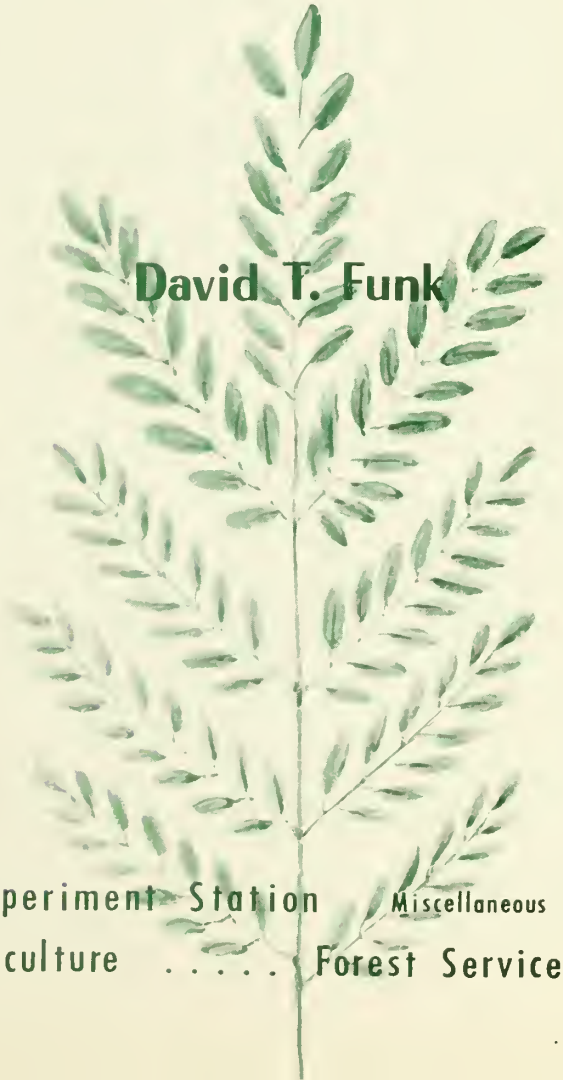
SILVICAL CHARACTERISTICS of HONEYLOCUST

David T. Funk



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This is the ninth of a series of 17 papers dealing with the silvical characteristics of forest trees important in the Central States region. The following species are included in this series. (Those marked with an asterisk have already been published.)

*Ohio buckeye
Yellow buckeye
*Northern red oak
*Black oak
Chinkapin oak
*Pin oak
*White oak
Swamp white oak
Bur oak
Butternut
*Black walnut
*Shellbark hickory
Sycamore
*Honeylocust
Hackberry
Black locust
*Eastern redcedar

Papers covering additional important American species will be issued by other Forest Experiment Stations of the U. S. Forest Service.

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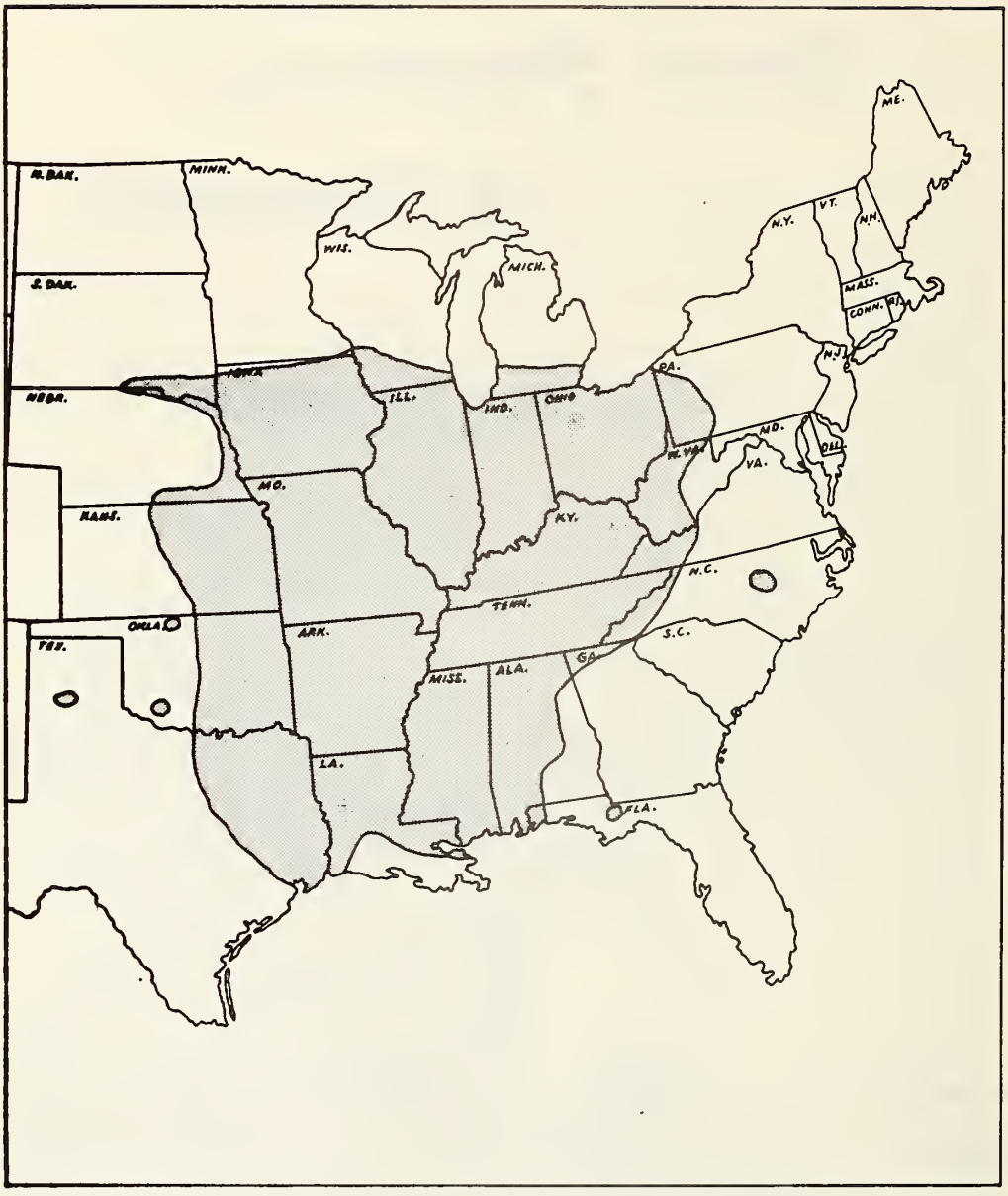
Silvical Characteristics of Honeylocust

DAVID T. FUNK, forester

Honeylocust is a medium-sized tree that occurs rather infrequently throughout the east-central United States. Its name refers to the sweet, succulent pulp found in the seed pod between the seeds.

This species is fairly rapid-growing, casts light shade and has good resistance to disease and insects. For these reasons it is favored as a street and lawn tree throughout much of the country, especially in its thornless, podless form, known as the Moraine locust.



In addition to its natural range as shown above, honeylocust is naturalized widely east of the Alleghenies as well as in Nova Scotia, and west of its natural range (19, 26, 34)1/. Honeylocust reaches its maximum development in the valleys of smaller streams in southern Indiana and Illinois (34). It is a common tree in the Wabash River bottoms of southwestern Indiana and is there one of the largest trees of the forest (15).

1/ Numbers in parentheses refer to Literature Cited, p. 10.

SITE

Climate

Honeylocust grows naturally in the humid section of the eastern United States (42). Average annual precipitation within this natural range varies from 20 inches in South Dakota and Nebraska to more than 70 inches in western North Carolina (43). Fifteen to 30 inches fall during the average frost-free season. Average annual snowfall ranges from none to 40 inches. In the northern extremes of the range the frost-free period is only 140 days long; in southern Louisiana it lasts 340 or more days (43).

In the area of optimum growth--the vicinity of the lower Wabash Valley--annual precipitation is 43 inches; growing-season precipitation is 22 inches; frost-free season is 190 days (43). In July in this area the normal daily maximum temperature is 90° F., and the normal daily minimum is 65° F.; the highest temperature ever recorded here was 116° F., the lowest about -17° F. (47).

Because honeylocust is distributed so widely, its temperature tolerance varies. Northern races terminate growth and become dormant relatively early; they overwinter well where the temperature drops below -30° F. (30). Southern races harden off later and are subject to frost damage when planted in the northern limits of the range (4, 18).

Soils

Honeylocust is most commonly found on rich, moist, alluvial flood plains of major rivers or on soils of limestone origin (5, 20, 37). Although ample soil moisture is necessary for best growth, the species is very resistant to drought (24, 46), and Sargent reported it growing on the dry "barrens" of central Kentucky (34). Drought hardiness makes honeylocust one of the most valuable species for shelterbelt planting in the Great Plains. It grows poorly on gravelly or heavy clay soils and fails on shallow soils (10, 24).

Out of 20 drought-hardy species of seedlings tested, honeylocust showed the third greatest alkali tolerance (38). It is also described as "...somewhat tolerant of salinity" (46). Best development is usually on soils with pH falling between 6.0 and 8.0 (24, 30).

Physiography

Honeylocust is typically a bottomland species, most commonly found only near streams or lakes (15, 22). Putnam and Bull mention that it is not common anywhere in the Mississippi River Delta, but is most frequent on low clay ridges and flats in first bottoms (32). It is a tree of secondary flood plains along Missouri River tributaries in Nebraska (48).

House states that honeylocust is found only below 2,500 feet in western North Carolina (22), but Howell gives 5,000 feet as the general upper altitudinal limit (24). Detwiler mentions a 20-year-old plantation at 6,900 feet in Colorado which showed "good" survival although the average height was only about 8 feet (16).

Associated Species

Honeylocust is rarely a major component of a natural forest stand. It is listed as a minor associate in three forest cover types as recognized by the Society of American Foresters (37): Northern red oak - mockernut hickory - sweetgum; sweetgum - Nuttall oak - willow oak; and sugarberry - American elm - green ash. The first two of these are considered to be edaphic climax associations (32, 37). Common associates not mentioned above include red maple, persimmon, blackgum, pecan, boxelder, Kentucky coffeetree, black walnut, and other oaks, elms, ashes, and hickories (10, 34, 37). No specific indicator plants are known.

Scattered honeylocusts are considered to be generally beneficial to growth of desirable grasses (16), probably because it is a legume.

Honeylocust seed pods, especially the larger ones borne by some southern strains, are a valuable stock feed, eagerly eaten by cattle (15, 16, 20).

The fruit is also eaten by cottontail rabbits, gray squirrels, fox squirrels, white-tailed deer, bobwhite, and snowshoe hare (7, 17, 46). Young planted honeylocust is preferred as forage over many other species by cottontails and white-tailed jackrabbits (31, 45).

LIFE HISTORY

Seeding Habits

Flowering and Fruiting

Some confusion has existed regarding honeylocust flowering. Various authors refer to this species as monoecious, dioecious, or polygamous. Polygamy appears to be the best choice as some of these trees are found with staminate flowers only, some are monoecious, and occasionally staminate, pistillate, and perfect flowers are all borne on the same tree (16, 19, 30).

Average date of first flowering in the southern limit of the range of honeylocust is May 10; in the northern area it is June 25 (19, 25, 44). By flowering time the leaves are nearly full grown (6), and it is late enough in the year that there is usually no frost danger to the seed crop (16).

Seed Production and Dissemination

Average date of seed ripening in the southern part of the range of honeylocust is September 15 with seed fall beginning about October 15. Corresponding dates toward the northern limits of its range are October 20 and January 1 (25). Seed dissemination often continues through late winter (44).

Seed is dispersed by cattle which scatter it after feeding on the pods (15). Brown (6), and Harlow and Harrar (20) also suggest that seed falling in winter may be spread by blowing over crusted snow.

The minimum commercial seed-bearing age is considered to be 10 years, with an optimum age of 25 to 75, and a maximum of 100 years (44). Named clones such as Millwood and Calhoun sometimes bear heavy seed crops 5 years after planting (1). Plentiful seed crops occur every year or two, and some seed is produced each year (10, 44).

Vegetative Reproduction

Honeylocust can be propagated by grafting, budding, and hardwood, greenwood, and root cuttings (39, 44). It has been reported as sprouting freely (46).

Seedling Development

A moist fertile soil serves as the best natural seedbed (44). Average germinative capacity is 75 percent. Germination is thought to be increased by the eating and dropping of the seed by animals or birds; this apparently softens the nearly impermeable seedcoat. The same effect can be achieved with seed to be sown in nurseries by mechanically scarifying the seed or immersing it in concentrated commercial sulfuric acid at 60-80° F. for an hour or two (44). Insect damage may reduce the percentage of sound seed.

Sapling Stage to Maturity

Growth Rates and Size Attained

Typical honeylocust in the forest is 70 to 80 feet high and 2 to 3 feet in diameter with a maximum size of 140 feet in height and 6 feet in diameter; growth is rapid, and it reaches maturity in about 120 years (20).

Most available growth data pertain to planted trees. Trees in five plantations in eastern Nebraska 18 to 35 years old grew an average of 1.8 inches in diameter each 10 years (28). Average height growth of honeylocust planted in shelterbelts from North Dakota to Texas was 1.6 feet per year for the first 7 years; this was slower than plains cottonwood and Siberian elm, but faster than American elm, green ash, or hackberry, all of which were frequently planted in this project (29).

The species has a strong taproot and a profusely branched root system (11) which penetrates deep soils as far as 10 to 20 feet (24). The root system is notably responsive to environmental conditions; a Missouri study showed that saplings on upland clay soil produced root systems about twice as long and twice as broad as those of older trees growing in alluvial soil of low ground where the water table was higher (3).

Reaction to Competition

Honeylocust is classed as an intolerant species and grows only in the open or in a dominant position in the forest (2). Lower limbs of forest-grown trees do not survive in deep shade, but the dead limbs are often retained for some time.

Climax Position of Species

Honeylocust is occasionally a pioneer on Midwest strip-mine spoil banks (27). It also pioneers in rocky limestone glades of Tennessee and Kentucky where it is often succeeded by eastern redcedar (16).

A northern Ohio study showed that as swamps dry up enough to allow shellbark hickory and bur oak to invade the elm - ash - soft maple association, honeylocust sometimes accompanies them (33).

ENEMIES AND HAZARDS

Insects

Although insect damage to honeylocust is usually not extensive, a few species are sometimes destructive in local areas. The most serious insect pect, especially in the South, is the mimosa webworm (Homadaula albizzia) (30). The honeylocust scale (Chionaspis gleditsiae) injures the bark, and although it is not directly fatal, it lowers vitality and growth rate (23). The white-marked tussock moth (Hemerocampa leucostigma) is a major defoliator.

Tetranychus ellipticus, a mite, has also been found to defoliate honeylocust in northwestern Indiana (35). Agrilus difficilis, a borer that attacks trees weakened by defoliation, drought, or storm damage, is often important west of the Mississippi River (12). Oncideres cingulatus, a twig girdler, prunes small branches of honeylocust as well as many other species. It can cause great damage when present in large numbers (12). The larvae of Amblycerus robiniae, a bruchid weevil, feed on honeylocust seed (12).

Diseases

Honeylocust is regarded as being relatively disease free (8). However, it is subject to canker (Thyronectria austro-americana) which can be fatal (13, 36), and to several wood rots. In the seedling stage it is also highly susceptible to cotton root rot (Phymatotrichum omnivorum). This disease is sometimes fatal (40).

Weather

Hopkins (21) reports heavy wind breakage of honeylocust in Kansas, but after a severe ice storm in western Illinois, Croxton (14) found that of 40 species of street and shade trees examined, honeylocust was among 5 species that suffered little or no injury. It is considered to be windfirm. Due to its relatively thin bark, it is easily damaged by fire.

RACES AND HYBRIDS

"The honeylocust ... has wide genetic variations ..." (39). Among those previously mentioned were northern races, which show relatively great winter hardiness, and southern races which bear pods much more nutritious for stock feeding purposes than those found on northern trees (9).

A thornless form, G. triacanthos f. inermis, is widely cultivated and occasionally found growing wild. About 60 percent of the seedlings grown from thornless honeylocust seed are without thorns themselves (15).

Gleditsia X texana, the Texas honeylocust, is considered to be a hybrid of G. aquatica and G. triacanthos. Its range is largely restricted to the Mississippi Valley (26), but it is also found in the Brazos River bottomlands of Texas (41). Deam suggests that this tree may not be a hybrid because he has noted striking uniformity in fruit and seedlings produced (15).

SPECIAL FEATURES

The large, sharp, branched thorns that commonly cover the trunk and limbs quickly distinguish honeylocust from any other tree except the waterlocust. Sargent holds that their formation is in part a response to light, and that they are found less frequently on forest-grown trees (34). These thorns are truly formidable and young trees have been trimmed to form an impassable tall hedge (20).

TREE SPECIES MENTIONED

Green ash	-	*Fraxinus pennsylvanica* Marsh.
Blackgum	-	*Nyssa sylvatica* Marsh.
Boxelder	-	*Acer negundo* L.
Kentucky coffeetree	-	*Gymnocladus dioicus* (L.) K. Koch
Plains cottonwood	-	*Populus sargentii* Dode
American elm	-	*Ulmus americana* L.
Siberian elm	-	*U. pumila* L.
Hackberry	-	*Celtis occidentalis* L.
Mockernut hickory	-	*Carya tomentosa* Nutt.
Pecan hickory	-	*C. illinoensis* (Wangenh.) K. Koch
Shellbark hickory	-	*C. laciniosa* (Michx. f.) Loud.
Honeylocust	-	*Gleditsia triacanthos* L.
Red maple	-	*Acer rubrum* L.
Bur oak	-	*Quercus macrocarpa* Michx.
Northern red oak	-	*Q. rubra* L.
Nuttall oak	-	*Q. nuttallii* Palmer
Willow oak	-	*Q. phellos* L.
Persimmon	-	*Diospyros virginia* L.
Eastern redcedar	-	*Juniperus virginiana* L.
Sugarberry	-	*Celtis laevigata* Willd.
Sweetgum	-	*Liquidambar styraciflua* L.
Black walnut	-	*Juglans nigra* L.
Waterlocust	-	*Gleditsia aquatica* Marsh.

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