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## Historical and cultural perspectives of oak trees in the American landscape

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### ABSTRACT

Over the course of history, oak trees have played a significant role in the natural landscape and built environment. While providing essential resources that sustain wildlife and even humans, they have aptly developed a legacy reflective of their importance across cultures. They inspire place names, emerge in stories and art, and appear on flags and coins. Their wood products, prominent in the architecture of ships, buildings, hand tools, and more, serve as a testament to their durability. Associated with qualities of endurance and longevity, the oak tree presents as a popular symbol. It is recognised as the national tree in the U.S., where oaks grow prolifically in a variety of environments. With such a reputation and many qualities resembling those of other desirable shade trees, oaks have become some of the most preferred, recommended, and beneficial species in U.S. urban forests.

### KEYWORDS

Balanophagy; culture; history; oak; wildlife

## Introduction

Comprised of nearly 60 species native to the U.S. alone, oak trees are the most widespread hardwoods in the temperate zone of the northern hemisphere (Arbor Day Foundation, 2019). Though hybridisation can make precise classification difficult, there are estimated to be between 600 and 800 species of trees and shrubs belonging to the genus *Quercus* (Young, 2013). Taking both deciduous and evergreen forms, oaks are broadly distributed across the North American landscape. It is no wonder that they percolate nearly every facet of human culture, from food and drink to literature, art, and history (Logan, 2005; Young, 2013).

Neither layman nor botanist though is likely to be aware of the full extent of cultural influence the wood has had: in architecture, beliefs, communications by land and sea and in writing, drinking and eating, the environment, as a resource to be used and conserved, the impact of its scarcity on individual trades and national standing, and much more (Young, 2013, p. 20).

## “What’s in a name?”

The dominance of oak trees and their influence is first and foremost obvious in nomenclature. Oak is the most widely used tree name among Western languages (Logan, 2005). Places, surnames, occupations, and nicknames are oak-derived. Oakland, California, for example, alludes to the 20 native species of oak that occur throughout the state (Costello, Hagen, & Jones, 2011). The city’s name originated from the Spanish word *Encinal*, meaning “oak grove,” which became Oakland with the arrival of English-speaking settlers (Dowd, 2017). German place names like Eichendorf and Eichsfeld, among others, implement the German word for oak: *Eiche* (Young, 2013). In addition, names with the roots *ac*, *ech*, *ag*, *og*, *hick*, *heck*, *chene*, *cas*, *daru*, *dru*, and *rove* are attributed to oak origin (Logan, 2005). Common surnames include Oakford, Oakham, and Oakhill or, in Estonia, Tamm, which is a direct translation of oak (Logan, 2005; Young, 2013). Where oak trees have grown, so did their influence in the names and lifestyles of those that depended on them.

## Oak symbolism and historic trees

“With something as widely dispersed, geographically and historically, as the oak, its meaning has become diffuse” (Young, 2013, p. 127).

The oak tree itself is a common and consistent figure in stories and art, symbolic across nations, cultures, and religions. Oaks are featured in folklore and mythology, poetry and proverbs, classic pieces of literature, and even slang (Young, 2013). For example, the oak tree is the most sacred tree in Celtic beliefs, its roots allegedly the door to the Otherworld. Accordingly, the Celtic name for oak is *daur*, the origin of the word “door” (Symbol Dictionary, 2019; Young, 2013). Oaks are prominent in paganism, often regarded as sacred by mythological gods, such as Thor (Young, 2013).

The oak tree is the national tree of many countries, including the U.S., where oaks overwhelmingly defeated other candidates in a 2004 vote of people’s choice for America’s national tree (Arbor Day Foundation, 2019). Oak species are the official tree of six U.S. states, including Connecticut, Georgia, Illinois, Iowa, Maryland, and New Jersey, as well as Washington, D.C. (Breyer, 2017). Beyond symbols, they have served as landmarks and places of refuge for many, including historic figures. Abraham Lincoln used the Salt River Ford Oak to navigate a river crossing near Homer, Illinois (Nadkarni, 2008). A symbol of American independence, the Charter Oak in Hartford, Connecticut was used by the colonists to hide the state’s charter from King James II (Rutkow, 2012; Young, 2013). Commemorated on Connecticut’s state quarter, the white oak, which failed in 1856, was officially mourned and remains the state tree to this day (Logan, 2005; Wikipedia, 2020).

## Oak wood products

The wood of oak trees has served many uses throughout time and across societies. Strong, watertight, and workable, oak trees were often preferred for shipbuilding (Logan, 2005). The Vikings crafted many of their notorious longships out of oak, and other European peoples followed suit (Logan, 2005; Young, 2013). The *USS Constitution* was made from 1,500 oak trees; white oak (*Q. alba*) from New England and live oak

(*Q. virginiana*) from the Georgia sea islands can be credited with earning the ship's nickname, "Old Ironsides," having successfully repelled British cannonballs (Arbor Day Foundation, 2019; Logan, 2005).

In addition to ships, oak trees made their mark in the joints and frames of buildings, with artistic flare arising through wooden architecture. Perhaps the most notable contribution of the European Middle Ages is the 660-ton, hammer-beam roof of Westminster Hall in London's Houses of Parliament (Logan, 2005; Young, 2013). On a smaller scale, oak wood was used to create furniture and hand tools (Young, 2013), and it is still a popular choice for wine barrels and liquor casks (Logan, 2005).

Byproducts from oak trees have included leather and ink. The word "tan" is derived from the Latin for oak bark (Logan, 2005), which is used for tanning hides to make leather. When ground fine and soaked in water, the bark releases tannins, which prevent the hides from decaying while creating a supple and waterproof material (Logan, 2005; Young, 2013). Additionally, tannin has been used for dyes and ink. The tannins that produce dyes are found in galls caused by wasps. The ink oak, *Q. tinctoria*, is named for its use in ink making (Logan, 2005). When combined with a binder, such as naturally occurring gum Arabic (i.e., *acacia* sap), the ink fixes readily to parchment (Young, 2013). The U.S. Constitution and Declaration of Independence, Leonardo da Vinci's drawings, and Bach's music were all drafted with oak gall ink (Logan, 2005).

## Balanophagy

Eating acorns, a practice still known as balanophagy, may have been a staple of the hunter-gatherer diet (Logan, 2005; Starin, 2014). Easy to collect, store, and process, with many nutritional benefits, acorns were used to feed humans and their livestock, especially boar in Europe (Bainbridge, 1986; Logan, 2005; Starin, 2014; Young, 2013). They appear in Greek and Roman written records, with the old Tunisian word for oak meaning "meal-bearing tree" (Logan, 2005). Acorns were particularly important as a food crop in California, where Native Americans harvested and consumed them for millennia (Prichep, 2014; Starin, 2014). They are also common in contemporary Korean markets, where they may be sold as starch flour, acorn jelly, or acorn noodles (Bainbridge, 1986; Logan, 2005; Prichep, 2014; Young, 2013).

Though tannins must be leached during preparation, acorns are a source of proteins, fats, carbohydrates, and minerals (Bainbridge, 1986; McShea & Healy, 2002; Miller & Lamb, 1985; Ocean, 2006). As such, they are good for maintaining low blood sugar levels, in addition to being lower in saturated fats than most other nuts (Young, 2013). Today, there is interest in reintroducing acorns to the human diet; recipe books and online resources detail how to sustainably collect and properly prepare them before cooking. Acorns may be roasted and eaten alone, though they were often used to fill out recipes, especially when grain was not available. Thus, they are growing in popularity as flour and becoming more common in baked goods, as well as soup (Logan, 2005; Ocean, 2006; Shaw, 2019; Stillman et al., 2018).

## Oaks and wildlife

Beyond their significance to people, oak trees are a key component of many wildlife habitats; they provide structure for cover and nesting sites and supply acorns, which are an important food source for many wildlife species, including mammals, birds, and insects (Martin, Zim, & Nelson, 1951; McShea & Healy, 2002; Miller & Lamb, 1985). Van Dersal (1940) identified 186 birds and mammals in the U.S. that utilise oak products, including acorns. Acorns rank at the top of the food list for wildlife in large part because of their abundance, especially during the winter, when other food items are scarce (Martin et al., 1951; Miller & Lamb, 1985). Martin et al. (1951) estimated that over 96 species in the U.S. consume acorns, while Miller and Lamb (1985) asserted that 49 of those species are found in the eastern U.S. alone. The distributions of deer, black bear (*Ursus americanus*), and turkey (*Meleagris gallopavo*) are no doubt influenced by oak populations, as they are heavily dependent on the presence of acorns, which comprise upwards of 50 to 75% of their diets (Martin et al., 1951; McShea & Healy, 2002).

Some interesting interactions and cycles occur among wildlife, oak trees, and acorns. During mast years, when oaks produce greater quantities of acorns, a corresponding increase in populations of both white-footed mice (*Peromyscus leucopus*) and white-tailed deer (*Odocoileus virginianus*) may occur in oak-dominated forests. Greater densities of both species in time and space increase the likelihood for transmission of Lyme disease, whereby white-tailed deer harbour adult deer ticks (*Ixodes scapularis*), which are most likely to acquire the Lyme disease bacterium via white-footed mice in their larval stage (McShea & Healy, 2002; Ostfeld, Keesing, Jones, Canham, & Lovett, 1998). Consequently, there is increased probability of Lyme disease transmission following heavy acorn production, when ticks and mice co-occur in greater numbers. White-footed mice are also known to consume gypsy moth (*Lymantria dispar*) caterpillars, helping to regulate populations of this invasive oak forest defoliator when it occurs in low densities (Jones, Ostfeld, Richard, Schaubert, & Wolff, 1998; McShea & Healy, 2002; Ostfeld, Jones, & Wolff, 1996).

Other common consumers of acorns include squirrels, jays, and weevils. Both squirrels and jays cache acorns, recovering only a portion of these seeds, leaving many more in the ground to germinate (Logan, 2005; McShea & Healy, 2002). The acorn woodpecker (*Melanerpes formicivorus*) of the Western and Southwestern U.S. is another caching species, notorious for storing acorns in granary trees (Cornell Lab of Ornithology, 2017). The eastern grey squirrel (*Sciurus carolinensis*) demonstrates an interesting behaviour in how it handles acorns from the two oak subgenera, the red oak group (subgenus *Erythrobalanus*) and the white oak group (subgenus *Leucobalanus*). Though white oak acorns have less nutritional value, they are preferred by most wildlife species (humans included) over red oak acorns, which have higher concentrations of bitter tannins that are more difficult to digest (Chung-maccoubrey, Hagerman, & Kirkpatrick, 1997; Ofcarcik & Burns, 1971). Another noteworthy difference between the subgenera is that white oak acorns germinate in the autumn, while red oak acorns overwinter and germinate in the spring (Fox, 1982). In response, eastern grey squirrels are known to immediately consume acorns from the white oak group and cache those from the red oak

group. White oak acorns may be cached, but only after removing the embryo of the seed. This halts the germination process, allowing the squirrel to later capitalise on the nutritional resources that would be otherwise utilised during germination (Fox, 1982; Hadj-Chikh, Steele, & Smallwood, 1996).

Jays are one of the greatest vectors of oak dispersal and propagation (Gómez, 2003), caching more than 4,500 acorns or more in a given year (DeGange, Fitzpatrick, Layne, & Woolfenden, 1989), sometimes up to a mile away from the source tree (Darley-Hill & Johnson, 1981), and recovering only one in four nuts (Logan, 2005). They are even credited with the rapid recolonisation of oaks following the last glacial retreat in North America and Europe (Harper, Standiford, & LeBlanc, 2019; Logan, 2005). Acorn-dispersing jay species include the European jay, *Garrulus glandarius* (Gómez, 2003), blue jay, *Cyanocitta cristata*, (Darley-Hill & Johnson, 1981), and Florida scrub jay, *Aphelocoma coerulescens* (DeGange et al., 1989.) The physiology of jay species is tied to their dietary needs, with bills adapted to tearing husks and hammering acorns into the ground (Logan, 2005). Breeding is also timed with acorn availability, and the innate ability of jays to remember landscape features can be attributed to caching behaviour (Clayton & Dickinson, 1998; Clayton, Yu, & Dickinson, 2003; Logan, 2005).

Another wildlife species adapted to the oak nut is the acorn weevil, an insect belonging to the snout beetle family, Curculionidae. Acorn weevils may have long or short snouts, called rostrums, which are used to bore through acorn shells to feed and lay eggs inside the nutmeat (Red Planet, 2018). Females have longer rostrums than males and deposit short, cylindrical larvae into acorns, where they feed and eventually bore their way out (NatureSpot, 2019). Acorns are subjected to heavy weevil damage, often rendering the seeds incapable of germinating or slowing growth (McShea & Healy, 2002; Miller & Lamb, 1985).

Acorn weevils are not the only insects to exhibit a peculiar relationship with oak trees. As mentioned, cynipid wasp species form galls on oaks. Galls are essentially growths comprised of plant tissue that occur in response to a chemical secretion produced by gall wasp larvae (Penn State, 2019). These growths form around the larvae, housing them until they become adults; self-fertile adult females lay their eggs elsewhere on the host and repeat the process (Logan, 2005). Some galls produce their own honeydew, which is fed upon by ants. The ants defend the galls against predators, namely parasitoids that would kill the wasp larvae or take over the gall for their own broods (Logan, 2005; Washburn, 1984).

Oak trees are a major component of wildlife habitat, especially in Northeastern U.S. forests. They host varying life stages of many insects, including larvae of wasps, weevils, and species of Lepidoptera. Tallamy and Shropshire (2009) found that the genus *Quercus* supports over 530 species of butterflies and moths, placing them first in a ranking of most valuable plant genera for lepidopteran hosts. Over 190 wildlife species utilise red oak (*Q. rubra*) forests in New England alone (DeGraaf & Yamasaki, 2001), for any combination of feeding, cover, nesting, and breeding. With such prevalence and significance in the natural landscape, it becomes readily evident as to why oak trees have a place among urban infrastructure in human-dominated environments.

## Urban oak trees

Urban trees and forests were not managed in the U.S. until the late 1800s. The roots of Arbor Day were founded in 1872 by J. Sterling Morton, and tree planting traditions ensued thereafter (Jonnes, 2016; Miller, Hauer, & Werner, 2015). Canadian forestry professor Erik Jorgensen is credited with coining the term “urban forest” in 1965 (Jonnes, 2016), but urban forestry was not formally recognised as a discipline within the forestry profession until the 1970s (Miller et al., 2015). By 1990, the U.S. Forest Service’s Urban and Community Forestry Programme finally achieved a line-item spot within the Farm Bill, dramatically increasing the programme’s funding (Jonnes, 2016).

Much of the commitment to urban forestry practices may be attributed to the devastating effects of pests and diseases, especially Dutch elm disease (DED). Elm trees were once considered *the* superior shade tree, revered across America for their shape, stature, and ability to tolerate harsh urban conditions (Jonnes, 2016). Following their collapse to DED, oak trees arose as a plausible alternative for urban foresters looking to replace their beloved elms. In an issue of *Arnoldia*, the journal of the Arnold Arboretum, dedicated to identifying replacement trees for the American elm, authors described red oaks as excellent street trees, “tolerant of poor, dry, compacted soils, salt, and atmospheric pollution” that are capable of withstanding “the inevitable impact of vehicles” (Jonnes, 2016).

Since then, oak trees have become common and recommended in street tree selection. Urban forestry researchers and professionals alike have explored their use in urban planting, particularly in response to climate change (Roloff, Korn, & Gillner, 2009). Given the variety, importance, and widespread distribution of *Quercus* spp. across the northern hemisphere, oaks are superb candidates for climate adaptation research (Cannon et al., 2018). Like the red oak, many other *Quercus* spp. feature tolerance of urban stressors, including heat, drought, and soil compaction (Roloff et al., 2009; Urban Horticulture Institute, 2009). There is further potential for assisted migration by promoting southerly species in more northern urban environments (Bradley & Harper, 2014). With such advantages, oak trees may be favoured in the U.S., where urban foresters continue to diversify their community tree assemblages to withstand the pressures of the built landscape, invasive pests and pathogens, and a changing climate.

## Summary

We let the dead veteran season for a year in the sun it could no longer use, and then on a crisp winter’s day we laid a newly filed saw to its bastioned base. Fragrant little chips of history spewed from the saw cut and accumulated on the snow before each kneeling sawyer. We sensed that these two piles of sawdust were something more than wood: that they were the integrated transect of a century; that our saw was biting its way, stroke by stroke, decade by decade, into the chronology of a lifetime, written in concentric annual rings of good oak (Leopold, 1949, p. 8).

Summarised in Leopold’s tale of the “good oak” in *A Sand County Almanac* (1949), it is evident that oak trees have longstanding, well-developed associations across the landscapes that they dominate. A formidable backbone to crucial structures throughout human history, an indispensable host and food source for wildlife, and a contender

for a top spot in the race of preferred urban trees, the oak is as significant as it is timeless.

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## Notes on contributors

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