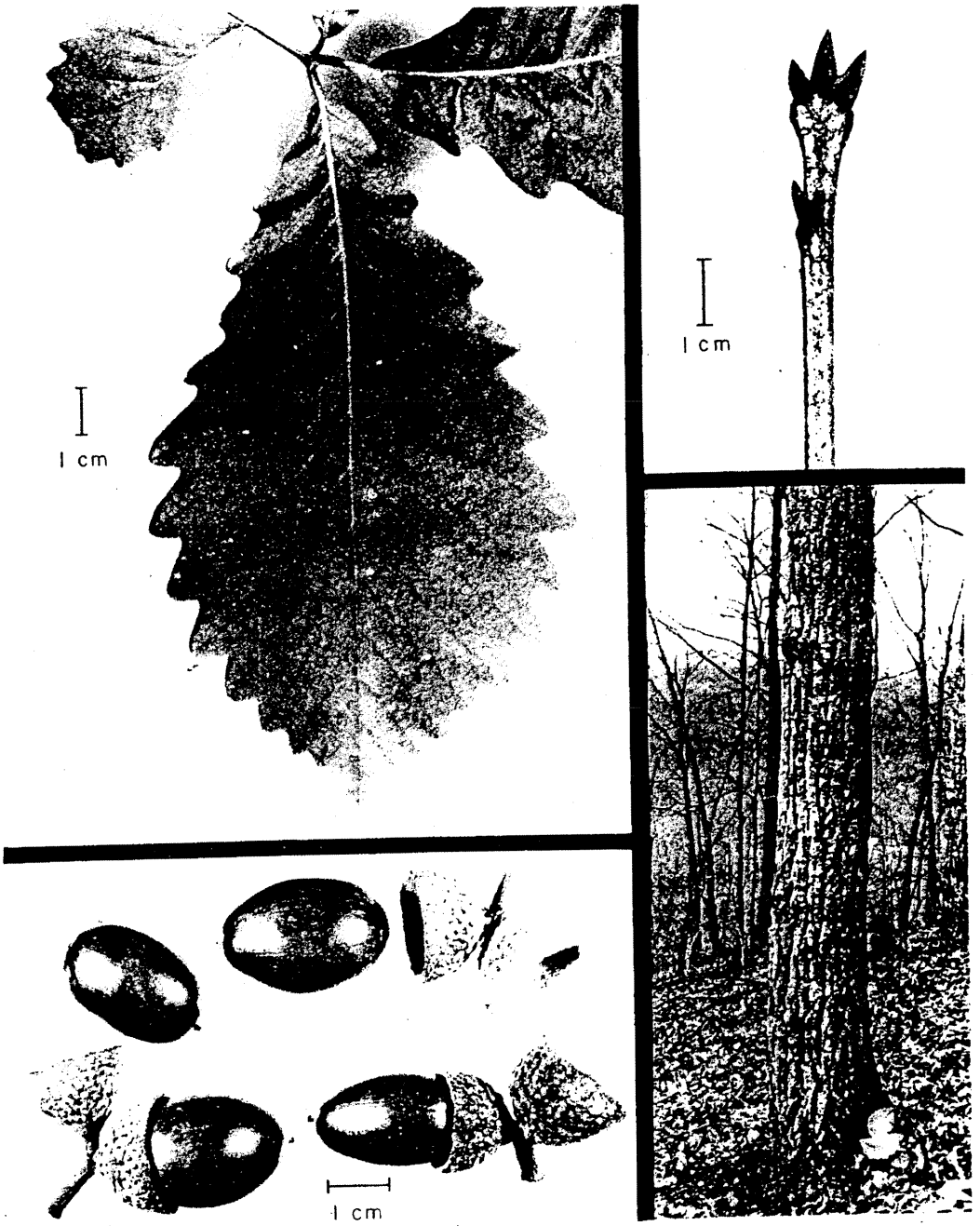
Post Oak/*Quercus stellata*

Chestnut Oak

Quercus prinus L.



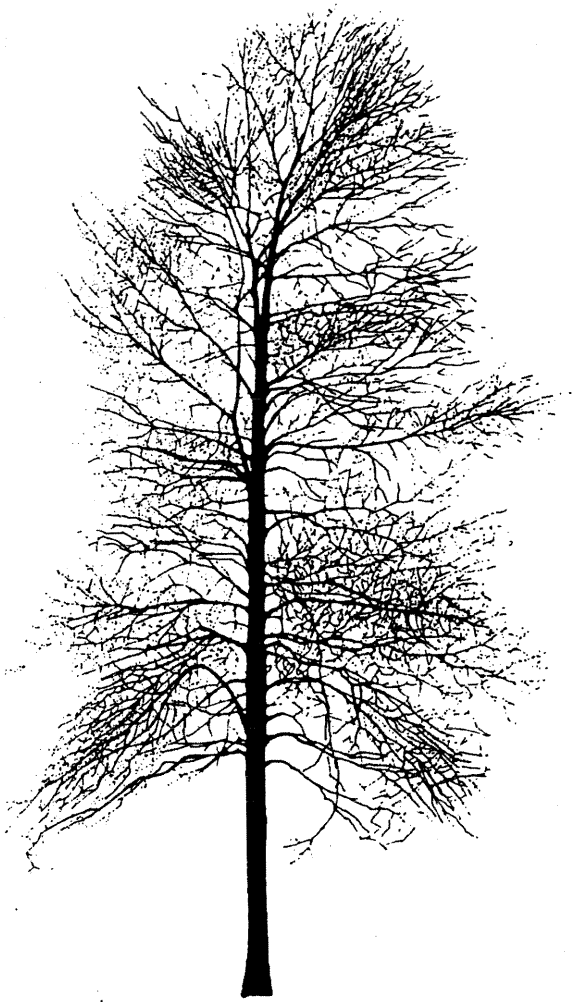
Bark dark reddish brown to nearly black, deeply furrowed with narrow ridges. **Branches** stout, spreading to ascending. **Twigs** stout, angulate, smooth, purplish-green when new, turning orange or reddish-brown. **Buds** ovate-conical somewhat angulate, 8 to 12 mm long, silky hairy. **Leaves** alternate, deciduous, simple; elliptic to obovate, 10 to 30 cm long, 3 to 8 cm wide; somewhat leathery, margin crenate with a vein ending in each rounded tooth, smooth green above, stellate-pubescent below. **Flowers** unisexual; staminate in catkins 5 to 10 cm long; pistillate in short spikes on stout peduncles. **Fruit** an acorn 25 to 35 mm long, 15 to 25 mm in diameter; cup vase-shaped, thin, rough with thickened scales, covering one-third to one-half of the nut.



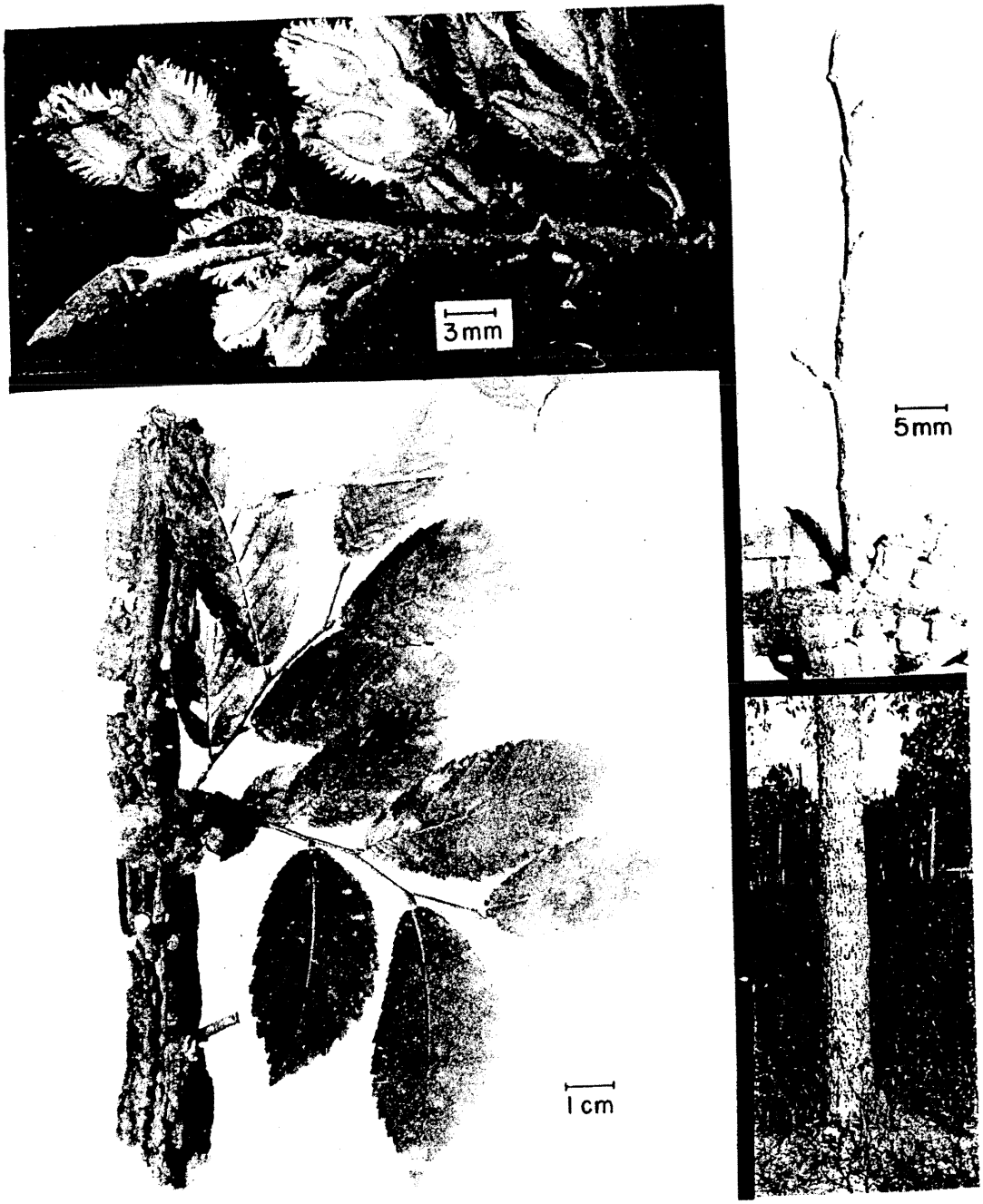
Chestnut Oak/*Quercus prinus*

Winged Elm

Ulmus alata Michx.



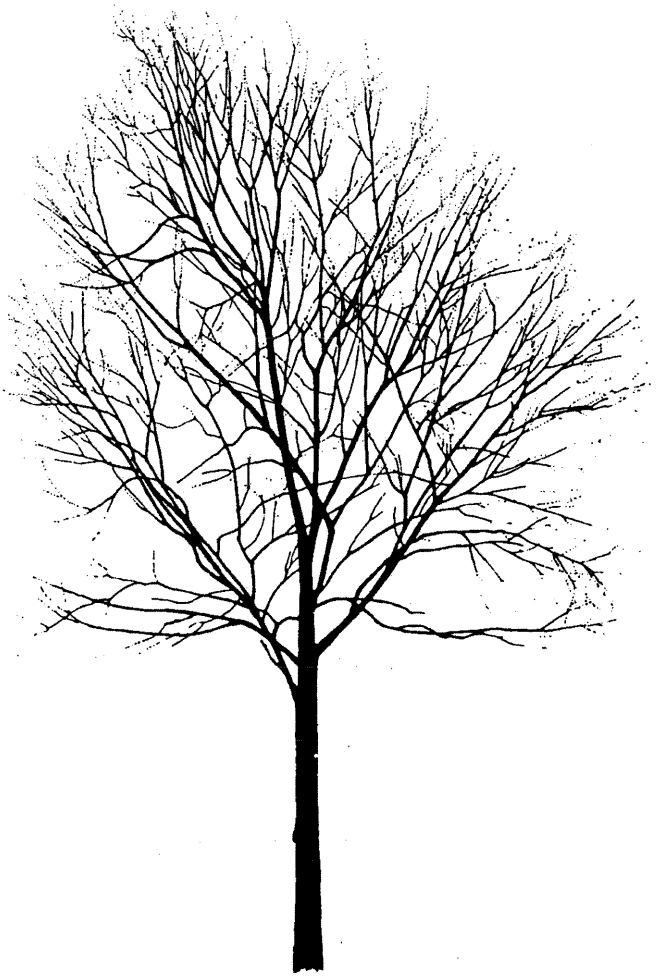
Bark dark, smooth at first becoming deeply furowed on larger trees. **Branches** slender, ascending to spreading, corky ridges or wings on branches 3 years or older. **Twigs** about 2 mm in diameter, light green tinged with red. **Buds** sharp-pointed, divergent from twig 3 to 4 mm long. **Leaves** alternate, deciduous, simple; broadly ovate to elliptic, 4 to 8 cm long, 2 to 4 cm wide; apex acute to short-acuminate, margin doubly to triply serrate, base rounded; dull green above, lighter green below with prominent pinnate veins.**Flowers** perfect, abundant, tiny, opening just before leaves unfold, several in a cluster at a leaf scar, blooming late January into February. **Fruit** a samara, flat and elliptic, 6 to 8 mm long, margin ciliate.



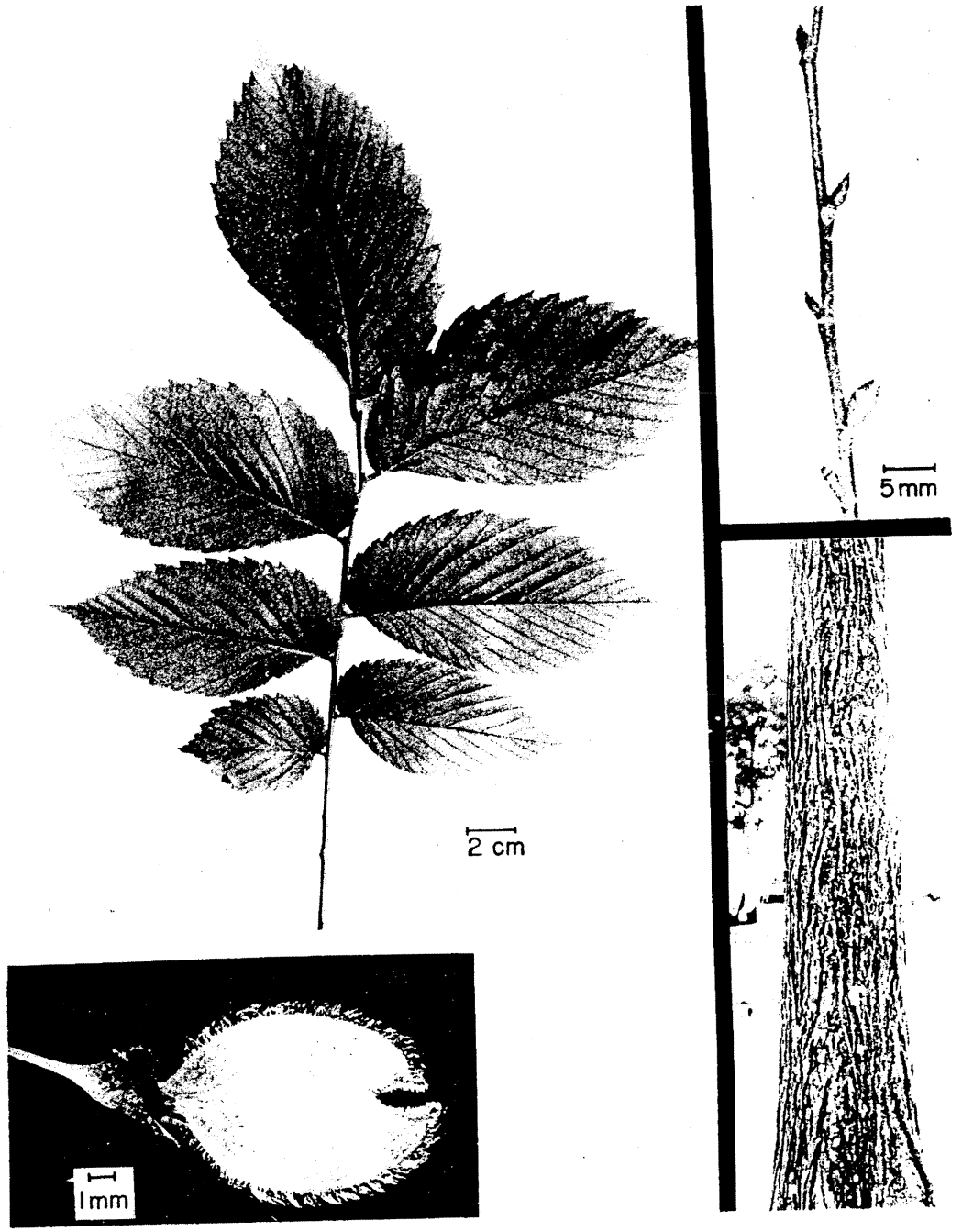
Winged Elm/*Ulmus alata*

American Elm

Ulmus americana L.



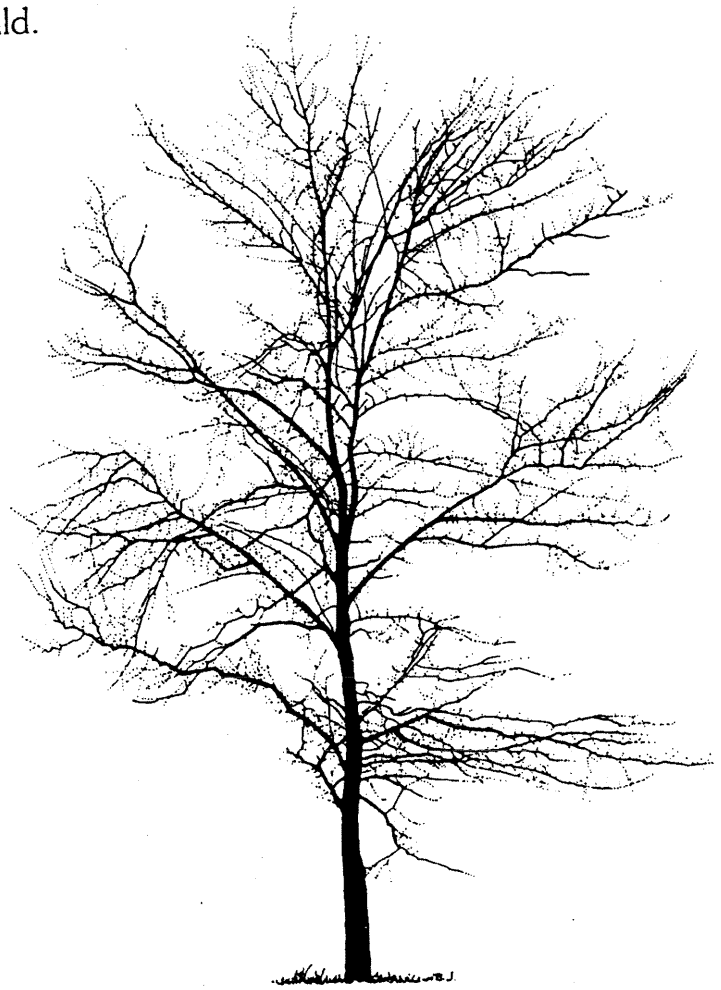
Bark gray to blackish, thick, divided into flat ridges by deep furrows. **Branches** ascending, arching, and spreading; open-grown trees vase-shaped in outline. **Twigs** 2 to 3 mm in diameter with 5 to 7 leaves which increase in size from basal to apical leaf, red-brown. **Buds** (leaf) brown, small, scaly, acute. **Leaves** alternate, deciduous, simple; broadly ovate, 5 to 15 cm long, 4 to 6 cm wide; apex acuminate, margin usually doubly serrate, base oblique on short petiole; upper surface smooth, marked with sunken veins pinnately arranged; veins more prominent on underside. **Flowers** perfect, buds greatly enlarge before opening; with very small flowers abundant in clusters; opening before the leaves expand, blooming from late December into February. **Fruit** a samara, oval to circular with wing surrounding the seed, about 10 mm in diameter, margin ciliate.



American Elm/*Ulmus americana*

Sugarberry; hackberry

Celtis laevigata Willd.

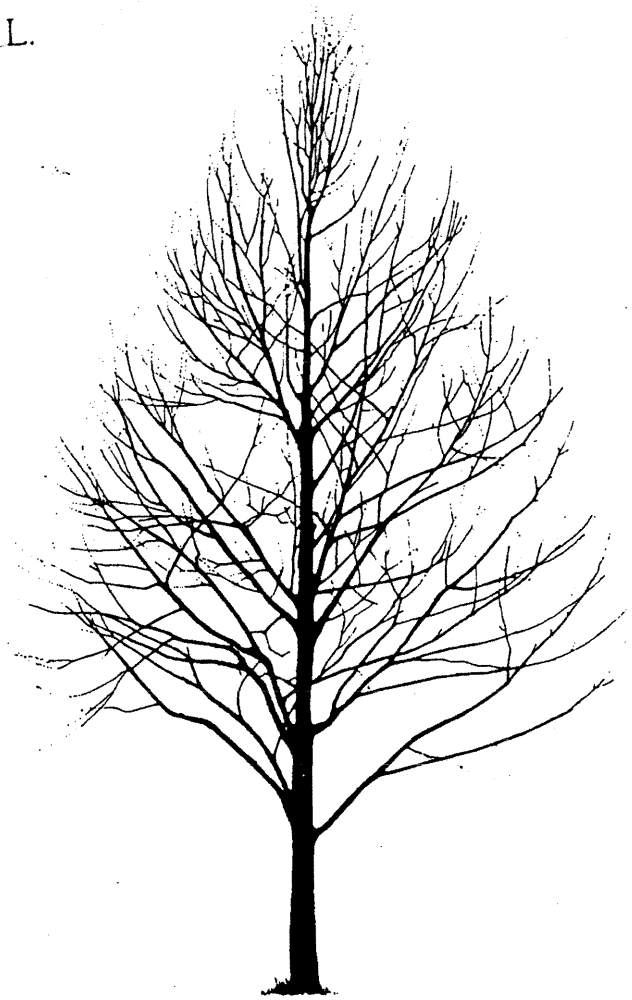


Bark light gray to almost white, thin, smooth, usually more or less studded with irregular corky outgrowths. **Branches** spreading, slender. **Twigs** about 3 mm in diameter, reddish-brown. **Buds** about 3 mm long, alternate. **Leaves** alternate, deciduous, simple; narrowly elliptic to broadly ovate, 6 to 10 cm long, 2 to 4 cm wide; apex acute, margin usually entire, base broadly rounded or oblique. **Flowers** unisexual or perfect, tiny, inconspicuous, many staminate and few pistillate appearing on the new growth as the leaves unfold. **Fruit** a drupe with a bony reticulated nutlet, about 5 mm in diameter, orange-red on a pedicel often shorter than the petiole of the subtending leaf.

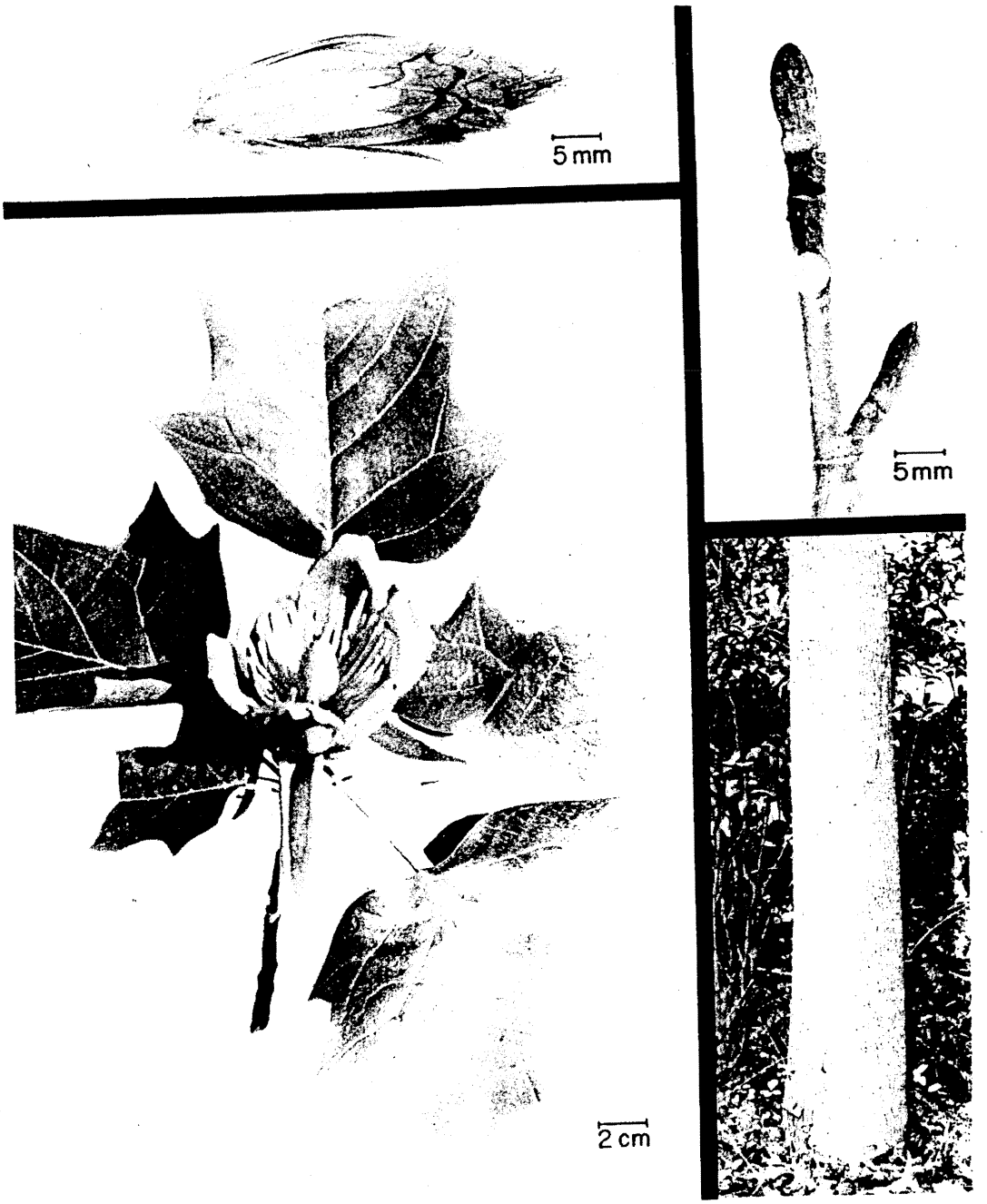
Sugarberry; hackberry/*Celtis laevigata*

Yellow-poplar

Liriodendron tulipifera L.



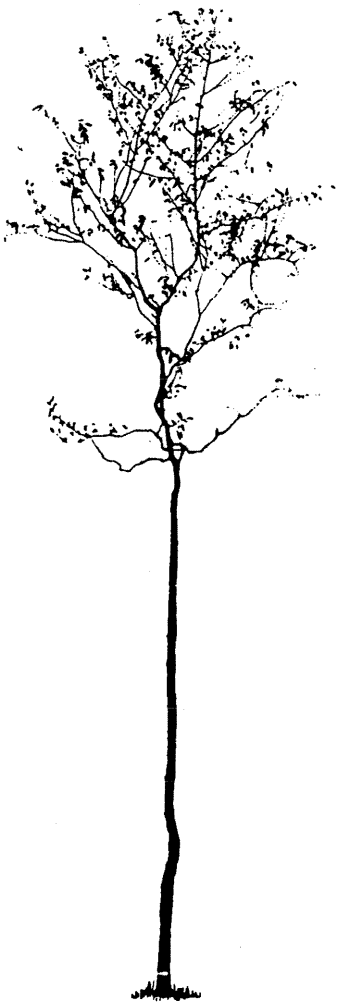
Bark thin and dark green on young trees, becoming ash-gray and conspicuously furrowed and ridged with age. **Branches** spreading to ascending, often drooping on large open-grown trees. **Twigs** smooth, about 5 mm in diameter, encircled by stipule scars, red-brown. **Buds** (terminal) grayish green, turning red in winter, flat about 10 to 16 mm long, scales valvate. **Leaves** alternate, deciduous, simple; dark green above, turning yellow in fall; 6 to 20 cm long and as wide as long; petioles 5 to 20 cm long, often longer than the blades on low branches. **Flowers** perfect, tulip-shaped, about 4 to 6 cm long, greenish-yellow with orange to reddish markings at base of petals, color intensifies with age. **Fruit** an aggregate cone, 5 to 8 cm long, gradually shattering into one-seeded, winged samaras.



Yellow-poplar/*Liriodendron tulipifera*

Sweetbay

Magnolia virginiana L.

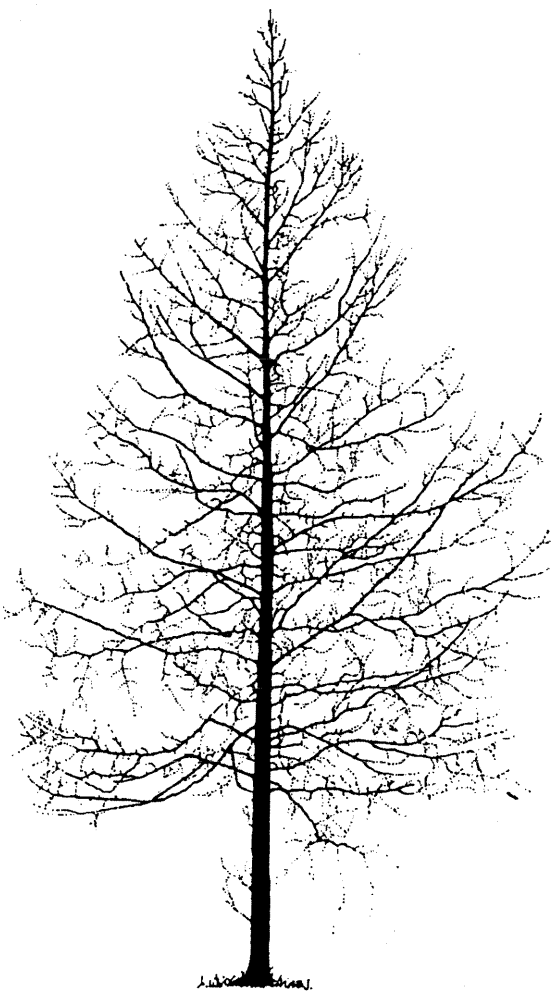


Bark dark gray, usually smooth, thin, in shady areas often encrusted with mosses, liverworts, and lichens. **Branches** stout, spreading to ascending. **Twigs** about 5 to 7 mm in diameter, encircled by stipule scars, green. **Buds** (terminal), silvery gray, pubescent, 15 mm long; smaller lateral buds often subtended by persistent petiole base. **Leaves** alternate, evergreen in South, deciduous in northern part of range, simple; elliptic to oblong, 10 to 15 cm long, 4 to 6 cm wide; margin entire, dark green above, silvery pubescent below. **Flowers** perfect, white, sweet-scented, 5 to 8 cm in diameter, appearing May to September. **Fruit** an aggregate of follicles which open and shed red seeds, irregular in shape, ovoid to ellipsoid, smooth, about 5 cm long.

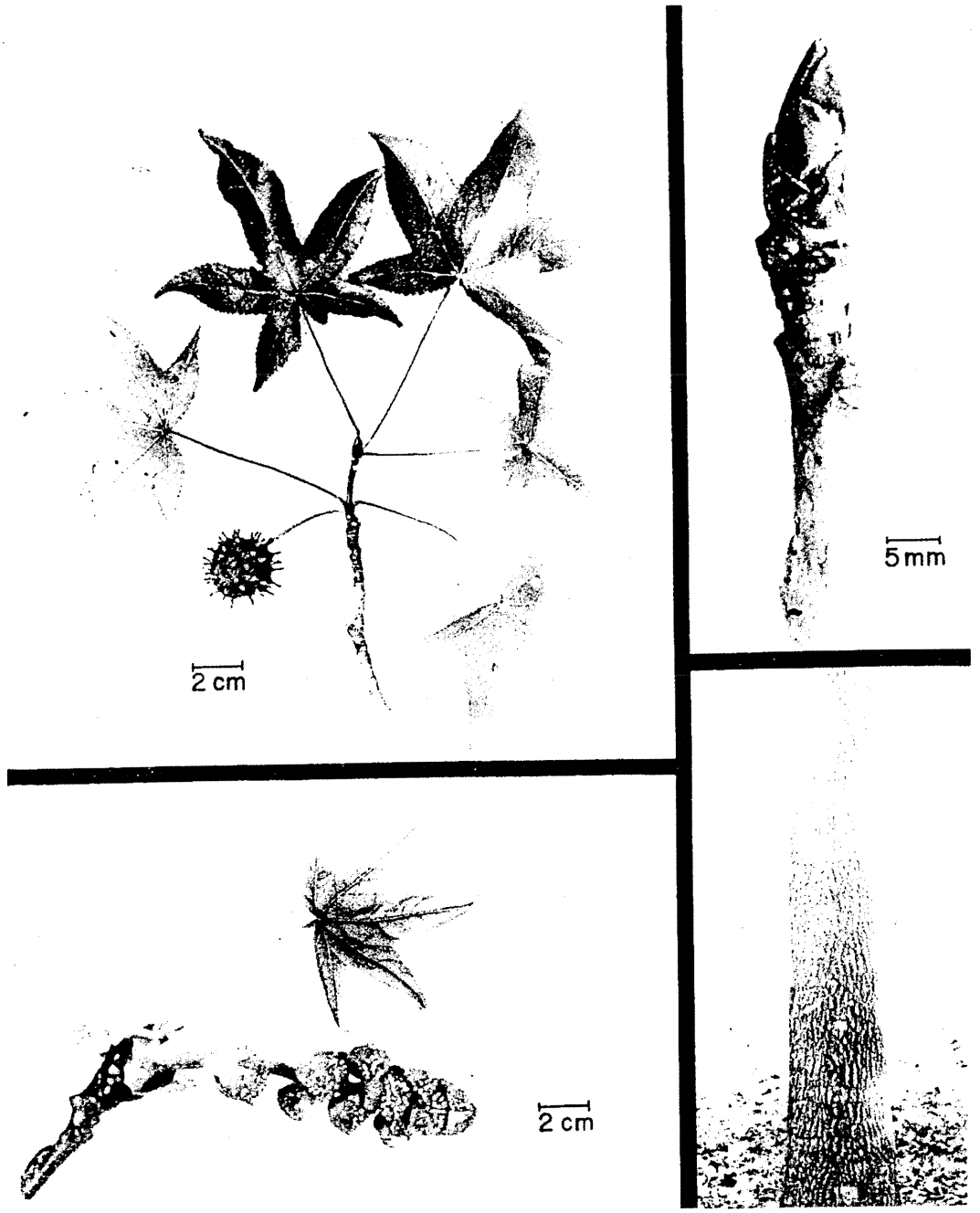
Sweetbay/*Magnolia virginiana*

Sweetgum; redgum

Liquidambar styraciflua L.



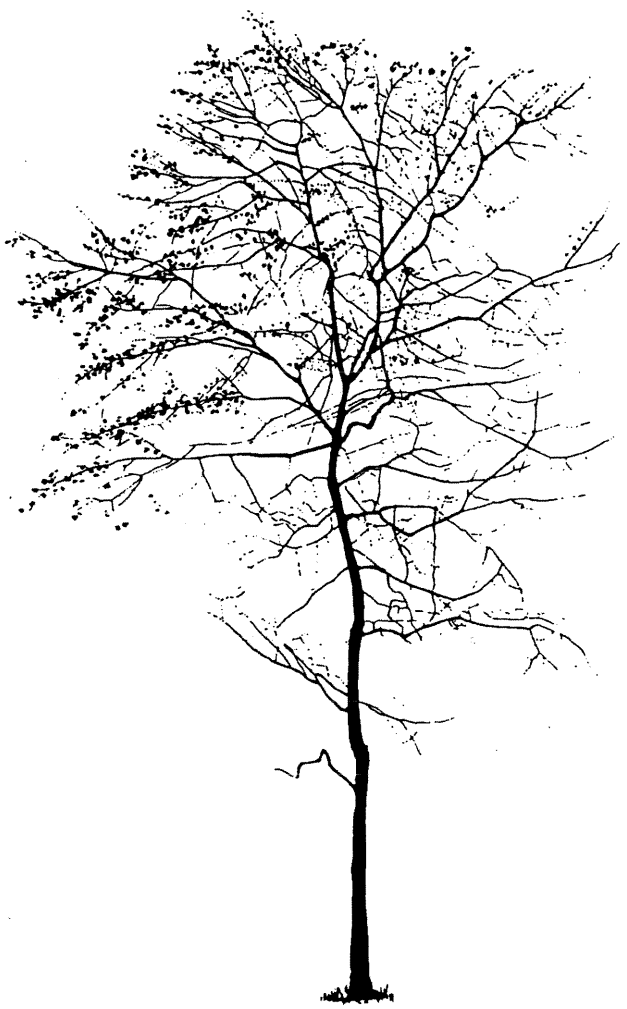
Bark dark gray, divided by deep furrows into narrow, rounded ridges. **Branches** stout, often with corky wings or outgrowths. **Twigs** about 4 to 6 mm in diameter, gray-brown. **Buds** (terminal) broadly egg-shaped, about 10 to 15 mm long, scales overlapping, slightly sticky. **Leaves** alternate, deciduous, simple; palmately 5- to 7-lobed; 8 to 20 cm wide, 6 to 15 cm long, often longer than broad; margin finely serrate; petioles 4 to 13 cm long. **Flowers** unisexual (plants monoecious), appearing as the leaves unfold; staminate clustered in terminal racemes; pistillate in small drooping spherical heads. **Fruit** in stalked spherical heads covered with small spine-like projections; seed cavity at base of each spine.



Sweetgum; redgum/*Liquidambar styraciflua*

Red Maple

Acer rubrum L.



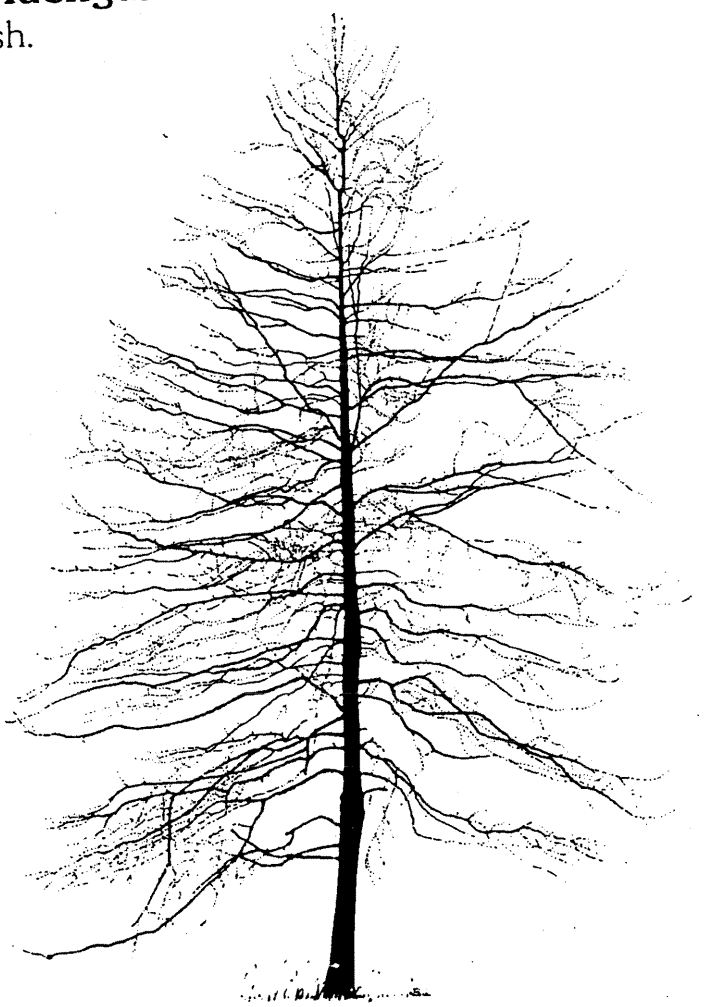
Bark gray, divided into scaly ridges by narrow furrows. **Branches** slender, spreading and ascending. **Twigs** about 3 mm in diameter, reddish. **Buds** spherical, reddish, clustered at apex of twig, scales with white ciliate margins. **Leaves** opposite, deciduous, simple; ovate to almost circular, 4 to 9 cm long, 2.5 to 7 cm wide, usually longer than broad; 3-lobed near the apex, margin finely serrate; dark green above, glaucous and lightly pubescent below, pubescence usually shed. **Flowers** typically polygamous, occasionally with perfect flowers, small, forming dense clusters from separate buds before leaf expansion, conspicuous because of the red to orange coloration. **Fruit** twin samaras 10 to 20 mm long.

Var. *drummondii*: **Leaves** larger than typical red maple, usually broader than long; 3 to 5 lobes or occasionally scarcely lobed, margins coarsely toothed, conspicuously glaucous below, usually permanently tomentose. **Fruit** samaras 4 to 5 cm long.

Red Maple/*Acer rubrum*

Black Tupelo; blackgum

Nyssa sylvatica Marsh.

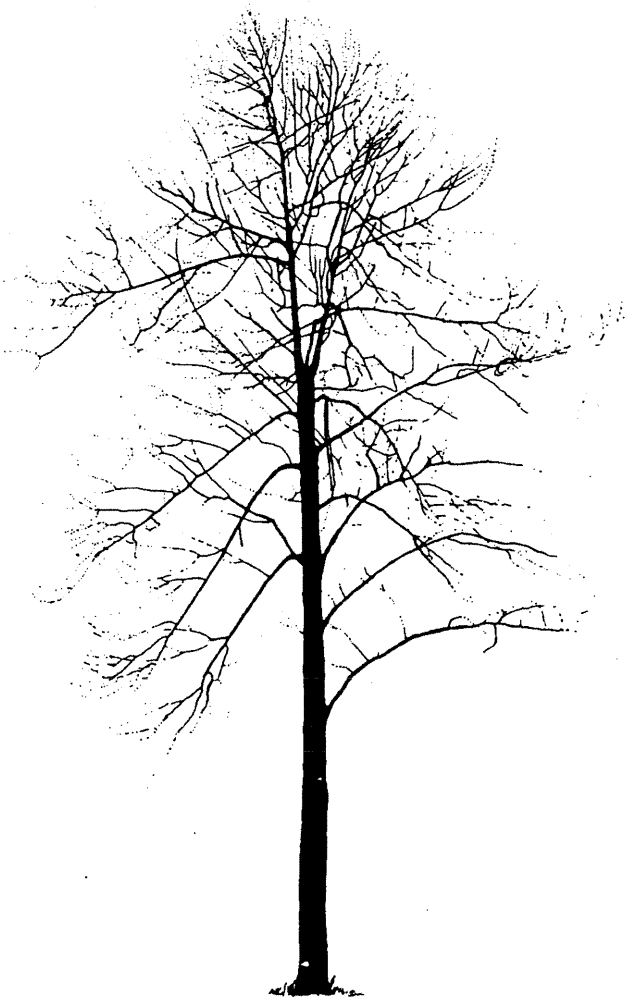


Bark black, marked with furrows and cross-cracks that divide the ridges into squarish plates. **Branches** slender, spreading to horizontal, often drooping in open-grown specimens. **Twigs** 2 to 3 mm in diameter, gray to reddish. **Buds** obtuse, of overlapping yellow-brown scales, terminal buds 6 mm long. **Leaves** alternate, early deciduous, simple; marked with irregular black spots and purple coloration from midsummer on; elliptic to broadly oval to obovate, 5 to 15 cm long, 3 to 8 cm wide; apex acute to broadly rounded, margin entire, base wedge-shaped. **Flowers** unisexual, less than 4 mm in diameter, appearing in April before leaf expansion. **Fruit** a black drupe 8 to 10 mm long, 1 to 3 on pedicels 3 to 5 cm long, stone faintly ribbed.

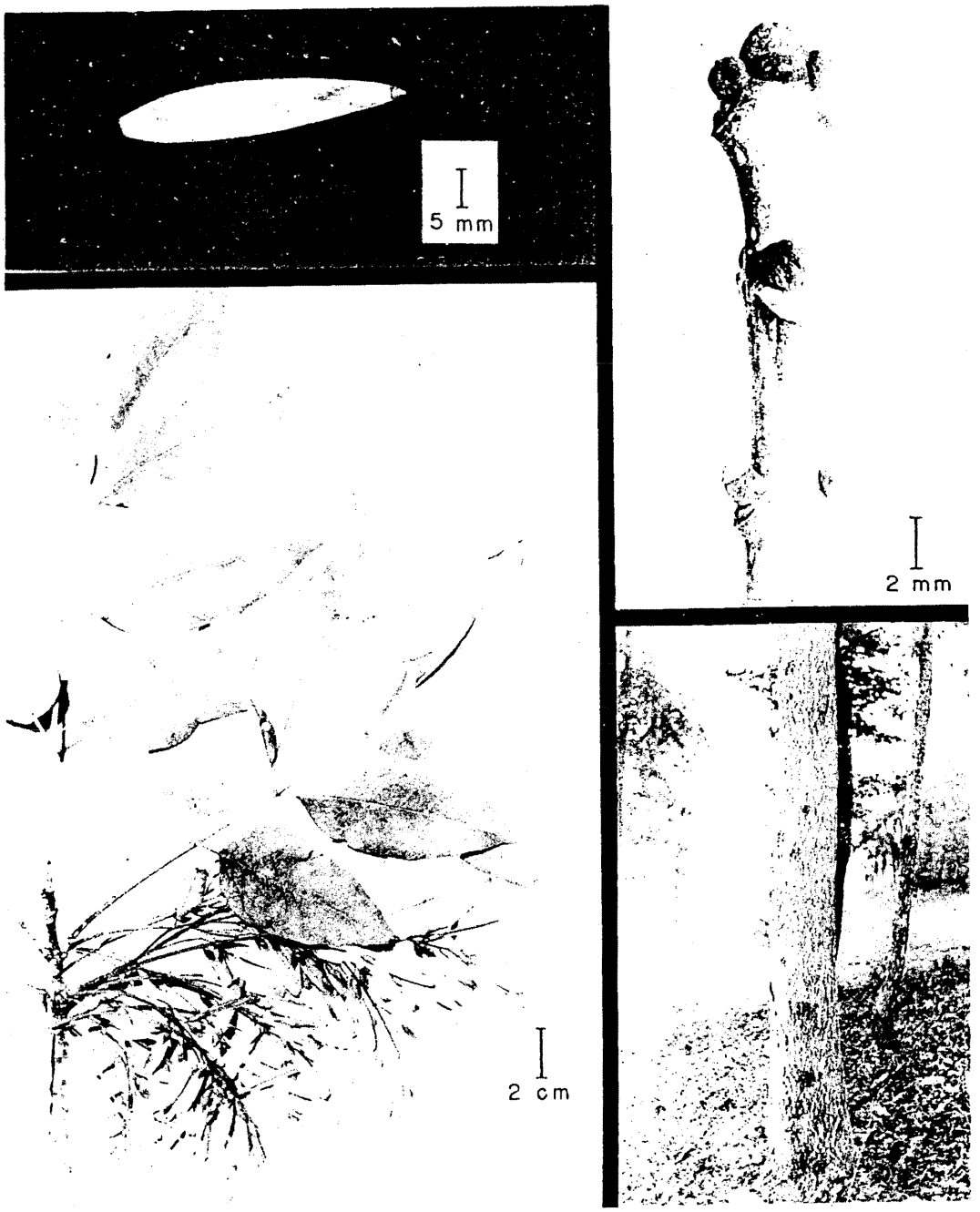
Black Tupelo; blackgum/*Nyssa sylvatica*

White Ash

Fraxinus americana L.



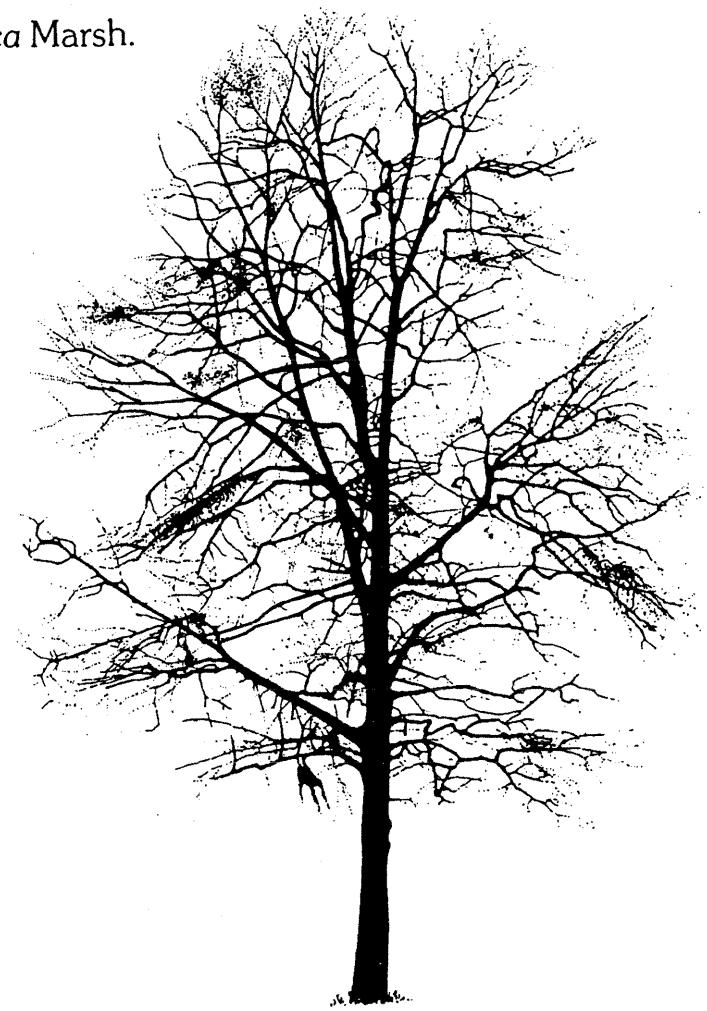
Bark gray to brownish, divided into narrow, deep furrows and ridges of equal width. **Branches** stout, wide-spreading. **Twigs** 3 to 6 mm in diameter. **Buds** (terminal) broadly ovoid consisting of 4 appressed scales, dark brown to black; lateral buds spherical, tightly appressed to a crescent-shaped leaf scar. **Leaves** opposite, deciduous, odd-pinnately compound; 20 to 30 cm long, white below when fresh; leaflets 7 to 9, petiolulate, oval to ovate, 5 to 15 cm long, 3 to 5 cm wide, apex acuminate, margin essentially entire, base broadly rounded, pinnate veins conspicuous on underside. **Flowers** unisexual (plants dioecious); pistillate inconspicuous about 1 mm in diameter, arranged in dense paniculate clusters; staminate conspicuous in mass. **Fruit** a samara, 25 to 60 mm long, wing terminal on the thickened seed.



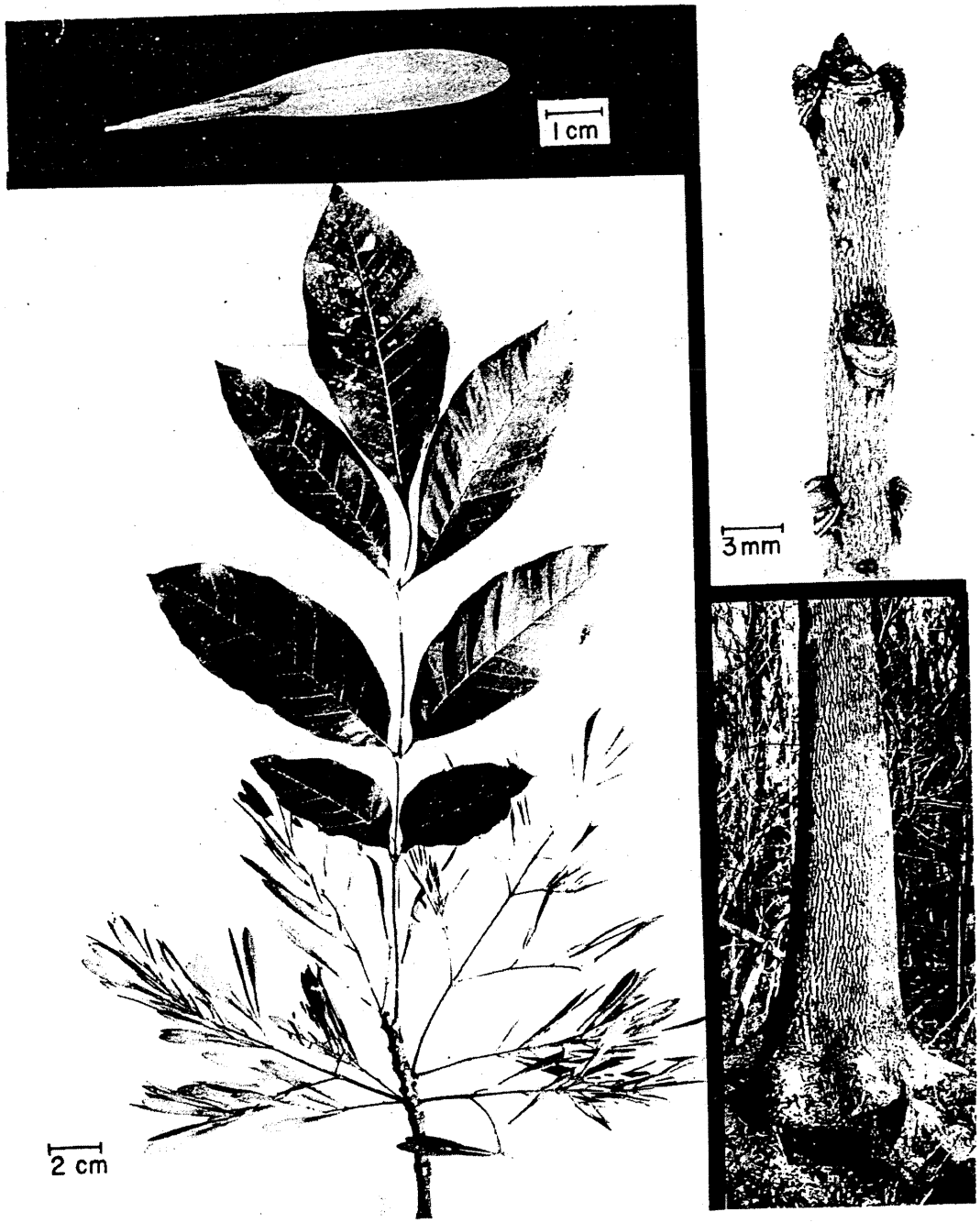
White Ash/*Fraxinus americana*

Green Ash

Fraxinus pennsylvanica Marsh.



Bark brownish, smooth when young, then breaking into narrow ridges with shallow narrow furrows. **Branches** drooping to spreading and ascending. **Twigs** stout, 4 to 6 mm in diameter, olive green. **Buds** terminal black; smaller lateral buds tightly appressed to the generally straight upper edge of the leaf scar. **Leaves** opposite, deciduous, odd-pinnately compound with 5 to 7, occasionally 9, leaflets; leaflets narrowly to broadly elliptical,apex acuminate, margin entire to finely serrate, base wedge-shaped, hairy below along the veins. **Flowers** unisexual (plants dioecious); pistillate inconspicuous in open panicles; staminate in compact conspicuous clusters. **Fruit** a samara 25 to 50 mm long, seed end conspicuously slender and extending about half the length of the samara, wing decurrent on seed end.



Green Ash/*Fraxinus pennsylvanica*

Selected References

Bailey, L. H.
1949. Manual of cultivated plants. Rev. ed. 1116 p. Macmillan Co., New York.

Brown, C. A.
1945. Louisiana trees and shrubs. Bull. 1, 262 p. Louisiana Forestry Commission, Baton Rouge.

Coker, W. C., and H. R. Totten.
1945. Trees of the southeastern states. 3rd ed. 419 p. Univ. of N. C. Press, Chapel Hill.

Collingwood, G. H., and W. D. Brush.
1974. Knowing your trees. Rev. by D. Butcher. 374 p. American Forestry Association, Washington, D.C.

Correll, D. C., and M. C. Johnston.
1970. Manual of the vascular plants of Texas. Contributions from the Texas Research Foundation, Vol. 6. 1881 p. Texas Research Foundation, Renner, Texas.

Fernald, M. L.
1950. Gray's Manual of Botany. 8th ed. 1632 p. American Book Co., New York.

Harlow, W. M.
1959. Fruit key and twig key to trees and shrubs. 106 p. Dover Publications, New York.

Harlow, W. M., and E. S. Harrar.
1941. Textbook of dendrology covering the important forest trees of the United States and Canada. 2nd ed. 561 p. McGraw-Hill Book Co., New York and London.

Harrar, E. S., and J. G. Harrar.
1946. Guide to southern trees. 712 p. Whittlesy House, McGraw-Hill Book Co., New York.

Kurz, H., and R. K. Godfrey.
1962. Trees of northern Florida. 311 p. Univ. of Fla. Press, Gainesville.

Little, E. L.
1953. Check list of native and naturalized trees of the United States (including Alaska). U.S. Dep. Agric., Agric. Handb. No. 41. 472 p.

Muller, C. H.
1951. The oaks of Texas. Contributions from The Texas Research Foundation 1(3):21-311.

Preston, R. J., Jr.
1961. North American trees. 2nd ed. 395 p. Iowa State Univ. Press, Ames (Reprinted 1970 by M.I.T. Press, Cambridge, Mass.).

Sargent, C. S.
1922. Manual of the trees of North America (exclusive of Mexico). 2nd ed. 910 p. Houghton Mifflin Co., Boston and New York. (Reprinted by Dover Publications, New York).

Small, J. K.
1933. Manual of southeastern flora. 1554 p. Published by author in New York.

Staff of Forest Resources Research Work Unit
1976. Hardwood distribution on pine sites in the South. U. S. Dep. Agric. For. Serv. Resour. Bull. SO-59. 27 p. South. For. Exp. Stn., New Orleans, La.

Vines, R. A.
1960. Trees, shrubs, and woody vines of the southwest. 1104 p. Univ. of Texas Press, Austin, Texas.

Wharton, M. E., and R. W. Barbour
1973. Trees and shrubs of Kentucky. 582 p. Univ. Ky. Press, Lexington.

GLOSSARY

Acuminate. Gradually tapering to a pointed apex.
Acute. Having the shape of an acute angle.
Aggregate. A cluster of ripened ovaries traceable to separate pistils of the same flower and inserted on a common receptacle.
Anther. The pollen-bearing portion of the stamen.
Anthesis. Time of flowering.
Apetalous. Without petals.
Apex. The tip of leaf, twig, or other plant part.
Apical. Pertaining to apex.
Ascending. Growing obliquely or indirectly upward from point of attachment.
Axil. Upper angle between a leaf or other plant part and the stem to which it is attached.
Bisexual. Having both sex organs on the same plant; a hermaphrodite.
Blade. The flat expanded portion of a leaf or parts of a compound leaf.
Catkin. A flexible, usually pendulous, scaly spike bearing unisexual flowers.
Ciliate. Having a margin fringed with hair.
Compound Leaf. A leaf with two or more separate leaflets.
Cordate. Heart-shaped with the point at the terminal end.
Crenate. Having a margin with rounded to blunt teeth.
Cuneate. Wedge-shaped.
Deciduous. Not persistent; said of leaves falling in autumn or of floral parts falling after anthesis.
Dehiscent. Opening by bursting or splitting.
Dentate. A margin with sharp teeth pointing outward.
Dimorphous. Occurring in two forms.
Dioecious. Unisexual, with staminate and pistillate flowers on separate plants.
Drupe. A simple one-seeded fleshy fruit, the outer wall fleshy, the inner wall bony.
Entire. Margins without teeth or lobes.
Evergreen. Having green leaves throughout the year.
Falcate. Sickle- or scythe-shaped.
Follicle. A dry, single-carpel fruit, opening along one side for seed dispersal.
Fluted. Regularly marked by alternating ridges and grooves.
Fruit. The seed-bearing product of a plant.
Glabrous. Smooth, devoid of hair or surface glands.
Glandular. Furnished with glands, or glandlike.
Glaucous. Covered with a white waxy or powdery bloom.
Globose. Spherical, globular.
Husk. Fleshy covering of nut in hickories.
Imbricate. Overlapping.

Leaflet. A single division of a compound leaf.
Membranous. Thin, more or less flexible, translucent.
Midrib. The central rib or central vein of a leaf or similar structure.
Monoecious. Having unisexual flowers, with both sexes borne on the same plant.
Nut. A hard-shelled, indehiscent, usually one-celled, one-seeded fruit.
Oblique. Slanted; of unequal-sided or non-symmetrical leaves or leaf bases.
Obovate. Inverted ovate.
Obpyriform. Inverted pear-shaped.
Obtuse. Blunt.
Odd Pinnate. Pinnately compound with a terminal leaflet.
Ovate. Having the lengthwise outline of an egg, broadest at the base.
Ovoid. Egg-shaped in 3-dimensions.
Ovule. An embryonic seed in the ovary of a flower.
Palmate. With veins or lobes radiating from a common center.
Panicle. A compound or branched raceme.
Paniculate. Borne in a panicle.
Parted. Divided by sinuses which extend nearly to the midrib.
Perfect. Having stamens and pistils in the same flower.
Persistent. Remaining attached.
Petiolate. Having petioles, not sessile.
Petiole. The stalk of a leaf.
Petiolulate. Having petiolules.
Petiolule. The stalk of a leaflet in a compound leaf.
Pinnate. Descriptive of compound leaves with the leaflets arranged on opposite sides along a common rachis. Also used to describe leaf venation.
Pistil. The seed-bearing organ of the flower.
Pistillate. Provided with pistils; usually descriptive of unisexual flowers.
Polygamous. Bearing perfect and unisexual flowers on the same plant.
Polymorphic. Having two or more forms.
Pubescent. Covered with fine, soft, short hairs.
Pyriform. Pear-shaped.
Raceme. An inflorescence consisting of a central rachis bearing a number of flowers with stalks of nearly equal length.
Rachis. The axis of a compound leaf or inflorescence.
Receptacle. The portion of the floral axis upon which the flowers are borne.
Reticulate. Forming a network.
Rhombic. Somewhat diamond-shaped.
Rib. A prominent vein.
Samara. An indehiscent winged fruit.
Scurfy. Covered with small scales.
Seed. A ripened ovule.
Serrate. With sharp teeth pointing forward.

Sessile. Without a stalk of any kind.
Simple. Of one piece; not compound.
Sinuate. Deeply or strongly undulate or wavy.
Sinus. A recess, cleft, or gap between two lobes.
Spatulate. Spatula-shaped.
Spike. An inflorescence consisting of a central rachis bearing a number of stalkless flowers.
Stamen. Pollen-bearing organ of the flower.
Staminate. Bearing stamens.
Stellate. Star-shaped.
Stipule. A leafy appendage attached to the twig at the base of a petiole: usually in pairs, one on each side, often shedding early.
Striate. With fine grooves, ridges, or lines of color.
Suture. Line of dehiscence.
Subglobose. Globe shaped, but slightly flattened.
Subsessile. Almost stalkless.
Tomentose. Coated with short, matted woolly hair.
Truncate. Having a blunt tip or end, appearing as if abruptly cut off transversely.
Undulate. Wavy.
Unisexual. Having stamens and pistils in separate flowers.
Valvate. Opening by valves as in a capsule or some leaf buds: meeting at the edges without overlapping.
Whorl. Circular arrangement of appendages at a node.
Woolly. Clothed with long, matted hairs.

Index

Acer rubrum, 5, 54
  var. *drummondii*, 5, 54
  var. *tridens*, 5
American elm, 4, 44
Ash, green, 5, 60
  white, 5, 58
Bitternut hickory, 2, 16
Blackgum, 5, 56
Blackjack oak, 4, 30
Black oak, 3, 22
Black tupelo, 5, 56
Carya cordiformis, 2, 16
  glabra, 2, 12
  ovata, 2, 14
  tomentosa, 2, 10
Celtis laevigata, 4, 46
  occidentalis, 4
Cherrybark oak, 3, 20
Chestnut oak, 4, 40
Elm, American, 4, 44
  winged, 4, 42
Fraxinus americana, 5, 58
  pennsylvanica, 5, 60
Green ash, 5, 60
Hackberry, 4, 46
Hickory, bitternut, 2, 16
  mockernut, 2, 10
  pignut, 2, 12
  shagbark, 2, 14
Laurel oak, 4, 32
Liriodendron tulipifera, 4, 48
Liquidambar styraciflua, 5, 52
Magnolia virginiana, 4, 50
Maple, red, 5, 54
Mockernut hickory, 2, 10
Northern red oak, 3, 26
Nyssa sylvatica, 5, 56
Oak, black, 3, 22
  blackjack, 4, 30
  cherrybark, 3, 20
  chestnut, 4, 40
  laurel, 4, 32
  northern red, 3, 26
  post, 4, 38
  scarlet, 3, 24
  Shumard, 3, 28
  southern red, 3, 18
  swamp chestnut, 4
  water, 4, 34
  white, 4, 36
Pignut hickory, 2, 12
Post oak, 4, 38
Quercus alba, 4, 36
  coccinea, 3, 24
  falcata, 3, 18
  falcata var. *pagodaefolia*, 3, 20
  hemisphaerica, 4
  laurifolia, 4, 32
  marilandica, 4, 30
  michauxii, 4
  nigra, 4, 34
  prinus, 4, 40
  rubra, 3, 26
  shumardii, 3, 28
  stellata, 4, 38
  velutina, 3, 22
Redgum, 5, 52
Red maple, 5, 54
Scarlet oak, 3, 24
Shagbark hickory, 2, 14
Shumard oak, 3, 28
Southern red oak, 3, 18
Sugarberry, 4, 46
Swamp chestnut oak, 4
Sweetbay, 5, 50
Sweetgum, 5, 52
Tupelo, black, 5, 56
Ulmus alata, 4, 42
  americana, 4, 44
Water oak, 4, 34
White ash, 5, 58
White oak, 4, 36
Winged elm, 4, 42
Yellow-poplar, 4, 48

Brown, C. A. and H. E. Grelen.

1977. Identifying hardwoods growing on pine sites. USDA For. Serv. Gen. Tech. Rep. SO-15, 69 p. South. For. Exp. Stn., New Orleans, La.

This publication illustrates and describes 26 hardwood species or varieties, including 16 oaks and hickories, with photographs of leaves, bark, buds, flowers, and fruits. Line drawings feature the winter silhouette of each species and a key is included to assist in identification.

☆U.S. GOVERNMENT PRINTING OFFICE 1977--775-499