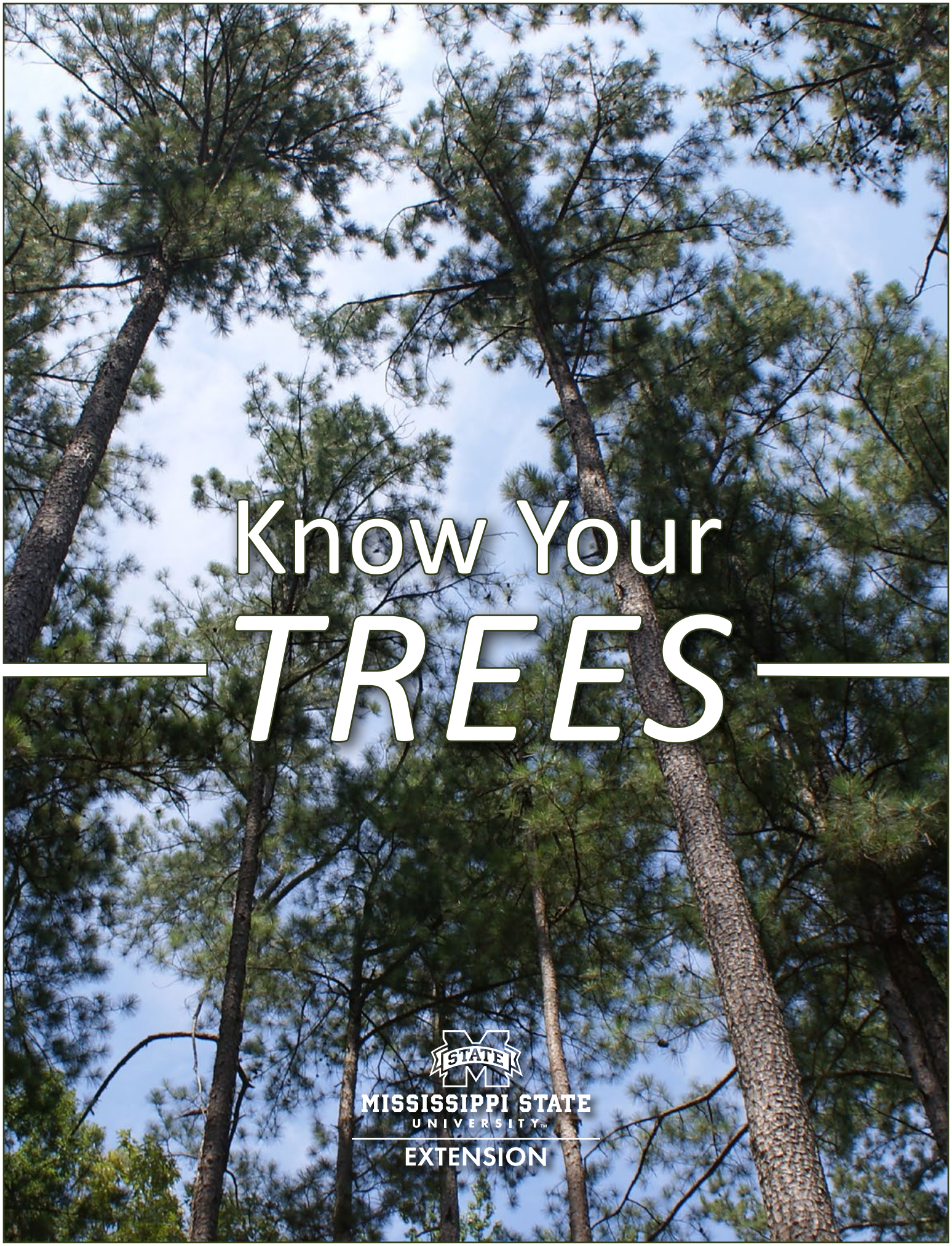
Know Your
TREES
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MISSISSIPPI STATE
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EXTENSION

PREFACE

Know Your Trees is an identification guide to some of the commercially important or common trees native to Mississippi. While we do not identify all native trees in the state, we do cover all areas of the state. In addition, *Know Your Trees* covers all tree species that 4-H youth need to learn for the Forestry Judging competition.

Of special note, the first printing of this publication was in April 1925. W. R. Mattoon, Extension forester, USDA Forest Service, and Dr. J. M. Beal, professor, Mississippi Agricultural and Mechanical College, authored the original publication (Extension Bulletin No. 32), titled *Forest Trees of Mississippi: How to Know Them*. The book gave "a brief, general description of the more common forest trees of the state." It provided identification characteristics with leaf, twig, and fruit drawings, and uses for 74 different tree species. The publication was reprinted in March 1936 and stood for another 21 years.

In June 1957, J. S. Therrell, Extension forester with Mississippi State College, made a major revision using the current title *Know Your Trees*, as Extension Publication 146. This revision included the addition of an identification key and eliminated substantial portions of the original text. It retained the drawings and species selections from the original book. The publication was reprinted in 1971.

In October 1993, Dr. Thomas Monaghan, Extension forestry coordinator with the Cooperative Extension Service, Mississippi State University, made another major revision. His revision highlighted 63 species, strengthened descriptive text, and incorporated black and white photographs as a replacement for drawings throughout the book. *Know Your Trees* had further minor revisions and reprints in 2006 and 2011. Consequently, this publication has remained in use over the last 99 years!

We are proud to update the publication with this latest major revision. This version includes 65 tree species with updated text providing more accurate descriptions of identification characteristics. There is a focus on plant taxonomy, which is the science of classification and naming of organisms. This current revision also includes color photography showing leaves and other distinguishing tree characteristics.

With the changes we have made in this revision of *Know Your Trees*, we hope you will find the publication more useful. Learning taxonomy can help with tree identification, even with species not highlighted in this publication. Furthermore, color photographs show detail not available in previous versions. We hope these changes will be helpful with identification and that you enjoy using this publication.

A. Brady Self and John D. Kushla

Front cover: Loblolly pine (*Pinus taeda*) forest on U.S. Army Corps of Engineers property near Grenada Lake.
Back cover: American sycamore (*Platanus occidentalis*; center) in Park Along the River, New Albany.

INDEX OF TREE SPECIES

FOREST RESOURCES

Mississippi is blessed with abundant natural resources. Mississippi's forestland is more productive than other parts of the South and nation. Our state has fertile soils, a long growing season, and precipitation well distributed throughout the year. About 65 percent of the state's land area—19.2 million acres—is commercial forest. Only in the Delta region is forestry not the predominant land use. Forestry and forest products provide over 61,600 jobs in the state. For all agriculture, timber harvest is third behind poultry and soybean production. With value-added processing of timber and wages paid, forestry contributes over $13 billion to the state economy every year.

Mississippians can improve on an already bountiful resource. Land is valuable for many purposes, so there is much competition for it in Mississippi. As a result, land values have remained high. Private, nonindustrial landowners own about 80 percent of Mississippi's forest land. With so much private ownership, public awareness and support of forest management practices are necessary in developing a strong forest economy. Forestry lets Mississippians strengthen their economy without sacrificing natural resource conservation. Thus, public awareness of our forests should always be a primary part of youth and adult education programs. By learning and understanding more about our forests, Mississippians can make wise decisions about their management and use.

TAXONOMY, TREE TYPES, AND NAMES

All parts of a tree are useful for its identification. This publication will introduce readers to identification of trees and their taxonomy. Taxonomy is the science of naming, describing, and classifying organisms. Taxonomic classification is hierarchical. Trees at the higher levels of classification have more traits in common, and progressively fewer traits in common moving down through the levels. Consequently, understanding taxonomy is helpful to learning tree identification, since taxonomy is based on shared traits. Indeed, learning the taxonomy may help you recognize types of trees that you have not seen previously.

Trees are land-living organisms of the kingdom Plantae. Like all plants, trees are capable of photosynthesis, or making their own food from carbon dioxide, water, and sunlight. All trees in this publication are in the subkingdom of Tracheobionta, meaning vascular plants. Trees have specialized, lignified (woody) tissues for conducting water, minerals, and nutrients throughout their bodies. Moving down through the classification, all trees in this guide are in the superdivision Spermatophyta, which is Latin for "seed-bearing plants."

Know Your Trees focuses on two major groups of seed-bearing trees: gymnosperms and angiosperms. Gymnosperm means "naked seed" in Latin, and such trees develop their seeds on a bract instead of enclosed in a fruit. These are geologically older plants, first appearing in the fossil record during the Paleozoic Era some 390 million years ago. Gymnosperms dominated the landscape by the Mesozoic Era, or the "age of dinosaurs," which began 250 million years ago. Meanwhile, the fossil record shows the first angiosperms evolved about 130 million years ago. Angiosperms have flowers and produce seeds encased in an ovary, or fruit. They eventually came to dominate vegetation on the earth.

All the gymnosperms in *Know Your Trees* are in the division Coniferophyta, Latin for "cone-bearing plants." Likewise, all the conifers in this book are in the class Pinopsida, having leaves that are needle- or scale-like, and are predominantly evergreen. In the lumber industry, conifers are known collectively as softwoods, since their wood is easier to work with cutting tools.

Angiosperms are in the division Magnoliophyta, or flowering plants. Furthermore, all the angiosperms in *Know Your Trees* are in the class Magnoliopsida. They are dicotyledonous, having two embryonic seed leaves. Angiosperms have a blade-like leaf, or "broadleaf." Many species are deciduous, dropping their leaves in the fall. In the lumber industry, these trees are known collectively as hardwoods, since their wood is generally more difficult to work with cutting tools.

Related trees are in the same taxonomic order, and more closely related trees are within the same taxonomic family. Trees within the same family share common characteristics particularly in leaf arrangement, flowers, fruit, and seed. Therefore, learning the taxonomy of trees will help with identifying species covered in this publication, as well as other trees not listed.

Most tree species have several common names used in different places or by different people. An example is the common term "old field pine." Mississippians using this term may be referring to loblolly pine or shortleaf pine, both of which naturally regenerate in retired fields. Using common names can cause confusion because several distinct species may share the same name.

For scientists, botanists, foresters, and others all over the world to know exactly what plant is being described or studied, the scientific name (Latin name) for the species is used. The scientific name is two words. The first is the generic name, or the name of the genus. The second word is the scientific epithet, which is a modifier for the generic name. Together, they describe the species. For instance, the scientific name of white oak is *Quercus alba*. *Quercus* is the generic name for all oaks. The word *alba* is Latin for "white" and describes the exact oak to which we are referring. If we wanted to refer scientifically to

all oaks, we would write *Quercus* spp., the abbreviation for species (plural). Scientific names eliminate confusion about a species because no two species will have the same scientific name. The taxonomy for common and scientific names presented in this publication are in accordance with the United States Department of Agriculture, Natural Resources Conservation Service, National PLANTS Database (https://plants.usda.gov/home).

LEAVES

Leaves are perhaps the easiest characteristic of trees to use in the identification process. This publication emphasizes the use of leaf characteristics for this purpose. The leaf description of each species is more detailed than descriptions of other characteristics, such as twigs, flowers, fruit, bark, or habitat.

Since leaves are so important in tree identification, learning leaf terminology is necessary. Leaf arrangement, shape, size, color, growth characteristics, and retention can all be used as identifying characteristics. The point where a leaf is attached to the twig is called the node. At the base of the leaf on the twig is a bud at the node. The stem-like part of the leaf that connects to the twig at the node is called the petiole.

Leaves having a single blade are called simple leaves (Figure 1a). Leaves having multiple blades are called compound leaves (Figures 1b and 1c), and each blade is called a leaflet. You can distinguish between a leaf and leaflet by following the petiole back toward the twig until you find a bud. These lateral buds do not appear at the base of a leaflet, only at the base of a leaf.

Leaf arrangement is an essential feature to identifying trees. For hardwood trees, there are terms describing leaf arrangement on twigs. If there is only one leaf at each node, the leaf arrangement is alternate or whorled. With alternate arrangement (Figure 2a), leaves usually appear to be staggered along alternate sides of the twig. In whorled leaf arrangement (Figure 2b), leaves are arranged in a spiral along the twig. If there are two leaves at each node, the leaf arrangement is called opposite (Figure 2c). In opposite leaf arrangement, two leaves appear to be arranged directly across from each other on the twig.

Figure 1a. A simple leaf is a single blade with a bud at the base of the petiole.

Figure 1b. Compound leaves have a complex structure with multiple leaflets. Leaflets are located along a rachis (primary leaf vein) in what is known as a pinnately compound leaf. This particular specimen is poison ivy.

Figure 1c. This is another example of a compound leaf. Leaflets radiate from the apex of the petiole in what is known as a palmately compound leaf.

Figure 2a. With alternate leaf arrangement, the nodes are staggered along opposing sides of the twig.

Figure 2b. In whorled leaf arrangement, three or more leaves are located at each node.

Figure 2c. In opposite leaf arrangement, leaf nodes are located across from one another on the twig, which is not common in trees. Common native tree species having opposite arrangement include maples, ashes, dogwoods, and buckeyes.

Figure 3a. An entire leaf margin is smooth along the edge.

Figure 3b. A serrate leaf margin has "teeth" along the edge.

Figure 3c. Lobed leaf margins have an undulating edge.

The edge of a leaf is called the margin. Some trees have leaves with an entire, or smooth, margin (Figure 3a). Other trees have leaves with serrated margins (Figure 3b). You also find some trees with lobed leaf margins (Figure 3c). These lobes are part of a single leaf blade, but they stand out by themselves because of the pattern of the leaf margin. The indentations on lobed leaves are called sinuses.

The final characteristic regarding a leaf is its retention in the fall. Trees that shed leaves in autumn are called deciduous, whereas trees that keep leaves through the winter are called evergreen or semi-evergreen. For our climate here in Mississippi, most hardwoods are deciduous, and most conifers are evergreen. There are exceptions to this generalization, which will be noted in the species descriptions.

TWIGS

Twigs are useful and necessary in studying leaves. To determine leaf arrangement, for instance, a twig section is necessary. Many other twig features—such as color and size of buds, leaf scars, color, smell, taste, and presence or absence of thorns, spines, wings, or plant hair—are helpful in identification.

FLOWERS AND FRUIT

This publication does not go into great detail in describing flowers and flower parts for identification purposes. Flower size, color, arrangement, and time of appearance are the main features described. In some species, male and female flowers appear on separate trees (dioecious). For dioecious tree species, fruit develops only from the female

flower on female trees. Other species have male and female flowers on the same tree (monecious), and some species have both sexes within the same flower (perfect).

Fruit can be useful in tree identification. All species produce fruit (seed), but not all individual trees do, as mentioned. In addition, fruits are available only at certain times of the year. Consequently, you cannot depend on them for identification. However, when fruit is present, it can be very helpful in identifying tree species. Fruits of angiosperm trees are described in general terms rather than in the technical, structural classification botanists use. Color, shape, size, and general appearance are usually mentioned in the short descriptions for fruit.

BARK

The bark of most trees is distinctive, but bark characteristics are difficult to describe. In addition, there is variation in bark of the same species. Also, bark characteristics may change dramatically with age and quality of the growing site.

Nevertheless, there are usually more differences in bark between species than within the same species, so bark can be useful in tree identification, especially in winter when leaves may not be present. As you become more familiar with each species, it is useful to recognize trees by their bark characteristics.

SIZE AND SHAPE

Size and shape refer to a species' growth pattern or form. Obviously no two trees grow exactly the same way, so size and shape must be described in very general terms. Knowing the size limits of a species may help you eliminate others from consideration when identifying a tree. Also, many species have nearly unmistakable form. For example, once you become familiar with the limbs and growth patterns of blackgum (*Nyssa sylvatica*), you can almost always recognize it from a distance with or without leaves.

OCCURRENCE AND HABITAT

All species of trees do not occur in all areas of the country or state. In fact, one species of tree may be plentiful in a small stream bottom and not be found on the ridge top a short distance away. This is important to know when you identify trees in your area. A few species common in north Mississippi are scarce in south Mississippi and vice versa. Some species are primarily upland species, while others are common to the bottomlands. Some tree species are found statewide but in particular habitats at a given location.

VALUE IN THE FOREST

All trees have some significance in their natural state. Values of trees in the forest may include such things as commercial use, wildlife habitat or food, the ability to survive under adverse conditions or on poor sites, the ability to protect soil and water, and natural beauty. Occasionally, a tree species may present a negative value to foresters and land managers, such as blackjack oak or American hornbeam. These are not valuable for timber and suppress reproduction of more valuable trees.

WOOD QUALITY AND USES

Thousands of products are made from various kinds of wood and wood derivatives: lumber, flooring, charcoal, chewing gum, paper, paint, firewood, furniture, tool handles, syrup, food additives, plywood, baseball bats, turpentine, toilet tissue, disposable diapers, plastics, and many others. Also, wood quality is important because it determines how a tree will be used once harvested. To determine such things as hardness, strength, color, and density of the wood, you would have to cut the tree. These features are not meant to help in tree identification but are mentioned so you will know more about a tree once it has been identified.

REFERENCES

Self, B., & Shannon, J. (2023). *4-H forestry competition handbook*. Mississippi State University Extension Publication 1991. http://extension.msstate.edu/publications/4-h-forestry-competition-handbook

Mississippi Forestry Commission. (2016). *Mississippi trees* (2nd ed.). https://www.mfc.ms.gov/programs/educational-workshops/publications/

Oswalt, S. N. (2015). *Forests of Mississippi, 2014* (Resource Update FS-49). U.S. Department of Agriculture Forest Service, Southern Research Station. https://www.srs.fs.usda.gov/pubs/48580

Tanger, S. M., & Measells, M. K. (2021). *The Economic contributions of forestry and forest products, Mississippi*. Mississippi State University Extension Publication 3562. http://extension.msstate.edu/publications/the-economic-contributions-forestry-and-forest-products-%E2%80%93-mississippi

United States Department of Agriculture, Natural Resources Conservation Service. (2021). *The PLANTS database*. National Plant Data Team, Greensboro, NC. http://plants.usda.gov

SPECIES IDENTIFICATION

Gymnosperms (Conifers)

Trees in this group produce seed that are exposed on a bract and not enclosed within an ovary or fruit. All gymnosperms in this guide are in the plant division Coniferophyta, or conifers. These trees bear seeds in cones.

Cupressaceae: Cypress family

Trees in this family have needle- or scale-like leaves. Most of them are evergreen, but some exceptions are noted in the species descriptions. Seed cones may be woody, leathery, or berry-like and fleshy. The bark on mature trees tends to be orange to reddish-brown and fibrous in texture, peeling in long strips.

Baldcypress, *Taxodium distichum*

The small, needle-like leaves are simple, ½ to ¾ inch long, and arranged in a feather-like fashion along either side of the twigs (Figure 4a). Rare among the conifers, baldcypress is deciduous, dropping its leaves in autumn. Actually, small twigs, which support the leaves, fall with the leaves attached. In the fall, leaves become light reddish-brown and eventually turn dark brown.

Figure 4a. Baldcypress leaves. The leaves appear as a frond of needles.

Figure 4b. Baldcypress knees are common to the species.

Twigs are a light green at first, then become light reddish-brown and eventually dark brown. The bark is quite fibrous and ranges from light gray to brownish-red. On older trees, it develops into flat ridges with shallow furrows.

Male flowers appear in slender, purple, hanging clusters, 4 to 5 inches long. Female flowers are scattered near ends of the branches of the preceding year and appear solitary or in pairs. The fruits are round cones, which do not look like cones as we normally think of them. They occur singly or in clusters of two or three and are about 1 inch in diameter. The winged seeds are nearly ¼ inch long and ⅛ inch wide. Gray squirrels and wood ducks eat the seeds.

Baldcypress becomes a large tree, up to 100 feet tall (in rare cases 140 to 150 feet tall) and 3 to 6 feet or more in diameter. The tree is easy to identify by its swollen trunk. The trunk flares out at the base into a deeply lobed, buttress-like structure, and the wide, spreading roots send up woody growths called "cypress knees" (Figure 4b). Baldcypress occurs normally on wet, swampy sites along flowing drainages, creeks, and rivers that are flooded several months of the year. However, it does not require standing water as many people believe. It grows quite well on upland sites. The main reasons baldcypress is normally found only in such wet areas is because it is highly susceptible to fire and competition from other trees.

Baldcypress heartwood is highly prized for its durability and working qualities. The wood is light and soft but not strong. It has rather dark, yellowish-brown heartwood and light sapwood. The heartwood is very durable, decay-resistant, and naturally resistant to termites. Baldcypress has a long lifespan that allows it to reach such large size. Huge old baldcypress "snags" are symbolic of the swamps of the Deep South. When hollow, these snags are valuable nesting sites for black bears, wood ducks, squirrels, and other small animals.

Baldcypress heartwood is greatly valued for outside trim. It has great natural beauty. It is in an especially select group of woods that hold paint longer and offer maximum resistance to the elements. The wood is used for various types of construction, fences, and other uses where durability and decay resistance are desired.

Baldcypress has a generally slow growth rate, but growth is average when trees are young and when competition is limited. Be careful when buying cypress lumber to use in building items where you need durability. The sapwood and second growth cypress lumber do not have the durability of the old growth and heartwood-type lumber.

Pond cypress, *Taxodium ascendens*

Pond cypress leaves are simple, awl-shaped, ¼ inch long, and pressed against the stem of the leaf and pointing upward, as its species name describes (Figure 5). The leaves are bright green but turn a rust color in autumn

Figure 5. Pond cypress needles point upward, giving the tree its scientific name.

Figure 6. Eastern redcedar leaves appear as overlapping scales.

before dropping off the tree. The cones are round, ¾ to 1 inch in diameter. They are green and leathery while developing and become woody upon maturity. Generally, pond cypress is a smaller tree than baldcypress, typically growing 50 to 60 feet tall, but it can reach 100 feet.

Pond cypress grows on wet sites typically in landscape depressions or ponds fed by acidic groundwater; this is where it gets its common name. It also has a buttressed root flare and "cypress knees." Occasionally, it will be found along still, blackwater rivers, which are highly acidic. Since topographic depressions tend to dry during the summer, pond cypress has adapted to fire by having thicker, fire-resistant bark.

In general, pond cypress has a very slow growth rate. This tree tends to be confined to growing in the Lower Coastal Plains at elevations below 100 feet. It ranges from southeastern Virginia, south to the Florida Everglades, and west to southeastern Louisiana. In Mississippi, it is found primarily in the south. The heartwood is decay-resistant and durable; its wood is often used for millwork and exterior trim.

Eastern redcedar, *Juniperus virginiana*

This tree is evergreen and has two kinds of leaves. Juvenile leaves are awl-shaped, appearing on young trees and on the more vigorous new growth of older trees. The awl-shaped leaves are about ½ to ¾ inch long. They are also opposite each other but do not overlap. Mature leaves are scale-like and are the most commonly seen. These are the leaves produced on all cedars after a certain age. The scale-like leaves are smaller, about 1/16 inch long, and appear opposite each other in four rows along the stem (Figure 6). They clasp the stem very closely and cause the stem to appear to be square. Twigs are very slender and usually appear to have four sides.

Eastern redcedar is dioecious, having separate trees with male or female flowers. The unfolding of small cones causes male trees to take on a golden color in February and March. Bluish-colored female cones are about 1/16 inch long and appear solitary at the ends of stems. The fruit is a pale or bluish-green cone that looks like a berry and is often called a berry or "cedar ball." It is about ¼ to ⅓ inch long and becomes quite slick and smooth in the autumn, with a rather firm skin and a thin, sweet flesh. There may be one or two seeds per cone. The seeds are about 1/16 or ⅛ inch long and wingless, relying on dispersion through bird droppings.

Eastern redcedar bark is reddish-brown, thin, and somewhat grooved on old and mature trees. The bark peels off in long, fibrous strips. Some older trees have a rather shaggy appearance. Redcedar can appear as a tall tree or a shrub and any size in between. The tree commonly reaches 40 to 50 feet in height with a trunk diameter of 1 to 2 feet. It appears in old fields and along fencerows as a small shrub with a pyramid-shaped crown with limbs beginning near the ground.

The wood is moderately dense, high in shock resistance, fine-textured, and even-grained. It has a distinctive taste and odor, works easily with tools, shrinks very little in drying, and is very resistant to decay. The soft, light sapwood is prized by wood carvers. The heartwood contains certain oils that have moth-repellant qualities. The heartwood is red, giving the tree its name. Redcedar wood is used for cedar chests, linen closets, wardrobes, cabinets, interior finish, fence posts, furniture, rustic work, pails, tubs, pencils, and miscellaneous carvings and ornaments.

Adapted to a wide variety of soils, Eastern redcedar occurs on abandoned fields and rocky areas and will tolerate mildly alkaline limestone soils. Its best development is on some of the upper slopes and rough terrain. It is usually widely scattered but may be found growing along fence rows where birds have dropped the seed.

Eastern redcedar is tolerant of shade, but its growth rate is slow. It is very susceptible to fire, and it is the host species for the cedar-apple rust fungus. Redcedar improves the

wildlife habitat of many poor sites where it may be the only tree. The cones are a favorite winter food source for birds. Redcedar also provides valuable roosting areas for many species of birds, such as mourning doves.

Pinaceae: Pine family

Trees in this family are evergreen. Leaves are linear and needle-like, arranged in bundles called fascicles. Seed cones are woody, with spirally arranged scales. Seeds are winged. The wood is resinous.

Loblolly pine, *Pinus taeda*

Needles are 6 to 9 inches long and occur in fascicles of three needles (Figure 7). They are yellowish-green to gray-green and may be slightly twisted. They are slender, rather stiff, and evergreen. They usually fall off in their third season. Twigs are stout, reddish-brown, and scaly. The buds are covered with reddish-brown scales. The bark on mature trees is ½ to ¾ inch thick. It is reddish-brown and is divided into irregular furrows with oblong, scaly plates.

Loblolly pine cones appear from March to April. Male cones, called strobili, are crowded in short clusters and are yellow. Female cones grow laterally from the twig just below the end of the new shoot. The yellow female cones may be solitary or clustered. A mature cone is from 3 to 6 inches long and reddish-brown. Cone scales have prickles on their scale tips. An individual seed is about ¼ inch long with a thin wing about ¾ inch long. The cones open and seeds fall usually in October. Two seeds are on each scale of the cone.

Tree improvement with loblolly pine began in the 1950s. It is the most planted species in Mississippi and the southeastern U.S. Nearly 1 billion loblolly pine seedlings are planted each year. It is intolerant of shade. After it reaches pulpwood size, it is not very susceptible to fire, so prescribed burning is often used as a forest management tool in loblolly stands. Loblolly has proven valuable in soil and water conservation. It has been planted extensively on abandoned, eroded, gullied land in north Mississippi to stabilize the soil and prevent excessive runoff and flooding. Wild turkeys, squirrels, quail, and some songbirds eat loblolly seeds.

Loblolly grows to 80 to 100 feet tall with diameter of 2 feet (and occasionally up 4 or 5 feet). It has a straight trunk, and the branches are relatively thick. Upper branches grow to form a rather compact, rounded crown. The wood is light brown, coarse-grained, and not very durable. It is an excellent producer of wood fiber for the pulp and paper industry. From larger trees with straight form, wood is used for lumber, railroad ties, pilings, poles, and plywood.

Loblolly occurs on a great variety of sites. It does well except on sites that hold excessive moisture during the growing season. It is very adaptable to different soils. Although occurring throughout Mississippi, it is most common in the northern two-thirds of the state. It often grows in pure stands but also in mixtures with shortleaf pine and hardwoods such as sweetgum, oaks, and hickories.

Longleaf pine, *Pinus palustris*

Longleaf pine is appropriately named because of its long needles that hang in fascicles of three, with dense clusters at the ends of branches, drooping down in a manner characteristic of the species (Figure 8). Needles are 10 to 15 inches long and are flexible and slender. The needles are evergreen, falling off at the end of the second year.

Twigs are rather thick, stout, scaly, and orange-brown. The buds are long, rather large, and covered in silvery-white scales that are characteristic of longleaf. The bark is light orange-brown and separates into large, flat scales. The bark is usually 1/16 to ½ inch thick on the trunks of young trees, and over an inch thick on mature trees.

Both male and female cones are dark rose-purple. Male cones appear in dense clusters, and female cones appear in pairs or clusters just before the point on the stem where new growth appears. Cones appear in early spring before new needles emerge. Mature cones are from 6 to 12 inches

Figure 7. Loblolly pine needles are in fascicles, or bundles, of three.

Figure 8. Longleaf pine needles range from 10 to 18 inches and are in fascicles of three.

long and are sometimes slightly bent or curved. They are the largest cones of the southern pines. Mature cones contain about 50 to 60 seed. Seeds are about ½ inch long and larger than the seed from any other southern pine. Seeds have a wing, 1¾ inches long, on one end. This wing allows the seed to be wind-scattered. The seeds often sprout soon after falling to the ground.

Longleaf often grows 80 to 120 feet tall and 2 to 2½ feet in diameter. It has a slightly tapering, clear trunk with very few branches for two-thirds of the length of the tree. Trunks are very straight, but limbs are gnarled and twisted, making for an irregular crown. The crown is usually open, and the canopy does not provide dense shade. A major value of longleaf pine is that it grows and reproduces readily in frequently burned areas. Longleaf has evolved to withstand frequent, low-intensity fires along the Coastal Plain. It is fire-resistant because dense needles protect its terminal buds and the tree has thick bark. Quail, turkeys, and fox squirrels readily eat the seeds. Feral hogs have been known to feed on the bark of roots and sometimes on tender taproots of young seedlings and saplings.

The wood is denser than that of other southern pines and is very hard for a yellow pine. It is strong, tough, coarse-grained, and durable. The heartwood is light red to orange; the sapwood is usually thin and very light, almost white. Longleaf pine wood is used for poles, bridges, fences, flooring, interior finishes, construction, lumber, sawtimber, and pulpwood. It is also used extensively for naval stores products such as turpentine, tar, and resin.

Longleaf pine usually occurs in sandy soils low in organic matter and usually strongly acidic. It grows both on sandy ridges and wetter sites in south Mississippi. It is associated with scrub oaks on drier sites and with slash pine and desirable hardwoods on some of the moister sites. As a fire-maintained ecosystem, longleaf forests have among the greatest biodiversity of any in North America.

Longleaf is one of the most important trees in southern forest history. At one time, the longleaf forest covered some 90 million acres of the Coastal Plain from Virginia south to central Florida and west to eastern Texas. It provided most of the timber for Mississippi's forest industry around the turn of the 20th century. Now, most of the old-growth longleaf pines are gone, but longleaf restoration efforts are underway across the South. The goal is to reestablish longleaf within its native range on sites where it once grew. With its resistance to fire, longleaf pine will continue to be an important timber resource for our state.

Shortleaf pine, *Pinus echinata*

As its name implies, needles on shortleaf pine are short, about 2½ to 5 inches long, and evergreen. The slender, dark bluish-green needles appear usually in fascicles of two, but bundles of two or three may appear on the same tree (Figure 9a). They begin to fall at the end of their second year but may persist until their fourth year.

Twigs are a light or pale green at first and may be covered with a purplish, shiny, powdery coating. They later become a reddish-brown tinged with purple. Twig bark begins to become scaly about the third year. The bark is almost black on young trees and reddish-brown on older trees. It separates into irregular, flat, scaly plates, with many small resin pockets between the layers. These resin pockets often leave dimples in the bark plates of mature trees (Figure 9b).

Shortleaf cones appear from March to April. Male cones are a pale purple and appear in short, dense clusters. The pale, rose-colored female cones appear two to three to a cluster on relatively stout stems. Fruit of shortleaf is a 1½- to 2½-inch-long cone. The cone is the smallest of the four important southern yellow pines. Cones are persistent and may remain on the tree for several years after the seeds have been shed. The cones appear solitary on short stalks. Each cone scale has two triangular-shaped seeds about ¼ inch long with a ½-inch-long wing. Seeds are shed in October and November, with each cone yielding about 25 to 35 seeds. A variety of birds eat the seeds.

Shortleaf pine may reach 80 to 100 feet tall and 2 to 4 feet in diameter with a long, straight trunk. Young shortleaf

Figure 9a. Shortleaf pine needles are in fascicles of two or three.

Figure 9b. Mature shortleaf pine bark plates often have dimples from resin pockets.

trees are usually rather scrubby looking. The branches of shortleaf form a rather loose, pyramid-shaped crown. Shortleaf is more disease and fire resistant than loblolly pine. An unusual feature of young shortleaf, up to 8 to 10 years of age, is its ability to sprout after the main stem has been cut or burned. Shortleaf is usually considered a slow grower, but this is partially caused by the low-quality sites it inhabits.

The wood is hard, strong, coarse-grained, and quite resinous. The heartwood is orange to yellowish-brown, and sapwood is nearly white with varying thickness. Shortleaf wood resembles longleaf wood but is lighter. It is one of the more desirable yellow pines for commercial use. The wood is used for sawtimber, bridge timbers, door and window frames, and sometimes furniture. It is also valued for poles, piling, structural lumber, and pulpwood.

Shortleaf commonly appears in the dry, hilly parts of Mississippi but grows naturally in many parts of the state. It invades old fields, heavily cut-over areas, and burned areas. It is found growing naturally in better quality upland hardwood stands of north Mississippi. Shortleaf is very rare in bottomland sites.

Slash pine, *Pinus elliottii*

Needles are rather stout, dark green, 8 to 12 inches long, and evergreen. They are densely crowded on branches in fascicles of two and three, often on the same branch (Figure 10a). The needles tend to lie somewhat flatly to branches instead of fanning out like longleaf needles.

Twigs are stout and orange at first, eventually becoming a darker color. The bark is about ¾ to 1½ inches thick and grayish-brown to reddish-brown. It is rough and separates on the surface into large, thin scales. Bark plates on mature trees tend to have an orange-brown color (Figure 10b).

The cones appear in January or February before the new leaves appear. Male, pollen-producing cones are purplish, and female cones are pink. Cones of slash pine are 3 to 6 inches long and are leathery brown with a glossy appearance as if they have been varnished. The seeds are triangular, about 1/16 to ¼ inch long. The wings on the seeds are ¾ to 1¼ inches long and about ¼ inch wide. Seeds average 80 to 90 per cone and most fall in October.

Slash pine grows 80 to 100 feet tall and 2 to 3 feet in diameter with a straight trunk. It has heavy branches, which branch horizontally from the main stem. The crown is usually rounded and much denser than that of longleaf pine. The wood is dense and very coarse-grained. The durable heartwood has a rich, orange color, and sapwood is very light. Slash pine wood is used extensively for pulpwood, sawtimber, poles, pilings, crossties, boxes, and crates. Also, it is probably second to longleaf for use in naval stores products.

Slash pine occurs naturally on wetter sites in south Mississippi. It grows on poorly drained flats along the Coastal Plain, around hummocks and swamps, and in other places where the water table is within a few feet of the surface of the ground. It also grows on adjoining drier sites. Slash pine is a good species for areas that may not otherwise be productive. Slash pine is also valuable as a planted species on areas formerly occupied by longleaf stands. It is favored over longleaf in these reforested areas because of its faster growth in the early years of development, as well as for its ease of nursery production and planting. The species also has some value to wildlife—quail, turkeys, and squirrels feed on the seed.

Young stands of slash pine less than 10 feet tall are quite susceptible to fire. Slash pine is very intolerant of shade and must have at least a codominant position to grow successfully. Its growth rate is medium to good.

Spruce pine, *Pinus glabra*

The slender, dark green, twisted needles are 1½ to 3 inches long and are in clusters of two (Figure 11). The needles are evergreen, dropping at the end of their second season or in the spring of their third year. Spruce pine bark is very distinctive. On young trees, the bark is smooth and pale gray. On older stems, it is about ½ to ¾ inch thick and

Figure 10a. Slash pine needles are 8 to 12 inches long in fascicles of two or three.

Figure 10b. Mature slash pines typically have orange-brown bark plates.

Figure 11. Spruce pine needles are 2 to 4 inches long in fascicles of two.

slightly irregularly divided into flat ridges by shallow rows. The bark on older trees looks more like that of oak than pine.

Male cones are yellow and appear in short, crowded clusters, and female cones appear on raised stalks. The cones are oblong and are about 1 to 2½ inches long. They are shiny brown and appear either singly or in clusters of two or three. Cones are persistent and often remain on the tree for several years, usually turning gray from weathering. In certain areas of its range, spruce pine may be the only pine in the forest. Therefore, seeds may provide food for certain species of birds when such foods are critically needed.

Spruce pine is a medium-sized tree, reaching 80 to 90 feet tall and 1½ to 2½ feet in diameter. It may have a straight trunk free of branches for about half its total height. The wood is soft, light, not very strong, rather brittle, and close-grained. The heartwood is light brown and sapwood is light. Spruce pine wood is used for lumber and pulpwood. It is used occasionally for fuel and infrequently for poles.

Spruce pine usually occurs in bottomlands and on moist or swampy areas in southern Mississippi. An occasional tree can be found scattered throughout areas where there are other pines and hardwoods. Spruce pine is rarely found in abundance. Spruce pine has a good growth rate. It is fairly tolerant of shade—the most tolerant of all southern pines. Insects and diseases don't usually threaten spruce pine.

Angiosperms

Angiosperms are flowering trees with seeds that develop in an ovary or fruit. All angiosperms in this guide are hardwood trees with blade-like leaves. They are primarily deciduous, but there are exceptions, and these are noted in the species description.

Aceraceae: Maple family

Maple leaves and branches have opposite arrangement, and leaves are commonly lobed. Maples have wind-pollinated flowers and winged, dry seeds in pairs, called samaras. Maples have very hard wood that is often used in furniture, flooring, or pulpwood.

Boxelder, *Acer negundo*

Box elder is unique among maples in having pinnately compound leaves, which are deciduous. Each leaf has three to five leaflets that are somewhat oval-shaped and often tri-lobed (Figure 12a). Above the middle, leaflet edges are coarsely toothed. Each leaflet is about 2 to 4 inches long and 2 to 3 inches wide, and leaf veins are prominent. The leaves are light green on the upper surface and paler on the lower surface.

Twigs are a useful means of identification. The current year's twigs are bright green and remain smooth, glossy, and green the first year. After their first year, twigs gradually darken, eventually becoming brown or gray.

Yellowish-green flowers appear with or before leaves on growth of the previous season. Male and female flowers are small and inconspicuous and appear on separate plants. Male flowers appear in long clusters about 1 to 2 inches

Figure 12a. Unique to maples, boxelder leaves are pinnately compound with three to five lobed leaflets.

Figure 12b. Boxelder, like all maples, has winged seeds called samaras.

long. Female flowers appear in narrow, drooping clusters. Seeds are double winged. These V-shaped, winged seeds are found in long, drooping clusters that remain on the tree through the winter (Figure 12b). The clusters may be 6 to 8 inches long. The seed are 1½ to 2 inches long, with each dewinged seed, or nutlet, being about ½ inch long. The seeds are valuable as squirrel and wild turkey food.

Boxelder is a rather small tree that may eventually reach 50 to 70 feet in height with a diameter of 2 to 3 feet. However, it is usually much smaller and typically does not reach commercial size. The bark is ¼ to ½ inch thick, pale gray or light brown, and deeply divided into broad, rounded ridges that separate on the surface into short, thick scales. Boxelder wood is light, soft, creamy-yellow to yellowish-gray, and not durable. The sapwood is soft, and heartwood is rather hard. Boxelder wood is rarely used in quantity but is occasionally used for inexpensive furniture, woodenware, and barrels.

Boxelder commonly occurs in Delta bottomland soils and along streams and moist sites in other areas of the state. It is moderately tolerant of shade, and reproduction is very good on bare soil in small openings. It has an excellent growth rate but matures at an early age. It is sometimes used for windbreaks.

Red maple, *Acer rubrum*

Red maple is well-named. Its red flowers open early in spring. Its seed and emerging leaves are red. The leaves are simple, opposite, and deciduous. They are 2 to 6 inches long and wide. Leaves have three to five lobes (Figure 13). The leaf margins have coarse, irregular teeth. They are light green above and paler and smooth on the undersides. Petioles remain reddish through the growing season. Cultivars of red maple have leaves that turn brilliant shades of red in the fall.

Twigs are rather slender, bright to dark red, and shiny. The terminal bud is red and blunt and about ⅕ inch long. On branches and young trees, bark is smooth and gray. On older trees, it becomes dark gray and about ¼ to ½ inch thick with flaky, long, narrow ridges that tend to peel.

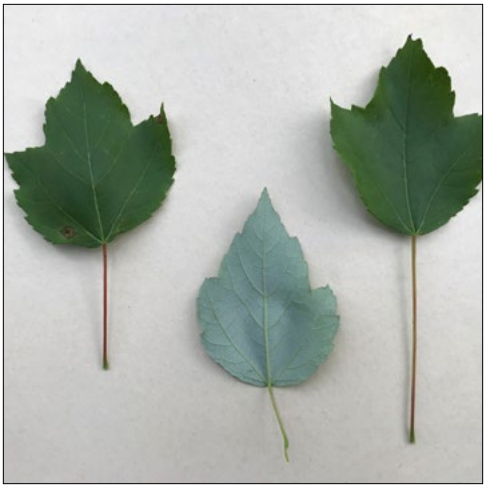

Figure 13. Red maple leaves are tri-lobed and have reddish petioles throughout the growing season.

Red maple may have three types of flowers: male, female, or perfect. Flowers are red or yellowish-red and emerge before leaves in dense clusters on growth of the preceding season. Female flowers quickly develop into double-winged, red seeds, in clusters or pairs on slender, drooping stalks. The wings are about ½ to 1 inch long, and seeds usually sprout soon after falling to the ground. Squirrels eat the buds and seeds in the spring and summer. Deer browse twigs, sprouts, and seedlings.

Red maple is usually a medium-sized tree about 40 to 50 feet tall and 1 to 2 feet in diameter. It has been known to reach heights of more than 100 feet and 5 feet in diameter under ideal conditions. In the forest, the trunk usually does not have branches for about 30 feet up and produces a narrow, short, rounded crown. In the open, tree branches appear near the ground, and the tree has a dense, oblong crown.

The wood is relatively soft and not strong. It is close-grained, with light brown heartwood and wide, lighter-colored sapwood. In the lumber industry, it is considered one of the soft maples and is worked easily with tools. It is stable after seasoning and can be glued easily. It also has no odor or taste. The wood is used for factory lumber, furniture, wall paneling, woodenware, and pulpwood. A defect occasionally found in the lumber is very small wormholes from ambrosia beetles. The wormhole defect has become an asset in paneling for rustic dwellings or custom furniture.

Red maple is the most common hardwood species of the eastern United States. It occurs on a wide variety of sites from bottomlands to uplands, except on the highest ridges and deepest swamps. It is most common in low areas and heavy soils. In the uplands, it appears in coves, on lower slopes, and in the heads of branches and small streams. It tolerates shade and has a medium to good growth rate. It is widely planted as an ornamental because of its growth rate and size, highly colored flowers and fruit, and autumn foliage.

Silver maple, *Acer saccharinum*

Silver maple leaves are opposite, simple, deciduous, and 6 to 7 inches long and wide. They usually have five lobes and uneven, coarsely toothed margins (Figure 14). Leaves are pale green on the upper surfaces and silvery-white on the lower surfaces, giving this maple its common name. On a windy day, the silvery undersides of leaves flash into view. The petioles are about 4 inches long.

Twigs are somewhat slender and brittle. Lustrous green at first, twigs later become reddish-brown and covered with numerous lenticels (pores). Unlike red maple, silver maple twigs have an undesirable odor when bruised. The bark on branches and trunks of smaller trees is smooth and gray.

On older trunks, bark becomes somewhat furrowed with long, loose, scaly plates that are loose at the ends.

Flowers appear before leaf emergence in dense clusters on growth of the preceding season. Male and female clusters of flowers appear on the same or different trees. Similar to red maple, a tree may also have perfect flowers with both male and female parts. The fruit is a double-winged samara 1 to 2 inches long, on slender, hanging stalks. Squirrels eat buds and seeds in spring and summer, and deer browse on twigs, sprouts, and seedlings.

Silver maple often grows 50 to 80 feet tall but can grow to more than 120 feet tall with a diameter of 3 to 4 feet. The trunk is usually short and divides 10 to 20 feet above the ground into stout branches that continue to branch, ultimately forming a broad, rounded crown.

Silver maple is considered one of the soft maples. The wood is close-grained and brittle but easily worked. Heartwood is pale brown and sapwood is white. The wood is used for factory lumber, furniture, flooring, and many of the same purposes as red maple.

Silver maple ranges from the northeastern and midwestern U.S. and south through most of Alabama and Mississippi. Silver maple occurs along rivers and streams across the state almost to the coast. In the uplands, it appears occasionally in coves and creek bottoms and the edges of stream and branch heads in northern Mississippi. It occurs on lower slopes in the Loess Bluffs.

Silver maple does not tolerate shade. Reproduction is very good by seed on bare mineral soils in openings on new ground. Its major value appears to be as an ornamental planted as a shade tree. It has an excellent growth rate and attractive foliage. However, considering the brittleness of its wood, it is not recommended to plant silver maple near structures, driveways, or streets.

Aquifoliaceae: Holly family

Most hollies are evergreen, but there are exceptions. Also, most hollies are dioecious, having unisexual (either male or female) flowers on a tree. Flowers occur in parts of four. The fruit is a berry (drupe) with a hard seed in the center.

American holly, *Ilex opaca*

American holly leaves are alternate, simple, and stiff. American holly is unusual as one of our evergreen hardwoods. Leaves are 2 to 4 inches long and 1 to 2 inches wide. They are leathery and have sharp, pointed spines along their margins. They are usually yellow-green above and paler and more yellow below. The holly leaf is one of the most easily recognized of all leaves (Figure 15).

Twigs are stout, green to light brown, and slightly hairy at first. They later become smooth. The bark is rather smooth, thin, and light gray. It has no distinct furrows or ridges. The bark becomes rougher on older trees and occasionally may have scattered, wart-like growths.

Individual trees are either male or female. Flowers appear in the spring and are quite small and hard to see. Male flowers appear in clusters of three to nine, and female flowers may be in clusters of one to three. Petals are greenish white and about ⅛ inch long. The fruit is dull red or yellowish, round, and berry-like. About ¼ inch in diameter, it ripens in late fall and remains on the branch during the winter. The berry contains one light brown nut that is ribbed on four sides. Many species of birds, small mammals, and white-tailed deer eat the fruits.

American holly normally reaches heights of 20 to 50 feet but occasionally reaches 100 feet. Mature tree diameter is usually ½ to 1½ feet but can reach as much as 3 feet. The tree usually has numerous lateral branches. Despite this, the trunk grows through the crown continuously and usually without forking. The crown is usually cone-shaped with slender, horizontal or slightly drooping branches.

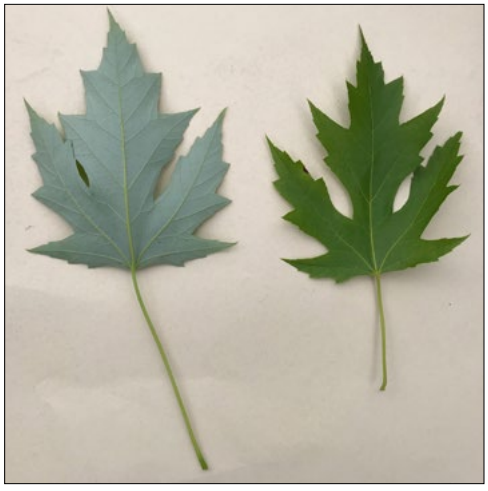

Figure 14. Silver maple has a coarsely toothed, lobed leaf.

Figure 15. American holly leaves have a thick, waxy layer, giving them a very tough, fibrous leaf.

The wood is hard but not too strong. It is considered the nearest to pure white of all wood. Easily dyed, the wood is sometimes dyed black and used as a substitute for ebony for piano keys, violin pegs, and such (more expensive musical instruments have genuine ebony). The wood is also used in its natural color for inlay work in cabinets and interior finishes. In any use, it must be kept dry, because it is not durable in contact with moisture.

American holly occurs mostly in minor stream bottoms and occasionally on high ridges and larger bottoms. In the uplands, it is scattered widely as an understory tree in the Piney Woods on all but the driest or wettest sites. Holly thrives in shade but will tolerate full sun. It has a slow growth rate. Reproduction is sparse but dependable. The foliage and fruit are widely used for holiday decorations. Trees of sawtimber size are very scarce. Although it is often attempted, transplanting holly trees is usually unsuccessful. Birds scatter the seeds, but low fertility keeps occurrence low. Holly resists saltwater spray and is sometimes used in coastal areas as an ornamental.

Betulaceae: Birch family

Leaves are simple and alternate, with toothed or double-toothed margins. Leaf veins are parallel. The bark tends to have horizontal lenticels. Single-sexed flowers appear on long, spike-like structures called catkins. Flowers of both sexes appear on the tree. Seeds are small, winged samaras.

American hornbeam, *Carpinus caroliniana*

American hornbeam leaves are alternate, simple, and deciduous (Figure 16a). The leaf base is rounded or wedge-shaped. They are 2 to 4 inches long and 1 to 1¾ inches wide. The upper surface is deep green and the underside paler. There may be tufts of white hair where principal veins join the midrib on the underside of the leaf. Petioles are slender, hairy, and about ⅓ inch long.

Twigs are at first silky, hairy, and green but become smooth and reddish to orange. Twigs are alternate, slender, and zigzagged in shape. The bark is thin and bluish-gray, often with blotches of various colors of gray to brown or black (Figure 16b).

Flowers of both sexes have some red and green coloring and appear on the same tree in separate clusters. Male flowers are approximately 1 inch long, with red scales at the base. Female flowers are ½ inch long. The fruit is a long cluster of three-lobed, leaf-like bodies, each bearing a rough, light brown nutlet at the base. These clusters are 3 to 6 inches long. The nut itself is about 1/3 inch long, and trees may fruit from August to October. Gray squirrels feed on fruit in bottomland hardwood forests. In some areas, wild turkeys and several other species of birds also eat the fruit.

American hornbeam is usually a small tree, 10 to 30 feet tall with a diameter of 8 to 12 inches, but it may reach a height of 40 feet and a diameter of 2 feet. Crowns are round-topped and spreading, with long, slender, drooping branches. The short trunk is often twisted with knots, flutes, and bulges that give it the appearance of having muscles.

The wood is dense, hard, and strong. It has light brown heartwood, thick sapwood, and conspicuous rays. At one time, the wood was used for handles because of its strength and hardness. It is also used for fuel.

American hornbeam is very tolerant of shade and so is a very prominent understory species, especially in Delta bottomlands. It grows slowly and is a prolific reproducer, usually from seed. It is generally considered to be an undesirable tree because of its slow growth, small size, and lack of use in commercial products, along with its hindering reproduction of more valuable hardwoods, such as oaks, after a harvest.

Eastern hophornbeam, *Ostrya virginiana*

The leaves of eastern hophornbeam are alternate, simple, and deciduous. They are 3 to 5 inches long and 1½ to 2½ inches wide. Leaf margins are sharply toothed (Figure 17a). The leaf base is usually rounded. Leaves are dull yellow-

Figure 16a. American hornbeam leaves are simple and have double-toothed margins. Twigs have a slight zigzag shape.

Figure 16b. American hornbeam bark is smooth and reveals fluting of the trunk, which look like muscles.

Figure 17a. Eastern hophornbeam leaves are finely double-toothed with parallel veins.

Figure 17b. The bark of eastern hophornbeam has narrow ridges that tend to peel, giving the bark a somewhat shaggy appearance.

green on the upper surface and paler below, with small tufts of hair in joints of veins.

Twigs are slender, hairy, and green at first, later becoming smooth and a lustrous, dark brown. The bark is quite conspicuous and should help with identification (Figure 17b). It is grayish-brown, thin, and broken into narrow, oblong, plate-like scales that are loose at the ends and give a shredded appearance to the trunk.

Flowers are red or reddish-brown and appear with leaves from March to May. This species is monecious, with both sexes of flowers appearing on the same tree. Male flowers are formed the previous season in groups of three at the ends of twigs and reach about 2 inches in length in the spring. Female flowers are small, solitary, and slender and grow erect on the twig. The fruit has a cone-like body 1½ to 2½ inches long and ⅔ to 1 inch wide. It is a dense cluster of nutlets enclosed in papery sacks that together form the hop-like fruit for which the tree is named. Fruits dry and fall apart after maturing, and wind scatters the seed. Bobwhite quail, wild turkeys, and other birds eat the seed. Squirrels, deer, and rabbits also feed on the fruits, buds, and flowers.

Eastern hophornbeam is usually a small tree, about 20 to 40 feet tall with a short trunk 8 to 15 inches in diameter. However, it can reach 70 feet in height with a diameter of 2 feet. It usually has a broad, round-topped crown with widely spreading, drooping branches. The wood is very dense, very hard, strong, tough, and close-grained. Heartwood may be light brown to reddish-brown; sapwood is thick and pale white or pale yellow. It is sometimes called ironwood because the wood is so hard. It is used for tool handles, posts, mallets, and sometimes fuel.

Eastern hophornbeam usually occurs as a small, crooked understory tree that is widely distributed along small streams and in bottomlands. It grows best in rich, moist woods along with other hardwoods. Sometimes it can be found in the understory of larger trees on slopes in hardwood forests. Eastern hophornbeam tolerates shade and grows slowly. Regeneration is mainly by seed. It is considered an undesirable species for the most part as it hampers regeneration of other tree species. It is sometimes planted as an ornamental.

River birch, *Betula nigra*

The leaves on this tree are alternate, simple, and deciduous (Figure 18a). They are 1½ to 3 inches long, and 1 to 2 inches wide. Leaves are light yellow as they unfold and become deep green and shiny on the upper surfaces. They are paler and yellowish-green on lower surfaces. The margins of leaves are deeply double-toothed.

Twigs are slender, hairy, and greenish at first, later becoming smooth and reddish-brown. The bark on young trees and branches is thin and a light reddish-brown or gray. The bark on older trees is exfoliating, separating freely into large, thin, papery scales as it peels from the trunk. Trunks may have various shades and colors ranging from white to pink to orange to dark brown. Bark at the base of very old trees may be an inch thick and deeply furrowed (Figure 18b). The bark is resinous and waterproof. Campers and those skilled in woodcraft value birch bark for starting fires even in the rain.

Flowers appear before leaves emerge. Both male and female flowers appear on the same tree. Male flowers form in the fall and remain through the winter in clusters of three. They increase from ¾ inch long in winter to 2 to 3 inches long the following spring. Female flowers develop during spring from buds below the male flowers. The fruit is cone-like and grows erect on twigs. It is 1 to 1½ inches long and consists of a three-lobed, finely hairy scale with small, hairy, winged nuts. Nutlets have hairy tips and are broader than the lateral wings. The fruit ripens in May or June.

River birch may reach heights of 70 to 80 feet and diameters of 2 to 3 feet. However, it is usually a smaller tree, and the trunk often divides 15 to 20 feet above the ground into two or three limbs with an irregular-shaped crown. The wood is light, medium hard, strong, and close-grained. River birch has light brown heartwood and pale sapwood. The species is not commercially valuable, but it is sometimes used for pulpwood, furniture, fruit and

Figure 18a. River birch leaves are simple and have a double-toothed margin.

Figure 18b. River birch bark exfoliates and is very resinous so that it will burn even when wet.

vegetable baskets, and woodenware. River birch usually occurs on new riverfronts and along banks of minor streams. You usually find it on moist sites along the fringe of forests. River birch does not tolerate shade and is very susceptible to fire and drought. It is the only birch native to Mississippi and has some value for stabilizing soil along stream banks. It has a relatively short life span but has a good growth rate and is valuable as an ornamental.

Bignoniaceae: Trumpet-creeper family

Leaves are large, simple, and deciduous. Trees have large, trumpet-shaped flowers. The tree produces winged, flat seeds. Seeds are in a long, thin pod that resembles a pea pod.

Southern catalpa, *Catalpa bignonioides*

Leaves of southern catalpa are large and heart-shaped, 5 to 8 inches long, and 4 to 6 inches wide (Figure 19). They are simple, opposite or whorled, and have entire (smooth) margins. The upper surface is light green and smooth. The underside is pale and slightly hairy. Leaf midribs are thick and very conspicuous. Petioles are also thick and about 5 or 6 inches long.

Figure 19. Southern catalpa leaves are heart-shaped.

Twigs are usually thick and brittle. They are greenish-purple at first, later becoming grayish-brown. Terminal buds are absent. Bark is thin, reddish-brown to gray, and about ¼ to ⅓ inch thick. On older trees, bark breaks into long, thin, irregular-shaped scales.

Large, white flowers are occasionally marked with yellow and purple spots. They contain both male and female parts and appear in May or June in clusters 8 to 10 inches long. They are among the most attractive blossoms of any of our flowering trees. Each flower is about 2 inches in diameter. The fruit is a woody, bean-like pod 6 to 20 inches long and ½ inch in diameter. It stays on the tree until spring, finally splitting into two sides that free numerous seeds. Seeds are flattened and oblong, have pointed wings, and are dispersed by the wind.

Southern catalpa commonly grows 25 to 35 feet tall but may reach a height of 60 feet or more and a diameter up to 3 feet. The trunk is usually short, crooked, and poorly formed. Long, heavy branches form a broad, wide, irregular crown. The wood varies from light to dark brown, is very coarse-grained, and has a distinctive, faint odor like kerosene. Its major attribute is its durability when in contact with the soil. The major use for catalpa wood is fence posts. It is used sometimes for small construction projects, especially where a durable wood is needed.

Southern catalpa occurs naturally from central Mississippi across Alabama to southwestern Georgia and northwestern Florida. However, the tree has been widely planted across the eastern United States. Usually it grows best on more fertile sites and may be found growing naturally along streams and riverbanks. Southern catalpa has been grown in plantations for catalpa (or catawba) worms. These are larvae from the catalpa sphinx moth and are highly prized for fish bait.

Trees grown in the forest seem to have a slower growth rate. For planted trees, growth rate is good to excellent. It tolerates shade. Reproduction is poor from seed, but it sprouts readily. Indeed, catalpa fence posts have actually sprouted after the fences were built. It is very susceptible

to fire. It has become a desirable ornamental because of the showy flowers and large leaves.

Cornaceae: Dogwood family

Trees may have opposite branching pattern, as with dogwoods, or alternate branching, as with gums. Leaves are simple with entire margins. Flowers are in parts of four or five and produce fruit that is a fleshy berry with a hard seed in the center, called a drupe.

Flowering dogwood, *Cornus florida*

Leaves of flowering dogwood are opposite, simple, and deciduous (Figure 20a). They are 3 to 6 inches long, 1½ to 2 inches wide, and oval or oblong with pointed tips. Leaves have arcuate venation, where leaf veins follow the edge of the leaf, making dogwood leaves easy to recognize. Leaves are light green on the leaf surfaces and paler and somewhat hairy on the undersides.

Twigs are green or red, smooth and glossy, and often covered with a delicate, powdery coating. The bark color is dark reddish-brown, dark brown, or black (Figure 20b). It divides into small, somewhat square blocks as the tree matures. These small, flat, scaly blocks give an appearance of alligator leather. You can easily tell dogwood bark from persimmon and black gum (similar in nature) because the blocky pattern is much smaller on dogwood.

Flowers are small and greenish, first appearing when leaves are about half grown. Flowers are perfect, with both male and female parts. The parts typically thought to be flower petals are actually four large, white, petal-like bracts notched at the tip. The true flower, however, is small and inconspicuous and in clusters at the center of these white bracts. Fruit are bright red, drupe-like when mature, and oval; they grow in tight clusters. They are green until they ripen around October. Dogwood fruit are a favorite fall and winter food for deer, wild turkeys, squirrels, and many songbirds. Deer sometimes browse dogwood sprouts.

Dogwood is a small tree, occasionally reaching 40 feet tall with diameter of 1 to 1½ feet. It usually appears as a low, bushy tree 15 to 30 feet in height with diameter of 6 to 10 inches. The trunk is short and does not taper much until the first branches. Branches spread to form a broad, low, flat-topped crown.

The wood is dense, hard, strong, and close-grained. It has light reddish-brown heartwood and wide, pale sapwood. The wood has limited use for specialty items such as shuttle blocks and tool handles. It is used occasionally for engraving work.

It occurs in minor stream bottoms in better-drained areas but rarely in major river or stream bottoms. In the uplands, it is common on better, moist soils that are well drained. Dogwood is shade tolerant and usually occurs as an understory species in mixed hardwood stands.

Figure 20a. Flowering dogwood leaves are simple and opposite, with veins that curve with the leaf margin.

Figure 20b. Mature flowering dogwood bark has a fine, blocky structure that looks similar to alligator hide.

Reproduction is usually good in shade. It has a slow growth rate but is highly prized as an ornamental for its beautiful white spring blossoms. It also has beautiful, dark scarlet foliage in the fall.

Blackgum, *Nyssa sylvatica*

Blackgum leaves are alternate, simple, and deciduous (Figure 21). They are oblong with pointed tips, 2 to 5 inches long, and 1 to 3 inches wide. The leaf margin is entire, the upper surface is dark green, and the underside is pale and hairy. Leaf veins curve forward toward the tip. In autumn, leaves turn golden to a brilliant red. The petiole is reddish and about 1 inch long.

Twigs are orange, red, or reddish-brown, becoming darker with age. Deep furrows divide the bark of mature trees into small square or rectangular blocks. This blocky pattern looks somewhat like alligator hide and is a dark reddish-brown to dark gray. The bark blocks of blackgum tend to be larger than on flowering dogwoods.

The tiny, inconspicuous male and female flowers occur on separate trees, and so the species is dioecious. Male flowers occur on dense stalks with many flowers per stalk. Female flowers occur in more open clusters with few flowers per cluster. The fruit is a round, dark blue drupe, ½ inch in

Figure 21. Blackgum leaves are simple and oblong with pointed tips.

diameter. Fruit is clustered on stalks about 1½ inches long and is fleshy with a bitter taste. The hard seed in the fruit is slightly ribbed. Many types of birds, including quail, turkeys, and ducks, eat the fruit. Deer, foxes, beavers, black bears, raccoons, squirrels, and other small mammals also feed on it. White-tailed deer enjoy young sprouts.

Blackgum is usually a medium-sized tree, 40 to 70 feet tall with a trunk diameter of 1 to 3 feet. However, it may reach a height of 100 feet with a trunk diameter of 4 or more feet. In the forest, the trunk is straight and does not branch until far into the crown. Crown shape varies from cone-shaped to flat-topped or rounded. Branch angle is usually perpendicular to the main stem.

The wood is hard, moderately dense, and moderately durable. Since the wood is somewhat weak, it is not used where wood strength is needed. It is hard to dry without shrinking and warping. However, blackgum wood is being used increasingly. High grades are used in televisions, entertainment centers, and other furniture. It is used for making crates, interior parts of furniture, and railroad ties when treated. It is a good pulpwood species, used to make high-grade book and magazine papers. At one time, sections of hollow blackgum were used as beehives. Early settlers sawed hollow trunks into sections and sealed them with flat boards to create hives. Blackgum twigs were also used for toothbrushes due to the fibrous nature of the broken wood.

Blackgum occurs throughout bottoms but only on higher sites that are better drained. It generally occurs in smaller stream and creek bottoms. In the uplands, it is widely scattered, with best development on lower slopes and coves. It may occur on ridges and dry sites, but the form on these sites is very poor, and it does not develop into a significant tree. It is moderately intolerant of shade and exhibits slow to medium growth rate. Even though seeds are widely scattered by birds, reproduction is rather sparse.

Water tupelo, *Nyssa aquatica*

Water tupelo leaves are alternate, simple, and deciduous (Figure 22). They are oblong, 5 to 12 inches long, and 2 to 4 inches wide. The margins are usually smooth and occasionally have one or two scalloped teeth. The leaf is a dark, lustrous green on the upper surface, pale and somewhat hairy on the lower surface. Leaf veins point forward toward the tip, and the petiole is stout, grooved, hairy, swollen at the base, and about 2 inches long.

Twigs are dark red and, at first, covered with light, tiny hairs, but they soon become smooth. The bark has long, deep furrows that form ridges roughened on the surface by small scales. It is brown or grayish-brown, thin, and about ¼ inch thick.

Flowers are small, yellowish, and inconspicuous, appearing before and sometimes with the leaves. The species is dioecious, with male and female flowers appearing on separate trees. Male flowers appear in dense clusters on long, slender, hairy stalks, and female flowers are solitary on short stalks. The fruit is a dark purple, oblong drupe about 1 inch long and marked by conspicuous light dots. It has a tough skin with a bitter flesh. It is on a slender stalk, 3 to 4 inches long, and matures in September and October. The seed is a hard stone, with sharp ridges or wings along its length. Wood ducks, many other birds, squirrels, deer, and other mammals eat the fruit. Deer also feed on foliage and young sprouts.

Water tupelo may reach 80 to 100 feet tall with a trunk diameter of 3 to 4 feet. The base of the trunk may reach very large diameters because it is distinctly swollen in many cases. The base is very similar to the base of baldcypress. It usually has a long, clear trunk with small, spreading branches forming an oblong or pyramid-shaped crown.

The wood is light, soft, close-grained, and not very strong. The wood has an interlocking grain, making it difficult to split. It has a light brown to nearly white heartwood and thick sapwood. Individual trees are often very clear and

Figure 22. Water tupelo leaves are simple and larger than those of blackgum. Also, this tree is found on wetter sites than blackgum.

free of defects. The wood takes stain easily, so it can be used as an imitation for walnut and mahogany. It is used for furniture, veneer, woodenware, fruit and vegetable crates, broom handles, pulpwood, and railroad ties when treated. Wood from the swollen base of the tree is highly desired by wood carvers, particularly those who carve items such as duck decoys. Wood from this base is very light and easy to work. It is also often used for fishing and net floats.

Water tupelo occurs in the swamps and flood plains of rivers and streams. Otherwise, it occurs only near flowing streams, in coastal areas, and along oxbow lakes. In the uplands, it occurs only at heads of streams, branches, or swamps and openings in bottomlands. It is often associated with baldcypress. Water tupelo is not tolerant of shade and has a medium growth rate. Reproduction varies from sparse to heavy, depending on the amount of sunlight and moisture available. Logging costs are very high for tupelo because of the almost year-round swampy condition of its habitat.

Ebenaceae: Ebony family

Leaves are usually simple and alternately arranged. Flowers are arranged in clusters on small stems. Most plants are dioecious, having unisexual (either male or female) flowers on a tree. Fruit often contains tannins for protection against animals feeding on it. Plants in this family have aromatic wood and dark heartwood.

Common persimmon, *Diospyros virginiana*

Leaves of common persimmon are alternate, simple, and deciduous (Figure 23a). They are oblong, 4 to 6 inches long, and 2 to 3 inches wide. The leaf margin is entire, the upper surface is dark green and leathery, and the lower surface is pale. The petiole is stout and about 1 inch long, with a reddish to purplish color.

Twigs are slender and slightly zigzagged. At first grayish to reddish-brown, twigs later become darker and are bitter to the taste. There is no terminal bud, and the lateral buds are small. The bark pattern is easy to recognize. It is dark and deeply divided into thick, rectangular plates or blocks (Figure 23b). It looks like alligator hide, similar to the bark of older blackgum, but much darker—from gray-brown to nearly black.

Flowers are small, green, and inconspicuous. The species is dioecious, with male and female flowers on separate trees, appearing when leaves are more than half grown. Male flowers appear in two to three flowers to a cluster; female flowers appear solitary. The fruit is a round berry that contains tannins when green, and so is very astringent. When ripe, the fruit is orange-red, soft, and sweet. The fruit rots very quickly after dropping and contains four to eight flattened seeds. The fruit matures from September to November and may remain on the tree until midwinter. Many species of wildlife eat it, including small mammals, songbirds, game birds, deer, and wild hogs.

Persimmon varies a lot in growth, depending on the site. On a good site, it can grow 60 to 100 feet tall with diameter of 1 to 1½ feet. In the forest on good sites, the trunk can be very tall, slender, and free of limbs for two-thirds of its total height. On poorer sites, the trunk is short, with spreading branches and an irregular crown, and it may be nothing more than a shrub or weed tree.

The wood is hard, dense, and strong. It has brown to black heartwood and pale yellow sapwood often streaked with black. Easily polished, persimmon wood was used mainly for golf club heads and shuttles in textile mills. Only a small quantity of persimmon lumber is produced. Some is used in small wood products such as handles for certain tools.

Persimmon occurs widely scattered on sites including wet flats and along the margins of sloughs and swamps. It develops best on newer alluvial areas in large bottoms. In the uplands, it grows best in coves and on lower slopes, but it can also be found on well-drained, sandy ridges.

Reproduction is very sparse but occurs even in the understory. It sprouts well from the stump and is one of

Figure 23a. Common persimmon leaves are simple and have petioles that remain reddish through the growing season.

Figure 23b. Common persimmon bark has a blocky structure.

the most fire-resistant hardwoods, but its growth rate is slow. Persimmon is frequently planted as an ornamental or fruit tree, and sometimes people eat the fruit. Native Americans used to crush and dry the fruit for making certain other foods.

Fabaceae: Pea family

This plant family contains many important crop plants including beans, peas, and soybeans. Plants in this family are leguminous, which means their root systems have symbiotic bacteria that can metabolize atmospheric nitrogen. Leaves are usually compound. Flowers are bilaterally symmetrical. The fruit matures in a pod.

Black locust, *Robinia pseudoacacia*

Black locust leaves are alternate, deciduous, and pinnately compound (Figure 24). A pair of small thorns occurs at the base of the leaf. Leaves are 8 to 11 inches long and have 7 to 19 leaflets. A leaflet is 1½ to 2 inches long and ½ to 1 inch wide, with an abrupt point or notch at the tip. Leaflets are dark bluish-green and smooth on the upper surfaces and paler below.

Twigs may be slender or stout, are somewhat brittle, grow in a zigzag pattern, and often have a pair of stipules at the bases of leaves. Bark is reddish-brown to dark brown, slightly cracked, and furrowed on young trees, becoming more deeply furrowed on old trees.

Flowers appear when leaves are nearly full-grown. They are perfect (male and female parts within the same flowers). The whitish, fragrant flowers are about 1 inch long and hang in drooping clusters on 4- to 5-inch stems. There is a natural variant that has pink flowers.

The fruit is a dark brown, thin pod containing four to eight seeds. It is 2 to 4 inches long and ½ inch wide. It resembles a long, thin butterbean. Bobwhite quail, other game birds, deer, and squirrels eat the seeds. Deer browse foliage during the seedling stage. The wide-spreading root system sends up sprouts that aid in naturally restocking open and abused land after operations such as mining.

Black locust may grow 70 to 80 feet tall and have diameters of 3 to 4 feet, but it is most commonly a smaller tree. Black locust has heavy limbs and often has branches close to the ground. The crown is usually narrow, oblong, and open. In the forest, the trunk may be free of branches for three-fourths of its length.

The wood is very hard, dense, strong, and durable. The heartwood is brown or greenish-yellow when first cut, and sapwood is pale yellow. The wood resists shock, holds nails well, and resists decay very well. It is difficult to work with hand tools because of its high silica content. Black locust wood is used for fence posts, poles, ties, mine timbers, and stakes. It is also used for boxes, crates, woodenware, and novelties. Sound, straight pieces are prized for use in pole barns.

Black locust occurs in small groups or singly in forest stands usually as a dominant tree. On burned-over or cleared land, it often occurs as a pioneer species and develops pure stands or locust thickets. The best growth of black locust in Mississippi is in the Loess Bluffs. Black locust does not tolerate shade and is not found as an understory species in dense woods. It has a medium to good growth rate, especially up to a few inches of diameter. It is planted for windbreaks, erosion control, mine reclamation, and fencepost production.

Eastern redbud, *Cercis canadensis*

Leaves of eastern redbud are alternate, simple, and deciduous (Figure 25). They are 3 to 5 inches long and wide, and the leaf margin is entire. They are heart-shaped, bright green on the surface, and smooth underneath except for a few scattered tufts of hair. The petiole is slender, 2 to 5 inches long, and slightly swollen at the point where it joins the leaf blade.

Figure 24. Black locust leaves are pinnately compound. The twigs have stipules with thorns at the bases of leaves.

Figure 25. Eastern redbud leaves are simple and heart-shaped.

Twigs are slender and slightly angled or zigzagged. They are first a light brown, becoming grayish-brown as the tree matures. Terminal buds are absent. The bark is thin, smooth, and brown, becoming darker and slightly furrowed, forming long, narrow plates that break up into thin scales on older trees.

Redbud is probably best known for its flowers. The flowers are light pink to bright purplish-red. Each flower has both male and female parts. They appear in early spring in clusters of four to eight before leaves emerge. Each flower is about ½ inch long, on a stalk about ½ inch long. The fruit is a thin, bean-like pod, 2½ to 3½ inches long, and it often remains on the tree throughout winter. Pods contain small, flattened, brown seeds about ¼ inch long.

Redbud is usually a shrub or small tree typically reaching a height of 23 to 30 feet with a trunk diameter under 10 inches. The trunk usually branches within 10 to 15 feet of the ground, forming a wide, flat crown. When grown as an ornamental, the crown is probably more uniform in shape.

Redbud is widely planted as an ornamental because of its showy flowers. It is one of the earliest blooming trees. Its flowers add beauty to the countryside in spring. Occasionally, squirrels eat the seeds, and deer may browse it. The wood has no commercial value, and trees rarely reach commercial size. It is tolerant of shade. Transplanted seedlings appear to grow well if planted properly.

Redbud frequently occurs along margins of woods and edges of fields, near streams, and in fertile bottoms. In the spring, you can easily spot it along roads and highways. It is rarely found on the Delta flood plain, and it is very sparse on high, dry upland sites.

Honeylocust, *Gleditsia triacanthos*

Honeylocust leaves are alternate and deciduous. They are either pinnately compound or doubly compound, often on the same branch (Figure 26a). The leaves are often confused with those of black locust. A major difference is that honey locust leaflets are much smaller than those of black locust. Leaflets are oval, ⅝ to 1 inch long, and about half that width. The numerous honey locust leaflets are smooth and dark green on the upper surfaces and yellowish-green on the lower surfaces.

Twigs are stout, zigzag-shaped, smooth, and shiny. The area where the petiole joins the twig is usually enlarged. Twigs become greenish-red to brown and are armed with large, sometimes branched thorns (Figure 26b). On old trunks, bark is grayish-brown to nearly black. It is sometimes smooth but usually roughened by a few furrows and thick, firm, broad ridges. Sometimes even bark on trunks is covered by many of the large three-branched thorns. The bark is often divided into narrow, flat plates and appears cracked and scaly on older trees. Thorns often grow on branches and the trunk.

Small, greenish or whitish flowers appear in narrow clusters 2 to 2½ inches long in the late spring. The fruit is a legume and is a twisted, flat, reddish-brown pod that does not split open. Pods are between 6 and 18 inches long and contain yellowish pulp with several seeds. Rabbits, squirrels, bobwhite quail, and white-tailed deer eat the fruit, and young plants are a preferred food of rabbits. Cattle and deer eat the seedpods, and bees sometimes feed on the flowers. The seeds are high in protein and phosphorus.

The tree will reach a height of 75 to 80 feet and up to 2 to 3 feet in diameter. However, it is usually found as a smaller tree. When open-grown, the trunk is usually short with a rounded crown. In a forest, the trunk is tall and rather free of limbs, with a broad, rounded crown with lateral branches drooping somewhat.

The wood is hard, dense, strong, stiff, and very shock resistant. It is hard to work with tools and tends to split. It is durable under wet conditions. Sapwood is narrow and creamy white, contrasting with the bright, reddish-brown heartwood. Sapwood is not as durable as heartwood. Honeylocust wood has about the same density as that of red oak. It is used for some interior furniture parts, interior trim, pallets, containers, and skids.

Figure 26a. Honeylocust leaves are pinnately or doubly compound.

Figure 26b. Honeylocust often grows thorns on the branches and trunk.

Honeylocust occurs on a wide variety of sites, from rich bottoms to mountain slopes to prairie soils. In Mississippi, you usually find commercial-sized honeylocust only in the Mississippi River Valley area and adjacent bluffs. Honeylocust is not especially susceptible to insects or disease but is easily damaged by fire. It is relatively intolerant of shade. Honeylocust has been in cultivation for many years and is often planted as an ornamental, especially a thorn-less type developed by grafting.

Fagaceae: Beech family

Trees in this family produce a cylindrical, wind-pollinated flower called a catkin. The fruit is a nut in a husk or cup-like cap. Leaves are simple, alternately arranged, and often lobed. This family includes the oaks.

American beech, *Fagus grandifolia*

American beech leaves are simple, alternate, and deciduous (Figure 27a). They are pale yellowish-green, oblong, coarsely toothed, 3 to 6 inches long, and 1 to 3 inches wide. The teeth on leaf margins are located only at ends of leaf veins. Veins are very evenly spaced and parallel to each other. This distinctive pattern is very conspicuous and helps in identifying the species. Although deciduous, leaves are persistent, turning tan to copper during autumn, often remaining on the tree through the winter. This makes identification easy in the winter.

Twigs are slender, dark yellow or gray at first, and somewhat hairy. They later become gray and smooth or zigzagged. Slender, sharply pointed, brown buds on twigs resemble tiny cigars. Bark is smooth, gray, and thin (Figure 27b). The tree is unique in that the bark grows as it ages, remaining smooth. Consequently, people often choose to carve their initials into this tree.

Both male and female flowers are on the same tree. Flowers usually open when leaves are about one-third developed. Male flowers occur in drooping clusters of many flowers. Female flowers occur in clusters of two on short, wooly stalks. Both flowers are very small and inconspicuous.

The fruit is called a beechnut. It has a prickly husk about ¾ inch long that is produced from September to November. When ripe, the husk opens to reveal two small, brown, triangular nuts. Many species of birds and mammals, including squirrels, bears, wild turkeys, deer, and occasionally quail, eat beechnuts. Large beech trees also provide den habitat for squirrels and other mammals.

American beech often reaches a height of 60 to 80 feet and 2 to 3 feet in diameter. However, it may reach a height of 120 to 150 feet and a diameter of 4½ feet in rare cases. In the open, the trunk is short and thick and breaks up quickly into numerous spreading limbs and slender, drooping branches, forming a broad, round-topped crown. In the forest, the trunk is often tall and slender, free of branches, with a narrower crown. Beech form is usually not as good as most other trees.

The wood is hard, dense, and light. It is strong and tough but not durable. Heartwood is light red, and sapwood is light in color. The wood is denser than most hardwoods and is easily recognized by its conspicuous rays and tiny pores. It is difficult to work with tools and difficult to dry. It is used widely for brush handles as well as flooring in gymnasiums, factories, and other commercial structures. The furniture industry uses beech because of its excellent finishing characteristics and generally light color. It is also used for woodenware, novelties, toys, barrels, and clothespins. It is especially good for containers, since it does not have any taste or color. An unusual market for beech is for chips used in brewing and aging certain types of beer.

American beech occurs most commonly on rich, moist bottomlands, but you can also find it on rich upland soils in coves and along streams. American beech is the only member of its genus in the U.S. It is very slow-growing and very tolerant of shade. Rarely found in great abundance, it is usually observed as scattered, solitary

Figure 27a. American beech leaves have parallel veins and a dentate margin, with a tooth appearing at the end of the leaf vein.

Figure 27b. American beech bark grows with the tree, and so remains smooth.

trees or in small groups. The tree makes a good ornamental, but it is difficult to grow grass beneath its shade.

Fagaceae, Genus *Quercus* spp.

Oak trees dominate hardwood forests of the northern hemisphere. They have significant importance for commercial forestry as well as wildlife. The oaks in this guide occur in two sections, red oaks and white oaks. There are common characteristics among oaks in these groups.

Subgenus *Quercus*, Section *Lobatae*: Red Oaks

The red oaks have a bristle tip on their leaf lobes, buds that are pointed, and acorns that mature in 18 months. The tree bark color tends toward dark gray to black. In addition, the acorn linings are hairy, and the nuts are bitter because they have a high tannic acid content.

Black oak, *Quercus velutina*

Black oak leaves are alternate, simple, and deciduous (Figure 28). They are 5 to 7 inches long and 3 to 5 inches wide. They have five to seven bristle-tipped lobes. Sinuses between lobes are C-shaped and do not go more than halfway to the midrib. Leaf surfaces are lustrous green, and undersides are copper green with tufts of hair where veins join the midrib. Petioles are stout and quite long, about 3 to 5 inches.

Twigs are stout, pale, and usually smooth, and they become dull reddish-brown to nearly black. Bark is dark brown and smooth on younger trees, becoming thicker and black and dividing into broad, deeply furrowed scales on older trees. It is rich in tannin, and the bright yellow inner bark is a source of quercitron, a yellow dye.

Both male and female flowers occur on the same tree. Male flowers grow in 4- to 5-inch clusters on growth of the preceding season. Female flowers are usually in groups of two or three, occasionally solitary, on short, hairy stalks. The fruit is an acorn about ½ to ¾ inch long, with approximately half of its length enclosed in the acorn cup. A variety of birds and mammals use the acorns.

Black oak often reaches 70 to 80 feet tall and occasionally up to 150 feet, with a trunk diameter of up to 3 to 4 feet. The tree has good form in the forest, and branches spread into a rounded crown in the open. The wood is hard, dense, strong, and coarse-grained, with light reddish-brown heartwood and lighter sapwood. Black oak is used to make furniture, barrels, boxes, crates, crossties, and timbers. Black oak is sparse and widely scattered on only the oldest alluvial soil and drier sites in bottomlands, mostly in northern Mississippi. It is more common in uplands on better pine sites in the northern part of the state. You usually find it on various upland sites in mixed stands.

Black oak is very shade intolerant, and reproduction is only fair in openings. Growth rate is medium to good on the best sites. It has a greater-than-average susceptibility to diseases and insects on poor sites.

Blackjack oak, *Quercus marilandica*

The leaves of blackjack oak are alternate, simple, and deciduous (Figure 29). They are 6 to 7 inches long and 2 to 5 inches wide. They usually have three large, rounded lobes. These lobes are not as obvious as those of some of the other red oaks, but the bristle tips are still visible. Leaves are dark yellow-green on the upper surface and orange and hairy on the lower surface, with an obviously thick midrib. The petiole is stout and about ½ inch long.

Twigs are at first coated with thick, pale, wooly hairs and later become dark brown and rather rough. Ultimately, they will be brown or ashy gray. The bark is about 1 to 1½ inches thick, very rough and hard, usually dark brown or black, and separated into square-shaped plates.

Blackjack oak is usually a small tree, rarely growing over 40 feet tall. Branches remain on the tree even after they die. These dead branches droop down, giving the tree a very rough and scraggly appearance. Trunk diameter is rarely

Figure 28. Black oak leaves are lustrous green above and coppery below.

Figure 29. Blackjack oak leaves are somewhat spatula-shaped.

more than 12 inches. Crowns may be narrower and more compact in the forest, but form is still very poor.

Reddish male and female flowers appear on the same tree along with leaves in the spring. Male flowers are in 2- to 4-inch clusters, and female flowers are on short, rusty stalks. Fruit is a pale, chestnut-brown acorn that matures during its second year. It is ¾ inch long, and one- to two-thirds of its length is enclosed in a thick cup. The cup has reddish-brown, loosely overlapping scales. Squirrels, deer, and other wildlife feed on blackjack acorns.

Blackjack oak commonly occurs on high, dry sites. It usually grows in abundance on these areas, where few other trees can survive. It is a very good indicator species. If blackjack is predominant, you can be sure the soil is dry, sandy, and infertile. Because of its habitat, it usually has a very slow growth rate. It is one of a group of oaks called scrub oaks, which foresters often try to eliminate in pine reproduction efforts.

Blackjack is usually considered a weed tree that hampers production of better timber. It is usually chemically deadened in timber stand improvement operations. The wood is dense, hard, and strong with dark, rich-brown heartwood and thick, lighter-colored sapwood. Its wood is used mostly for posts, fuel, and charcoal.

Bluejack oak, *Quercus incana*

Bluejack oak leaves are alternate, simple, and deciduous. They are 2½ to 4½ inches long and ¾ to 1¼ inches wide. They are similar in shape to willow oak leaves but are bluish-green on the surface and wooly or hairy on the underside (Figure 30). They are somewhat thickened and tend to curl under slightly at the edges. They have a stout, yellow midrib, and the petiole is ¼ to ½ inch long.

Young twigs are very hairy and wooly. Later, they become smooth and gray to dark brown and finally darker. The buds are about ¼ inch long, and bark is ¾ to 1½ inch thick. It is divided into thick, square plates about 1 to 2 inches long, covered by dark brown to nearly black scales.

Male and female flowers are on the same tree. Male flowers appear in wooly clusters 2 to 3 inches long and are reddish and become yellow as they open. Reddish female flowers appear on short, wooly stalks. The fruit is an acorn that ripens its second year, occasionally appearing on branches that are 3 to 4 years old. It is about ½ inch long, light brown to dark brown, and covered with small, grayish hairs. About one-third of the acorn is enclosed by the cup. Bluejack oak is a prolific acorn producer, considering its small size. It is also fairly consistent in acorn production from year to year. A variety of wildlife eat the acorns.

Bluejack oak has very poor form. It is a small tree, usually around 15 to 20 feet tall with a trunk of less than 12 inches in diameter. It has stout branches that form a narrow, irregular crown. On the very best sites, it may grow 60 to 75 feet tall, with a trunk diameter of 18 to 20 inches.

Bluejack oak occurs on dry, sandy ridges, pine barrens, and some dunes on Mississippi's Lower Coastal Plain. It also occurs on the rich, moist soils of Pine Flats. It has a slow growth rate and is somewhat tolerant of shade. Since bluejack oak is a very low-quality tree, it may be removed in site preparation operations. However, it is one of the few oaks that grow well on very low-quality sites in the Lower Coastal Plain. It does grow well as an understory tree in longleaf pine stands. The wood is hard, strong, and close-grained and has light reddish-brown heartwood and dark sapwood. Bluejack oak wood has little or no commercial value except for firewood and fence posts.

Cherrybark oak, *Quercus pagoda*

The leaves on cherrybark oak are alternate, simple, and deciduous. They are 6 to 8 inches long and 4 to 6 inches wide. They have 7 to 11 bristle-tipped lobes. The surface of the leaf is glossy green, and the underside is paler and hairy. The cherrybark leaf has a pagoda-shaped base, with V-shaped lower sinuses (Figure 31a).

Twigs are hairy or wooly the first winter and later become dark reddish-brown. The bark is about 1 inch thick and is

Figure 30. Bluejack oak leaves are lanceolate (lance-shaped) and blue-green.

Figure 31a. Cherrybark oak leaves have a pagoda-shaped base.

Figure 31b. The bark on mature cherrybark oak resembles that of black cherry, giving this tree its common name.

roughened by small, closely oppressed, plate-like scales (Figure 31b). It resembles the bark of older cherry trees, hence its common name. The bark is dark grayish-black; broken into long, shallow furrows; and rich in tannins.

The flowers are very similar to those of southern red oak. Fruit is an acorn about ½ inch long and ⅜ inch across. The acorn cup is saucer-shaped and encloses about one-fourth of the acorn. Acorns are valuable to a wide variety of birds and animals.

Cherrybark oak may reach heights of 120 to 130 feet and diameters of 3 to 5 feet. It is the largest of the red oak group. In the forest, it has a tall, clear trunk and a short, narrow crown. In the open, it has a wide-spreading crown. The wood is dense, hard, and strong. It has light reddish-brown heartwood and thin sapwood. Cherrybark oak has excellent form, and the wood is high in value. It is used for veneer, furniture, factory lumber, and other secondary uses such as barrels and crossties.

Cherrybark oak occurs on rich bottomlands; on good, loamy sites; and in better-drained creek bottoms. Occasionally you find it on silty clay flats and low ridges, but it does not do as well on these sites. It also occurs widely in the uplands on better sites that are rich, moist, and well drained. It does not do well on medium-quality upland sites and does not occur on poor, dry sites. The growth rate is good to excellent. It is not shade tolerant but reproduces easily with adequate light. It also sprouts efficiently and shows some promise for planting.

Laurel oak, *Quercus laurifolia*

Laurel oak leaves are alternate, simple, and semi-evergreen since they remain on the tree until spring (Figure 32). They are 2 to 4 inches long and ½ to 1 inch wide. The leaves are lance-shaped, oblong, or diamond-shaped (rhomboid). Leaf margins are usually entire and seldom have lobes or teeth. There is a bristle-tip at the leaf apex. The leaf surface is a lustrous green, and the underside is lighter with an obviously yellow midrib. The leaf is shiny on both sides. These characteristics distinguish the laurel oak leaf from the live oak leaf. Petioles are stout, yellow, and about ¼ inch long.

Twigs are slender, dark red, and shiny at first, later becoming reddish-brown or dark gray. Terminal buds are about ⅒ inch long and are covered with lustrous, red-brown scales. Bark is dark brown, possibly tinged with red, and slightly scaly on young trees. On older trees, the bark is thicker, nearly black, and divided by deep furrows into broad, flat ridges.

Male and female flowers occur on the same tree. Male flowers are borne in hairy clusters 2 to 3 inches long, and reddish female flowers appear on stout, smooth stalks. The fruit is an acorn, generally solitary, about ½ inch long. One-fourth of its length is enclosed in a saucer-shaped cup. Acorns are eaten by a variety of wildlife.

Laurel oak is usually a small- to medium-sized tree but will occasionally reach 50 to 70 feet in height and 2 to 3 feet in diameter on good sites. The crown is dense and evenly rounded with slender branches. Laurel oak is not very highly regarded as a timber tree and is usually removed in modern forestry practices. The wood is dense, very strong and hard, and coarse-grained. It has dark, reddish-brown heartwood and thick, lighter-colored sapwood. It is used locally in the southern part of the state for pulpwood or firewood. Laurel oak is commonly used as an ornamental tree.

Laurel oak occurs mostly on bottomland sites on wet flats, on margins of swamps, and occasionally on low ridges. It primarily grows near the coast and is not found in north Mississippi. A very similar species, the Darlington oak (*Quercus hemisphaerica*), is found on drier, upland sites.

The growth rate of laurel oak is good to excellent, usually maturing in about 50 years. It does not tolerate shade. With plentiful light, reproduction occurs mainly by seed because the species does not sprout well. It is also susceptible to fire and insects.

Figure 32. Laurel oak leaves are semi-evergreen and shiny on both sides. The leaf may have a diamond (rhomboid) shape, giving rise to another common name for this tree, diamond-leaf oak.

Northern red oak, *Quercus rubra*

Northern red oak leaves are alternate, simple, and deciduous. They are 5 to 9 inches long and 4 to 5 inches wide, with 7 to 11 bristle-tipped lobes. Sinuses tend to be shallow (less than half the distance to the midrib) and C-shaped (Figure 33). The upper surface of the leaf is green and smooth, and the lower surface is pale. The leaves turn a rich red in the fall. Petioles are about 1½ inches long, stout, and reddish.

Twigs are green to reddish-brown, smooth, shiny, and stout. Brown terminal buds may be smooth or slightly hairy and are about ¼ inch long. The bark is smooth on young trees, changing to gray-brown or black with age. On old trees, furrows separate bark into flat ridges. Male and female flowers appear on the same tree. Male flowers occur in hairy clusters 4 to 5 inches long, and female flowers are solitary or paired on short stalks. The fruit is a chestnut-brown acorn, borne solitary or in pairs. It is ¾ to 1¼ inches long. The shallow, saucer-shaped cup encloses about one-fourth of the nut.

Northern red oak is usually a medium-sized tree, 60 to 70 feet tall and 2 to 3 feet in diameter. It usually has a short, massive trunk. Occasionally you may find it as a taller tree reaching more than 100 feet. In dense forest stands, the trunk grows into a narrow, round-topped crown. In the open, the trunk is short and massive and soon divides into stout limbs, forming a broad crown. The wood is hard, dense, strong, and close-grained. Northern red oak has pale, reddish heartwood and paler sapwood. The wood is used for furniture, interior finishing, crossties, posts, timbers, and general construction.

Northern red oak occurs on well-drained sites on the north end of the Delta area as well as in northern Mississippi. In the uplands, it is found on the best moist, deep soils of middle to lower slopes, bluffs, and coves. It is rarely found on drier sites and is usually found only in the northern part of the state. It does not like shade and has a medium to good growth rate. Reproduction is relatively easy to accomplish with adequate light.

Figure 33. Northern red oak leaves are broad with shallow sinuses.

Nuttall oak, *Quercus texana*

Leaves of Nuttall oak are 5 to 9 inches long and have five to nine lobes. The upper pair of lobes is usually largest, and the bottom pair is separated by deep U-shaped sinuses (Figure 34). Leaves are a dull, dark green on the upper surface and paler and nearly hairless on the lower surface.

Twigs are smooth and olive green to reddish-brown on younger stems and become gray with age. Buds are about ¼ inch long with gray-brown scales. The bark is dark brown, slightly furrowed, and broken into flat ridges with tight scales.

Male and female flowers appear on the same tree, usually from March to May. The fruit is an acorn that may appear alone or paired, ¾ to 1⅓ inches long and ½ to 1 inch wide. About one-fourth to half of the acorn is enclosed in the acorn cup. Nuttall oak is one of the best mast producers in the red oak group. Acorn crops rarely fail, and many acorns remain on trees until late winter. Squirrels have a ready supply of acorns from Nuttall oak during winter floods. Deer and turkey also like the acorns.

Nuttall oak is normally a medium-sized tree, growing 60 to 80 feet tall. However, it can grow up to 100 feet in height with a 3-foot diameter.

The wood is dense, hard, and strong. However, it is difficult to dry and tends to crack and split when seasoned. Nuttall oak wood is acceptable for factory lumber but is not used for ties and timbers since it splits too easily. On rare occasions, the timber is used for veneer.

Nuttall oak has a very limited distribution ranging from the Missouri Bootheel south through Arkansas, Louisiana, and Mississippi. It ranges east into south-central Alabama and west into Texas in isolated pockets. It is limited to bottoms of major streams that enter the Gulf and larger tributaries of these streams. It is found on flats, low ridges, shallow sloughs, and margins of swamps, but not in the uplands. Nuttall oak also makes a fine ornamental on such sites.

Figure 34. Nuttall oak leaves have deep U-shaped sinuses beyond the first lobes closest to the base.

Nuttall oak has a good to excellent growth rate and does not like shade. It is a prolific seed producer, but flooding in the growing season can kill young seedlings. Even large and mature trees are sometimes killed by severe drought or lowered water table.

Scarlet oak, *Quercus coccinea*

Scarlet oak leaves are alternate, simple, and deciduous. They are 3 to 7 inches long and 2 to 5 inches wide. The leaf base is flatter than those of most other oaks. Leaves may have five to nine, but usually seven, bristle-tipped lobes. Lobe tips usually have multiple bristles. Sinuses are deep (more than half the distance to the midrib vein) and C-shaped (Figure 35). Upper leaf surfaces are lustrous bright green, and undersides are pale green with tufts of hair where veins connect to the midrib. Petioles are slender, 1 to 2 inches long. Terminal buds are reddish.

At first, twigs are slender, smooth, shiny, and light reddish-brown or grayish-brown. Eventually, they become dark brown and are covered with pale lenticels (pores). The bark is smooth on young stems and branches, becoming darker and rough on older trunks. It is ½ to 1 inch thick, divided by shallow furrows and irregular ridges, and covered by small, brown scales.

Both male and female flowers appear on the same tree, usually when leaves are about half grown. Male flowers appear in hanging clusters 3 to 4 inches long on growth of the preceding season or from the terminal bud. Female flowers appear in groups of two to three or alone on short stalks in leaf axils of the current season. The fruit is a pale reddish-brown acorn, solitary or in pairs. It is ½ to 1 inch long, and about one-third to half of its length is enclosed in the thin, reddish-brown cup. A distinct, identifying feature of the acorn is concentric rings around the apex. Acorns are generally of the same value to wildlife as most other red oaks.

Scarlet oak usually grows to 70 to 80 feet in height with comparatively small branches spreading to form narrow, open, and irregular crowns. A few trees reach a height of 150 feet with diameters up to 4 feet. The wood is strong, dense, and coarse and has very prominent, conspicuous rays in cross-section. It has similar uses to the other red oaks. Scarlet oak wood is used for general construction, interior finishes, furniture, crossties, and timber.

Scarlet oak occurs in scattered fashion on dry, light, sandy upland soils, mostly in northern Mississippi. As its name implies, scarlet oak produces beautiful scarlet foliage in the fall. Consequently, it is also desirable as an ornamental on upland sites.

Shumard oak, *Quercus shumardii*

Shumard oak leaves are alternate, simple, and deciduous. They are 6 to 8 inches long and 4 to 5 inches wide with seven to nine multiple-bristle-tipped lobes (Figure 36). They have a dark green, smooth surface and are paler underneath with tufts of hair where veins join the midribs. The petioles are smooth and about 2 inches long.

Twigs are moderately stout, smooth, and grayish-brown. Terminal buds are about ¼ inch long and grayish-brown. Bark is thick with light gray, scaly ridges separated by deep, darker furrows.

Male and female flowers appear on the same tree. Male flowers occur in 6- to 7-inch clusters, and female flowers are either solitary or paired on slightly hairy stalks. The fruit is an acorn ¾ to 1 inch long and ¾ inch in diameter. Acorn cups vary from saucer- to cup-shaped and enclose about one-fourth of the nut. They may be found solitary or in pairs and are used by a wide variety of wildlife.

Shumard oak becomes a large tree, up to 90 to 125 feet in height and 4 to 5 feet in diameter. In the forest, trunks are straight and clear of limbs up to one-half or more of the total height. In the open, it has a short trunk and a broad crown. The wood is dense, hard, and strong. Shumard has some of the best qualities of all red oaks and is used for high-quality veneer, furniture, factory lumber, barrels, and crossties.

Figure 35. Scarlet oak leaves have deep sinuses and a flat base.

Figure 36. Shumard oak leaves have deep sinuses and multiple bristles on lobe tips.

Shumard oak occurs in deep, rich bottoms and along streams and is usually restricted to better ridges in older alluvial areas. You rarely find it on younger soils. It is widely distributed but never in great abundance in the bottomlands. In the uplands, it is located on the best ridge sites and on lower slopes. Shumard oak tolerates a wide range of soil pH, including alkaline soils. A former national champion Shumard oak is located on the Noxubee Wildlife Refuge in Noxubee County, Mississippi.

Shumard oak has a good to excellent growth rate. It is intolerant of shade. It reproduces easily in full sunlight. It competes well against ground vegetation, and the tree sprouts well. It also shows some promise for planting.

Southern red oak, *Quercus falcata*

Leaves of southern red oak are simple, alternate, and deciduous. They are 3 to 9 inches long and 4 to 5 inches wide. The leaves usually have three to five and sometimes seven bristle-tipped lobes (Figure 37). They are a lustrous, dark green on the surface and rusty-colored and hairy on the lower surface. Leaf bases are almost always bell-shaped. Petioles are flat and slender and up to 1 to 2 inches long.

Twigs are at first hairy and orange, becoming a dark red or reddish-brown by autumn, and finally becoming a reddish-brown or ash-gray. The bark is about ¾ to 1 inch thick and dark brown to dark gray. Shallow furrows divide it into broad ridges covered with thin, closely oppressed scales. Male and female flowers occur on the same tree. Male flowers are borne in 3- to 5-inch clusters, and female flowers are found on shorter clusters. The fruit is an acorn about ½ inch long. It is found solitary or in pairs, and one-third of its length is enclosed in a shallow, thin cup. Many kinds of birds and mammals eat the acorns.

Southern red oak grows to as much as 100 feet tall but is usually found 60 to 80 feet in height with diameters of 2 to 3 feet. In the open, it typically has large, spreading branches forming a broad, round-topped crown that make it an excellent shade tree. In the forest, the trunk is usually clear but not very long, and the crown is fairly narrow.

The wood is hard, strong, and coarse-grained with light red heartwood and thick, lighter-colored sapwood. It is used commonly for boxes, barrels, crates, furniture, and fuel. It is also used for crossties and large timbers. Some of the best trees on good sites produce good factory lumber and sometimes veneer logs. The bark, rich in tannin, has been used in the past for tanning leather and as an astringent in certain medicines.

Southern red oak usually occurs on dry, sandy clay soil in the uplands. It is very common on dry ridge tops and upper slopes. Its best development occurs on deep, rich, well-drained slopes in the uplands. It is not typically a bottomland species but is sometimes found on the oldest terraces. It has a medium growth rate when grown on reasonably good sites. Reproduction is easy with adequate light, and it also sprouts prolifically.

Water oak, *Quercus nigra*

Water oak leaves are alternate, simple, and usually deciduous, but sometimes they don't drop until late winter. They are 2 to 4 inches long and 1 to 2 inches wide. The variable-shaped leaves may be narrow and without lobes or may have a slightly lobed appearance at the apex (Figure 38). They are a dull blue-green on the surface and paler below, sometimes with rusty tufts of hair at bases of the leaf veins. Twigs are slender, smooth, and reddish-gray, becoming grayish-brown their second year. Buds are less than ¼ inch long and reddish-brown. Bark is smooth and brown on younger trees, becoming dark gray with rough, scaly ridges as the tree matures.

Reddish male and female flowers appear on the same tree during spring or shortly before leaves emerge. Male flowers occur in hairy-stemmed clusters 2 to 3 inches in length and female flowers on a short stalk. Fruit is an acorn, occurring solitary or in pairs. The acorn is ⅓ to ⅔ inch long, and a third to half of its length is enclosed in

Figure 37. Southern red oak leaves have three to five lobes with bristle tips and are bell-shaped at the base.

Figure 38. Water oak leaves are simple and ovoid (egg-shaped) with or without lobes at the apexes.

a shallow acorn cup. Acorns usually drop by December. Water oak is usually considered a very dependable acorn producer. Deer, squirrels, quail, turkeys, and other wildlife eat the acorns.

Water oak usually reaches a height of 80 feet but occasionally may be 125 feet or more on good sites, with a trunk diameter of 2 to 3½ feet. On good sites in the forest, it has a tall, slender, straight trunk. The species nearly always has numerous small branches and twigs, which make a very dense crown. When grown in the open, it has a shorter trunk and a rounded crown. The wood quality is dense, hard, strong, and close-grained. It has light brown heartwood and thick, lighter sapwood. Its wood is used for factory lumber, crossties, timbers, and fuel.

Water oak occurs widely on loamy ridges, bottoms, silty clay flats, and terraces. In the uplands, it occurs on all sites except the very wettest. Best development in the uplands is on lower slopes. It has very poor development on high, dry sites. A former national champion water oak is in Itawamba County, Mississippi.

Water oak is intolerant of shade, but reproduction is excellent with adequate light. It has a good to excellent growth rate on good sites. It has a relatively short life span. This tree is susceptible to fire at all stages of its life, and insect and disease damage is common. The species is extensively planted as an ornamental tree because it grows quickly and provides good shade.

Willow oak, *Quercus phellos*

Willow oak leaves are alternate, simple, and deciduous. They are 2 to 5 inches long and about ½ to 1 inch wide. Leaf margins are entire (smooth). Leaf shape is somewhat like a willow leaf (long and narrow), giving this tree its common name (Figure 39). They are light green, smooth on the surface, and paler below. The petioles are slender and about ¼ inch long.

Twigs are reddish-brown and slightly hairy at first, later becoming gray and smooth. Buds are brown and ⅒ inch long. Bark is much like a water oak's. It is generally smooth at first and forms shallow furrows that break bark on older trees into irregular plates.

Figure 39. Willow oaks have long, slender leaves similar to those of the willow.

Male and female flowers appear on the same tree and appear just before leaves emerge. Yellowish male flowers appear in slender stemmed clusters 2 to 3 inches long. Reddish female flowers appear on slender, smooth stalks. The fruit is a yellowish-brown acorn, alone or in pairs, approximately ½ inch long and ½ inch in diameter. About a fourth of the nut is enclosed in the acorn cup and is covered with fine, pale hairs. Wildlife value willow oak acorns as much as those of water oak, although willow oak typically does not produce as many.

Willow oak is a large tree, commonly reaching 80 to 100 feet tall and 3 to 4 feet in diameter. In the forest, it has a tall, clear trunk with small branches that form a narrow or cone-shaped, round-topped crown. In the open, it forms a round, symmetrical crown similar to water oak's.

The wood is dense and strong but not quite as hard as some of the other oaks'. Willow oak is rather close-grained. Heartwood is light brown tinged with red, and sapwood is thin and lighter. Willow oak wood is used for factory lumber, crossties, and timbers.

Willow oak occurs widely on ridges and high flats of major bottoms. It is less common in small stream bottoms. It is sometimes found in nearly pure stands in areas with hardpans where drainage is poor. Willow oak is rare in the uplands except where there is a hardpan.

Intolerant of shade, willow oak responds well when released. It is susceptible to fire. The growth rate is generally good to excellent but varies greatly by site. Growth rate on hardpan areas is usually poor to medium. It is an important species because of its good growth rate and wide distribution in bottomlands.

Genus *Quercus* spp.

Subgenus *Quercus*, Section *Quercus*: White Oaks

The white oaks have rounded lobes on their leaves, acorns that mature in 6 months, and rounded buds. Acorns have lower tannic acid content than red oaks, and the inside lining of the shell is hairless. The tree bark is generally light gray, and structure varies from coarse blocks to large plates. In addition, the heartwood in white oaks develop blockages (tyloses) when no longer transporting water. This anatomical characteristic of the heartwood is useful for making water-tight barrels used for aging alcoholic spirits.

Chinquapin oak, *Quercus muehlenbergii*

Chinquapin oak leaves are simple, alternate, and deciduous. They are somewhat elliptical in shape, 3 to 6 inches long and 1½ to 3 inches wide. The margins are coarsely toothed and tend to point toward the leaf apex, but they lack bristles. The leaves are shiny, yellowish-green above and paler below. Its leaves resemble those on the Allegheny chinquapin, giving this tree its common name (Figure 40).

Twigs are brown the first year, turning gray in the second year. This species is monecious, with trees having male and female flowers. Buds are small (less than ¼ inch) and dark brown and have blunt apexes. Acorns are about 1 inch long and ¾ inch wide. They are dark brown with cups that cover about a fourth to half of the nut.

The chinquapin oak tends to grow as a medium-sized tree (50 to 60 feet tall) but can reach heights up to 90 feet. This oak tends to prefer deep, well-drained soils and is especially tolerant of alkaline soils. It grows moderately fast in full sunlight. The wood is durable and used for fences and railroad ties. Its acorns are a valuable source of food for a wide variety of wildlife.

Live oak, *Quercus virginiana*

Live oak leaves are simple, alternate, and semi-evergreen with leaves dropping during spring after new leaves have appeared. The smooth-margined leaves are shiny and dark green on the surface and pale and hairy underneath (Figure 41). They are thicker and stiffer than most oak leaves and are about 2 to 5 inches long and ½ to 2½ inches wide.

First-year twigs are ash-gray or light brown and somewhat hairy but finally become darker and smooth. Terminal buds are less than ¼ inch long and light brown. The bark is ½ to 1 inch thick and dark brown, possibly tinged with red. It is slightly furrowed, separating on the surface into small, dense scales.

Male and female flowers appear on the same tree. Yellowish male flowers grow in hairy clusters, and reddish female flowers occur in slender clusters 1 to 3 inches long. Fruit is an acorn usually in clusters of three to five, rarely appearing solitary or in pairs. The acorn is dark, shiny brown, and about ⅓ to ¾ inch long, with half its length enclosed in the acorn cup. Live oak usually fruits between September and December and is a consistent acorn producer. The acorns have a "sweeter" flavor (due to lower tannin content) to wildlife. In some areas, they are the most heavily eaten acorns by wild turkeys.

Live oak is usually about 50 to 60 feet in height and up to 3 to 4 feet in diameter. It is one of the few trees whose crown grows wider than tall. This distinctive, spreading form is useful for species identification. Live oak usually separates a few feet above the ground into several large, spreading limbs, forming a low crown that sometimes spreads up to 130 feet across. Even when grown in forested conditions, live oak seldom has good form; it is almost always crooked or bent.

The wood is very hard, extremely dense, strong, tough, and close-grained. It has light brown or yellow heartwood and thin, nearly white sapwood. Poor form limits its use as a timber tree, but the wood is very useful wherever a

Figure 40. Chinquapin oak. Note that the lobes point forward.

Figure 41. Live oak leaves have a waxy layer and are evergreen. They are elliptical but lack a bristle at the apex.

tough, strong wood is required. Live oak was one of the first species reserved in the United States because of its value in shipbuilding. The wood was widely used in the early history of the U.S. for heavy timbers in Navy vessels. For example, the hull of the USS Constitution was built from live oak grown on St. Simons Island, Georgia.

In Mississippi, live oak occurs principally in the lower Southeastern Coastal Plain, although it has been planted as far north as the Tennessee line. Live oaks are very resistant to saltwater spray and strong winds. This is one reason it is a valuable tree on the Gulf Coast. It has a very long life, often several hundred years. It easily resprouts from roots when larger trees are cut or girdled. Its capacity to resprout makes it very difficult to kill. The bark has been used in the past for tanning leather, and the tree is valued as an ornamental.

Overcup oak, *Quercus lyrata*

Overcup oak leaves are alternate, simple, and deciduous. The leaf is narrow at the base and divided into spreading lobes at the top. They are 5 to 10 inches long and 1 to 4 inches wide. They may have five to nine irregularly shaped lobes (Figure 42a). Leaf surfaces are dark green and smooth, and the undersides are paler.

Twigs are slender and green, possibly tinged with red. They are slightly hairy at first and later become gray or light brown. The bark resembles that of white oak. It is light gray and broken into thick plates that separate on the surface into irregular, thin scales.

Male and female flowers appear on the same tree. Male flowers are light yellow and are borne in 4- to 6-inch, slender clusters. Small, wooly, inconspicuous female flowers appear solitary on very short stalks or no stalks. The fruit is an acorn that is ½ to 1 inch long, somewhat flattened, and usually broader at the base than its length. This acorn is almost completely covered by a scaly acorn cup, giving the tree its common name (Figure 42b). A variety of birds and animals feed on these acorns.

Overcup oak may reach a height of 90 to 100 feet with a diameter of 2 to 3 feet, but it is usually smaller. Tree form and quality vary greatly. It often has a short, crooked trunk that forks about 20 feet aboveground. The wood is dense, hard, tough, and strong. It has dark brown heartwood and lighter sapwood. Overcup oak commonly has poor form. Wood from good-quality trees is mixed with that of other white oaks and used for the same purposes.

Overcup occurs widely on poorly drained, heavy soils in large bottoms. It is somewhat scattered on better sites. It commonly occurs in sloughs, margins of swamps, and backwater areas. It is primarily a bottomland species and seldom occurs naturally in the uplands. It is occasionally found in the flatwoods and on poorly drained soils subject to periodic flooding. Overcup oak is moderately intolerant of shade. The growth rate is moderate except in very swampy areas, where it is poor. It is a prolific reproducer, but periodic flooding common in its habitat often kills seedlings.

Figure 42a. Overcup oak leaves have a narrow base and irregular lobes with deep sinuses.

Figure 42b. Overcup oak acorn cups nearly enclose the entire nut, giving this tree its common name.

Post oak, *Quercus stellata*

Post oak leaves are alternate, simple, and deciduous. They are 4 to 5 inches long and 3 to 4 inches wide. The lobes below the leaf apex are often perpendicular to the mid-vein, forming a thick cross (Figure 43). Upper leaf surfaces are dark green, with undersides lighter and hairy.

At the end of the first growing season, twigs are covered with short, soft hairs. They later become gray or dark brown to nearly black or bright brown tinged with orange. Buds are usually 1/10 inch long or less and covered with chestnut-brown, softly hairy scales. The bark is ½ to 1 inch thick and light to dark gray. At first, it is blocky or scaly. On older trees, it becomes irregularly furrowed with plate-like scales.

Male and female flowers are on the same tree. Flowers appear from March to May with the leaves. The fruit is an acorn that grows solitary, in pairs, or in clusters. It can be ½ to ¾ inch long and matures in one season like other white oaks. The acorn cup is about half the acorn length. Acorns

Figure 43. Post oak leaves are lobed, with the upper pair of lobes resembling a cross.

Figure 44. Swamp chestnut oak leaves have parallel veins with tiny lobes on the margins.

appear from September to November. Many kinds of birds and mammals eat post oak acorns, which are considered one of the most important food sources for wild turkeys in the eastern states.

Post oak is usually a medium-sized tree, 40 to 50 feet tall and 1 to 2 feet in diameter. However, some specimens may reach 100 feet in height and 2 to 3 feet in diameter. The form of post oak is usually poor. Sometimes in the forest, it has a long, clean trunk with a narrow crown. However, it frequently grows in the open, where it usually has a short trunk and a large, broad, rounded crown and large, twisted branches. These stout, spreading branches usually do not have very dense foliage, and the crown is very open and irregular.

Post oak wood is very dense, hard, close-grained, and durable. Heartwood may be a light or dark brown, and sapwood is a lighter color. Most high-grade post oaks have now been cut, leaving trees that are generally considered lower grade. Post oak is a good species for crossties and timbers. It was used extensively for fence posts in the past, giving it its common name. It is used for fuel, barrels, and furniture.

Post oak is not a bottomland species (there is a bottomland post oak, *Quercus similis*, that occurs occasionally on some of the older terrace sites and bottomlands). It occurs on the highest, driest sites in the upland and is sparse on good, upland hardwood sites. It is very drought resistant and becomes a dominant species on dry sites. It has a very poor growth rate and is moderately intolerant of shade. It reproduces itself readily by seed or sprouts.

Swamp chestnut oak, *Quercus michauxii*

Swamp chestnut oak leaves are alternate, simple, and deciduous (Figure 44). They are 5 to 8 inches long and 3 to 4 inches wide. The leaf margin has a wavy pattern of teeth. Leaves have dark, shiny green surfaces and are pale silvery and fuzzy on the undersides.

Twigs are bright reddish or orange-brown the first winter, finally becoming ash-gray. They are moderately stout. Terminal buds are about ¼ inch long and covered with thin, red scales. The bark is ½ to 1 inch thick, is separated into thin scales, and closely resembles white oak.

The tree often grows 100 feet tall and 3 to 5 feet in diameter. In the forest, trunks sometimes do not have branches until 30 to 50 feet aboveground. At that point, branches form at narrow angles, resulting in a compact, round-topped crown. In the open, the tree has a shorter trunk and perfectly rounded crown.

Male and female flowers appear on the same tree. Yellowish male flowers occur in 3- to 4-inch clusters, and female flowers occur in smaller clusters with fewer flowers. The fruit is a large, bright brown acorn 1 to 1½ inches long and ¾ to 1¼ inches thick. About one-third of its length is enclosed in a thick acorn cup. The acorns are valuable to a wide variety of wildlife and livestock. Cattle will feed on the acorns, giving this species another common name of cow oak.

The wood is dense, hard, strong, tough, close-grained, and durable. It has light brown heartwood and thin, dark-colored sapwood. The wood has similar properties to white oak and is used for the same purposes. In the past, basket makers used the wood, giving this tree another common name of basket oak.

Swamp chestnut oak commonly occurs in large creek bottoms on well-drained, loamy ridges and occasionally on wet, silty, clay flats. It is not considered an upland species but is sometimes found in coves and openings into true bottoms. It is moderately intolerant of shade and has a medium to good growth rate. It easily reproduces, but reproduction is sometimes limited because insects and wildlife eat the acorns.

Figure 45. White oak leaves have long, slender lobes and deep sinuses.

White oak, *Quercus alba*

White oak leaves are alternate, simple, and deciduous. They are 5 to 9 inches long and 2 to 4 inches wide. Leaves are lobed with deep sinuses, with seven to nine lobes shaped like fingers that stick out from leaf edges (Figure 45). Leaves are bright green on the upper surface and paler below. The midrib is yellow, and the petiole is stout and up to 1 inch long. Twigs are slender, reddish-brown to gray, and usually smooth. Terminal buds are less than ¼ inch long. The bark is light gray or nearly white, thick, and divided into flat ridges or long, irregular, thin scales.

Flowers appear when leaves are about one-third developed. Both male and female flowers appear on the same tree from April to May. Yellowish male flowers are in small, hairy, drooping clusters, 2½ to 3 inches long. Reddish female flowers are small and solitary and appear in axils of leaves of the current season on short stalks. Fruit is a light chestnut-brown acorn about ¾ inch long. The cup encloses about a fourth of the acorn. White oak acorns appear from September to October and are valuable to many species of birds and animals. Deer, turkeys, and squirrels are the major users of the acorns. Trees tend to have either very good or very poor acorn crops. Native Americans ate acorns after boiling them.

Usually a large tree, white oak grows 80 to 150 feet tall and 3 to 5 feet in diameter. It has a tall, clear, straight trunk and a narrow crown in the forest. In the open, it has a shorter trunk and a broad, spreading crown. White oak is shade intolerant and has a medium growth rate. It reproduces well by seed and sprouts, but seed supply is often lacking because wildlife eat them.

White oak occurs sparsely on well-drained soils in bottomlands. It is most common on better drained creek bottoms in northern Mississippi but is not primarily a bottomland species. It is widely distributed in the uplands, mostly on middle and upper slopes in areas with steeper terrain.

White oak is capable of producing high-grade timber. The wood is hard, dense, strong, and durable. It has pale brown heartwood and lighter sapwood. Vessels in the heartwood are clogged with bubble-like outgrowths from adjacent cells, called tyloses. The tyloses prevent water from soaking through the wood. Consequently, the wood is prized for barrels in wine and whiskey production. In addition, white oak is used in furniture, millwork, construction, crossties, fence posts, agricultural implements, large timbers, and other purposes where high-quality wood is needed.

Hamamelidaceae: Witchhazel family

Leaves in this family are simple and alternately arranged. Trees and shrubs in this family have sticky pollen. Flowers tend to be wind-pollinated, with petals that are narrow and ribbon-like. Fruits are woody.

Sweetgum, *Liquidambar styraciflua*

Sweetgum leaves are alternate, simple, and deciduous. They are 5 to 7 inches long and wide. Star-shaped, five-pointed, lobed leaves make sweetgum easy to recognize (Figure 46). The margins are finely toothed. Leaves are a lustrous green above and paler below with a few tufts of hair between the veins. They turn beautiful colors in the fall.

Twigs are rusty red and shiny, often with wide, corky wings, but sometimes without wings altogether. The bark is light gray and furrowed, with narrow, broken ridges. Older trees are deeply furrowed; younger trees have shallow furrows.

Male and female flowers appear on the same tree. Both are very small, greenish, and inconspicuous. Fruit is as unmistakable as the leaves. It is a 1- to 1½-inch round cluster of smaller capsules, often called a sweetgum ball. The light brown seeds are contained within individual, smaller capsules. When the fruit ripens, these capsules open, and wind and birds help scatter the seed. Squirrels and songbirds eat sweetgum seed, and squirrels feed on buds in the spring, as well. Quail, doves, wood ducks, and occasionally wild turkeys eat seed that drop to the ground.

Figure 46. Sweetgum leaves are distinctly star-shaped.

Sweetgum has the unusual ability to survive after being girdled by beavers.

Sweetgums can grow into some of the largest trees in Mississippi. In rich bottomlands, these trees can grow to 150 feet or taller and 3½ to 4 feet in diameter. Specimens taller than 100 feet are still very common, with diameters exceeding 3 feet. In the forest, the trunk is tall, clean, and straight, and it tapers into a narrowly oblong crown. When open grown, the crown is spreading and more rounded.

The wood is medium in hardness and density. It has a uniform texture and beautiful, dark, reddish-brown streaked heartwood with thin, nearly white sapwood. It responds well to cutting and stains very well. It is used for cabinet wood, furniture, furniture frames, veneer, boxes, crates, and extensively for pulpwood. Veneer made from the heartwood is sold under a variety of different trade names and competes well with more expensive hardwoods.

In bottomlands, sweetgum occurs on almost all but the wettest sites. It is prevalent on upland sites but develops best on lower slopes and coves. You usually do not find it on the highest, driest sites. It occurs often in pure thickets and is one of the first woody species to become established in abandoned fields. Sweetgum is shade intolerant and has a medium to good growth rate. It sprouts from both roots and stumps and reproduces very easily by seed under full sunlight.

Juglandaceae: Walnut family

These trees have wind-pollinated flowers in the form of catkins. Leaves are large, pinnately compound, and alternately arranged. The leaves are aromatic. Their fruit are nut-like drupes.

Black walnut, *Juglans nigra*

Black walnut leaves are alternate, pinnately compound, and deciduous (Figure 47). They are large—12 to 24 inches long with 15 to 23 leaflets. Each leaflet is between 3 and 4 inches long and about 1 inch wide. Leaflets are finely toothed, smooth above, and hairy on the undersurface. Sometimes the terminal leaflet is absent.

Twigs are stout, somewhat hairy, and orange-brown to light brown. The terminal bud is ⅓ inch long. Mature bark is dark brown to grayish-black, 2 to 3 inches thick, and divided by deep furrows into broad, rounded ridges that may be thick and scaly at the surface. The bark is light brown and scaly on young stems.

Both male and female flowers are borne on the same tree and appear when leaves are about half developed. Male flowers appear in 3- to 5-inch clusters. Male flowers are in long, drooping, rope-like clusters, and the inconspicuous female flowers appear at the tip of the current year's branchlets. Fruit is a nut-like drupe in a shell, solitary or in pairs. It is enclosed in a solid, green, round husk that does not split open, even after ripening. The fruit itself is black with a very hard, thick, finely ridged shell enclosing a rich, oily kernel that is tasty and highly nutritious.

Figure 47. Black walnut leaves are pinnately compound.

Squirrels like black walnuts and are probably more valuable to the tree than the tree is to them. Tree occurrence is very scattered, and the walnuts are probably not a mainstay to squirrel diets, but squirrels bury nuts and do not recover all of them. These buried nuts are important in establishing new trees.

Black walnut trees can grow up to 125 feet tall with diameters of 4 to 5 feet, but they are more commonly 75 to 100 feet tall with diameters up to 2 to 3 feet. Trunk form in the forest is straight and continuous into the crown. It gradually breaks up into stout limbs that form a narrow to broad, round-topped crown. Many black walnut trees are older and located around old house places and old churches. In open areas, the tree usually has a very short trunk, thick limbs, and a very broad, rounded crown.

The beautiful, chocolate-brown heartwood of black walnut is one of the most valuable in the world. It is very durable, worked easily with hand or machine tools, and easy to polish and glue. It can be handsomely finished and has outstanding grain and pattern. It is dense, hard, strong, somewhat coarse-grained, and highly prized for gunstocks, furniture, interior finishing, cabinet work, veneers, and caskets. During World War II, it was used for airplane propellers.

Black walnut is very sensitive to soil type and requires deep, well-drained, nearly neutral soil with a generous supply of moisture and nutrients. Trees occur in scattered fashion throughout most forested areas. They are usually found in fertile bottomlands and on gentle slopes with other hardwoods.

Black walnut plantations or orchards have become increasingly popular in recent years because of perceived wood and nut value. The species has a medium to good growth rate. Of note, because of the wood's value, black walnut has become subject to cases of tree theft in some

areas of the central United States, where black walnut reaches its maximum size. However, as a lumber-producing tree, black walnut does not carry as much value in the southern states. Longer growing seasons and greater growth rates result in faster growth and reductions in value to buyers.

Mockernut hickory, *Carya tomentosa*

Mockernut hickory leaves are alternate, pinnately compound, and deciduous (Figure 48). They are 8 to 16 inches long with five to nine leaflets. Each leaflet is 5 to 8 inches long and 3 to 5 inches wide. Leaflets are usually broadest above the middle, have sharp points at the tips, and have toothed margins. They are also quite wooly, especially on the undersides. Lower pairs of leaflets gradually get smaller and are substantially smaller than the upper pairs. The leaf stalk is also wooly, with pale, orange-brown, fine hairs.

Twigs are usually very stout, hairy, and reddish-brown at first, turning gray the second season. Buds are about ½ to 1 inch long, yellowish, and hairy or wooly. Mockernut has the largest terminal buds of any of the hickories, usually ½ inch or longer. The bark is dark or light gray and about ½ to ¾ inch thick. It is roughened by irregular furrows that separate into broad, diamond-shaped ridges.

Flowers appear when leaves are about half developed. Both male and female flowers appear on the same tree. Male flowers appear in slender, flexible, drooping clusters. The clusters are 4 to 5 inches long and appear in groups of three on the same stalk. Female flowers are borne in groups of two to five on one erect stalk. Male flowers are yellowish-green and red, and female flowers are a dark red. The fruit appears either solitary or paired. It is 1½ to 2 inches in diameter with a thick husk. The husk splits nearly to fruit base, yielding a nut with four ridges and a thick, hard shell. Meat of the nut is slightly sweet. Fruit is a dark reddish-brown, and the nut is a pale reddish-brown. Mockernut is a preferred hard mast food for squirrels. Squirrels usually cut the nuts while still green. Hickories usually produce more fruit when they are older than 40 years.

Mockernut is a medium-sized tree that reaches 50 to 80 feet tall and 1 to 2 feet in diameter. It has a broad, rounded crown and stout branches. Branches extend about halfway down the trunk. In the open, it has a broad, open crown and usually a ragged appearance. The crown is narrow and oblong when grown in a forest.

The wood of mockernut hickory is strong, hard, dense, tough, and elastic. In fact, hickory typically rates at the top of our woods for strength, toughness, and elasticity. Despite these properties, it is still susceptible to decay when used in contact with the ground. If kept dry, it lasts indefinitely. The heartwood is dark brown, and sapwood is nearly white and usually quite thick. The wood is used for agricultural implements, tool handles, ladder rungs, furniture, skis, and other sporting equipment. It is highly valued for snow skis and is exported to Europe for that purpose. The tool handle industry led all other industries for hickory use in years past.

Mockernut hickory is abundant in mixed hardwood forests on drier upland slopes. It is one of the most commonly occurring hickories in Mississippi, except in the Delta region. It is more common in the pine-oak-hickory areas of north Mississippi than in south Mississippi. Squirrels scatter the nuts and are probably the biggest factor in natural reproduction of this and other hickories. Mockernut is a slow-growing species. It is moderately intolerant to shade and is very susceptible to fire.

Pecan, *Carya illinoinensis*

Pecan leaves are alternate, pinnately compound, and deciduous. Pecans have larger leaves than other hickories. Leaves are 10 to 20 inches long with 9 to 17 leaflets (Figure 49). Leaflets are 4 to 8 inches long and 1 to 2 inches wide with sharp, pointed tips and toothed margins. Leaflet bases have unequal sides. Leaves are usually a yellowish-green on the upper surface and are usually smooth, but

Figure 48. Mockernut hickory leaves are pinnately compound and often have golden or rusty plant hair, giving the leaf a fuzzy appearance and feel.

Figure 49. Pecan leaves are large and pinnately compound with 9 to 17 leaflets.

may be a little hairy. They are paler and may be either smooth or finely hairy on the underside.

Twigs are tinged with red at first and coated with loosely matted hairs. Later, they become smooth and slightly hairy and are marked with small orange spots called lenticels (pores). Terminal buds on twigs are about ½ inch long, sharply pointed, and covered with clusters of bright yellow hairs. The bark is moderately thick and a light brown or grayish-brown. It is about 1 to 1½ inches thick and is divided by narrow furrows into irregular, flattened, scaly, interlacing ridges. These ridges are broken on the surface into thick scales.

Flowers of both sexes are in separate clusters on the same tree. Light yellow-green male flowers appear in slender clusters 3 to 5 inches long. Yellowish female flowers may have a few or many flowers in an oblong cluster. Fruit occur in clusters of 3 to 11 and are 1 to 2½ inches long and ½ to 1 inch wide. The husk is thin-skinned and separates along four lines to expose the reddish-brown, thin-shelled nut. The nut is usually 1 to 1½ inches long. It is smooth with a possibly dark, mottled, and reddish-brown to black coloring. The nut meat is very sweet. Squirrels, turkeys, and other wildlife prefer pecans. It is more valuable than other hickories because the thin shell is easier to break open.

Pecans are large trees, sometimes reaching 100 to 120 feet in height and up to 6 to 7 feet in diameter. In the forest, stout, spreading branches form a narrow, symmetrical crown with an inverse pyramid shape. The wood is dense and coarse-grained but not as strong as other hickories. Heartwood is light brown tinged with red, and sapwood is light. It is used mainly in the furniture industry, which is the largest market for pecan. Pecan lumber is also used for flooring in public buildings, dance floors, gymnasiums, roller skating rinks, industrial plants, and warehouses. Pecan was once used in quantity in the automobile industry for making flooring and bracing on assembly lines. It is also used in railroad car decking, entertainment cabinets, folding camp cots, chairs, shipping containers, and various veneers.

Pecan does not occur naturally in the upland areas of Mississippi. It is largely restricted to the riverfronts on loamy soils, especially in the Mississippi River system. You find it most easily where it has been planted for nut production in orchards. Pecan trees cut for wood are not the same trees that yield nuts for commercial use. Only wild pecan trees are cut for their wood. Trees planted in orchards are usually selected hybrid trees that come from nurseries.

Pignut hickory, *Carya glabra*

Pignut hickory leaves are alternate, pinnately compound, and deciduous (Figure 50). They are 8 to 12 inches long and usually have five to seven leaflets. Leaflets are 4 to 6 inches long and 2 to 3 inches wide, and they have finely toothed margins. They are yellow-green and smooth on the upper surface, paler and smooth on the lower surface, and occasionally hairy along the midribs. The petiole is smooth and free of hair.

Figure 50. Pignut hickory leaves are pinnately compound with five to seven leaflets.

Twigs are slender and usually smooth. They are yellowish-green and later become brown as the tree matures. Bark is a dark gray with shallow, diamond-shaped furrows. The ridges are sometimes scaly at the surface and narrow. Bark is ½ to ¾ inch thick.

Flowers appear when leaves are about half developed. Male and female flowers are borne on the same tree. Yellowish-green male flowers appear in clusters of three on a common stalk that is about 3 to 5 inches long. Female flowers appear on new growth in clusters of two to five. Pignut fruit is variable in size and shape but is usually pear-shaped or rounded, 1 to 2 inches long, and reddish-brown. The enclosed nut is oblong or oval and small, with a thick, bony shell. Nut meat is usually sweet but sometimes bitter. Optimum fruit production occurs when a tree is more than 75 years of age. Nuts are a food source like all hickories for wildlife, especially squirrels.

Pignut reaches a modest size of 60 to 80 feet tall and 1 to 2 feet in diameter, but occasionally will grow larger. The tree usually has a slender, slightly tapering trunk that is often free of limbs for half its height. In the forest, the crown is oblong and rather narrow with short, spreading branches. When grown in the open, it has a larger, rounded crown.

Pignut occurs on dry ridges and hillsides on well-drained, upland sites, but it is also commonly found on some moist sites. It is associated with many species of oaks and pines. Pignut is most common in hilly sections of Mississippi. It is considered a climax species throughout its range. It is tolerant of shade and slow growing. It sprouts from stumps. The species is highly susceptible to fire and is attacked by a variety of insects. The wood is dense, hard, very strong, tough, elastic, and close-grained. Heartwood is dark, while sapwood is light. The wood is used for tool handles, wagons, agricultural implements, and fuel.

Shagbark hickory, *Carya ovata*

Shagbark hickory leaves are alternate, deciduous, and pinnately compound (Figure 51a). A dark yellow-green, they are smooth on the upper surface. They are paler on the lower surface and may be smooth or slightly hairy. Leaves are 8 to 14 inches long and have five to seven leaflets. Leaflets are 5 to 7 inches long and 2 to 3 inches wide with finely toothed margins.

Twigs are stout and usually covered with fine, soft hair. They become dark reddish-brown and finally gray as they mature. Terminal buds are ½ to ¾ inch long, with three to four dark brown, loose-fitting scales. The bark is light gray, ¾ to 1 inch thick, and separated into rough strips or plates that are loose at both ends. The bark peels on older trees, giving the tree its common name (Figure 51b).

Flowers appear when leaves are about half developed. Male and female flowers appear on the same tree. Male flowers appear in slender, light green clusters up to 4 inches long. Female flowers have a rusty, wooly appearance and are in clusters of two to three. The fruit is 1 to 1½ inches in diameter.

The husk separates along four channels to yield a light-colored, thin-shelled nut with a sweet kernel. Shagbark is usually dependable in producing large crops of nuts every year. It is common to collect 2 to 3 bushels of nuts under a single large tree. Some large shagbarks have been reported to yield 15 to 18 bushels. Squirrels eat shagbark hickory nuts from the time fruits approach maturity into the next spring when they are picked up on the forest floor. Humans also eat the nuts, which are the most commonly eaten of the hickory nuts after pecans.

Shagbark hickory usually reaches a moderately large size of 60 to 90 feet tall but sometimes reaches 120 feet or taller with diameters of 2 to 3 feet. In the open, the trunk forks into stout, upward-sloping limbs that form an irregular and open crown. In the forest, the tree is often free of limbs for more than half its height and has a narrow crown.

The wood is strong, dense, hard, tough, and elastic. It has a close, straight grain. The sapwood is light, and heartwood is a darker brown. Young trees, which usually occur in second growth stands, contain more sapwood than heartwood. Shagbark is one of the most valuable hickories and is used for tool handles, wagons, wheels, fuel, and smoking meat. The furniture industry has accepted it widely.

Shagbark hickory prefers deep, moist soils along streams and on moist hillsides. It occurs throughout most eastern hardwood forests on many kinds of sites along with many other species. It may appear in bottomlands along with sycamore and in upland areas with beech and white and red oaks. It is moderately tolerant of shade and can usually renew itself in the hardwood forest. Although

Figure 51a. Shagbark hickory leaves are pinnately compound, normally with five leaflets.

Figure 51b. Shagbark hickory has exfoliating bark that peels into strips or plates.

slow growing in comparison to other kinds of trees, it is probably one of the fastest growing hickories. It is susceptible to fire but reproduces from sprouts after fires.

Lauraceae: Laurel family

This family of trees is found in warm climates across the world. Leaves tend to be leathery, and many species are evergreen. Wood, bark, and foliage are aromatic. Fruits are one-seeded drupes.

Sassafras, *Sassafras albidum*

Sassafras leaves are alternate, simple, and deciduous. They are 4 to 6 inches long and 2 to 4 inches wide. Sassafras leaves are polymorphic, meaning they may grow in different shapes (Figure 52). The leaves may be unlobed with an entire margin, mitten-shaped with either a right- or left-hand lobe, or three-lobed with the center lobe being largest and smaller lobes on the left and right. They are yellowish-green on the surface and pale green underneath, with hairs along the veins. Petioles are about 1 inch long. The leaves and all other plant parts are aromatic, having a citrus-like scent when bruised.

Twigs are yellowish-green and slightly hairy at first but turn smooth and orange-red later. They may be mottled with dark green or grayish-brown patches. The bark is thick and dark brown and has deep furrows and flat-topped ridges crossed by horizontal cracks. The bark of younger trees is grayish-brown and slightly furrowed.

Sassafras is dioecious, with male and female flowers appearing on separate trees. Flowers are greenish-yellow and appear with leaves in drooping clusters, with only a few flowers per cluster. The fruit is a blue drupe about ½ inch long on the end of a thick, red stalk 1 to 2 inches long. Songbirds, turkeys, quail, squirrels, and other small mammals eat the fruit. White-tailed deer browse twigs in the winter and foliage in the spring and summer. Young sprouts are especially desirable as a browsing plant after fire or some other disturbance.

The wood is fairly soft, relatively light for a hardwood, and coarse-grained. The wood has a dull, orange-brown heartwood and pale yellow sapwood. It is durable when in contact with soil and remains watertight, even when under water for periods of time. Sassafras wood is used for small boat construction, boat oars, and fence posts. Its attractiveness has increased its use in specialty products, sometimes bringing very high prices. At one time, it was used to make dugout canoes along the Mississippi River. Also, sassafras is probably most widely known because of sassafras tea made from the roots. The oil of sassafras is made from bark, twigs, and roots and was once used for root beer flavoring.

Sassafras occurs on widely scattered and well-drained sites in bottomlands. In the uplands, it occurs on most sites but generally does best in coves and lower slopes. It is very common as a small tree or shrub along fencerows and old pastures. It is intolerant of shade. The growth rate varies from poor to excellent, depending on site quality. Reproduction is sparse and erratic, but it does sprout efficiently. It sometimes takes over small openings on ridge tops and old fields where it is generally a small shrub or weed tree.

Magnoliaceae: Magnolia family

Leaves in this family of trees are alternate and simple. Trees in this family have flower parts arranged in spirals on a conical receptacle. In addition, flower petals and sepals are not differentiated, a trait seen in some of the earliest fossil flowers. Flowers are pollinated by insects and birds.

Southern magnolia, *Magnolia grandiflora*

Southern magnolia leaves are simple, somewhat oval, and evergreen. They are 5 to 8 inches long and 2 to 3 inches wide. You can easily recognize Southern magnolia by its thick, leathery, shiny leaves that persist for 2 years before falling. The surface is a lustrous green, and the underside is a rusty orange-red with wooly hairs. Leaf margins are entire and tend to curl under slightly (Figure 53). Southern magnolia is Mississippi's state tree.

Twigs are stout and wooly and vary from green to olive. The bark is gray to light brown and ½ to ¾ inch thick. It is relatively smooth on young trees with a few cracks or furrows becoming more furrowed on older trees. Southern magnolia grows up to 90 feet tall and 2 to 3 feet in diameter. In the forest, it usually has a clear, straight trunk and a much cleaner form than when grown in the open. As an open-grown ornamental, it develops a broad, cone-shaped crown with many branches close to the ground.

The flowers are large, showy, white, and cup-shaped. They have a spicy fragrance. They are perfect (having male and female parts), have as many as 12 petals, and may be 8 inches in diameter. This beautiful bloom is Mississippi's state flower. It blooms from April to late summer. The fruit is a cone-shaped cluster resembling a pine cone, 3 to 4 inches long and 1½ to 2½ inches in diameter. It is purplish at first and turns rusty brown. This fruit contains several bright red seeds that are about ½ inch long. Squirrels like the seeds, as do various rodents, songbirds, quail, turkeys, and other small mammals.

The wood is moderately hard, fine-textured, and straight-grained. It has light to dark brown heartwood and pale to creamy-white sapwood. It is very easy to work and well

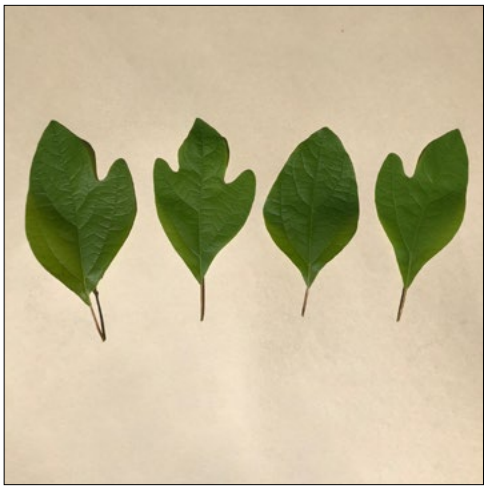

Figure 52. Sassafras leaves are polymorphic, which means they have different shapes. They may be oval with an entire margin, two-lobed in the shape of a mitten, or tri-lobed.

Figure 53. Southern magnolia leaves are simple and evergreen with entire margins and a glossy surface. Southern magnolia is the Mississippi state tree and flower.

suited to many purposes. It is used for factory lumber, furniture, veneer, doors, cabinet work, fixtures, paneling, baskets, and crates.

The natural range for southern magnolia is primarily within 200 miles of the coast, usually in minor or secondary stream bottoms, and on margins of swampy areas. In the uplands, it is mainly on middle and lower slopes on deep, rich soils and heads of branches. It is planted extensively as an ornamental. Southern magnolia tolerates shade but grows well in full sun. It has a medium growth rate and few problems with insects or disease. Reproduction is quite erratic, and it typically appears as a solitary tree mixed with other hardwoods and pines in the forest. As an ornamental, southern magnolia is found across the state. Huge specimens are found growing on the front lawns of antebellum houses.

Sweetbay, *Magnolia virginiana*

Sweetbay leaves are simple, elliptical, and semi-evergreen, remaining green through the winter and falling in the spring (Figure 54). They are oblong, 4 to 6 inches long, and 1 to 3 inches wide. Leaf margins are entire. Leaves are bright, lustrous green above and silvery-white below. They give a very sweet aroma when crushed. Twigs are bright green and hairy at first, becoming reddish-brown and smooth after the first winter. Bark is dark gray, thin, and smooth, with patches of darker and lighter coloring. It may become slightly furrowed on older trees.

Flowers are white, as with other magnolias, and measure 2 to 3 inches across. They are very fragrant and have 9 to 12 petals. They appear from April to June and are perfect, having both male and female parts. Fruit is a dark red, cone-like cluster of small capsules that contain seed. The fruit is yellowish-green with red, oval, flat seeds about ¼ inch long. Seeds hang from the pod by slender threads. Squirrels and other small mammals, songbirds, turkeys, and quail eat the seeds. Deer browse the leaves year-round.

Normally, sweetbay is a slender tree, 20 to 30 feet tall, with a diameter of not more than 12 to 15 inches. However, on the best sites, it may reach a height of 60 feet and a diameter of 1 to 2 feet. The branches are small and erect, gradually spreading to form a small, open, irregular crown. The wood is soft and fine-textured. Heartwood is light brown tinged with red, and sapwood is creamy-white. Sweetbay wood is used for some package veneer, box lumber, pulpwood, woodenware, and broom handles. It is sometimes used as a substitute for yellow poplar sapwood in making factory lumber.

Figure 54. Sweetbay leaves are simple, elliptical, and semi-evergreen. They are dark green above and silvery-white on the undersides.

Sweetbay occurs in swampy areas subject to periodic and frequent flooding. It occurs on poorly drained sites in the uplands as well as on borders of swamps, pine barrens, shallow swamps, and deep coves. Reproduction is erratic but can be good when occurring in openings with plenty of light. It is moderately tolerant to shade and has a slow to medium growth rate. It is not particularly susceptible to any disease or insect. Cattle will graze it, but since it is hard to reach, this is usually not a problem.

Yellow poplar, *Liriodendron tulipifera*

Yellow poplar leaves are 4 to 8 inches long, about the same width, and deciduous. Yellow poplar leaves are lobed, which is a unique shape for this family. They are usually four-lobed, with the two lower lobes being the widest (Figure 55a). The leaf silhouette resembles the shape of a tulip, giving this tree another common name of tuliptree. Leaves are green and smooth on the upper surface and paler and smooth on the lower surface. They turn brilliant yellow in the fall. The petioles are slender and 4 to 6 inches long.

Twigs are smooth and pale green at first, becoming reddish-brown and finally dark gray. The bark is light gray and very firm, with shallow furrows that separate narrow, flat, diamond-shaped ridges. On very old trees, it may be more deeply furrowed. The bases of bark furrows are much lighter in color, almost white.

The flower is about 1½ to 2 inches in diameter, with yellowish-green petals marked with a reddish-orange band near the base of the flower (Figure 55b). These beautiful flowers are solitary and appear after leaves have developed at the end of twigs. They are perfect, having both male and female parts. Flowers are usually pollinated by bees. The fruit is a light brown, oblong, conch-shaped cluster of winged seeds. It breaks up as it matures in September and October, allowing seed to be scattered by the wind. Yellow poplar sprouts are excellent for deer browsing. Squirrels eat seeds in early fall and midwinter.

Yellow poplar is one of the largest hardwoods. It often grows 200 feet tall with a diameter of 4 to 6 feet or more. In the forest, the first branch may be as high as 60 to 70 feet above the ground. A tall, clear, straight trunk is characteristic of the species.

Figure 55a. Yellow poplar leaves are simple with four lobes.

Figure 55b. Yellow poplar flowers are yellowish-green to reddish-orange.

The wood is relatively soft and lightweight. It is not very strong but works easily and is easy to kiln dry. It resists warping and can be glued and painted easily. Heartwood is usually green when freshly cut and oxidizes to brown. However, occasionally minerals can stain heartwood to red, blue, black, purple, or almost any color. Sapwood is thin and nearly white. The furniture industry is the largest user of yellow poplar. It is also used in general construction, wooden boxes, veneer, doors, moldings, siding, interior trim, exterior trim, piano parts, cabinets, kitchenware, toys, novelties, and a wide variety of other purposes.

When found on bottomland sites, yellow poplar occurs on the best, well-drained terraces, but it is not primarily a bottomland species. It is mainly found along minor streams. In the uplands, it is widespread except on drier ridges. It has its best development and is most plentiful in coves and on lower slopes in the uplands. It may also occur on moist sites in the Piney Woods and along drainages in the Coastal Plains. Yellow poplar has a good to excellent growth rate. It is very intolerant of shade, sprouts well, and is a prolific reproducer on bare soils in clear openings with adequate sunlight. It is very susceptible to fire, grazing by livestock, and flooding.

Moraceae: Mulberry or fig family

Trees in this family have white, milky latex sap. Flowers are arranged along the stem in small clusters. Trees in this family produce fleshy fruits that are the fusion of ovaries from many flowers. Leaves are alternately arranged. Most species appear in warm climates.

Osage-orange, *Maclura pomifera*

Osage-orange leaves are alternate, simple, and deciduous. They are oval-shaped, 3 to 6 inches long, and 2 to 3 inches wide (Figure 56). They have a rounded base and a tapered tip. Leaf margins are entire. The upper leaf surface is shiny dark green, becoming bright yellow in the fall.

Twigs are stout, bright green at first, and later become light grayish-brown. They are often armed with straight, stout spines. The bark is approximately ¾ inch thick and varies from a dark gray to a dark orange. It is deeply furrowed on older trees, with prominent ridges that scale off into thin strips.

The species is dioecious, with male and female flowers appearing on separate trees. The male flower is a long-stalked cluster, 1 to 1½ inches long. Female flowers appear in a short-stalked, dense cluster about 1 inch in diameter. Fruit is a pale green ball that resembles an orange. It is 3 to 5 inches in diameter and is actually a dense growth of many smaller fruits. It secretes a milky white, sticky sap if punctured. This fruit is often called hedge apple, horse apple, or mock orange. Bobwhite quail reportedly feed on the seed after the fruit drops from the tree and decays. Squirrels and white-tailed deer feed on the fruit in times of limited food availability.

Osage-orange usually grows 20 to 40 feet tall with a diameter of about 12 inches, but it may grow up to 50 to 60 feet with a diameter of 3 feet or more. The trunk is usually short and stout, with thick, crooked, spreading branches forming a round, open, irregular crown. The wood is very dense, hard, and strong. It is coarse-grained and durable when in contact with soil. It has bright orange

Figure 56. Osage-orange leaves are oval-shaped with rounded bases and tapering tips.

heartwood and thin, pale sapwood. Osage-orange wood is used for fence posts, railroad ties, and yellow dye. A major limitation in using the wood is crookedness of the tree. The French word for this tree (*bois-d'arc*) means "wood of the bow." Native Americans, such as the Osage, made fine bows from this wood. Fine bows are still made from it.

Osage-orange often occurs along fencerows, pastures, old country roads, and old homesites. It is more common in north Mississippi and is very common in the Black Prairie area, tolerating alkaline soils. It does well on other fertile soils. It has a slow growth rate, is somewhat tolerant of shade, and reproduces erratically but sprouts well. Osage-orange is widely scattered because it was used so much in the past as an ornamental tree and for fence posts.

Red mulberry, *Morus rubra*

Red mulberry leaves are alternate, simple, and deciduous. Leaf margins are coarsely toothed. Leaves are 3 to 6 inches long and about the same width. Mulberry leaves are polymorphic, growing in different shapes (Figure 57). The leaves may be unlobed, mitten-shaped with either a right- or left-hand lobe, or three-lobed with a large center lobe and smaller lobes on the left and right. All shapes may appear on the same tree and possibly the same branch.

Twigs are smooth and yellowish to bluish-gray. Inner bark of twigs turns orange if the outer bark is scraped away. There is no terminal bud. Lateral buds are chestnut-brown and about ¼ inch long. Bark is dark brown with a reddish tinge and scaly, with tips of the scales curling up and peeling off. The bark peels off in long, narrow flakes.

Male and female flowers may grow on the same or different trees. Flowers appear with leaves in long, drooping clusters. Female flower clusters are shorter than male clusters. The fruit is a berry-like cluster that resembles a small blackberry. It is green at first and becomes dark red as it matures. It is quite tasty and can be eaten directly or made into jellies, jams, and pies. Many songbirds feed on the fruit, although it is only available for a short time in the spring. Quail, squirrels, wild turkeys, and other small mammals also eat the fruit. Deer browse foliage during the spring and summer.

Red mulberry is usually about 30 to 60 feet tall, with a trunk diameter up to 1 to 1½ feet, but it may reach 70 feet tall with a diameter of 3 to 4 feet. It usually has a short trunk and a dense, spreading crown. The wood quality is soft, light, not very strong, coarse-grained, and fairly durable when in contact with soil. The pale orange heartwood turns brown when exposed to light; the sapwood is a lighter color. Its durability leads to its use for fence posts when available. It is also used for barrels, boats, some farm tools, and caskets. Larger mulberry logs have been sold for unusually high prices and shipped to foreign markets for specialty uses.

Red mulberry occurs on widely scattered sites in the bottoms, except in swamps, sloughs, and higher ridges. It is most commonly found on heavy, moist, but well-drained soil. In the uplands, it is scattered widely on the best moist soils but is not as common as in the bottoms. It is not typically found in any location in great abundance. Red mulberry is very tolerant of shade and has a slow to fair growth rate. It seeds and sprouts readily.

Oleaceae: Olive family (includes ash species)

Leaves are oppositely arranged. Ash trees have strong yet flexible wood. Their fruit is a winged seed called a samara.

Green ash, *Fraxinus pennsylvanica*

Green ash leaves are opposite, compound, and deciduous. They have five to seven leaflets, and leaflet margins above the middle are toothed (Figure 58). They are dark green on the top and light green underneath. They are generally smaller than white ash leaves. Each leaflet is 3 to 4 inches long and 1 to 1½ inches wide. Leaflets gradually narrow into a long, slender point. In addition, the leaf scar on green ash is shaped like the letter D.

Twigs may have small, pale hairs that persist for a year or two. Ultimately, twigs become ashy-gray or light brown

Figure 57. Red mulberry is another tree with leaves that are polymorphic (having multiple shapes). The leaves may be heart-shaped, two-lobed in the shape of a mitten, or tri-lobed. The margins are coarsely toothed.

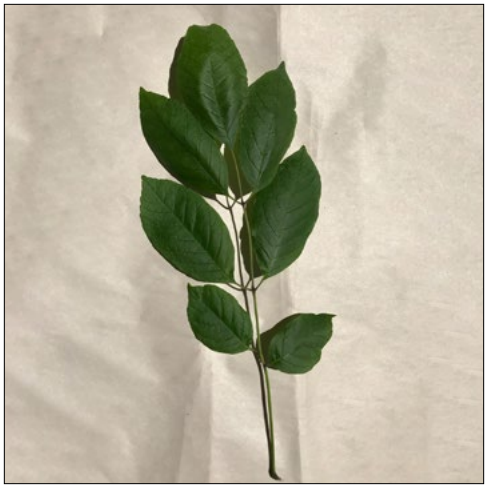

Figure 58. Green ash leaves are pinnately compound with five to seven leaflets. They are dark green on top and light green underneath. The leaf scar is D-shaped.

tinged with red. Bark is ½ to ⅔ inch thick and brownish-gray possibly tinged with red. The bark on upper tree limbs of green ash is rough compared to the smoother bark of white ash. Trunk bark is slightly furrowed, and the surface of the ridges separates into thin scales. Bark ridges also have a somewhat diamond-shaped interlacing or net-like pattern.

Flowers appear before or with the leaves. This species is dioecious, with male and female flowers appearing on separate trees. Male flowers are in dense, purplish-red clusters, and female flowers are in greenish-red, open clusters. They are inconspicuous and occur in March and April. The fruit is a samara (a winged seed) 1 to 2 inches long. Seeds hang in clusters. An individual green ash seed makes up more than half the total length of the wing. Birds feed on the seed, and deer browse the foliage of young plants.

Green ash commonly grows 50 to 60 feet tall and up to 1 to 1½ feet in diameter. The tree has stout, upright branches that form a compact, irregular-shaped crown when grown in a forest. Grown in the open, the species has a good shade tree form. Green ash is usually a smaller tree than white ash. The wood is dense, hard, and strong. It has light brown heartwood and light-colored sapwood. On wet sites, green ash commonly develops a swollen trunk, useful only for trim and interior furniture parts. The rest of the stem on these trees is still of good quality. Green ash has wood with qualities similar to white ash, so its uses are similar. It is used for tool handles, furniture, interior trim, paneling, doors, and cabinets. It is also used for certain marine supplies, such as boats and oars.

Green ash occurs principally on bottomland sites. It is widely distributed on new sediment soils and bottoms and is common on flats and shallow sloughs. It occurs occasionally in wet coves and branch heads in the uplands but is generally not considered an upland species. Green ash is widely distributed in bottoms because of its ability to develop under the most adverse conditions.

Green ash seedlings are somewhat shade tolerant, but mature trees do not like shade. It has a medium growth rate and is very susceptible to fire. It is moderately susceptible to drought, and grazing is often a serious problem. It quickly establishes in abandoned fields, providing needed cover in agricultural areas.

White ash, *Fraxinus americana*

White ash leaves are opposite, pinnately compound, and deciduous. They generally have seven to nine leaflets, making them larger than green ash (Figure 59). Leaflets are 3 to 5 inches long and 1½ to 3 inches wide. Leaflet margins may be smooth or slightly toothed. They are green and smooth on the upper surface and a pale silver and slightly hairy on the lower surface. The common name comes from the whitish color of the leaf underside. The leaf scar on white ash is crescent-shaped.

Twigs, like the leaves, are opposite. Young twigs are dark green or brown tinged with red and covered with pale, loose hairs. They become orange or ashy-gray to light brown during the first winter. The bark is ashy-gray to brown. It is deeply divided by narrow furrows into ridges that often interlace, forming a somewhat diamond-shaped pattern.

The species is dioecious, with male and female flowers occurring on separate trees, before leaf emergence. They are reddish, very small, and inconspicuous. Purplish-red male flowers appear in dense clusters, and female flowers appear in more open clusters. The fruit is a winged seed, or samara, that grows in clusters. These clusters may be 6 to 8 inches long, and an individual seed and its wing are about 1 to 2 inches long. The wing extends slightly along the side of the seed. The loose, drooping seed clusters are on trees from April until frost. Various birds feed on the seed, and deer browse the foliage of young plants.

White ash often grows 70 to 80 feet tall with a diameter of 1 to 2 feet but may grow to 120 feet with a diameter of up to 6 feet. It tends to grow into a larger tree than green ash. This tree develops a clear, straight trunk and narrow crown in the forest. In the open, it branches closer to the ground and produces a broad shade tree.

White ash wood is hard, very strong, tough, elastic, and straight-grained. It is a little lighter in density than oak and has pale brown heartwood with nearly white sapwood. White ash wood is best known for its use in baseball bats, but introduction of the emerald ash borer into the United States has forced manufacturers to consider other species or materials. It is used for tool handles, furniture, interior trim, paneling, doors, and cabinets. It is also used for certain marine supplies, such as boats and oars. White ash has been recognized as the best wood for long tool handles, such as shovels, rakes, hoes, and pitchforks.

White ash commonly occurs on rich, moist but well-drained bottomland soils. It is our most widely distributed upland ash species. It is usually found on lower slopes and in ravines and coves in the uplands. White ash is very

Figure 59. White ash leaves are pinnately compound with seven to nine leaflets, which is larger than the green ash leaf. The leaf scar is crescent-shaped.

susceptible to fire and grazing. As with green ash, older white ash is shade intolerant, but seedlings are moderately tolerant of shade. It is a prolific reproducer through sprouting and by seed and has a medium growth rate.

Platanaceae: Plane-tree family

Trees in this family have bark that sheds in irregular sheets. Leaves are simple and alternately arranged, often lobed. Flowers are arranged in hanging clusters. Fruits are arranged as cylindrical globes of small, winged seeds.

American sycamore, *Platanus occidentalis*

American sycamore leaves are alternate, simple, and deciduous. They are usually 4 to 7 inches long and wide. They may be larger on young, vigorous trees or sprouts. Leaves usually have three to five lobes. Leaf margins have widely spaced teeth of irregular sizes and lengths (Figure 60a). The upper leaf surface is light green and smooth; the lower leaf surface is lighter green, with hairs along the veins. The petiole is 3 to 5 inches long.

Twigs are stout and zigzagged. At first green and slightly hairy or wooly, they later turn brownish to gray. At first, bark is creamy-white or pale green and smooth. It then becomes brown and scaly and flakes off to reveal new, whitish bark underneath. The bark is exfoliating, with older bark continually flaking off to reveal new, lighter bark underneath (Figure 60b). This gives an irregular, patchy coloration to the whole tree. Near the base of older trees, bark becomes thick and furrowed and is usually a dark grayish-brown. The distinctive bark is an identifiable characteristic for this tree.

Although it is not the tallest hardwood tree, American sycamore is probably the most massive in Mississippi. It can reach heights of 100 to 170 feet and diameters of 3 to 12 feet. In the open, the large crown may be as much as 100 feet across.

Both male and female flowers are on the same tree, appearing when leaves have just begun to develop. Male flowers are dark red and appear at the base of leaves. Female flowers appear at the end of twigs on long stalks and are greenish and sometimes tinged with red. The fruit is a ball about 1 inch in diameter that hangs from a 3- to 5-inch-long stem throughout the winter. It is a dense cluster of small seeds. This ball breaks up early in spring to allow wind to scatter the small seed.

The wood has an interlocked, close grain and is moderate in hardness, stiffness, and strength. It is pinkish or cream-colored with dark heartwood and lighter sapwood. The interlocking grain makes sycamore very difficult to split. It is used in furniture and furniture parts, cabinetry, butcher's block, food preparation utensils, and pulpwood.

Figure 60a. American sycamore leaves are simple and lobed with irregular teeth.

Figure 60b. American sycamore bark is exfoliating, with older bark continually flaking off to reveal new, lighter bark underneath.

American sycamore occurs widely on fronts and banks of streams, on many open areas, and on light, moist soils in bottoms. In the uplands, it appears in coves and around heads of streams. In north Mississippi, it is common to find large, solitary trees in old pastures and waste areas, and along borders of lakes, streams, and ditch banks.

Sycamore is very intolerant of shade but is a prolific reproducer on bare, mineral soil with full light. It is also an excellent sprouter. After timber harvesting, it is common to find that sycamore stumps produce too many sprouts. It is a good prospective tree for planting due to its excellent growth rate on a variety of sites. In the forest, its interlacing root system is valuable in preventing erosion along stream banks and levees.

Rosaceae: Rose family

Trees in this family have showy flowers and often produce edible fruits. Many commercial fruit trees are in this family, including apples, apricots, cherries, peaches, pears, plums, and quinces. Leaf arrangement is generally whorled, and leaf margins are often serrated. Although fruits are edible, the seeds have amygdalin, which can release cyanide during digestion.

Black cherry, *Prunus serotina*

Black cherry leaves are alternate, simple, and deciduous. They are oblong to somewhat lance-shaped, 2 to 6 inches long, and 1 to 1½ inches wide (Figure 61a). Leaf margins are finely toothed. Surfaces are smooth and dark green, and undersides are paler green with a rusty-red, slightly hairy midrib.

Twigs are slender, reddish-brown, smooth, and shiny and sometimes covered with a film that rubs off easily. Terminal buds are less than ¼ inch long and chestnut-brown. Twigs have a bitter almond-like taste due to the presence of cyanic acid. The bark is thin and smooth at first, with horizontal lenticels. As the tree ages, bark becomes dark and scaly. On older trees, the lower trunk bark is covered with small, scaly plates with slightly upraised edges (Figure 61b). The bark of the upper trunk and branches is lighter and smoother.

Flowers are white, perfect, ¼ to ⅓ inch wide, and are in large, drooping clusters, appearing when leaves are nearly grown. The clusters are between 3 and 6 inches long. Fruit develops in clusters of dark red or black, shiny drupes, ¼ to ⅓ inch in diameter. Black cherry fruit are edible and are used for making jelly and wine. Wild turkeys, squirrels, songbirds, and other small mammals eat the fruit.

Black cherry develops into a medium-sized tree, 50 to 60 feet tall and no more than 2 to 3 feet in diameter. It has a long, straight, clean trunk and a small crown when growing in the forest. When grown in the open, the trunk is usually short, and the crown is irregularly oblong. Some black cherry trees have reached heights of more than 100 feet with diameters exceeding 5 feet.

The wood is hard, strong, and moderately dense. It compares very well to black walnut. It is close-grained and polishes very smoothly but is not as easily worked with hand tools as black walnut. Heartwood varies from light to dark red, and sapwood is narrow and white. It is one of the few dark-colored woods that are not durable when in soil contact. Black cherry is one of North America's most valuable woods for furniture, cabinets, interior trim, paneling, and woodenware. It is used for engraver blocks and patterns after seasoning.

In bottomlands, black cherry occurs scattered on the older, alluvial soils but is not abundant in any particular location. It is also scattered in the uplands but is probably a little more abundant. It does best on moist, well-drained soils of lower and middle slopes. It is found on drier sites, but development is poor. Black cherry is typically absent from the Delta flood plain.

Black cherry is moderately tolerant of shade. Reproduction is persistent but very sparse and occurs only on moist, exposed, mineral soils. It has a slow to medium growth rate. It is very susceptible to fire but resprouts easily from the base. Leaves and twigs contain cyanic acid and are poisonous to livestock. However, deer browse foliage without harm.

Salicaceae: Willow family

Trees in this family have unisexual flowers arranged in catkins on separate plants (dioecious). Leaves are simple and alternately arranged. Trees in this family have medicinal properties.

Figure 61a. Black cherry leaves are simple and lance-shaped with finely toothed margins.

Figure 61b. Notice the distinctive bark scales that develop on mature black cherry trees.

Black willow, *Salix nigra*

Black willow leaves are alternate, simple, and deciduous (Figure 62). They are lance-shaped, 3 to 6 inches long, and ½ to ¾ inch wide. The tips of leaves are narrowly tapered, and outer edges are finely saw-toothed. Leaves are smooth on both upper and lower surfaces. Twigs are slightly hairy at first but soon become smooth and reddish-brown to orange. They are rather slender and droopy and are easily broken at the nodes. The bark is dark brown to black with deep furrows and shaggy scales on older trees. It is between 1 and 1¼ inches thick.

Male and female flowers are on separate trees and bloom in February and March. They appear before leaves. Both male and female flowers are yellow. Fruit is a reddish-brown capsule about ⅛ inch long. It contains many small seeds with long, silky down or tufts of hair. These seed are blown by wind and drift down to float on the surface of lakes and streams. Willow is sometimes planted for stream bank stabilization.

Black willow commonly grows to only 30 to 40 feet in height, often with several stems growing in a cluster. Trunks are often twisted, curved, or leaning. The taller and larger willow trees on good sites have long trunks that are often free of branches for at least half of their total height.

The wood is moderately light, moderately soft, and very weak. It doesn't hold nails well, but it is shock resistant and does not easily split. It works, glues, takes and holds stains, and finishes well. It shrinks quite a bit during drying and is not durable. The heartwood is pale reddish-brown, and sapwood is nearly white and fine-grained. One distinctive use of willow wood is for making artificial limbs. It is also used for boxes, crates, furniture, woodenware, and novelties. It is often used with cottonwood lumber, and the two are often mixed. Shavings are used for packing material. It is also used for paper pulp and is mixed with cottonwood to make fine-quality paper. Native Americans used willow extract as a pain reliever. The bark contains salicylic acid, which is the active ingredient in aspirin.

Black willow usually occurs on wet sites along streams, lake shores, and flat, swampy areas. It grows on most soils but has a shallow, wide-spreading root system and needs abundant and continuous water during the growing season. The best sites for black willow are in the Mississippi Alluvial Valley. It is a pioneer species occurring on new soil produced as the river deposits loads on sandbars.

About 70 species of willows are native to North America, but only black willow is important for lumber. The growth rate of willow is excellent. It is very susceptible to drought and fire. It reproduces profusely on bare, wet, mineral soil. It also sprouts vigorously but cannot compete well with ground vegetation. It does not tolerate shade and is one of the most shade intolerant of all American sawtimber species.

Eastern cottonwood, *Populus deltoides*

Eastern cottonwood leaves are alternate, simple, and deciduous (Figure 63). They are heart-shaped or triangular, light green and smooth on the upper surface, and somewhat paler on the lower surface. They are about 3 to 5 inches long and wide. Leaf margins are coarsely toothed, and petioles are long, flat, and smooth. Twigs are stout and yellow tinged with green or brown. On young trunks, the bark is a smooth greenish-yellow. Bark on older trees is ash-gray and roughened by long, deep furrows running parallel the length of the tree. The furrows are often interconnected.

The species is dioecious, with male and female flowers on separate trees and appearing before leaves. Male flowers are reddish, rope-like clusters, 3 to 4 inches long, that appear in the spring. Female flowers occur in drooping, bead-like clusters, 2½ to 3¼ inches long. These capsules split open to shed seeds, which are attached to white, cotton-like fuzz. This fuzz helps wind scatter the seed.

Cottonwood is one of the tallest trees of the eastern U.S. forests, reaching heights close to 200 feet and diameters up to 6 feet. The trunk tapers but continues to hold its

Figure 62. Black willow leaves are simple, alternate, and lance-shaped.

Figure 63. Eastern cottonwood leaves are simple and triangular or heart-shaped.

shape well into the crown. On young trees, the crown is usually pyramid-shaped but becomes more rounded on older trees. When open grown, the crown is rounded and usually as broad as it is long. In a forest situation, it will have a clear trunk for half to two-thirds of total tree height and a small crown.

Cottonwood sprouts and foliage are preferred browse for white-tailed deer; in fact, they sometimes make establishment of young seedlings difficult. Rabbits also eat bark from young seedlings. Cottonwood is very common and grows naturally along streams. It gives some erosion control along streams and drainages.

The wood is light, soft, weak, fine-grained, and easily warped. Heartwood is dark brown or gray, and sapwood is white and quite thick. Cottonwood shrinks substantially during drying; careful seasoning is required to avoid warping. Cottonwood does not split easily and is difficult to work without producing chipped or fuzzy grain. It holds paint well. Cottonwood has an especially long fiber that makes it strong for its weight. It had been used for beverage cases and other containers and crates. It is also used for interior parts of furniture, some lumber, and veneer core stock in furniture manufacturing. Moreover, its light color is ideal for making paper. Even though it is lightweight, it is strong and durable. Consequently, it is used to make high-grade magazine and book paper. It is one of the few hardwood species planted and grown specifically for pulpwood.

Cottonwood is widely distributed but usually occurs on recently deposited soil along major streams. It also occurs on recently abandoned fields, rights-of-way, and burned-over areas. Upland sites include coves, stream beds, ditch banks, and wet pasture. Cottonwood does not develop well if grown more than 15 to 50 feet above average stream level in the area.

Cottonwood is the fastest growing commercial forest tree in North America. Diameters of 8 inches and heights of 50 feet have been attained in two growing seasons on good sites. Cottonwood is shade intolerant. It is very susceptible to decay and death after fires and on unfavorable sites. It is susceptible to drought, and, if weakened in any way, it is susceptible to insect attack.

Cottonwood trees are valued as ornamentals due to their fast growth. However, you must be careful to select male trees because sometimes the white cottony seed of female trees will drift and blow against screens and houses. Also, be careful where you plant cottonwood. It has a shallow but strong root system that has been known to buckle sidewalks and clog storm sewers. You can reproduce cottonwood from cuttings. A small stick cut from a live cottonwood tree, if placed in the ground to a depth of 12 inches with 4 inches aboveground, takes root and develops as a new tree. Buds must point up.

Tiliaceae: Linden family

Trees in this family have simple, alternately arranged, deciduous leaves. Leaves are somewhat heart-shaped with asymmetrical bases, meaning one side is longer than the other. Flowers are complete, having male and female parts.

American basswood, *Tilia americana*

American basswood leaves are alternate, simple, and deciduous. They are 3 to 5 inches long and 2½ to 3 inches wide. Leaf margins are coarsely toothed (Figure 64). Leaves are somewhat heart-shaped. They are dark green and smooth on the upper surface and paler below with wooly hairs. Twigs are slender, somewhat shiny, free of hair, and light gray or brown. They become dark gray or brown and somewhat wrinkled or roughened with time. Bark is about 1 inch thick, deeply furrowed, and stringy textured. It is rather scaly at the surface.

Flowers appear after leaves and contain both male and female parts. They are quite fragrant, creamy to yellowish-white, and are in drooping clusters. Bees pollinate the flowers, producing excellent honey. Flower clusters are attached to narrow, leaf-like structures called bracts. The fruit is on stalks attached to the bracts. About the size of a pea, fruit is brown and nut-like. Each fruit contains two seeds and is covered with thick, reddish-brown fuzz. Squirrels, birds, and other small mammals eat basswood fruit in the summer.

The tree grows 100 feet tall or more, reaching diameters of 3 to 4 feet. In closed forest stands, the tree often has a straight, clear trunk and no branches for half its height. When open grown, it forms a beautiful, broad, round-topped crown. The wood is light, soft, and not very strong. It has low shock resistance and is fine-textured and even-grained. It has light brown to nearly white heartwood that is hard to distinguish from the thick sapwood. Easy to work, it holds paint well, glues easily, and is stable after seasoning. Wood carvers prize basswood because of its even grain and workability. It is manufactured into crates and boxes. Some goes into furniture, especially as interior

Figure 64. Notice the uneven leaf. Photo courtesy of Stan Priest, Mississippi Department of Wildlife, Fisheries, and Parks.

parts that are overlaid with higher-grade woods. It is also used for pulpwood.

American basswood is commonly found in the northeastern and midwestern states and is rare in Mississippi. It occurs only on the old, rich sites and terraces, in some creek bottoms, and in soils along the Mississippi River. Its best development is in the uplands and on the middle or lower slopes of ravines and coves. American basswood is moderately tolerant of shade and has a medium growth rate. Its value suffers due to its scarcity. Reproduction is poor, and much of the reproduction is from stump and root sprouts following cutting or fire.

Ulmaceae: Elm family

Elm leaves are simple and alternately arranged. They often have an asymmetrical base where one side is longer than the other. Trees in this family have small, wind-pollinated flowers. Their fruit is a winged seed called a samara.

American elm, *Ulmus americana*

American elm leaves are simple, alternate, and deciduous (Figure 65). They are 4 to 6 inches long and 2 to 3 inches wide. Leaf margins are doubly toothed. The upper surface is dark green and appears smooth but feels slightly rough, and the lower surface is somewhat hairy and lighter colored. Leaf veins are evenly spaced and parallel to each other. Petioles are about ¼ inch long. Twigs are slender, greenish, and slightly hairy at first. They later become smooth and reddish-brown. The bark on larger trees is rough and ashy-gray and broken into irregular, thick scales by deep, somewhat diamond-shaped furrows.

Flowers are perfect, which means both sexes appear within the same flower. The red and green flowers appear before leaves, in long clusters of three to four flowers. Fruit is a small seed encased in a greenish-red, flattened, papery, wing-like covering found in oblong clusters on long stems. Seeds fall from trees about the time that leaves appear. Squirrels feed on buds in late winter and early spring and feed on seeds in late spring.

American elm is the largest of the elms. It grows 100 to 120 feet tall, with a diameter of 6 to 11 feet. In the forest, it may have a tall, clear trunk, but it is more commonly found divided about 30 to 40 feet aboveground into numerous upright limbs that gradually spread with a graceful, rounded crown. Its vase-shaped form made American elm a highly popular street tree in the 19th and early 20th centuries.

The wood is dense, hard, and strong, with an interlocked grain that makes it difficult to split. It has light brown heartwood and thick, pale sapwood. It is not durable when in contact with soil. American elm wood has low to medium value and is used for furniture, factory lumber, barrels, crates, chairs, boxes, and planks.

American elm occurs primarily on moist, rich soils along streams. It occurs widely throughout bottoms except in deep swamps. It is not common on upland sites except on moist, deep, rich soils. Exotic diseases primarily from invasive pests have destroyed large numbers of elms. It was one of the most popular shade trees in America, but many of the older American elm trees have succumbed to disease and been removed.

Slippery elm, *Ulmus rubra*

Slippery elm leaves are alternate, simple, and deciduous. They are 5 to 7 inches long and 2 to 3 inches wide. The leaves resemble those of American elm but are slightly longer (Figure 66). This elm has the largest leaf of the elms. They are very rough on the upper surface. Twigs are stout and somewhat roughened, ultimately becoming dark grayish-brown. Bark is ashy-gray to dark brown, thick, and rough, with shallow furrows. The inner bark secretes a thick, sticky sap.

Flowers are perfect and appear before leaves in short-stalked clusters of three. Each flower bud produces several clusters. On various parts of flowers, you find green, yellow, red, and reddish-purple. The fruit is a small seed encased in a flat, papery, winged covering about ¾ inch long. The greenish seed cavity is on a short stalk and

Figure 65. American elm leaves are simple and alternately arranged, with toothed margins.

Figure 66. Slippery elm leaves look similar to those of American elm but are slightly longer and have very rough top surfaces.

covered with thick, rusty-brown fuzz. Fruit has one seed and is hairy only over the area where the seed is. The wing around the seed is not hairy. Squirrels feed on buds and seeds in spring.

Slippery elm is usually 50 to 60 feet tall with a diameter of 1 to 2½ feet, but it occasionally reaches 80 feet tall with a diameter of 2 to 3 feet. The form is similar to that of American elm. The trunk is usually shorter and breaks up into numerous large, spreading limbs that form an open, flat-topped crown. The wood is hard, dense, and strong. It is coarse-grained with a dark, reddish-brown heartwood and paler sapwood. It is more durable when in contact with soil than American elm. Slippery elm wood is used for fence posts, railroad ties, barrels, implements, chairs, and crates. Inner bark is used in making certain drugs.

The tree gets its name from the slick inner bark. Native Americans and early settlers chewed the inner bark to ease a sore throat. Slippery elm tolerates shade, has a medium growth rate, and reproduces well in openings. It is most common in north Mississippi and occurs along streams; on low, fertile slopes; and even on outcrops of limestone.

Sugarberry, *Celtis laevigata*

Sugarberry leaves are simple, alternate, and deciduous (Figure 67a). They are 2½ to 5 inches long and 1 to 2½ inches wide. Leaf bases are rounded or wedge-shaped, and leaves taper down to a long, narrow point. Leaf margins are entire. Leaves are usually light green and smooth on the upper surface, paler and smooth on the lower surface. Twigs are slender, somewhat shiny, light green to reddish-brown, and covered with scattered lenticels (pores). Sugarberry bark is easy to recognize. It is pale greenish-gray to grayish-brown. It is thin and smooth except for numerous wart-like ridges, commonly found on older trees (Figure 67b).

Sugarberry may have three kinds of flowers: male, female, or perfect (both male and female parts). Flowers are small, inconspicuous, and creamy-green and appear in the spring. The fruit is an orange, red, or yellow drupe about ¼ inch in diameter. It ripens around September. Each drupe is solitary on a ¼- to ½-inch stalk. A thin layer of flesh covers the hard, wrinkled seed that resembles a tiny golf ball. Many songbirds, some upland game birds, and small mammals eat the fruit. It is a good fall and winter food for wild turkeys, and deer occasionally browse leaves and twigs.

Sugarberry is usually not more than 50 feet in height and 2 feet in diameter but can reach 90 to 100 feet. Limbs spread to form broad crowns in the open. In the forest, it develops a generally straight trunk that may not have branches for the first 20 to 40 feet. The wood is coarse-grained and weak. It has pale yellow heartwood and creamy-white sapwood. It is very easy to work, glues well, and has good cutting qualities. Sugarberry wood is used for interior furniture parts, boxes, crates, barrels, and fuel.

Sugarberry occurs throughout Mississippi in moist soil along river bottoms and good upland sites. It is widely distributed in urban areas because it is popular for planting as an ornamental. It has a good growth rate but does not like shade. Although it reproduces well by seed and sprouting, it is easily damaged by fire, and even light burns can kill reproduction. Heavy or hot fire will kill or seriously damage even large trees.

Sugarberry is often called hackberry, but the two are different species. The common hackberry, *Celtis occidentalis*, is a more northerly species that occasionally occurs in Mississippi. Hackberry leaf margins are toothed, a major difference between the two species.

Winged elm, *Ulmus alata*

Winged elm leaves are alternate, simple, and deciduous (Figure 68). They are 1½ to 3 inches long and 1 to 1½ inches wide. They are smaller than leaves of American or slippery elm. They are dark green and smooth on the upper surface and paler with light, soft hairs underneath.

Winged elm gets its name from corky ridges, or "wings," that are often present on twigs. Twigs are smooth and light

Figure 67a. Sugarberry leaves are simple and alternately arranged. They have rounded bases and tapered apexes. The margins are smooth.

Figure 67b. Sugarberry bark is distinctive with warty ridges.

green tinged with red at first. They later become reddish-brown to grayish-brown. The wings usually begin to appear on twigs after the first season. Bark is light brown, possibly tinged with red, and divided into irregular-sized flat ridges and furrows.

Flowers appear before leaves on long, drooping stalks. Tiny, petal-less flowers occur in clusters of three to five. The small, orange-red to reddish-brown fruit consists of a single flat seed with a narrow wing. It is about ⅓ inch long, notched at one end, and covered with white hair. Squirrels feed on buds in late winter and seeds in late spring.

Winged elm is usually a medium-sized tree, growing 40 to 50 feet in height and 1 to 2 feet in diameter. On better sites, it may reach 80 to 100 feet in height and 2 to 3 feet in diameter. It usually has a short trunk, and branches form a narrow, oblong, round-topped crown. The wood is dense and hard but not strong. It is close-grained with light brown heartwood and thick, lighter-colored sapwood. Winged elm wood is used for baskets, chairs, crates, and non-watertight barrels. It is sometimes mixed with the other elms for factory lumber and occasionally for crossties. The inner bark is very fibrous and has been used for making baling twine.

Winged elm is a common tree and occurs throughout most of Mississippi, except in extreme coastal areas and some Delta counties. It occurs widely on flats and ridges in bottoms and is common on all but the wettest sites in the uplands. It is also commonly seen as an ornamental and street tree. Winged elm is not as susceptible to disease as other elms. It tolerates shade and reproduces well by seed and sprouts. It has a moderate growth rate.

Figure 68. Winged elm leaves are simple and alternately arranged. Corky ridges are commonly found on the branches.

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