

***Buckleya*—The Oldest Cultivated Plant in the Arnold Arboretum**

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While not a particularly important plant from either an economic or a horticultural point of view, *Buckleya distichophylla*, or the piratebush as it is now called, is nonetheless a semi-parasitic plant of some mystery that intrigued both Asa Gray and Charles Sargent. In this article, Dr. Howard, Director of the Arboretum from 1954 to 1978, manages to blend history, botany, and horticulture into a classic plant portrait.

Although the Arnold Arboretum was legally established in 1872, the first plantings on the grounds did not occur for several years. It is of interest, therefore, that a plant collected in Tennessee by Asa Gray in 1843 was transplanted to Hemlock Hill in Jamaica Plain in 1946 and so represents the oldest documented cultivated plant in the Arnold Arboretum. Strangely, it is a semi-parasitic plant with an unusual history. It is not common in cultivation, has no well-known common name, and is to be recommended only for its oddity.

Buckleya distichophylla (Nutt.) Torrey was first seen by Thomas Nuttall in his travels along the French Broad River in East Tennessee in 1816. Nuttall, an English-American botanist and ornithologist, was to become the director of the Harvard Botanic Garden in Cambridge, Mass., in 1822, preceding the more famous Asa Gray. His discovery was described by him as *Borya distichophylla* in his book *The Genera of North American Plants* in 1818. Unfortunately, he assigned it incorrectly to a genus in the Oleaceae, the olive family.

The plant was found again in the spring of 1843 by Samuel Bradford Buckley, a naturalist and plant collector for Professor John Torrey of Columbia College. Torrey then correctly assessed the plant to represent a new genus of the sandalwood family, Santalaceae, and named it *Buckleya* in honor of Mr. Buckley. Torrey recognized that the proper specific name was that published earlier by Nuttall, and made the transfer and new combination. Professors Torrey and Gray had published *A Flora of North America*, containing short descriptions of all the known indigenous and naturalized plants growing north of Mexico, and were continuing a program of collecting unusual plants. Thus Gray sought out *Buckleya* in the fall of 1843 and returned with herbarium specimens and plants and fruits of the rare *Buckleya* for cultivation at the Harvard Botanic Garden, then under his direction. The introduction to cultivation of a living partially parasitic plant is unusual, yet it was successful. Herbarium specimens from this plant labelled "Hort. Cantab." or "Botanic Garden of Harvard University" are dated 1852, 1879, 1926, and 1930; the last two, by John George Jack for the Arnold Arboretum herbarium.



Buckleya distichophylla. Drawing by C. E. Faxon, first published in *Garden and Forest* 3, p. 237, 1890. From the Archives of the Arnold Arboretum.

Charles Sargent was the director of the Botanic Garden of Harvard University in Cambridge from 1873 until 1879, and there he prepared plans and plants for the development of the Arnold Arboretum property in Jamaica Plain. One can assume that Sargent noted the lack of fertile fruits on the *Buckleya* in the botanical garden and attempted vegetative propagation. When this was unsuccessful, he sought additional plants from the wild, and in 1888 he and W. M. Canby made a trip across the Smoky Mountains of Tennessee, including a "detour to the French Broad for the purpose of looking up *Buckleya*." He reported that he found plants in ripe fruit at

Paint Rock and sent back several hundred seeds packed in damp soil as well as a number of small seedlings. All arrived at the Arboretum in good order, and the seeds germinated "at once." These accessions were recorded in the numbered inventory of the Arnold Arboretum as "#3255," a plant collected by Sargent at Paint Rock, Tenn., Oct. 1888, and "3255-1 seeds" from the same area. Herbarium vouchers of fruiting specimens support the collection data. We have no record of the length of time the plants or seedlings obtained by Sargent were maintained in the living collections, for the existing records show only the undated annotation "dead or

disposed of," representing a period when non-ornamental plants were removed from the living collections.

Sargent wrote of his search for this plant and of its introduction to cultivation in an article on "New or Little Known Plants" in *Garden and Forest* in 1890. A plate prepared by Charles Faxon was included and is reproduced here. *Buckleya*, as a native plant, was not included in any edition of *A Manual of Botany* as prepared by Asa Gray, although several of these editions included the state of Virginia, where the plant has been found. It was first mentioned in the eighth edition of *Gray's Manual of Botany* published by M. L. Fernald in 1950. Sargent mentioned the plant only briefly in a footnote in his *Silva of North America*. *Buckleya* is included in Rehder's *Manual of Cultivated Trees and Shrubs*, but supporting specimens for this record are only those of the Botanic Garden of Harvard University.

When the Botanic Garden in Cambridge was abandoned in favor of university-sponsored housing at the end of World War II, the shrub introduced by Asa Gray in 1843 and cared for by Charles Sargent in 1873 was transplanted to the grounds of the Arnold Arboretum in 1946. It continues to thrive in a natural stand of *Tsuga canadensis*, the Canada hemlock.

Buckleya is a genus of dioecious shrubs, the male and female flowers occurring on different plants. The specimen Asa Gray collected is a female plant. *Buckleya* is known to be a semi-parasitic plant, that is, during part of its development it is dependent as a parasite on the attachment of its roots to those of other plants. The plant becomes a shrub, has green leaves, and does manufacture its own food. I have not been able to locate a 19th-century reference to this parasitism, but herbarium specimens from the Biltmore Herbarium, collected in 1897, were made deliberately to show the haustorial connection with *Tsuga canadensis*. Since the natural range of *Buckleya distichophylla* is also that of the Carolina hemlock, botanists speculate that *Tsuga*

caroliniana might have been the original host plant. In the last decade, other botanists have reported an association of *Buckleya* with species of *Pinus*, and, in fact, as many as twenty-five different forbs, grasses, and ferns as well as broad-leafed trees. Even today it is not clear at what stages of growth or for how long or to what degree *Buckleya* must be dependent on a host plant.

Sargent reported in 1890 the lack of success in attempts to propagate vegetatively the specimen of *Buckleya* in the Botanic Garden in Cambridge. Since that time the Arnold Arboretum has acquired several seed lots of *Buckleya distichophylla* from native locations and from other plants in cultivation in the United States, and one infertile seed lot from the Forest Botanic Garden, Charlottelund, Denmark. Mr. Fordham, longtime plant propagator for the Arnold Arboretum, has conducted many experiments with this species. In spite of Sargent's early report that seeds germinate "at once," Mr. Fordham has found that seeds failed to germinate when planted directly upon receipt. However, seeds given a cold treatment of 40 degrees for two or three months produced seedlings in over 50 percent of the cases. In 1962, a generous quantity of seeds and cuttings was received from Mr. Fred Lape from plants growing in the George Landis Arboretum in Esperance, New York. Mr. Lape wrote that the original plants in his collection came from seed collected by F. M. Crayton of Biltmore, North Carolina; they germinated well and are established in the Landis Arboretum as well as in an old woodlot. He reported that in one place "there is a spread of it the size of a small room," and that the large plants fruit heavily each year.

The cuttings received rooted poorly under mist propagation and developed roots only at the very base of the cutting. Other cuttings treated with Amchem 60-89 diluted to 5000 ppm produced better roots. The seeds developed and the seedlings appeared to flourish without a *Tsuga* or any other host plant present in the container. Thirty-five of the vigorous seedlings were planted on Hemlock



A young, vigorous Buckleya distichophylla seedling, raised from seed sent by the George Landis Arboretum in Esperance, New York, in 1978 (AA #166-78). It was planted in a pot with a Canada hemlock (seen on the left) in 1980, and planted outdoors in 1983. Photo by P. Del Tredici, 1986.

Hill in the Arboretum in 1963, but by the fall of 1964 all had died. Other seedlings planted near a hemlock in the nursery area persist to the present but have yet to flower and so are unsexed. Regrettably, these plants, even if staminate, are too far from the older pistillate plant for normal cross-pollination.

The fruits of the American *Buckleya distichophylla* are drupes resembling a small olive in size and shape. When mature they are a yellow-green in color and they turn a tan or light brown color on drying. The fruits may possess four narrow lanceolate bracts at the summit which are shorter than the fruit. These often fall early but if they persist are certainly of no aid in dispersal.

In 1846 the German botanical collectors Philip Siebold and Joseph Zuccarini described in their *Flora of Japan* a plant they called *Quadriala lanceolata*, literally referring in the name to the four large bracts found on the fruit. Friedrich Miquel, in 1870, recognized this plant to be of the same genus as *Buckleya distichophylla* of the United States and published the combination. Thus *Buckleya* was recognized as one of the many genera occurring in the southeastern United States and in Japan and China. *Buckleya distichophylla* is known today from Tennessee, Virginia, and North Carolina. *Buckleya lanceolata* (Sieb. & Zucc.) Miq. is known from Japan (Honshu) and China (Hona, Hupeh, Shensi, Szechwan) with a possible second Asiatic species, *B. graebneriana* Diels from Shensi in China. Two other species from Asia have been referred to *B. lanceolata* in herbarium annotations made by Rehder.

In 1892 on a collecting trip to Japan, Charles Sargent found fruiting specimens of *Buckleya lanceolata* on the steep banks of the Kisogawa near Agematsu in Nagano prefecture of central Honshu in Japan. Upon his return Sargent wrote in *Garden and Forest* of the Japanese *Buckleya*: "Indeed it is so common in some parts of the country that the fruit, which is gathered when about two-thirds grown, having been subjected to some pickling or

preserving process, is sold as a condiment, packed in small, neat wooden boxes. Nikko is the headquarters of the industry, and in late autumn the fruit of *Buckleya* is displayed in many of the shops which line the street leading through the straggling village up to the burial place of the founder of the dynasty of the Tokugawa Shoguns. To appreciate the flavor of *Buckleya*, the culture and refinement of the Japanese palate is essential." There is no record of the seeds Sargent described being grown at the Arnold Arboretum, but in 1905, John George Jack, Sargent's colleague, returned to the same area and obtained comparable fruiting herbarium specimens. It appears that both men might have attempted to introduce this species into cultivation. In 1964 the Arnold Arboretum received fruits of *Buckleya lanceolata* from the Kobe Municipal Arboretum in Kobe, Japan. After a cold treatment of 40 degrees for three months, several seeds germinated, but the seedlings could not be established. In 1902 the Japanese botanist, S. Kusano, in an article in the *Journal of the College of Science of the Imperial University of Tokyo*, noted that no information had been published on the host plants of *Buckleya* or for the abundant local species. He described the haustorial connections with species of *Cryptomeria*, *Abies*, and *Chamaecyparis* as well as nine genera of dicotyledonous trees and shrubs. Although he did not locate naturally occurring parasitism with *Pinus* or *Torreya*, he was able to establish such relationships experimentally.

Buckleya lacks a common name and never will be widely cultivated or useful as an ornamental plant. It is, however, a good example of a rare plant of limited distribution showing unusual phytogeographical relationships, representative of a small family, and worthy of a place in the educational collections of an arboretum. The oldest cultivated plant in the Arnold Arboretum also has a historical connection with several of America's distinguished botanists.