

The Eastern Hop Hornbeam: Its Natural History and Landscape Potential

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The eastern hop hornbeam, *Ostrya virginiana* (Mill.) K. Koch, is a tree with an ornamental value that has largely gone unrecognized. This ubiquitous native understory tree is one of the least-studied trees in North American forests: literature searches turn up very little reliable information on its cultural requirements or ecology. In this article I will bring together the available horticultural information and point out areas where more research is needed. Lack of publicity may be the only reason that this tree has not become more popular.

Ostrya virginiana is the most widespread species in its genus. It is hardy to USDA zone 4 and is found from Nova Scotia to Minnesota and south to eastern Texas and Florida. The genus name, *Ostrya*, is derived from the Greek word *ostrua*, designating a tree with very hard wood (Vines 1960). Many of its common names also refer to the hardness of its wood: ironwood, leverwood, hardhack, and hornbeam. Two other common names are deerwood and Indian cedar.

The genus *Ostrya* belongs to the Betulaceae, or birch family. According to T. S. Elias (1980), it is a genus of only eight species, which are quite similar to each other. All are short deciduous trees or shrubs, with simple and alternate leaves and

very short petioles. All are monoecious (bearing flowers of both sexes on the same tree). Staminate catkins are borne in groups of two or three at the tips of the previous year's twigs, and the fruits are borne in clusters of bladderlike sacs. All species exhibit rough, scaly bark.

Three species are found in the United States and Canada. Of these, two are described in horticultural literature: *Ostrya virginiana* and *O. knowltonii* Coville. Unlike the widespread *O. virginiana*, *O. knowltonii* is a rare tree, with an extremely limited range at altitudes of 1500–2100 m in canyons of southwest Texas, New Mexico, Arizona, and southern Utah. It differs from its relative in its lesser height, nearly always under 9 m. Its limbs are slender and crooked, forming a rounded crown. Its leaves are somewhat similar to those of *O. virginiana*, but they are smaller and more broadly ovate. Both its leaves and petioles tend to be somewhat more pubescent than those of *O. virginiana*, a characteristic that is typical of some desert species. The flowers and fruits are also smaller than those of the other species but similar in structure. Bark and twigs are similar.

Elias (1980) mentions the Chisos hop hornbeam (*Ostrya chisosensis*), which he



Trunk of a mature eastern hop hornbeam (*Ostrya virginiana*) at the Arnold Arboretum

describes as a shrub, rarely a tree, found in the same region as *O. knowltonii*. No other horticultural information is available on this obscure species.

Historically, the eastern hop hornbeam has been labeled a "weed tree" of no commercial value. Most management prescriptions for commercial forest land classify the hop hornbeam as a competitor to more profitable species and recommend its removal. In fact, one of the few published research papers available on hop hornbeam (Diller and Marshall 1937) deals exclusively with techniques of cutting the tree to reduce chances of resprouting. The authors observed that "hop hornbeam is one of the less

desirable species in the farm woodlands of Ohio and Indiana. In many areas it dominates the understory so completely that the reproduction of the more valuable trees is often suppressed. . . ."

The wood of this species is light brown, tinged with red or white. The specific gravity of *Ostrya* wood is 0.83 (Young 1933), which ranks it among the hardest of our native woods. Its use is limited to such items as tool handles, golf clubs, mallets, fence posts, miscellaneous woodenware, and fuelwood. It is reported to take a very fine finish and probably would be a very valuable wood if the tree were larger.

The buds and catkins of the hop hornbeam are a preferred winter food of the ruffed grouse, especially in New York, Pennsylvania, and Wisconsin (Hamilton 1974), and the fruit is a secondary fall food. Other animals that feed on hop hornbeam are the bobwhite, ring-necked pheasant, downy woodpecker, mockingbird, purple finch, red, gray, and fox squirrels, deer, and cottontail (DeGraaf and Whitman 1979; Hamilton 1974).

Undoubtedly, the hop hornbeam's greatest assets are its ornamental qualities. At one time it was recommended for use as a street tree. Restricted root space and the fact that many city trees are planted with bare roots may have been major factors in the hop hornbeam's poor performance in the few cities where it has been tried. Because of this adverse experience, many horticultural writers unjustly removed the species from their lists of recommended trees. In cities where the tree has been located and planted properly, its performance is reported to be excellent. Nurseries in Buffalo, New York, cannot grow enough of the trees to satisfy demand (personal communication

from R. Walkowiack, June 23, 1983).

The hop hornbeam is small in stature, usually attaining only 10.5 m. As such it is useful for smaller properties or locations with limited overhead space. The largest hop hornbeams are found in Arkansas and Texas, where some specimens reach 18 to 21 m high and have trunk diameters of 45–60 cm. In the Northeast 10.5 m is the average maximum height, and crown spread is usually equal to two-thirds of the height. Trunk diameters are seldom greater than 15 cm and rarely reach 30 cm. The habit of the hop hornbeam is graceful, with many horizontal or drooping branches. Few trees its size can match the hop hornbeam in fineness of texture, from the narrow shaggy strips of gray bark on its trunk to its slender reddish brown twigs.

The shape of the tree is distinctly irregular, ranging from conical to oval to irregularly rounded. Understory trees are often irregularly shaped, because of the various directions of the light penetrating the forest canopy. Its status as an understory tree also means that the hop hornbeam tolerates dense shade. It is not restricted to shady spots, however, and grows well in full sun. It is in full sun that the tree develops its most desirable rounded form.

The leaves of the hop hornbeam are alternate, egg-shaped, and 7–12 cm long and 3.8–5 cm wide. The margin of the leaf is serrate. The top surface of the leaf is glossy green in summer. The lower surface is pale green and somewhat hairy, especially along the veins and midrib. Various fall colors have been observed, from a poor yellow or yellowish brown to red and even purple. Some trees retain their leaves well into the winter, though leaf retention is not a very reliable or widespread trait within the species

and may perhaps be the basis for developing a cultivar in the future.

The most notable ornamental features of this tree are its fruits and flowers. The hop hornbeam gets its name, in part, from the similarity of its fruits to the true hop fruits (*Humulus* sp.). The compound fruit is oblong. It is made up of a cluster of bladderlike sacs, each containing a single, ovoid, faintly striated nutlet about 6 mm long. Often, the smaller sacs at the bottom of the cluster are empty. The fruit clusters become conspicuous in July, when their color is an attractive pale green in contrast to the darker green of the leaves. The fruit ripens from late August to early October, and the sacs turn tan to light brown. The sacs are covered with fine, stiff hairs that are irritating to the skin when handled.

The hop hornbeam's flowers are not dramatic or showy but are interesting nonetheless. The tree is monoecious and bears its flowers in catkins much the same way as other members of the birch family. The staminate catkins are from 2.5–5 cm long and reddish brown. They begin to expand slightly in March and then more rapidly until fully open in April, when they pollinate the pistillate catkins emerging with the leaves from beneath the bud scales.

The bark of the new shoots, twigs, branches, and trunk varies considerably and is quite attractive. The newest shoots are reddish green with minute brown lenticels. Larger twigs, and branches less than 5 cm in diameter, are smooth and purplish brown to red-brown in color. On these smooth stems the lenticels are tan to gray and lengthen horizontally, so that the young bark looks much like that of birch or cherry. Stems 6 cm and greater in diameter have the characteristic gray, narrow, striped bark that sets

hop hornbeam apart from other native trees with rough bark.

The hop hornbeam is a slow-growing tree, reaching, on average, 6 m in 20 years. Some speculate that this slow growth is responsible for the remarkable strength and toughness of the wood. The strong flexible twigs and excellent branching structure make the hop hornbeam almost impervious to damage by ice, wind, or heavy snow. Popular opinion also maintains that the species is extremely pest resistant; however, this cannot be substantiated until the tree is studied further, especially in stressful situations.

Growing the Hop Hornbeam

Propagating the hop hornbeam is a challenging task. The seeds exhibit a double dormancy that requires lengthy stratification in a moist medium in order to germinate. The regimen most often recommended for stratification is to place seeds in moist sand or peat for 60 days at 20°–30°C and 140 days at 5°C. An alternative regimen is 6½ months at 10°–22°C and 90 days at 5°C (Schopmeyer 1974). Despite the low percentage of germination, propagation by seed seems to be the only practical method for nursery production. Grafting hop hornbeam on rootstock of the same species, or perhaps on rootstock of another species in the birch family, may be attempted in the future at the Holden Arboretum. If the attempt proves successful, cultivars chosen for improved fall color, leaf retention, or improved growth rate may be developed. Tissue culture may also be an avenue to explore if cultivars prove to be commercially promising.

The soil and moisture requirements of the hop hornbeam are not rigid. In nature the

tree is found in moist bottomland soils, near streams and rivers, and on dry, gravelly ridges, with oaks and hickories. It does not tolerate flooded or heavily compacted soils. Average garden soils will adequately support hop hornbeam, provided that drainage is good. Slightly acid soils are best but not crucial. In general, adding generous amounts of peat to average soils is the only site preparation that should be necessary when planting a hop hornbeam.

Planting sites for this tree must allow adequate space for rooting and branching. Adequate space is essential for the development of a root system that will provide necessary moisture and nutrients. Lawns less than 3 m wide, or within 5 m of a wall or building, will not provide adequate rooting space. Protection from wind is not necessary except for staking the tree during the first year or two to provide support while new roots are being formed.

Most people who know this tree agree that it is difficult to transplant successfully, especially if specimens are large. Wild trees tend to have exceptionally irregular root systems, which penetrate deeply in loose soil, so it is best to move them when they are young. Hop hornbeam should always be balled and burlapped when planted in order to improve its chances for establishment and preserve the mycorrhizal relationships the tree relies upon (Hamilton 1974).

A new approach to container growing apparently improves establishment of hop hornbeam and other species with "difficult" root systems. This approach (called the "Minnesota System") was developed by Dr. Harold Pellett (1981) and involves the use of bottomless containers arranged in trays of standing water. This prunes the strong taproot and produces a more fibrous, compact



Eastern hop hornbeam (*Ostrya virginiana*) growing in a sunny location.

root system that is better able to support the newly planted tree.

The Holden Arboretum is currently promoting the use of the hop hornbeam by providing both the grower and the buyer with reliable information about this little-used tree. It is currently in the process of locating seed sources and determining the best methods of germination. Next, soils, transplanting techniques, and planting sites will be tested and evaluated to determine optimum cultural practices for growing the tree. The staff hopes to stimulate public interest in this tree by increasing awareness of its utility, ease of maintenance, and understated charm.

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