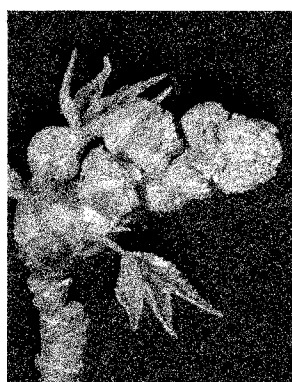
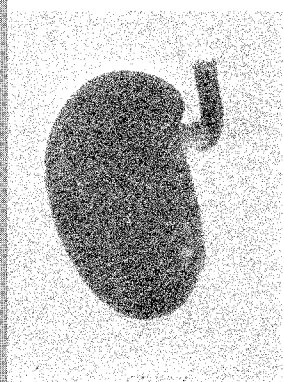
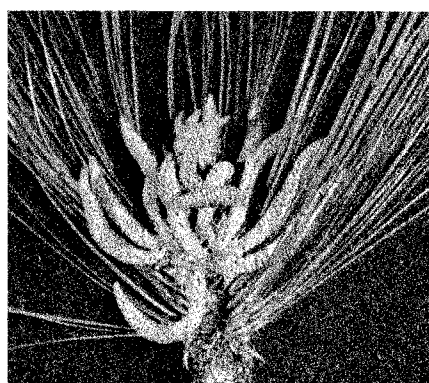
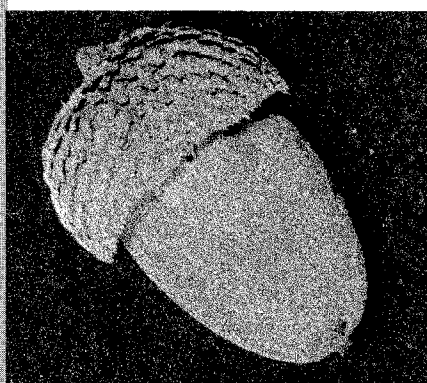
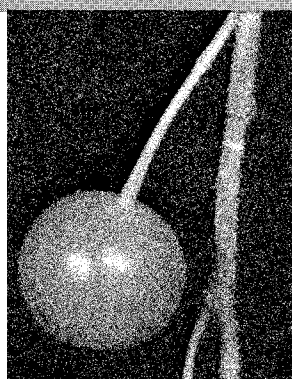


Southern Fruit-producing Woody Plants Used by Wildlife



Southern Fruit-producing Woody Plants Used by Wildlife

Edited by

Lowell K. Halls

Southern Forest Experiment Station
Forest Service, USDA

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FOREWORD

This publication describes and provides illustrations of 106 woody plant species that produce fruit useful to wildlife in southern forests. Information about plant growth requirements, management, and nutritional quality are also included. Trees, shrubs, and vines that produce fleshy fruits or nuts are emphasized because their fruits are a vital source of food for many animals.

The area of consideration extends from eastern Texas and Oklahoma, eastward to Virginia, south to Florida, and encompasses about 200 million acres of forest. Major forest types that characterize the area are: white pine-hemlock, cedar, longleaf-slash pine, loblolly-shortleaf pine, oak-pine, oak-hickory, and oak-gum-cypress. The main geographical provinces are Coastal Plain, Appalachian-Piedmont Plateau, Ouachita-Ozark Highlands, and Appalachian Mountains.

The climax vegetation of the entire area is oak-hickory, but mainly as a result of fire and of cultural manipulation by man, most upland areas in the Coastal Plain and Piedmont are dominated by pines. Because pines are intolerant of shade these stands are usually even-aged. In bottomlands and mountains where fires are excluded, hardwood stands usually are even-aged although the dominant species are intermediate to tolerant of shade.

Forests managed primarily for timber have the potential to sustain much wildlife when management is directed toward increasing the amount of fruit available. Trees grown in stands that are open have well developed crowns and produce more fruit than trees with narrow crowns that grow in dense stands. Understory plants growing in light to moderate shade begin fruiting when they are younger and produce fruit crops more consistently than plants growing in deep shade. Age of the trees affects productivity; trees in the middle of their lifespan produce more fruit than either young or old trees. Prescribed burning increases fruit production of many understory species, but for other species destroys or seriously reduces the capacity to produce fruit. Finally, genetically superior trees may grow 20 to 30 percent faster than unimproved trees, and it is likely that fruit production can be increased correspondingly.

The variety of fruits is as important to wildlife as the abundance. When many kinds of plants are present fruits are likely to be available year around, stands produce fruits consistently year after year, and the habitat will meet the needs of many wildlife species. The presence of

a variety of fruits helps animals obtain a balanced diet, especially in the South where many forages are deficient during several months of the year.

The Appendix table presents chemical composition values of fruits and seeds for species about which data are available. Exact comparisons between species should be made with caution because of differences in analytical procedures and the time and place of collections. Nevertheless, the data are indicative of relative nutritional values and should serve as useful guides in habitat evaluation and management. In the text, nutrient content in percent of dry matter is according to the following classification:

	High	Medium	Low
Crude protein	213	8-12	≤ 7
Crude fat	≥ 7	4-6	≤ 3
Crude fiber	≥ 24	17-23	≤ 16
Nitrogen-free extract (NFC)	260	51-59	≤ 50
Phosphorus (P)	≥ 0.26	0.13-0.25	≤ 0.12
Calcium (Ca)	≥ 1.00	0.21-0.99	≤ 0.20

It is hoped that this paper will help the forest land manager to identify some of the more important fruit-bearing woody plants and that the information will enable him to do a better job of management.



Pomes

POMES

Pomes are fruits that have several tough papey-walled cavities each containing seed, and the cavities are surrounded by thick flesh. These fleshy fruits may be large, as are apples, or small and berry-like as are the fruits of the hawthorn.

Fresh pomes have high moisture contents, and on a dry-weight basis, are usually very high in carbohydrates but low in crude protein. Most of them are edible to both humans and wildlife.

The genera discussed here are all members of the Rosaceae family.

Serviceberries/*Amelanchiers* spp.

Joseph F. Larson

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There are five species of serviceberries in the southern United States. Allegheny serviceberry (*A. laevis* Wieg.), a shrub or small tree of up to 40 feet tall, grows on dry open woodlands, and in roadside thickets, cool ravines, on hillsides, or on damp wooded slopes and banks. Downy serviceberry [*A. arborea* (Michx. f.) Fern.], a shrub or small tree of up to 25 feet tall, is found in dry woods and open ground, and on wooded hillsides. Thicket serviceberry [*A. obovalis* (Michx.) Ashe], a slender shrub that forms colonies, occurs in open woods on sandy pine barrens along the Coastal Plain. Dwarf serviceberry [*A. spicata* (Lam.) K. Koch.], a stoloniferous shrub, grows on gravelly or rocky shores, sandstone or limestone cliffs, and ledges, in woods or thickets, and on pine barrens, or sand dunes. Shadblow serviceberry [*A. canadensis* (L.) Medic.], grows in clumps up to 20 feet tall, chiefly in swamps and bogs and on low grounds in woods.

When growing together several *Amelanchier* species will hybridize freely, making positive identification difficult. All of the species have several to many showy white or pinkish flowers that appear in advance of the foliage or with it. The leaves are simple, deciduous, alternate, pinnately veined, usually serrate, and elliptical or oblong in shape. The genus is illustrated in this bulletin by shadblow serviceberry, the species most often reported as a wildlife food plant.

Serviceberries are valuable wildlife food plants. The fruits are readily eaten by many species of songbirds during the early summer. The twigs, foliage, and flowers are consumed by white-tailed deer. Rabbits feed on the twigs. Ruffed grouse eat the fruits in fall and the buds in spring. Beaver, red fox, the eastern flying squirrel, and the eastern red squirrel consume the fruit, bark, and twigs. Chipmunks and bears relish the fruits. Cottontails feed on fallen fruits. Songbirds utilize the fruits adhering to branches in the winter. Fruits are high in nitrogen-free extract and low in crude fiber. Of the serviceberries, downy serviceberry fruits are the least edible.

Serviceberries are often grown for their showy early white flowers and edible fruits. Seeds should be collected immediately when ripe before being eaten by birds. Seeds can be planted in fall, but for spring planting they should be stratified in peat at 33° to 41°F for 90 to 120

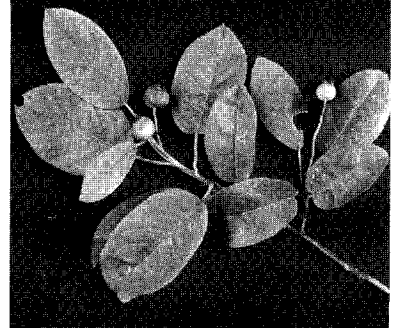
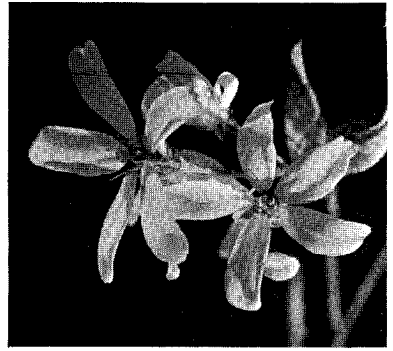
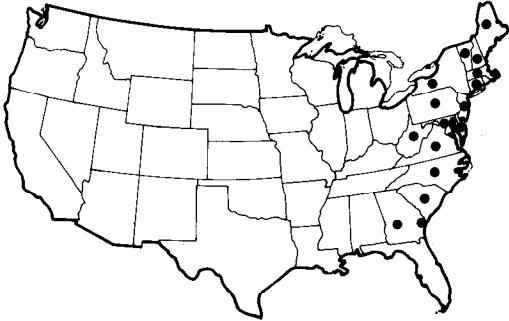
Shadblow Servicebeny

A shrub, usually with several upright trunks up to 20 feet high, growing in clumps.

Leaves alternate, simple, deciduous, 1 to 2.50 inches long, 0.70 to 1.10 inches wide, finely serrate on the margin, white tomentose beneath when young.

Flowers white, appearing with leaves, late March (southeast) to early June (northeast).

Fruit a blackish, juicy, sweetish berrylike pome, 0.33 inch in diameter.



days. Seedlings are usually transplanted at 1 year in the nursery and field planted 2 or 3 years later. Plants can also be propagated by cuttings in the fall, or from suckers in the spring.

Serviceberries are usually welcome vegetation. In addition to their high aesthetic value and their importance as wildlife food, their fruits are edible to humans. Also, some of the larger species are used for wood products, such as handles.

Other *common names* for the genus are Juneberry, shadblow, and shadbush. In the eastern and northeastern states the term shad probably comes from the flowering of these species at the same time that shad begin to ascend streams in spring.

Hawthorns/Crataegus spp.

Paul A. Shrauder

Forest Service, USDA

Roanoke, Virginia

The hawthorns are easily recognized as a group, but species are extremely difficult to identify, even by specialists. Because of great variation among individuals and probable prolific hybridization, the number of species has been variously listed from 100 to over 1,200. Most authorities recognize about 800 species.

The shrubs or small trees range in height from 2 to 40 feet. The leaves are alternate, simple, serrated or lobed, deciduous, lustrous, dark green in color, and usually have a rubber-like texture. The characteristic stiff and sharply pointed thorns range from 0.5 inch to 6 inches in length. The perfect, showy, white, or rarely pinkish flowers are usually borne in terminal, cyme-like clusters. Flowers usually bloom in April and May, and their strong almond-like fragrance aids immensely in insect pollination.

The small, apple-like fruits are bright red, yellow, green, or black in color. They are generally open and concave at the apex and are borne in branched clusters. The flesh is usually dy and unpalatable, but in some species it is tart and palatable. Fruits contain from one to five bony seeds that are widely disseminated by both birds and mammals. Because of their thick shells, the seeds are slow in germinating, often "lying over" for a season.

The twigs are moderate or slender, more or less zigzag and marked by oblong, mostly pale lenticels. Light green when they first appear, the twigs later become red, lustrous orange-brown, or gray. Leaf scars are horizontal, slightly elevated, narrowly crescent-shaped, and show three bundle scars. The winter buds are rather small, roundish or bluntly pointed, generally smooth, and reddish or bright chestnut in color, and have many overlapping, exposed bud scales.

Hawthorns occur on a wide variety of sites and on soils ranging from heavy clay to sandy loam. Several hawthorns attain their best development on dy stony ridges and mountain slopes; others flourish in moist river bottoms and along the edges of swamps, mostly in neutral soil.

Hawthorns are intolerant, and most species represent an early stage in plant succession. They seed into openings quickly and are

Blueberry Hawthorn

A beautiful round-topped tree attaining a height of 40 feet, armed with short curved spines.

Leaves have serrate margins, are sometimes lobed, dark green glabrous and lustrous above, paler and glabrous beneath, 0.75 to 3.50 inches long, 0.50 to 2 inches wide.

Twigs green and minutely pubescent at first, glabrous and reddish brown to gray later, spines 0.33 to 0.66 inches long, stout, curved, and gray to brown.

Flower borne in many-flowered corymbs, 0.33 inch across, white at first and orange later.

Fruit bright blue or black with glaucous, 0.33 to 0.50 inch long, thin flesh, three to five nutlets. August.

Other common names: blue *haw*, *pomette bleue*



Parsley Hawthorn

A shrub or small tree 15 to 25 feet high, scaly bark.

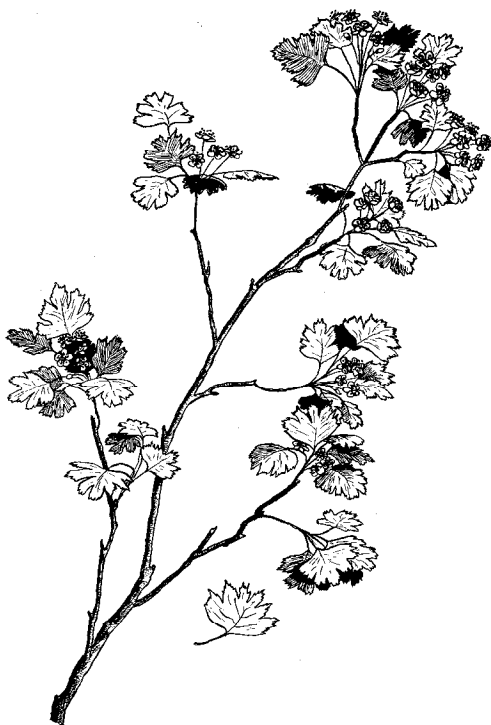
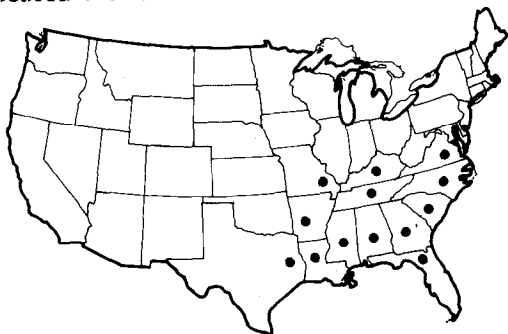
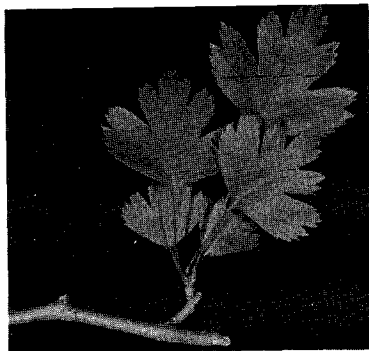
Leaves broadly ovate, sharply serrate, deeply incised, pubescent when young. At maturity, thin, glabrous above, pubescent along veins below, 0.75 to 1.50 inches long.

Twigs thorny, pubescent when young; spines 1 to 2 inches long.

Flowers 0.50 to 1 inch wide, white, almond-like fragrance. April.

Fruit 0.50 inch in diameter, bright red, thin succulent flesh, one to three nutlets. October.

Other common names: *parsley haw*, *parsley-leaved thorn*.



frequently found in abandoned fields, pastures, and meadows. Although most numerous in areas around livestock farms, the plants also occur along the edges of or within moderately dense pine and hardwood forests. Their long sharp thorns help protect them from livestock grazing, and the long taproot helps them survive extended droughts.

Hawthorns are frequently a deterrent to timber regeneration and early growth. Impenetrable thickets, however, may be gradually invaded by shade tolerant trees. Maintenance of the hawthorn thickets consists mainly of controlling or eliminating the invading species of plants, usually by selective cutting.

Fruits of hawthorns are eaten by several kinds of songbirds, particularly the sparrows and cedar waxwing, and by game birds such as wild turkey, bobwhite quail, and wood ducks. Hawthorns are a key item in the fall diet of ruffed grouse. Squirrels, foxes, raccoons, rabbits, white-tailed deer and rodents eat the fruit quite extensively. The fruits are relatively low in crude fiber. Some species retain their fruits over winter, but on others fruits mature and drop in early spring. The browse is considered fair in palatability for deer, and is most heavily used in May and June.

Hawthorn stands serve as important brood-rearing areas for ruffed grouse and wild turkeys and as excellent cover for woodcocks. Hawthorn also provides nesting sites for many birds such as brown thrashers, catbirds, robins, blue jays, and mourning doves.

Hawthorns are occasionally attacked by several pests. Tent caterpillars, fall webworms, and canker worms eat foliage, and aphids and mites injure it. Apple borers may injure the trunks and leafminers are found on foliage and fruit. Usually, however, the damage from such pests is not serious. Most hawthorns are highly susceptible to rust, with redcedar as the alternate host.

Because of their showy flowers and fruits, hawthorns are often planted in parks and gardens. The fruits of some species, particularly riverflat hawthorn, are often picked by humans and made into wine or jelly.

Plants are easily transplanted from the wild when young. Older plants have deep taproots that are hard to dig, and are less sure to survive transplanting. Nursery stock is available for planting but is expensive.

For wildlife purposes, the most practical way to establish hawthorn thickets is by seeding. Seeds should be cleaned, stratified in sand over winter, and planted in spring. The number of seeds per pound ranges from 6,000 to 40,000 with about 40 percent germination. Because of

Riverflat Hawthorn

A deciduous shrub to small tree.

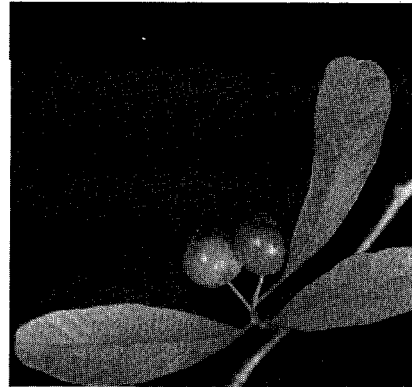
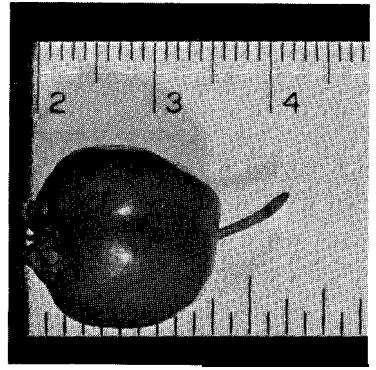
Leaves dark green and usually glabrous above, rusty brown and pubescent below.

Twigs brown to reddish brown to grey, scattered white pubescence when young, becoming glabrous, spines up to 1.50 inches long; buds small, round and glabrous, reddish in color, leaf scars slender and flat V-shaped, hard pith.

Flowers white, borne before leaves. February to March.

Fruit red, three to five nutlets. April to May.

Other common name: *May haw*.



One-Flower Hawthorn

A slender shrub 3 to 12 feet high.

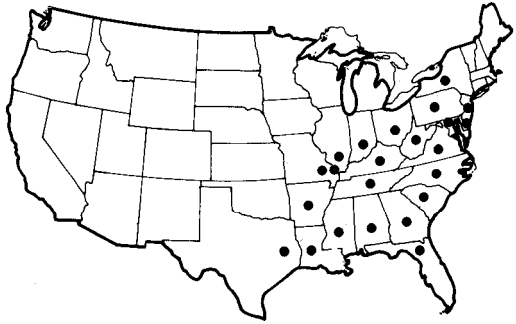
Leaves sharply **serrate**, upper surface dark green and lustrous, with scattered hairs; lower surface pubescent.

Twigs reddish brown to gray and densely pubescent when young, older twigs are **gray** and glabrous, spines slightly armed or straight, 0.50 to 2.25 inches long.

Flowers **on** short, tomentose **pedicels**, white, two or three together or single. May.

Fruit usually solitary, 0.36 to 0.50 inch thick, pubescent, greenish yellow to dull red, fleshy dry and firm, three to five nutlets. October.

Other common name: *Dwarf thorn*.



rust, hawthorns should not be planted in areas where redcedar is abundant.

Four species of hawthorns are illustrated here:

(1) Blueberry hawthorn (*C. brachyacantha* Sarg. and Engelm.) is a small tree that grows along margins of streams and swamps. It is distinguished from other species by its blue fruit which ripens in August.

(2) Parsley hawthorn (*C. marshallii* Eggl.) grows in open woods and low hills, usually along streams.

(3) Riverflat hawthorn (*C. opaca* Hook & Arn.) is found in wet soil around shallow ponds. It is the famous May haw of the South. The large size and acid character of the fruit are particularly desirable for jelly. Buds are eagerly sought by squirrels in spring.

(4) One-flower hawthorn (*C. uniflora* Muenchh.) is a shrub that grows in woods or on sandy or rocky banks.

Common Apple

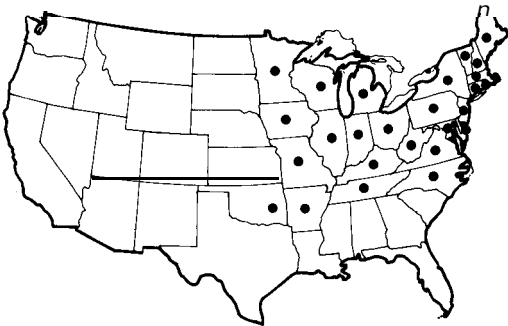
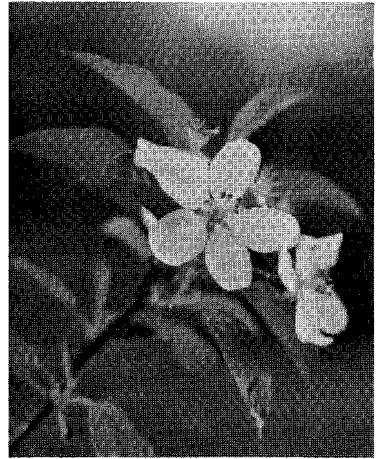
A small tree, 15 to 50 feet tall with a short trunk and spreading branches.

Leaves alternate, margin finely serrate; blade 1 to 4 inches long, 0.75 to 3 inches wide; upper surface dull green, glabrous; lower surface paler and pubescent.

Twigs stout, reddish-brown, glabrous, lustrous; branchlets short and spurlike.

Flowers in terminal cymes, pinkish-white. May to April with leaves.

Fruit a fleshy pome, 1.33 to 4 inches in diameter, green to yellow to red, five papery locules in flesh, two seeds in each locule. September to November.



Common Apple/Pyrus malus L.

Lowell K. Halls

Forest Service, USDA

Nacogdoches, Texas

The common apple is an introduced species that escaped from cultivation and is frequently found on old fields, clearings, and abandoned home sites. It grows in a wide variety of soils and climates but does best on clay-loam soil.

The fruits and seeds are eaten by upland game birds, including the bobwhite quail and mourning dove, and by many kinds of songbirds. The fruits are a favorite fall and winter food for ruffed grouse, which also eat the buds in spring. The fruit and bark are eaten by fur and game animals, particularly opossums, raccoons, and foxes. White-tailed deer eat the fruit, foliage, and twigs. Some damage occurs by pecking of fruit by birds and the eating of bark of both trees and saplings by rabbits and mice.

Most of the commercial apples are propagated vegetatively.

Other common names: Pommier, scarb-tree, wilding-tree, crab-tree, crab apple.



Drupes

A drupe is a fleshy or pulpy fruit in which the inner ovary wall (endocarp) is hard and stony, enclosing a seed. Cherries and plums are good examples.

DRUPES

Drupes are extensively eaten by wildlife and many are important for human consumption. Usually the fruits are low in crude protein and high in carbohydrates, but the nutrient contents vary quite widely among species. Some members are high in prussic acid and may be dangerous to humans and livestock.

The genera discussed here are members of several family groups.

Alabama Supplejack

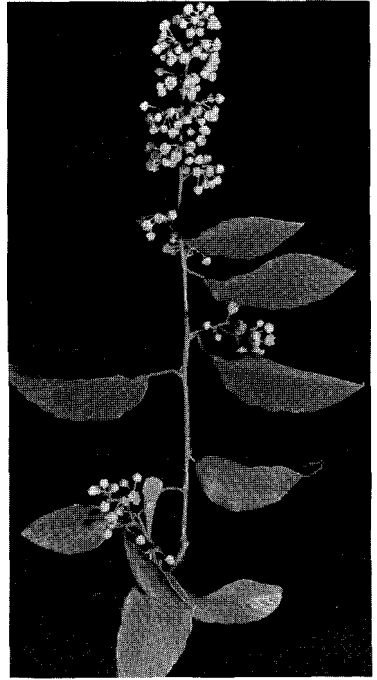
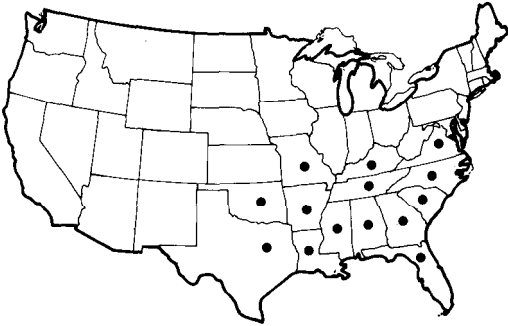
A high climbing, large, twining vine.

Leaves alternate, dark green, glabrous, 1.50 to 3 inches long and 0.75 to 1.50 inches broad.

Twigs are much branched, slender, green and gray streaked to brown when young and red-dish brown or black when older.

Flowers are greenish-yellow. March to June.

Fruit is a bluish-black drupe, 0.25 to 0.33 inch long, July to October.



Alabama Supplejack/*Berchemia scandens* (Hill) K. Koch

Lowell K. Halls

Forest Service, USDA

Nacogdoches, Texas

Growing in rich moist soils, this high-climbing vine encircles and quickly grows to the tops of trees or whatever support is present. The strong, pliable stems may girdle and kill large trees.

The fruits of Alabama supplejack are eaten by many kinds of birds, including wild turkey, bobwhite quail, and mallards, and by small mammals such as raccoons and squirrels. White-tailed deer eat both the fruits and the foliage. The heaviest use of Alabama supplejack browse twigs occurs in spring and summer. When forming hedges or thickets along fences, the species provides excellent nesting area and escape cover for rabbits and birds.

Alabama supplejack plants growing in the open consistently produce fruit annually. Ripened fruits persist on plants through most of the winter; thus, they are a source of food at a critical period. The fruits are low in crude protein and phosphorous, high in crude fiber, and moderately high in calcium.

Alabama supplejack grows well beneath trees, but forage and fruit yields are several times greater when plants grow in the open. The plants withstand prescribed burning in winter, which is the practice that is usually recommended for keeping the plant growth close to the ground. If left unchecked, most of the foliage soon grows beyond reach of deer.

The strong pliant vines are often used in wickerware.

Other common name: rattan vine.

American Beautyberry/Callicarpa *americana* L.

Lowell K. Halls

Forest Service, USDA

Nacogdoches, Texas

This deciduous shrub thrives on a wide variety of forest sites. It grows well in shade but does best in the open or beneath high, fairly thin pine canopies. In late March, it puts out new green leaves oppositely arranged on the twig. Twig growth is essentially completed by July, but when portions of the current season's growth are removed some of the lateral buds break dormancy and form new twigs. The rootstocks resprout if the stems are killed by woods fires. The plants do not compete with trees being grown for saw logs or pulpwood.

Small bluish flowers form in the leaf axils mostly during June but occasionally through the summer. The conspicuous berries, the real trademark of the plant, become noticeable in June and mature from August to September. Many persist to January.

The fruits are important quail food during the winter, and are frequently eaten by deer from August through October and to a lesser extent at other times of the year. They are also eaten by squirrels, raccoons, opossums, foxes, and domestic livestock.

The fruits are readily available in August and September, a time when other wild fruits are scarce. Furthermore, their high water content (about 80 percent) can be important to wildlife during these usually dry months.

In an east Texas study, American beautyberry yielded more fruit than 13 other species during a 10-year period. In the open, plants grew rapidly the first few years and produced abundant fruit. Yields peaked at 1,722 grams per plant, when plants were 5 years old. The following year, however, the plants deteriorated and many stems died back. This general decadence continued for 2 years, and fruit yields declined to 107 grams. The next year many of the old stems sprouted at the base, and the plants again produced a substantial fruit crop. During the next 2 years, severe dieback of stems diminished fruit yields. In the woods, young plants developed more slowly, produced less fruit, and after plants were 5 years old the fruit yields tended to be high and low in alternate years. Differences in fruit yields between open- and woods-grown plants lessened as they became older, and at age 12 yields were similar to each other.

The twigs and leaves are eaten by deer and cattle during the growing season and occasionally in early winter. As a deer browse plant American beautyberry is considered medium in preference, but as with other medium preference plants it may be a major part of a deer's

American Beautyberry

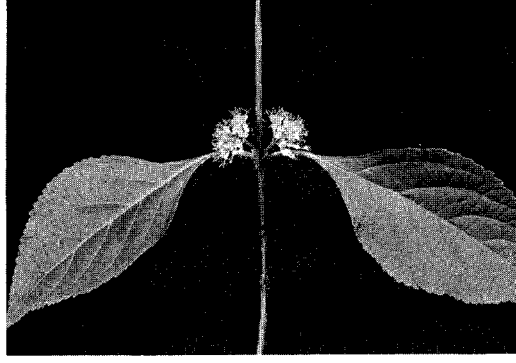
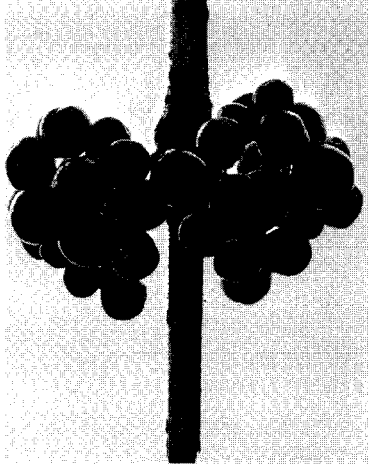
A much-branched shrub commonly 2 to 8 feet tall.

Leaves deciduous, white pubescent below, soft-textured, aromatic, 3 to 9 inches long, 1.50 to 5 inches wide.

Flowers small, bluish, clustered in leaf axils, June.

Fruit is a purple berry-like drupe with four seeds, each about 0.03 inch long. August to September, persist to January.

Twigs round or four-sided, densely hairy.



diet when highly preferred foods are scarce. When deer and cattle use the plants very heavily, browse and fruit yields are likely to be lessened, but the plants are seldom killed.

Fruits are relatively low in crude protein and phosphorus, and medium in nitrogen-free extract and calcium.

During the period of rapid growth in spring, the new leaves and twigs have enough crude protein, phosphorus, and calcium to meet the maintenance and growth requirements for both deer and cattle. When growth ceases, the protein and phosphorus content drop below the amount needed by the animals but the calcium remains adequate. Leaves and twigs from a plant that has been through a recent fire are higher than average in nutrient content and palatability.

American beautyberry is easily propagated. Seed collected in the fall can be sown in the field or nursery the next spring. Plants grown in the nursery can be outplanted the following winter. Losses from transplanting are usually few. The plants also are easily rooted from stem cuttings. The best time to take cuttings is September. If cuttings made then are propagated in the greenhouse they can be outplanted in late winter and will produce fruit the following summer. American beautyberry is best maintained by a moderate disturbance such as logging and readily sprouts after a winter burn.

American beautyberry is an attractive plant for yards and parks. Its brightly colored fruit, the ease with which it can be propagated, and its ability to grow in the shade and on a variety of sites with very little culture all add to its popularity.

Other common names: Spanish-mulberry, French-mulberry, Bermuda-mulberry, sour-bush, and sow-ben-y.

Sugarberry

A tree up to 100 feet high and 2 feet in diameter.

Crown spreading and round-topped or oblong. Bark thin, smooth, with prominent warty growths.

Leaves simple, alternate, deciduous, thin, light green and glabrous **above**, paler and smooth below, 3-veined at base, 2.50 to 4 inches long, 1 to 2.50 inches wide.

Twigs light green to reddish brown, lustrous.

Flowers **small**, inconspicuous, greenish, borne as slender glabrous **pedicels**, **male** fascicled, female solitary or two together. Spring.

Fruit **an orange** red to black drupe, 0.25 inch in diameter, flesh thin and **dry**. Seed sweet, **solitary**, **pale** brown, rough. Ripens in **late** summer and persists through winter.



Sugarberry/ *Celtis laevigata* Willd.

Lowell K. Halls

Forest Service, USDA

Nacogdoches, Texas

Sugarberry is widely distributed on bottomlands except deep swamps. It thrives on various types of soil but is most common on clay soils of broad flats or shallow sloughs within the flood plains of major southern rivers. The species grows in association with a wide variety of hardwoods. It is intolerant of shade, but when released, grows rapidly and suppresses species of higher commercial value. In dense, even-aged stands it prunes itself well and produces a straight stem.

The fruits are eaten by many songbirds, upland game birds, and small mammals. It is a preferred fall and winter food of wild turkey. White-tailed deer occasionally eat the leaves and twigs.

Fruit yields are optimum when trees are 30 to 70 years old. Seeds are borne nearly every year with good crops in most years. Late spring frosts sometimes kill the flowers and reduce the seed crop. Seeds are low in crude protein, moderate in phosphorus, and high in calcium.

Seed may be sown in fall or stratified in moist sand at 41°F for 60 to 90 days and sown in spring. The species can also be propagated by cuttings. Small stumps sprout readily, and there is some sprouting from root collars of fire-damaged seedlings and saplings. The bark is thin and easily damaged by fire. A light burn kills reproduction and a heavier burn may kill or seriously damage large trees.

The wood is used to a limited extent for furniture, flooring, crating, fuel, and cooperage. The species is often planted along streets or as a yard tree.

Other common names: sugar hackberry, hackberry, Texas hackberry.

Hackberry/*Celtis occidentalis* L.

Lowell K. Halls

Forest Service, USDA
Nacogdoches, Texas

Hackberry is principally a bottomland tree, but it grows on many soils and is frequently found on limestone outcrops or limestone soils. Sites with a permanently high water table are unfavorable for hackberry, although periodic flooding apparently is not detrimental.

Hackberry is found in many forest stands but seldom occurs in pine stands. It is intermediate to tolerant of shade, and trees suppressed for a long period are often of poor form. It is drought resistant and in the South is often planted for shade and as a shelter belt.

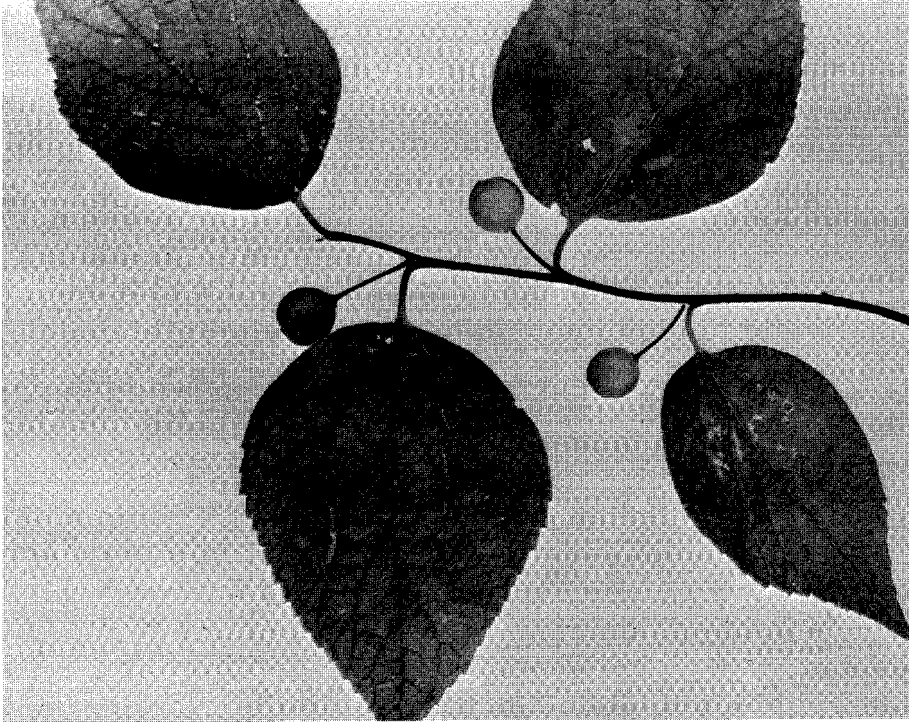
The fruits are eaten by many species of birds and small mammals. They are preferred fall and winter food for turkeys, and a principal food for raccoons. They make up a small part of the diets of pheasants, waterfowl, quail, and ruffed grouse. Squirrels eat the fruits, and to a lesser extent the buds and bark.

Hackberry bears good seed crops in most years. Seeds are exceptionally high in calcium, moderate in nitrogen-free extract, crude protein, and phosphorus, and low in crude fiber. Seed can be sown in fall or stratified in moist sand at 41°F for 60 to 90 days and sown in spring. Hackberry can also be propagated from stem cuttings and by layering. Sprouts develop from stumps of small trees but rarely from larger trees.

The wood is occasionally used commercially for fuel, furniture, veneer, and agricultural implements.

Hackberry is highly susceptible to fire, which opens the way for wood decay organisms.

Other common names: common hackberry, sugarberry, nettle-tree, false-elm, bastard-elm, beaverwood, rim-ash, one-berry.



Hackberry

A tree 30 to 50 feet tall and 18 to 24 inches **in** diameter; its gray bark bears corky warts and ridges.

Leaves simple, alternate, deciduous, coarsely **serrate**, light green and glabrous **above**, paler green and pubescent below, blade 2.50 to 4 inches long, 1.50 to 2 inches wide, leaf base **in-**equilateral.

Twigs green to reddish brown, slender, glabrous **or** pubescent, zigzag.

Flowers small and green; appear with **or** shortly **after leaves**; female flowers borne solitary **or** in pairs; lower flowers usually **male** only.

Fruit a **globose**, orange-red drupe, turning dark purple, 0.25 to 0.33 **inch in** diameter, persistent. Flesh thin, yellow, **sweet**. Seed bony, light brown, smooth **or** pitted. September-October.



Fringetree/Chionanthus virginicus L.

Phil D. Goodrum

U.S. Fish and *Wildlife Service*

Nacogdoches, *Texas*

Fringetree is most abundant in the understory of pine-hardwood forests, especially on moist, acid, sandy loam soils. It reaches best development in semi-open situations but is moderately tolerant of shade and occasionally is found in dense understories. Though its distribution is wide, it is usually a minor part of the total vegetation. It is among the shorter-lived shrubs.

The date-like fruit and seeds are eaten by many birds and mammals including turkey, quail, and deer. Fringetree is preferred browse for deer in the Gulf Coast Plain, but in the Piedmont and mountains it is browsed only lightly. Greatest use is in spring, summer, and fall. The species is moderately intolerant of browsing, and plants often die when more than one-third of the annual growth is removed. The foliage is eaten by cattle.

Observations in Mississippi, Louisiana, and eastern Texas indicate that hot fires will rootkill most specimens but a light fire induces sprouting and helps keep forage available to deer.

Fringetrees are planted throughout the South as ornamentals. The bark has medicinal uses as a diuretic and fever remedy.

Other common names: white fringetree, old man's bear, flowering ash, grandfather-gray-beard.

Fringetree

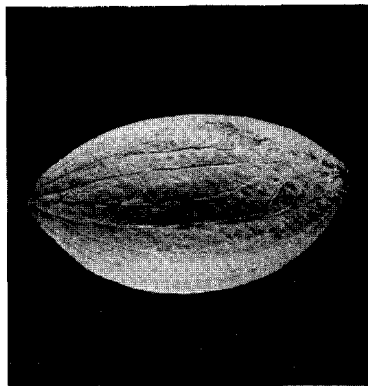
A shrub or small tree up to 35 feet high.

Twigs reddish-brown at tip, stout, **pubescent**.
Leaf scars raised and moderately **large**; **lenticels warty**, round, or shield-shaped.

Flowers white and fragrant, borne **in** delicate drooping panicles 4 to 6 inches long. **March** to June.

Leaves opposite, deciduous, 4 to 8 inches long, 1 to 4 inches **wide**. Dark green and glabrous **above**, paler below **with hairs on** veins.

Fruit a purple oval drupe 0.50 to **1 inch long**, borne **in loose** clusters, one to three seeds. August to October.



***Flowering Dogwood/Cornus florida*L.**

Lowell K. Halls

Forest Service, USDA
Nacogdoches, Texas

Flowering dogwood is an understory species that is very tolerant of shade and is especially common in young forests and mixed pine-hardwoods. Dogwood is found on a variety of soils ranging from deep moist soils along streambanks to well drained light upland soils, but is usually scarce or absent on poorly drained soils. It grows best on sites having a northern aspect and moist, rich loams with a pH of 6 to 7. A shallow root system makes it vulnerable to prolonged droughts.

Virtually all game species use the fruit. It is a preferred food by wild turkeys, and is readily eaten by white-tailed deer, ruffed grouse and quail, and to a lesser extent by wood ducks. The fruit is eaten by many kinds of songbirds, particularly cardinals, grosbeaks, robins, brown thrashers, and cedar waxwings, and by mammals such as rabbits, foxes, black bears, and chipmunks. Grouse sometimes eat the buds and flowers during spring.

Because of its browse and fruits and its widespread occurrence, dogwood is one of the most important deer food plants. Foliage and twigs are often heavily browsed except in the Gulf Coast areas where use is light to moderate. The browse is most palatable in spring and least, in winter.

Cattle frequently compete with deer and may use up to 50 percent of available browse. Dogwood is also browsed by rabbits.

In east Texas, maximum dry-weight yields of fruit were 1.7 pounds for 11-year-old trees growing in the open and 0.2 pounds for plants growing beneath pine trees. The pulp-seed ratio of fruits usually ranges from 1:0.85 to 1:1.05.

The fruits are low in crude protein and phosphorus but high in calcium. The browse is high in calcium, manganese, and cobalt, but low in crude protein during the winter. The leaves of dogwood may concentrate fluorine.

Dogwood seed germinates in the spring after it has lain on the ground over winter. Freshly gathered seed will germinate following moist storage for 100 to 130 days at 0° to 10°C. Seed stored above 15° will not germinate.



Flowering Dogwood

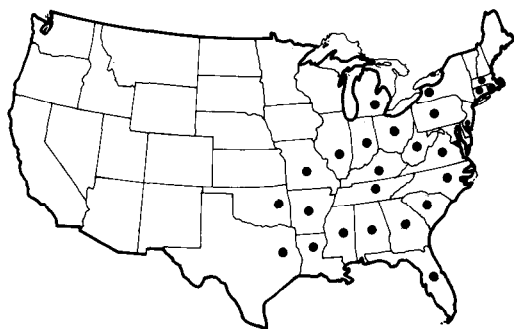
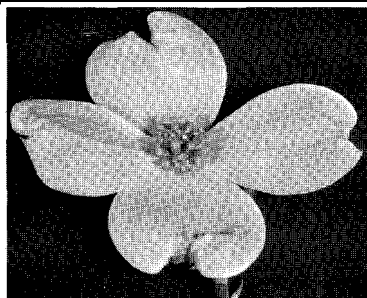
A shrub or small tree up to 40 feet tall.

Leaves simple, opposite, dark green above, light green and **glaucous** below, often clustered near end of branches. Blades 3 to 5 inches long, 1.50 to 2.50 inches wide.

Twigs green or purple, often with whitish bloom. Buds scaly, outer **scales** of terminal bud **bivalvate**. Leaf **scar** somewhat raised upon the persistent leaf base.

Flower **bracts** snowy white or, rarely, pink; 1.25 to 2.50 inches long. **March** to June.

Fruit a bright red, clustered drupe, 0.25 to 0.50 **inch** long. September to October and persist through early winter.



Dogwood can be propagated by layering and cuttings.

Because the bark is thin, stems are easily killed by fire, but rootstocks send up numerous sprouts that provide succulent and nutritious forage. Plants die if flooded for several weeks.

Its flowers and foliage make dogwood a favorite among gardeners. The wood is used for shuttleblocks in the textile industry and for other specialty products.

Dogwood litter decomposes rapidly, thus making its nutrients readily available.

Other common names: dogwood, arrowwood, boxwood.



***Dwarf Huckleberry/ Gaylussacia dumosa* (Andr.) T. & G.**

Ralph H. Hughes
Forest Setuice, *USDA*
Fort Myers, Florida

Dwarf huckleberry grows best in shaded peaty or sandy soils and is commonly found in flat damp woods that are frequently burned. Like other plants in similar habitats, it is protected from extermination by a network of underground stems that put up new shoots after a fire.

Fire can be used as the main management tool for dwarf huckleberry. Plants flower and fruit vigorously and prolifically if pruned back by fires at regular intervals. On forested ranges managed for quail or wild turkey, huckleberries are most abundant on areas burned at two- or three-year intervals. When burned in winter the plants do not bear fruit the following growing season; however, when burned in July or August the plants bear fruit the following year.

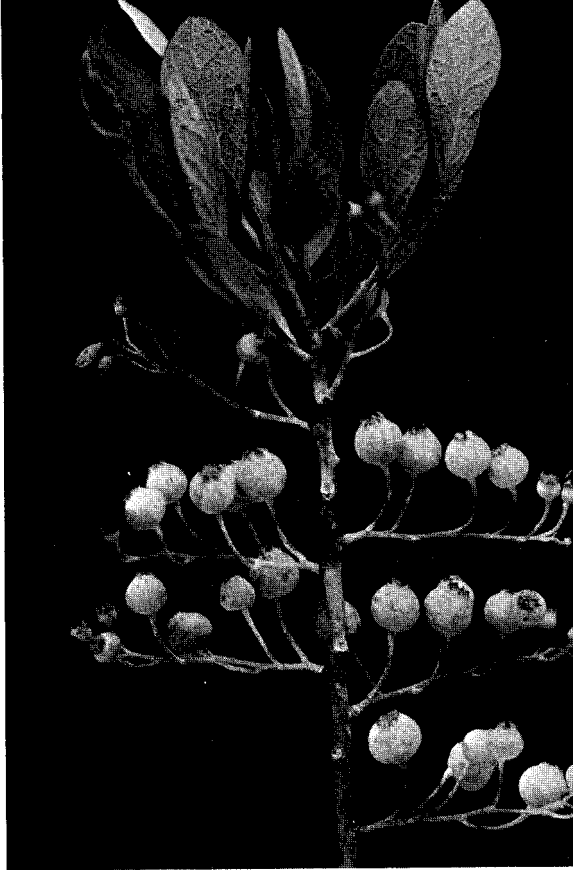
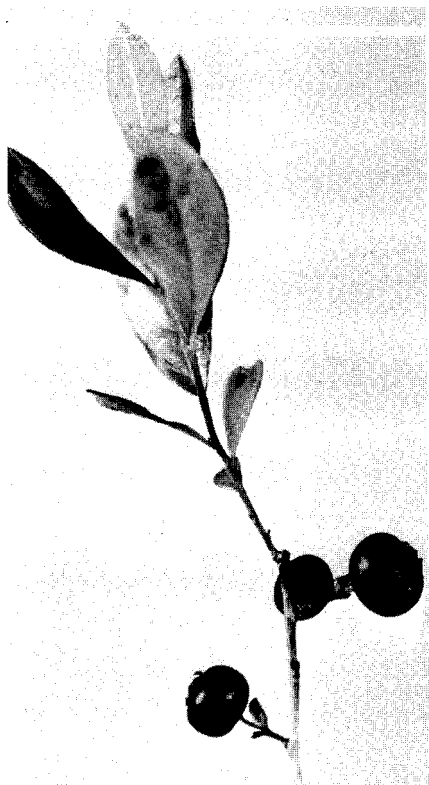
Fruits of dwarf huckleberry are eaten by bobwhite quail, wild turkey, ruffed grouse, several songbirds, foxes, and squirrels. In one south Georgia study, fruit, including huckleberries, was more than half the food of quail during June and July. A large portion of the huckleberry seeds eaten by quail in summer pass through the digestive system without being crushed. When taken during the winter months the seeds are thoroughly pulverized.

On burned areas the leaves and stems are eaten by cattle. Leaves have been found in small quantities in the stomachs of white-tailed deer in Florida.

Dwarf huckleberry is propagated by seeds, layers, or division. Many native species of huckleberry have been collected and planted in gardens.

Blueberries are often mistaken for huckleberries. The latter have 10 one-seeded nutlets; the blueberry is a true berry with many small seeds immersed in the pulpy flesh.

Other common names: bush huckleberry, and gopher-berry.



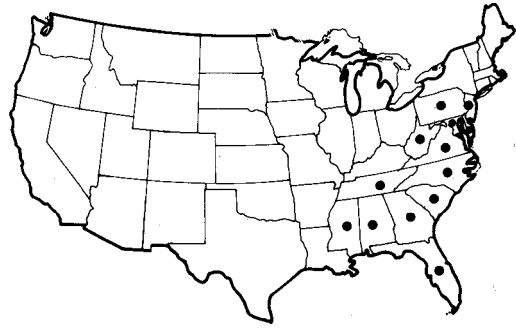
Dwarf Huckleberry

A low shrub not usually over 18 inches tall, with creeping stems and upright branches.

Leaves 0.50 to 2 inches long, deciduous, thick or somewhat leathery, upper surface shining, resinous beneath. New growth glandular hairy.

Flowers white or pinkish, appearing in rather dense racemes before the leaves are fully expanded. April to June.

Fruit blue to black globose berry-like drupe, 0.20 to 0.30 inch in diameter, nutlets one-seeded, 10 per fruit. May and June.





Hollies/*Ilex* spp.

Hollies are mostly small trees or shrubs. The leaves are simple and alternate and are deciduous on some species, evergreen on others. The plants are usually dioecious. The female flowers tend to be solitary, and the male flowers cluster in the axils. The fruits are berry-like drupes with one stone in each of four to nine cells. At maturity the fruits are red, reddish-orange, black, or, rarely, yellow. For most species the fruit persists through winter.

The fruits are eaten by many kinds of birds and mammals, and foliage of some of the evergreens is an important source of winter food for white-tailed deer.

The fruits are low in crude protein and phosphorus, and high in crude fat and crude fiber.

***Dahoon/Ilex cassine* L.**

Ralph H. Hughes

Forest Service, USDA

Fort Myers, Florida

Dahoon is found in swamp margins and low ground, along stream borders and pond edges, in damp acid soils, often beneath closed canopies of southern pines and loblolly bay. It grows naturally farther south than any other native red-fruited holly.

Rootstalks sprout readily after a burn and forage can be increased by cutting tree-like plants. Where regularly killed back by fire or by cutting, dahoon is browsed all year by deer and cattle.

The ripened red fruits are eaten by raccoons, opossums, squirrels, deer, and many kinds of birds including bobwhite quail and wild turkey. Fruits ripen in autumn and remain on the tree until spring. They are not edible by man, being emetic and cathartic.

Seeds germinate readily, and specimens may grow a foot or more in one season. Freshly gathered and cleaned seeds germinate in a month when sown in greenhouse flats containing a mixture of sand, soil, and peat.

Dahoon is easily grown from cuttings and may be grafted on *Ilex opaca* stocks. Terminal twigs in good growth are best for cuttings.

The plant is quite variable in fruit production and selection is necessary to get the best types. Selections and hybrids of the species are widely distributed by the nursery trade in the southeastern United States.

The berries are gathered widely during the holiday season. Because the leaves are not conspicuously spiny dahoon is rarely recognized as a holly.

Other common names: dahoon holly, Christmas berry, yaupon, cassena, Alabama dahoon.

Dahoon

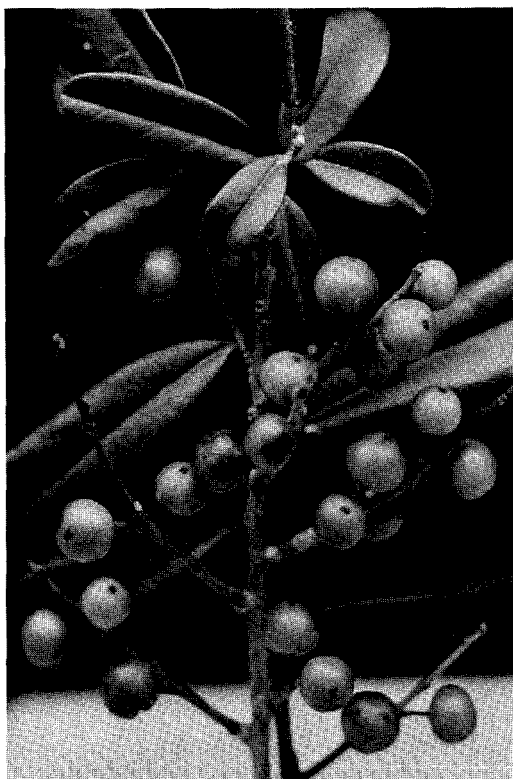
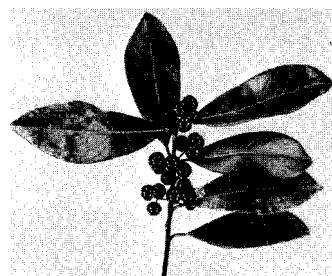
A shrub or small tree up to 25 feet tall.

Leaves 1.30 to 4 inches long, leathery, with down-like hairs beneath. Evergreen.

Stem slender, finely hairy the first 2 or 3 years. Leaf scar crescent shaped, bundle scar solitary, pith smooth and continuous.

Flowers numerous, small, white in umbel-like clusters, usually on new growth. May to June.

Fruit bright to dull red or yellow, 0.20 to 0.75 inch in diameter, four nutlets, each about 0.16 inch, persists until spring.



Large Gallberry

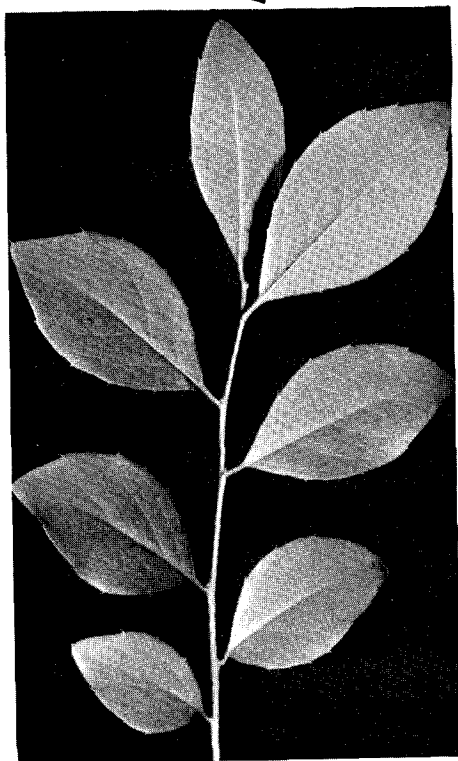
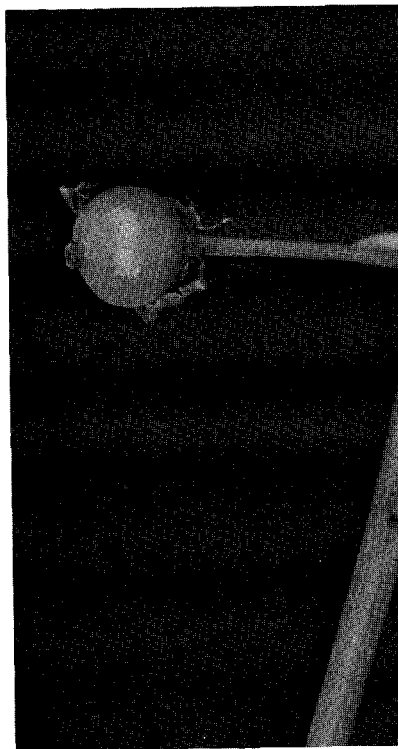
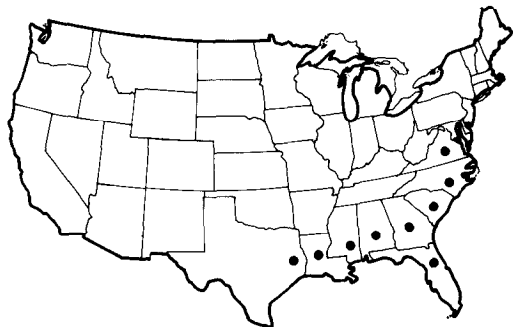
A shrub usually **less** than 10 feet high.

Leaves 1.50 to 3 inches long, **glaucous** beneath, tips **acute** and short, **sharp** spines are sparingly borne on leaf edge from about midpoint to tip, evergreen.

Stem slender, green to gray, smooth or slightly **hairy**

Flowers small and white. April to May.

Fruit shiny, black, smooth, **soft**, and pulpy. Ripens **in fall**.



Large Gallberry/Ilex coriacea **(Pursh) Chapm.**

Lowell K. Halls

Forest Service, USDA

Nacogdoches, Texas

Large gallberry grows in the shade or in the open along streams and swamps as well as on upland sites that have sandy, acid soils.

Game animals and birds, including deer and quail, eat the fruits, but the yields are generally less than those of other hollies. Large gallberry is one of the most preferred deer browse plants within its range and furnishes palatable forage throughout the year. Forage yields are high even where browsing is heavy. Unless the stems are killed back regularly by fire or other means, most of the foliage grows beyond reach of deer. Rootstocks sprout readily after a burn.

The plant closely resembles common gallberry (*I. glabra* L.) but can be distinguished by the spine on its leaf margins, glaucous undersurface of leaves, and a generally larger growth.

Other common names: shining inkberry, baygall-bush, tall inkberry holly, sweet gallberry.

***Possumhaw/Ilex decidua* Walt.**

Lowell K. Halls

Forest Service, USDA

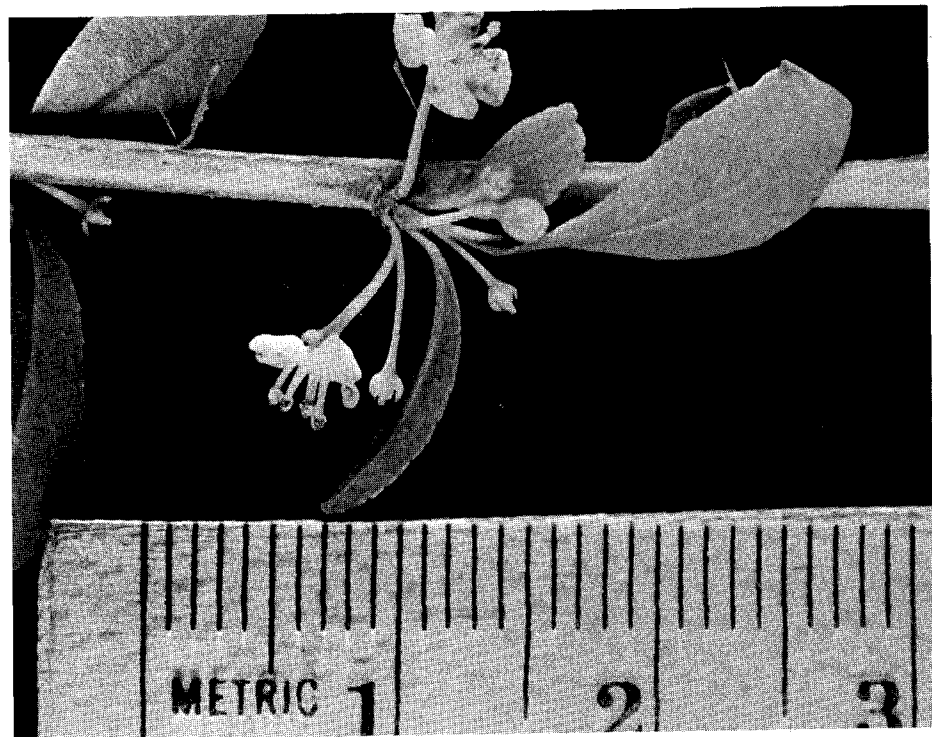
Nacogdoches, Texas

Possumhaw occurs along streams or ponds. The persistent orange to scarlet fruits make the plants conspicuous during fall and winter.

Deer and cattle eat the leaves and tender twigs in early spring. The fruit is taken in winter by many birds, including wild turkey and quail, and by deer. The plants often interfere with timber reproduction, but can be controlled by burning or slashing stems or by spraying with 2,4,5-T in diesel fuel? Slashing or burning is preferable because the resulting sprouts are readily eaten by deer.

Other common names: swamp holly, deciduous holly, bearberry, winterberry, Curtiss possumhaw.

¹This paper reports research involving herbicides. It does not contain recommendations for their use nor does it imply that the uses discussed here have been registered. All uses of herbicides must be registered by appropriate State or Federal agencies before they can be recommended.



Possumhaw

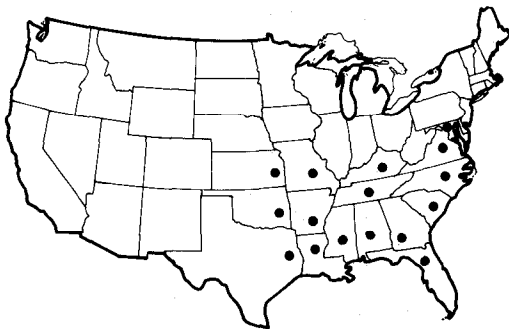
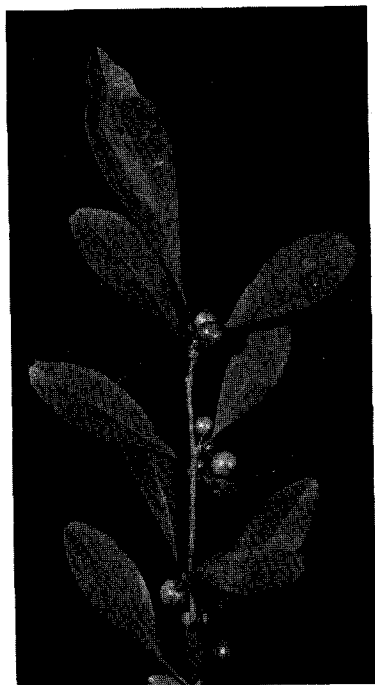
A shrub or small tree up to 30 feet tall.

Leaves 1.25 to 3 inches long, 0.50 to 1.50 inches wide, alternate in crowded groups at end of short branchlets, thick and firm, deciduous, smooth on upper surface, lower surface sometimes pubescent on ribs.

Twigs have gray bark with warty-appearing lenticels; buds small with two scales; leaf scars small, half circular or occasionally narrow slits; one bundle scar.

Flowers small, whitish. **March** to May.

Fruit orange to scarlet, 0.30 inch in diameter. Ripens in early fall, persists through winter.



Gallberry

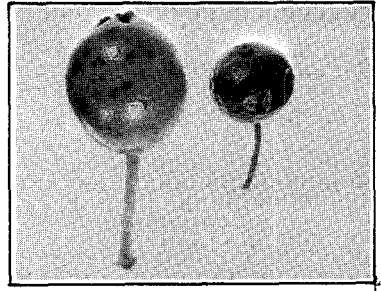
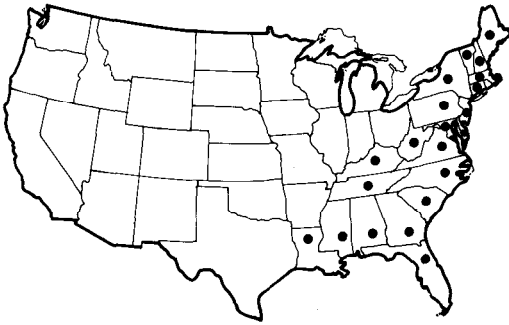
A stoloniferous shrub, forming dense clumps up to 6 or 10 feet in height.

Leaves leathery, persistent, lustrous dark green above, lighter with tiny dots beneath, 1.20 to 1.80 inches long and 0.60 to 0.80 inch wide.

Flowers white, male flowers several, on long peduncles; female flowers solitary on new growth. February to July.

Fruit black, shiny, smooth, up to 0.30 inch in diameter, borne individually or in small clusters, persistent. July and August.

Seeds three to nine, usually six, black, thin, flat, smooth. About 0.14 inch in diameter and 0.03 inch thick.



***Gallberry/Ilex glabra* (L.) Gray**

Ralph H. Hughes

Forest Setvice, *USDA*
Fort Myers, Florida

Gallberry is most abundant in the piney flatwoods of southeastern Georgia and central and northeastern Florida. In the upper parts of its natural range where soil reaction is weakly acid, gallberry is conspicuously absent, but it is present in wet, sandy, and peaty places where soils are highly acid. It grows poorly in soils with a high lime content.

Because of its stoloniferous habit, gallberry often grows in thickets and excludes many favorable forage plants, thereby reducing the grazing capacity for domestic livestock. The thickets are also severe obstacles to naval stores operations and greatly increase the danger of woods fires.

Gallberry thrives with frequent winter burning. Fire kills back top growth for a few months, but new sprouts soon furnish as many stems as were originally present or more. While top growth may be checked by annual burning, particularly by summer burning, seasonal patterns of carbohydrate level in roots and stems are unaffected by season of burning. Recovery of carbohydrates apparently occurs within one year regardless of time of year burned.

Even without burning, gallberry persists and oftentimes increases beneath canopies of pine. In the flatwoods of Georgia, foliage cover of gallberry increased threefold during 20 years continuous protection from fire. In one series of plots not burned in 30 years gallberry now is the dominant understory shrub.

Natural seedlings are rare and virtually all new growth originates from sprouts.

Fruits, each containing about six nutlets, remain on the bush throughout the winter, but begin falling when new growth starts.

The fruit has been recovered from many species of birds including mourning dove, bobwhite quail, and wild turkey, and from white-tailed deer, marsh rabbits, and bears. Songbirds such as the hermit thrush and mockingbird have been observed eating the fruit. Livestock eat the foliage sparingly; deer in central Florida eat the leaves and berries during the fall and winter.

In the coastal flatwoods, where gallberry covers many thousands of acres, gallberry fruits and seeds are eaten by quail during the early-spring. The seeds are nearly always ground up, that is, rarely do they pass through the digestive tract without being crushed.

Good seed crops seem to appear annually; however, an individual plant or clump may bear heavily one year and be barren the next. Plants killed back by fire or cut off near the ground bear neither flowers nor fruit until the second year.

Good germination may be obtained immediately after collection by cleaning and sowing seed in a moist, fungus-free medium at a temperature of 60°F until the seeds sprout.

Gallberry is often planted as specimen shrubs and hedges because of its shining, persistent foliage and black, glistening fruits.

Gallberry flowers are the source of fine honey in the Georgia-Florida pineywoods.

Other common names: inkberry, bitter gallberry, winterberry.

Myrtle Dahoon/*Ilex myrtifolia* Walt.

Lowell K. Halls

Forest Service, USDA
Nacogdoches, Texas

Myrtle dahoon grows in wet acid soil around cypress ponds and swamps and in pine barrens.

Fruits are eaten by small mammals and birds.

The plants are often used as ornamentals and can be grown readily from seed. It often hybridizes with dahoon.

Other common names: small-leaf dahoon, myrtle holly, cypress holly, myrtle-leaved holly, dahoon.

Myrtle Dahoon

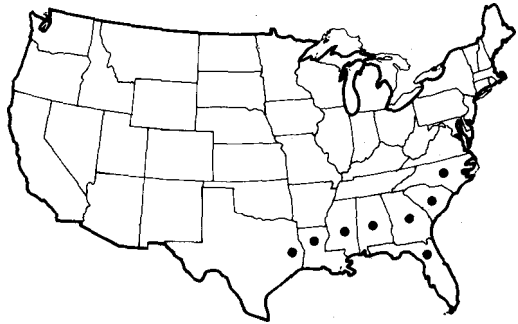
A small, evergreen shrub with numerous crooked rigid stems, or a small tree up to 23 feet tall.

Leaves leathery, 0.40 to 1.50 inches long, 0.20 to 0.33 inch wide, **entire** margin, upper surface dark green and glabrous, lower surface paler and glabrous.

Twigs slender, rigid, smooth, **pale**, puberulent at first, **glabrate** later.

Flowers borne **on** new growth, small, **inconspicuous**, petals white. May.

Fruit 0.25 inch diameter, red to **orange** and **yellow**, **flesh** thin and yellow, four nutlets, ribbed. Matures **in late fall**, persistent **over winter**.



American Holly/*Ilex opaca* Ait.

Lowell K. Halls

Forest Service, USDA

Nacogdoches, Texas

American holly grows in well-drained rich woods, in hammocks, and along banks of streams.

The fruits are eaten by many species of songbirds, mourning dove, wild turkey, quail, small mammals, and white-tailed deer. The foliage is sometimes browsed by cattle.

This tree is planted widely as an ornamental. The bright colored fruit and attractive evergreen foliage are used as Christmas decorations.

Holly seed may be sown broadcast or in drills in the fall or stratified over winter and sown in the spring. Recommendations for American holly also include: stratification for 30 days at 75°F to 80°F before sowing; burying seeds mixed with sand or peat and sowing them after the second winter; sowing berries and covering them with a heavy mulch until the spring of the second year. Holly plants should be transplanted only when dormant. Propagation by cuttings, layering, or grafting is also practiced.

The close-grained, shock-resistant wood is used for cabinets, interior finish, novelties, handles, fixtures, and scientific instruments.

Other common names: holly, white holly.

American Holly

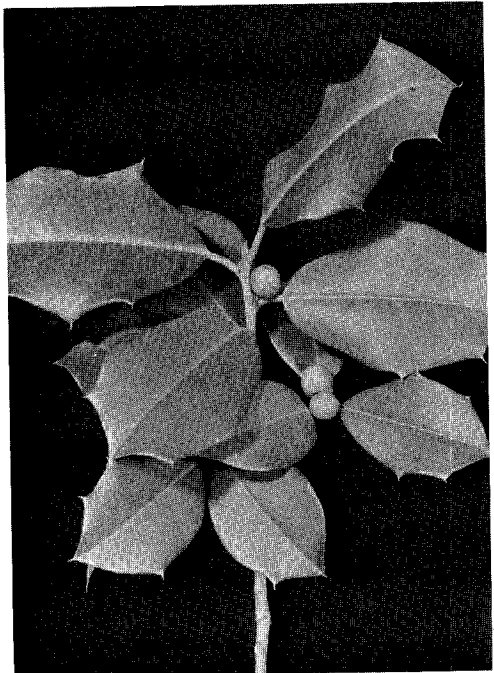
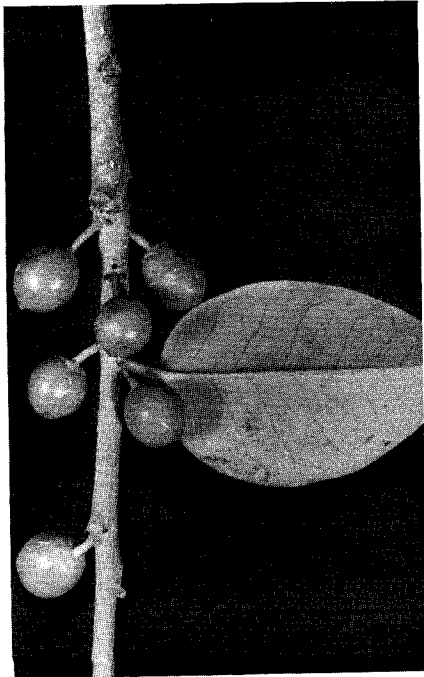
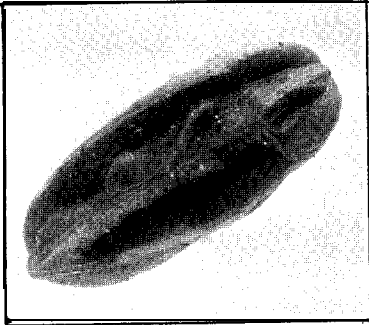
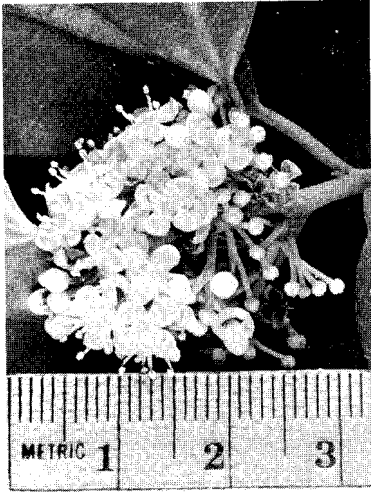
An evergreen tree to 70 feet tall, with short crooked, branches and a rounded or pyramidal crown.

Leaves simple, alternate, persistent, oval with stiff, wavy margin, with sharp, stiff, flat spines; upper surface dark green lustrous or dull, paler and glabrous to puberulous beneath, 2 to 4 inches long, 1 to 1.50 inches wide.

Twigs stout, green to light brown or gray, glabrous or puberulous.

Flowers dioecious; short stalked clusters, staminate in three- to nine-flowered cymes, small, white, petals four to six. April to June.

Fruit spherical or ellipsoid, drupes mostly red, more rarely yellow or orange, 0.25 to 0.50 inch long; nutlets, ribbed. November and December.



***Yaupon/Ilex vomitoria* Ait.**

Lowell K. Halls

Forest Service, USDA

Nacogdoches, Texas

Yaupon grows in moist sandy soils that have permeable subsoils. It is most abundant in the Coastal Plain forests of Louisiana, Texas, and Arkansas. It begins growth in mid-March, when many new shoots form and elongate rapidly. During dry weather twig growth practically ceases, but the plants put on a new flush when soil moisture again becomes favorable. With enough rain, plants continue growing to mid-October.

Yaupon provides fruit for deer, turkey, quail, squirrel, raccoon, and many songbirds. For deer, yaupon leaves are a reliable source of green forage in late winter, and are of special significance because they contain sufficient protein for maintenance of deer.

When browsed heavily, yaupon tends to hedge, and the short stiff branches protect enough leaves inside the crown to keep the plant alive. Thus, the species survives on overstocked range, although the plants may develop grotesque shapes.

Yaupon grows well beneath trees but best in the open. Up to 150 pounds per acre of yaupon browse (green weight) have been grown beneath pine stands in east Texas, but plants in the open have produced 5 to 57 times more than plants of the same age beneath trees.

Yaupon plants growing in the open tend to bear high fruit yields in alternate years. In a study near Nacogdoches, Texas the ratio of fruit yields between open- and woods-growth plants was found to be 19:1. At age 11, fruit yields for plants in the open averaged nearly 5 pounds (dry weight).

Fruits are low in crude protein, phosphorus, and calcium, and high in fat and crude fiber.

Yaupon competes with forage grasses for moisture and is regarded as a weed species by cattle growers in central Texas. It offers little hindrance to tree growth, and is not considered a pest in forest management.

Summer burns or a series of hot winter fires will kill yaupon. However, infrequent winter burns of moderate intensity may serve a useful purpose in keeping new growth near the ground and available to deer. Fruit yields will be at a minimum in the year following a burn.

Yaupon

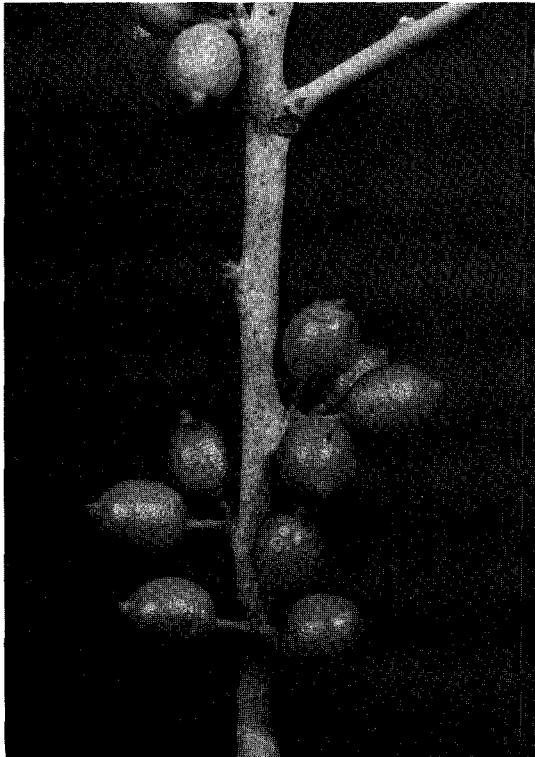
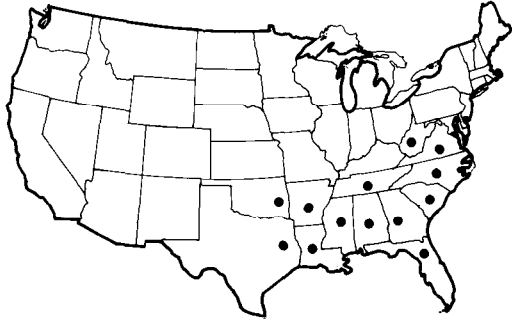
Thicket-forming shrub **up to 25 feet tall.**

Leaves evergreen, leathery, dark green and **lustrous above, pale below**; 0.5 to 2 inches long, persistent for two to three years.

Stem has stiff divergent branches, smooth whitish-gray bark.

Flowers small and white **in** nearly sessile **clusters on** branches of **previous** year; **some monoecious**, others dioecious. April.

Fruit a bright red **drupe** 0.25 inch in diameter, four **pale** amber seeds 0.15 inch long. October, persists through winter.



Although yaupon may be difficult to grow from seed, good results were obtained with a schedule developed at the Stephen F. Austin Experimental Forest near Nacogdoches, Texas. Mature seeds were collected in the fall, stored over winter in moist sand at about 40°F, sowed in nursery beds the following March, and then kept covered for a year with a thin layer of soil and 2 to 3 inches of pine straw. In the spring of the second year the straw was removed and seeds germinated. Seedlings remained in the well-watered nursery until the following February when they were transplanted by dibble into an old field that had been disked the previous month. Even though the annual rainfall was only 50 percent of normal, 78 percent of the seedlings were alive at the end of the first year.

Propagation by cuttings is inconsistent. In a three-year study under greenhouse conditions at the Stephen F. Austin Experimental Forest, an average of 14 percent of stems rooted when placed in a 3:1 sand-peat mixture and watered by an intermittent spray for 13 weeks. The highest rooting percentage for any one collection was 53 percent from stems taken in May.

Yaupon is also useful as an ornamental. With pruning, it forms an attractive hedge for the yard or a roadside shrub for highway beautification. Its lustrous evergreen leaves are pleasant to see in winter. The shiny red berries are especially pretty and often are used with Christmas greenery.

Other common names: Cassena, Christmas-berry, evergreen holly.

Red Mulberry/Morus rubra L.

Dwight M. Moore

Arkansas Polytechnic College
Mon ticulo, Arkansas

William F? Thomas

Forest Setvice, USDA
Gainesville, Georgia

Red mulberry usually occurs on rather moist sites at elevations below 2,000 feet. Seeds are carried great distances by birds and mammals, so trees might appear on any site which is not too dry. The species occurs as a minor component of both hardwood and coniferous stands within its site range, but is more noticeable as a lone tree near streams and in other moist places. It occurs as a secondary species in succession and is seldom found among first invaders. It is relatively intolerant to fire. Red mulberry appears to be decreasing over much of its range, possibly because of a bacterial disease.

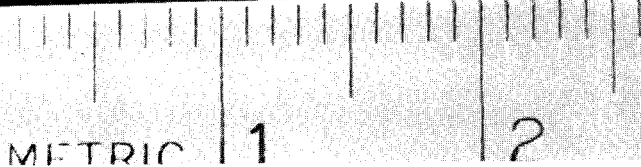
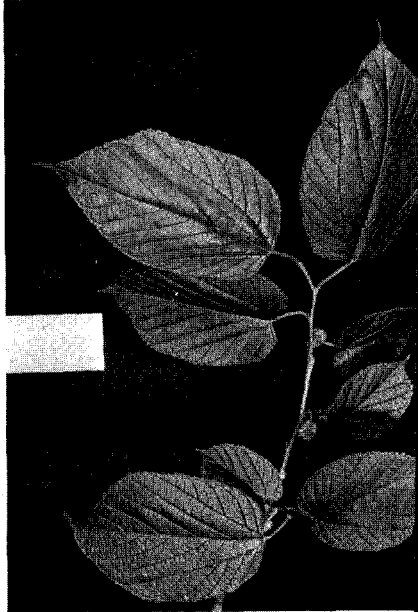
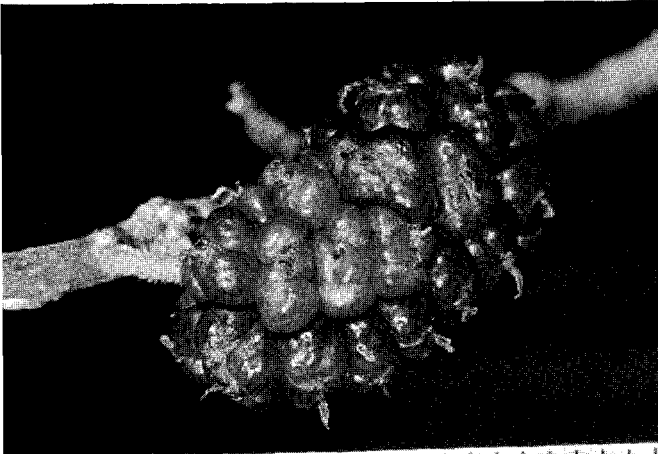
Many songbirds feed heavily on red mulberry fruit when it is available in the spring. Its usefulness as a bird food, however, is limited mainly by its short period of availability and its season of occurrence. Fruits are relished by squirrels, are a favorite food of grouse, and are also eaten by quail, by wild turkey to a limited extent, and by small mammals such as opossums and raccoons. The foliage is browsed by deer, mostly during spring and summer, and rabbits feed on the bark in the winter.

The optimum seed-bearing age is 30 to 85 years, and the maximum 125 years. Late frosts seldom damage flowers since flowers appear after or with the leaves. Excessively rainy seasons at the time of flowering may prevent pollination; otherwise, a good crop of fruit may be expected every year.

The species is most easily reproduced by sowing seed. Seeds mixed with sand or sawdust may be sown broadcast or in drills during the fall. Stratified seed or seed soaked in water for one week may be sown in the spring and covered with one-fourth inch of soil. Germination is generally poor if seeds are not stratified.

The sweet fruits of red mulberry are palatable to humans. Fruits are eaten directly or made into jelly, jams, pies, and drinks.

The wood is light-weight but durable, and is used for fence posts, barrels, boat building, and farm tools.



Red Mulberry

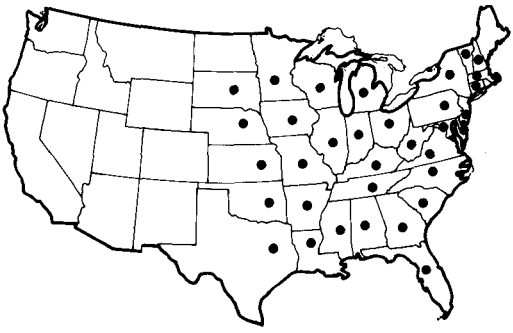
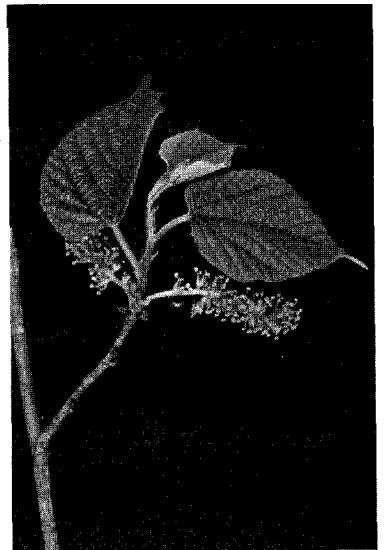
A tree up to 70 feet tall.

Leaves deciduous, simple, alternate, 3 to 9 inches long, three to seven lobed or unlobed, doubly serrate, rough and glabrous above, soft pubescent beneath.

Twigs glabrous, yellowish tan to bluish gray; pith soft, continuous, and white; inner bark turns orange when outer bark scraped away; bud scales orange-tan with dark edges; leaf scars half round or flat oval or circular; many bundle scars in one cluster.

Flowers form with leaves in spring, male spikes cylindric, female spikes cylindric and sessile. March and April.

Fruit an aggregate of small drupes, 0.75 to 1.25 inches long, dark purple or red, resembling a blackberry, juicy. April to June.



Southern Bayberry/Myrica cerifera L.

Lowell K. Halls

Forest Service, USDA
Nacogdoches, Texas

Southern bayberry grows in thickets, woods, swamps, sandy areas, and low, acid prairies.

The fruit is eaten by many kinds of songbirds, bobwhite quail, wild turkey, and by foxes. It is the main food of tree swallows when these birds winter in Florida and the Gulf area. The fruits, twigs, and foliage are eaten sparingly by deer. Heavy browsing by deer is considered by many biologists as an indicator of overpopulation.

The fruits are very high in crude fat content, high in crude fiber, and low in crude protein and phosphorus. The fruit coat is extremely hard and will often pass through the animal undigested, except for the waxy covering which is low in nutritive value. Fruits are widely dispersed by birds. The fruits are not generally considered preferred food, but their persistence makes them a highly regarded emergency item during late winter after more desirable foods are no longer available.

Plants survive burning by resprouting vigorously from the root collar.

Plants can be transplanted when young, but propagation is best accomplished by seeding in moist, silty, acid sand. Best results follow stratification. Propagation by layering is also possible.

The species is planted as an ornamental. Candles were formerly made from the wax extracted by boiling the berries. The bark and leaves reportedly have some medicinal value.

Other common names: bayberry, candle-berry, waxmyrtle, southern waxmyrtle.

Southern Bayberry

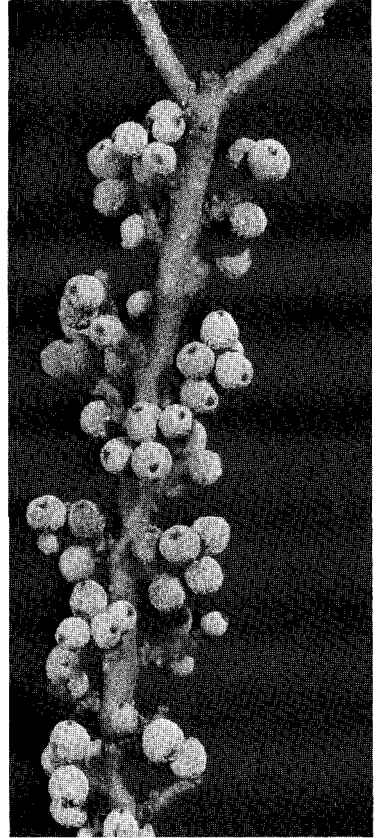
A shrub or **small tree up to 40 feet tall.**

Leaves simple, alternate, persistent, 1.50 to 5 **inches** long, 0.25 to 0.75 **inch** wide, margin **entire** or coarsely **serrate above** the midpoint, shining **above**, resinous with orange-colored glands beneath, **aromatic** when crushed.

Twigs reddish brown to gray, young parts **have** deciduous orange-colored glands, young branchlets waxy, glabrous.

Flowers dioecious, **male**, cylindric, 0.25 to 0.75 **inch** long; female catkins, short, **ovoid**. **March** to April.

Fruit a glabrous, persistent drupe, 0.12 **inch** diameter, **globose**, light green, covered with bluish-white wax; seed **pale**, minute, **solitary**. September to October.



Northern Bayberry/*Myrica pensylvanica* Loisel

Lowell K. Halls
Forest Service, USDA
Nacogdoches, Texas

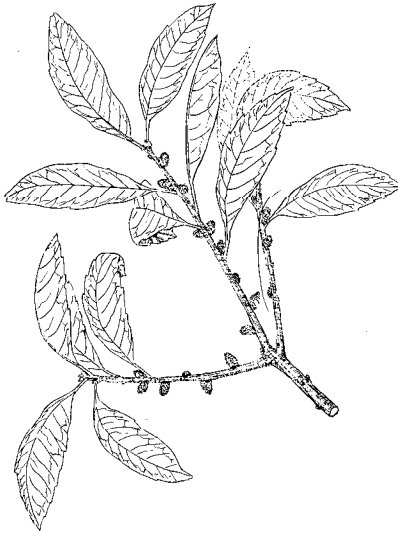
This species grows in sandy, boggy soils in the Coastal Plain.

The seeds are eaten by many kinds of birds, particularly by the ruffed-grouse and bobwhite quail.

The fruit is high in fat content and is widely known as a source of wax that is obtained by boiling the fruit in water. The wax is also used for manufacture of soap. Leaves and berries are sometimes used in flavoring soups and stews.

Other common names: baybery, candle-berry, wax berry, tallow bayberry, bay berry waxmyrtle, small wax berry, candle tree, tallow-tree.

Northern Bayberry



A stout, stiffly branched shrub up to 9 feet tall.

Leaves half evergreen, alternate, 2 to 4 inches long, 0.50 to 1.50 inches wide, entire margin, dark green and semi-lustrous above, glabrous or finely pubescent along veins, lower surface pale and dull green.

Twigs gray, stout, glabrous, glandular-scaly.

Flowers dioecious, male, cylindrical, 0.25 to 0.75 inch long; female short, oblong, smaller than male. May to July.

Fruit a persistent, drupe 0.25 inch diameter, waxy-glandular, white, resinous, in crowded clusters, young fruit densely pubescent. September and October.



Water Tupelo/*Nyssa aquatica* L.

Lowell K. Halls

*Forest Service, USDA
Nacogdoches, Texas*

Water tupelo grows in swamps, alluvial soil, low wet flats or sloughs, and small ponds, and is rarely higher than 5 feet above the average level of streams. It is associated with many moist-site hardwoods. It may stagnate in crowded even-aged stands but will generally respond to release.

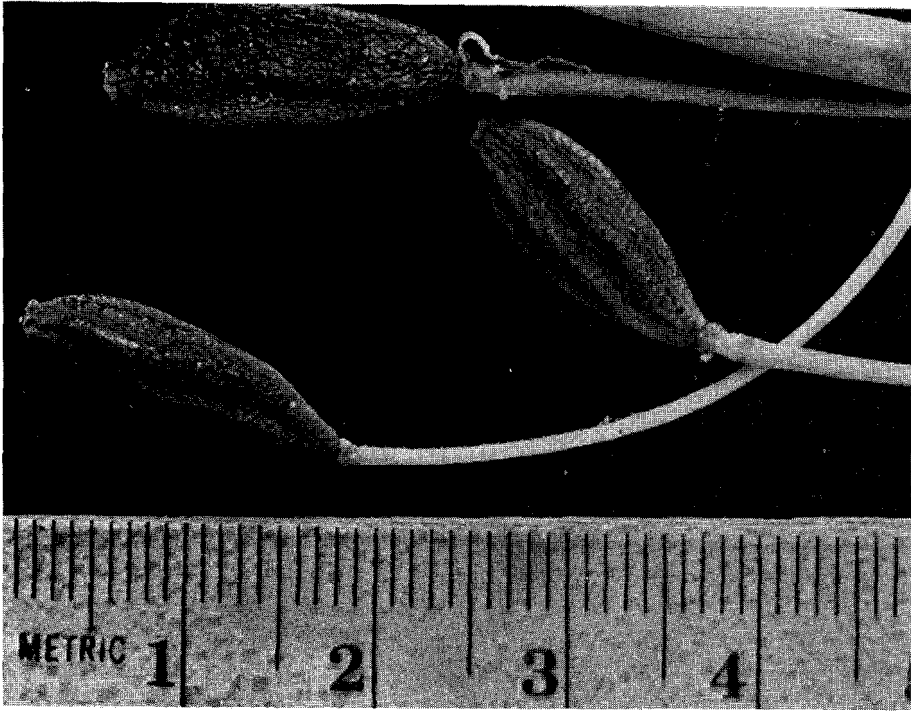
The fruit is eaten by wood ducks, several other kinds of birds, and by squirrels, raccoons, and deer. The flowers have some value as bee food. Deer feed on the foliage and sprouting twigs.

Seed production begins when trees are about 30 years old or about 8 inches diameter at breast height. A heavy crop is produced nearly every year. Untreated seed can be sown in fall, but seed sown in spring should be stratified at 30° to 50°F in moist sand for 60 to 90 days. Water tupelo requires full light for satisfactory germination and seedling development.

Water tupelo is damaged by fire, which facilitates the entrance of rot. Foliage is commonly stripped by forest tent caterpillars; such injury prevents fruiting.

The wood is made into boxes, woodenware, and fruit crates. The light spongy roots can be made into net floats and corks, and are commonly used by duck decoy carvers.

Other common names: cotton-gum, sour-gum, tupelo, swamp tupelo, tupelo-gum, bay poplar.



Water Tupelo

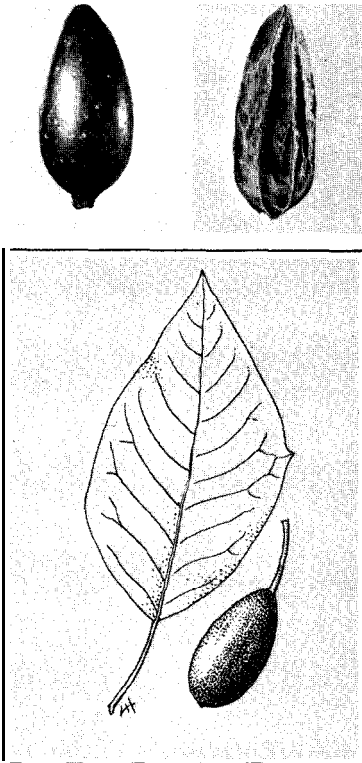
A large tree with swollen base, up to 100 feet tall and 3 to 4 feet in diameter at breast height.

Leaves oblong, simple, alternate, deciduous; entire margin, dark lustrous green and glabrous above, paler and pubescent beneath, 5 to 10 inches long, 2 to 4 inches wide.

Twigs dark, red, stout, tomentose, pithy.

Flowers form before or after leaves; male in clusters, female solitary. March to April.

Fruit a drupe 1 inch long, oblong, dark purple, drooping peduncles 3 to 4 inches long; stone rounded, brown or white. September and October.



Black Tupelo

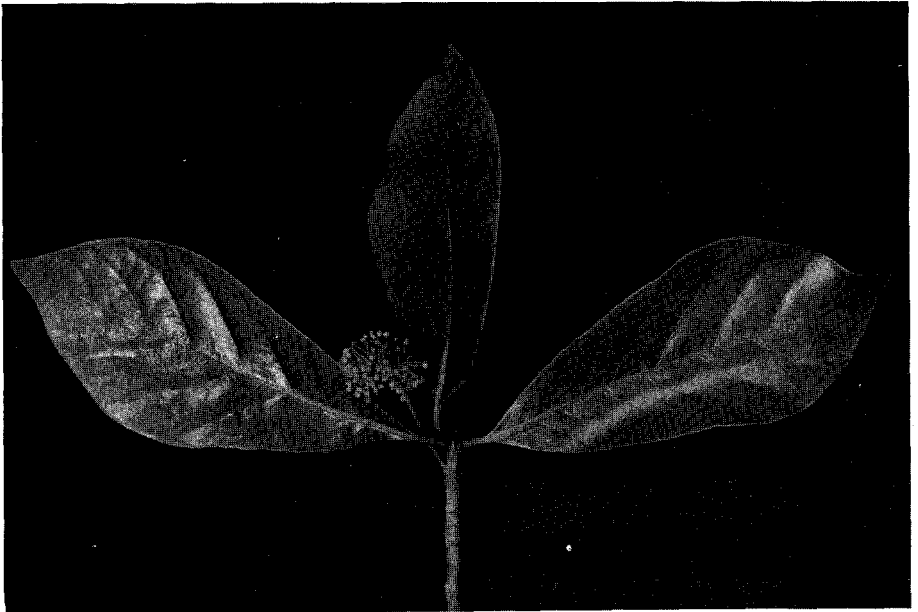
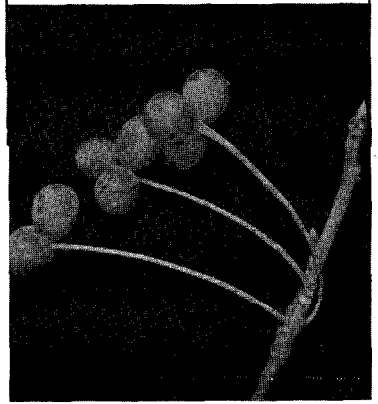
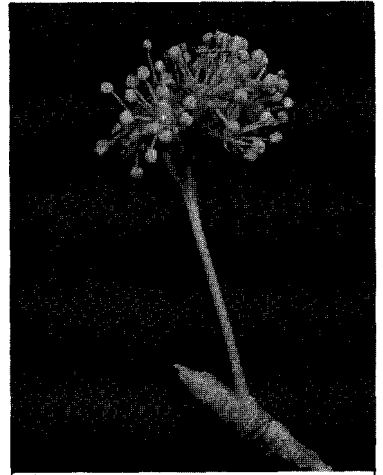
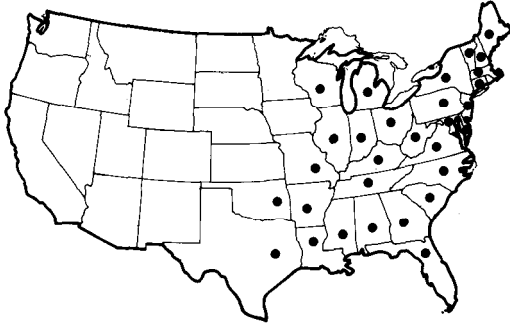
A tree up to 120 feet tall and 4 feet in diameter at breast height.

Leaves simple, alternate, deciduous, entire, or with a few coarse teeth, 2 to 4 inches long, 1 to 3 inches wide, thick, firm, lustrous green above, pale and hairy below, frequently with short abrupt tip.

Twigs moderately stout, reddish brown, zigzag appearance, terminal bud ovoid 0.25 inch long, covered with several overlapping reddish brown scales, half round leaf scars, three conspicuous bundle scars.

Flowers in axillary clusters, perfect and imperfect. April to June.

Fruit a bluish black, glaucous drupe, 0.25 to 0.50 inch long, usually three to five to a stalk, stone indistinctly ribbed. September and October.



Black Tupelo/Nyssa sylvatica
var. *sylvatica* Marsh.

Swamp Tupelo/Nyssa sylvatica
var. *biflora* (Walt.) Sarg.

Lowell K. Halls

Forest Service, USDA
Nacogdoches, Texas

Black tupelo grows in the uplands and in alluvial bottoms. Best development in the southeastern United States is on the lower slopes and terraces. Swamp tupelo is limited to the Coastal Plain swamps and estuaries; it develops best in the coves and swamps of the Southeast.

Black tupelo does not dominate any major forest type, but it is a component of many hardwood and pine types. Swamp tupelo is of major importance on moist-sites of the lower Coastal Plain.

The fruits of both varieties are eaten by numerous birds, such as quail, wood duck, robin, mockingbird, brown thrasher, thrushes, flicker, and starling, and by several mammals such as white-tailed deer, black-bear, fox, beaver, opossum, raccoon and squirrels. The fruits are considered staple food for wild turkey, although the seeds are often voided whole. Fruits are high in crude fat and fiber, low in crude protein and moderate to high in phosphorus and calcium. The young trees and sprouts are relished by white-tailed deer, but the older plants are of intermediate palatability.

Both varieties require full sunlight for optimum early growth. However, black tupelo will tolerate more overhead competition than swamp tupelo and is usually found mixed with other species but rarely attains dominance except in mountains. Swamp tupelo often develops in even-aged stands but does not assert dominance and will stagnate if heavily stocked.

Untreated seed can be sown in the fall but spring-sown seed should be stratified at 30° to 50°F in moist sand for 60 to 90 days.

Both varieties suffer from fire. Black tupelo is more often affected by fire because it grows on drier sites; however, a fire may cause severe mortality and timber degrade in swamp tupelo during dry years. The sprouts following fire are highly palatable and nutritious to deer.

Both varieties may be planted as ornamentals. The wood is used for veneer, plywood, and several wood products.

Other common names for water tupelo: blackgum, swamp black tupelo, swamp blackgum.

Other common names for black tupelo: blackgum, pepperidge, sour-gum, tupelo, tupelo-gum, swamp hornbeam, yellow gum.

Swamp Tupelo

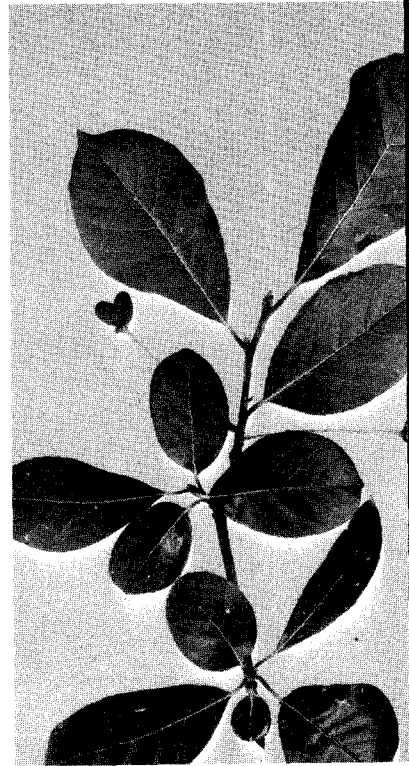
A tree up to 100 feet **tall** and 4 feet **in** diameter at breast height, base of trunk swollen.

Leaves simple, alternate, narrow, obtuse, **lustrous above**, 2 to 5 inches long, 1 to 3 inches wide, broad.

Twigs stout, reddish brown, **half-round** leaf scars, three bundle scars.

Flowers axillary clusters, **perfect and imperfect**. April to June.

Fruit a blue to black drupe, 0.33 to 0.50 **inch long**, stones prominently ribbed, generally two to a stalk. September and October.



Redbay/Persea borbonía (L.) Spreng.

Phil D. Goodrum

U.S. Fish and Wildlife Service
Nacogdoches, Texas

Redbay occurs scattered or in thickets along margins of streams, in swamps and hammocks, and occasionally as an understory species in the uplands. It grows well either in deep shade or in the open, and in both young and old forest stands.

The fruit is eaten by at least two species of songbirds and by wild turkey. In the longleaf pine belt, redbay seed may form a sizeable portion of bobwhite quail diet during fall and winter.

Redbay is of intermediate palatability to deer. At low herd densities it is eaten sparingly, but with heavy stocking current growth is usually browsed closely. Old growth is taken occasionally.

Redbay is browsed heaviest in fall and winter and withstands grazing well. In Mississippi, 40 percent of the annual growth was removed for 2 or 3 years without causing death. On heavily stocked ranges, plants whose foliage is entirely accessible to deer may be killed.

Fire stimulates seed germination and induces the growth of vigorous, palatable sprouts. Winter burning at 3- or 4-year intervals is probably best for making this species most valuable for deer forage.

The tree is sometimes used as an ornamental because of its fruit and evergreen leaves. The dried leaves are a flavoring for gumbo and meat dishes. The red-colored wood is used for furniture, boatbuilding, interior finish, and cabinets.

Other common names: sweetbay, redbay persea, swampbay, swampbay persea.



Redbay

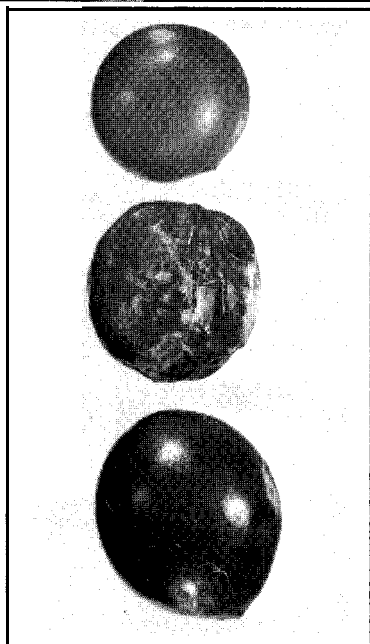
An evergreen tree up to 70 feet tall and trunk diameter of 1 to 3 feet.

Leaves aromatic, simple, alternate, persistent, bright green lustrous **above**, **glaucous** beneath, 3 to 4 inches long, 1 to 1.50 inches thick.

Twigs slender, buds small, generally **globose** with two outer **scales** woolly, leaf **scars** circular, bundle **scar** **solitary**, pith near 0.50 twig diameter, angular **in cross section**.

Flowers small, **pale**, yellow, borne **in axillary** panicles. May to July.

Fruit an egg-shaped drupe, dark blue or deep purple, about 0.50 inch long, lustrous; seed **solitary**, flesh thin and dy. Autumn.



Wild Cherries and Plums/*Prunus spp.*

Lowell K. Halls

Forest Service, USDA

Nacogdoches, Texas

Wild cherries furnish food for many kinds of birds and mammals. Game birds and songbirds eat the fruits when they ripen in the summer and fall, and sometimes eat them before they are ripe. Songbirds will often gorge themselves with berries and then fly to nearby perches and regurgitate the pits. The fruits are an important staple food for wild turkeys, and are eaten by squirrels, raccoons, pheasants, ducks, grouse, and quail. Fur and game mammals often feed on cherries that have fallen to the ground after birds have taken their harvest on the trees. These mammals also eat the bark of the tree. In spring, buds are eaten by game birds such as ruffed grouse. Deer eat the fruit and, along with rabbits, feed extensively on the twigs and foliage.

The fruits of plums are also eaten by birds and mammals but to a lesser extent than cherries.

The leaves of *Prunus* are alternate and simple, deciduous or persistent, and mostly serrate. The flowers are bisexual, and have five rounded white or pink petals and many stamens borne on a cuplike base. They are sometimes solitary but mostly in umbel-like clusters or racemes. They often precede the foliage in appearance. The fruit is a drupe, often with thick, edible flesh and usually with a single-seeded stone.

Most members of this genus are sensitive to fire. Plums often occur in thickets and when protected from fire make ideal winter cover for quail and other small wildlife species.

Mexican plum (*P. mexicana* S. Wats.) is a shrub or small tree that grows along river bottoms, lake shores, and hardwood slopes.

Pin cherry (*P. pensylvanica* L.f.) grows on many kinds of soils. In the northern part of its range it is found on nearly all forest types, usually in clearings, where it often forms thickets. In the southern part of its range it grows at elevations of about 2,500 to 4,500 feet. It is intolerant of shade, aggressively invades cleared areas, and grows fast, particularly when young. It seldom lives over 30 years.

Pin cherry can be seeded either in fall or spring. If seeded in fall, the seeds should be cleaned of pulp, soaked in water, and planted one

Mexican Plum

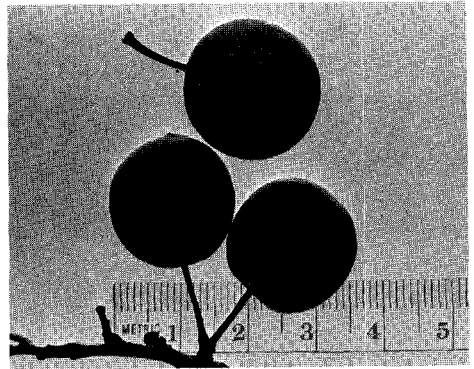
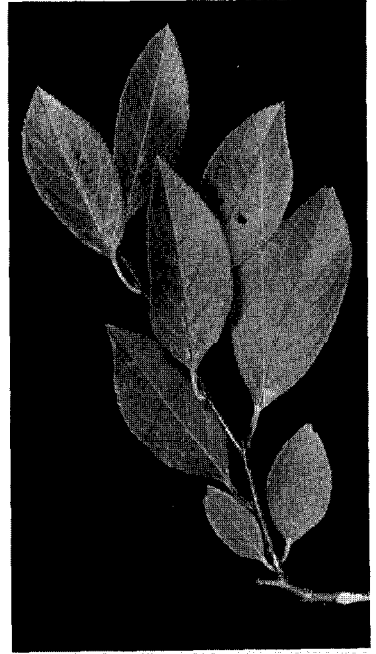
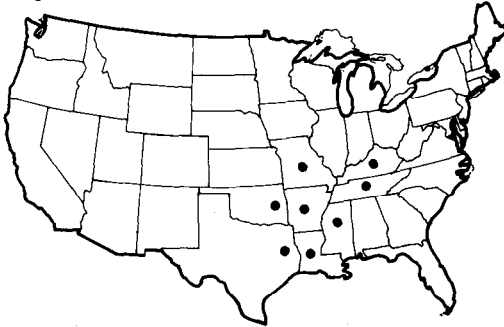
A shrub or **small** tree up to 25 feet high, with irregular open **crown**.

Leaves 1.75 to 3.50 inches **long**, 1 to 2 inches wide, singly or doubly **serrate**, upper surface yellowish green, glabrous, shiny, hairy below.

Twigs slender, stiff, glabrous, **pubescent** early, shiny grayish brown.

Flowers white, 0.75 to 1 inch diameter. April to July.

Fruit dark purplish, 0.25 to 1.33 inches in **diameter**, flesh **juicy**; **stone** oval, smooth. July to September.



Pin Cherry

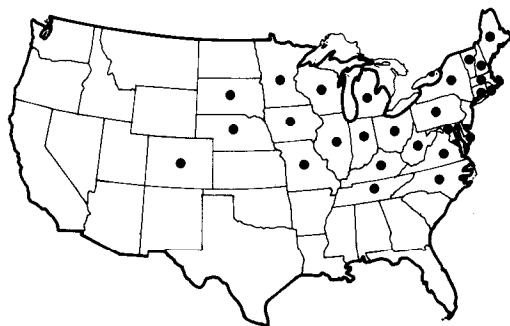
A small tree 30 to 40 feet high, 18 to 20 inches in diameter at breast height.

Leaves oblong, finely and sharply **serrate**, lustrous **above**, green and glabrous beneath, 3 to 4 inches long, 0.75 to 1.25 inches wide.

Twigs light red, glabrous, lustrous, covered with **pale** lenticels, short, thick **spur-like** branchlets, winter buds **ovoid**, 0.50 inch long, bright **red-brown** **scales**.

Flowers 0.50 inch in diameter, white. May.

Fruit, 0.25 inch in diameter, thick light-red skin, thin flesh, **stone** oblong, 0.20 inch long. July to September, may persist into **fall**.



inch deep in mulched beds. If held over winter seeds should be stratified in moist sand for 60 days at 68° to 86°F, and then for 90 days at 41°F.

Pin cherry is occasionally planted as an ornamental. Once established it maintains itself until overtopped by competing trees. It is, however, susceptible to several diseases and insects and has a shallow root system. The fruits are eaten by humans.

Other common names are bird cherry, fire cherry, northern pin cherry, pigeon cherry, wild red cherry.

Black cherry (*P. serotina* Ehrh.) grows on all except very swampy or dy sites within its range and in association with a great many other hardwoods. Growth is best in the southern portion of the northern hardwood type. The species is intolerant of shade, and tends to dominate secondary succession initiated by fire, windthrow, or logging, especially after clearcutting mature northern hardwoods.

Individual trees produce some fruit nearly every year and tend to be consistent in fruit production. In a fully stocked 40-year-old northern hardwood stand in Pennsylvania, fruit yields of black cherry were as high as 120 pounds per acre. Fruit fall begins at ripening. Before germination will take place, the seed requires a period of after-ripening that usually occurs during winter on the forest floor. For artificial planting, seed should be stratified in moist sand or peat for 90 to 120 days at 41°F, or soaked 30 minutes in H₂SO₄, or a combination of the treatments.

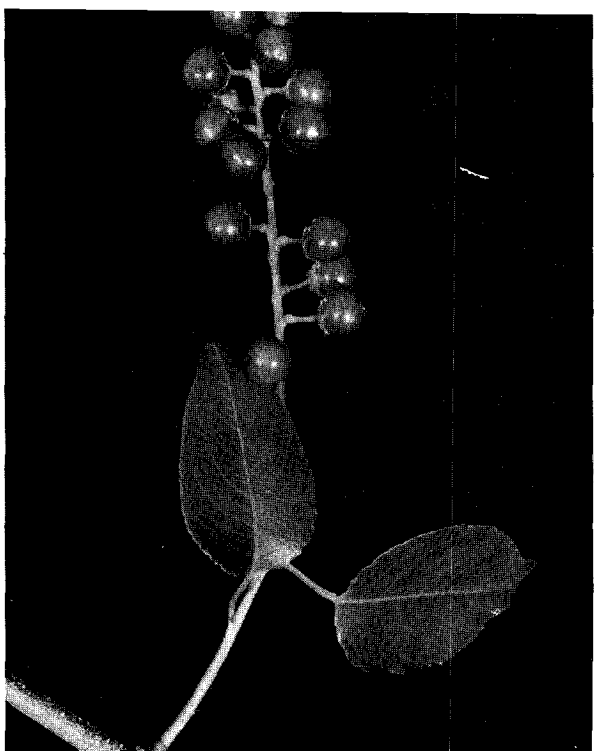
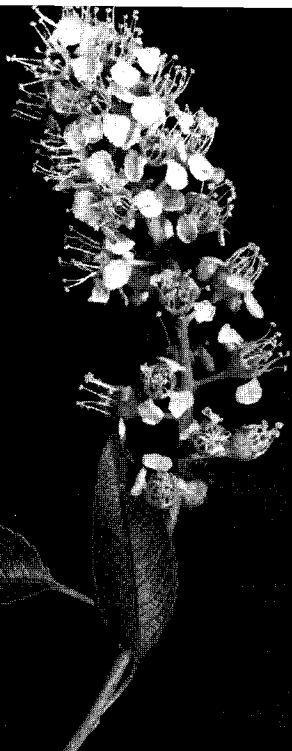
Fruit contains moderate amounts of crude protein, phosphorus, and calcium, but is high in crude fiber.

In even-aged stands the growth of black cherry is rapid for the first 45 to 50 years. The trees require a free or dominant position to thrive. If dominant or co-dominant in pine stands, the black cherries make good growth, but those in the understory decline in growth or die out. Black cherry responds little to thinning. Practically all black cherry seedlings may be destroyed by rabbits or deer unless protected in some way.

Black cherry is highly susceptible to fire; however, after very hot fires, most top-killed trees resprout from the base.

The fruits of black cherry are used for making jelly and wine and sometimes for flavoring rum and brandy. The bark is used medicinally as a cough remedy. The leaves and twigs contain cyanic acid, and wilted foliage is poisonous to livestock. Apparently, deer can eat unwilted foliage without harm.

The wood is used for veneer, furniture, interior finishings, and several wood products.



Black Cherry

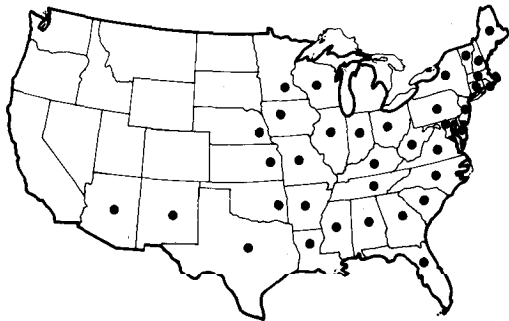
A medium-sized tree, 50 to 60 feet tall and 2 to 3 feet in diameter, with long, straight, clean cylindrical bole.

Leaves 2 to 6 inches long, 1.50 inches wide, margin finely serrate, dark green and very lustrous above, paler below, simple, alternate.

Twigs with bitter almond taste, slender, reddish brown; terminal buds 0.20 inch long, ovate, chestnut brown; lateral buds smaller; leaf scars small, half round.

Flowers white, in drooping panicles, 0.25 inch diameter. March to June.

Fruit a drupe, 0.33 to 0.50 inch diameter, black when ripe, flesh dark purple, stone oblong, 0.33 inch long. June to October.



Flatwoods Plum

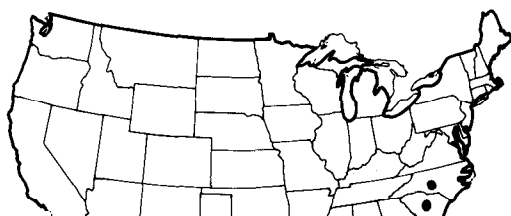
A shrub or small tree 15 to 20 feet high with short, crooked trunk occasionally forms thickets.

Leaves 2.50 inches long, glabrous above, pubescent beneath.

Twigs slender, spurlike, reddish brown, lustrous, glabrous, winter buds 0.06 inch long, chestnut brown scales.

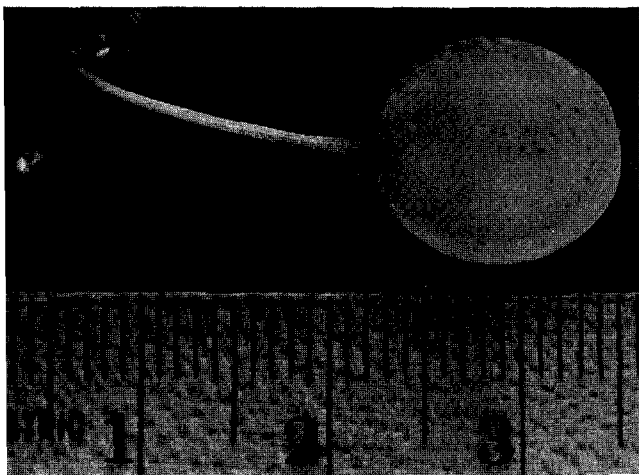
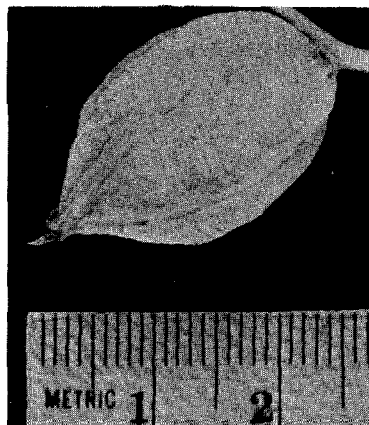
Flowers white, 0.50 to 0.75 inch broad. March to April.

Fruit dark purple, sometimes red or yellow, bitter-sour and astringent to taste, stone oval, 0.50 inch long, rough. Late summer.



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Other common names are mountain black cherry and rum cherry.

Flatwoods plum (*P. umbellata* Ell.), grows on sandy soils in open pine and hardwood forests of coastal areas. The fruit is low in crude protein, moderate in phosphorous and calcium, and high in nitrogen-free extract. Deer eat both the fruit and leaves. Seed germination is hastened by stratification for 90 days at 41°F in moist sand or peat. The fruit is used for jellies and preserves.

Other common names: Hog plum, sloe, black sloe.



***Shining Sumac/Rhus copallina* L.**

var. *copallina*

Malcolm Edwards

Forest Service, USDA

Atlanta, Georgia

This species grows in dense thickets in old fields, along roadsides, and near powerlines. It is usually associated with broomsedge and blackberry. The plants grow well on dry acid soil and persist in the understory until canopy closure.

Fruits are eaten by many species of game birds, particularly ruffed grouse, and by songbirds. Entire fruiting heads are eaten by deer. The bright-red fruit cluster remains on the plant into the winter and is available when more desirable foods are scarce. Fruits often serve as emergency food for turkey. There are approximately 1,500 to 2,500 seeds per head. Rabbits feed on the bark, twigs, and fruit. The plant is occasionally browsed by deer. It will tolerate about 20 percent browsing without damage; however, plants were reduced 30 percent by deer browsing outside an enclosure on the Pisgah National Forest in North Carolina.

The fruit is high in crude fat and phosphorus and low in protein.

Shining Sumac is often planted as an ornamental because of its brilliant red leaves and maroon colored fruit. The fresh berries taste like lemon. The bark and leaves are used for tanning.

Other common names: flameleaf sumac, dwarf sumac, winged sumac, and sumac.



Shining Sumac

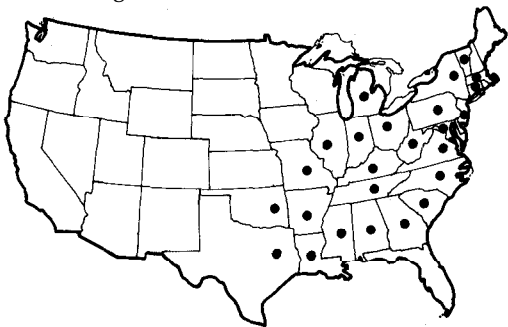
A slender-branched shrub or small tree up to 25 feet **tall**.

Leaves alternate, pinnately compound, 5 to 12 inches long; **rachis** pubescent, broadly winged, leaflets 7 to 11, 1 to 3.50 inches long, 0.50 to 1.25 **inch** broad, **lustrous, glabrous** to pubescent **above**, hairy and glandular below.

Twigs green to reddish-brown, velvety **pubescence**; buds silvery tan, pubescent and without **scales**, terminal bud **absent**; leaf scars **horse-shoe-shaped** encircling buds half way. Bundle scars **many**, pith dark tan, 0.50 **stem** diameter, sap milky and sticky, lenticels dark rusty-brown and numerous.

Flowers borne **in** a densely pubescent, terminal compact panicle, petals greenish-white. July to September.

Fruit a red, glandular, hairy drupe, 0.12 to 0.16 **inch** diameter, compact panicles **erect** or **drooping**, seeds solitary, smooth. Ripens in **fall**, **persists** through winter.



Smooth *Sumac/Rhus glabra* L.

Malcolm Edwards

Forest Service, USDA

Atlanta, Georgia

Smooth sumac is usually found in old fields with broomsedge and blackberries. It appears shortly after clearing and responds well to disturbances such as fire and timber cutting.

The fruit is eaten by many kinds of game and songbirds. Bobwhite quail eat it year around, and the seeds have reportedly comprised 50 percent of crop contents. Birds cannot sustain weight on a heavy diet of sumac, and it is normally eaten with other foods. It is sometimes regarded as a "stuffing" or an emergency food; however, at times it is eagerly eaten by cottontails, white-tailed deer, ruffed grouse and wild turkey. Browse is eaten by deer and the bark by squirrels and rabbits during the winter.

The fruits are low in crude protein, but high in crude fat, and moderate in phosphorus.

Fruit production is consistent. There are approximately 2,000 seed per head.

Invasion of new areas is by seed, but established sumac reproduces primarily by rootstocks.

Smooth sumac is widely planted as an ornamental because of its brilliant colors in fall. Also, it is occasionally used for erosion control and shelterbelt plantings. Various parts of the plant have been used for medicinal purposes and for staining and dyeing.

Other common names: white flameleaf sumac, dwarf sumac, southern sumac, and scarlet sumac.

Smooth Sumac

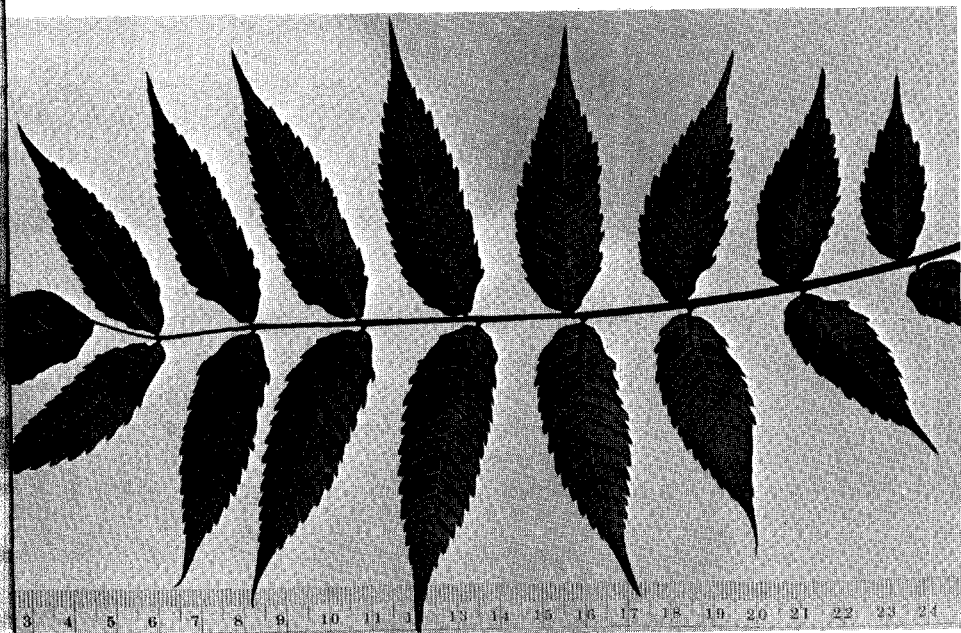
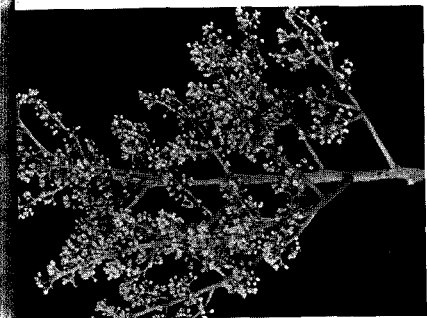
A thicket-forming shrub or small tree attaining a height of 20 feet.

Leaves alternate, pinnately compound, 11 to 31 leaflets, sharply **serrate**, dark green **above**, lighter to white below, leaflets 2.50 to 4.75 inches long, 0.50 to 1.25 inches broad.

Twigs glabrous, tan to blotchy gray, buds with tan to silvery dense **pubescent**, true terminal buds absent, leaf scars encircling buds, bundle scars **many**, pith **orange**, half diameter of **twig**, sap **milky** and sticky, lenticels light brown and scattered.

Flowers **in** terminal compact panicles, petals white. June to August.

Fruit a drupe 0.16 **inch** long, covered with **short**, red velvety hairs, one seeded, **stone** smooth. September to October.



***Common Poison Ivy/Rhus radicans* L.**

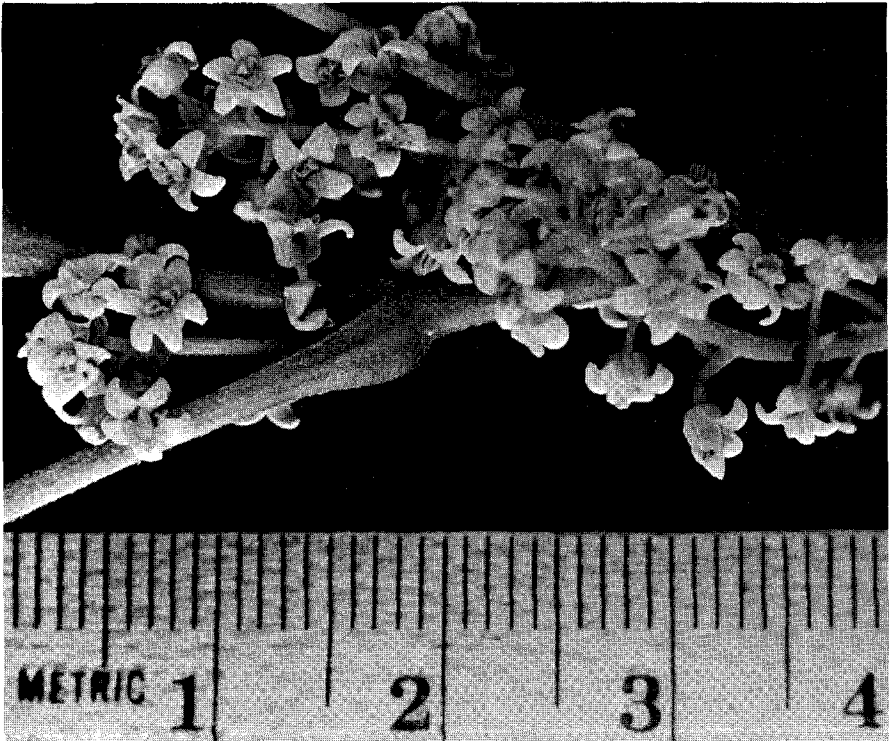
Malcolm Edwards
Forest Service, USDA
Atlanta, Georgia

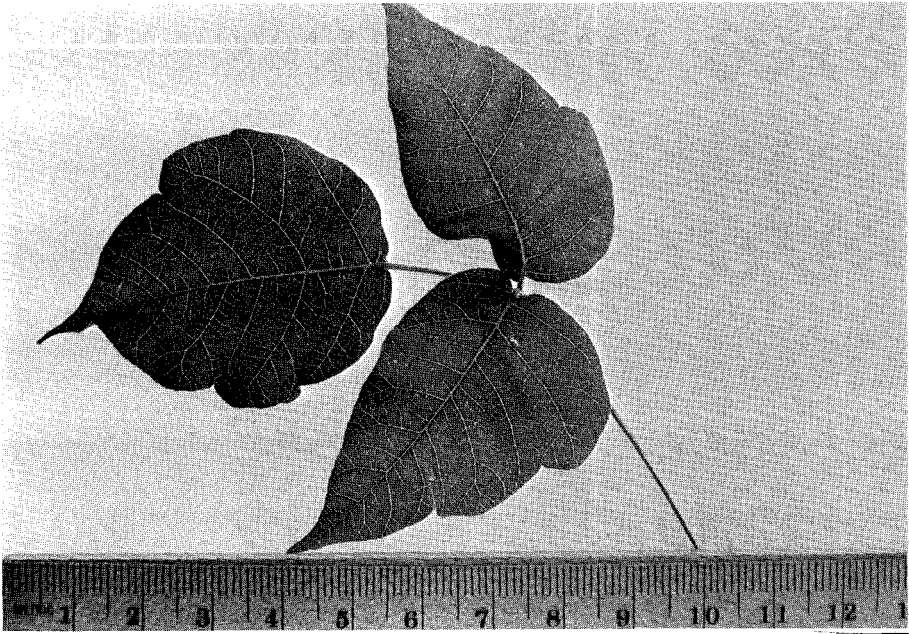
This shade-tolerant species is common from the first stages of plant succession to a climax forest under a wide range of soil conditions, and from moist shaded sites to dry exposed ones.

The fruit is eaten by many kinds of birds, including quail, pheasants, wood ducks, ruffed grouse, and wild turkey. It comprises a significant portion of squirrel diet in bottomland hardwoods in years when other mast is sparse. Deer eat the fruit and lightly browse the leaves and twigs.

Upon contact with the skin this plant produces blisters and eruptions accompanied by intense itching and burning. It is also reported to have some medicinal uses, and the sap is sometimes used for making varnish.

Other common names: three-leaf ivy, climbing ivy, poison-oak, mercury, black mercury vine, and cow-itch.





Common Poison Ivy

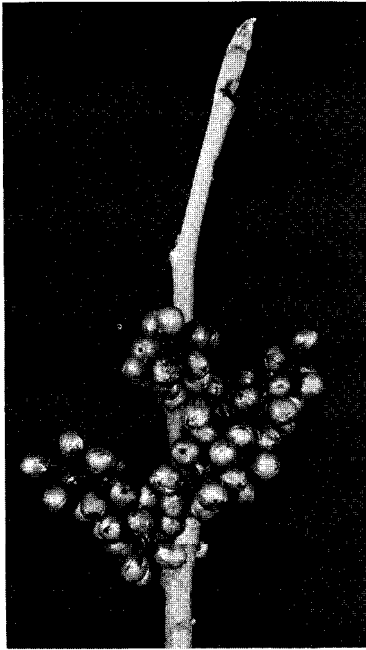
A poisonous suberect shrub or woody-stemmed vine.

Leaves deciduous, trifoliate, variable in shape and size, dull green and glabrous above, paler and pubescent below, 1.50 to 6.75 inches long, 0.50 to 4 inches wide.

Twigs climb by aerial rootlets with disk-like suckers which adhere to support; stem woody, suberect where by itself, dark reddish-brown to grayish-tan or brown, leaf scars large, V-shaped, five bundle scars, buds naked.

Flowers borne in axillary panicles 1 to 4 inches long, small greenish-white, fragrant. May to July.

Fruit a persistent drupe, clustered, 0.12 to 0.25 inch in diameter, dull white, waxy, glabrous or sparsely pubescent. August to November.



***Staghorn Sumac/Rhus typhina* L.**

Malcolm Edwards
Forest Service, USDA
Atlanta, Georgia

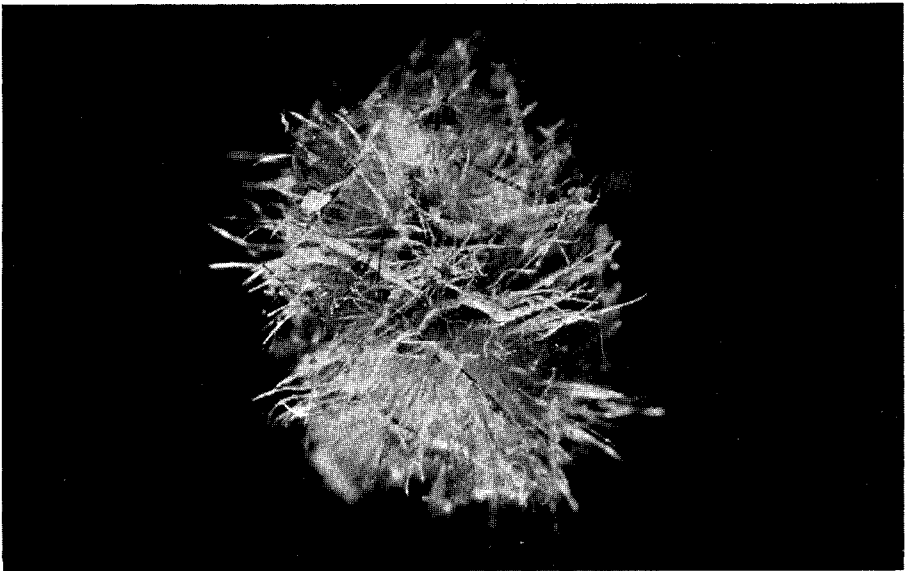
This open-growing species is found in dry, gravelly or rocky soil along forest edges and occasionally in fairly dense woods. Typical growing sites include abandoned fields, roadsides, right-of-ways, fence rows, and young plantations. Plants spread by roots and are generally in clusters. Although growth is rapid plants are short-lived.

The fruits are eaten by many kinds of birds including mourning dove, bobwhite quail, and ruffed grouse, and by mammals such as skunk, white-tailed deer, cottontail, and opossum.

Field plantings may be established from seed either in fall or spring. To insure adequate germination, seeds should be scarified in concentrated sulphuric acid for 1 to 4 hours.

The wood is occasionally used for cabinets or small articles of furniture. The root, bark, and leaves are rich in tannin. The crushed, acid fruits, when steeped in water, make a cooling drink. Plants are sometimes used for erosion control and as ornamentals.

Other common names: velvet sumac, hairy sumac, American sumac, and Virginia sumac.



Staghorn Sumac

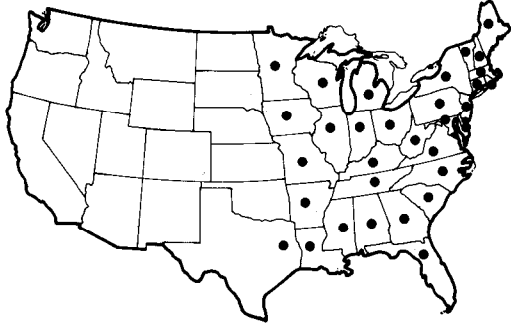
A stout thicket-forming shrub, up to 40 feet tall and 3 to 14 inches in diameter at breast height.

Leaves alternate, deciduous, odd-pinnately compound, 5 to 24 inches long, **rachis** green to reddish, soft velvety hairs, leaflets 9 to 31, **opposite**, 1.50 to 6 inches long, 0.33 to 1.75 inches wide, upper surface light to dark green, dull, lower surface whitish and hairy on the veins.

Twigs stout, brittle, brown to **orange**, branches densely **pilose**, numerous lenticels, buds tan, conic, brown, hairy, leaf scars **horse-shoe-shaped**, bundle scars in clusters of three, pith round, orange-brown.

Flowers in dense, terminal greenish-yellow **panicles**, staminate, 7 to 12 inches long, 4 to 6 inches wide; pistillate smaller, **erect**. June to July.

Fruit dense, terminal conical panicles, 6 to 8 inches long, 2 to 4 inches wide, drupes 0.12 to 0.16 inch long, with long velvety hairs, flesh thin and dry, seed **pale** green to brown. June to September but persistent through winter.



Dewberries, Blackberries, and Raspberries/Rubus spp.

Daniel W. Lay

*Texas Parks and Wildlife Department
Nacogdoches, Texas*

The many species, hybrids, and varieties of *Rubus* constitute one of the most important sources of fruit for wildlife in the South. Common names applied to three groupings are dewberry, blackberry, and raspberry.

Technically, these species are a part of the rose family, having regular flowers, with five sepals and petals, and alternate leaves. The plants have thorny, semi-woody stems and fleshy fruit with seeds on the surface. Flowers are white with touches of pink.

The three subdivisions can be distinguished by growth habits. Dewberries are prostrate vines with fine spines and glandular hairs. Blackberries are more upright, some to 15 feet, have fluted or ridged green canes, larger spines, and no hairs. Tips of canes may take root when they touch the ground. Leaves of raspberries have white or light-colored undersides and the stems are usually white-powdered.

Dewberry fruiting starts in early spring and continues through mid-summer. The second-year canes have leaves with five leaflets. The blackberry begins fruiting in late May and is the most widespread and significant of the groups. Raspberry fruits mature from June to October.

The green fruits of all three groups turn red before they ripen to a shiny, jet black. The fruits are sought by deer, turkey, quail, raccoons, chipmunks, ruffed grouse, squirrels, and many birds, including woodcock. The fruits are eaten mainly when fleshy, but even the dried persisting berries are eaten to some extent in fall and winter.

One study of fruit used by deer in eastern Texas revealed blackberry seeds in deer droppings 23 times in 30 samples collected during June. The period of use was May to September, which is the approximate period of availability. The leaves of blackberry are among the first to appear in late winter. At this time they are highly palatable and on many ranges are a significant part of the browse consumed by deer. Fruits are high in nitrogen-free extract, low in crude protein, and moderate in phosphorous and calcium.

Blackberry follows herbaceous weeds in invading disturbed sites and is the forerunner of trees and shrubs which shade it out. It is

Dewberry

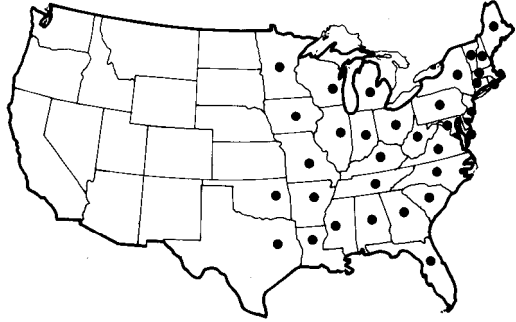
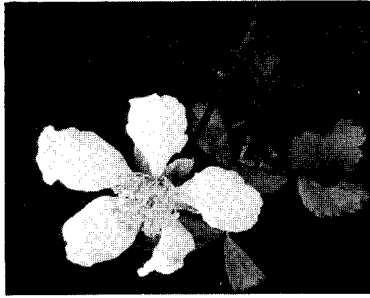
Grows usually low on ground in dry or wet areas.

Leaves green on both sides, three leaflets, compound, serrated.

Twigs erect at first then trailing, sends up floral branches a few inches high which bear flowers and fruit, prickles.

Flowers borne singly on floricane, white. April to June.

Fruit receptacle becomes soft and juicy, comes off the plant with drupelets, black. June to August.



Blackberry

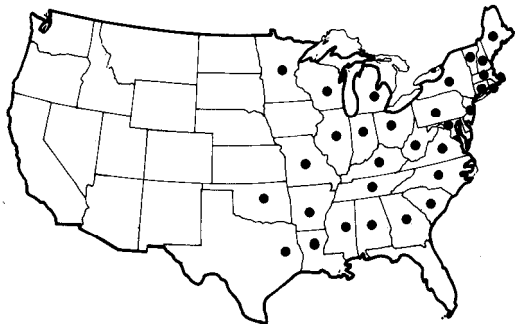
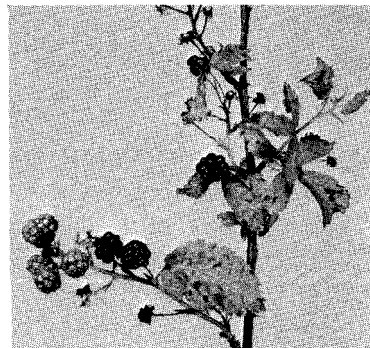
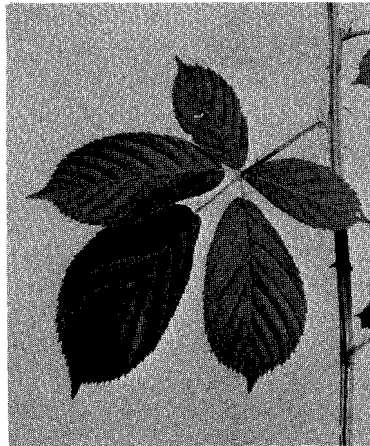
Grows in dense thickets, up to 4 feet tall in dry and wet areas from lowlands to hills.

Leaves quite variable in size and shape, usually green on both sides, compound and simple.

Twigs erect or arched, green or reddish-brown, stems biennial, first year canes vigorous, leaves commonly have five leaflets, second-year canes produce short branches which bear flowers and fruit, tips of canes take root when they touch ground, prickles.

Flowers borne on floricane in clusters, white. May to July.

Fruit receptacle becomes soft and juicy and comes off with drupelet, 0.50 to 1 inch long, deep purple or black. May to July.



favored by soil disturbance, fire, and overstory removal and grows best in full sunlight. The extensive, nearly impenetrable thickets are especially good cover for birds, rabbits, and other small rodents and are common nesting sites for small birds.

Seeds and rootstocks persist in most soils, ready to grow when conditions are favorable. Establishment should not be difficult where the plants are not present. No seed is available commercially, but one can transplant local rootstocks. Sandy, well drained soils are best, although many river bottoms have heavy growths of blackberry. Blackberries produce prolifically when grown in full sunlight. When grown in shade fruit production is low, but the stems are nearly thornless.

After the second year, canes die and add to the density of the "briar patch." For best vigor, stands should be stimulated with fire or disking when their fruit production declines or when they get too tall and dense for the fruit to be available.

Some quail hunters have had occasion to cuss the thorny rubus species because quail often retreat into their protective cover. But for birds and many other types of wildlife, dewberries, blackberries, and raspberries are important and necessary food plants.

Raspberry

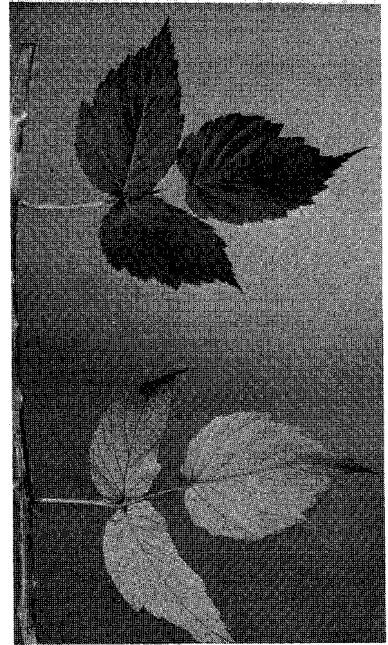
Grows in dense thickets on dry or wet places.

Leaves variable in shape and size, commonly compound, three leaflets, usually white or light-colored on underside.

Twigs erect or arched, root at tip, smooth, cylindrical, usually with whitish bloom that is easily rubbed off, leaving a purplish or light-colored stem, second year canes produce short branches which bear flowers and fruit, prickless, or prickles.

Flowers white, or short spurs. May to July.

Fruit an aggregate of drupes that comes away in a thimble-shaped unit, receptacle remains dry and hard, red or black. June to October.



Palmetto/Sabal spp.

Lowell K. Halls

Forest Service, *USDA*

Nacogdoches, Texas

Sabals are members of the palm family and have a berrylike or drupelike fruit.

Scrub palmetto (*S. etonia* Swingle) grows primarily in the sand pine-scrub oak forest type along with dwarf palmetto. White-tailed deer feed heavily on the fruits even when unripened. Over 100 pounds per acre of palmetto fruit may be produced during a good year.

Other common name is corkscrew-palm.

Dwarf palmetto [(*S. minor* (Jacq.) Pers.)] grows in dry hills, flatlands, and wet alluvial floodplains.

The fruit is eaten by several kinds of songbirds and by raccoons, squirrels, and white-tailed deer. Fruits are occasionally browsed by cattle. Now and then dwarf palmetto is planted as an ornamental.

Other common name is bush palmetto.

Cabbage palmetto [*S. palmetto* (Walt.) Lodd.] grows in sandy soils along the coastline; in prairies, marshes, pinelands, and hammocks, usually where limestone is near the surface; and throughout the Florida peninsula.

Fruits are eaten by songbirds, bobwhite quail, small mammals, white-tailed deer, and black bear. Fruits are a major winter food of wild turkeys in Florida. The tree may provide the best nesting site available for grey squirrel, and the caracara nearly always nest in it.

The edible bud or "cabbage" is sold precooked in many stores and is also eaten raw as a salad.

Cabbage palmetto is the state tree of Florida and is often used in ornamental plantings. It invades quickly on disturbed soil and is now more abundant than ever.

The young leaf stalk bases are processed commercially for fiber, brushes, and whiskbrooms.

Other common names: Carolina palmetto, common palmetto, palmetto, cabbage-palm.

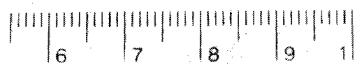
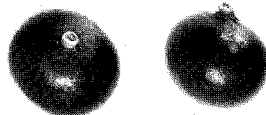
Scrub Palmetto

A shrub with a recumbent, twisting stem.

Leaves deeply cleft, fan-shaped, up to 2.50 feet in diameter, with many filaments.

Flower cluster 1.50 to 2.50 feet long, often prostrate at maturity.

Fruit, a black drupe, 0.37 inch or more in diameter.



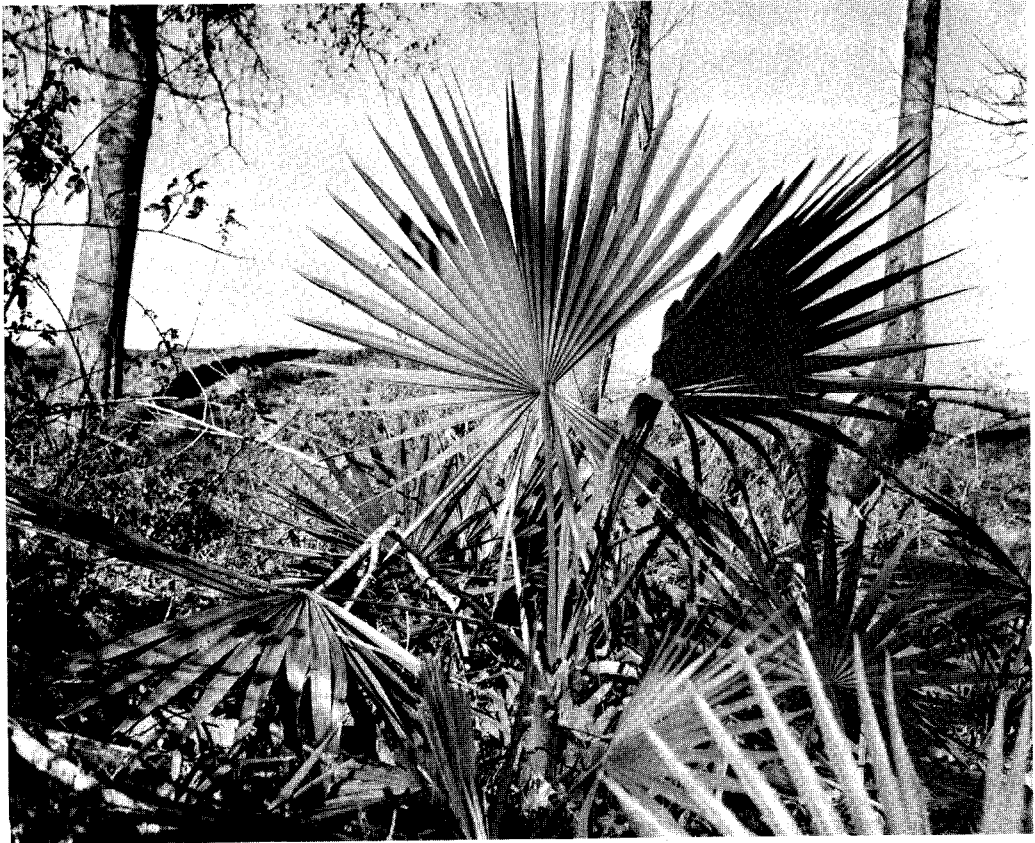
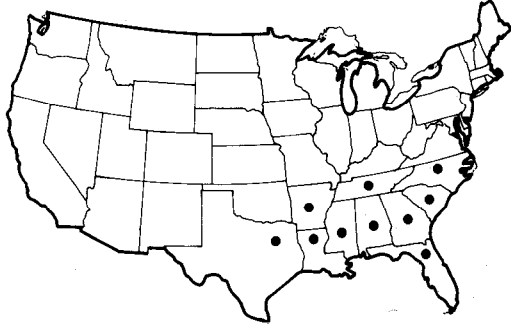
Dwarf Palmetto

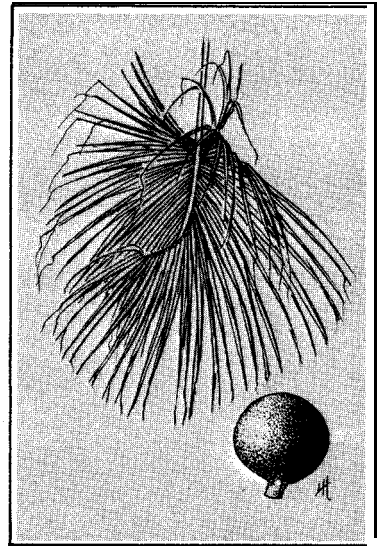
A shrub with two growth phases, stemless in dry hills but with short stems in alluvial flood-plains.

Leaves consist of a stout, usually erect, smooth petiole and a fan-shaped blade 1 to 3 feet in diameter. The leaves have a bluish cast, and are rather stiff without filaments.

Flower cluster elongate 3 to 6 feet long, erect.

Fruit a black, dy, hard drupe 0.25 to 0.33 inch in diameter.





Cabbage Palmetto

A branchless tree up to 80 feet tall and 1 to 2 feet in diameter. The trunk is clothed during early life with decayed leaf stalks (boots) that later fall away and leave a fairly smooth lightly ridged stem.

Leaves persistent, blades fanlike, shiny, and deep green in color, 4 to 7 feet long, segments are free at tips, petioles smooth and as long or longer than blades.

Flowers small, creamy-white, borne in profusion on panicles from leaf axils.

Fruits drupelike, 0.33 inch diameter, seed chestnut-colored and extremely hard, 0.25 inch broad. Large clusters often hang downward.



American Elder/Sambucus canadensis L.

Donald J. Hankla

North Carolina *Wildlife Resources* Commission
Raleigh, North Carolina

American elder is found on stream banks and in major bottoms and sometimes on moist sites in upland woods. It occurs in full sun but is common in the understory, provided that the canopy allows some direct light to enter.

The fruit is an important source of summer and early fall food for many kinds of songbirds. Robins, mockingbirds, and catbirds eagerly consume the ben-y-like drupes before they are ripe. Ruffed grouse, quail, wild turkey, and mourning doves eat the fallen fruit. Squirrels, rabbits, raccoons, opossums, chipmunks, and deer feed on the fruit or foliage.

The fruits are moderate in crude protein, and high in crude fat and phosphorus.

Deer preference for foliage varies from low to medium. In the Piedmont and Gulf Coast the rating is generally low, though in Piedmont Georgia it may be used regularly and heavily in September even where honeysuckle and greenbrier are abundant. The foliage is heavily used in Louisiana, but browsing is seldom severe enough to retard normal growth.

American elder is thicket-forming and furnishes excellent nesting cover for small birds. New growth tastes bitter and contains a glucoside that is sometimes fatal to cattle and sheep. The older growth has some forage value.

Before planting, seeds should be scarified with sulfuric acid for 10 to 20 minutes or stratified in moist sand for 60 days at 68° to 86°F alternating daily, then 120 days at 41°F. Untreated seeds sown in the fall ordinarily do not complete germination until the second year.

The fruit is sought for making wines, jellies, and pies. Limited use is made of the plant as an ornamental.

Other common names: elder, sweet elder, common elder, blackberry elder.

American Elder

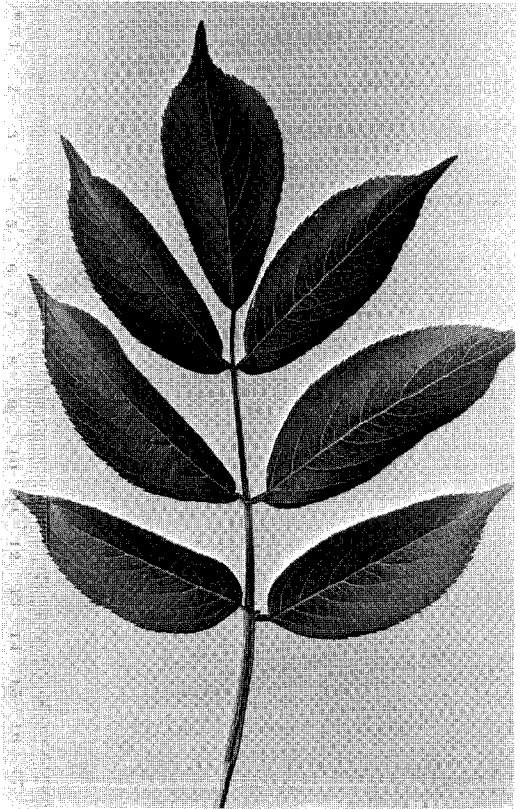
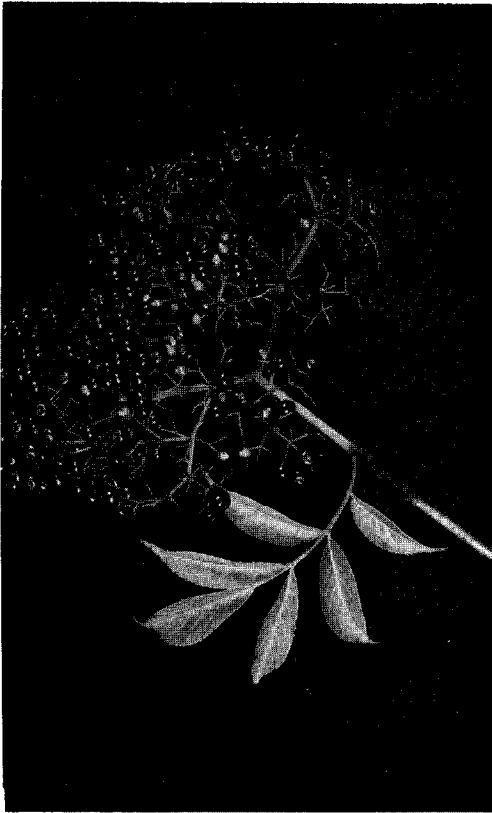
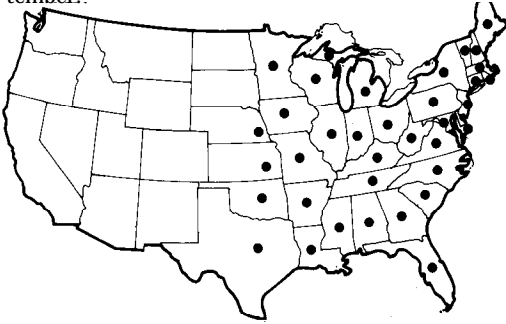
A **many-stemmed** shrub averaging 7 feet tall.

Stems dotted with **corklike** lenticels, pith white; buds medium-sized, conical, and somewhat **de-**pressed.

Flowers white in **convex** cymes up to 10 inches across. June to July.

Leaves deciduous, upper surface lustrous bright green, lower surface paler, 4 to 12 inches long.

Fruit bery-like **in** clusters, drupe deep purple, 0.15 to 0.25 inch in diameter. August and Sep-
tember.



Sassafras/Sassafras albidum **(Nutt.) Nees**

Robert G. Leonard

Arkansas Game and Fish Commission
Little Rock, Arkansas

Sassafras grows best in open woods and along fence rows on moist, well-drained sandy loam soils. It is a pioneer species on abandoned fields and on dy ridges and upper slopes, especially after fire. It is highly susceptible to frost and frequently suffers from winter killing in the northern part of the range. On poor sites its growth is short and frequently shrubby.

The fruit is eaten by songbirds, wild turkey, ruffed grouse, bobwhite quail, raccoons, squirrels, black bear, and other mammals. Usually, however, the quantity of fruit is limited. Fruit production is optimum when trees are 25 to 50 years old. Seeds are high in crude protein, moderate in phosphorus, high in crude fat, but low in calcium.

White-tailed deer browse the twigs in winter and the succulent growth in spring and summer. Sprouts are particularly palatable and grazed heavily after a fire or disturbance.

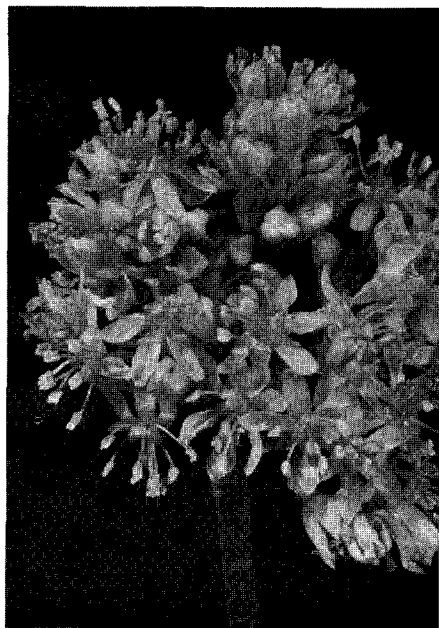
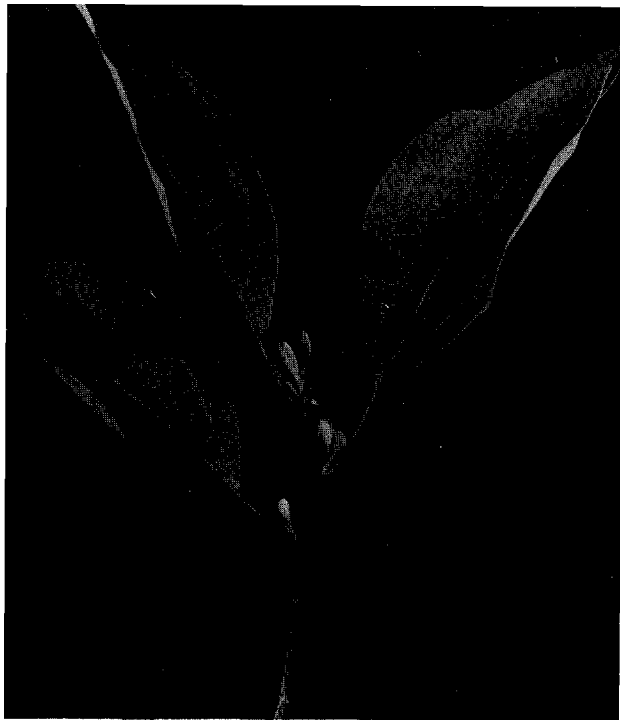
Sassafras seed usually remain dormant until spring although some early maturing seed may germinate in the fall. Stratification for 30 days in moist sand at 41°F breaks natural dormancy.

Sassafras is intolerant of shade and reproduction is sparse and erratic except by sprouting. The dense stands often found in woods openings or old fields are from sprouts rather than seed. The species is susceptible to fire damage, but it sprouts readily after a fire.

On good sites where competition is not too severe sassafras grows rapidly; thus the highly palatable sprouts soon grow out of reach for deer unless they are periodically (every 2 to 5 years) killed or cut back by fire or mowing.

The orange wood is durable, toarse-grained and light, but is neither hard nor strong. The wood has been used for cooperage, buckets, boats, posts, and furniture. A tea is made from the outer bark of the roots; an extract of the bark is used as an orange dye for wool. The oil is included in some soaps. When invading pastures and old fields sassafras is considered a weed tree.

Other common name: common sassafras.



Sassafras

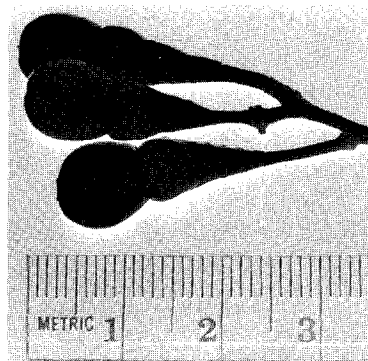
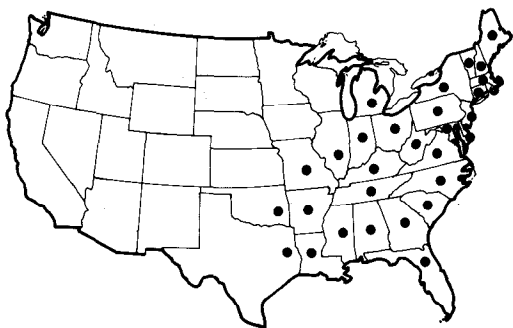
A tree, attaining a height of 90 feet.

Leaves alternate, simple, deciduous, thin, aromatic, blades 3 to 5 inches long, margin entire or divided into two to three mitten-shaped lobes, bright green above, glabrous beneath, hairy on veins.

Twigs yellowish-green, pubescent at first, turning glabrous and orange-red later, twig mottled with dark green and grayish brown, pith soft and white, leaf scars half round to crescent shaped, one bundle scar, twigs spicy.

Flowers greenish-yellow, in loose open cluster before leaves unfold, axillary in racemes about 2 inches long, March to April.

Fruit a blue, spicy drupe, lustrous, 0.50 inch long, borne on a thickened, red pedicel, stone solitary, light brown. July to September.



Saw-Palmetto/*Serenoa repens* **(Bartr.) Small**

Lowell K. Halls

Forest Service, USDA

Nacogdoches, Texas

This species grows on sandy pinelands, prairies, hammocks, or dunes, on acid or alkaline soils. It is frequently the dominant shrub in the fire-dependent flatwoods ecosystem.

Palmetto fruits are heavily utilized by white-tailed deer, black bear, and feral hogs, and are eaten by wild turkey in winter and spring. Twenty-one pounds of saw-palmetto drupes were taken from the stomach of one bear in Florida.

Saw-palmetto produces vigorous regrowth after burning, but fruiting is reduced. The emerging leaves are grazed by cattle. Mature fronds are occasionally cropped heavily by cattle when on a high protein supplement or when other forage is scarce. For maximum fruit production the plants must be protected from fire.

The leaves are used for Easter decorations, the flowers are a source of honey, and the stems a source of tannic acid extract.

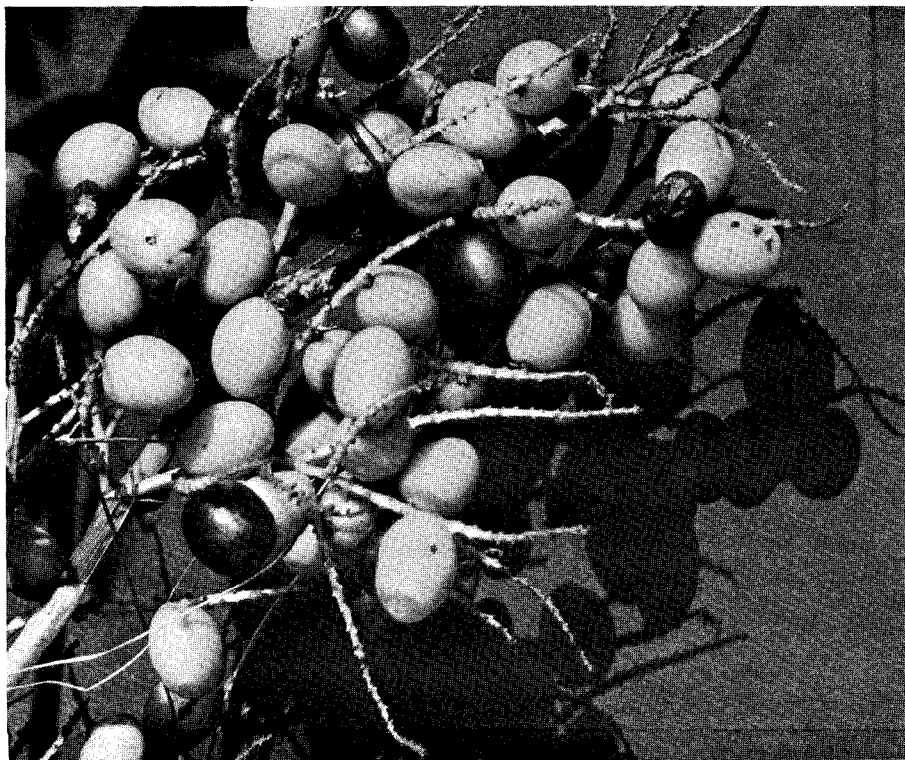
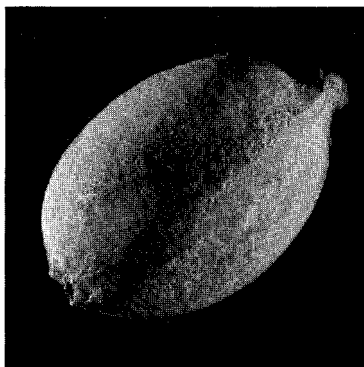
Saw-Palmetto

A shrub usually 3 to 7 feet high, with creeping or horizontal stems often rooting beneath, occasionally becoming a small tree in light shade.

Leaves clustered, erect or ascending, fan-shaped, 1 to 2.50 feet broad, stiff, green or glabrous, petioles longer than blade, armed with sharp, rigid, recurved teeth.

Flowers erect or spreading, elongate, zigzag, usually numerous, white, 0.17 to 0.25 inch long. Spring to early summer.

Fruit an ovoid drupe, black to dark brown, 0.60 to 1 inch long, seeds erect, solitary, panicles weighing up to 9 pounds.



Viburnum/Viburnum spp.

Herman L. Holbrook

Forest Service, USDA
Atlanta, Georgia

James C. Lewis

U. S. Fish and Wildlife Service
Stillwater, Oklahoma

Viburnums are typically understory species found on a variety of sites. Rusty blackhaw (*V. rufidulum* Raf.) attains its best growth on moist, rich alluvium but is found on dry sites and at elevations up to 3,500 feet in Virginia and Tennessee. Possumhaw viburnum (*V. nudum* L.) grows in swamps on sandy, acid soils and is often found in pinelands. Arrowwood (*V. dentatum* L.) is most common on sandy soils and moist sites such as wet thickets, swamps, and meadows. It is found on chert soils in Virginia. Mapleleaf arrowwood (*V. acerifolium* L.) is found on dry, sandy or rocky soils, in thickets, on hillsides and on sandstone bluffs. Hobblebush (*V. alnifolium* Marsh.) grows in moist woods and cool ravines. All of the viburnums are fairly shade tolerant and are typically of the mid and late successional stages.

Viburnums have showy, umbrella-shaped clusters of small white or pink flowers that appear in spring or early summer. The simple, deciduous leaves are opposite; the stem at the point of attachment is marked by a characteristic line. Mature fruit is red or blue-black, round or slightly flattened, and about one-quarter inch in diameter. The umbrella-shaped fruit clusters usually contain one to two dozen drupes. Species reproduce vegetatively and by seed. Invasion of new areas is by seed, followed by root suckering or layering of stems. Seed germination is normally delayed until the second spring after ripening.

Viburnums are valuable to wildlife chiefly for their fruit, a one-seeded drupe with a flat stone and thin oily flesh. The fruit is available from late summer through fall and is readily taken by songbirds, ruffed grouse, wild turkey, quail, squirrels, beaver, rabbits, raccoons, chipmunks, and deer. Good seed crops are usually borne every year or two and are heaviest in the open. The twigs, bark and leaves are eaten by deer and beaver. Fruits are low in crude protein and crude fiber and high in nitrogen-free extract and crude fat.

Viburnums are widely used as ornamentals for their showy flowers and their foliage. Many commercial varieties are available on the market.

Mapleleaf Viburnum

A shrub 2 to 6 feet **tall**, often forming thickets.

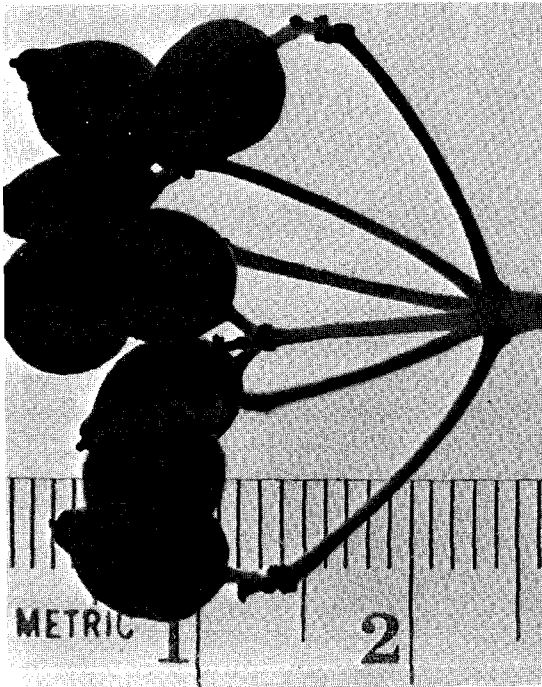
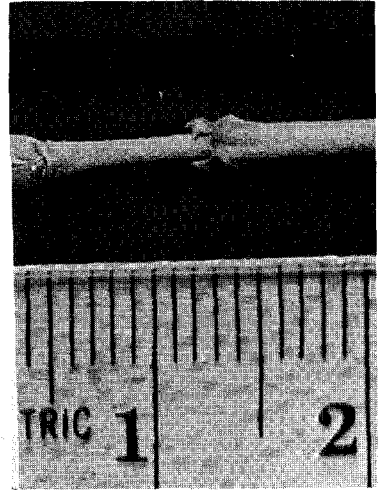
Leaves 1.25 to 5 inches wide or long, lateral veins **continuous** to margins, lower leaf surface copiously dotted.

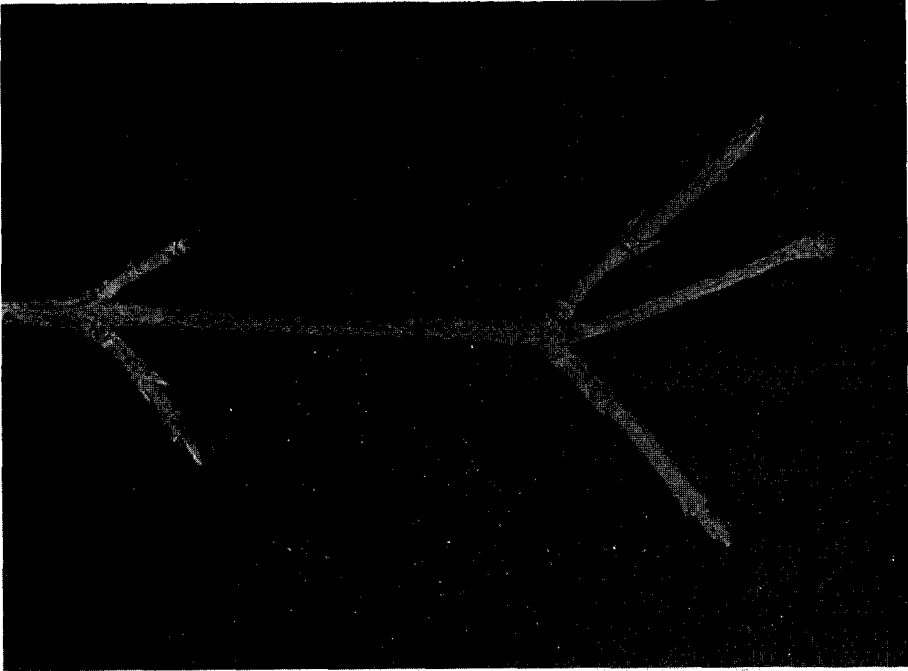
Twigs pubescent, pith narrow, leaf scars **narrow**, V-shaped to crescent shaped, connecting around twig, three bundle scars, buds yellow to rusty, two or three pairs of visible **scales**.

Flowers **in cymes** 0.75 to 3.50 inches wide. May to **August**.

Fruit flattened, with shallow **grooves** on each **side**. **July** to October.

Other **common names**: *arrowwood*, *possum-haw*, *squashbeny*, *dockmackie*.





Hobblebush

A straggling shrub 3 to 15 feet tall.

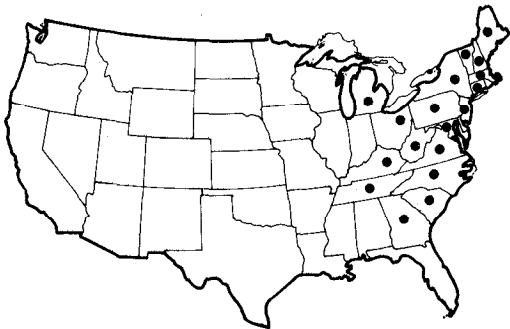
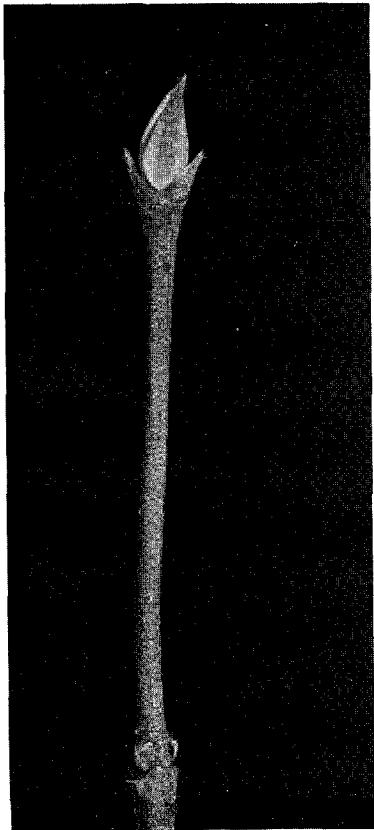
Leaves 3.50 to 8 inches long and nearly as wide, scurfy on underside, lateral venation pinnate, branching several times, ending at serrations of leaf margin.

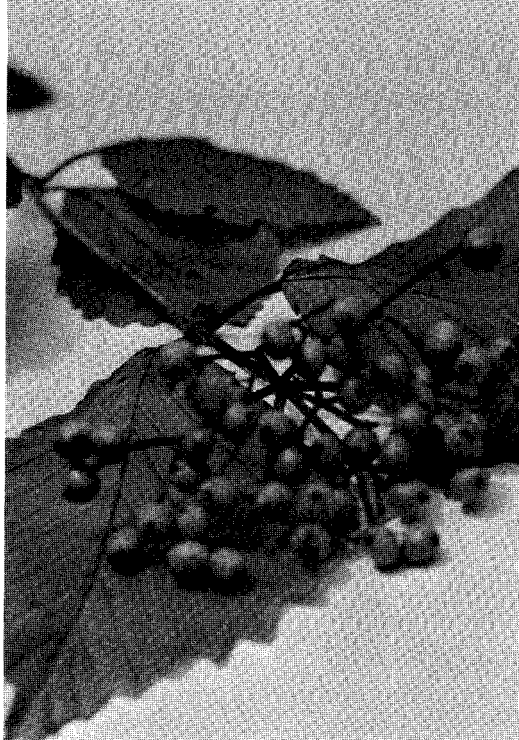
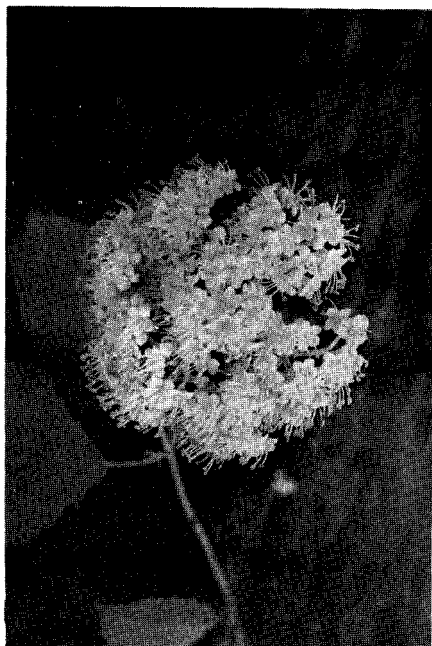
Twigs scurfy, buds large, naked, scurfy, terminals often exceed 1 inch.

Flower 1 to 2 inches wide, essentially without stalks.

Fruit clusters 1 to 2 inches wide, **drupe** flattened on one side, grooved on all faces. August to October.

Other common names: *witch-hobble, tangle-legs, moose-wood.*





Southern Arrowwood

A shrub 3 to 15 feet tall.

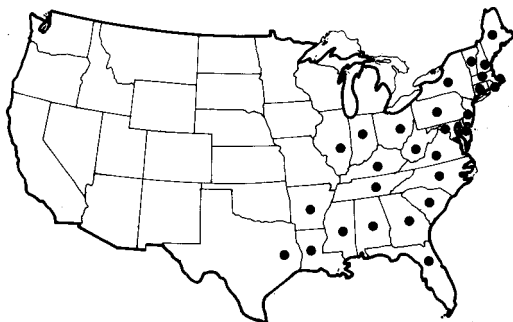
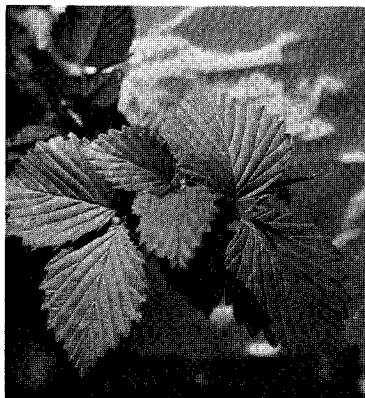
Leaves 1 to 4.50 inches long, veins continuous to margin, **many** single or **tufted** hairs at fork of branched veins on the under surface.

Twigs glabrous, **pith** continuous and white to rusty in color, leaf scars narrow, V-shaped, continuous around twig, three bundle scars, terminal buds acute with two or three pairs.

Flower **cymes** 1.25 to 4.50 inches wide. June to August.

Fruit with shallow grooves on one side. August to November.

Other common names: arrowwood *viburnum*, *mealy-tree*, *withe wood*.



Possumhaw

An irregularly branched shrub or small tree, rarely over 20 feet.

Leaves leathery, shiny, 2 to 5 inches long, 1 to 2 inches wide, olive green to dark green above, lower surface paler and with rusty brown scales.

Twigs reddish brown to purple brown, few minute hairs, older twigs gray and glabrous, leaf scars, U- to V-shaped and narrow, encircling young stem but later separated, three bundle scars, buds slender, 0.50 inch long with scales, pith white and soft.

Flowers 2 to 4 inches wide. April to June.

Fruit in cymes, 2 to 4.5 inches across, pink at first but glaucous-blue later. Matures in fall.

Other common names: *witherod*, *bifbery*, *nanny-berry*.



Rusty Blackhaw

An irregularly branched shrub or tree up to 40 feet tall.

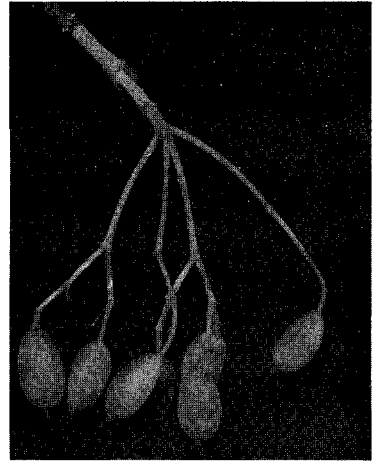
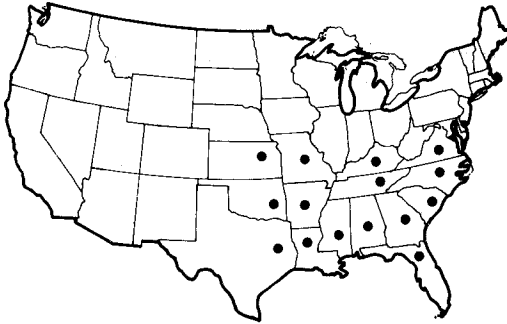
Leaves semi-evergreen in South, 1.50 to 4 inches long, 1 to 2.50 inches wide, dark green, leathery, shiny above, paler below with red hairs on veins, margin finely serrate.

Twigs reddish brown, glabrous, naked buds, covered with short rusty pubescence, leaf scars U- to V-shaped, three bundle scars; pith white, soft, 0.33 or less of total twig diameter.

Flowers in flat cymes, 2 to 6 inches across. April to May.

Fruit bluish-black in drooping clusters, 0.33 to 0.50 inch in diameter. July to October.

Other common names: *rusty nanny-berry*, *southern nanny-berry*, *blackhaw*, *southern blackhaw*.





Berries

BERRIES

Berries are fruits in which the entire ovary, including the endocarp or inner ovary wall, becomes a fleshy or pulpy mass enclosing one or more seeds. Most species are eaten by wildlife and several species such as grapes and tomatoes are important food sources for humans. The fruits are usually high in carbohydrates and low in crude protein.

The genera discussed here are members of several family groups.

***Common Persimmon/Diospyros virginiana* L.**

Leslie L. Glasgow
Louisiana State University
Baton Rouge, Louisiana

Persimmon grows best on alluvial soils such as clay and heavy loams of neutral pH. It also grows on poorly drained upland sites, but fails to reach commercial size. It is a pioneer species in abandoned fields, and is also found in the understory of dense stands.

Ripe fruits of persimmon are eaten by many species of wildlife but especially by opossum, raccoon, fox, and deer. The fruits are also eaten by skunks, wild turkeys, bobwhite quail, crows, rabbits, squirrels, hogs, cattle, and many songbirds.

The seeds and fruits are generally low in crude protein, crude fat, and calcium, but high in nitrogen-free extract.

Deer browse readily on persimmon sprouts, but cattle graze them only lightly.

Optimum seedbearing age is 20 to 25 years. Seeds remain dormant overwinter and germinate in April or May. Before planting, seeds should be stratified under moist conditions for 2 to 3 months at 33 to 41°F. The seedlings develop a strong taproot, and they are difficult to transplant but when established survive under very adverse dry conditions.

Prolonged flooding during the growing season will kill young trees.

Persimmon sprouts profusely from stumps and from root collars after fire. Plants may be propagated by root cuttings and grafting.

Persimmon is frequently planted as an ornamental or fruit tree, and the fruits are occasionally used for desserts. Indians smashed and dried the pulp as an additive to many other foods.

The wood is hard, smooth, and even-textured and is particularly desirable for golf clubs and shuttles.

Other common name: eastern persimmon.

Common Persimmon

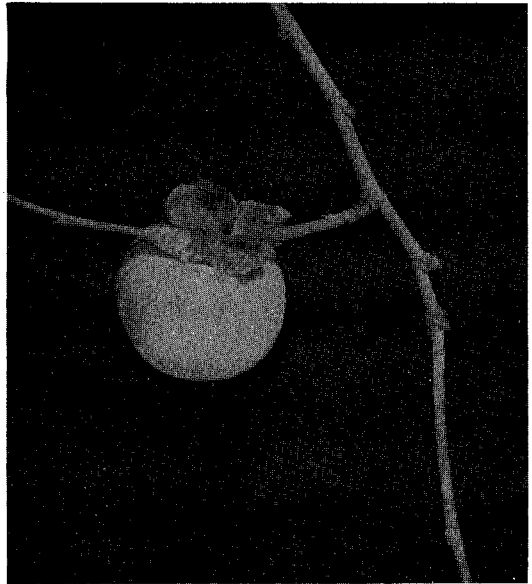
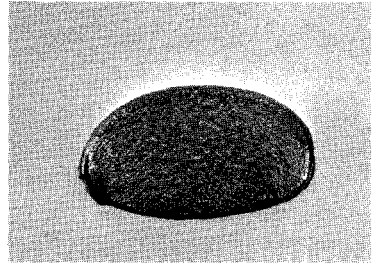
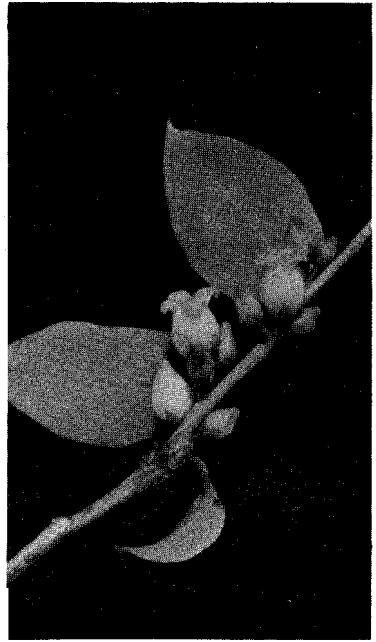
A tree or shrub usually 30 to 50 feet high, but may reach 70 feet or more on good sites. The heartwood is very hard and black; the tree is a close relative to the commercial ebony.

Leaves alternate, entire, thickish, ovate, smooth or nearly so., deciduous, dark green above, light below with whitish bloom, 2 to 6 inches long, 1 to 3 inches wide.

Twigs slender, slightly zigzag, lacking terminal bud, lateral buds are small, short pointed, two or three scales.

Male and female flowers on separate trees. April and May.

Fruit a rounded or slightly flattened berry becoming yellow or orange, soft, sweet, juicy at maturity, astringent when green, rots quickly after falling to ground. Seeds four to eight, flattened. September to November, may remain on tree into winter.



***Eastern Redcedar/Juniperus virginiana* L.**

Lowell K. Halls

Forest Service, USDA
Nacogdoches, Texas

The species grows on a variety of soils ranging from dry rocky outcrops to swampy land. It is frequently found on thin soils with limestone or dolomitic outcrops. Pure stands are scattered throughout its range, generally on abandoned farmlands or dry uplands. It is drought resistant and frost hardy, but cannot withstand flooding. The trees tend to make the soil more alkaline. Stockmen consider the plant a nuisance because it produces poor forage, and is an aggressive invader on over-grazed ranges or abandoned fields, often completely dominating such sites.

Juniper fruits are eaten by many wildlife species including bobwhite quail, ruffed grouse, pheasant, wild turkeys, rabbits, foxes, raccoons, skunks, opossums, and coyotes. Waxwings travel in groups to feed on the juniper berries. The fruits are moderate in calcium, high in crude fat and crude fiber. The seeds are very high in total carbohydrates.

Junipers provide good nesting and roosting cover for many birds, and dense thickets make good escape cover for deer.

New growth changes from succulent green to light brown in the second year but does not become woody until the third season. The numerous low, lateral branches provide an abundance of green, but low-quality roughage that may serve as emergency food for deer in times of stress. During such times, browse lines develop on older trees, and younger ones become hedged. Tree-size plants are seldom killed, but most reproduction is destroyed.

Various methods of planting are recommended. Store seed in fruit 1 year, then clean, scarify, and sow in the fall; or store seed in fruit 1 year, then clean and stratify in peat for 100 days at 41°F and sow in the spring; or stratify outdoors in the shade from May until sowing time in the fall.

Natural reproduction mainly from seeds that birds or mammals drop on bare or partially bare soil. Growth is relatively slow and a long rotation is required to grow it to sawtimber size. Trees 20 to 30 years old are generally 18 to 24 feet tall and 2.25 to 3 inches in diameter.

Eastern Redcedar

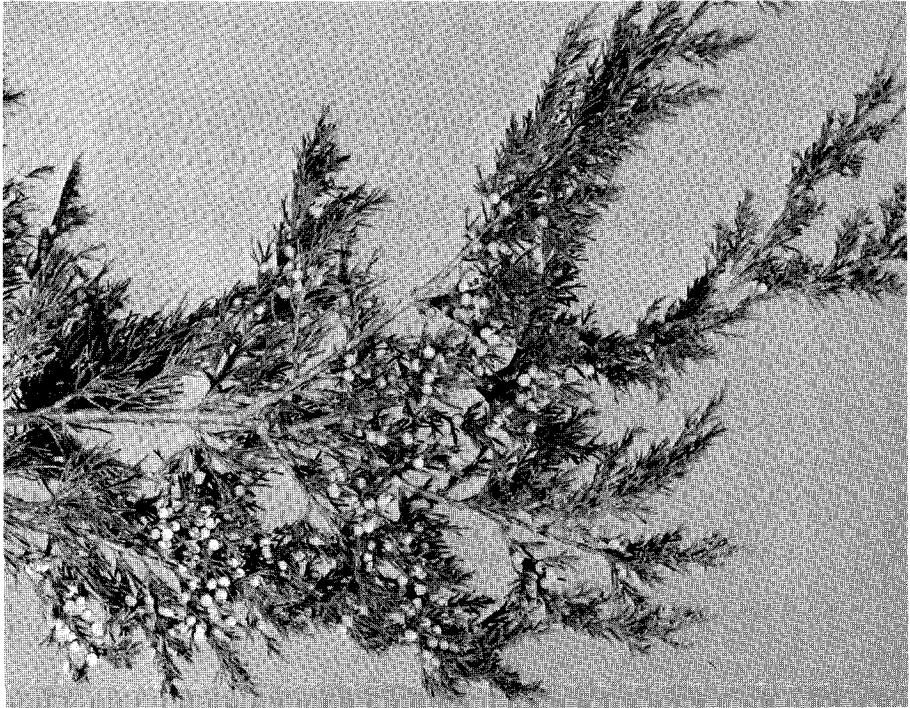
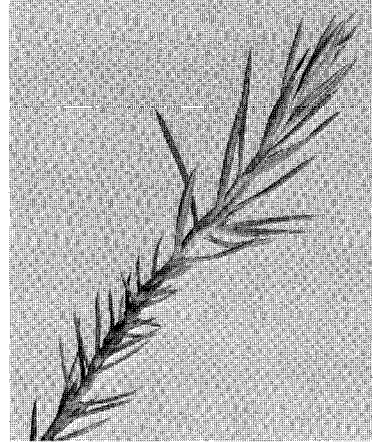
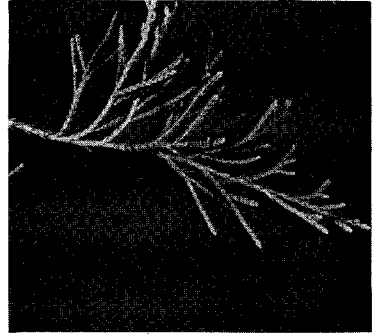
An evergreen tree 40 to 50 feet high, pyramidal crown.

Leaves of two kinds, the scalelike are glandular, dark green, obtuse, 0.06 inch long, four ranked; the awl shaped are sharp pointed, 0.50 to 0.75 inch long.

Twigs reddish brown, round or angled.

Flowers dioecious, catkins small and terminal, male oblong, female cones globular; scales spreading, fleshy, purplish. March to May.

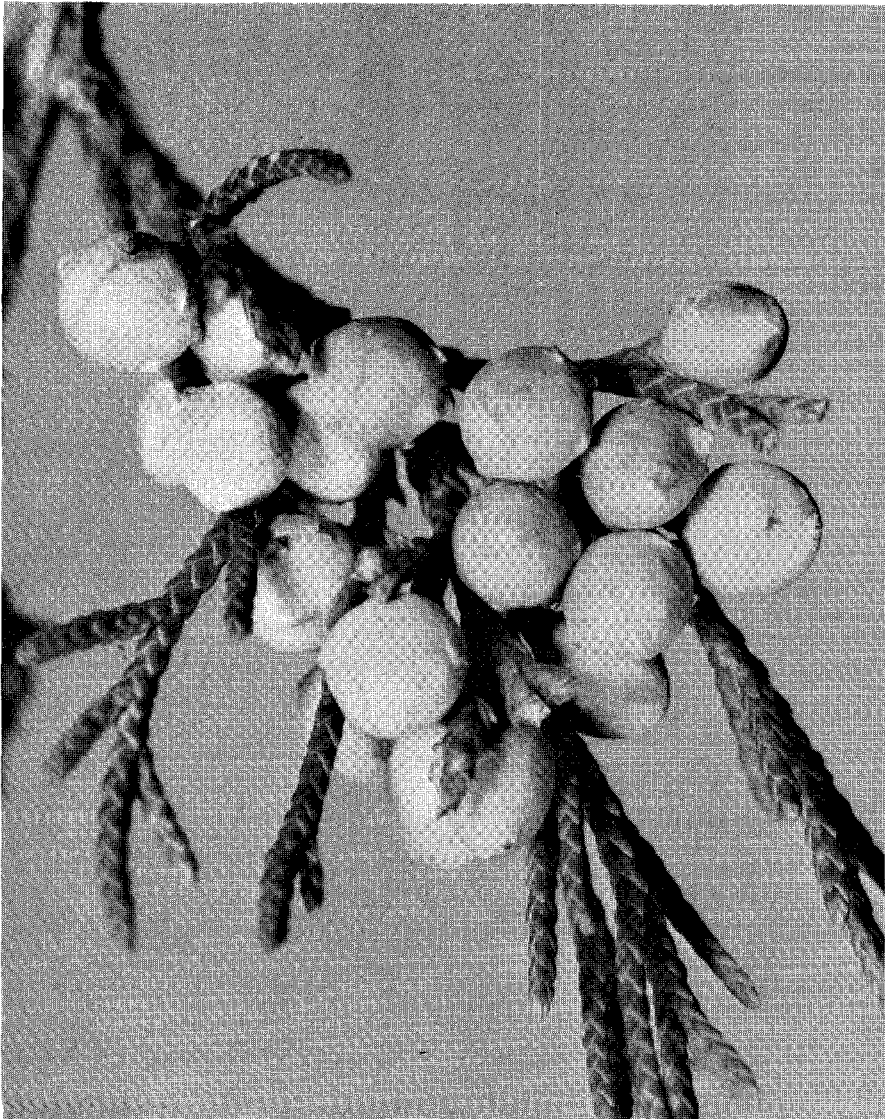
Fruit berry-like on straight peduncles, pale blue, glaucous, 0.25 to 0.33 inch diameter, seeds one or two ovoid, 0.12 to 0.16 inch long, smooth, shiny. September to December.



Fire is the worst enemy of redcedar. The thin bark and roots near the surface of the ground are injured by relatively light fire. The foliage, however, does not burn easily and fires generally will not penetrate stands unless litter is heavy.

The wood is used for novelties, posts, poles, boats, woodenware, paneling, closets, chests, and pencils. The extract of cedar oil has various commercial uses. The species is sometimes used in shelterbelt plantings and many varieties are horticulturally important.

Other common names: red juniper, redcedar, savin, and Carolina cedar.



***Japanese Honeysuckle/Lonicera japonica* Thunb.**

Lowell K. Halls
Forest Service, USDA
Nacogdoches, Texas

Originally introduced from Asia, Japanese honeysuckle now occurs throughout the South but mainly on low moist ground along streams or on fence rows and borders of woods. Scattering of seeds by birds plus man's transplanting accounts for its wide dispersion. Plants can be established vegetatively from root and stem cuttings, rooted stolons, single plants, or even blocks of soil containing roots. The plantings need cultivation for the first year. Once established plants propagate by stolons, which on open, moist sites spread as much as 15 feet in a year.

The fruits are eaten by many kinds of songbirds, and by wild turkeys, quail, and white-tailed deer. Honeysuckle browse is relished by deer. The dense network of vines and leaves produce abundant forage that is readily eaten the year round, but primarily in winter. Frequently the outer stems and leaves are browsed very closely, but the tangled mat of old stems forms a barrier against complete removal. New shoots arising from old growth are a continuous source of nutritious forage.

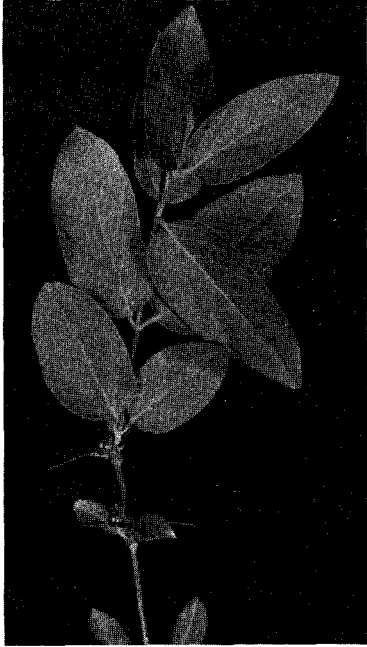
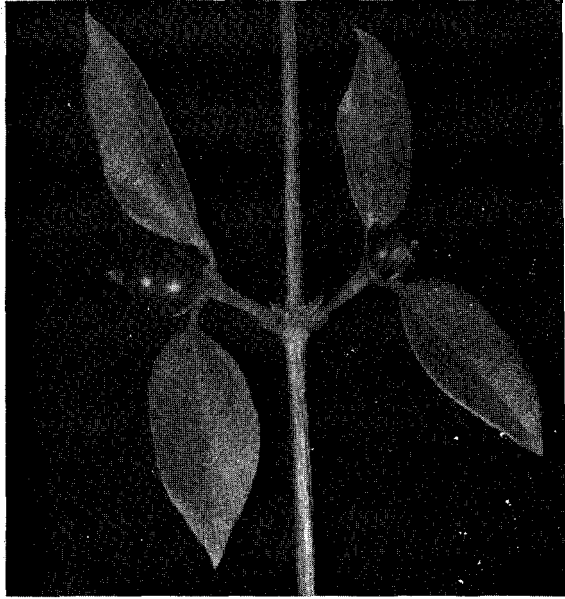
Its ease of propagation and high vigor make Japanese Honeysuckle valuable as game food but a nuisance in timber management. The most difficult task is confining it to specified areas. Uncontrolled, the species overwhelms and strangles low-growing plants and trees, including some that are valuable to wildlife. In open areas it quickly covers the ground and severely restricts forest tree regeneration. It competes with young timber in 10 percent of the forest land from Georgia to Maryland. In timber stands of pulpwood size and larger, shading and needle cast keep the species in check until the trees are harvested.

In a study near Nacogdoches, Texas, fruit yields were 222 grams (ovendy weight) for plants growing in the open and 11 grams for plants growing in the woods. Fruits persisted on plants through the winter. The pulp/seed ratio ranged from LO.27 to 1:0.45. The fruits are low in crude fiber, high in nitrogen-free extract, and moderate to high in phosphorus and calcium.

Honeysuckle makes good winter forage for cattle and provides excellent cover for quail, turkey, songbirds, and small mammals.

The species is often seen as an ornamental.

Other common names: honeysuckle, southern honeysuckle, white honeysuckle, and Chinese honeysuckle.



Japanese Honeysuckle

A trailing or twining woody vine.

Leaves semi-evergreen, entire, hairy, 1 to 3 inches long; 0.50 to 0.75 inch wide.

Stem bark shreddy, twigs reddish-brown, hairy, **hollow in center**.

Flowers fragrant, **in pairs from leafy bracts**. **Corolla** 0.50 to 1.50 inches **long**, white or pink, **later yellow**. June to August.

Fruit a black **pulpy** berry, 0.16 to 0.25 inch long. September and October.





Saw Greenbrier

A straggling to climbing vine.

Leaves tardily deciduous, usually thick and often blotched with white. 1.50 to 4.50 inches long, 0.70 to 3 inches wide, margins and main veins usually prickly.

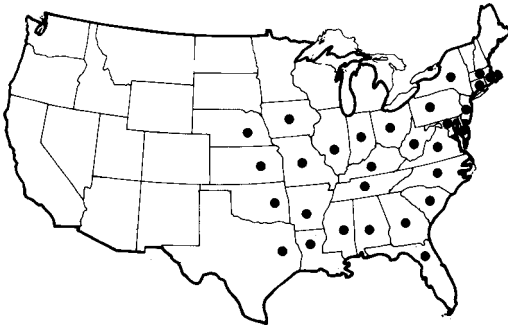
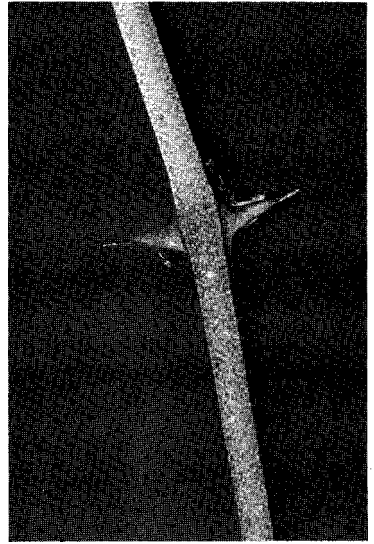
Cane four-angled or round, zigzag in upper reaches, main branches with stiff, flattened, black-tipped spines clustered at the nodes.

Flowers April to June.

Fruit black with a bloom, about 0.25 inch long, single seed, stretchy. October to November.

Underground stems are woody tubers, single or in a compound mass up to 6 inches across. Roots with short, resinous-tipped spines.

Other common names: *China brier*, *bullbrier*, *fiddle-leaf* greenbrier, and *sawbrier*.



Greenbriers/Smilax spp.

Phil D. Goodrum

U.S. Fish and Wildlife Service
Nacogdoches, Texas

Greenbriers are a group of thorny, woody vines, all more or less alike in appearance. They retain leaves most of the year. The flowers are pale green and very small.

The five species discussed here are widely distributed in both dense and cutover forests, in swamps and abandoned fields, and along fence rows. They tolerate shade but maximum growth of twigs and production of fruit is obtained from plants growing in the open.

The fruits are eaten by ruffed grouse, wild turkey, bobwhite quail, by at least 38 species of songbirds, and by mammals such as white-tailed deer, black bear, opossum, raccoon, squirrels, and rats.

The fruits of greenbriers are moderate to low in crude protein, phosphorus, and calcium, moderate in crude fat, and high in nitrogen-free extract.

Common greenbrier (*S. rotundifolia* L.), the most widely distributed species, is especially abundant in low, damp flatwoods. Laurel greenbrier (*S. laurifolia* L.), is largely confined to bay and swamp margins and banks of marshy streams, but occasionally is found on upland sites. Lanceleaf greenbrier (*S. smallii* Morong), is most abundant in the lower Coastal Plain along edges of small streams, swamps, and ditches in well drained but not dry soil. Cat greenbrier (*S. glauca* Walt.), and saw greenbrier (*S. bona-nox* L.), grow in a variety of soils and moisture conditions.

Greenbriers are present in all stages of plant succession. Rhizomes may persist for years, even when the canes have been killed by fire or by disturbance of the ground. Disturbance may scatter the rhizomes and thus multiply the plants. Canes live from 2 to 4 years and produce flowers after the first year, usually from annual shoots on the upper parts of the cane.

Saw greenbrier plants bear fruit annually but usually in small amounts. Some fruit persists through most of the winter. The average pulp to seed ratio is 1:1.59.

Greenbriers are considered by many to be the most important group of deer food plants in the South. The fast-growing green canes

Cat Greenbrier

A slender, climbing vine.

Leaves tardily deciduous, 1.50 to 4 inches long, 1.25 to 3 inches wide, white or **glaucous** on the underside.

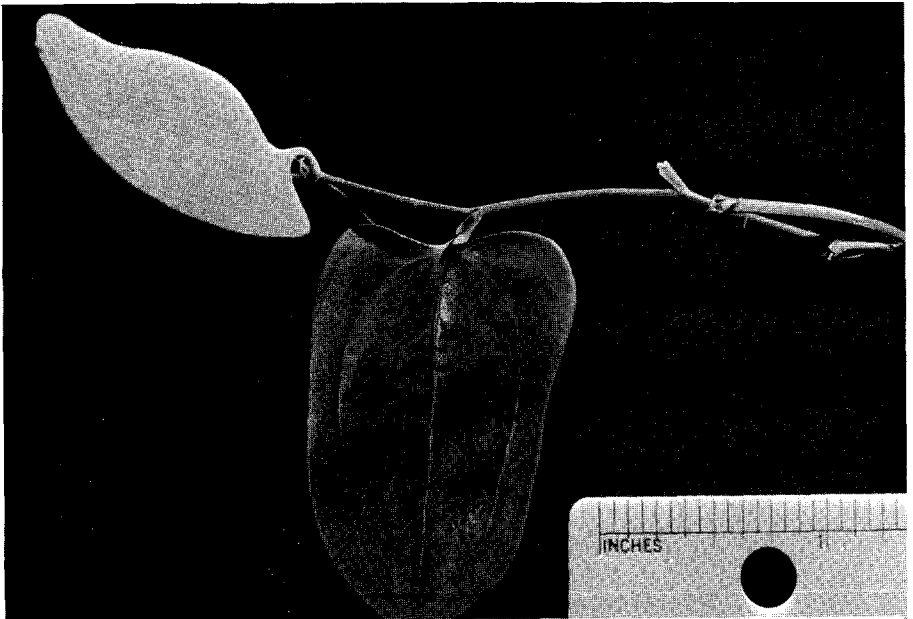
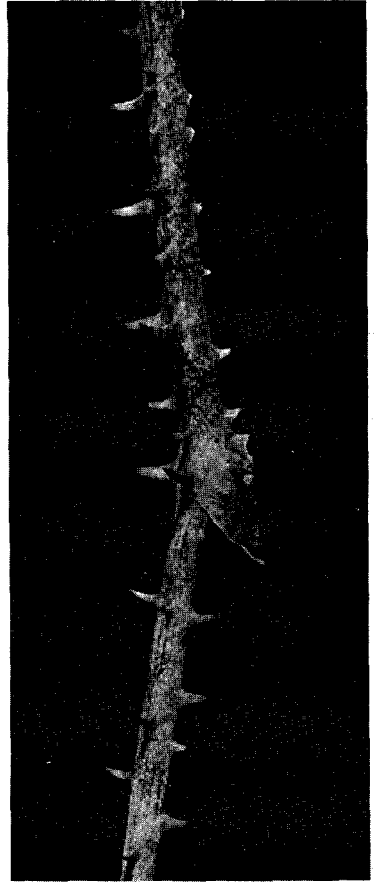
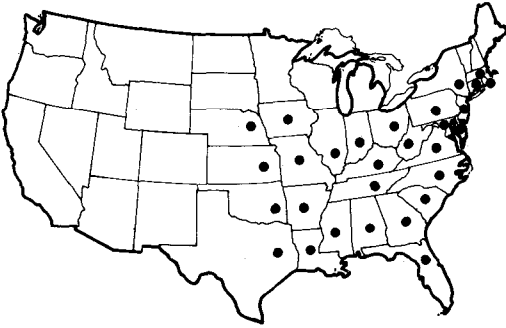
Cane green or mottled brown, lower part thickly set with slender, slightly recurved, needle-like spines between the **nodes**.

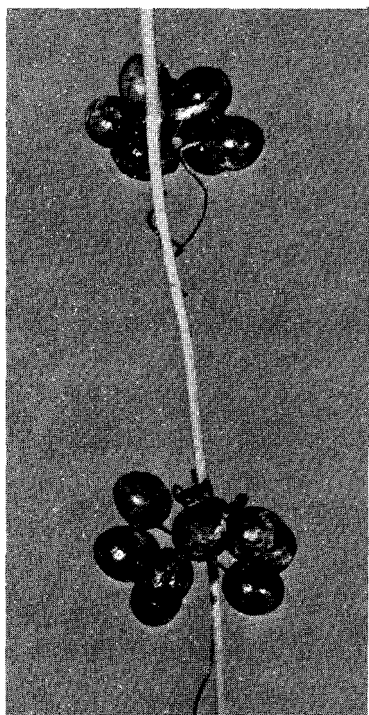
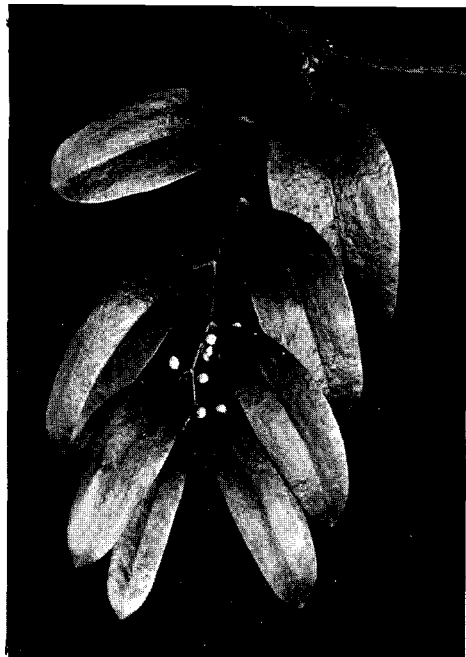
Flowers May to June.

Fruit black with a **bloom**, ripens in first year. Seeds two or three.

Underground stems consist of tubers and rhizomes. Tubers 0.50 to 2 inches thick, not spiny; rhizomes with small prickles between **nodes**.

Other common names: **sawbrier**, **wild sarsaparilla**, **stretch greenbrier**, **catbrier**, and **glaucous-leaf greenbrier**.





Laurel Greenbrier

A stout, high-climbing vine.

Leaves 2 to 6 inches long, 0.50 to 1.50 inches wide, evergreen, thick and leathery, with three prominent veins.

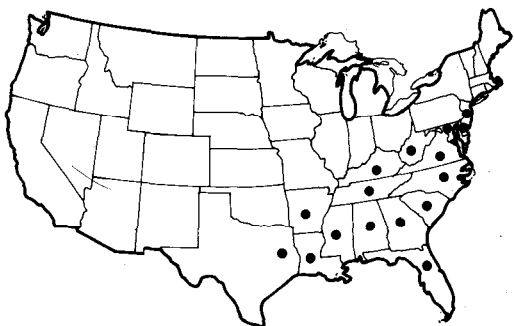
Cane mostly round, up to 0.50 inch thick, spines abundant on lower part, flattened but stout, up to 0.50 inch long. Usually no spines on joints.

Flowers greenish-white. July and August.

Fruit shiny black, in clusters of 5 to 25. **Ma-**tures in October, during second year after flowering.

Underground stems a hard and knotty thickened mass with red dish surface. No true stolons.

Other common names: *laurelleaf* greenbrier, bamboo-vine, and blaspheme-vine.



and tender shoots are very palatable, and the leaves are eaten all year. Greenbriers were among the most heavily grazed of 73 browse species in an east Texas pine-hardwood forest.

The growing habit and fleshy root system make greenbriers very tolerant to deer browsing. Rhizomes usually produce new canes annually. These canes grow quickly, but if the tips are nipped off new branches form at one or several remaining nodes. Thus, browsing helps in making the new growth available.

Greenbriers withstand heavy grazing and browse use, especially cat greenbrier because it tends to form a dense hedge of stiff stems. About 50 or 60 percent of the annual growth of greenbriers may be eaten without mortality of roots.

Cattle compete with deer for the stems and leaves.

When canes grow out of reach of deer, forage conditions can be improved by a prescribed burn. The regrowth is immediately available and has more crude protein than older stems.

The young stems are relished by swamp rabbits.

Common greenbrier may overburden young trees, but the loosely twining vines of other species do not dominate the ground completely enough to inhibit the growth and development of tree seedlings. The spiny stems are a nuisance to woods workers.

Greenbriers can be propagated from rootstocks, but canes may not appear until the second year after planting. Lanceleaf greenbrier will not spread from the planting point except by dissemination of seed, because it has tubers instead of rhizomes.

Underground parts of laurel and lanceleaf greenbriers are high in starch content and were valued by the Indians as food. Large tubers are eaten by hogs. The vines are extensively used for decoration. The new leaves make a good salad and the young shoots are eaten as greens.

Common Greenbrier

A tough, stout woody vine climbing up to 20 feet and forming tangled thickets.

Leaves 2 to 6 inches long, 1 to 6 inches wide, mostly round and smooth, tips abruptly pointed, green both sides, shiny beneath. Lardily deciduous.

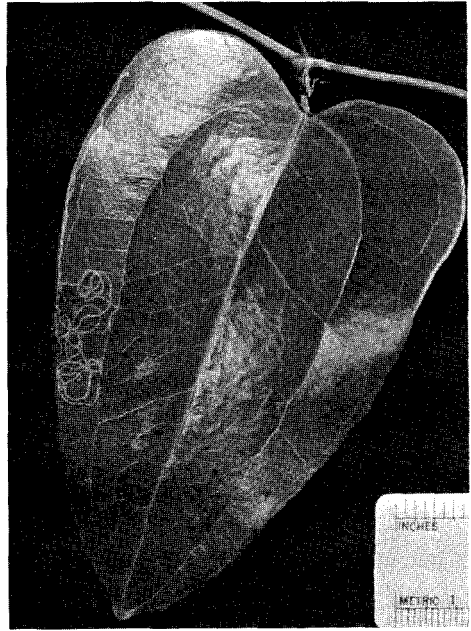
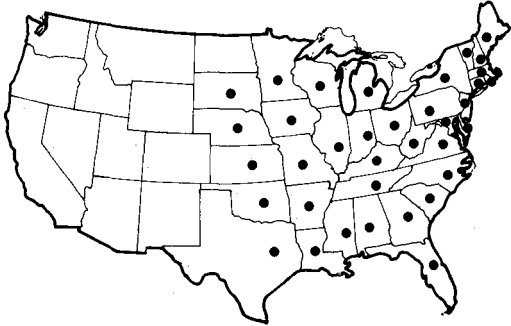
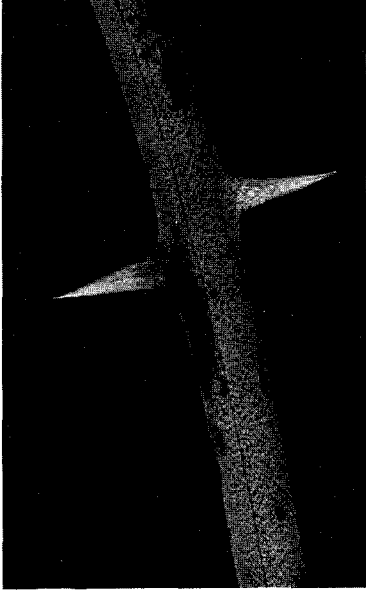
Cane round or four-angled, green at all ages. No spines on nodes.

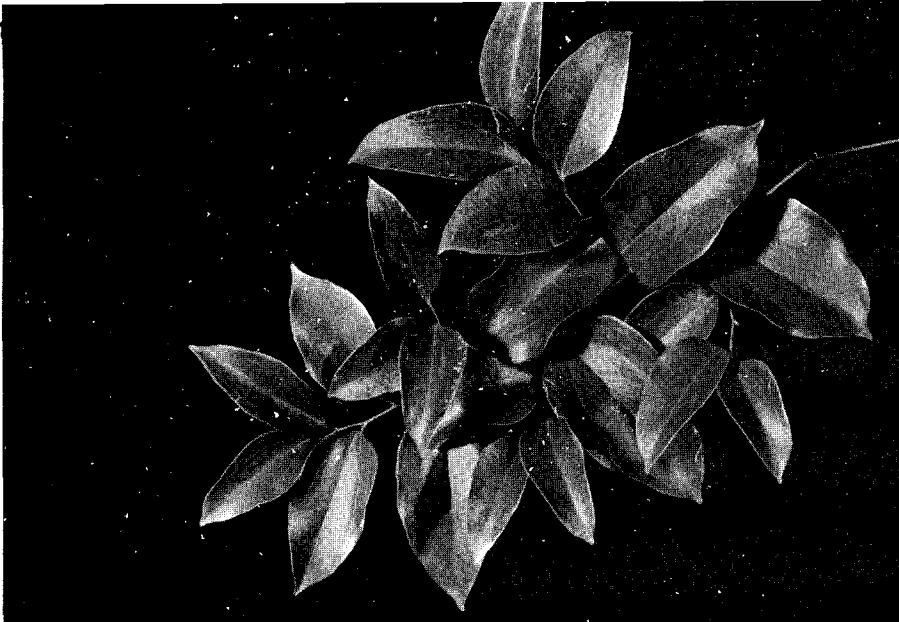
Flowers March to May.

Fruit black with a bloom, matures in one year. Seeds two to three. September to October.

Underground stems long, slender, and glabrous. No tubers.

Other common names: common *bullbrier*, *horsebrier*, *sawbrier*, *Devil's-hop-vine*, and roundleaf *greenbrier*.





Lanceleaf Greenbrier

A stout high-climbing vine that grows up for many feet without branching.

Leaves 2 to 5 inches long, 0.75 to 2 inches wide, mostly lance-shaped, deep green and shining on upper surface, five veins, rarely seven. Ever-green. Young leaves are smaller than adult leaves and have minute blunt teeth on margins.

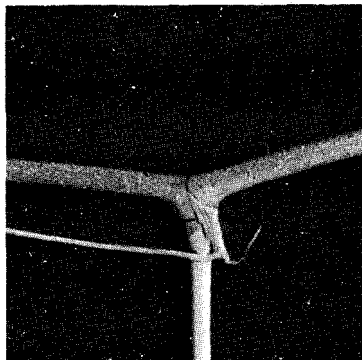
Cane dark-greenish or reddish-brown, spotted with gray. Spines few and scattered, flattened, often recurved, about 0.20 inch.

Flowers jasmine-like odor. April to July.

Fruit up to 0.25 inch thick, in clusters, maroon to blackish-red when ripe, usually two seeds. Matures second year in June.

Underground stems tuberous, may reach a length of 2 feet and weigh up to 16 pounds; young tubers firm like an Irish potato.

Other common names: *thornless smilax*, *coral greenbrier*, and *bamboo-vine*.



Blueberries/*Vaccinium*spp.

Edward E. Dale, Jr.

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Blueberries are a widely distributed group of shrubs or small trees. The various subdivided genus *Vaccinium* is not well understood taxonomically. Many hybrids occur among species that have overlapping geographic ranges. Blueberries have somewhat four-angled branchlets; alternate, evergreen or deciduous leaves; and white, greenish, or rose-colored flowers that are generally drooping and somewhat bell-shaped. The fruit is a globose, four- to five-celled berry with a persistent calyx on the flattened end.

Tree sparkleberry (*V. arboreum* Marsh.), is found in sandy or rocky woods, thickets, and clearings. It is one of the few blueberries that grows in neutral or slightly alkaline soils.

Dryland blueberry (*V. vacillans* Torr.) and common deerberry (*V. stamineum* L.) are usually found in colonies, often in nearly pure stands. They generally grow on well drained, acid soils in dry, open pine or oak woods, along rocky ledges, and occasionally in abandoned fields.

Ground blueberry (*V. myrsinites* Lam.) is common in wet sandy soils in uncultivated places. In Florida it is the most widespread and abundant of the wild blueberries. It responds favorably to range burning. No fruit is produced the season in which the burning is done, but a substantial increase usually occurs the following year. The pruning action of fire generally assures regular crops of berries. In south Georgia, sprouts appear in early March after a January burn and attain a height of about one foot by midsummer. Plants usually occur in large colonies. Ground blueberries persist beneath fully stocked stands of pine, but plants growing in low light intensities produce fewer flower buds and fruits than those growing in the open. Maximum vegetative growth and flower bud formation seem to occur in full sunlight.

The sweet juicy fruits of blueberries are relished by many species of wildlife. They are among the most important summer and early fall

Tree Sparkleberry

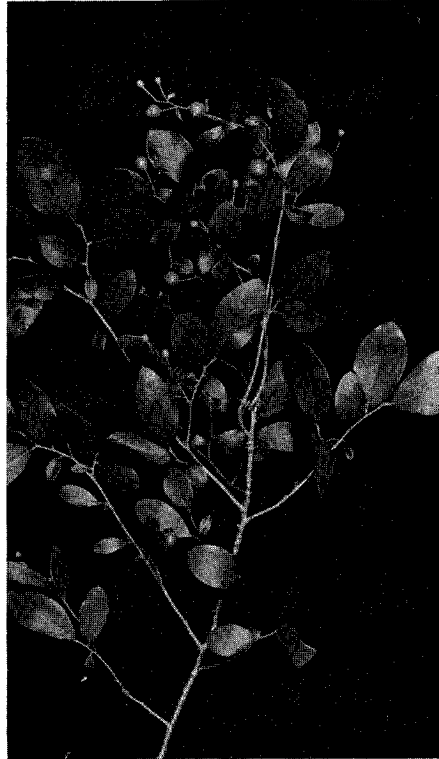
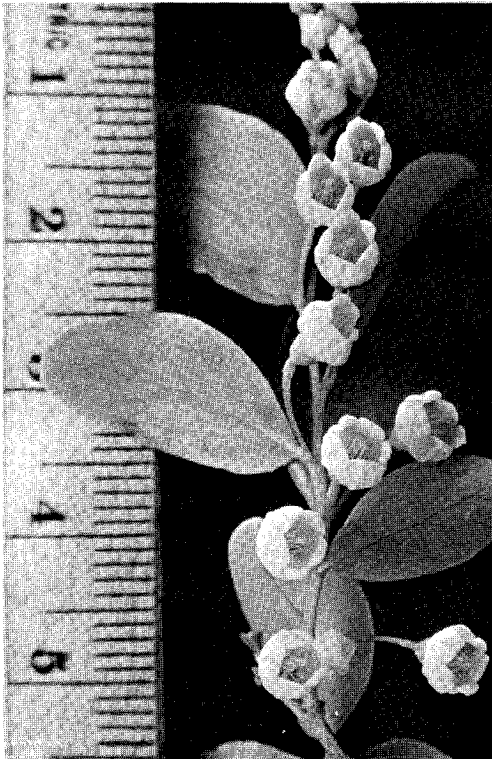
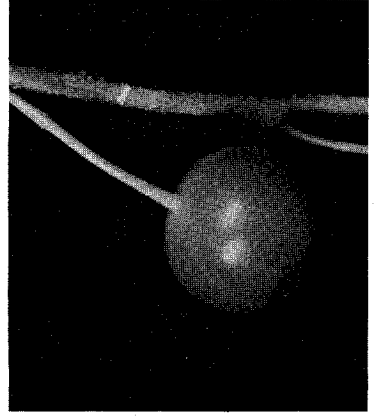
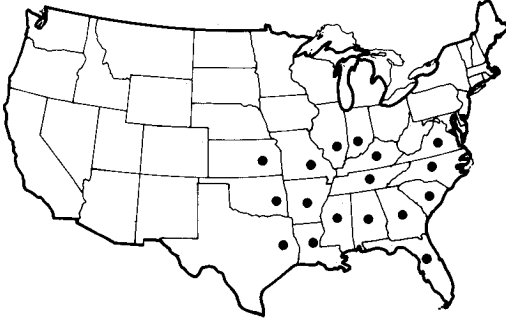
A shrub or small crooked tree up to 30 feet tall.

Leaves 1 to 3 inches long, tips rounded, margins turned inward, deciduous, becoming evergreen southward.

Flowers white on long slender stalks in loose, leafy-bracted clusters.

Fruit black, about 0.23 inch in diameter, with dry pulp and hard stone-like seeds. Ripens in August to October but often persistent over winter.

Other common names: *farkleberry*, *whortleberry*, *tree-hucklebeny*, *winter-hucklebeny*.





Ground Blueberry

A low, much-branched shrub up to 3 feet tall.

Leaves 0.30 to 0.80 inch long, leathery, evergreen, underside usually glandular.

Flowers white to pink in umbel-like clusters.

Fruit dark, sometimes covered with bloom, about 0.23 inch in diameter. May.

Other common names: *evergreen blueberry*, *Florida evergreen blueberry*.



foods for ruffed grouse and are a preferred summer food for wild turkey. They are eaten by bobwhite quail and by songbirds, particularly the scarlet tanager, robin, cardinal, bluebird, and thrasher. Blueberries comprised about 2 percent of the quail diet in June, and huckleberries and blueberries, 19 percent of the quail food in July in one south Georgia study. Blueberries are a favorite of black bear and are eaten by deer and by many small mammals such as chipmunks, rabbits, foxes, and raccoons. The buds and winter foliage of blueberries are also eaten by ruffed grouse.

The fruits are low in crude protein and phosphorous, but high in nitrogen-free extract.

In some areas blueberry foliage is unpalatable; in others it is choice deer food. Dryland blueberry ranks as a second- or third-choice plant in the western Gulf Coast. In the flatwoods and pine-oak sites of Florida, utilization of several blueberry species ranged from 10 to 38 percent.

A summer survey in the Choccolocco Wildlife Management Area of northeastern Alabama, where dryland blueberry comprised 72 percent of all shrubs, showed that 54 percent of the annual growth was removed. Browsing was greatest in April and May, but continued during winter. Availability and utilization were highly variable in different years.

Some domesticated animals eat young twigs and leaves. The browse is of negligible value to sheep and cattle.

Blueberries are eaten extensively by humans. Several large-fruited species are cultivated. Others are used as ornamentals. The hard and very close-grained wood of tree sparkleberry is sometimes used for tool handles.

The blueberries in general may be propagated vegetatively or from seed. Standard procedure for seed is to clean it from the fruits in a household blender and store dry in vials with cork stoppers in an ordinary refrigerator, at a temperature of about 40°F until used. Seeds may be sown on moist, shredded sphagnum moss in flats, held in a moist seed pit over winter, and then brought into a greenhouse for germination. Handled this way, the seed of commercial blueberry varieties held in storage 1-13 years gave fair to very good germination rates.

In commercial production, blueberries are usually propagated by means of hardwood cuttings. These are commonly taken during the late winter and inserted in the planting medium in the spring.

Ground blueberry has long been valued as an ornamental because of its small evergreen leaves, am-active flowers, and fruits.

Common Deerberry

Diffusely branched shrub rarely more than 6 feet tall.

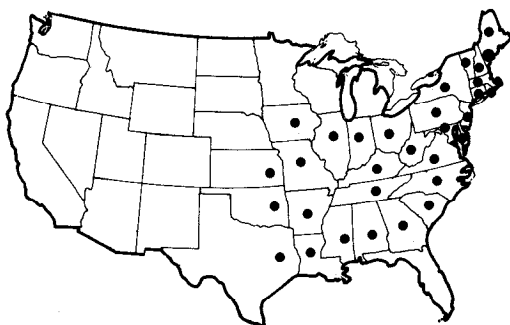
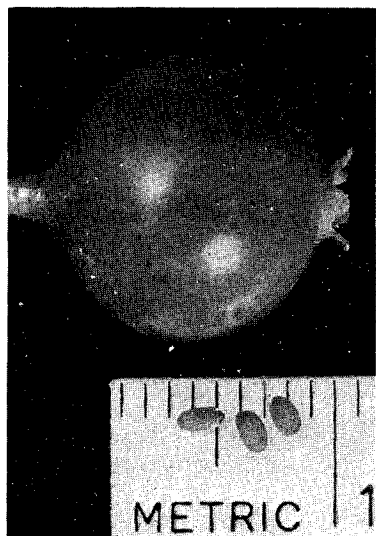
Leaves rounded at base, 1.20 to 3.50 inches long, deciduous.

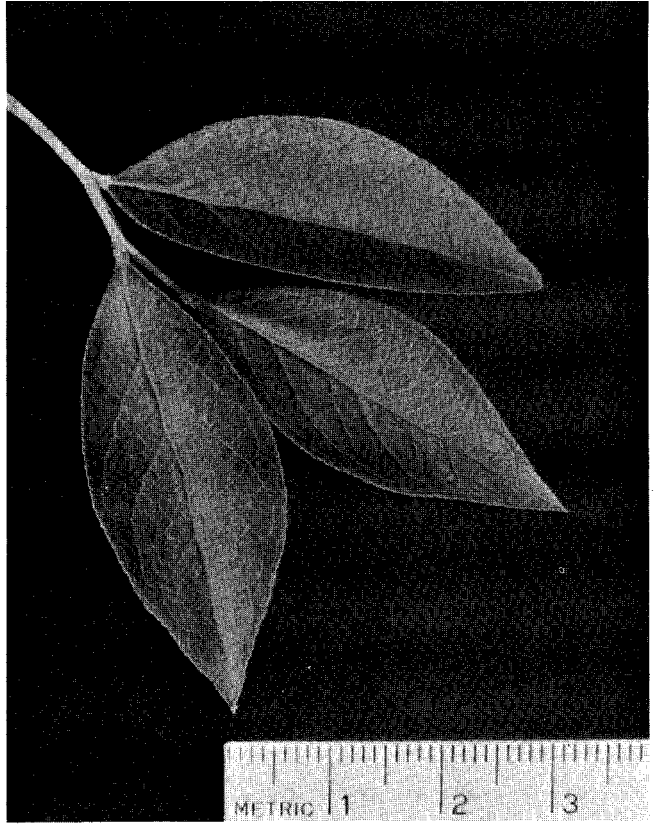
Twigs pubescent when young; bark becomes platy and fissured on old plants, leaf scars small, half round to circular with one dot-like bundle scar.

Flowers greenish-white to purple on specialized flowering branches subtended by leafy bracts. April to June.

Fruit green or yellowish, about 0.40 inch in diameter, usually drops after maturity in late July to September.

Other common names: *squaw huckleberry*, *buckberry*.





Dryland Blueberry

A low **shrub** 0.50 to 3 feet **tall**.

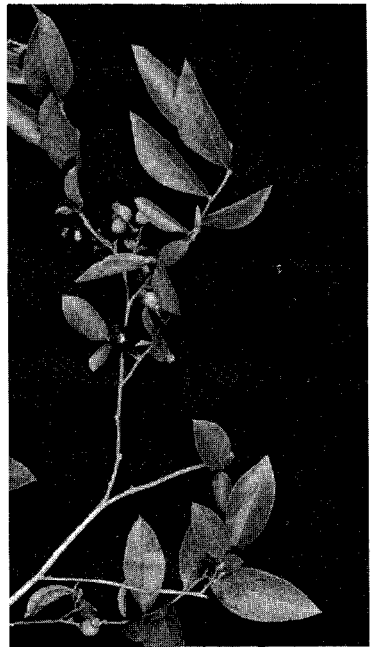
Leaves V-shaped at base, 0.75 to 1.75 inches long, deciduous, leathy when mature.

Twigs brown or greenish, often crooked.

Flowers greenish to purplish **on** ends of branches or from **old axils**, appear **before** leaves are fully expanded.

Fruit blue to black, 0.20 to 0.30 **inch** in diameter. June to September.

Other **common names**: *Blueridge blueberry*, *low bilbeny*, *lowbush bluebeny*, *sugarhuckleberry*.



Grapes/ *Vitis* spp.

A. B. Massey

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Grapes are important food and cover plants for a variety of birds and mammals. The vines climb over brushy thickets, fences, woodland borders, and high into trees. Grapes grow best in moist fertile soils and are commonly found along stream banks. They are relatively intolerant to shade.

The plants are usually dioecious, but some have perfect flowers. The fruits are fleshy berries. Leaves are simple. The vines usually climb by the coiling of tendrils.

The fruits of grapes are relished by many songbirds, ruffed grouse, and several mammals such as black bear, white-tailed deer, and raccoons. Fruits are especially important to wild turkeys and grouse, and these birds tend to congregate where grapes are abundant during the fall and winter. Fruits are also eaten by bobwhite quail, wood ducks, and squirrels, and to a lesser extent by red foxes. Young canes and occasionally the dried leaves are eaten by deer. The abundant foliage provides good wildlife cover. The shredded bark on most species is a source of material for nests. The plants are widely cultivated for their delicious fruits, and are readily propagated by cuttings, grafting, or layering.

In summer, grape stands provide excellent escape and nesting cover for songbirds.

The fruits are generally low to moderate in crude protein, moderate in phosphorus, and high in nitrogen-free extract.

Trees with grape vines in them appear to be preferred sites for leaf nests of gray squirrels.

Four of the most widespread grapes are described here.

Summer grape (*V. aestivalis* Michx.) grows on warm sandy soil in dry woods, thickets, and along roadsides. It is most abundant in the upper Piedmont and mountains. Fruits remain on the plant, slowly drying to a raisin-like consistency, and are available into winter. The plant produces good fruit crops in most years; however, the yields fluctuate greatly between years.

Sweet winter grape (*V. cinerea* Engelm.) grows in moist alluvial soils along streams, thickets, and bottomlands.

Summer Grape

A vigorous vine, climbing by tendrils.

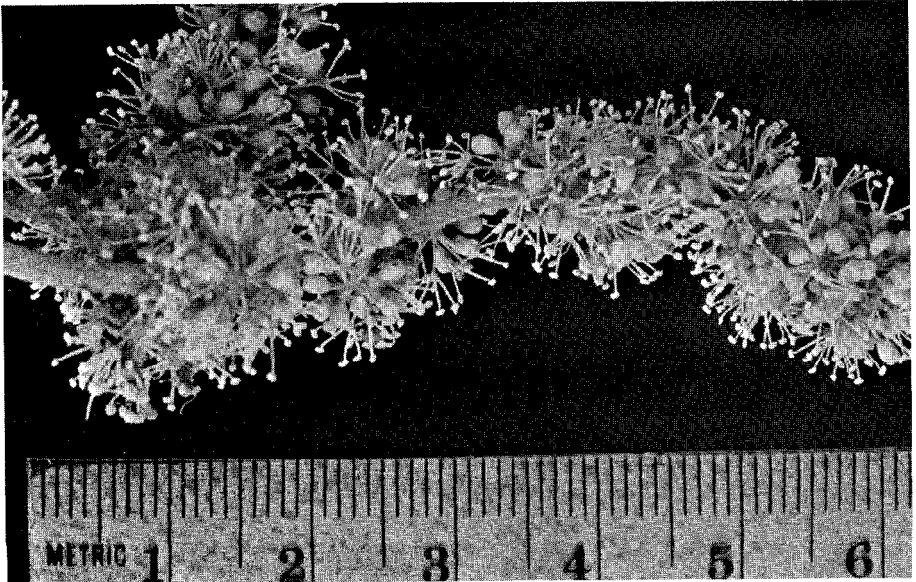
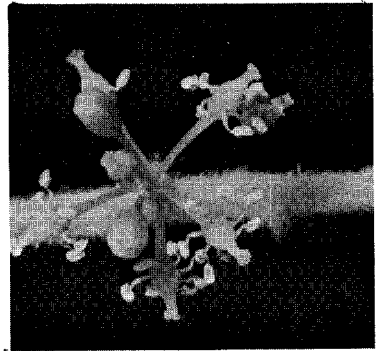
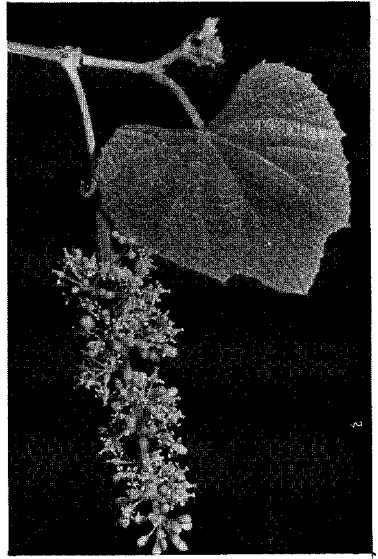
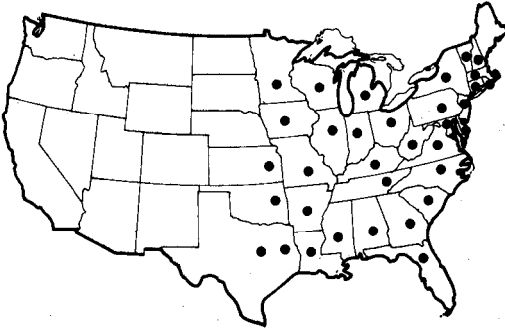
Leaves 2 to 8 inches long, margin irregularly toothed or lobed, smooth, dull, and glabrate above, lower surface rusty tomentose.

Twigs reddish-brown, woolly at first, then glabrous, nodes swollen, 0.50 to 0.12 inch thick, bluish-gray waxy bloom, buds rusty brown pubescent underneath scales, pith soft, brown, interrupted at nodes, lenticels uncommon, leaf scars triangular to half round, bundle scars indistinct.

Flowers small, clustered in a slender, loose panicle. May to July.

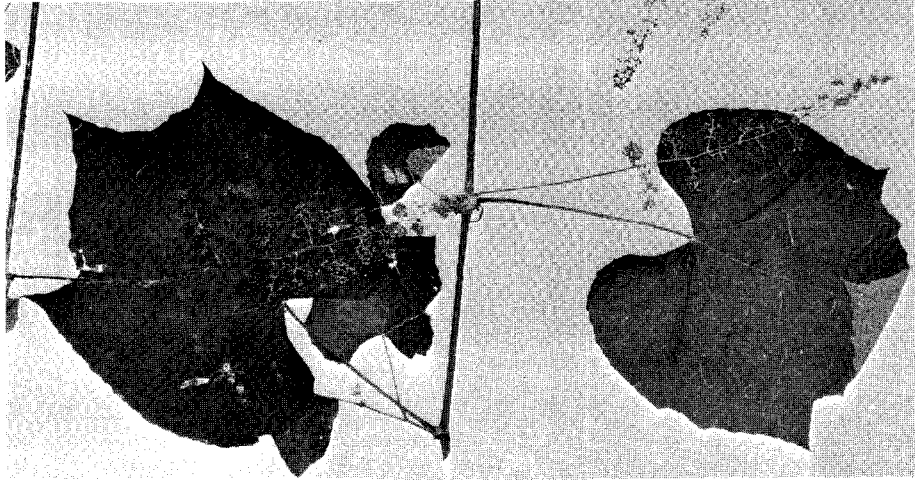
Fruit 0.20 to 0.50 inch diameter, dark blue to black, two to four seeds. September to October, but persistent into winter.

Other common names: pigeon grape, bunch grape.



Muscadine grape (*V. rotundifolia* Michx.) grows in moist, shady situations, and in high bottomlands where land is well drained.

Frost grape (*V. vulpina* L.) grows along river banks, bottomlands, and rich thickets. It endures cold better than most other grapes, but it withstands long summer heat and drought poorly.



Sweet Winter Grape

A lax, high-climbing vine attaining **large** size.

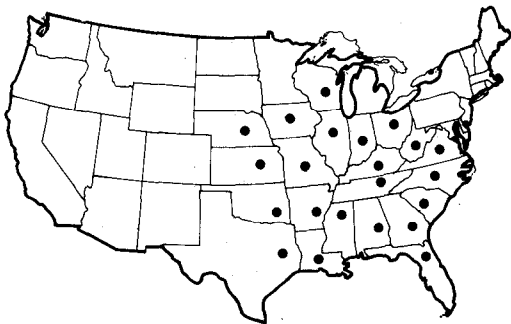
Leaves 4 to 8 inches long or broad, deep basal **sinuses**, margin unlobed, upper surface at first with thick, white tomentum, dark green, **diminishing** at maturity, lower surface densely felty.

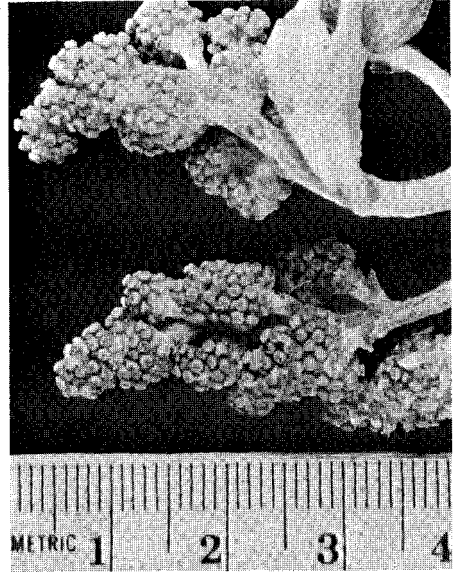
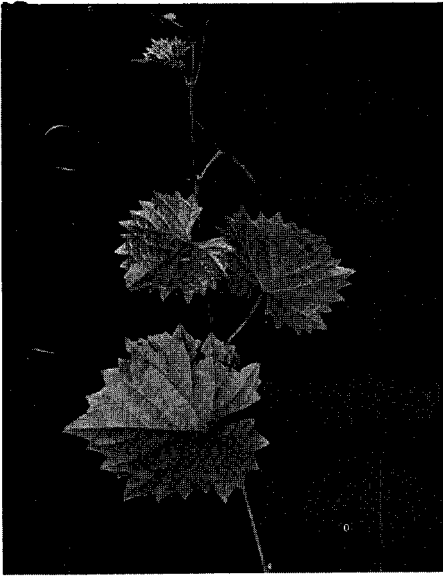
Twigs angled when young, densely **white-felty**, **pale brown to gray**, **nodes enlarged**.

Flowers in open panicles. June to July.

Fruits numerous, 0.16 to 0.33 **inch** diameter, black or purple, slight bloom, tough skin, one to three seeds. September to October.

Other common names: pigeon **grape**, **gray-bark grape**.





Muscadine Grape

A slender high climbing vine lacking the shreddy bark of most grapes.

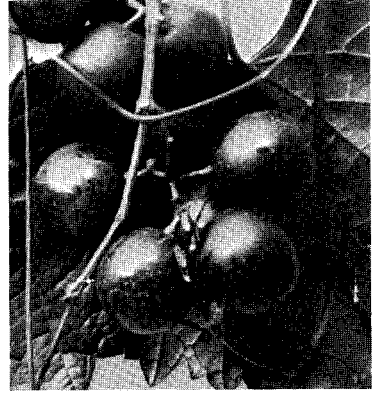
Leaves seldom lobed, margin coarsely serrate, thick, firm, upper surface glabrous, dark green, lustrous, lower surface paler, glabrous, blade 1.75 to 5 inches long, 2 to 4 inches wide.

Twigs green to reddish brown, warty, tendrils simple, leaf scars alternate, buds rusty brown underneath scales, pith firm, light tan, lenticles profuse and lighter than twigs, leaf scars half round to circular.

Flower- in small, dense, short-branched panicles. May and June.

Fruit purplish-black soon after ripening, borne in clusters, 0.33 to 1 inch diameter, skin tough, flesh thick and tough. August.

Other common names: *Southern fox grape, bullace grape, bullet grape, bull grape, scuppernog.*



Frost Grape

A vigorous high climbing vine, attaining a **length** of 10 to 30 feet or more, trunk **sometimes** 1 to 2 feet thick.

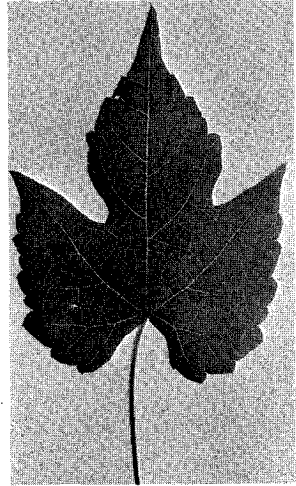
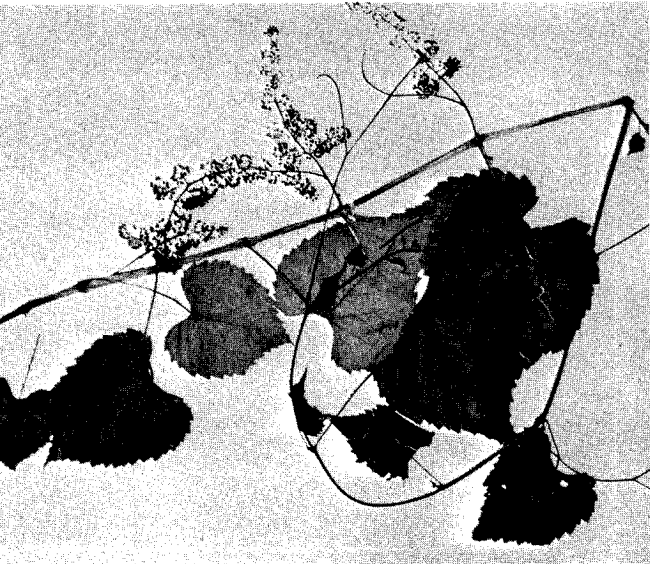
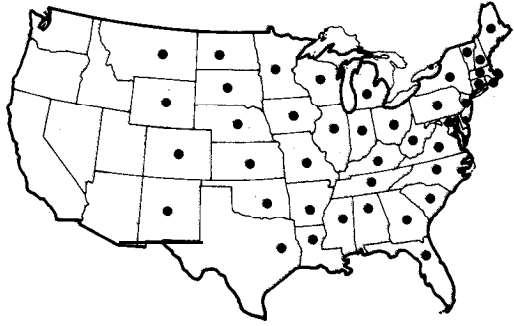
Leaves 3 to 5 inches long, broader than long, about one-third **folded** toward upper surface, teeth **on margin large**, smaller teeth between, both **surfaces** smooth, upper dark green, below paler.

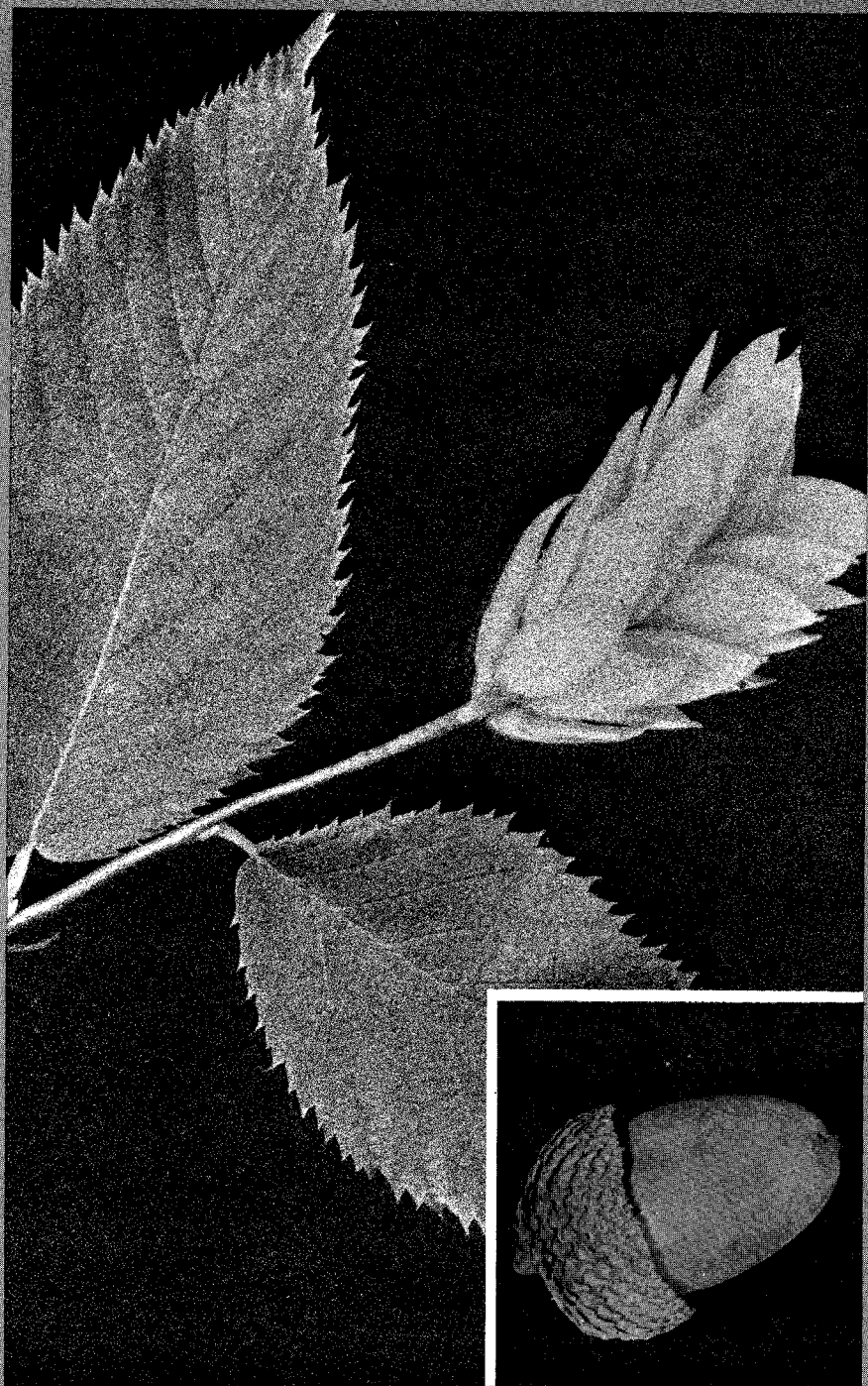
Twigs **pubescent** when young, reddish, **becoming** glabrous, **clear** green, **nodes** slightly swollen and a **little** bent, thin diaphragms, **large** pith.

Flowers **in** clusters 3 to 5 inches long. May to June.

Fruit persistent, 0.25 to 0.33 **inch** diameter, black (rarely white), thin **skin**, two to four seeds. September to October.

Other **common** names: **winter grape**, **chicken grape**.





Nuts

NUTS

Nuts are hard indehiscent, one-celled, and one-seeded fruits. They are commonly referred to as hard mast. The seed, or kernel, is relished by wildlife, and in some cases, such as pecan, by humans. In many species the nuts are a concentrated source of crude fat, in some the nuts are high in crude protein, and in others nuts are high in nitrogen-free extract.

Most of the nut-bearing genera are in the Juglandaceae and Fagaceae families.

***American Hornbeam/ Carpinus caroliniana* Walt.**

Lowell K. lialls
Forest Service, USDA
Nacogdoches, Texas

This very tolerant, small crooked understory tree grows in rich woods and swamps. Although of secondary importance as wildlife food, the nutlets, catkins, and buds are eaten by several kinds of birds, including ruffed grouse, ring-necked pheasant, and bobwhite quail. The seeds, bark, and wood are consumed to some extent by rabbits and beavers. The foliage is eaten by deer, but is low-choice.

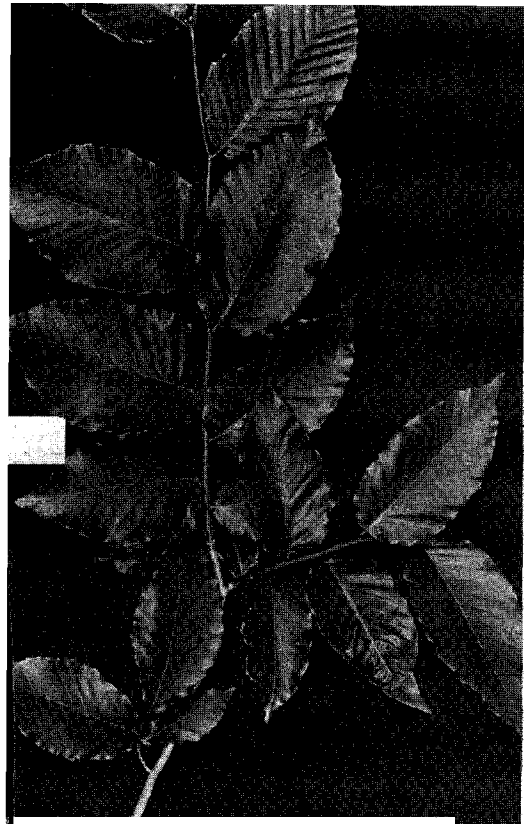
Hornbeam is especially important as an understory species for gray squirrels in bottomland hardwood forests. The fruit is eaten in some areas by wild turkeys.

Occasionally the species is planted as an ornamental, mainly for its orange and scarlet leaves in autumn. Germination is rather low for stored seed, but if collected slightly green in August, germination rates are good. Seed should be planted in rich moist soil. The tree grows slowly and the maximum seed-bearing age is 25 to 50 years.

The seeds are moderate in crude protein and phosphorus content, high in crude fiber, and low in calcium.

The wood may be used for such products as golf clubs, handles, fuel, mallets, and wedges.

Other common names: blue beech, water beech, and ironwood.



American Hornbeam

A **small** crooked understory tree, up to 35 feet tall.

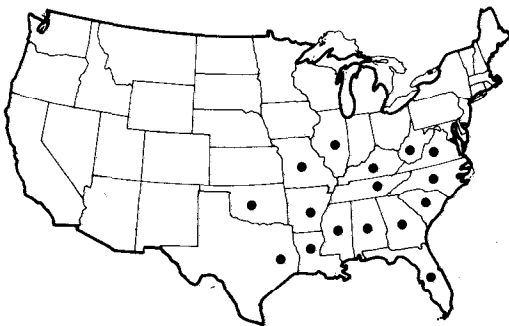
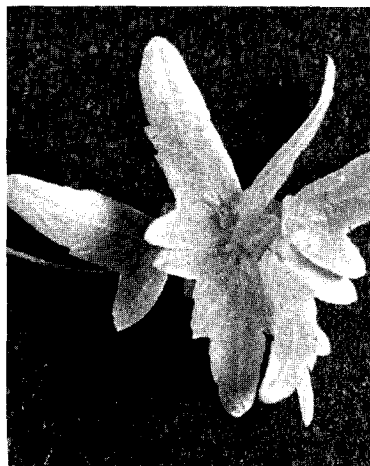
Leaves oblong to narrowly **oblong-ovate**, 1 to 3 inches **long**, wedge or heart shaped, bluish green, deciduous.

Twigs alternate, slender, zigzag, gray or red.

Bark thin, bluish gray, sometimes blotched.

Flowers green below, red **above**. **April** to June.

Fruit a nutlet about 0.33 **inch long**, **ovoid**, **acute**, borne at base of a three-lobed **bract**, **many** together forming **loose** pendent clusters 3 to 6 inches **long**. August to October.



Hickories/Carya spp.

Lowell K. Halls

Forest Service, USDA

Nacogdoches, Texas

Hickories are slow-growing, deciduous trees that live as long as 250 years. In spring the scaly buds usually put forth both male and female flowers—the male below and the female above the odd-pinnate leaves. The hard, bony nut is surrounded with a thick husk that separates into four valves. Nuts ripen and fall September to November

Hickories are a source of food to many kinds of wildlife. The nuts are relished by squirrels, and may be eaten even before ripening. Nuts and flowers are eaten by the wild turkey and several kinds of songbirds. Apparently the nuts can be crushed by gizzard action in the turkey. The nuts and bark are eaten by black bears, foxes, rabbits, and raccoons. Small mammals eat the nuts and leaves. White-tailed deer make light use of the leaves, twigs, and nuts.

The kernel portion of hickory seeds is exceptionally high in crude fat—up to 70 and 80 percent in some species. Crude protein, phosphorus, and calcium contents are generally moderate to low. Crude fiber is very low.

For propagation purposes nuts should be stratified over winter in a mixture of sand and peat or in sandy loam and protected from freezing by covering with compost, leaves, or soil.

CARYA

HICKORY



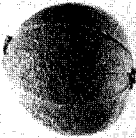
C. aquatica

water hickory



C. cordiformis

bitternut hickory



C. glabra

piñnut hickory



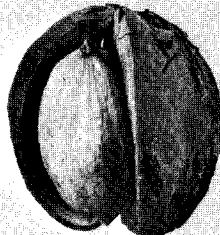
C. myristiciformis

nutmeg hickory



C. illinoensis

pecan



C. laciniosa

shellbark hickory



C. ovata

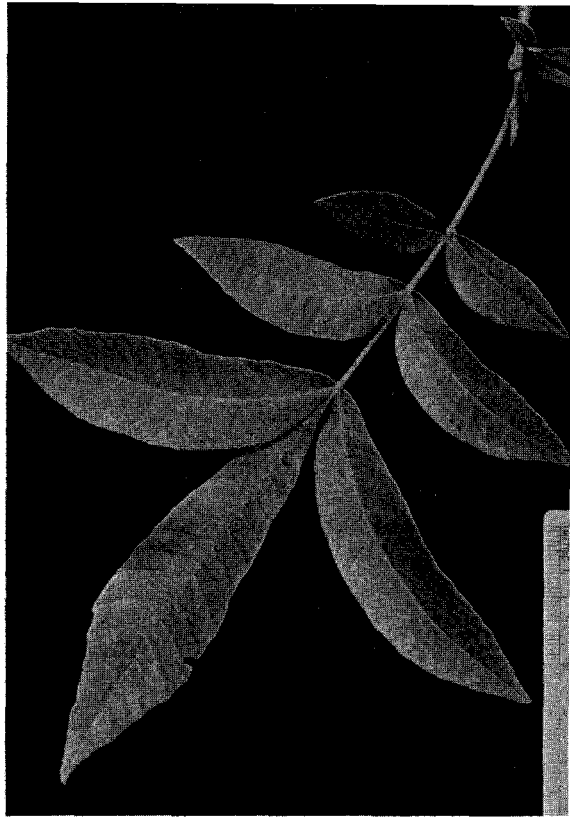
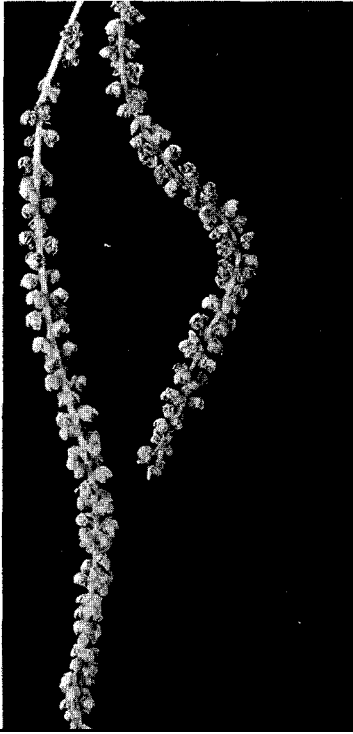
shagbark hickory



C. tomentosa

mockernut hickory





Water Hickory

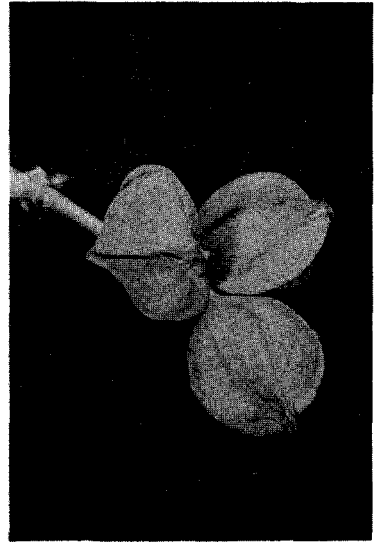
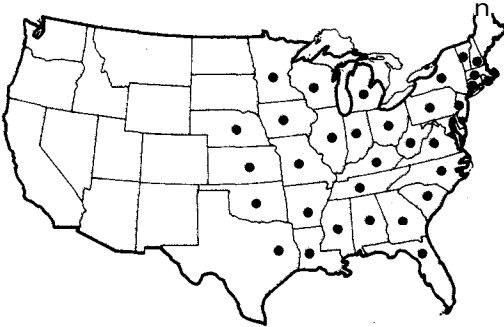
A water-loving tree attaining a height of 100 feet with an irregular narrow crown.

Leaves alternate, deciduous, dark green, 9 to 15 inches long.

Twigs reddish brown or gray, tomentose at first, glabrous later, lenticels **pale**.

Flowers in catkins, staminate 2.50 to 3 inches, yellow glandular; pistillate **2- to 10-flowered**. **March** to May.

Fruits often clustered, **flattened**, 1 to 1.50 inches **long**, about 1 inch wide. Nut **flattened**, reddish brown. Seed **very bitter**. September to **November**.



Water Hickory/ *Carya aquatica* **(Michx. f.) Nutt.**

O. W. Gupton

Virginia Military Institute

Lexington, Virginia

Water hickory is primarily a subclimax tree of the Coastal Plain forests. It is found most often in poorly drained heavy clay flats and sporadically in swamp forests. The largest specimens of water hickory are found in the lower Mississippi Valley. Although it requires abundant moisture and light for good early growth, water hickory can withstand considerable shade and competition after establishment. Stump and root sprouting is prolific on trees up to 24 inches in diameter.

Although squirrels eat the seeds of water hickory, it is one of the hickories least preferred by wildlife. In areas with good squirrel populations nuts are cut but few seeds are eaten. Nuts have been found in the stomachs of mallard and wood ducks.

Optimum seed-bearing age ranges from 40 to 75 years. An estimated 20 to 30 pounds of fruit were observed under a large tree in late January. Late freezes seriously affect flowering and fruiting

Transplanting, budding, and grafting are difficult. Propagation is by seed. Planting is best done in early spring to reduce rodent destruction; however, the bitter taste of the seeds minimizes this problem. Seeds should be stratified in sand or peat at 30 to 35°F for 90 to 150 days. Seeds dry-stored for a year need only 30 to 60 days of stratification. Plants are susceptible to leaf mildew and witches' broom [*Microstroma juglandis* (Brenz.) Sacc.] and to common white wood rot (*Fomes ignarius* Fries).

The wood is soft, brittle, close-grained and dark brown, and is used little except for fences and fuel.

Fire causes both bud and stem rots. Pigs eat many of the seeds and seedlings.

Other common names: bitter pecan, swamp hickory, wild pecan.

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

O. W. Gupton

Virginia Military Institute
Lexington, Virginia

Bitternut occurs in moist or dry woods, in mountain valleys, along stream banks, and in swamps. It is probably the most rapid growing of all the hickories and holds its foliage longer than the other species. Well drained, sandy or clayey loams are most suitable. Bitternut is the most abundant and uniformly distributed of the hickories. Although it is usually found on wet bottomlands it is hardy on much poorer soils. Its life span is about 200 years.

Seeds of bitternut do not usually constitute a large portion of the diet of squirrels. In an area of good squirrel population in Virginia large quantities of fruits, mostly uncut or with seeds partially eaten, were found on the ground in late February. Optimum seed-bearing age ranges from 50 to 125 years.

Propagation is by seed and is usually best in early spring. The stock is much used in grafting and budding. This species sprouts from stumps more vigorously than other hickories.

The wood is hard and used for tool handles, hoops, boxes and crates, furniture, flooring, and fuel (especially in smoking meats). Burning occurs with an intense flame and little ash is deposited.

Diseases are leaf mildew and witches' broom [*Microstroma juglandis* (Brenz.) Sacc.] and common white wood rot (*Fomes ignarius* Fries).

This a good park or shade tree.

Other common names: swamp hickory and pignut.

Bittemut Hickory

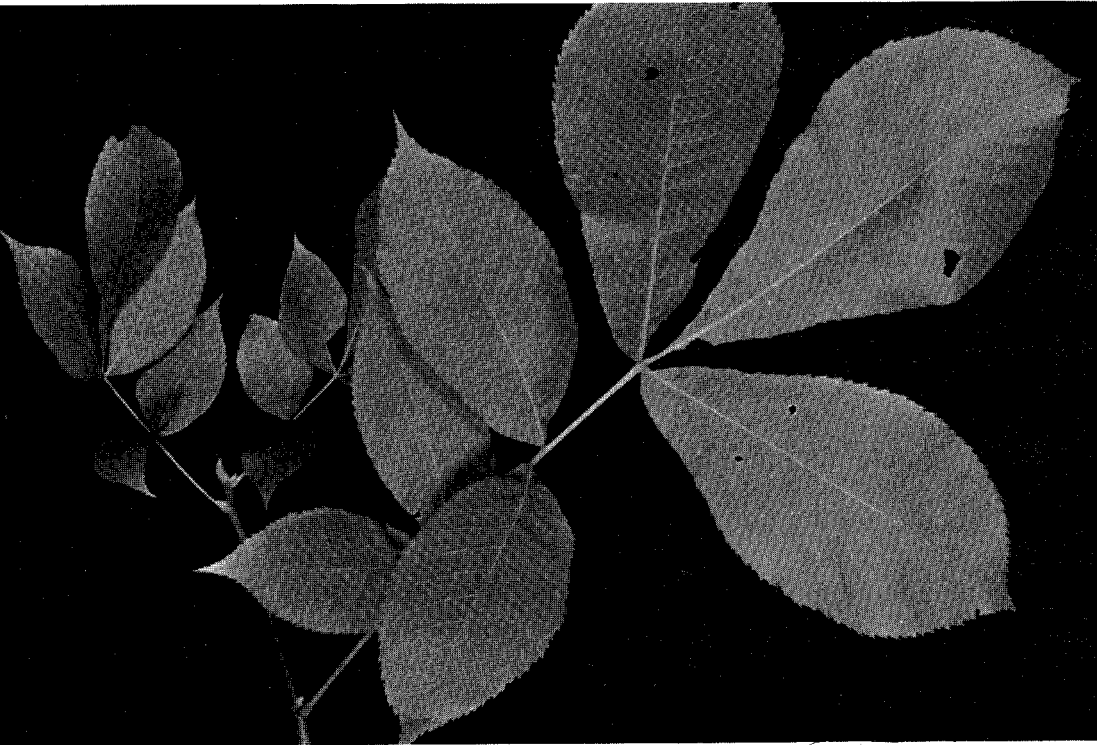
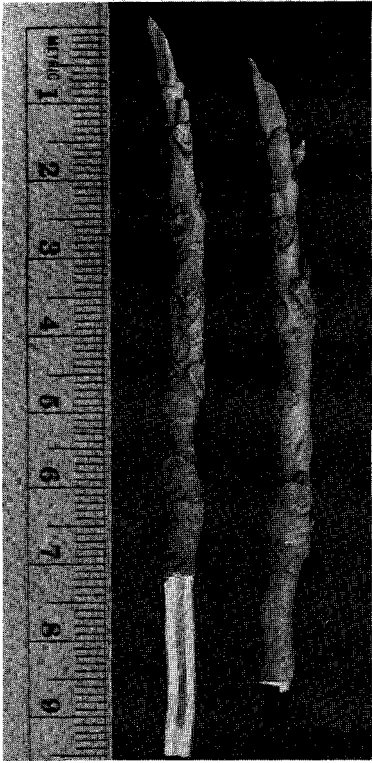
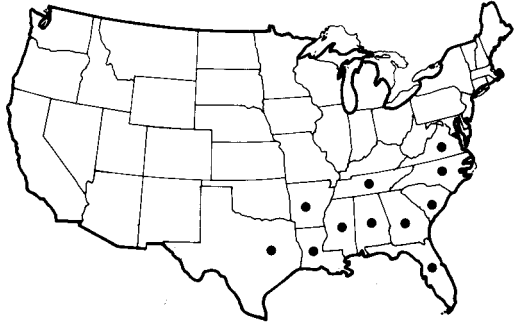
A tree 50 to 80 feet and up to 170 feet, with stout limbs and a broad spreading head.

Leaves 6 to 12 inches long, 7 to 11 leaflets on a glabrous rachis.

Twigs greenish brown to reddish brown; winter buds scurfy, bright yellow.

Flowers in catkins, staminate in threes, 3 to 4 inches long, reddish hairy, pistillate in one's and two's, sessile. **April** to May.

Fruits slightly flattened; husk yellow, scaled. Nut **globose** to **ovate**, abruptly pointed into a conical beak. Seed bitter. **September** to **October**.





Pignut Hickory

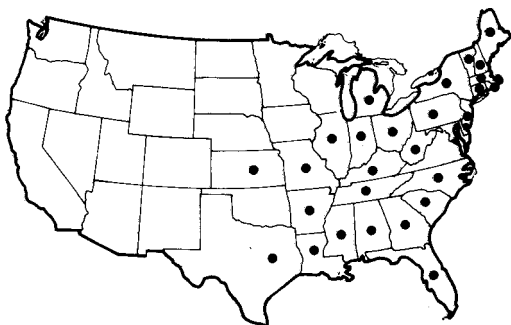
A tree usually 80 to 90 feet tall, but may reach 120 feet.

Leaves yellowish green and glabrous above, paler below, 8 to 12 inches long, three to seven leaflets, sessile and ovate.

Twigs reddish brown, glabrous, dotted with pale lenticels, long terminal buds, glabrous pale brown.

Male flowers-yellowish green, catkins 2 to 2.50 inches, three branched, pistillate, few flowered. April to May.

Fruit brownish, pear-shaped, about 1.25 inches long and 0.75 inch wide, hull tardily dehiscent, nut thick shelled, meat usually sweet but astringent, sometimes bitter. September and October.



Pignut Hickory/*Ca ya glabra*

(Mill.) Sweet

Lowell K. Halls

Forest Service, USDA

Nacogdoches, Texas

Pignut is the hickory most commonly found in the Appalachian forest, and is considered a climax species throughout its range. It generally inhabits dry ridges and hillsides with well-drained upland soils but is also common on moist sites in the southern Appalachians. It is associated with many species of oaks and in the Piedmont, with pines. The species is intolerant of shade in the Northeast and tolerant in the South.

Optimum fruit production occurs at 75 to 200 years of age.

The species has been cultivated for many years and responds well to increased fertility. It sprouts prolifically from stumps, but is difficult to reproduce from cuttings. It is slow-growing and hard to transplant.

Pignut hickory is easily damaged by frost and fire. It is also damaged or injured by sapsuckers, anthracnose, bark canker, trunk rot, and by beetles. It is probably one of the most preferred foods of a twig girdler and is attacked by several species of gall insects.

The wood is used for fuel, tool handles, wagons, and agricultural implements.

Other common names: oval pignut hickory, red hickory, broom hickory, redheart hickory, small-fruited hickory, sweet pignut, and switch hickory.

Shagbark Hickory/*Carya ooata* (Mill.) K. Koch

Kenneth A. Nicely

Virginia Polytechnic Institute and State University
Blacksburg, Virginia

Shagbark hickory occurs throughout the eastern hardwood deciduous forests on many kinds of sites and with many other species. In bottomlands, it may be associated with *Quercus alba*, *C. Iacinososa*, and *Platanus occidentalis*; in better drained areas it may be associated with *Acer rubrum*, *Fagus grandifolia*, and *Q. rubra*. In the North it occurs abundantly on upland areas and reaches its greatest size and best development on the western slopes of the Allegheny mountains and the lower Ohio Valley.

The species is moderately tolerant to shade and is able to perpetuate itself in the eastern hardwood forests. Although slow-growing, it is probably one of the fastest-growing hickories. It reproduces readily by sprouts, a factor which is of importance in reproducing the species after fires. It develops a strong, deep taproot and is rarely damaged by wind. The tree is attacked by several leaf parasites, and the fruits are especially subject to attack by the hickory weevil (*Curculio cuyas*), an insect that also does extensive damage to the pecan.

Average yield of nuts is 2 to 3 bushels per open-grown tree with extreme yields up to 18 bushels.

The nuts of the shagbark are eaten by squirrels from the time the fruits approach maturity in August, to their prime in September and October, and to the next spring wherever they are found on the forest floor or in logs and stumps. The thickness and hardness of the shell is probably a major factor limiting the use of this fruit by some game animals. The nut is very tasty to humans and is the common hickory nut of commerce.

Other common names: Carolina hickoy, scalybark hickoy, shell-bark hickoy, white hickoy, sweet-walnut, upland hickoy.

Shagbark Hickory

A tree 70 to 90 feet in height, rarely reaching 120 feet.

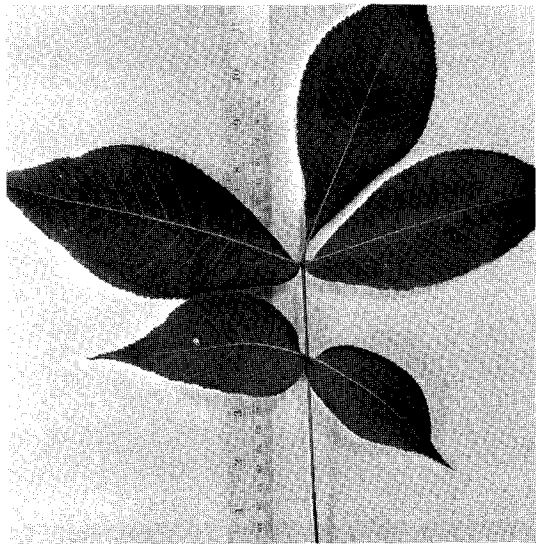
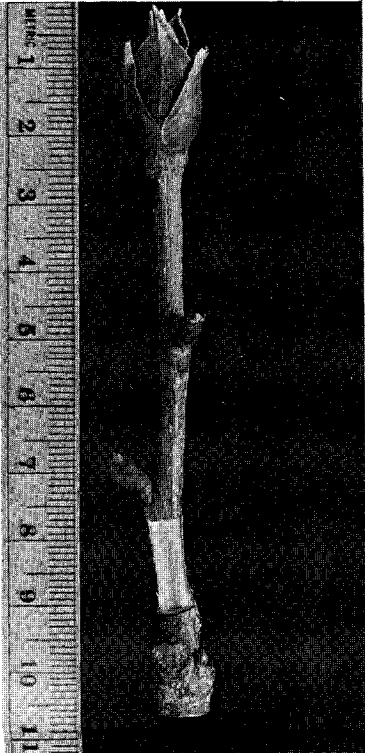
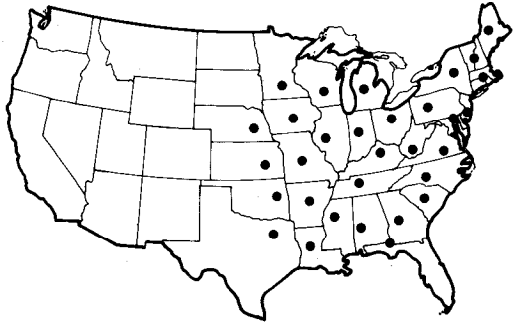
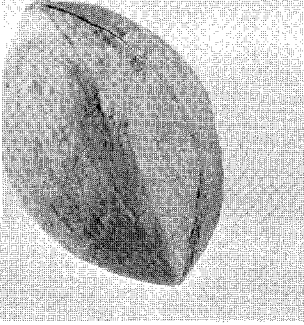
Leaves 10 to 14 inches long; five to seven leaflets, upper surface glabrous, lower surface glabrous or pubescent; individual leaflets serrate and ciliate, the hairs denser and forming a tuft near the apex of each serration.

Twigs stout, usually pubescent; terminal bud 0.50 to 0.75 inch long, three to four dark brown outer loose-fitting scales.

Male flowers in slender light-green catkins up to 4 inches long; pistillate, borne in two- to three-flowered spikes.

Bark light gray, 0.75 to 1 inch thick, tight when young but later separating into strips up to 1 foot or more in length which remain attached, giving the characteristic shaggy appearance.

Fruit 1 to 1.50 inches in diameter; nut prominently or obscurely four ridged. September and October.



Mockernut Hickory

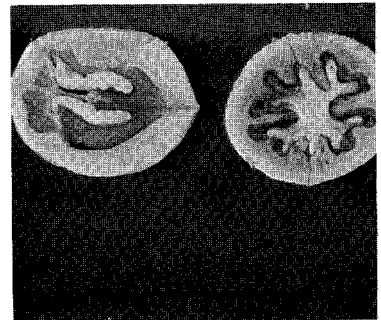
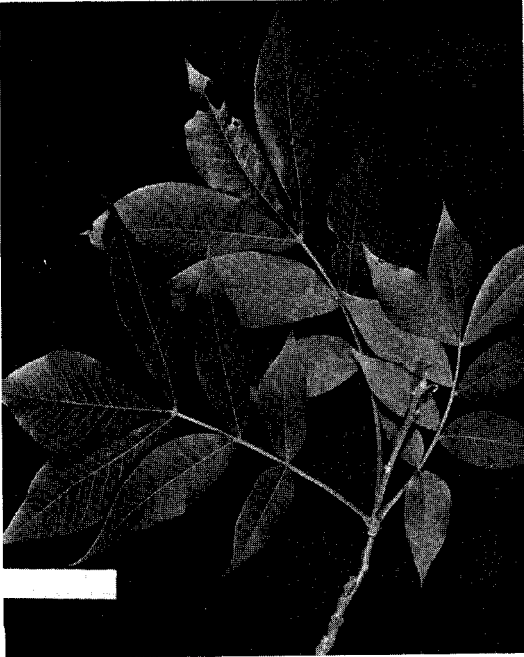
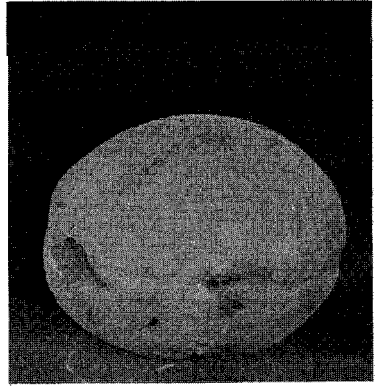
A tree up to 100 feet **tall**, 3 to 5 feet **in** diameter at breast height.

Leaves 8 to 24 inches long with five to nine leaflets. lateral leaflets sessile. 5 to 8 inches long, 2 to 5 inches wide, shiny yellowish green **above**, paler below, brownish-orange hairs.

Twigs stout, grayish brown to reddish, buds **large** 0.50 to 1 **inch**, yellow and tomentose.

Male flowers three branched, 4 to 5 inches **long**, **yellowish** green, hairy; pistillate two to five flowered, dark red.

Fruits **solitary** or paired, **globose**, 1 to 3.50 inches long, short necklike base. **Hull** dark reddish brown, hairy with yellow resinous dots, four ribbed; nut brownish white, shell thick, kernel sweet. September and October.



Mockernut Hickory/*Carya tomentosa* **Nutt.**

Lowell K. Halls

Forest Service, USDA

Nacogdoches, Texas

Mockernut hickory is usually found as a component of the eastern oak-hickory forest. It also occurs in beech-maple forests and is the only hickory found in the pine forests of the sandy belt of the southern states. Most of the merchantable mockernut grows on moderately fertile uplands, attaining its best development only on deep fertile soils. The species is intolerant, but it recovers rapidly from suppression.

Mockernut is a preferred mast food for squirrels. Nuts are cut while still green. Gray squirrels cut hickory nuts into small pieces, but flying squirrels cut a hole in one end, from which the edible kernel is extracted. The nuts are also tasty to humans but the trees are seldom cultivated for fruit.

Best production of fruit is at 40 to 125 years of age.

Mockernut is extremely susceptible to fire. It is often damaged seriously by the hickory bark beetle.

The wood is used for vehicle parts, handles, fuel, and agricultural implements.

Other common names: bullnut, white hickory, white heart hickory, nognut, whitebark hickory, fragrant hickory.

Chinkapin/*Castanea* spp.

Lowell K. Halls

Forest Service, USDA

Nacogdoches, Texas

Two species of chinkapin are commonly found throughout the South.

Castanea pumila (L.) Mill. is a large shrub or tree with branchlets more or less pubescent and leaves densely tomentose beneath. It grows in sandy open woodlands and thickets. It has two variants: Allegheny chinkapin (*C. p.* var. *pumila*) and Ashe chinkapin (*C. p.* var. *ashei* Sudw.) Allegheny chinkapin is a thicket-forming shrub or tree. The bur is closely covered by scales bearing short erect crowded slender bristles. Ashe chinkapin is a shrub or small tree with usually several trunks from the base. The bur has broad open areas and somewhat remote scales that bear horizontally divergent short bristles.

Castanea alnifolia Nutt. is a small shrub or arborescent shrub. The branchlets typically are smooth and leaves thinly tomentose beneath. The species grows on rolling hills on open woodlands and in thickets. It also has two variants: Downy chinkapin (*C. a.* var. *alnifolia*) and Florida chinkapin (*C. a.* var. *floridana* Sarg.). Downy chinkapin is a dark erect colonial shrub that spreads by underground rootstocks. Florida chinkapin is an arborescent, noncolonial shrub.

The nuts of both species are eaten by a number of birds and by small mammals such as squirrels, rabbits, and chipmunks. The kernels are sweet and edible to man.

The tree-forms have occasionally been used for posts, crossties, and fuel, but the plants seldom grow large enough for commercial use.



Allegheny Chinkapin

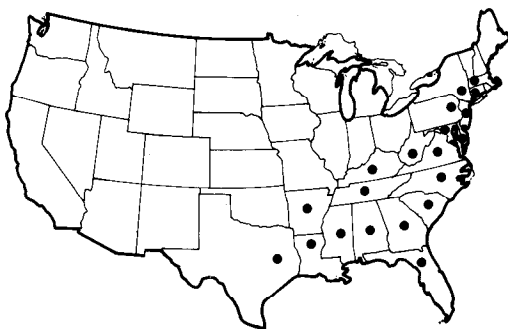
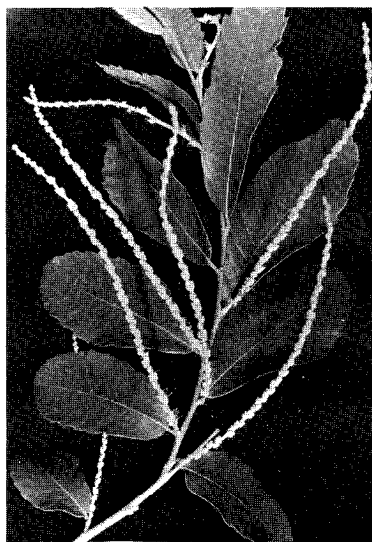
A tree or shrub up to 50 feet high, often with many trunks from the base.

Leaves alternate, simple, deciduous, elliptic, bristle-toothed margin, green and glabrous above, whitish-downy to white-glabrate below, 3 to 4 inches long, 1 to 1.50 inches wide, petiole stout and glabrous.

Twigs reddish brown, slender, pubescent or glabrous. Bark furrowed.

Flowers borne in two kinds of catkins on same tree, one bearing all male flowers, another with male and female. Staminate catkins 4 to 5 inches long, cylindrical.

Fruit a bur, spines stout, pubescent. Bur splits into two to four valves bearing one to three shiny brown nuts, 0.50 to 0.75 inch long. Late summer and early fall.



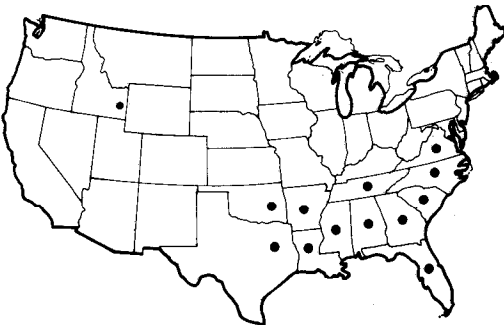


Downy Chinkapin

A shrub with underground rootstocks and **erect** branches.

Leaf-blades cuneate to lanceolate with a **cuneate** base, 2 to 4 inches **long**, obtuse or opiculate at the base, with tawny or dirty-white tomentum beneath.

Fruit is a **solitary nut** 0.60 to 0.80 inches **long**.



American Beech/*Fagus grandifolia*

Ehrh.

Lowell K. Halls

Forest Service, *USDA*
Nacogdoches, Texas

Beech grows on fertile bottomlands and uplands, preferably in cool, shady, moist locations. It is seldom found in limestone valleys. Beech is very tolerant and throughout most of its range is considered a climax species. It is highly susceptible to frost. It is associated with a large number of other hardwood species, mainly maple, birch, magnolia, basswood, black cherry, oaks, and hickories.

Beech trees develop well under partial cuttings or singletree selection cuttings, but they do poorly when forest stands are heavily cut or clearcut. Trees that have been injured or suddenly exposed by cuttings often develop epicormic branches.

Beechnuts are eaten by many kinds of birds and mammals. They are a favorite food for squirrels, which also eat the catkins. The nuts and buds are choice for wild turkeys. The nuts are a preferred food of ruffed grouse, chipmunks, and black bear and are occasionally eaten by bobwhite quail. The small sweet edible nuts are sometimes gathered and sold commercially and are a source of vegetable oil and hog food. The first nuts to fall are usually wormy or aborted.

Seeds are high in crude fat and calcium and moderate in crude protein and phosphorus. Optimum production of fruit is when trees are about 60 years of age. Trees tend to have either very good or very poor crops.

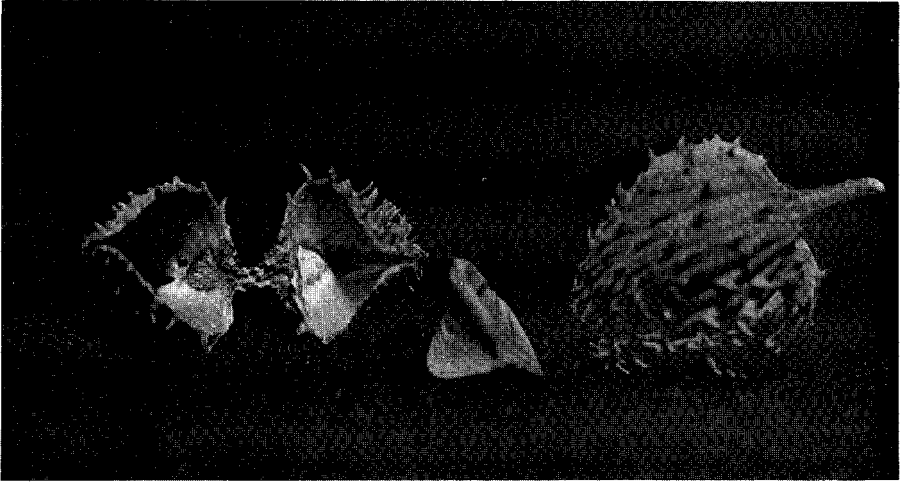
The seed can be sown immediately in the fall or stratified in sand at 41°F for 60 to 90 days for spring sowing. Rodent protection is necessary and partial shade required for most of the first year. Transplanting is usually done with 1- to 3-year-old plants. Seedlings develop better under shade than in openings, and many seedlings are found beneath dense stands.

The most serious insect pest of beech is the scale which serves as a predisposing agent for infection by the *Nectria* fungus. Because of its thin bark, beech is susceptible to fire and susceptible to sunscald in stands that have been opened.

The tree is very desirable for ornamental planting, but it is difficult to grow grass beneath the heavy foliage.

The wood is commercially sold for fuel, and for wood products such as tool handles, flooring, cooperage, and toys.

Other common names: beech, red beech, ridge beech, white beech, and beechnut.



American Beech

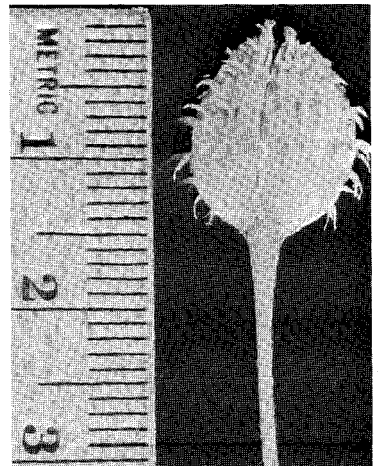
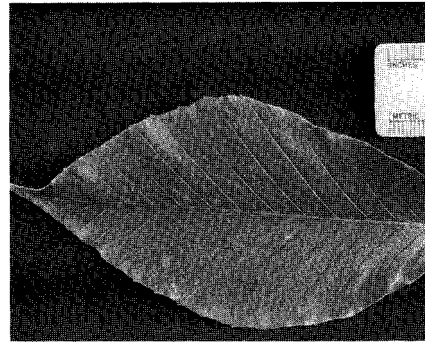
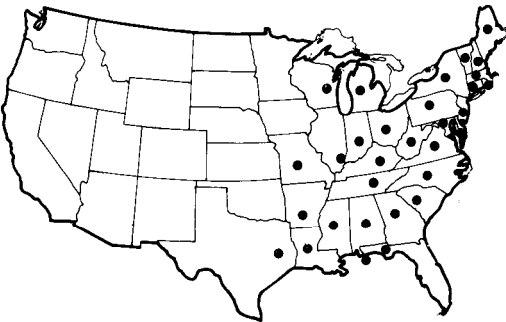
A tree averaging 60 to 80 feet in height, but may become 170 feet tall.

Leaves pale yellowish-green, oblong, coarsely serrate, veins beneath silky, deciduous, alternate, 3 to 6 inches long.

Twigs reddish brown to light gray with age, light-tan lenticels on new growth, hard pith, alternate leaf and bud scars, buds up to 1 inch, six times longer than wide, scales reddish tan, terminal buds present.

Flowers borne in lateral clusters in early spring, monoecious.

Fruit a pair of small, brown, three-angled sweet nuts in burl-like involucre. September to November, persistent seeds fall after first heavy frost.



Butternut/Juglans cinerea L.

Donald D. Strode

Forest Service, USDA

Washington, D. C.

The butternut prefers rich, moist, well drained loams; however, it is found on drier rocky sites, especially sites with a limestone origin. It is very intolerant of shade and never occurs in pure stands but is found singularly or in small groups in association with other hardwoods. It is not an important timber species.

Because of its extensive range, butternut is associated with many species. Common associates include basswood, black cherry, beech, black walnut, elm, hemlock, hickory, oak, red maple, sugar maple, yellow-poplar, white ash, and yellow birch. Butternut is used occasionally for boat building and interior decorating. It is also used by wood carvers. The wood can resemble black walnut when properly finished. The kernel of the nut is sweet, oily, and edible. The species is called "butternut" because of the oily kernel which may become rancid like butter.

As does black walnut, butternut has an "antagonistic" action that causes withering and death in certain cultivated plants. The toxic material is localized in the vicinity of the roots.

Various species of animals eat butternuts, including white-tailed deer, cottontails, and squirrels. But because of its scattered occurrence, the over-all value of butternut for wildlife is small. The seeds are buried by rodents, chiefly squirrels, and this accounts for a large share of the seedlings in natural stands.

Optimum seed-producing age is 30 to 60 years. A tree can produce from one-fourth to one bushel of seed.

The most serious and widespread disease of the species is an ascomycete, *Melanconis juglandis*. The disease is slowly progressive and eventually kills the tree. Butternut is very susceptible to fire damage. Although this species is generally wind-firm it is subject to frequent storm damage.

Early settlers used the inner bark of butternut for medicinal purposes. Pioneers extracted a dye from the husks for coloring homespun clothing. During the Civil War, backwoods troops were called "Butternuts" after the color of their clothes.

Other common name: white walnut, oilnut

Butternut

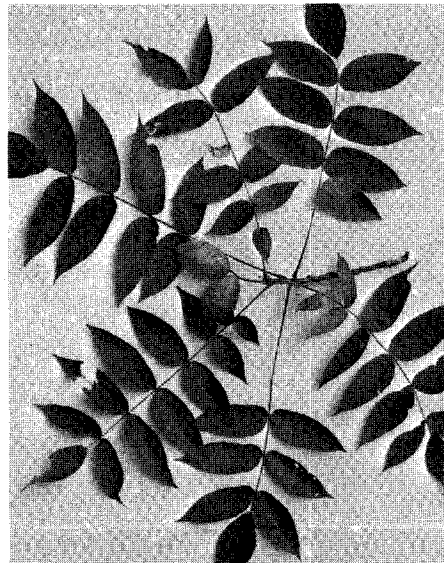
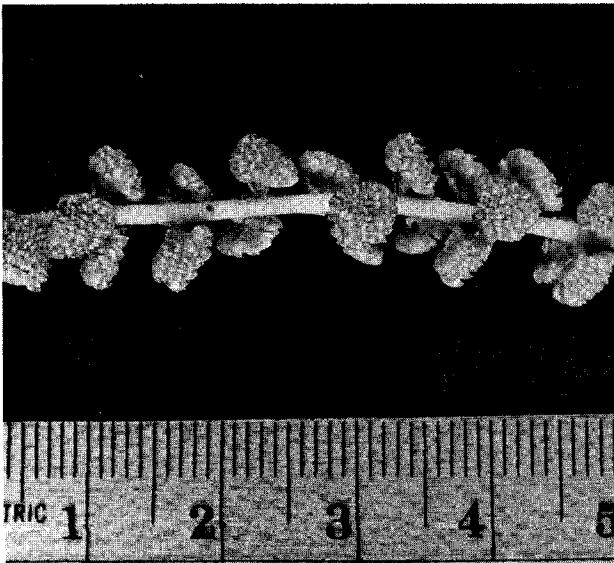
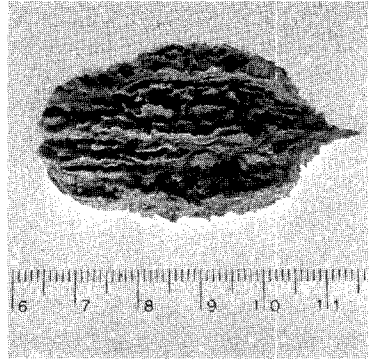
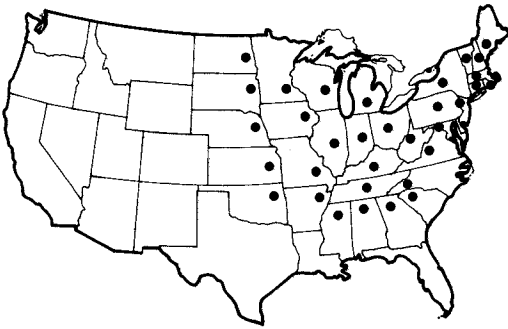
A **small-** to medium-sized tree up to 70 feet tall with diameter of 3 feet; trunk **usually** short and divided into several **large** spreading branches.

Leaves alternate, deciduous, 10 to 25 inches **long**, odd pinnately compound, 11 to 19 leaflets, elliptic, 2 to 5 inches long, 1.50 to 2 inches wide, yellowish-green and fine **pubescent** above, **paler** below.

Twigs reddish brown to gray, **puberulent**, **lenticels** **pale** and abundant, leaf scars **large**, bundle scars in three V-shaped groups, terminal bud 0.50 to 0.75 **inch long**, **scales** entire, pith **thin-plated**, diaphragm thickened.

Flowers monoecious, **male** catkins 1.50 to 5 inches **long**, **greenish**; female solitary or **several** together, five- to eight-flowered. April to June.

Fruit a nut deeply sculptured and rough with ragged ridges, covered with a fibrous fleshy husk. September and October.



Black Walnut/Juglans nigra L.

Donald D. Strode

Forest Service, USDA

Washington, D. C.

Black walnut is one of the best known and most valuable hardwood species. It is very sensitive to soil conditions and requires a deep, well-drained, nearly neutral soil with a generous supply of moisture and nutrient material for best growth. It is generally found as scattered trees throughout forested areas. Primary associates include yellow-poplar, white ash, black cherry, basswood, beech, sugar maple, oaks, and hickories. Black walnut is rated from intolerant to very intolerant of shade.

Although all native walnuts are useful to wildlife, the black walnut is the most important. The large, distinctively flavored nuts furnish food for red squirrels in fall, eastern gray squirrels in fall and winter, and are important in the diet of eastern fox squirrels. All nuts buried by squirrels are not recovered; therefore, these animals are important in establishing new trees. Best fruit production begins when trees are about 30 years old and continues for another 100 years. Large trees can produce several bushels of nuts in one year.

The kernel portion of the fruit is very high in crude protein and crude fat and high in phosphorus.

The wood of black walnut is noted for its beauty and the ease with which it is manufactured into fine furniture and cabinets. It is highly prized for hand carving and is preferred for gunstocks. The wood is durable and is used for railroad ties and posts.

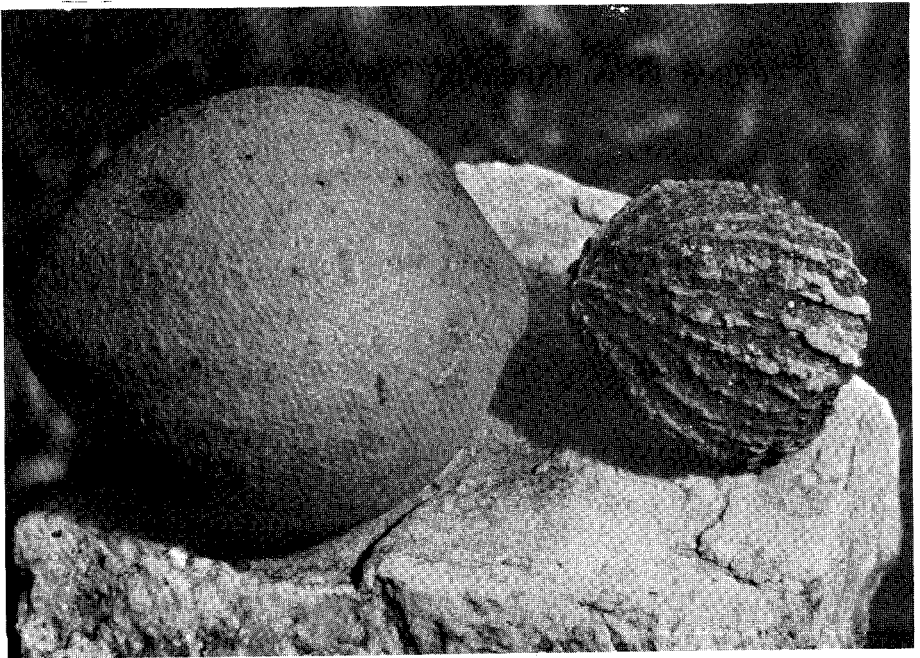
The nuts of black walnut have a distinctive flavor and many rural families collect and sell nuts to commercial extractors who use the meat for cookies, candies, and other confedions.

Walnut trees damage other plants severely when roots come into direct contact.

Normal freezing and thawing usually will cause seeds to break dormancy the spring after maturation, but germination is often delayed until the second year.

The species has few important insect enemies. The most serious is the walnut caterpillar (*Datana integerrima*). Trees are seldom killed;

however, some loss in current growth by defoliation usually occurs. Black walnut is wind-firm and not easily damaged by ice and windstorms. The thick bark and naturally durable heartwood make it resistant to damage and decay after fires.



Black Walnut

A tree **up** to 125 feet tall and 4 to 5 feet **in diameter** at breast height.

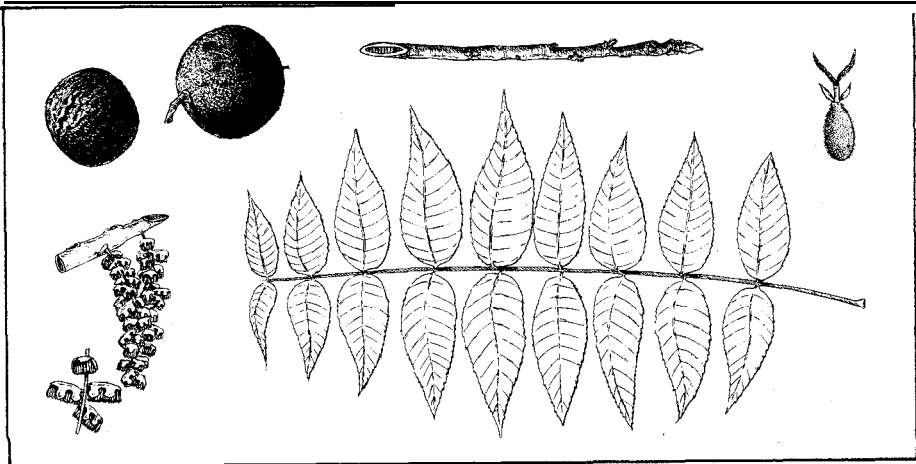
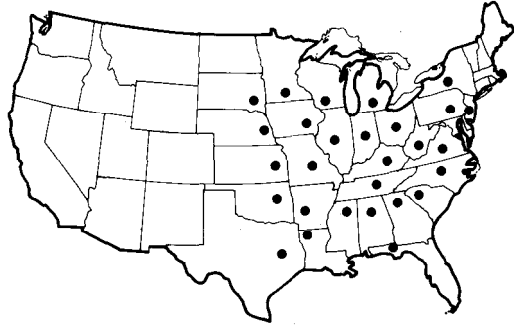
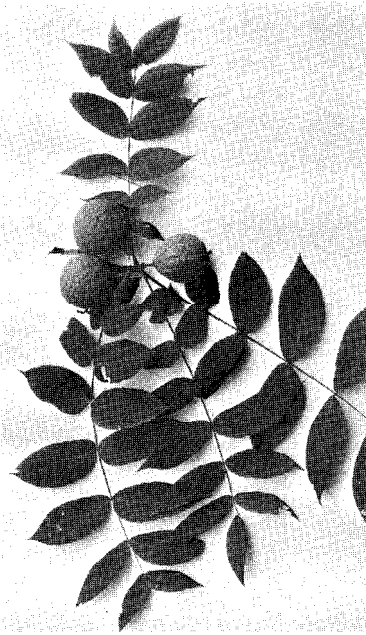
Leaves compound, 1 to 2 feet long, with 15 to 23 dull-green serrately margined leaflets. **Leaflets** opposite **and** approximately 1 **inch** wide and **3 inches** or more **in length**, fragrant when **crushed**.

Twigs stout, more or **less** hairy, orange-brown to light brown with buff-colored, finely **chambered** pith. Leaf **scars large**, V-shaped and **conspicuous**.

Flowers monoecious, **male** catkins 2 to 5 inches long, female flowers **in 2-** to 5-flowered spikes, about 0.25 **inch** long.

Fruit **an ovoid**, corrugated, sweet, edible nut 1.12 to 1.50 inches long, **enclosed in** a thick, hairy, yellowish-green husk, borne solitary or **in clusters** of two or three. September to **November**, fall at maturity.

Bark light brown and scaly **on** young stems, becoming dark brown and deeply fissured into **broad**, rounded, intersecting ridges **on** old trunks.



Eastern Hophornbeam/Ostrya virginiana (Mill.) K. Koch

Lowell K. Halls
Forest Service, USDA
Nacogdoches, Texas

This small understory tree grows best in rich moist woods in association with other hardwoods; however, it grows in a wide variety of soil and moisture conditions. It is a slow grower and not aggressive.

The fruits, buds, and catkins of hophornbeam are eaten by several kinds of birds and mammals. Hophornbeam ranks high as food for ruffed grouse, and is used by bobwhite quail, squirrel, deer, cottontail, ring-necked pheasant, purple finch, rose-breasted grosbeak, and downy woodpecker. Seeds are a preferred winter food of wild turkey. Hophornbeam also provides some nesting and escape cover for birds and mammals.

The seeds are high in crude protein, crude fat, crude fiber, phosphorus, and calcium.

The preferred method of establishing hophornbeam is to plant 2-foot high or taller stock in masses or groups in forest openings, woodland borders, or old fields. If planted by seed the species should be sown in fall or stratified over winter in sand or peat at 41°F and sown in spring. Natural regeneration is mainly by seed, which germinate in the first spring after seed fall.

The hops dry and gradually fall apart soon after ripening and are dispersed largely by wind, but occasionally by birds. Seed production per plant varies from year to year. The plants do not produce seed in quantity until about 25 years old.

Other common names: American hophornbeam, hornbeam, hophornbeam, ironwood, deerwood, leverwood, hardhock.

Eastern Hophornbeam

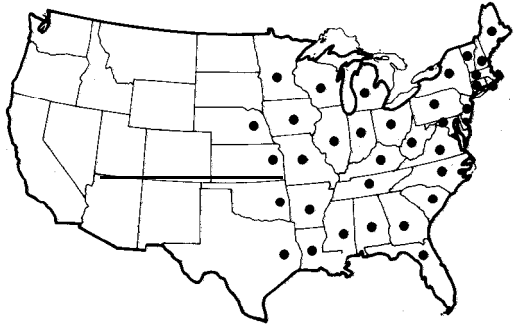
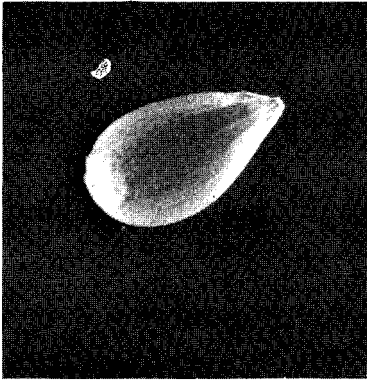
A small, slow-growing tree up to 60 feet tall.

Leaves simple, deciduous, 2.50 to 4.50 inches long, 1.50 to 2.50 inches wide, margin sharply and doubly serrate, glabrous and yellowish green above, hairy and paler below.

Twigs reddish brown to brown with white lenticels, bud scales with fine longitudinal striations, yellowish green with purple-brown edges, leaf scars half round to crescent shaped with three bundle scars; crooked, slender, pubescent.

Flowers monoecious, male catkins, 1 to 3 inches long, one to three at end of branches; female catkins small, solitary, slender. March to May, with leaves.

Fruit a flattened ovoid nutlet, in conelike imbricate clusters, nuts 0.25 inch in diameter enclosed in the sac, cluster 1.50 to 2 inches long. September and October.





Oaks/Quercus spp.

Lowell K. Halls

Forest Service, USDA

Nacogdoches, Texas

Oaks are the most important and widespread hardwood trees in temperate regions. They include some of our largest and most stately trees, but some are shrub-like. They thrive at different altitudes and in many soil types.

Some species are deciduous, others evergreen. The leaves are alternate and simple. Winter buds, clustered at the ends of twigs, are composed of many overlapping scales. Minute flowers are borne in early spring with the leaves. Male and female flowers are on the same tree. Male flowers are in clustered, drooping, slender, yellowish catkins. Female flowers are solitary or few and greenish. The fruit is an acorn which matures in one or two years and sheds soon afterwards in autumn. It has a hard shell, a cup of overlapping scales, and a seed.

Oaks are classed into two groups. The red or black oaks have leaves with apexes and bristle-tipped lobes; their acorns usually mature the second year. White oaks have leaves with apex and lobes that are not bristle-tipped; their acorns mature the first year. With a few exceptions, seeds of the white oak group have little or no dormancy, and will germinate soon after falling. Acorns of the black oak group are usually dormant and germinate the following spring under natural conditions. For germination to occur the moisture content of acorns must not drop below 30 to 50 percent for white oaks and 20 to 30 percent for red oaks.

Most oaks are intermediate in tolerance, and young plants can compete in a broad range of light tolerance if soil moisture is adequate. There is high mortality among newly established oak seedlings; few survive the first year without dying back and sprouting at least once.

Upland oaks can be established by seeding or planting. Recently forested sites are generally better than abandoned fields. Lack of repellents to protect acorns from animals severely limits direct seeding, but oaks can be planted readily by conventional methods and will survive well on suitable sites. They require ample sunlight for best growth, and competing vegetation must be controlled.

In managing oaks for wildlife at least half of the oak trees in the stand should be at least 40 years of age. If clearcutting is the regenera-

tion method the cutting units should be small and well distributed over the management unit. No more than one-eighth of the unit should be regenerated during any cutting cycle.

A small residual basal area distributed in a few large trees can produce a bumper crop of acorns.

Acorn crops vary from nearly zero to 250,000 or more acorns per acre. Many times the white oak group will produce in a particular year, and the red oak group will have practically no yield; at other times, the opposite occurs.

The number of acorns depends on the size of the tree crown, which is closely related to stem diameter at breast height, to site, and also to the inherent ability of the individual tree to bear fruit. Some trees never bear many acorns whereas others are always heavy producers in good mast years. Average annual yields of fresh acorns for some of the larger trees may be 18 pounds or more, but may be considerably less in other years. In West Virginia, red oaks produced a yearly average of 170 acorns per milacre of crown cover as compared to 96 for the white oaks. Size of acorn crop showed no relation to site quality. Immature acorns made 34.7 percent of the total crop. The condition of all acorns was: sound 13.5 percent, insect damage 32.8 percent, animal damage 52.2 percent, and other 0.5 percent. The amount of sound, undamaged acorns varied from 11 percent to 73 percent between years .

Many acorns are lost to nut weevils and gall insects, and by destructive forces such as freezing, drying out, burning in wildfires, and flooding. These forces account for relatively large losses in poor crop years and relatively small losses in good crop years. Only about 46 percent of the acorn crop falls to the ground in sound condition. In the southern Appalachians the greatest damage to well-developed acorns was caused by insects, ranging from 26 to 81 percent.

Oaks exceed all other tree groups in their contribution to wildlife food. Innumerable kinds of birds and mammals avidly eat the acorns, the only source of high energy through winter months in many areas. Animals fatten quickly, go through the winter in good condition, and are most likely to breed and grow healthy young when acorns are available. In fact, the breeding success of game animals such as squirrels and white-tailed deer is closely linked to acorn yields in hardwood forests. During years when the acorn crop fails many animals go hungry and are hard-pressed for survival.

Acorns from the white oak group are considered the most palatable. Black oak acorns tend to be bitter, have a higher tannin content, and are

used less than the white oak group when both are available. The relative low palatability of the black oak acorns may be an advantage in that many of them are buried and stored and eaten in late winter or early spring when food shortages are often acute.

Acorns are particularly important to several kinds and groups of mammals and birds. Acorns in shallow ponds and streams are a great enticement to mallard and wood ducks, causing them to remain over winter when an ample supply is available. Squirrels eat the oak catkins in spring and eagerly search for acorns wherever they are available. Bobwhite quail eat the smaller acorns whole, and they pick up fragments or pick out the meat of larger ones. In some areas acorns are the most important staple food for wild turkeys, particularly in the winter. In Louisiana, turkeys almost always locate their winter range where acorns are available. Turkeys eat the acorns whole regardless of size. In wild turkey management it is suggested that oaks constitute at least 30 percent of the mast-producing potential and that one-third of the oaks be in the white oak group. Ruffed grouse eat acorns throughout the year. Woodpeckers, black bears, and raccoons have a special appetite for acorns. In Florida, acorns and other nuts comprised nearly one-half of the bluejay's total food. White-tailed deer are fond of the large acorns and they also browse on the foliage and twigs of some oak species.

Oaks also provide useful wildlife cover. They furnish nests and den-trees for birds and for small climbing mammals. Oak leaves and twigs are used by many birds for nesting materials.

Acorns are high-energy foods and animals fatten readily on them. Some oak species are high in crude fat content (mainly the red and black oaks); nearly all species are low in crude protein, phosphorus, and calcium. Acorns in the black oak group generally have a higher fat content than those in the white oak group.

Wood from oaks is used widely for furniture, building materials, cooperage, and fuel. Trees are used as ornamentals in yards, parks, and along city streets.

White Oak/Quercus alba L.

Lowell K. Halls

Forest Service, USDA

Nacogdoches, Texas

White oak grows on a wide range of soils and sites within its range except the extremely dry, shallow soil ridges, poorly drained flats, and wet bottomlands. It does best on deep, well-drained loamy soils on northerly and easterly lower slopes and coves, and is moderately susceptible to frost. It is closely associated with other oaks, hickories, and a large variety of hardwoods and pines. It seems to have been replaced by Durand oak in northeast Florida.

White oak tends to have either very good or very poor fruit crops. Acorn yields per tree are extremely variable. The average is probably 700 to 1,000 acorns per tree, but yields up to 7,700 acorns per tree have been reported. Some trees are consistently better producers than others. Seeds germinate almost immediately after falling. When the moisture content of the embryo falls below 50 percent of the dry weight viability is greatly reduced.

Much of the second-growth white oak has originated from sprouts following cutting or fire. Seedlings persist for many years beneath a forest canopy even though the tops may die back. Opening of the forest stand by cutting results in the rapid growth of the seedling sprouts present. White oak is considered a slow-growing tree, but when not overtopped it grows faster than hickories and nearly as fast as red and black oaks.

White oak is generally considered intermediate in shade tolerance. It tends to become dominant in a stand, and usually prunes well in moderate to heavily stocked stands. When associated with other oaks and hickory, in the central and southern hardwood forests, it is considered a climax tree.

Decay of heartwood resulting from fire scars causes the most serious losses in white oaks. It is rather free of insect pests.

Other common names: fork-leaf white oak, ridge white oak, stave oak.

White Oak

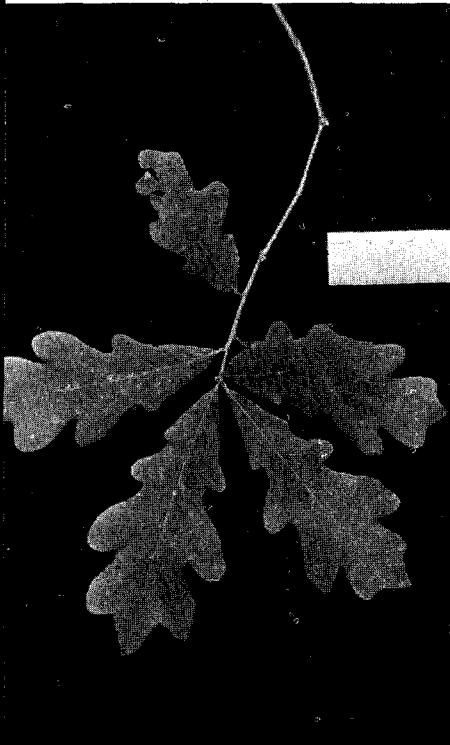
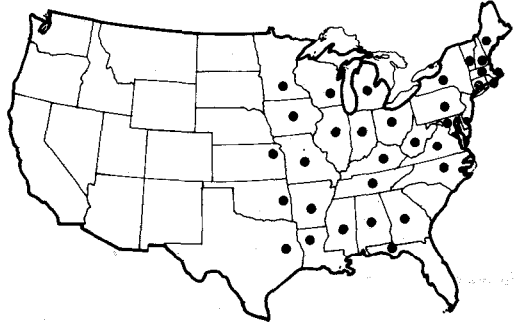
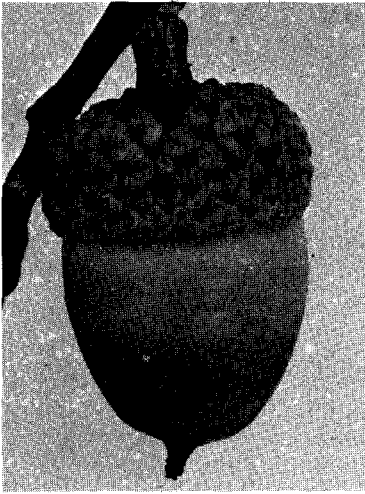
A tree 80 to 100 feet high and 3 to 4 feet in diameter at breast height.

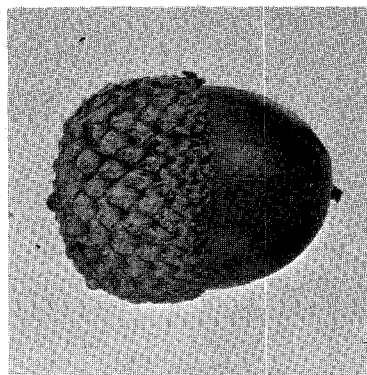
Leaves deciduous, 5 to 9 inches long, 2 to 4 inches wide, seven to nine lobed, deep sinuses, glabrous bright green above, paler below.

Twigs slender, reddish brown to gray, glabrous, terminal buds 0.19 inch long, leaf scars half-moon shaped.

Flowers with leaves April to May.

Fruit sessile or short stalked, nut 0.50 to 0.75 inch long, ellipsoid, one-fourth length in bowl-shaped cup. September to October.





Chapman Oak

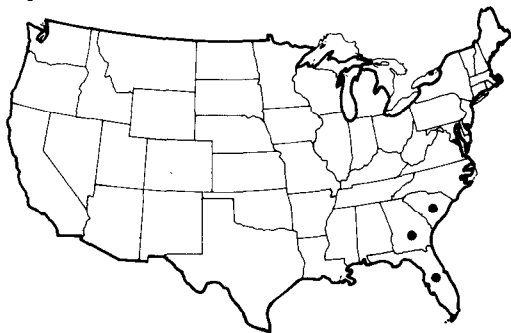
A shrub or small tree up to 25 feet **tall**, 5 to 6 inches **in diameter** at breast height.

Leaves dark green, glabrous and lustrous **above**, light green, or silvery white and glabrous **below**, 2 to 3 inches long, 1 **inch** wide, persistent until **late winter** or spring.

Twigs olive-brown to brownish gray, **winter buds ovoid**, 0.13 **inch** long.

Flowers **in** spring.

Fruit sessile, **solitary** or paired, nut oval, 0.62 **inch** long, 0.37 **inch** thick, but extremely variable **in** size and shape, **pubescent** from middle to apex, one-third to one-half of nut **enclosed in** cups.



Chapman Oak/Quercus chapmanii Sarg.

Chapman Oak

A. G. Spratt

Florida Game and *Fresh Water* Fish Commission

Tallahassee, Florida

Chapman oak grows well on sands and other well drained soils. It is a dominant species in the sand pine scrub community. Growth is sparse under closed canopies of sand pine. Old rank growth predominates in cutover stands of sand pine which have not been regenerated.

Fruiting is most abundant in areas with open to light overstory. Fruit yields are increased when the cutover pine stands are chopped. In Florida sand pine-scrub forest types, acorn yields of Chapman oak range from 8 to 11 pounds per acre per year.

Acorns of Chapman oak are of primary importance to deer in the sand pine scrub. They are also eaten by scrub jays, squirrels, turkeys, and quail.

Other common names: Chapman white oak, scrub oak, chapman's oak.

***Swamp Chestnut Oak/Quercus michauxii* Nutt.**

Swamp Chestnut Oak
Stephen L. Beckwith
University of **Florida**
Gainesville. Florida

This species occurs principally on low ground, along river bottoms, or in ravines with other hardwoods.

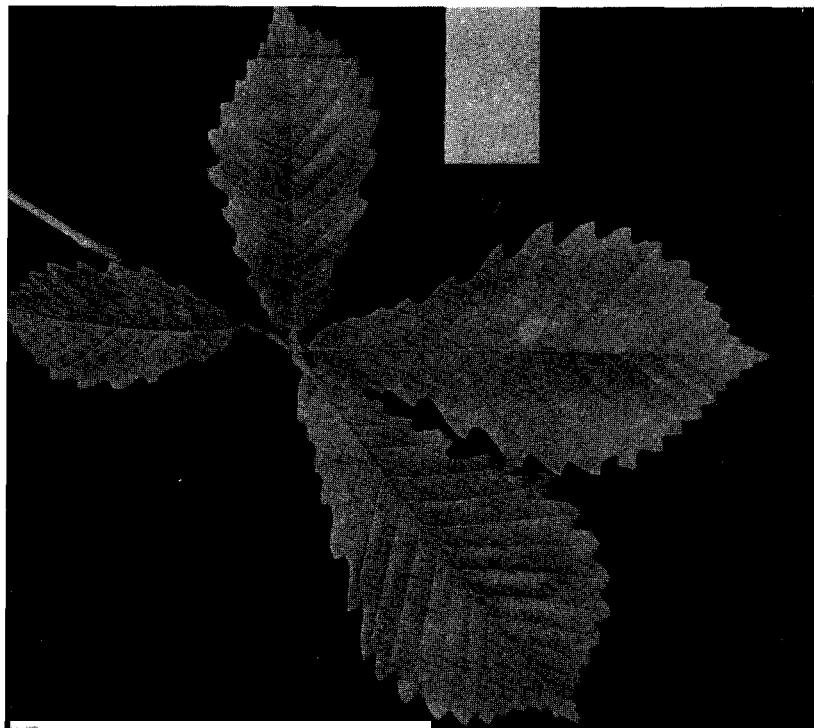
Optimum acorn production begins at about 40 years of age. Germination begins soon after seedfall.

The species is moderately tolerant of shade but easily established in openings. Competition from other species limits early development of swamp chestnut oak seedlings unless they are released by weeding.

Acorn damage from weevils is sometimes heavy, particularly in poor to fair seed years.

The acorn is very palatable but its large size precludes use by most wildlife except white-tailed deer, squirrels, and wild hogs. It can be eaten readily, however, by most wildlife after the shell sheds and germination begins.

Other common names: cow oak, basket oak, white oak.



Swamp Chestnut Oak

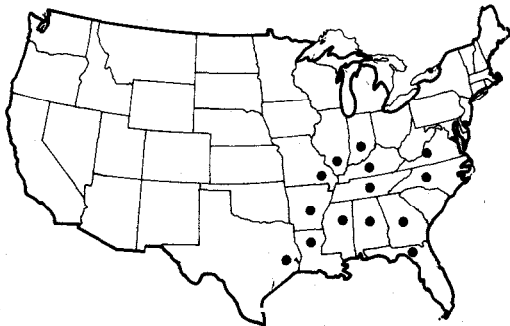
A tree usually 60 to 80 feet tall and 2 to 3 feet in diameter.

Leaves deciduous, 5 to 8 inches long, 2 to 4.50 inches wide, upper surface dark green, lustrous; lower surface **pale** green to silvery white.

Twigs moderately stout, reddish- to **orange-brown**, terminal buds 0.25 **inch** long, covered with thin red **scales**.

Flowers appear with **leaves** mostly from April to May.

Fruit 1 to 1.66 inches long, sessile or short stalked, about one-third of **acorn enclosed in** cup. September and October.



Dwarf Live Oak

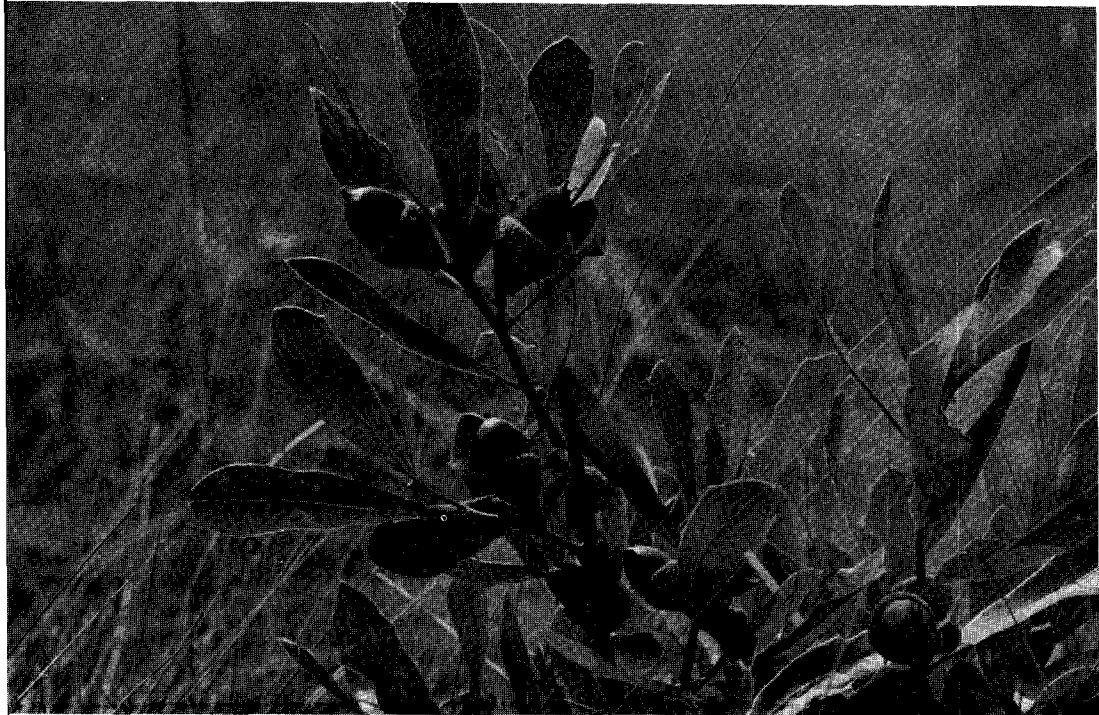
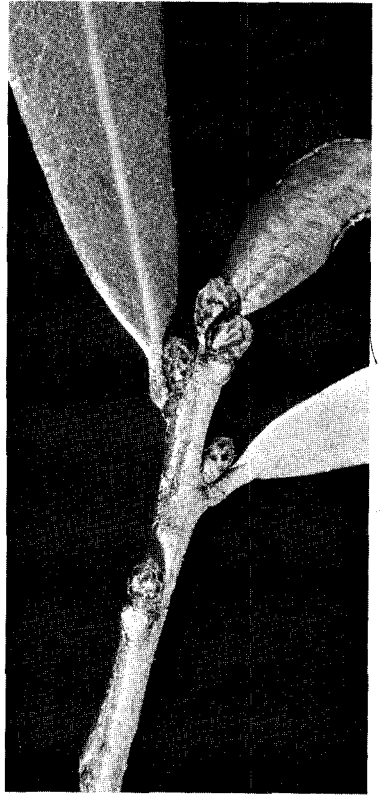
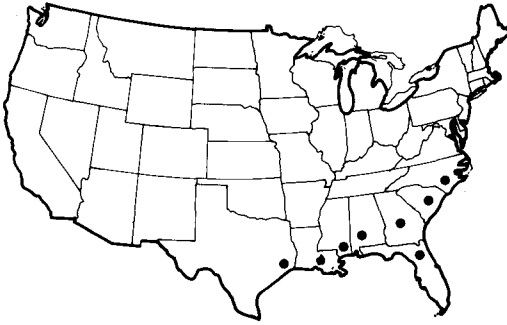
An evergreen shrub up to 3 feet tall, with underground stems.

Leaves evergreen, obovate, toothed, glabrous above, pubescent below, 2 to 5 inches long, extremely variable in size and shape.

Twigs reddish to grayish brown, pith star-shaped in cross section, terminal bud obtuse or rounded, clustered, leaf scars triangular to circular with three bundle scars.

Flowers April and May.

Fruit solitary or several on a long stalk, cup hemispheric, nut ovoid, inner surface of cup hairless, almost indistinguishable from live oak acorns. August to November.



Dwarf Live Oak/*Quercus minima* **(Sarg.) Small**

Lovett E. Williams, Jr.

Florida Game and Fresh Water Fish Commission
Gainesville, Florida

Dwarf live oak is found in pine flatwoods, on deep sands behind beach areas, and in seepage areas of sandy-clay uplands on sites subject to burning.

It begins to bear fruit at about 4 years of age when grown from seed in the open and usually produces some fruit annually, but the amount varies considerably. In an east Texas study the maximum acorn yield (ovendry) was 201 grams and the minimum was 3 grams per plant over a 6-year period for young plants growing in the open. Plants in the woods did not bear acorns.

Dwarf live oak is closely associated with fire and often is the only oak to be found in some large expanses of regularly burned pine flatwoods. When protected from fire for 5 to 6 years in damp slash pine-gallberry-saw palmetto sites it becomes inconspicuous. But with the advent of fire it sprouts and flourishes for a year or two until it is overgrown by competing plants.

Maximum acorn production is attained when dwarf live oak is burned in August. In northern Florida, stands burned later than October fail to produce acorns the next summer.

Dwarf live oak acorns are easily germinated by planting them 2 or 3 inches deep in sandy soils as soon as they mature. The plants grow well when transplanted by short leaf-bearing underground stem cuttings. Good cuttings can be obtained during late winter from stands which were burned the previous summer.

Chestnut Oak/Quercus prinus L.

Lowell K. Halls

Forest Service, USDA

Nacogdoches, Texas

Chestnut oak grows on dry, sandy, or gravelly soils, and it reaches maximum size in well-drained coves and bottom sites.

Trees begin to produce acorns when about 10 inches in diameter at breast height with optimum yields at about 14 to 24 inches diameter. Acorns germinate soon after falling if seedbed conditions are favorable. For artificial planting, the seeds should be gathered as soon as they fall to prevent drying, and stored in sealed containers at 32° to 36°F, or stored in cool cellars.

The tree is intermediate in shade tolerance. Reproduction persists under overhead shade, but the tops will die back and resprout repeatedly unless they are provided full sunlight. Growth is slow. Chestnut oak is susceptible to fire, but it is the most resistant of oaks to heart and sapwood decay.

The chestnut oak acorn is a favorite food of white-tailed deer and gray squirrel, but because of its size it is usually eaten only by large birds such as wild turkey. The leaves are frequently browsed by livestock.

The tree is often planted as an ornamental. The wood is used for posts, tools, baskets, cooperage, boards, veneer, and fuel.

Other common names: rock chestnut oak, rock oak, white oak, cow oak, basket oak, Micheaux oak, swamp white oak.

Chestnut Oak

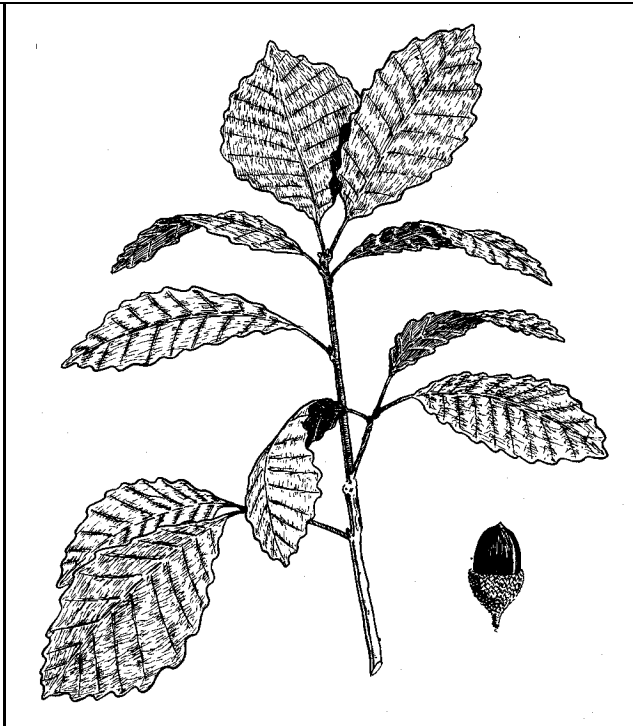
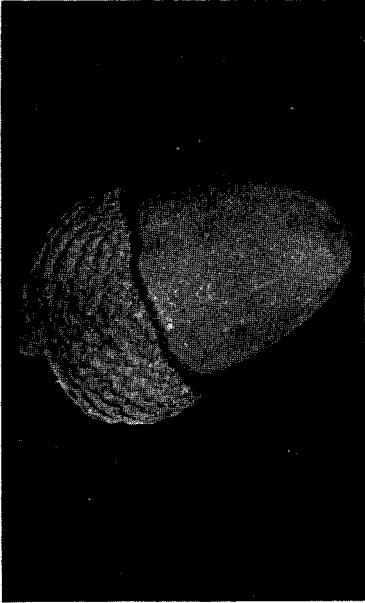
A tree with well formed, straight narrow trunk and narrow crown, 60 to 80 feet high, 2 to 3 feet in diameter at breast height.

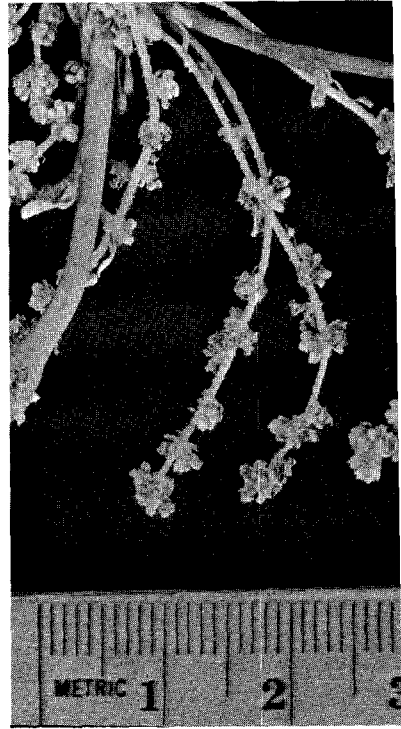
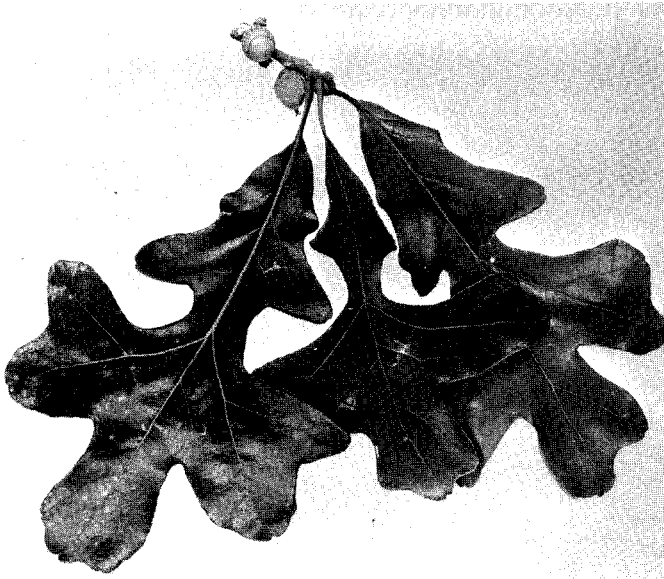
Leaves deciduous, glabrous and lustrous green above, paler and pubescent below, 4 to 8 inches long, 1.50 to 4 inches wide.

Twigs smooth, reddish-brown to gray later, stout, buds 0.25 inch long, covered with thin, red scales, pale on margin.

Flowers April to May.

Fruit sessile or stalked, solitary or paired, 0.75 to 1.50 inches long, one-third to one-half of acorn in cup. September and October.





Post Oak

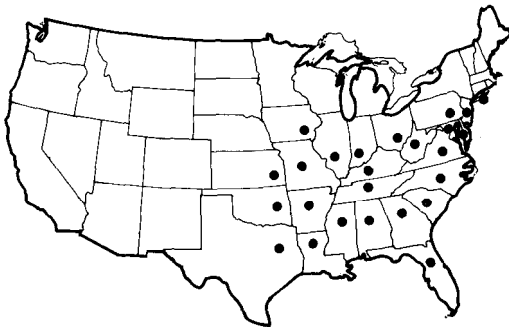
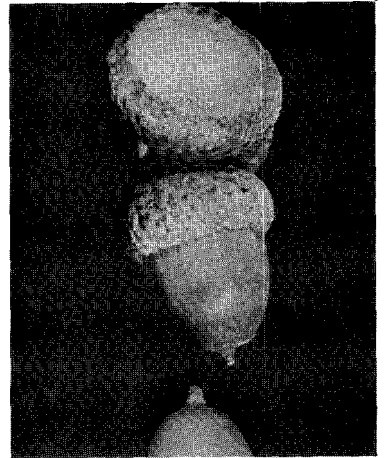
A small to medium size tree, 40 to 50 feet high, 1 to 2 feet in diameter at breast height.

Leaves deciduous, 4 to 7 inches long, 3 to 4 inches wide, five-lobed with deep round sinuses, dark green, rough and glabrous above, paler and tomentose below, leathery and thick.

Twigs brown, stout, buds 0.06 to 0.12 inch long, brown, covered with chestnut-brown pubescent scales.

Flowers **March** to May.

Fruit **sessile** or **short stalked**, solitary or paired or clustered, 0.50 to 0.75 inch long, cup **one-half** length of **acorn**, pale and pubescent within, tomentose externally. September to November.



***Post Oak/Quercus stellata* Wangenh.**

Lowell K. Halls

Forest Sewice, *USDA*

Nctcogdoches, Texas

Post oak grows on a wide variety of soils and on many sites. Typically, it is found on rocky ridges, sandy outcroppings, and southern exposures.

Post oak acorns are eaten by many kinds of birds and mammals and are considered one of the most important sources of food for wild turkeys in the eastern states.

The species is intolerant of shade, but on dry sites it may be a permanent or climax species. Because of its slow growth it is often overtopped by other trees, mostly oaks. However, it tends to persist and become dominant on poor sites because of its drought resistance. In some places it replaces shortleaf pine after repeated wildfires. In Texas, it forms virtually pure stands and invades open prairie after fire protection. Seeds germinate soon after dropping and seedlings develop a thick taproot.

Post oak acorns are heavily attacked by insects.

The wood is used for crossties, fuel, fence posts, furniture, and lumber.

Other common names: iron oak, cross oak, branch oak, rough oak, box oak.

Live Oak/*Quercus virginiana* Mill. var. *virginiana*

Lovett E. Williams, Jr.

*Florida Game and Fresh Water Fish Commission
Gainesville, Florida*

Live oak is found on a wide variety of soils but most often on sandy soils of recent geologic origin. It is resistant to salt spray and tolerates salinity.

Live oak is a consistent acorn producer. The acorns have a sweet flavor, thus they are highly preferred by wildfire. They are the most heavily used acorns by wild turkey in Florida. Few acorns remain viable over winter because a large portion are worm infested.

Seeds germinate soon after falling to the ground under favorable moisture and temperature conditions. When tops are killed or when the tree is girdled the roots sprout prolifically. The capacity to resprout makes live oak very difficult to kill.

Live oak is harmed by fire and high water but is relatively free of insects and disease. It is very long-lived, even for an oak. Its large spreading branches, short trunk, huge size and draping of spanish moss make the live oak the beautiful symbol of the classical deep South.

The wood is not of much commercial value but may be used for purposes where a hard, dense, rot-resistant, and strong wood is required.

Other common name: Virginia live oak.



Live Oak

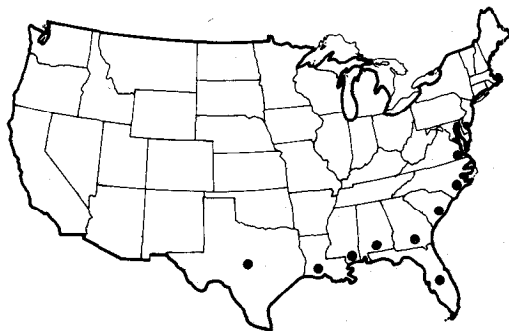
A tree 40 to 50 feet high, 3 to 4 feet **in** diameter at breast height, with large massive horizontal **limbs**.

Leaves evergreen, dark green and lustrous **above**, **paler** and glabrous to **pubescent below**, 2 to 5 inches long, 0.50 to 2.50 inches wide, shed **in late** winter and spring.

Twigs grayish brown, glabrous, terminal buds 0.17 **inch** long, light brown, leaf **scars** half-moon shaped.

Flowers **March** to May.

Fruit **in clusters** of three to five, nut **ellipsoid**, 0.33 to 0.50 **inch** long, **one-half enclosed** in cup. September to December.



Southern Red Oak

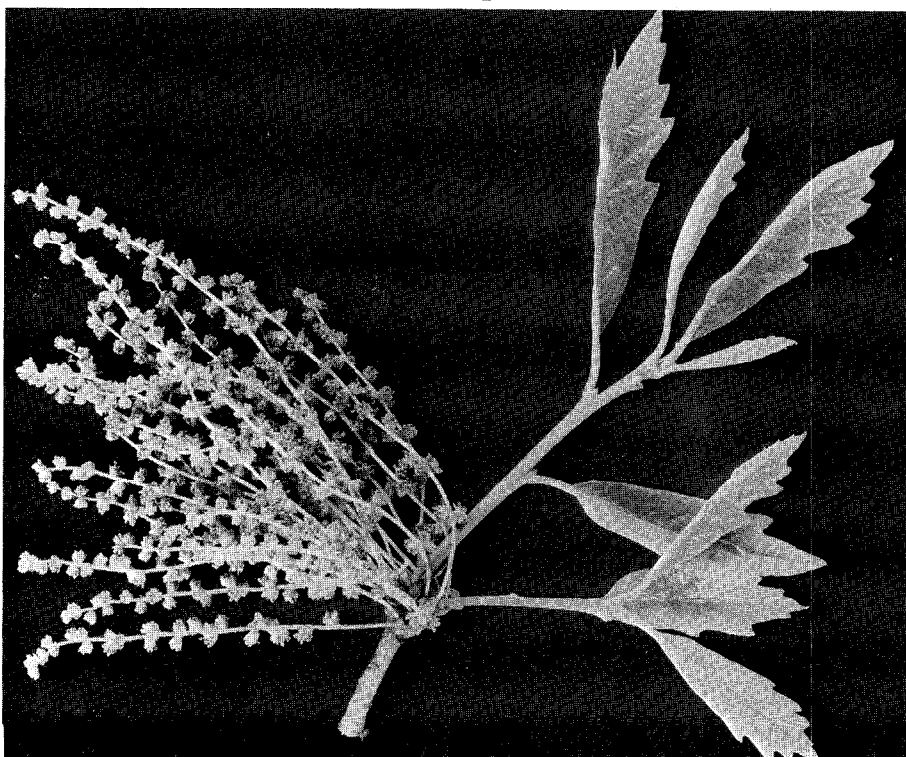
A tree up to 80 feet **tall**.

Leaves deciduous, 5 to 9 inches **long**, 4 to 5 inches wide, three to **seven** bristle-tipped **lobes**, dark green and lustrous **above**, **paler** with brown beneath.

Twigs dark red, **pubescent**, terminal buds 0.13 to 0.25 **inch** long, **ovoid**, reddish-brown **scales**, stout.

Flowers **April** to May.

Fruit solitary or **in** pairs, sessile or short stalk, 0.50 **inch** long, one-third **length in** shallow thin cup. September and October.



Southern Red Oak/Quercus falcata ***Michx. var. falcata***

Lowell K. Halls

Forest Service, USDA

Nacogdoches, Texas

Southern red oak usually occurs on dry, sandy, or clay soils, on dry ridgetops, and upper slopes facing south and west. Occasionally it is found along streams and moist loam slopes. It is commonly associated with other oaks, hickory, and pines and is rated as intermediate or intolerant of shade.

Acorns are eaten by many kinds of birds and mammals. Maximum acorn production occurs when trees are 50 to 75 years old. Seeds germinate in spring. The acorns may be stored in sealed containers for a year or two at 32° to 36°F, but it is best to plant immediately when gathered or to stratify at 32° to 38°F for 30 to 45 days before planting. Acorns to be sown should never be allowed to dry out.

The tree is susceptible to injury by fire but sprouts vigorously from the stump when the top has been killed or cut back.

Southern red oak is often planted as an ornamental and the wood is used for general purposes, rough lumber, and furniture. The bark is excellent for tanning and is used as an astringent in medicine.

Other common names: red oak, Spanish oak, water oak, turkey
f o o t o a k .

***Bear Oak/Quercus ilicifolia* Wangenh.**

Burd S. McGinnes

U.S. Fish and *Wildlife* Service
Blacksburg, Virginia

Bear oak grows on dry, acid, rocky, sandy, sterile soils, especially in pine barrens and on bare rocky mountain tops.

It is an intolerant, light-demanding species that follows clear-cutting or fire. It has the ability to grow upon exposed and inhospitable sites where it serves as a "cover tree" until displaced by more valuable timber species. Since it often grows in thickets and monopolizes the site it is often considered a nuisance in timber regeneration.

Bear oak usually produces good crops of acorns annually; thus, it is a dependable source of food for many game species and songbirds. The acorns are small and are eaten by many of the smaller birds, particularly jays and woodpeckers. Deer browse on the foliage and twigs.

Stratified seeds may be sown in the spring, or fresh seeds in the fall at the rate of 2 pounds per 100 square feet. The seed should be covered with one-half to one inch of firmly packed soil.

Trees begin to bear acorns at an early age when grown from sprouts; the optimum yields occur at 5 to 8 years. After trees are 8 years old the acorn yields decline, but plants 24 years old have continued to produce acorns.

Sprout production can be increased by cutting stems to the ground and by fire.

Other common names: scrub oak, black scrub oak, turkey oak, jack oak, redbrush.

Bear Oak

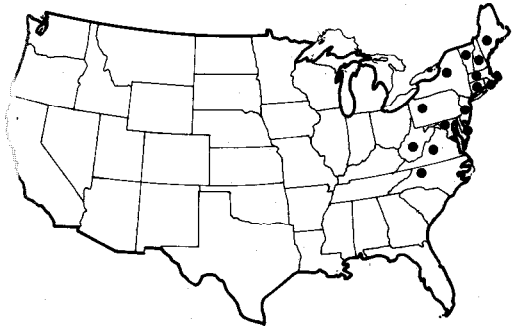
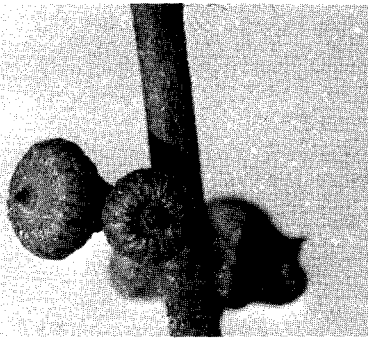
A **much-branched** straggly shrub or small tree 3 to 10 feet but may **reach 20 feet tall**, trunk up to 5 or 6 inches in diameter at breast height.

Leaves with three to **seven shallow sinuses**, dark green **above**, whitish-felted beneath, 2 to 5 inches long, 1.50 to 3 inches wide.

Twigs tinged with red and **pubescent** at first, **becoming** glabrous and darker **in** second year, and ultimately dark brown or black, winter buds blunt, 0.12 inch long, dark chestnut brown.

Flowers appear **before** or with **leaves**.

Fruit **produced** in great profusion, sessile or stalked, **in** pairs or **solitary**, nut **ovoid**, broad **flat** at base, 0.50 inch long, half the length in bowl-shaped cup. September and October.



Bluejack Oak/*Quercus incana* Bartr.

Lowell K. Halls

Forest Service, USDA

Nacogdoches, Texas

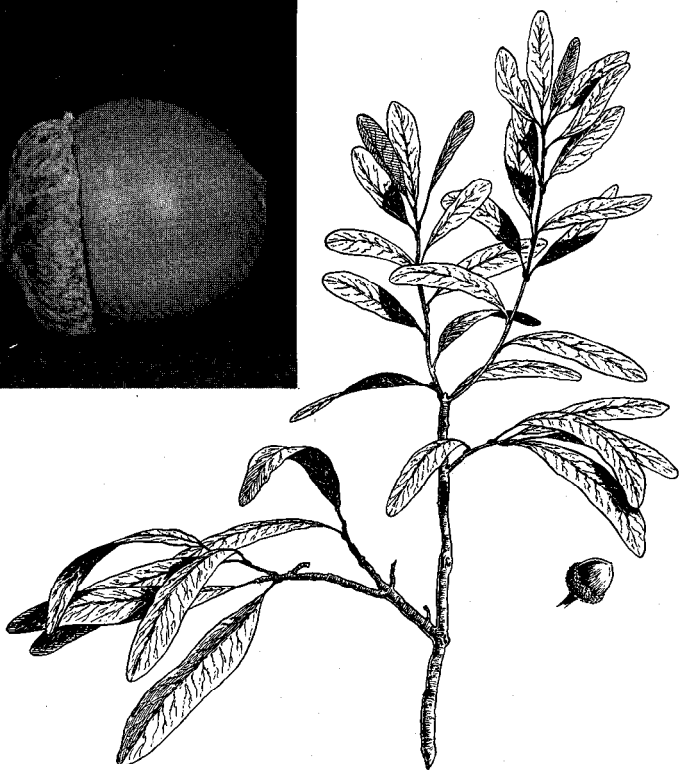
Bluejack oak grows on dry sandy ridges, pine-barrens, and dunes in the Coastal Plain often in association with turkey oak.

Acorns are first produced when trees are about 2 inches in diameter at breast height with optimum yields at 4 to 8 inches diameter. It is one of the highest acorn yielders per square foot of basal area. Yields are quite consistent from year to year.

It is recommended that this oak be retained on dry sandy ridges since bluejack is one of the few oak species that grows well on sites with a low site potential to grow timber. It grows well as an understory tree in longleaf pine stands, giving little competition to the pine.

Bluejack oak is of little commercial value except for firewood and fence posts.

Other common names: sand jack, cinnamon oak, shin oak, upland willow oak, turkey oak.



Bluejack Oak

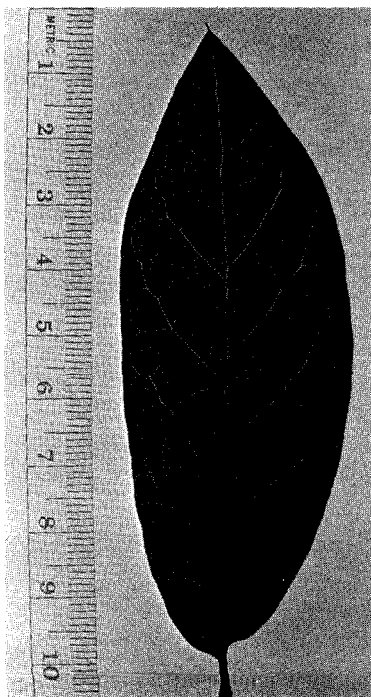
A shrub or small tree up to 35 feet high.

Leaves deciduous, **entire**, grayish green, densely tomentose beneath, smooth **above**, 2 to 5 inches long, 0.50 to 1.50 inches wide.

Twigs heavily tomentose when young, gray to dark brown when older.

Flowers in spring.

Fruit **sessile** or short stalked, **globose**, brown to blackish with grayish **pubescence**, 0.50 inch long, cup one-third of length.



Laurel Oak

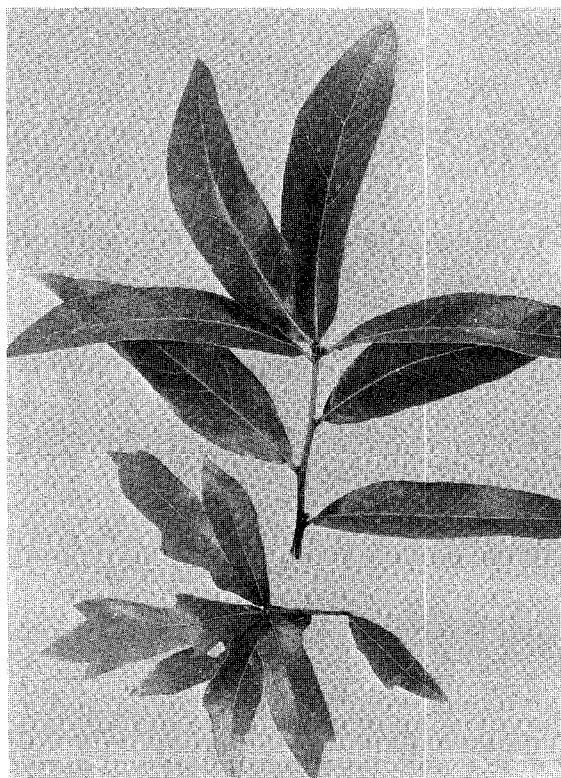
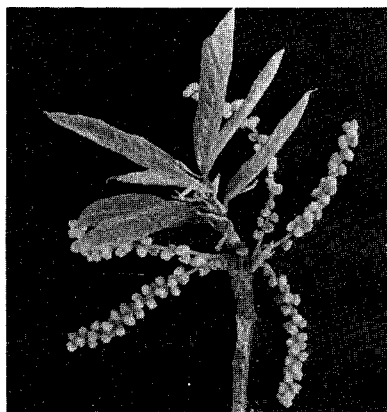
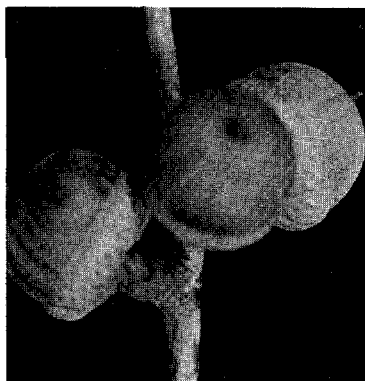
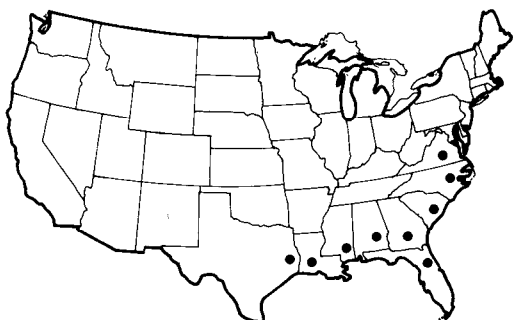
A tree 60 to 70 feet high, 2 to 3 feet in diameter at breast height.

Leaves semi-evergreen in South, deep shiny green and glabrous above, paler and lustrous beneath, 2 to 6 inches long, 0.50 to 1 inch wide.

Twigs slender, dark red, glabrous, terminal buds 0.10 to 0.12 inch long, covered with lustrous, red-brown scales.

Flowers February and March.

Fruit solitary and sessile, 0.50 inch long, one-fourth length in cup. September and October.



Laurel Oak/Quercus laurifolia Michx.

Stephen L. Beckwith

University of Florida
Gainesville, Florida

This relatively short-lived oak occurs commonly along streams, river bottoms, and on the better moist upland soils. It is fairly tolerant of shade, but is not considered a climax species. It often becomes established and grows up through the dense canopy of a swamp border. It is damaged by fire.

The trees usually mature in about 50 years. When cut or burned, laurel oaks produce many sprouts from the base of the stump, and some old trees produce sprouts from their roots.

The tree is often planted as an ornamental. The wood is mostly used for fire wood.

Other common names: Darlington oak, obtusa oak, diamond-leaf oak, swamp laurel oak, laurel-leaved oak, water oak.

Blackjack Oak/Quercus marilandica **Muenchh.**

Lowell K. Halls

Forest Service, USDA

Nacogdoches, Texas

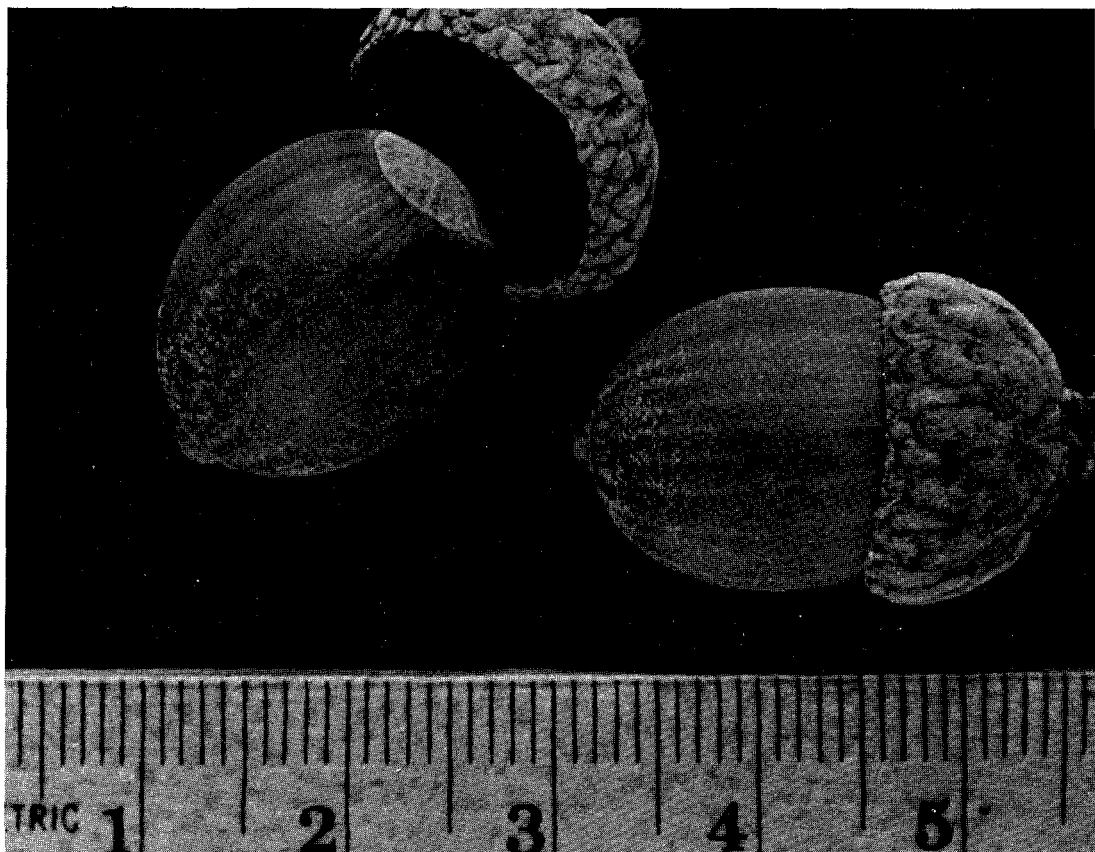
Blackjack oak usually grows on dry, sandy, sterile soils in association with bluejack oak.

Trees begin to bear acorns when about 8 inches in diameter at breast height and reach optimum production at about 16 inches.

The tree has little commercial value and is often poisoned in timber stand improvement operations. Squirrels prefer the nuts over those of most other red oaks.

The wood is used mostly for posts, fuel, and charcoal.

Other common names: blackjack, barren oak, black oak, jack oak.



Blackjack Oak

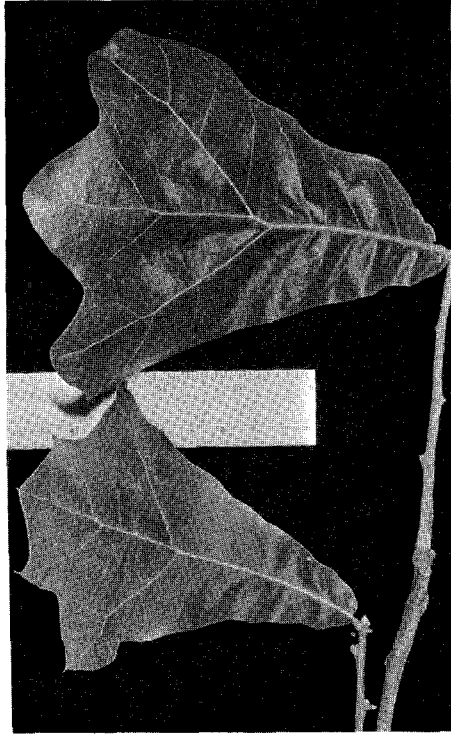
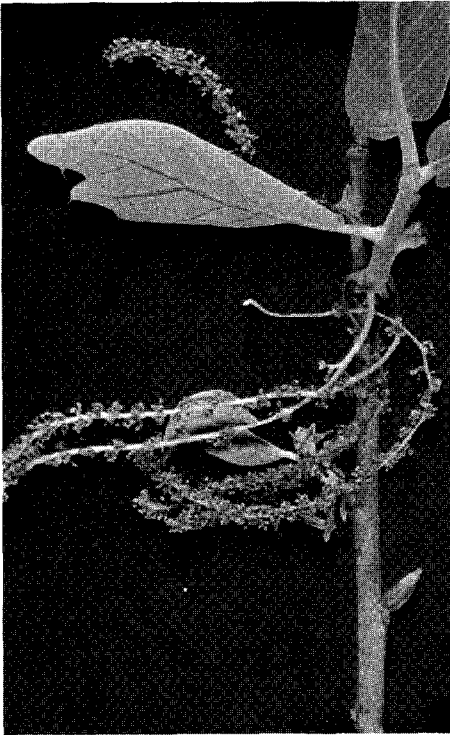
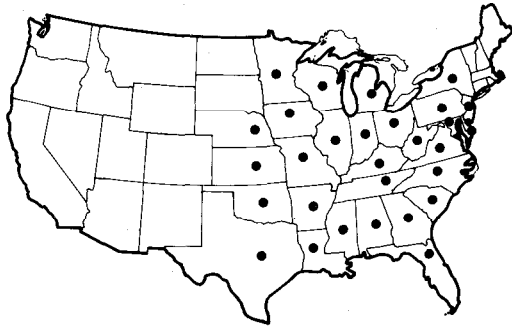
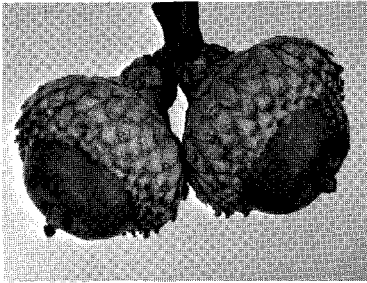
A **small** poorly formed tree up to 60 feet **tall** and 2 feet **in** diameter at breast height.

Leaves deciduous, stiff, bristle tipped; upper surface **dark** green, glossy, glabrous; lower **surface**, scurfy and yellow hairs; 3 to 7 inches long, 2 to 5 inches wide.

Twigs grayish brown, stout, glabrous; buds 0.17 to 0.33 **inch** long, reddish-brown, densely **to-**mentose.

Flowers with **leaves** in spring.

Fruit 0.60 to 0.80 **inch** long, **in** pairs or solitary, sessile or **on short** stalk, **light** brown, one- to two-thirds **in** cup. September and October.



Water Oak

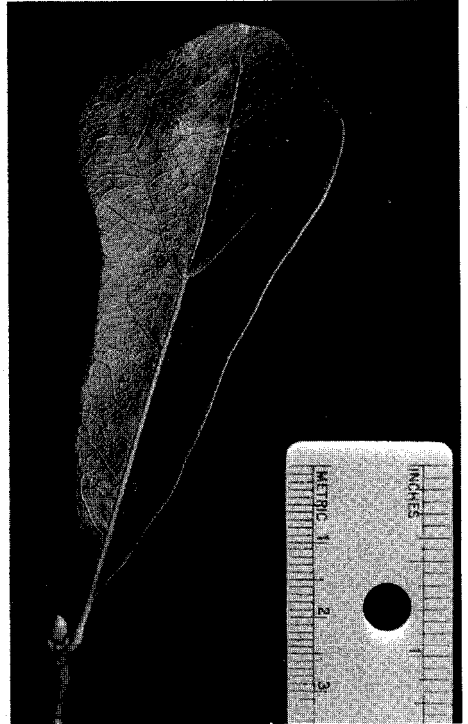
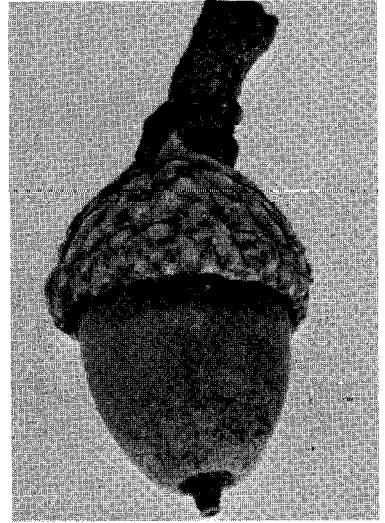
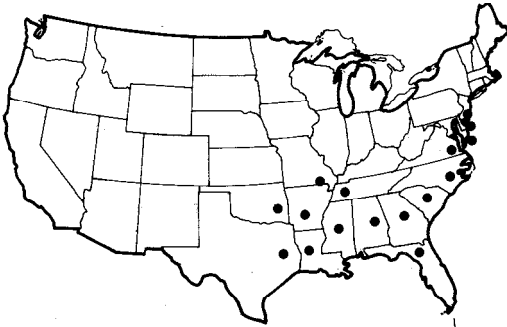
A tree 60 to 70 feet **tall**, 2 to 3 feet **in** diameter at breast height.

Leaves persistent, variably shaped, **entire**, **bristle** tipped, blades 2 to 4 inches long, 1 to 2 inches wide, upper surface lustrous green, **lower** surface lighter.

Twigs slender, glabrous, reddish gray; buds **ovoid**, reddish brown, 0.13 to 0.25 **inch** long.

Flowers with or shortly **before leaves** in spring.

Fruit **sessile** or short stalked, solitary or paired, 0.33 to 0.67 inches long, one-third to one-half **enclosed in** shallow cup. September and **Oc-**tober.



Water Oak/Quercus nigra L.

Bryant A. Bateman

Louisiana State University

Baton Rouge, Louisiana

Water oak is found along small streams, on the margins of swamps, on bottomlands, and on deep or moist upland soils, including pine flatwoods in Florida. The best sites are alluvial bottoms, the better-drained silty clay or loam ridges, and the borderlines between flats and ridges.

The tree is intolerant of shade. It grows fast but is relatively short-lived. On good Delta sites it may reach a diameter of 4 feet in 75 years and then is likely to deteriorate.

Good acorn crops are borne nearly every year. Mature trees may produce one-quarter to one and one-half bushels of fruit per year. In Louisiana, water oak is the most dependable producer among the oaks. Production in the Mississippi Delta averaged almost 45 pounds per tree over a 10-year period. Seeds germinate the spring after seed fall. Seeds germinate well under moderate shade, but seedlings must be released to continue growth. Early height growth on good sites is about 2 feet per year for the first 25 years. Water oak can withstand considerable flooding, but complete prolonged submergence during the growing season will kill the trees.

The tree is susceptible to fire at all ages.

Acorns are readily eaten by deer and by squirrels. Most acorns have dropped by December.

Water oak is extensively planted as an ornamental. The wood is used for firewood, crossties, and poles.

Other common names: possum oak, red oak, spotted oak, bluejack oak, duck oak, pin oak, barren oak.

Nuttall Oak/*Quercus nuttallii* Palmer

Bryant A. Bateman

Louisiana State University

Baton Rouge, Louisiana

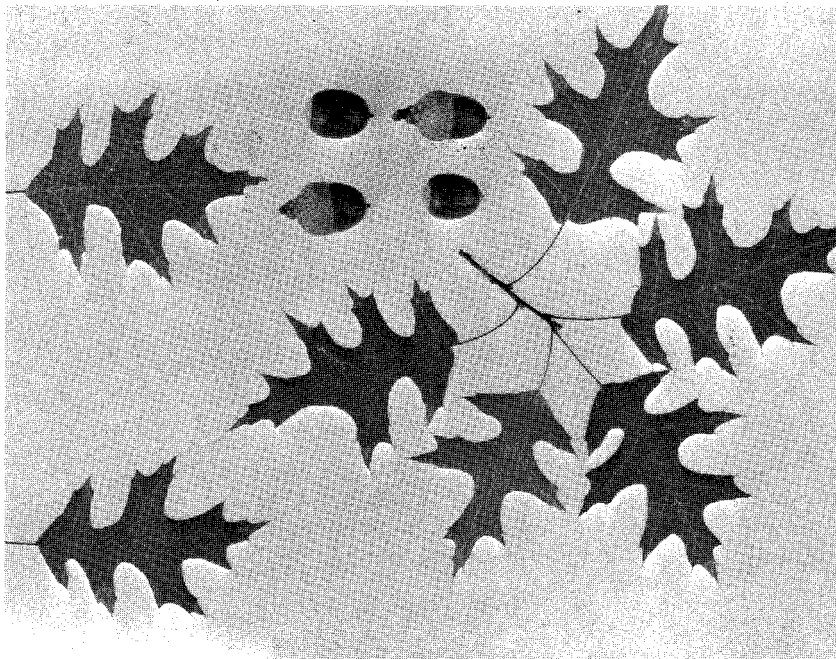
Nuttall oak is mid-tolerant of shade and grows on the poorly drained first and second bottoms. Typically, it grows on clay flats that are normally covered with 3 to 8 inches of water throughout the winter.

Optimum acorn production begins when trees are about 20 years old. The average tree yields one-quarter to one and one-half bushels of clean nuts. The seeds germinate the spring after maturity. Seedlings become established both in the open and in the shade, but they cannot survive in the shade. Oftentimes, the seedlings are killed by high water during the growing season. The trees grow rapidly and are nearly always dominant or codominant in the stand.

In Louisiana, deterioration sets in soon after trees reach 20 inches in diameter at breast height; however, sound vigorous trees over 30 inches in diameter have been found in Arkansas.

In Louisiana Nuttall oak is considered one of the best mast-producing species. Acorn crops rarely fail, and many acorns remain on the trees in January. During periods of winter flooding squirrels find a ready supply of acorns still on the trees. Acorns are also favored by deer and are available to turkey. Quail will use broken parts of the large acorns, but the Nuttall site is very poor quail habitat.

Other common names: red oak, smooth-bark red oak, tight-bark red oak, yellow-butt oak, striped oak, pin oak.



Nuttall Oak

A medium sized tree, up to 100 feet high and 3 feet **in** diameter at breast height, strongly **but-tressed** when **old**.

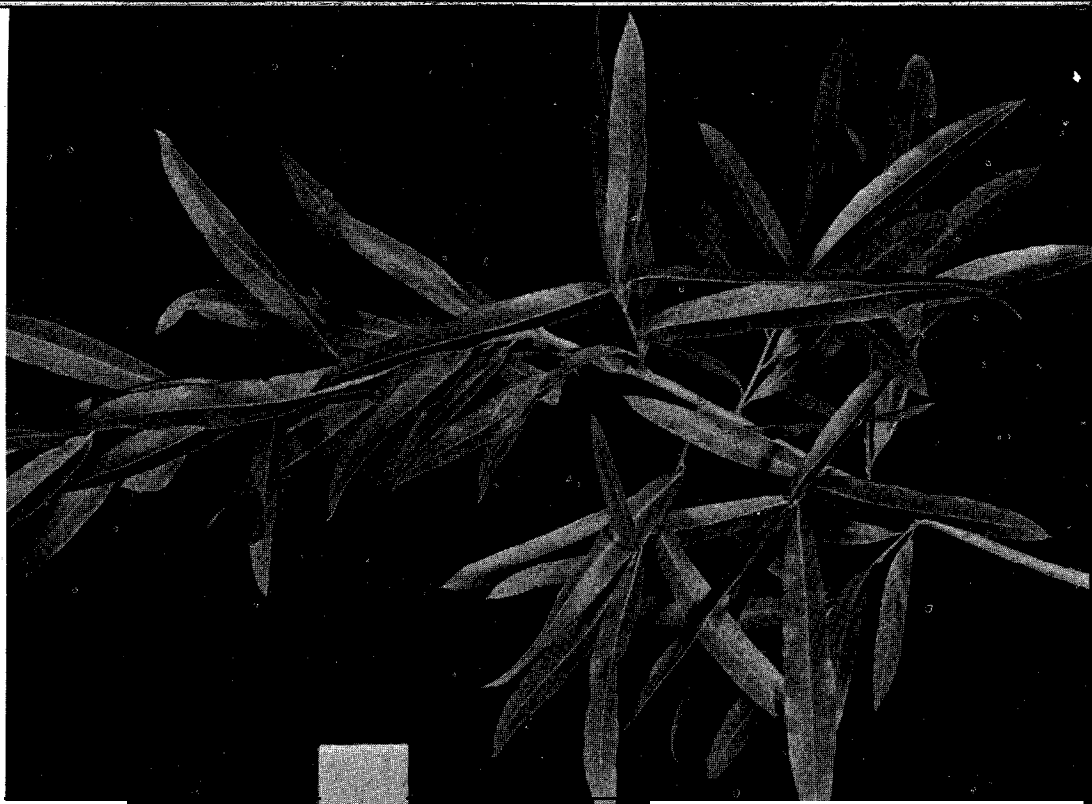
Leaves deciduous, five to **seven** lobed, two to five bristled teeth **on each lobe**, blade 4 to 8 inches long, 2 to 5 inches wide; upper surface **dull**, dark green, lower **pale**.

Twigs glabrous, olive green to reddish brown when **young**, **gray** when older, bud 0.25 **inch** long, gray-brown **scales**.

Flowers **March** to May.

Fruit sessile or short stalked, 0.75 to 1.33 **inch** long, 0.50 to 1 **inch** wide, one-fourth to one-half of length **in** a cup; cup **continued** into a conspicuous neck at the base. September to **Feb-**ruary.





Willow Oak

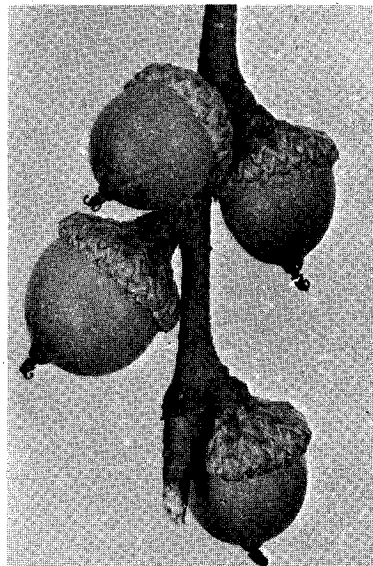
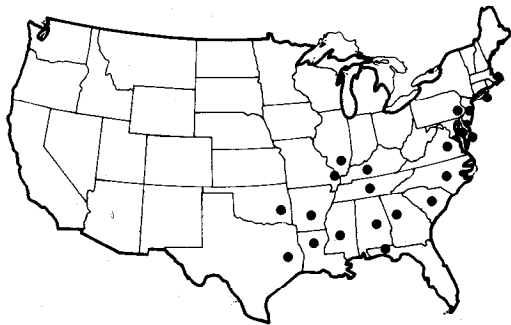
A **large** tree 80 to 100 feet high, 3 to 4 feet in diameter at breast height.

Leaves deciduous, linear, light to dark green and glabrous **above**, lower surface paler and glabrous, blade 2 to 5 **inches** long, 0.33 to 1 **inch** wide.

Twigs reddish-brown and **pubescent** first, later gray and glabrous, buds brown, **ovoid**, 0.08 to 0.17 **inch** long, glabrous **scales**.

Flowers February to May, shortly **before** trees leaf out.

Fruit solitary or **in** pairs, sessile or short stalked, **acorn** 0.40 to 0.60 **inch** long, as broad as long, one-quarter of nut **in** cup. August to October.



Willow Oak/ *Quercus phellos* L.

Lowell K. Halls

Forest Service, USDA
Nacogdoches, Texas

Willow oak grows on many alluvial soils. Site quality decreases from higher to lower topographic positions, and in the Mississippi Delta it decreases with increase of clay in the soil.

Mature trees produce 0.25 to 1.50 bushels of acorns per tree. Seeds germinate the spring after seedfall. Early height growth is moderate. Prolonged submergence during the growing season is fatal.

Willow oak is a subclimax tree. It is intolerant of shade, but all except suppressed trees of poor vigor respond well to release. It is susceptible to damage by fire. Trees not killed by fire are frequently wounded and open to serious butt rot. It sprouts readily from young stumps.

The tree is often planted as an ornamental. The wood is of lesser value than other commercial oaks but is used for fuel, charcoal, and general construction.

Other common names: peach oak, pin oak, red oak, water oak, swamp oak, swamp willow oak.

***Running Oak/Quercus pumila* Walt.**

Lovett E. Williams, Jr.

Florida Game and *Fresh Water* Fish Commission
Gainesville, Florida

Running oak is found in pine flatwoods and open sandy pine-oak scrub, and forms loose thickets from underground stems. It is a member of the subclimax fire community and is the only described species of the “black oak” group in the southeastern U. S. that matures its acorns from flowers in a single year.

This species does not compete with pine for sunlight. It is slow-spreading and does not become a serious weed problem. It fruits heavily the summer after a summer burn.

Acorns growing on the short shrub are available to wildlife before maturity, but under normal circumstances wild hogs, turkeys, deer., fox squirrels, crows, and other wildlife do not eat the acorns until they are nearly mature and easily popped from the cup.

Other common name: ground oak.

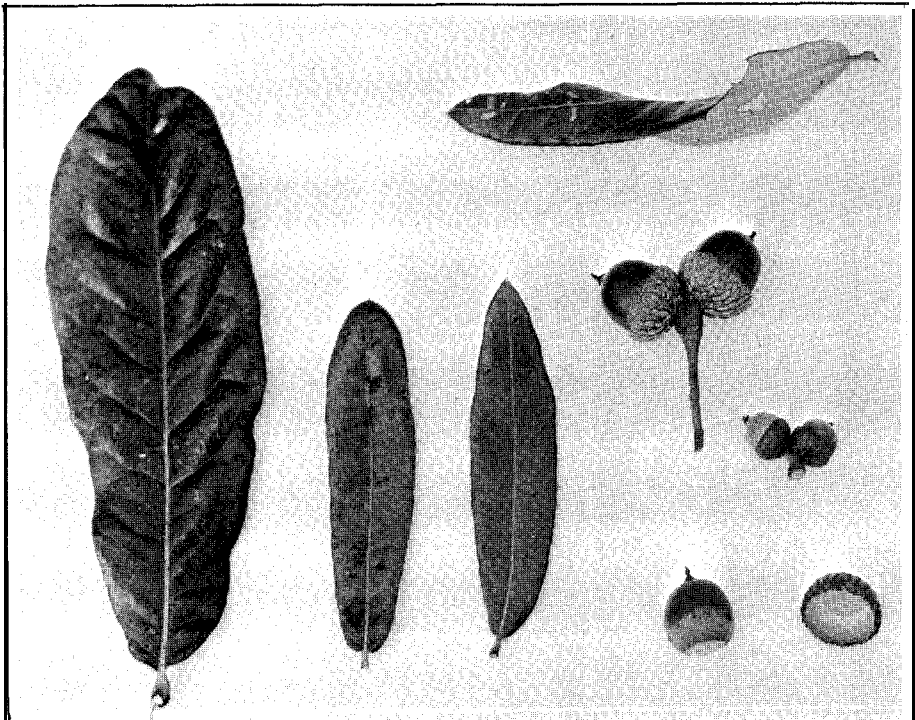
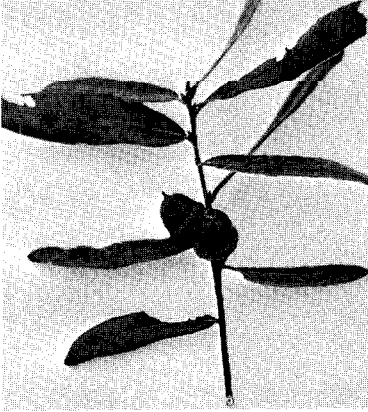
Running Oak

A thicket-forming shrub, 2 to 8 feet tall, with **large** underground stems. In undisturbed habitat the thickets may be 50 feet in diameter.

Leaves abscise in late winter or spring, thin, leathery, glabrous above, usually grayish and **soft tomentose** below, 2 to 6 inches long.

Twigs reddish brown to brown with **star-shaped pith**, leaf scars triangular to half round with three bundle scars, buds pointed, with long **subtending bracts**.

Fruit sessile or nearly so, cup saucer-shaped, inner surface of cup hairy, seed scar orange to gold colored, acorn brownish to black. July to October.



Northern Red Oak/Quercus rubra L.

Lowell K. Halls

Forest Service, USDA

Nacogdoches, Texas

Northern red oak grows in soils ranging from clay to loamy sands, and from deep, stone-free to shallow, rocky soils. It is found most frequently on northern and easterly aspects, lower and middle slopes, coves, and ravines.

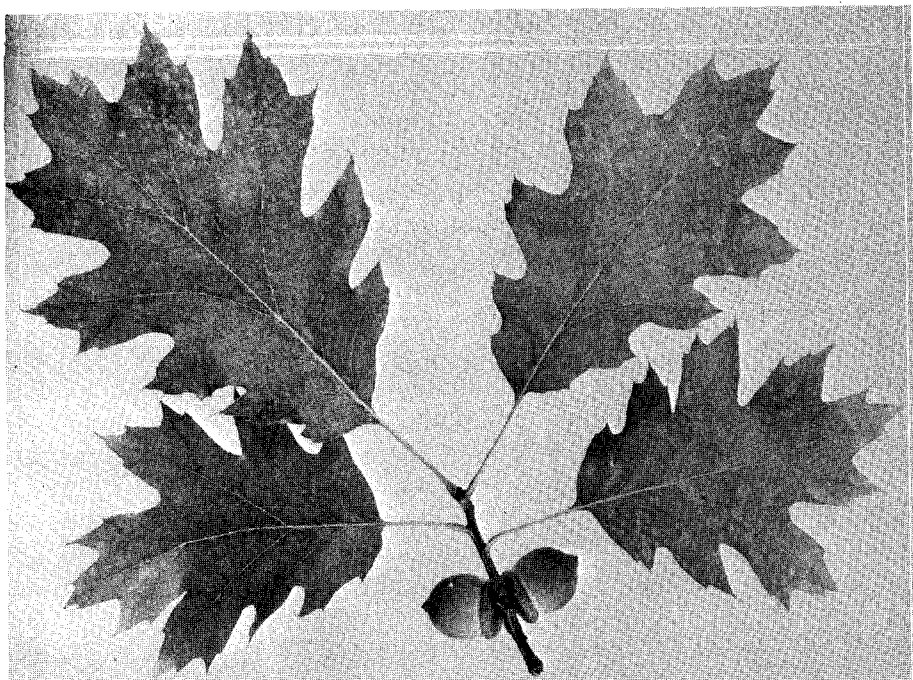
Acorn production is optimum when trees are 50 to 125 years old. Yields of approximately 8 pounds per square foot of basal area can be expected from trees 18 inches in diameter at breast height. The acorns are bitter and do not seem to be eaten by wildlife as much as some of the other oaks.

Acorns germinate the spring after seedfall. Germination is followed by vigorous and rapid taproot development that enables the seedlings to withstand much dryness while still very small.

The species is intermediate in tolerance to shade and responds well to release. It grows rapidly, sprouts from the trunk freely, is long-lived, but is easily damaged by fire and subject to beetle and fungus attack, especially heart rot.

The tree is widely planted as an ornamental. The wood is used for furniture, interior finishing, crossties, posts, mine timbers, and general construction. The wood is considered to be better than that of other red oaks but not as good as that of white oak. It has a tendency to check, split, and shrink and is difficult to dry.

Other common names: gray oak, common red oak, eastern red oak, mountain red oak, red oak.



Northern Red Oak

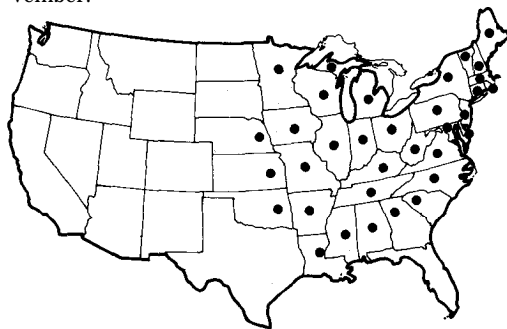
A medium sized tree 60 to 70 feet high, 2 to 3 feet in diameter, short massive trunk.

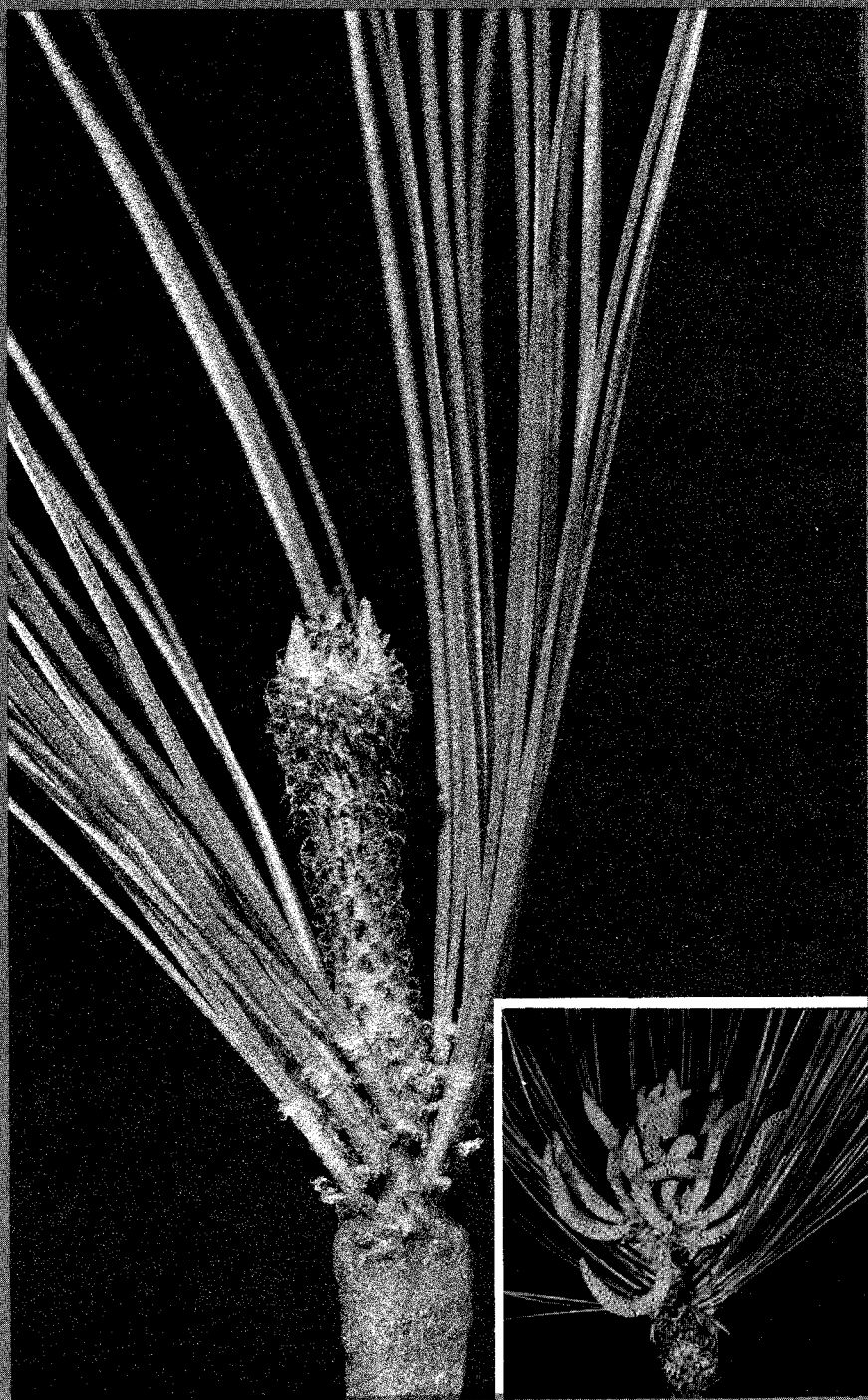
Leaves deciduous, blades 5 to 9 inches long, 4 to 6 inches wide, margin has 7 to 11 lobes that extend halfway to midrib, upper surface dull, dark green, smooth, glabrous, lower surface paler and glabrous.

Twigs green to reddish brown, lustrous, glabrous, stout, pith star-shaped, terminal buds brown, ovoid, glabrous or somewhat pubescent, 0.25 inch long.

Flowers May to June.

Fruit **solitary** or paired, sessile or short stalked, 1 to 1.25 inch long, cup at base of acorn, saucer shaped, 0.50 to 0.75 inch thick. October to November.





Cone & Conelike

CONE AND CONELIKE

A cone is a multiple fruit with overlapping scales. Seeds are the edible portion of the fruit, and they are eaten by many kinds of wildlife and occasionally by humans.

Seeds from the cones of pines are high in crude protein, crude fat, crude fiber, and phosphorus. Seeds of magnolia are very high in crude fat, and moderate in crude protein, phosphorus, and calcium.

Southern Magnolia/Magnolia grandiflora L.

Lowell K. Halls

Forest Service, USDA

Nacogdoches, Texas

Southern magnolia grows best in moist well-drained soils along streams or near swamps in the Coastal Plain, and in low, moist sites in upland areas. It is considered climax in the southeastern coastal maritime zone. It is usually associated with a large variety of moist-site hardwoods but cannot withstand prolonged inundation. It endures considerable shade when young, but needs more sunlight as it becomes older.

The seeds are a favorite food of squirrels. They are also eaten by other rodents, many songbirds, opossums, bobwhite quail, and wild turkey.

Magnolia produces prolific crops of seeds annually. There are 40 to 60 seeds per cone.

The wood is used for fuel, baskets, crates, woodenware, and furniture.

The tree is widely cultivated for its beautiful flowers and showy leaves.

Other common names: bull-bay, evergreen magnolia, great laurel magnolia.

Southern Magnolia

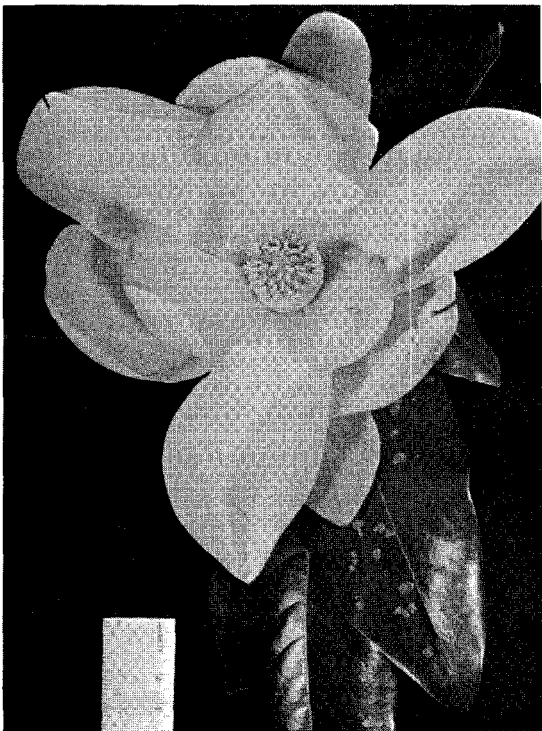
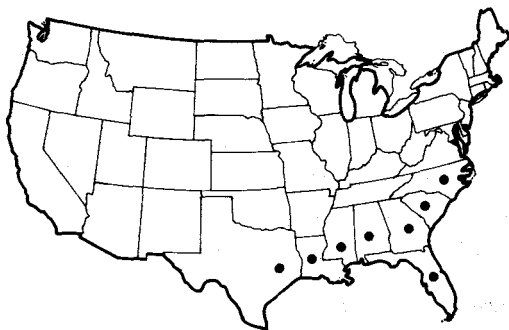
A **large** tree, usually about 50 feet **tall** but may **reach** 100 feet or more, 2 to 3 feet **in** diameter at breast height.

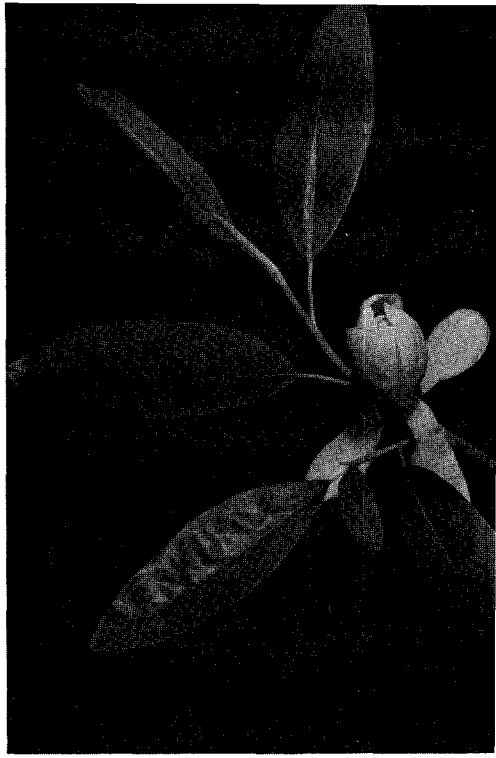
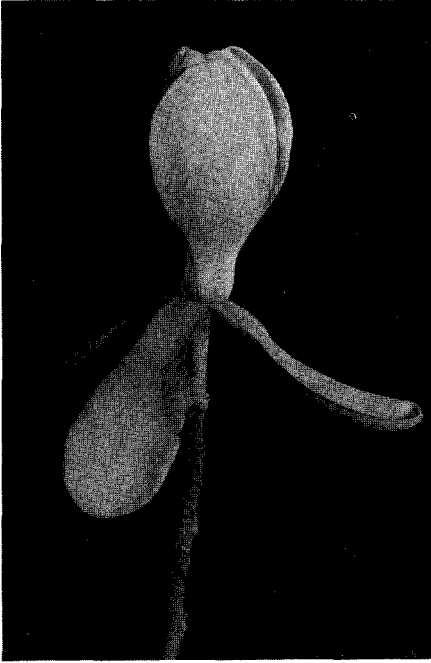
Leaves evergreen, coriaceous, shiny and dark green **above**, rusty-tomentose beneath, 4 to 9 inches long, 2 to 3 inches wide.

Twigs green to olive, stout.

Flowers white, often **purple** at base, **wax-like**, fragrant, 6 to 8 inches across. **April** to **August**.

Fruit conelike, **rose-colored**, rusty-hairy, **with** several one- to two-seeded fleshy **follicles**, 2 to 4 inches long, 1.50 to 2 inches wide. July to October.





Sweetbay

Large shrub or small tree up to 35 feet tall.

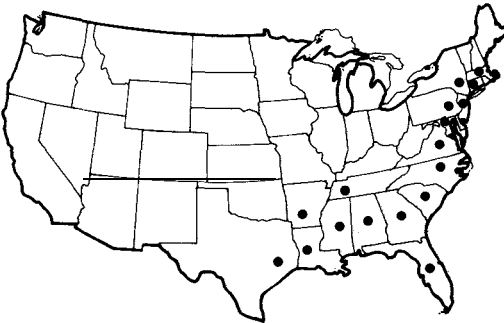
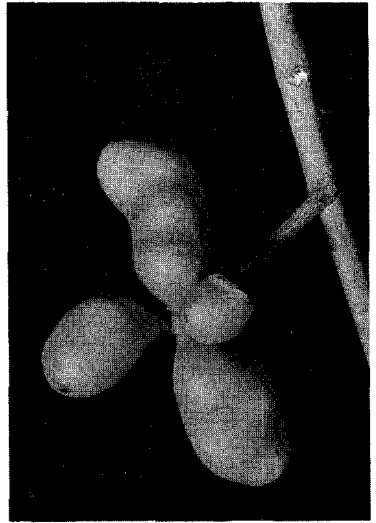
Leaves alternate, tardily deciduous in North or persistent; leathery, pungently aromatic, 3 to 6 inches long, 1 to 2.50 inches wide. Upper surface dark green, lower chalky white and often silky.

Bark gray, smooth or slightly furrowed on older plants, aromatic, bitter.

Twigs slender and bright green. Winter buds covered with fine silky pubescence.

Flowers white and fragrant, 2 to 3 inches broad. May to June.

Fruit a cone like aggregate of small to ovoid follicles, yellow or reddish when ripe. September.



***Sweetbay/Magnolia virginiana* L .**

Robert Kral

Virginia Polytechnic Institute and State University
Blacksburg, Virginia

Sweetbay is common on sites that are poorly drained or often flooded. Such sites are usually acid, but the species also grows in alkaline soils of ravines and hammocks.

It tolerates shade but is favored by logging of a swamp forest. Drainage and lowering of the water table may limit sweetbay to watervays. Burning of the shrub bogs causes sweetbay and many of its associates to be replaced by cane stands or by saw-palmetto in the longleaf and slash pine types. An increase of organic matter in the form of muck may reduce or eliminate sweetbay from the shrub bog.

Sweetbay somewhat resembles southern magnolia (*M. grandiflora* L.), loblolly-bay [*Gordonia lasianthus* (L.) Ellis], and redbay [*Persea borbonia* (L.) Spreng.]. It may be quickly distinguished by the startling whiteness of its under-leaf surfaces.

The seeds are readily eaten by squirrels, and lightly by other small mammals, songbirds, wild turkey, and bobwhite quail.

The leaves and twigs are browsed all year. Utilization by deer is generally moderate to heavy, depending on whether plants are abundant or scarce. In Florida forests where production was 115 pounds per acre, 38 percent of current growth was taken.

Cattle compete strongly for sweetbay. In winter 25 percent of their diet may consist of sweetbay browse.

Its persistent leaves, fragrant white flowers, and decorative fruit make sweetbay am-active to gardeners.

Plants usually produce some fruit annually but the yields are small. Seeds drop from cone soon after maturity.

Other common names: swampbay, sweetbay magnolia, whitebay, evergreen magnolia, laurel magnolia, swamp magnolia, southern sweetbay.

***Pines/Pinus* spp.**

Lowell K. Halls

Forest Service, USDA

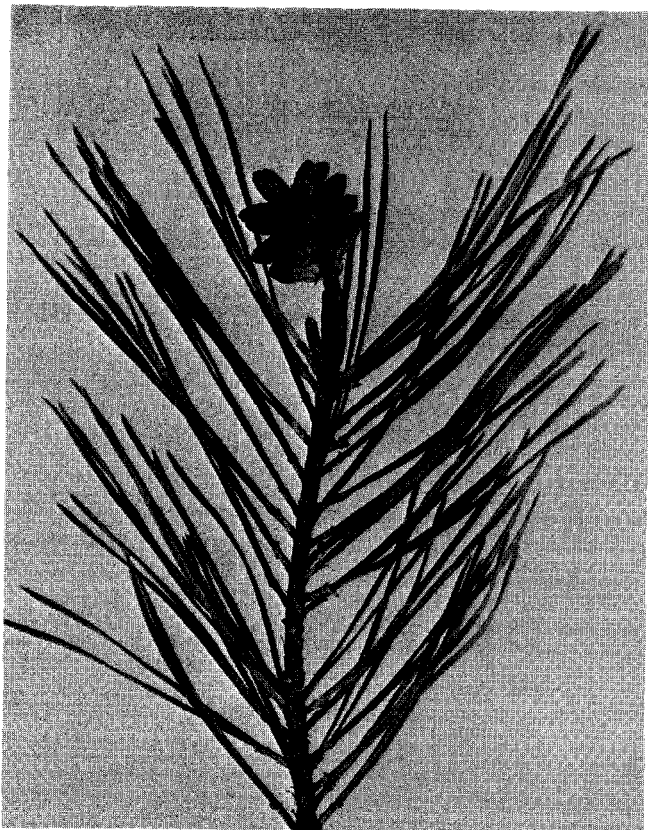
Nacogdoches, Texas

Pines are closely linked to wildlife and habitat values in the South. In some cases the relationship between pines and wildlife is beneficial and at other times conflicting. For example, pine seeds furnish food for many kinds of birds and small mammals. The seeds are second only to the oaks in importance as food to wildlife. Pine seeds are especially important to birds in the coastal pinelands and consumption may be so heavy as to jeopardize both natural and artificial regeneration of pine seedlings. Pine seed depredation can be averted on direct-seeded sites by treatment with repellents. In open-grown pine stands the associated species may provide valuable food and cover for many kinds of wildlife, but in extensive dense stands wildlife activity may be extremely limited. Young pines may be seriously damaged by some species of wildlife. Cottontail rabbits and possibly swamp rabbits often sever stems of newly planted seedlings. Eastern pocket gophers may eat the roots of pines they encounter in tunneling and may pull small pines into their tunnels. Deer may damage seedlings, especially newly planted seedlings in late winter.

Pinelands are the chief habitat for some birds such as the pine warbler, brown-headed nuthatch, and Bachman's sparrow. Old-growth stands are indispensable to the existence of the rare red-cockaded woodpecker. Pine needles are eaten by grouse. The evergreen foliage is year-around wildlife cover. Larger pine trees are favorite roosting places for many birds, including the robin, wild turkey, and mourning dove. Such trees serve as nesting sites for the bald eagle and mourning dove. Pine needles are used as nesting materials by several kinds of birds.

Pines are monoecious. Male cones are borne in late winter or early spring in clusters at the tips of the preceding year's branches. They are elongate-cylindric, mostly dangling, and consist of numerous spirally arranged stamens. They wither after pollen is shed. Female cones are borne on newly emerging shoots just forward of a cluster of staminate cones. After pollination the ovulate cones become hard and woody.

The winged or wingless seeds of pine are borne in woody cones that mature at the end of the second year. They may shed promptly or remain attached to the tree, sometimes not opening.



Sand Pine

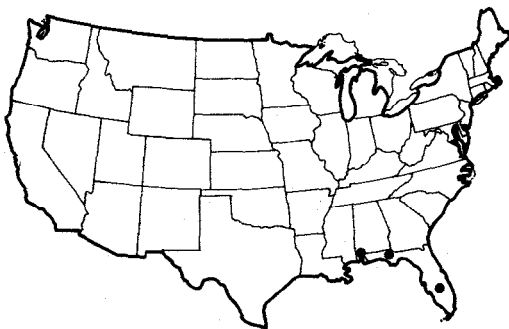
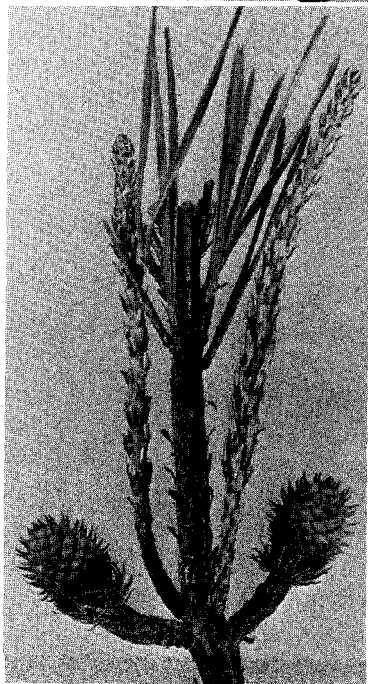
A tree up to 60 feet high, usually with crooked bole.

Needles in two's, 3 to 4.50 inches long, slender, flexible.

Twigs smooth and slender, much branched.

Flowers December and January.

Mature cones 2 to 4 inches long, persistent and unopened for many years, short, prickless. October.



S hortleaf Pine

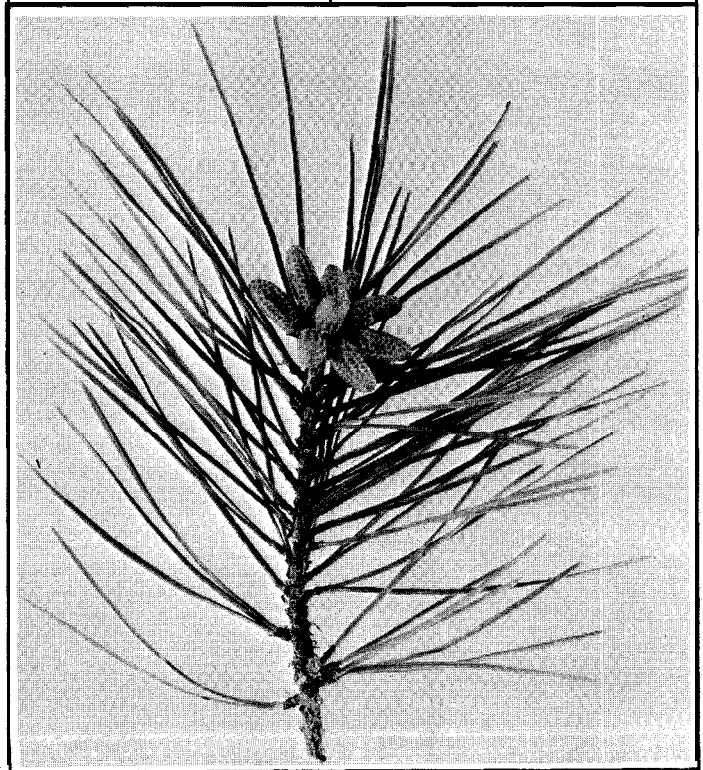
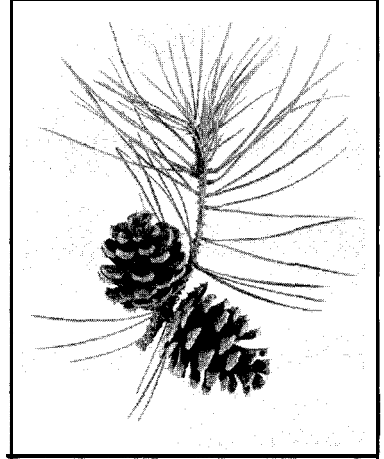
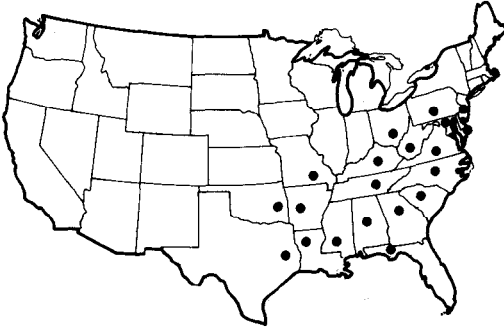
A fast-growing tree up to 100 feet tall and 2 feet in diameter at breast height.

Needles usually two in cluster, sometimes three, 3 to 6 inches long, slender, dark bluish-green.

Twigs stiff, stout, brittle, brownish to greenish purple at first, dark red-brown to purple later.

Flowers March to April.

Cone solitary, sessile, or short stalked, 1.50 to 2.50 inches long, persistent on branches, each scale has two triangular seeds about 0.25 inch long, wing about 0.50 inch long. October and November.



Pine cones are a source of food for squirrels. Squirrels eat or cut pine cones when they are still green and in the dough stage in late summer, then again in late winter when the cone has matured and dropped off. Pine cones are poor quality food but an important source of food during stress periods. Fox squirrels use more cones than gray squirrels.

Seeds from the cones are sought by several kinds of birds and mammals. Wild turkey eagerly pick the loosened seed from fallen cones. The seeds are preferred food for quail and grouse and for many kinds of songbirds, particularly the chickadees, crossbills, grosbeaks, jays, nutcracker, nuthatches, warblers, and woodpeckers. The seeds, bark, and foliage are eaten by bears, beavers, and rabbits. Squirrels eat the seeds and also the catkins.

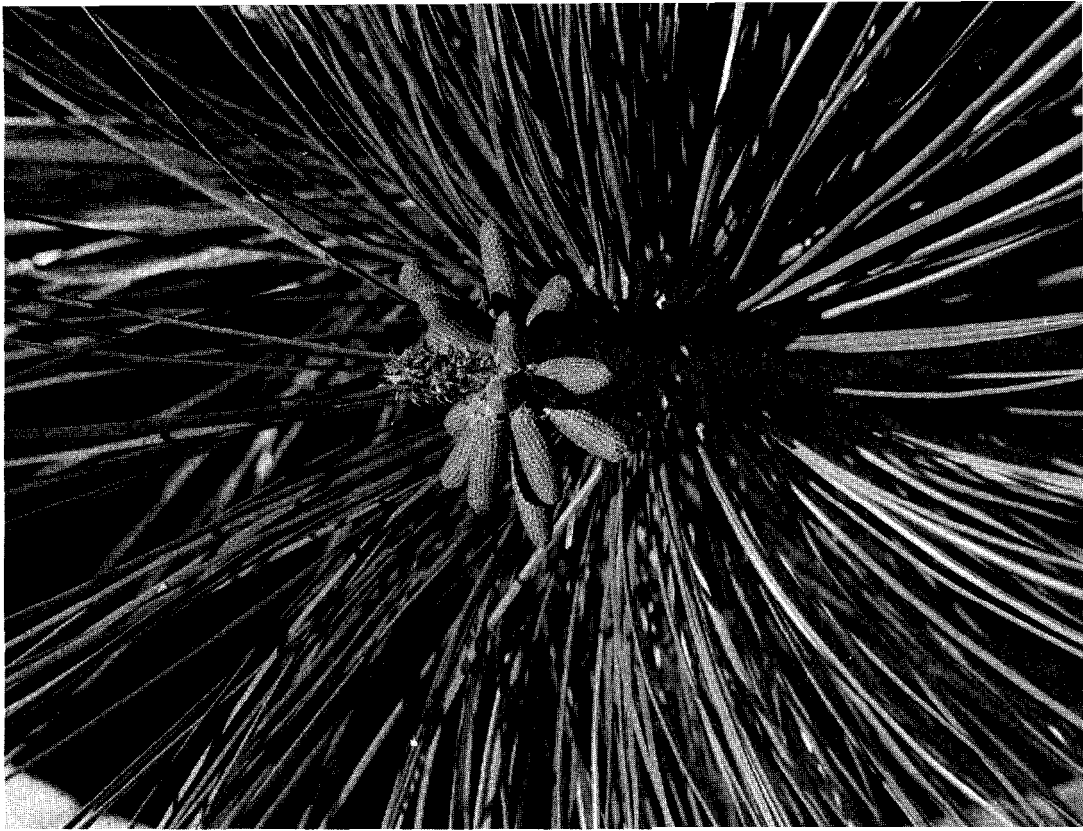
Foliage of pine seedlings may be grazed by deer, especially the planted seedlings from nursery stock, but it is usually an emergency food and rarely contributes a substantial part of deer diet.

Seven species of pine provide significant food (mainly seeds) and cover for wildlife in the South.

Sand pine [*P. clausa* (Chapm.) Vasey] grows mainly in Florida on light, sandy, infertile and slightly acid soils derived from deep deposits of marine sand and clay. In parts of north central Florida (Ocala National Forest) the species grows in dense, even-aged pure stands that originated as a direct result of fire. In west Florida sand pine does not need fires to reproduce; thus, it frequently occurs in uneven-aged stands and often invades oak lands. Trees bear cones at about 5 years of age, and heavy cone crops are usually produced every year. Cones remain closed for several years on standing trees until death or a fire occurs, and seed availability to wildlife is erratic. Cones on harvested trees will open when the surface temperature of the soil is high. There are about 75 seeds per cone.

Shortleaf pine (*P. echinata* Mill.) grows across the South on a wide variety of soils but does best on fine sandy loams or silt loams that have no distinct profile and have good internal drainage. Trees begin to bear seed at 5 to 20 years of age, and good to excellent crops occur at intervals of 3 to 6 years. Cones yield about 25 to 35 seeds. Seeds generally begin to fall in late October and about 90 percent fall by late December. Shortleaf pine is quite resistant to fires and young shortleaf pines sprout readily after a fire or grazing.

Slash pine (*P. elliotii* Engelm. var. *elliotii*) is common in the lower Coastal Plain on sandy soils that are often underlain with poorly drained hardpans. Outside the flatwoods it usually occurs in narrow



Slash Pine

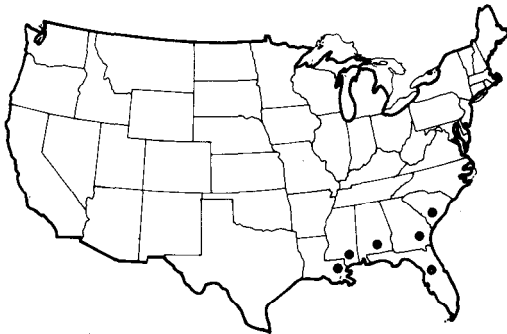
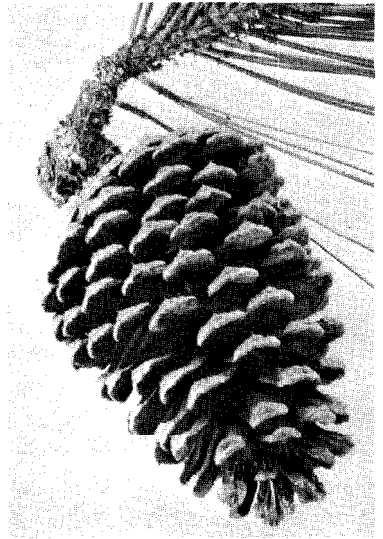
A rapid-growing tree **up** to 100 feet tall and 3 feet **in** diameter at breast height.

Needles two to three **in** clusters, 5 to 10 inches long at end of twig, dark lustrous green.

Twigs stout, **orange** to brown, buds with **silvery-brown scales**, terminal bud **large**, 1 **inch** long, 0.25 to 0.50 **inch** thick.

Flowers January to February, **before** new **leaves**.

Cone 2 to 6 inches long, 2 to 3.50 inches wide, **scales** with curved prickles; seeds 0.25 **inch** long, triangular, wing 0.75 to 1 **inch** long, thin. September and October.



Longleaf Pine

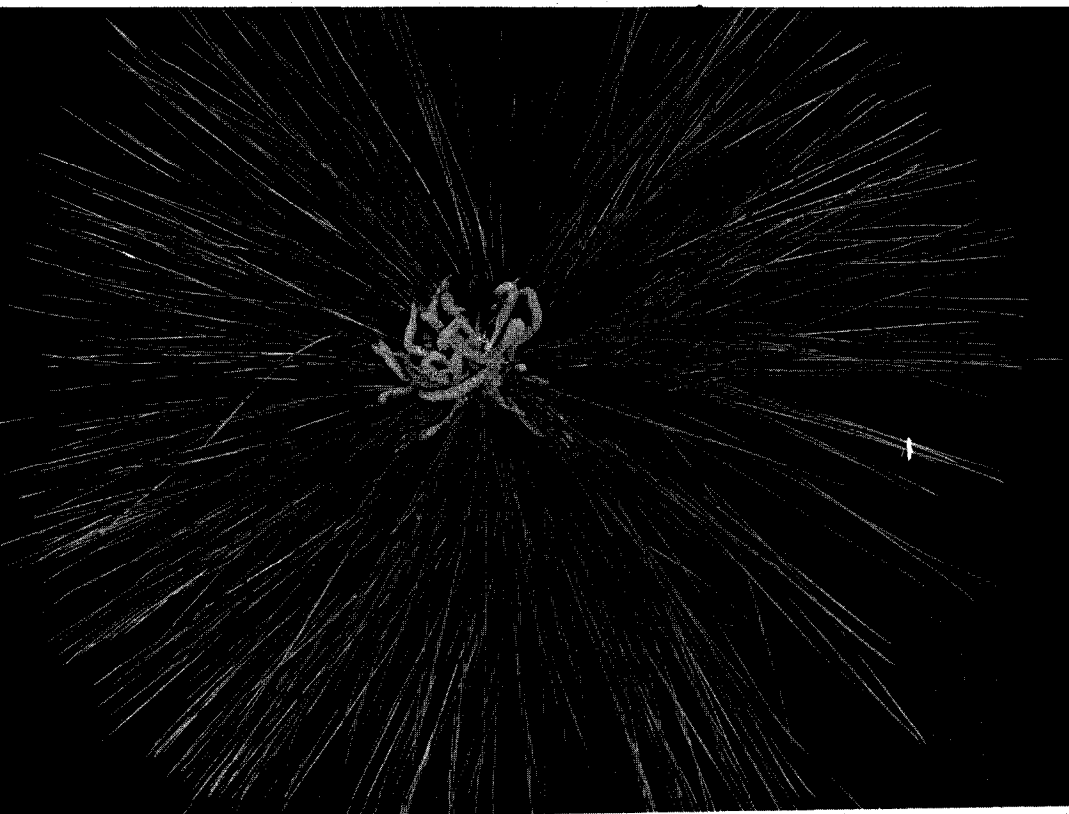
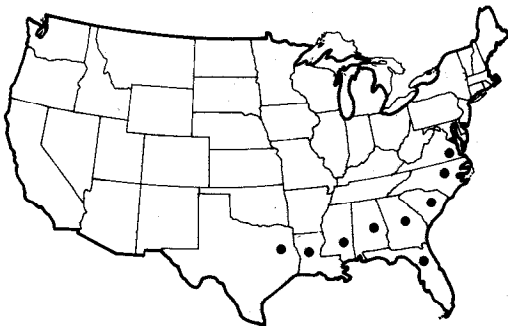
A tree up to 125 feet **tall** and 4 feet **in** diameter.

Needles **in** three's, flexible, slender, 10 to 15 inches long.

Twigs stout, scaly, orange-brown, buds long, white silvery, scaly.

Flowers February to April.

Cones 6 to 12 inches long, recurved spines. Seeds triangular, ridged, 0.25 to 0.50 inch long, thin wing 1.50 inches long. September and October.



bands along creeks, bays, and minor drainages. Seed production begins when trees are 7 to 10 years old or more than 4 inches in diameter at breast height. There are about 87 seeds per cone. More than 75 percent of the seeds fall during October. The seedlings are easily killed by fire, but after trees are 12 to 15 feet tall winter fire does little damage.

Longleaf pine (*P. palustris* Mill.) grows in sandy soils low in organic matter and medium to strongly acid. It is associated with scrub oaks (especially turkey and bluejack oaks) on sandy ridges and with slash pine and hardwoods on moister sites. Longleaf begins to bear seed when it is about 6 inches in diameter at breast height. Some open-grown trees will bear cones every year, but good crops are sporadic. Longleaf seeds are the largest of southern pine seeds; mature cones contain 50 to 60 seeds. Seeds fall from September to December, mostly within a 2-week period. Longleaf pines are exceptionally resistant to fire except in the first year after germination and later when 0.50 to 3 feet tall. With complete protection from fire, other pines and hardwoods invade longleaf sites.

Open longleaf stands are more appropriate than dense stands for wildlife because of the more consistent seed production from trees with well developed crowns and because of the herbaceous understory. When prescribed burned frequently, the stands are especially good habitat for bobwhite quail. Because of their large size, longleaf pine seeds may provide a substantial part of wildlife food on upland areas, particularly for fox squirrel and bobwhite quail. Hogs eat the seeds and the thick succulent root bark of young seedlings and saplings. Goats and sheep can do considerable damage to young plants.

Eastern white pine (*P. strobus* L.) grows on most all sites within its range but best on well drained sandy soils. It begins to bear seeds at 5 to 10 years of age. Trees 50 or more years old have yielded well in over 400 cones. The number of good seeds per cone ranges up to 73. and most of the seeds are dispersed in August and September. Resistance to fire is low because of the thin bark on the stem and exposed roots.

Loblolly pine (*P. taeda* L.) grows on a variety of soils from the poorly drained flatwoods of the lower Coastal Plain to the old residual soils of the upper Piedmont. It grows best on soils with poor surface drainage, a deep surface layer, and a firm subsoil. Loblolly pine often grows in pure stands where moisture is plentiful, but it also grows in mixtures with shortleaf pine and with many hardwoods, particularly sweetgum, oaks, and hickory.

Trees produce their best crops of seed when 35 to 60 years old. Seed production fluctuates greatly among years, from negligible

Eastern White Pine

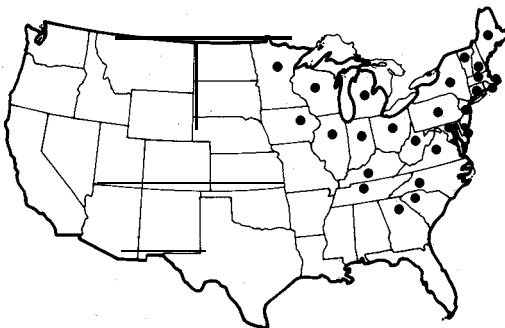
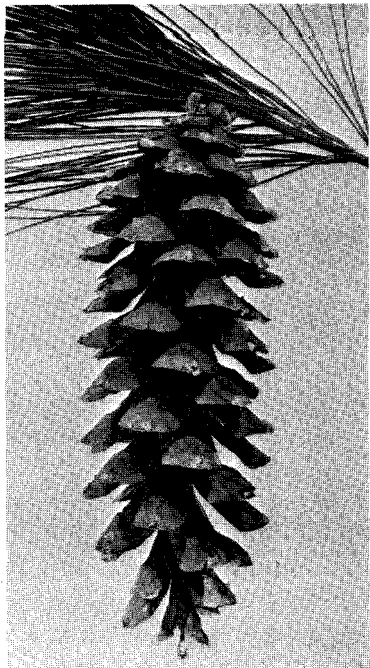
A tree 80 to 100 feet high and 2 to 3.50 feet in diameter at breast height.

Needles 3 to 5 inches long in five's.

Twigs orange-brown, glabrous, buds covered with thin reddish or orange-brown scales.

Flowers May to June.

Cones 4 to 8 inches long, seeds 0.25 inch long, wings 0.75 inch long. August and September.



Loblolly Pine

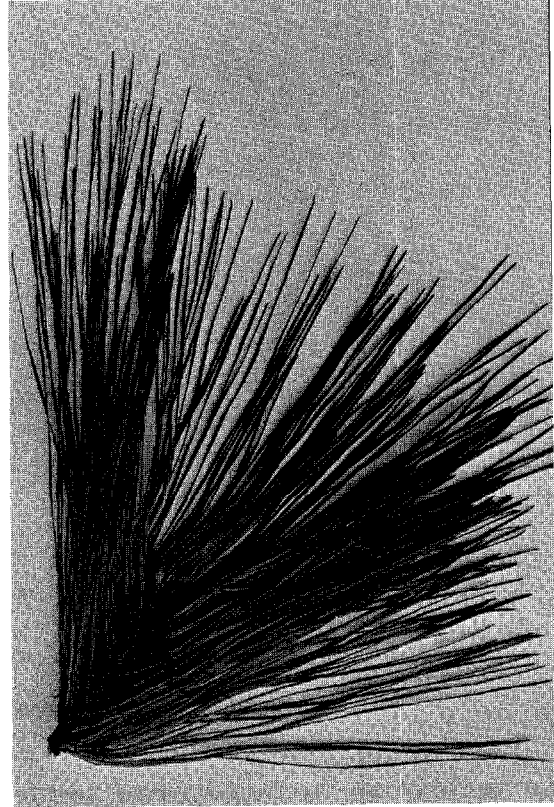
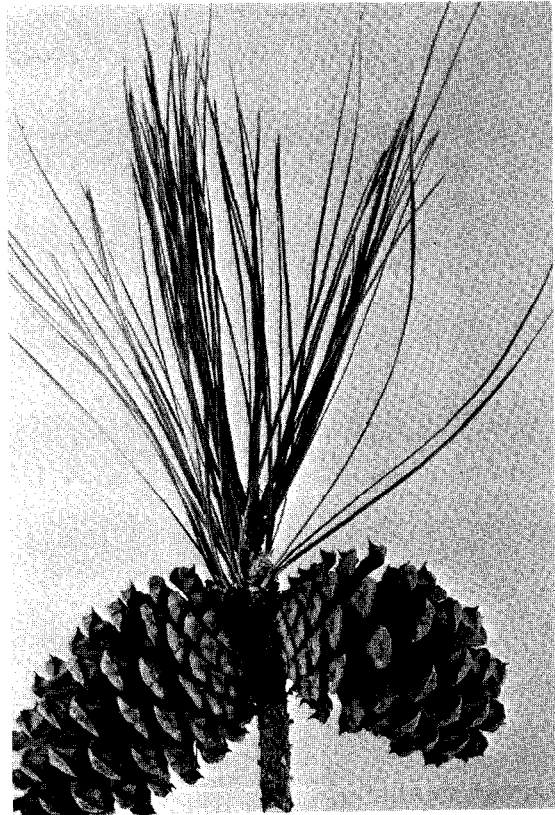
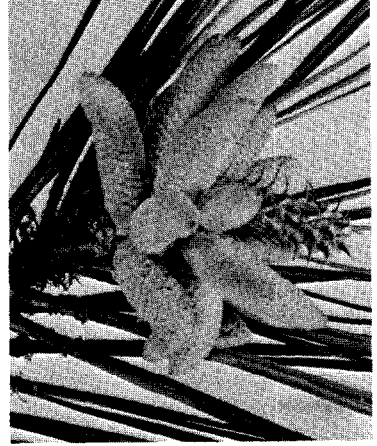
A fast-growing tree 90 to 110 feet **tall** and 2 to 2.50 feet **in** diameter at breast height.

Needles are 6 to 9 **inches** long **in** fascicles of three, persistent **till third season**.

Twigs stout, reddish-brown, scaly, buds covered with reddish-brown **scales**.

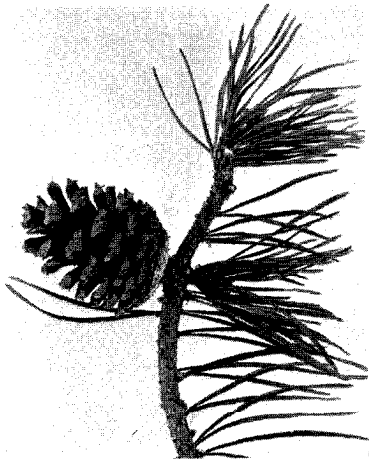
Flowers March to April.

Cones 2 to 6 inches long, two seeds on each scale, 0.50 inch long, thin wing 0.75 inch long. **October**.





Virginia Pine



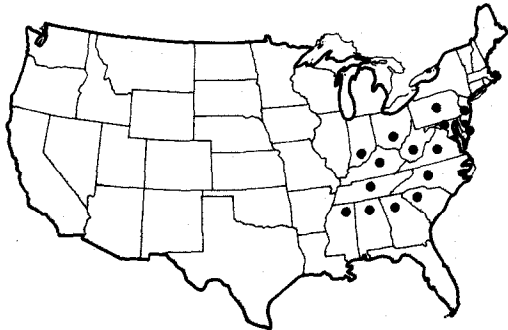
A **small** to medium tree **up** to 40 feet high and 12 to 15 inches **in** diameter at breast height.

Needles 2 inches **long in** fascicles of two.

Twigs **have** thin skin.

Flowers **March** to May.

Cone 1 to 3 inches long, sessile, two seeds **in** scale, empty **cones persistent** for 5 to 15 years **on** tree, seeds 0.25 **inch long**, wing 0.33 **inch** long. September to November.



amounts to bounteous crops. Seeds per cone range from 20 to 200, with an average of about 57. Seedfall usually begins the early part of October, and 80 to 90 percent fall by January. Birds and rodents eat many seeds but apparently not enough to hinder regeneration except in poor seed years. Young loblolly pines are ver-y susceptible to fire.

Virginia pine (*P. virginiana* Mill.) grows in the Piedmont, on the foothills of mountains, and on the western edges of the northern Coastal Plain on a wide variety of soils, but best on clay, loam, or sandy loam. It often grows in pure stands, usually as a pioneer transitional type that is eventually replaced by climax hardwoods. Open-grown trees may produce seeds as early as 5 years of age, but in dense stands cone production is delayed up to 50 years. Seeds fall in October and November, however, many cones remain closed for several months or years. Young trees are particularly vulnerable to fire because of their thin bark. Surface fires may cause considerable damage even to old trees.



Legumes

LEGUMES

Legumes are dry fruits which open longitudinally along two sutures and have one or more seeds borne along one suture. The close relationship of the many members of the legume family is shown by their pea-like flowers, pod-like fruits, and compound leaves.

The seeds of native legumes are eagerly sought by many kinds of wildlife, and the cultivated species such as the beans and peas are a major source of food for humans and livestock.

Legumes are characteristically high in crude protein and phosphorus.

Honeylocust/Gleditsia triacanthos L.

Lowell K. Halls

Forest Service, USDA

Nacogdoches, Texas

This species is found most commonly on the alluvial flood plains of major rivers and on soils of limestone origin at elevations below 5,000 feet. It develops a strong taproot and a profusely branched root system that penetrates 10 to 20 feet deep.

Honeylocust is intolerant of shade and to survive and mature it must retain a dominant position in the stand. Its common associates are red maple, blackgum, persimmon, pecan, oaks, elms, ashes, and hickories. On some disturbed soils it is a pioneer species. It matures in about 120 years.

Honeylocust fruit is eaten by rabbits, squirrels, bobwhite quail, and white-tailed deer. Young plants are preferred forage for rabbits. The sweet seed pods are eaten by cattle and by deer, and the flowers are reportedly a good source of bee food. The seeds are high in crude protein and phosphorus.

Optimum fruit production occurs when trees are 25 to 75 years old. Good seed crops are produced every year or two, and some seed each year.

There are several methods recommended for pretreatment of seeds before planting: soak in water for a short period at 185° to 195°F, scarify or soak in concentrated sulphuric acid at 60° to 80°F for 1 to 2 hours.

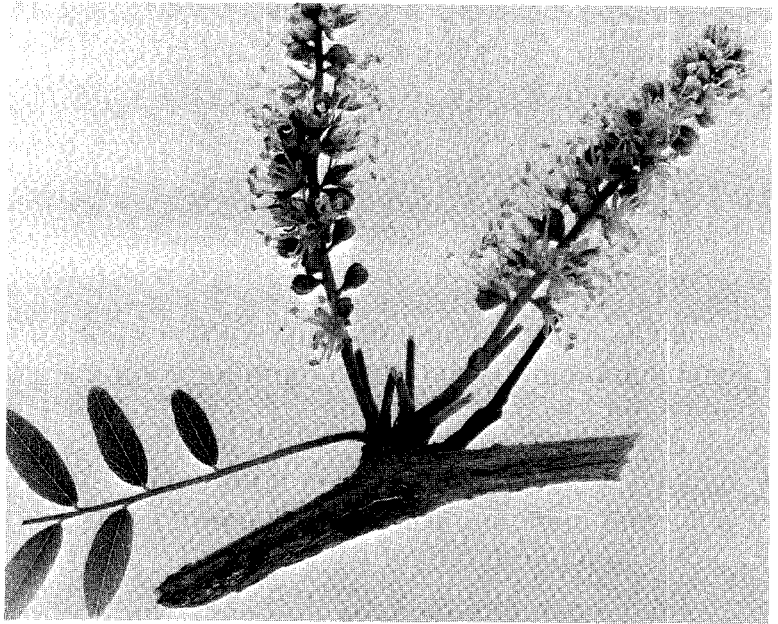
Seed germination is thought to be increased by passage through digestive tracts of birds and mammals.

Honeylocust can be propagated by grafting, by budding, and from hardwood, greenwood, and root cuttings. It sprouts freely.

It is relatively free of insects and disease but is easily damaged by fire.

Honeylocust has been in cultivation for many years and is often planted as an ornamental, particularly the thornless kind. The wood is used for farm implements, fuel, lumber, posts, vehicles, furniture and railroad cross-ties.

Other common names: honey-shucks, sweet locust, thorny locust, ~~three-thorned~~ acacia, common honeylocust.



Honeylocust

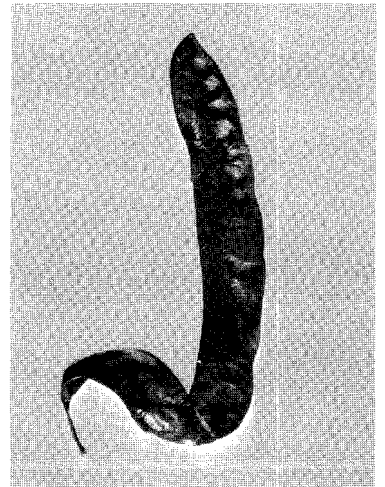
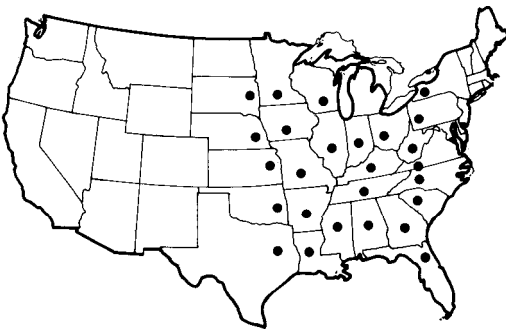
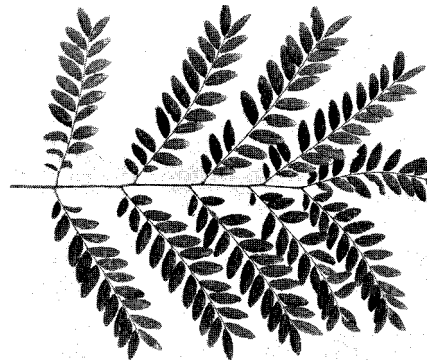
A tree, 70 to 80 feet tall up to 140 feet, 2 to 3 feet in diameter at breast height, maturity in about 120 years. Thorny trunk and branches and a loose open crown.

Leaves once or twice pinnate, 5 to 10 inches long, deciduous; 15 to 20 leaflets, 0.75 to 2 inches long.

Twigs zigzag with long, brown, stout spines, usually branched, winter buds minute, three to four together, naked and scaled, terminal bud lacking, thorns absent near top of tree.

Flowers minute, greenish or whitish in narrow clusters at nodes of previous year. May to June.

Fruit a legume, linear, 0.50 to 1.50 feet long, flat, dark brown, slightly cm-ved and twisted, contains many hard, brown seeds. September to October.



***Black Locust/Robinia pseudoacacia* L.**

Donald D. Strode

Forest Service, USDA

Washington, D.C.

Black locust thrives in deep, well-drained, fertile loams. Limestone soils are especially favorable. It does not grow well on very sandy, very acid, or wet soil. It is shallow rooted and thus sensitive to soil conditions that impede or produce excessive aeration and drainage. It is highly susceptible to frost damage.

In forest stands it occurs in groups or singly, but on burned-over forest or cleared land it often develops pure stands. Best seed crops occur when trees are between 15 and 40 years of age. Heavy seed crops occur at 1- or 2-year intervals, with light crops in between. Seed pods open while on the tree during winter and early spring. Few seeds germinate without delay because of the impermeable seed coat, but seeds can be softened with sulfuric acid or by soaking in hot water.

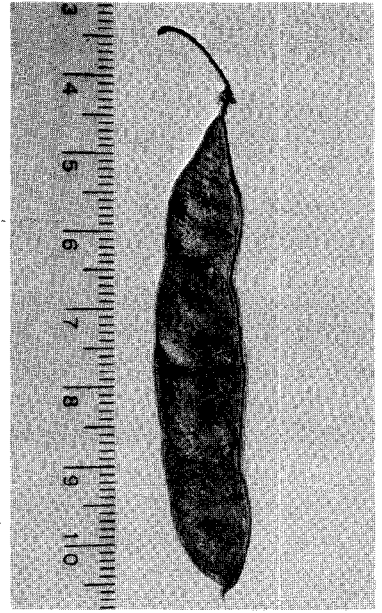
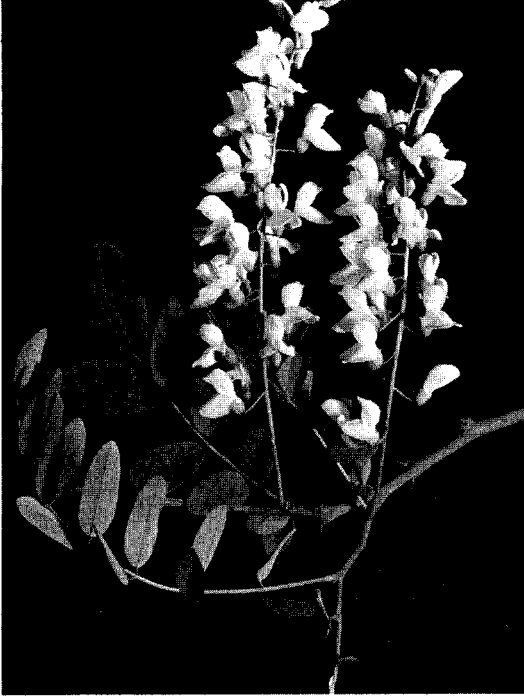
Black locust is very intolerant to shade and is not found in dense woods except as a dominant tree. Where it has room, its rapid growth enables it to compete successfully with more tolerant trees. It usually matures in 20 to 30 years, but trees may live for 40 years or more before they show signs of deterioration resulting from attacks by fungi and insects. The locust borer is the most serious insect enemy. Iron deficiency and damping off are the most serious seedling diseases.

Black locust seeds are consumed to a limited extent by bobwhite quail and other game birds and by squirrels. Foliage is browsed by deer during the seedling stage. Despite its widespread distribution it does not rate high as a wildlife plant.

The seeds are very high in crude protein and phosphorus, high in crude fat, and low in calcium.

Black locust heartwood is highly resistant to decay, therefore, it is used extensively for fence posts and other wood products in contact with the soil. The tree is often used as an ornamental. Being a legume, it enriches the soil. Because of its wide-spreading root system it is often planted for erosion control.

Other common names: yellow locust, locust, white locust, green locust, post locust, and false acacia.



Black Locust

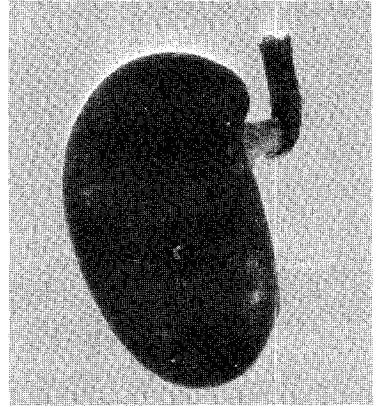
A rapid-growing spiny tree attaining a height of 100 feet, with a trunk diameter of 30 inches.

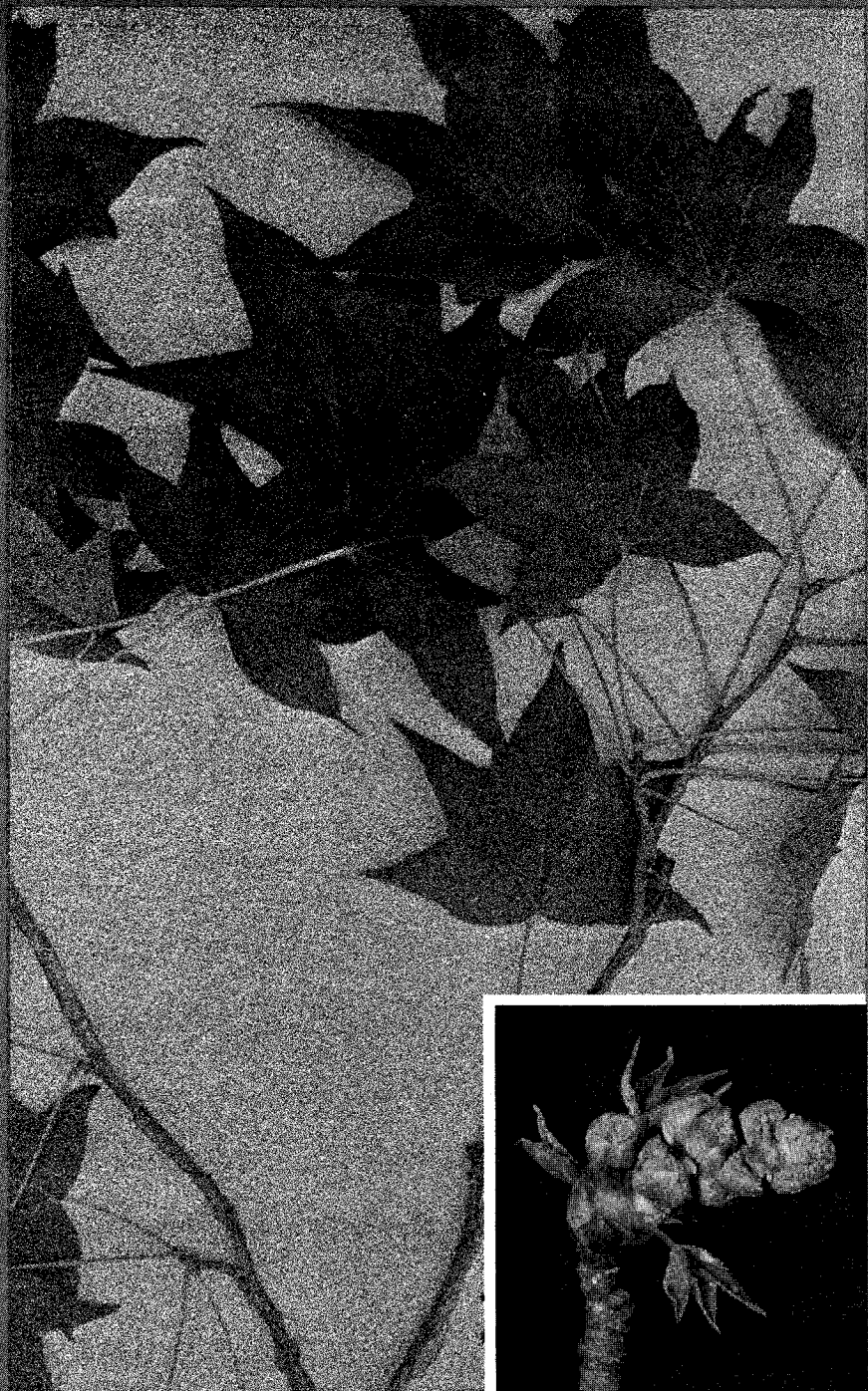
Leaves pinnately compound, alternate, **deciduous**, 8 to 14 inches long; 7 to 19 leaflets, 0.50 to 2 inches long; mature leaves bluish-green and glabrous above, paler and glabrous beneath.

Twigs stout, zigzag, brittle, greenish-brown, glabrous, two spines from twig at each leaf, pith homogeneous, no terminal buds, lateral buds naked, leaf scars **ovate**, three bundle scars.

Flowers **loose** pendant racemes, 4 to 5 inches long, individual flowers bonnet-shaped, 1 inch long, white, fragrant. May to June.

Fruit a flattened, linear legume, 2 to 5 inches long, 0.50 inch wide, persistent, seeds four to eight, hard flat, kidney-shaped. September to October.





Capsule

A capsule is a dry dehiscent fruit composed of more than one carpel. In sweetgum the capsules are fused at the base into a round prickly head, each capsule with one or two winged seeds.

CAPSULE

The seeds are high in crude protein, crude fat, phosphorus, and calcium.

***Sweetgum/Liquidambar styraciflua* L.**

Thomas Hooper

Ouachita National Forest
Russellville, Arkansas

Sweetgum is typically a southern species found on moist, moderately rich alluvial soils. However, it is found on a great variety of sites and soils and in association with many species of the various hardwood mixtures as well as certain pine types throughout the southeastern United States. It is rapid-growing, long-lived; and fairly free from insects and disease. As a hardwood it is exceeded in abundance and commercial harvest only by the oak group.

Sweetgum is an early succession plant on disturbed sites, being a prolific seeder that also sprouts readily from roots and stumps after fire, root disruption, and heavy logging. Because of the species' intolerance to shade, it reproduces only on cleared areas and grows as dominant and codominant trees in the forest. The tree seems to be preferred by squirrels for building leaf nests, and the larger trees are commonly used as dens by squirrels and fur-bearers. Beavers have a liking for this species, which in turn has an unusual tolerance of the animal; a high percentage of beaver-attacked trees survive.

When sweetgum first begins to mature in July or August, squirrels and chipmunks eat the seeds and continue to take them in quantity on through September. Squirrels eagerly seek the buds in spring. In November and December, after the seed balls have opened, bobwhite quail, doves and wood ducks eat seeds that drop to the ground. In Florida, sweetgum seeds were found in 130 of 1,659 quail examined, and several birds had taken as many as 800 seeds. The seeds were up to 8.5 percent of the bobwhite's diet during the month of December. The seeds are an incidental food for wild turkeys.

In good crop years a single tree may produce as much as 30 pounds of fruit (dry weight), and up to 2 pounds of seeds. Bumper crops are produced every 2 or 3 years. The seed is disseminated soon after maturity. Propagation by sprouts is possible but is unsatisfactory for commercial timber production. Propagation is mainly by seeds, and in commercial plantings seeds should be stratified 30 to 90 days, or water soaked 15 to 20 days before sowing in the spring.

Sweetgum may make a tall, straight stately shade tree in a rather short time. It has no showy flowers, but the leaves take on some brilliant fall colors. The spiny seed balls detract from its yard value.

Sweetgum

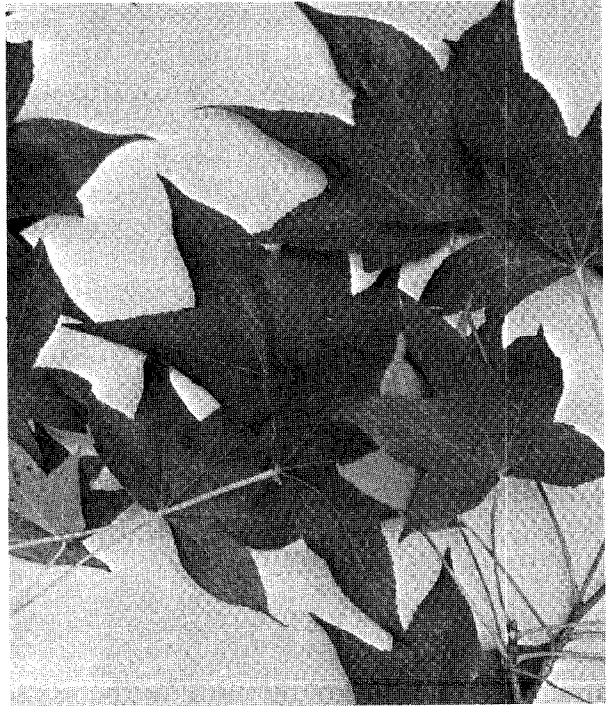
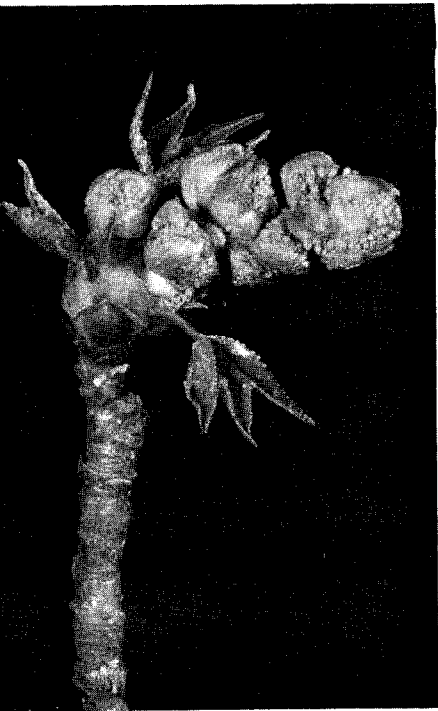
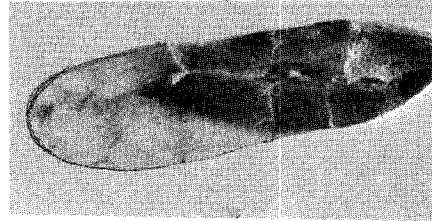
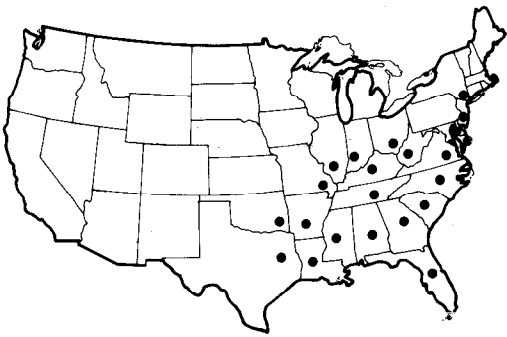
A tree attaining heights up to 150 feet and diameter of up to 48 inches.

Leaves are simple, alternate, deciduous, 3 to 9 inches wide with three to seven lobes, glabrous and glossy above, pubescent along veins beneath, aromatic when bruised.

Twigs rusty-red, glabrous with wide corky wings, or without wings, bark rough, deeply furrowed, brown to grey.

Flowers monoecious, very small, greenish. March to May.

Fruit 1 to 1.50 inches diameter, spinose; seed light brown. September to November, persistent.



The wood is used for flooring, furniture, veneers, general construction, boxes, wooden ware, and several other wood products.

The resinous gum has been used for medicinal purposes, as a perfuming agent in soap, and as an adhesive. It is sometimes chewed by children.

Sweetgum is injured by fire, particularly summer burns. If the sapwood is not killed by fire, a protective layer of gum will form over the wood. However, with repeated fires the fungi and insects may become established and cause extensive damage or death.

Other common names: American sweetgum, redgum, sapgum, whitegum, alligator tree, bilsted.



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APPENDIX

Table 1. — Chemical *composition and size of fruits and seeds, and seed-bearing* characteristics of *plants*.

Plant groups and species	Chemical Composition					Size			Seed-bearing characteristics of plants		References	
	Part analyzed	Crude protein	Crude fat	Crude fiber	NFE or total carbohydrates	P	Ca	Fruits	Seeds	Minimum age		Interval between large crops
Percent of dry weight.....							Avg. number per pound	Years	Years			
Pomes												
Amelanchier canadensis	Fruit	8.1	4.4	12.3	71.5				50,000			20
C. brachyacantha	Fruit	3.9	8.2	29.2	58.3	.13	.13					17
C. crusgalli	Fruit	2.8	3.3	32.8	57.4	.04	.42					20
C. marshallii	Fruit	7.8		47.3		.14	1.56					10
	Fruit	8.8	8.6	34.2		.14	.91					16
Pyrus malus									20,000		2	19
Drupes												
Berchemia scandens	Fruit	6.0	5.7	41.5	46.2	.10	.47	10,000		3	1	9,17
Callicarpa americana	Fruit	5.5			53.6	.12	.26	32,500		2	1-2	9,10
	Fruit	6.9	8.4	30.5		.32	.25					17
Celtis laevigata	Seed	7.2	4.5		34.8*	.21	.88	2,200	6,000	15		1,16
C. occidentalis	Fruit	9.5	6.9	8.9	60.0	.30	1 1 . 3 0	2,050	4,300			16,17
	Fruit	8.3	4.4	7.7	52.9	.22	1 2 . 4 0					20
Chionanthus virginicus								630	1,800	5-8		6
Cornus florida	Fruit	5.6	16.7	38.2	37.7	.25	1.50	3,200	4,500	6	1-2	9,16,17
	Seed, de-pulped	5.0	6.2		14.7*	.09	1.9					
	Seed, intact	4.0	20.5		18.3*	.13	1.2					2
	Fruit	5.9				.12	1.7					10
Gaylussacia dumosa	Fruit	2.5	3.9	23.3	69.5	.06	.21		350,000			B
	Seed	4.9	5.1	54.9	34.6	.10	.33					B

Table 1. — Chemical composition and size of fruits and seeds, and seed-bearing characteristics of plants.(Continued)

Plant groups and species	Chemical Composition						Size		Seed-bearing characteristics of plants		References	
	Part analyzed	Crude protein	Crude fat	Crude fiber	NFE or total carbohydrates	P	Ca	Fruits	Seeds	Minimum age		Interval between large crops
		--Percent of dry weight ..					Avg. number per pound		Years	Years	
<i>Ilex decida</i>	Fruit	7.4	11.3	35.2	45.6	.11	.28					17
<i>I. glabra</i>	Fruit	5.1	9.0	11.4	72.5	.09	.41		29,000		1	16,B
	Seed	18.1	15.8	28.1	35.5	.30	.81					
<i>I. opaca</i>	Fruit	4.7	7.9	34.0	52.8	.09	.40		28,430	5		16,17
<i>I. vomitoria</i>	Fruit	6.2						6,200	37,800	4	1-2	9,10,16
	Fruit	6.8	7.7	29.9		.09	.16					17
<i>Morus rubra</i>	Seed,											
	intact	11.6	3.8		16.9 ¹	.22	.77	3,900	360,000	10	2-3	2,9,16
<i>Myrica cerifera</i>	Fruit	5.3	23.2	30.0	41.1	.04	.28		84,000			16,17
	Fruit	5.6	21.8	42.0	29.0	.04	.26					11
<i>M. pensylvanica</i>	Fruit	7.1	24.8	41.5	24.9	.03	.13		55,000			11,16
<i>Nyssa aquatica</i>								215	456	30	1-2	16
<i>N. sylvatica</i> var.												
<i>sylvatica</i>	Seed	3.5	10.4		14.51	.18	.06		3,380			1,16
	Fruit	6.4	14.4	35.8	42.7	.35	.31					17
<i>N. sylvatica</i> var. <i>biflora</i>									2,415			16
<i>Prunus pensylvanica</i>									14,200	2		16
<i>P. serotina</i>	Seed,											
	intact	7.8	4.9		20.8 ⁷	.16	.22		4,240	5	1-5	2,16
	Seed											
	de-											
	pulped	13.7	1.8		15.3 ⁷	.14	.14					1
	Fruit	13.9	7.0	32.7	43.0	.20	.42					11
<i>P. umbellata</i>	Fruit	7.5	8.6	26.5	56.9	.28	.20					17
<i>P. virginiana</i>	Fruit	6.8	6.3	20.9	63.3	.07	.16		4,790			16,20

	Seed	13.1	15.7	50.9	18.8	.19	.18						20
Rhus copallina var copallina	Fruit	7.4	26.1	26.8	39.1	.32	.13	57,000					16,17
	Pulp	5.5	10.8	20.7	57.6	.10	.85						11
	Seed	13.4	12.9	29.7	41.8	.37	.14						11
R. glabra	Fruit	6.4	22.4	30.4	40.0	.35	.27	23,000- 48,000	49,000	3-4			16,17
	Fruit	6.1	11.2	34.9	47.3	.16	.16						20
	Seed, intact	2.4	14.2		16.81	.08	.28						2
R. radicans													
R. typhina							30,000	53,300					16
Rubus spp.	Fruit	5.8	4.9	21.5	64.4	.19	.33						11
Sambucus canadensis	Fruit	11.7	16.0	22.4	48.7	.75	.36	232,000			1		16,17
	Fruit	11.1	12.9	17.9	52.6	.36	.13						20
Sassafras albidum	Seed	17.1	46.6		13.6	.23	.06	2,800	5,800	4	2-3		1,9
Viburnum acerifolium								4,800	13,100	2-3	1		16
V. alnifolium								7,580	11,500			3-4	16
V. cassinoides								3,000	27,600		1		16
V. dentatum	Fruit	6.4				.14	.46		20,400	3-4			10,16
V. nudum	Fruit	6.3	12.8	13.3	67.2	.17	.18						17
V. rufidulum	Fruit	4.6	12.7	12.5	69.9	.11	.17	2,300		5			9,17
Benies													
Diospyros virginiana	Pulp	3.3	.9	5.3	87.4	.12	.08		1,200	10	2		11,16
	Seed	4.6	2.0	23.6	63.0	.20	.13						11
	Seed	9.1	2.0		26.6 ¹	.20	.03						1
	Fruit	6.1	3.3	10.9	79.4	.11	.10						17
Juniperus virginiana	Seed	5.6	6.8		79.8 ⁺	.14	.40		43,600	10	2-3		1,16
	Fruit	5.3	14.8	31.5	46.3	.17	.84						17
Lonicera japonica	Fruit	6.2	3.8	9.3	80.0	.15	.49	8,000		3			9,17
	Fruit	10.4	7.8	6.6	69.4	.31	.66						11
Smilax bona-nox	Fruit	11.1	7.8	18.6	62.1	.15	.19	5,700		4			9,17

Table 1.— Chemical composition and size of fruits and seeds, and seed-bearing characteristics of plants. (Continued)

Plant groups and species	Chemical Composition						Size		Seed-bearing characteristics of plants		References	
	Part analyzed	Crude protein	Crude fat	Crude fiber	NFE or total carbohydrates	P	Ca	Fruits	Seeds	Minimum age		Interval between large crops
		Percent			of dry weight			Avg. number per pound		Years		Years
S. glauca	Fruit	9.8	8.2	17.9	63.7	.13	.14					17
	Fruit	10.2	7.5	18.6	60.8	.16	.25					11
S. laurifolia	Fruit	8.9	6.4	17.8	66.5	.23	.09					17
S. rotundifolia	Fruit	7.6	4.1	23.0	64.9	.13	.19	5,900		6		9,11
Vaccinium arboreum	Fruit	3.4										10
	Fruit	3.9	12.2	20.3		.05	.33					17
	Seed, intact	3.0	2.9		33.6'	.06	.33					2
Vaccinium stamineum	Fruit	3.8	5.5	11.2	78.0	.05	.05					20
Vitis aestivalis	Fruit	9.1	14.9	22.9	52.3	.36	.38					17
V. cinerea	Fruit	6.4	7.2	19.8	66.0	.17	.38					17
V. rotundifolia	Fruit	4.8						635		4		9,10
	Fruit	6.6	9.0	18.3		.21	.43					17
V. vulpina	Fruit	5.4	0.9	13.4	77.6	.15	.06	14,500				19,20
	Fruit	9.8	9.5	22.2	54.3	.26	.52					11
Nuts												
Carpinus caroliniana	Seeds	11.6	9.7	51.8	26.5	.22	.12	30,000		15	3-5	16,17
Carya aquatica	Kemel	10.2	32.0	3.2	54.2	.20	.15		164	20	1-2	16,17
C. cordiformis	Kemel	7.5	48.3	2.4	41.3	.24	.16		156	30	3-5	16,17
	Seed, husked	3.3	30.8		17.1'	.12	.46					2
C. glabra								200	30		1-2	16
C. ovata	Kemel	13.3	74.4	1.5	8.8	.37		100	40		1-3	16,20
	Seed, husked	5.9	37.4		13.0'	.15	.20					1

	Kemel	12.4	70.6		5.31							1
C. tomentosa	Kemel	11.9	82.6	2.9	2.0	.35	.14		36	25	2-3	16,17
	Seed,											
	husked	3.7	20.0		12.7'	.08	.22					2
Fagus grandifolia	Seed	7.8	10.6		6.5 ¹	.26	1.18		1,600	40	2-3	2,16
Juglans cinerea									30	20	2-3	16
J. nigra	Kemel	29.3	60.2	1.0	6.7	.59	tr		40	12	2-3	16,20
	Kemel	28.2	64.3	1.9	4.7	.60	.09					17
	Seed,											
	husked	5.1	10.5		14.41	.20	.07					1
	Kemel	23.1	60.4		3.8 ¹							1
Ostrya virginiana	Seed	15.3	19.8	46.4	17.0	.28	1.09		30,000			16,17
Quercus alba	Acorn	6.3	6.3	2.5	82.3	.16	tr		120	20	4-10	16,20
	Acorn	4.6	2.9		46.6 ¹	.08	.22					1
	Acorn	4.1	1.2	19.9	74.4	.08	.27					17
Q. chapmanii	Acorn	4.5	4.5	17.0		.10	.28					C
Q. falcata var. falcata	Acorn	6.5	15.8	18.1	59.2	.10	.21		540	25	1-2	16,17
	Acorn	4.2	15.6	20.6	57.7	.08	.43					11
	Acorn	5.1	17.0		23.0'	.08	.32					2
Q. ilicifolia	Acorn	10.3	20.0	3.0	64.6	.19	tr		700			16,20
	Acorn	6.1	19.4	18.3	54.6	.10	.19					11
Q. incana	Acorn	6.2	20.0	15.9	57.5	.15	.18		218			17
Q. laurifolia	Acorn	5.0	26.8	3.4	62.3	.10	.09		560	15	1	16,A
Q. marilandica	Acorn	7.0	16.2	19.0	57.4	.11	.26		210			17
	Acorn	6.3	10.7	20.9	60.1	.09	.37					11
Q. michauxii	Acorn	4.1	3.3		56.1'	.12	.08		85	20	3-5	2,16
Q. minima	Acorn	6.6	7.2	13.5	72.5	.06	.05			4		9,17
Q. nigra	Acorn	3.8	20.3		25.8'	.06	.32		395	20	1-2	1,16
	Acorn	5.3	20.5	16.7	57.1	.08	.28					17
Q. nuttallii	Acorn	4.4	5.2	26.4	63.6	.08	.20		95	5	3-4	16,17
	Acorn	3.8	15.0	13.2	66.6	.05	.17					11
	Acorn	4.5	13.2		46.2 ¹	.09	.04					2

Table 1.— *Chemical composition and size of fruits and seeds, and seed-bearing characteristics of plants.*(Continued)

Plant groups and species	Chemical Composition						Size		Seed-bearing characteristics of plants		References	
	Part analyzed	Crude protein	Crude fat	Crude fiber	NFE or total carbohydrates	P	Ca	Fruits	Seeds	Minimum age		Interval between large crops
	--Percent of dry weight						Avg. number per pound		Years	Years		
Q. phellos	Acorn	5.9	19.6		31.2 ¹	.08	.18		462	20	1	1,16
	Acorn	5.1	21.1	17.2	56.1	.09	.27					17
Q. prinus	Acorn	4.6	1.0	29.4	64.6	.11	.16		100	20	2-3	16,17
	Acorn	6.9	5.1	2.6	83.2	.15	tr					20
	Acorn	6.4	3.3	15.2	72.9	.12	.14					11
Q. pumila	Acorn								360	4		9
Q. rubra	Acorn								125	25	3-5	16
Q. stellata	Acom	5.2	5.7	19.5	66.7	.11	.40		380	25	2-3	11,16
	Acorn	3.8	5.2		37.91	.08	.25					1
	Acorn	8.3	5.1	15.8		.10	.15					17
Q. virginiana var. virginiana	Acorn	4.4	8.2		46.4 ¹	.06	.06		352		1	1,16
	Acorn	5.9	6.9	15.1	71.8	.09	.13					17
Cone and Conelike												
Magnolia grandiflora	Seed, intact	10.8	41.2		12.4 ¹	.28	.17		6,450	10	1	2,16
M. virginiana	Seed	9.3	38.5	28.3	23.2	.23	.33		7,530	6		9,16,17
Pinus clausa									75,000	5	1-2	16
P. echinata	Seed	26.7	17.6	32.7	22.2	.65	.05		46,300	5-20	3-10	16,17
	Seed	28.6	22.1	32.9	9.9	.76	.08					11
P. elliotii var. elliotii									13,500	7-10	2-3	16
P. palustris	Seed	26.7	19.3	37.1	13.5	.68	.04		4,900	20	5-7	16,17
	Seed	33.9	28.4	23.9	28.9	.73	.08					11
P. strobus									26,500	5-10	3-10	16

P. taeda	Seed	17.4	13.5	48.8	19.7	.47	.05	18,200	5-10	3-13	16,17
	Seed	15.9	6.7	56.4	17.0	.35	.04				11
P. virginiana								55,400	5	1-3	16
Legumes											
Gleditsia triacanthos	Seed	17.5	2.6		16.9 ¹	.31	.10	2,800	10	1-2	1,16
	Seed	26.5	2.4	13.5	56.5	.69	.28				17
Robinia pseudoacacia	Seed	38.7	9.0		12.3 ¹	.68	.05	24,000	6	1-2	1,16
	Seed	44.8	8.6	19.3	26.5	.63	.13				17
Capsule											
Liquidambar styraciflua	Seed	25.3	26.2		11.6 ¹	.69	1.51	82,000	20-30	2-3	1,16
	Seed	26.7	23.7	20.2	27.9	.55	.85				17

¹Total carbohydrates.

A Beckwith (unpublished)

B Knox (unpublished)

C Spratt (unpublished)

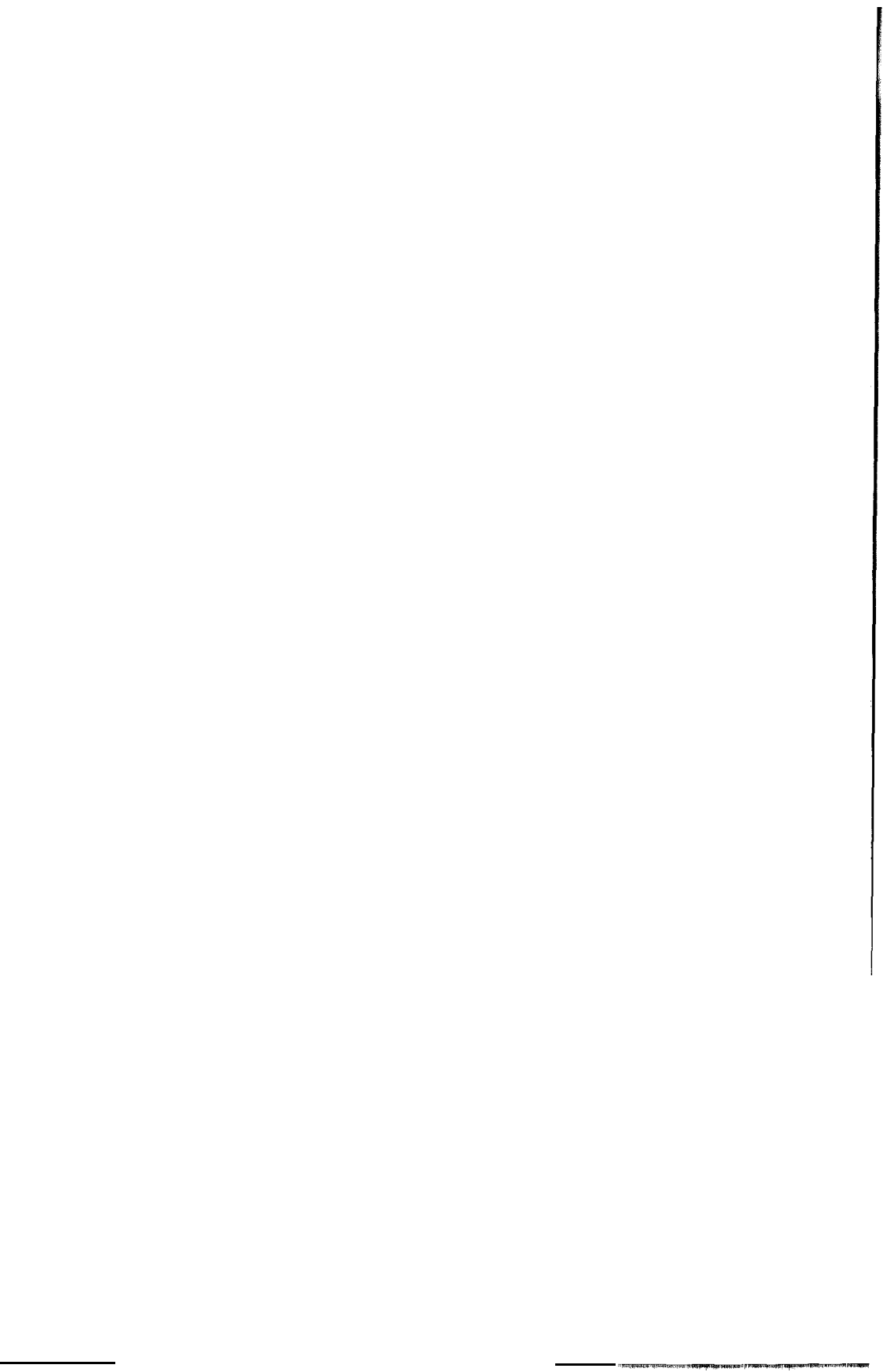


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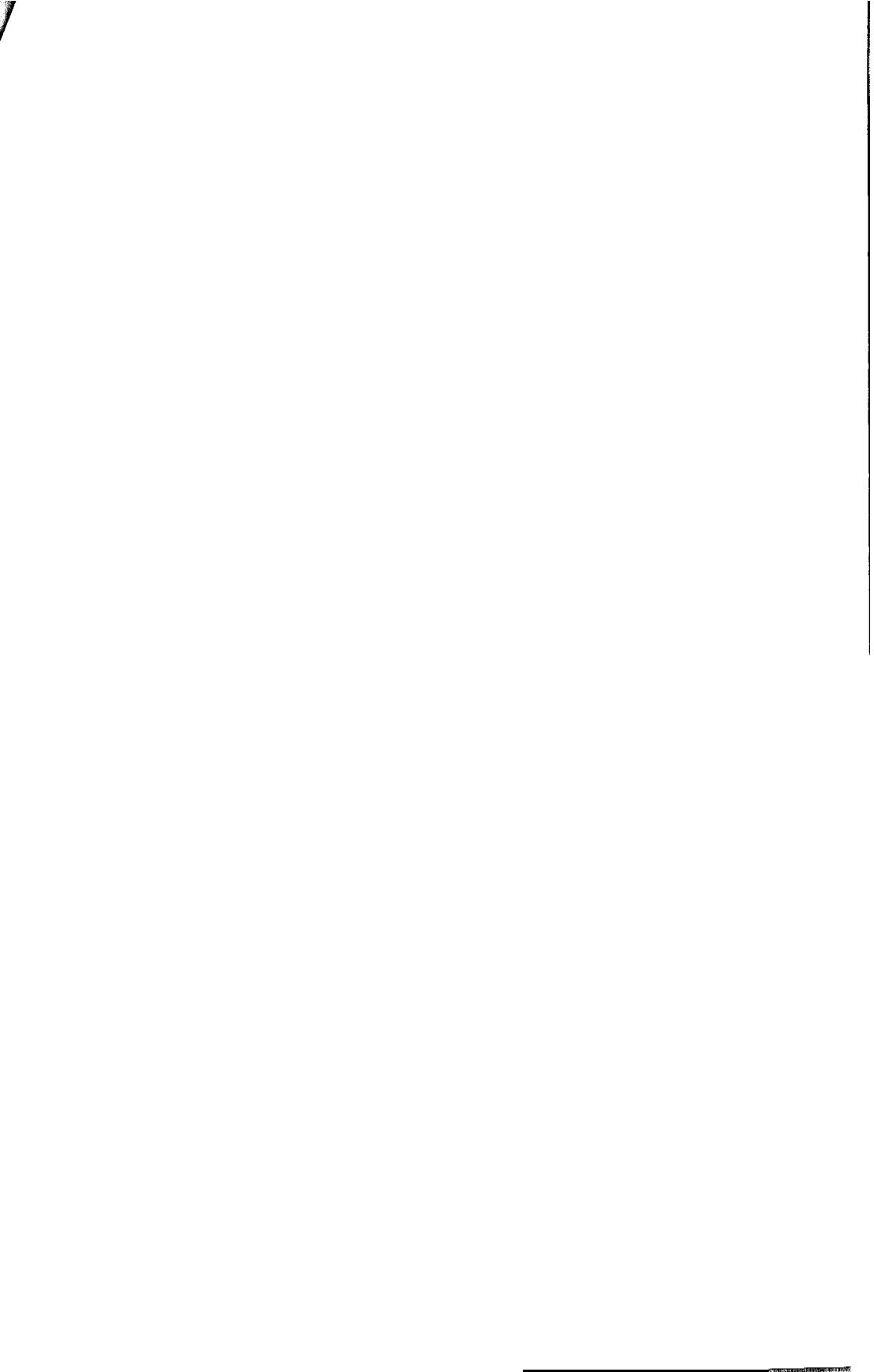
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Describes and provides illustrations of 106 woody plant species that produce fruit useful to wildlife in southern forests. It also includes information about plant growth requirements, management, and nutritional quality. Trees, shrubs, and vines that produce fleshy fruits or nuts are emphasized.



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