

**Ecological Importance of Native Americans Culture to the
Kentucky Coffee Tree (*Gymnocladus dioicus*)**

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INTRODUCTION

Although little is known about the specific uses of Kentucky coffee tree (*Gymnocladus dioicus*) by early Native Americans of the Great Lakes region, through careful comparisons to similar species, a more thorough understanding of the ethno-botanical practices of its users, and through a better understanding of the tree itself, much can be construed. Native Americans of the Great Lakes region utilized Kentucky coffee tree for food, medicine, and in their recreational and ceremonial practices. Because flowing water serves as the tree's only active seed dispersal agent today, and because a strong correlation exists between current stands of Kentucky coffee tree and former Native American settlements, we can infer that these cultures played a significant role in shaping the tree's current range.

NOMENCLATURE

Kentucky coffee tree is a coarsely branched angiosperm with male and female flowers borne on separate trees. Its scientific name is derived from these traits: *Gymnocladus* meaning "naked branch," (referring to the stout branching) and *dioicus* referring to the species having both male and females trees (Row 2007). George Washington's diaries from the late 1700's contain the first known account of the name "coffee tree" being used. "He was given some seed of this species for planting at Mount Vernon" (Hill 1993). Thomas Jefferson also acquired Kentucky coffee tree seeds from General George Rogers Clark in 1783, which he planted at Monticello (Kentucky State Senate Bill Number 150). The tree's hard seeds, similar in color to coffee beans, can be roasted and brewed into a menial substitute for coffee, which was expensive and hard to find away from coastal ports at the time. "Land developers [wanting to get settlers out to the 'far west'] advertised Kentucky as a place where a tree grew with beans that could be

roasted and brewed to make a fine coffee substitute. Although drinkable, the beverage was no substitute for coffee, and the early settlers quickly dropped it as soon as the real thing became available.” (Hill 1993). It is from this that the common name “coffee tree” was derived. The tree’s coarse branching and early leaf drop also lead to common names such as dead tree or stump tree. Only two other species of *Gymnocladus* exist; both are found in Asia.

Kentucky coffee tree is a member of the pea family (*Leguminosae*), of which many species are noted for their ability to fix nitrogen. Although research indicates that the tree does not have nitrogen-fixing bacterium (*Rhizobium* sp.) on its root system in the form of nodules, recent research suggests that “Kentucky coffee tree can fix nitrogen, but at much lower rates than nodulated legumes.” (Van Sambeek 2007).

Tree morphology

Kentucky coffee tree is alternately branched and its leaves are bipinnately compound with an entire margin. The leaves can reach 100 cm in length and 50-60 in width, with around 40 leaflets per rachis, making them one of the largest woody leaves native to North America. The tree leafs out somewhat late in the spring and turns a brilliant yellow in early fall, leaving the tree “naked” for 5-6 months of the year. Its twigs are stout and have large, heart-shaped leaf scars with 3-5 conspicuous bundle scars present. Its pith is a distinctive salmon-pink color. The tree’s bark is a scaly, dark grayish-brown that becomes more coarsely fissured with age. Inconspicuous flowers appear in May and June after the leaves on female plants, and are a greenish-white color. From these flowers, the tree produces soft, white-green pods that ripen to a dark-brown color in September or October. When ripe, they are flat, thick, and 15-25 cm long by 2.5-5 cm wide, each containing from 3-8 coffee-colored seeds separated by a gooey, sweet,

bright green pulp. Kentucky coffee tree can reach a mature height of 18-30 meters with a spread of 12 to 15 meters. The tree is hardy in zones 3-8 and tolerant of acidic soil. It has limited shade tolerance and prefers lighter textured alluvial soils, although it is moderately tolerant of drought and occasional flooding (Dirr 1998). It is through such flooding that the seed's only natural means of scarification and dispersal are accomplished today. As such, flood control practices could significantly alter current stands of Kentucky coffee tree.

Despite its tolerance of adverse conditions and its wide range in North America, in few places is Kentucky coffee tree common. It is mostly found in small groves or as a single tree, but rarely as the dominant species of a community. The tree today is a threatened species in Ontario and listed as a special concern to several states in the United States (Walters 2001). This is mostly due to the inability of the tree's seeds to germinate without scarification. According to Lauri L. Walters, less than 5% of the seeds usually germinate without special treatment. (Walters 2001). Squirrels do not cache them, so the seeds do not spread from the mother tree except along streams where the seeds may be transported by water down-stream (Row 2007). A recent study by M. Leslie McClain and Marion T. Jackson for Indiana State University shows that the species has a strong clumping tendency through root suckering and that a lack of effective dispersal agents for the heavy fruit account for its inability to spread beyond these small stands.

The high frequency and low mean area per tree of the coffee tree as its own nearest-neighbor reflects the cloning habit of the species. The coffee tree appeared as its own nearest-neighbor in about three of five comparisons (61%). The mean area occupied by coffee trees with other coffee tree as nearest-neighbors transposes to a density of about 440 trees per acre (1,087 per hectare) (roughly twice the average density expected for similar but non-cloning species in both seral and mature situations) (McClain 1984).

The study also showed a high frequency of Kentucky coffee trees in flood bottoms, which is likely a result of the tree's tolerance to occasional flooding and because streams are the only means of natural dispersal for the seeds. The study also suggests that "streams were natural corridors of movement for the Indian, which may account in part for the frequency of coffee trees in many stream valleys." (McClain 1984).

Kentucky coffee tree serves little if any industrial value – mainly due to it being relatively uncommon – but its benefits as a native alternative to less desirable species in cities and parks are becoming more and more evident. The tree is free from serious insect or disease problems.

Pre-history

It is likely that the seed pods of the Kentucky coffee tree were eaten by large herbivores in North America (such as the mammoth) near the end of the Pleistocene Epoch. The extinction of these animals – thought to coincide with changing climate, an introduction of humans to the North American continent, or some combination of both – has made the tree, and its pods, anachronistic to the present condition of North America.

"These extinct American herbivores once dispersed the seeds of such big-fruited plants as honey locust, Kentucky coffee tree, and Osage orange, all of which produce fruits that no native animal today regards as food. Now the seeds either rot with the pulp or sprout too close to the parent tree." (Barlow 2000)

Human interactions with Kentucky coffee tree certainly could have played an important role in the perpetuation of the species, especially when considering the loss of its original relationship with large herbivores.

ETHNOBOTANY: Food

Native Americans of the Great Lakes region used mast trees similar to Kentucky coffee tree as both a source of food and for utilitarian and spiritual purposes. It is known that the tree was used as a food source, but to what extent is not entirely understood. Kentucky coffee tree was known to be used as an inferior substitute for coffee by early pioneers and several sources suggest that the seeds were roasted and eaten (Walters 2001; Row 2007; Hill 1993; Bowles 2004). Because the seeds and pod are poisonous, they must be roasted at 150°F for at least three hours to be safe for human consumption.

“[The seeds] reportedly contain cytisine, a quinolizidine alkaloid and nicotinic receptor agonist, which can be dangerous [if consumed]. However, researchers at Indiana State University have been unable to find experimental data verifying the presence of cytisine. A single major alkaloid was found to be present in many coffeetree plant parts. The alkaloid is thought to be neutralized in the roasting process. Hydrocyanic acid has also been suggested as a possible toxin...There is at least one anecdotal report of a human poisoning by Kentucky coffee tree.”
(Row 2007).

If eaten raw, the seeds can be damaging or even fatal, as “the alkaloid cystosine...causes gastrointestinal disorders that can lead to irregular pulse and coma.” (Bowles 2004). There have

been reports of the seeds falling into water and poisoning livestock and fish. It is also thought that hunting tribes would put large quantities of the seed into lakes and streams to stupefy or kill fish, which are sensitive to saponines present in the beans (Row 2007). Similar accounts of such practices have been observed among Bushmen in Africa (Neuwinger 1996). Although bitter and probably distasteful to some palates, the seed is certainly at least edible. Sturtevant suggests that Kentucky coffee tree pods could be cooked or preserved much like the pod of tamarind, and “are said to be wholesome and slightly aperient [having a mild purgative or laxative effect].” (Sturtevant 1972).

Aside from Kentucky coffee tree, Native Americans also used the seeds and/or pods of two other leguminous trees: honey locust (*Gleditsia triacanthos*) and redbud (*Cercis canadensis*). “The fleshy, inner seed pod of these species was scraped and used as a sweetener,” (Reidhead, 1984). Dirr describes the inner pulp of Kentucky coffee tree as being edible, even stating that he consumed it as an adolescent (Dirr 2004). Because the pods often persist on the tree until spring, it is likely that such a food source would have been used only as a luxury or when easily accessible if other nuts and seeds were more readily available, especially considering the toxic nature of the seeds.

ETHNOBOTANY: Medicinal

The medicinal values of Kentucky coffee tree were also important to early Native Americans in the Great Lakes region. The Omaha were specifically cited as having used the tree in medicine:

The outer covering of the root was used in hemorrhage, particularly from the nose or during childbirth. This root was used also when the kidneys failed to act. The

native name of the tree was *noⁿ'titahi*. The root, powdered and mixed with water, was administered to women during protracted labor. (Fletcher, 1970).

It is also noted that pulp from the tree could be used to combat fever and to treat headaches. Tribes of the Omaha would mix bark of Kentucky coffee tree and gayfeather (*Liatris aspera* Michx.) to use as an appetizer and tonic when mixed with crushed buffalo-gourd (*Cucurbita foetidissima* H. B. K.). Among other uses, it is suggested that the pulp was also used as a laxative (Fletcher). According to Row, the pulp was also used as a treatment for insanity and the leaves could be seeped as a tea-like drink (Row 2007).

ETHNOBOTANY: Bowl-and-Dice games

Perhaps the most significant use of beans from the Kentucky coffee tree was not for consumption, but rather for ceremonial and recreational purposes. Beans from the Kentucky coffee tree were used as dice in a game that, according to Joseph B. Oxendine's book American Indian Sports Heritage, was found in nearly every pre-colonial culture in some shape or form. Oxendine continues, stating that "Stewart Culin (1907) identified dice games, or activities roughly described as such, among 130 different tribes. He observed that 'from no one tribe does it appear to have been absent'" (Oxendine, 1988).

The game itself was given many names, including squaw dice, women's dice, bowl-and-dice, platter, hubbub, *Paquessen*, or simply called dice (Oxendine 1998; Densmore 1972; Macfarlan 1958; Lescarbot 1856; Gurnoe 1971; Jones 1971). While different forms of the game can be found across the United States, the most common variation of the dice game in the Great Lakes region was played with a bowl or basket, up to eight dice or sticks, and a hide or blanket (Oxendine 1988). To play the game, a hide or blanket was spread out on the ground and a pair or

group of players sat around it. Two sides were needed, but the number of people on each side could be as few as one or as many as could fit around the playing area. The number of games played was decided by the players if the game was played for leisure; a dream or vision would otherwise dictate the number of games necessary: either 4, 8, or 12 (Densmore 1972). Each player took turns tossing the dice by either throwing them upward out of a bowl and catching them again, or by throwing them against a hide or blanket that was held perpendicular to the ground and allowing them to fall, where they were scored (Macfarlan 1958). The score of each roll was determined by counting the number of dice of one color and assigning points based on a scoring system. Tribes across the U.S. had different methods of scoring, but the overall objective was the same: to receive the most points. Players kept track of scores using decorated sticks or beans, and the winner was the first to reach a set number. Culin cites one example of scoring described in 1851:

Eight buttons, about an inch in diameter, were made of elk horn, and having been rounded and polished, were slightly burned upon one side to blacken them...[and] a certain number of beans, fifty, perhaps, were made the capital, and the game continued until one of the players had won them all. Two players spread a blanket and seated themselves upon it; one of them shook the deer buttons in his hands and then threw them down. If six turned up of the same color, it counted 2; if seven it counted 4; and if all, it counted 20, the winner taking as many beans from the general stack as he made points by the throw. He also continued to throw as long as he continued to win. When less than six come up, either black or white, it counted nothing, and the throw passed to the other player....The game ending as soon as the capital in the hands of either player was exhausted. (Culin 1992).

Native Americans often placed wagers on such games, and spectators became involved by placing side bets (Oxendine 1983). While most Indians played because of social customs and

not to gain possessions, by the 19th and 20th century such games were relatively uncommon because most early colonists to North America sought to stop such “evil” practices (Oxedine 1983). While betting would have occurred when the game was played for recreation, the most significant implications of the game occur as it was played to fulfill a dream obligation. In such cases, the importance sits in the playing of the game and not in who is the victor. Robert E. Ritzenthaler, in his book Woodland Indians of the Western Great Lakes, describes the Potawatomi version of the dice game as being played mostly in winter by women (although it wasn’t uncommon for men to play as well), in place of double ball (a game also played by women, similar to lacrosse) (Ritzenthaler1983). Such games, according to Ritzenthaler, were played not simply for recreation, but “to honor the spirits and to cure the sick,” Frances Densmore describes such ceremonial activities in his book Menominee Music:

The custom of fasting in order to receive a dream is common to many tribes of Indians. The dream promises certain benefits and makes certain requirements in order that the benefits may be received. The requirements differ among Indian tribes, and the Menominee believe that they must play certain games in order to receive the benefits of two classes of dreams. If a woman dreams of the spirit women in the east, she must play either the bowl-and-dice (akä'-sianûk') or the double-ball (kowitzi'isowûk) game at definite times and in a prescribed manner, according to the directions received in the dream (Densmore 1972).

Densmore also cites similar traditions with the Sioux and Chippewa. In most cases, the playing of ceremonial bowl-and-dice games was said to provide healing or alleviate trouble or anxiety. It is noted by Densmore that Winnebago women also played the game and tell a story of its origins:

According to Thundercloud, a Winnebago informant, there are four spirit women playing the bowl-and-dice game in the northern sky, and the eight stars in a circle (constellation known as the Northern Crown) are their dice. Once these stars

dropped down to the earth and became the dice with which the Indian women play the game...Early in the morning, when the sky is red, the spirit women are playing their dice game, and the color in the sky is the color on their faces. (Densmore 1972).

Colonists, again, viewed many of these practices as deplorable, which can account for the dwindling of such games by the 19th century. One such view can be observed in an account of the Hurons given by Father Brebeuf in 1636:

There are three kinds of games particularly in vogue with this people; cross, platter, and straw. The first two are, they say, supreme for the health. Does not that excite our pity? Lo, a poor sick person, whose body is hot with fever, whose soul foresees the end of his days, and a miserable sorcerer orders for him as the only cooling remedy, a game of cross. Sometimes it is the invalid himself who may perhaps have dreamed that he will die unless the country engages in a game of cross for his health. Then, if he has ever so little credit, you will see those who can best play at cross arrayed, village against village, in a beautiful field, and to increase the excitement, they will wager with each other their beaver skins and their necklaces of porcelain beads. (Thwaites 1901)

Because of the nature of the game, and the cultural and spiritual significances associated with it, games could continue for long periods of time. Oxendine states that “as with other games of chance, dice games often continued for long periods. According to Walker (1905), Sioux women often became completely absorbed in the game, ‘sometimes playing all day and all night at a single sitting’ (p. 289). Other writers have reported games continuing for three or four days” (Oxidine 1983). The length of these games shows not only its popularity as a recreation, but also the significant role it played in Native American spirituality and culture.

Variant forms of the dice game can be found in nearly every Native American Culture across the United States. While the premise was basically the same, the tools used to play it were equally as numerous. As Katherine J. Gurnoe states in her paper from the Task Force on Ethnic Studies (1971): “like the games themselves, the implements with which they were played were considered sacred and could not be sold. They were often decorated with sacred symbols that were supposed to bring luck to the player.” Men, women, and children all played the game, but it is most often cited as a game for elderly women.

The type of bowl or basket used in the dice game was dependant on available materials, spiritual evocations, or personal preference. Densmore states that in one instance, a turtle shell was used in accordance with a dream. If no such obligations existed, carved wooden bowls, woven baskets, or pottery were used to toss and catch the dice (Oxendine 1988).

The most intriguing aspect of the bowl-and-dice game, however – and probably the most significant concerning the range of Kentucky coffee tree – was the type of material used to create the dice. Native Americans played with two-sided dice, as opposed to the traditional six-sided dice used most commonly today. “These flat dice were colored or had decorative markings on one side, but the opposite side was plain. There were made of bone, shells, split cane, wood, peach or plum pits, stone, pottery, and a variety of other materials” (Oxendine 1988). While no direct sources indicate the use of Kentucky coffee tree beans as dice in such games, there can be no doubt that similar natural materials were modified and used. Ritzenthaler states that Menominee, too, used plum stones as dice, along with antler, beaver or muskrat teeth, and pieces of wood. “The Chippewa also used plum stones (they called the game, in fact, plum stones), and both men and women played. The plum stones were carved to represent various images – a fish,

a hand, a man, a canoe – the object being to make the figures stand upright” (Ritzenthaler 1983). The Dakota also use a similar name for their version of the game (Domenech 1881).

Canada plum has been cited on numerous occasions as having been planted, or at least influenced, by Native Americans. Sturtevant reports that “it was, says Pickering, from early times planted by the New England Indians. During the ripening of the fruit, the western Indians live sumptuously and collect quantities for drying” (Sturtevant 1972). Again the use of seeds as dice is cited, this time by Katherine Gurnoe, who states, “each player used individual counters, usually seeds of some type. Buckeye seemed to be the most popular, however, many other seeds such as fig and persimmon seeds, or plum pits were used” (Gurnoe 1971). Louis Thomas Jones describes the use of plum seeds, acorns (likely split lengthwise into halves), grains of maize, and “other objects close at hand” in his book Indians at Work at Play (1971). John Lawson also encountered the game in the early 18th century and noted in his book A History of North Carolina that Native Americans played with persimmon stones as dice (Lawson 1718).

Because Kentucky coffee tree seeds are impermeable to water and require scarification to germinate, the act of carving or cutting the seeds by Native Americans for use in bowl-and-dice games would have created conditions beneficial to germination should the seeds become lost or discarded.

ETHNOBOTANY: Rattles

Music was another significant aspect of Native American culture that may have utilized Kentucky coffee tree seeds. Among the instruments described by Densmore in his book Menominee Music are drums, rattles, flutes, and whistles, not to mention songs of voice and dance (Densmore 1972). It is suggested by Hendrick in his expose of historical New York

agriculture that Iroquois living on the shores of Cayuga and Seneca Lakes used Kentucky coffee tree seeds in rattles (Hendrick 1966). The two types of rattles used by the Menominee are described by Densmore: the first consisted of a hollow gourd filled with seeds or pebbles, and the second type he referred to as a “doctor’s rattle,” as it was used by a doctor when treating the sick.

Other uses

The Walpole Island Heritage Center in Ontario Canada comments on the appeal of Kentucky coffee tree seeds as beads in rustic jewelry. The center also points out that “they are known as “hully-gullies” and are sometimes carried by children as a good luck charm.”

Although rarely used industrially, Kentucky coffee trees are rot resistant and occasionally used in the U.S. for railway ties, fence-posts, and in construction (Row 2007). Its lack of abundance makes it of little use commercially, but the tree is becoming popular as an ornamental.

As we can see, Kentucky coffee tree and similar fruit and nut species played a significant role in Native American culture. Utilization of the tree undoubtedly made it a valuable resource to Native Americans in the Great Lakes region, and whether intentionally or unintentionally managed, the tree was certainly affected by it.

DISCUSSION

Though little direct evidence exists concerning the use of Kentucky coffee tree seeds in Native American culture during pre-colonial times in the Great Lakes region, secondary evidence certainly is available. The importance of the tree to these cultures – and conversely, the importance of Great Lakes cultures to the dispersal of the tree – should not be taken lightly.

The beans of the Kentucky coffee tree are edible, but with so many other mast trees plentiful in the pre-colonial era (and even today), it is unlikely that they were used as a food source to a great extent, unless necessity proved otherwise. Evidence for the association of Kentucky coffee trees with Indian village sites, however, has been cited by several authors, and archaeological evidence suggests the use of other, similar mast trees in Native American culture.

There appears to be an association of American chestnut, *Castanea dentata* (Marsh.) Borkh., groves and Indian village sites in lower Ontario, and Jury (1952) is inclined to the opinion that the trees were planted by the Indians. The Iroquois of New York planted the Canada plum, *Prunus nigra* Ait., and possibly Kentucky coffee tree, *Gymnocladus dioicus* (L.) K. Koch, since it is most often found near village sites. (Day 1953)

Hendrick also states his suspicion that Kentucky coffee tree may have been planted by Native Americans, “since the plant in New York is most commonly found on the shores of Cayuga and Seneca Lakes near the sites of Iroquois villages. Certainly, they used the seed in making a drink, and from this the whites learned the art and gave the name ‘coffee tree.’” (Hendrick 1933)

In his book Vegetation of Wisconsin, John T. Curtis also discusses Native American practices of managing the land. Again we see that, while no conclusive proof of direct management of Kentucky coffee tree by Great Lakes Indians exists, “circumstantial evidence, both here and elsewhere, strongly supports the contention that such actions did take place” (Curtis 1959). Canada plum (*Prunus nigra*), white gentian (*Gentiana flavida*), wild leek (*Allium tricoccum*), sweetflag (*Acorus calamus*), and groundnut (*Apios americana*) were among the Wisconsin species identified by Curtis as having been cultivated by Native Americans. He further elaborates on Kentucky coffee tree, saying,

The large, hard seeds of this species were used in a sort of dice game by various tribes. As a result, they were carried about when the tribe moved its headquarters, many becoming lost in the vicinity of the villages. At present, the species has a very local distribution in Wisconsin, with each locality at or near the site of an Indian village. (Curtis 1959).

Red mulberry (*Morus rubra*), giant mallow (*Hibiscus militaris*), and lotus (*Nelumbo lutea*) are also cited as other species thought to be introduced into Wisconsin by the Indians (Curtis 1959).

Palaeo-archaeological data also seems to confirm the extensive use of mast trees in pre-colonial Native American societies. In fact, Adovasio, through his study of the Meadowcroft Rockshelter, suggests there was “long-term and generally increasing nut, fruit and berry consumption by eastern Natives during the Holocene. At Meadowcroft Rockshelter (PA), charred and uncharred hackberry (*Celtis*) seeds and charred and uncharred nutshells of walnut and hickory were common throughout the deposits along with *Chenopodium*, *Vaccinium* and *Rubus* seeds (Adovasio *et al.* 1978).

Differences in the environmental management practices of semi-nomadic hunter-gatherer cultures and those of agricultural communities is relatively insignificant when determining the effect these people had on the management and dispersal of Kentucky coffee tree. While permanent agricultural communities were more likely to have had an influence on existing stands of Kentucky coffee tree through the implementation of fire, cutting, and possibly even planting practices; hunter-gatherer communities were effective dispersal agents. Mark D. Abrams writes that despite the semi-nomadic lifestyle of these cultures, “some hunter-gatherers returned to the same places on a seasonal basis and may have invested time in tending key tree species (Snow, 1978). Reoccupation was not uncommon, and often people moved only very short distances.” (Abrams 2008).

Conclusion

Evidence seems to suggest a strong relationship between Native American ethnobotanical practices and current stands of the Kentucky coffee tree, both through direct association and by careful examination of the Great Lakes culture. Physiological characteristics of the tree do not limit its range, but do seem to affect the ability of the seeds to disperse. Because few if any natural means of dispersal exist today, the tree's current range must be attributed to influences of human cultures and their management practices – both intentional and unintentional.

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