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Chinquapin oak leaves and acorns. Creative Commons image by Paul Wray, Iowa State University, Bugwood.org.

Introductory

SPECIES: *Quercus muehlenbergii*

AUTHORSHIP AND CITATION:

Tirmenstein, D. A. 1991. *Quercus muehlenbergii*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: <https://www.fs.fed.us/database/feis/plants/tree/quemue/all.html> [2022, April 29].

Revisions:

On 2 March 2018, the common name of this species was changed in FEIS
 from: chinkapin oak
 to: chinquapin oak. Images were also added.

ABBREVIATION:

QUEMUE

SYNONYMS:

Quercus muhlenbergii Engelm. [[31](#)]
Quercus prinoides J.M. Coult, misapplied
Quercus prinoides Willd. var. *acuminata* (Michx.) Gleason

NRCS PLANT CODE:

QUMU

COMMON NAMES:

chinkapin oak
chinquapin oak
yellow chestnut oak
chestnut oak
rock chestnut oak
rock oak
yellow oak

TAXONOMY:

The currently accepted scientific name of chinquapin oak is *Quercus muehlenbergii* Engelm. [36]. Many authorities recognize this species under an alternate spelling, *Q. muhlenbergii* Engelm. [31]. Chinquapin oak is a member of the white oak subgenus or section (*Lepidobalanus*) [9] and is placed within the chestnut oak subsection (*Prinoideae* Trelease) [44]. Two forms have been delineated on the basis of leaf and nut morphology [23]. A form characterized by wide leaves has been identified as *Q. muehlenbergii* f. *alexanderi* (Britton) Trel. [75].

Chinquapin oak hybridizes with many other oak species, including bur oak (*Q. macrocarpa*), white oak (*Q. alba*), Gambel oak (*Q. gambelii*), dwarf chinquapin oak, *Q. x deamii*, *Q. x introgressa*, and *Q. bicolor x prinoides* [36,40]. Hybridization with gray oak (*Q. grisea*) and swamp white oak (*Q. bicolor*) is suspected [68,69]. *Q. x deamii* (= *Q. fallax*) is probably a hybrid of chinquapin oak and white oak or chinquapin oak and bur oak [7,23]. *Q. introgressa* may be a natural hybrid of chinquapin oak and dwarf chinquapin oak. Introgressants and hybrid swarms between chinquapin oak and dwarf chinquapin oak are common [68].

LIFE FORM:

Tree

FEDERAL LEGAL STATUS:

No special status

OTHER STATUS:

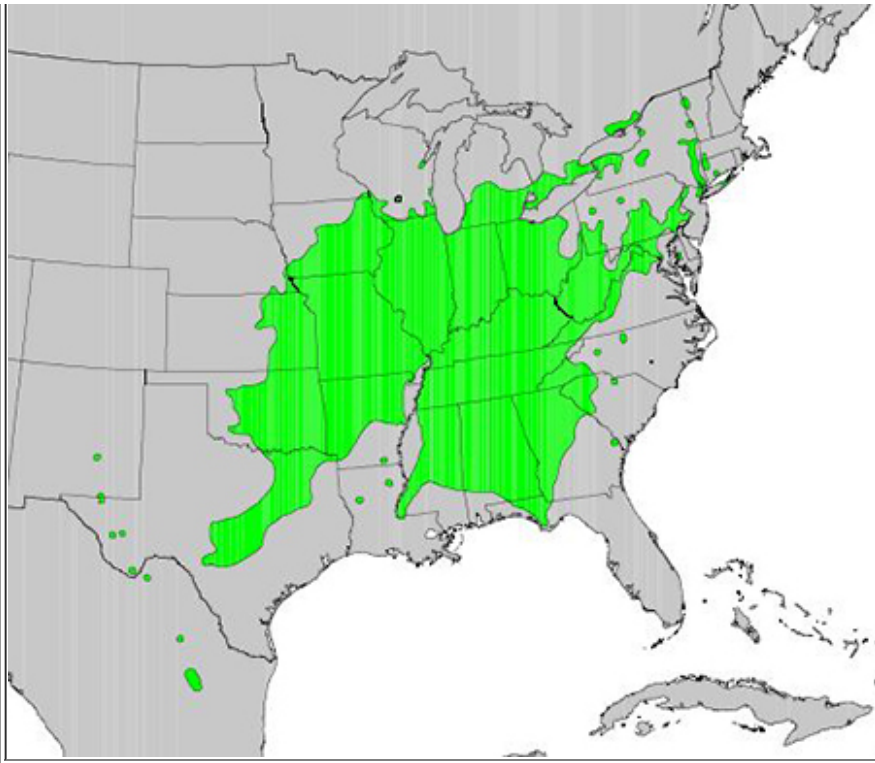
NO-ENTRY

DISTRIBUTION AND OCCURRENCE

SPECIES: *Quercus muehlenbergii***GENERAL DISTRIBUTION:**

Chinquapin oak is widely distributed throughout much of eastern and central North America [11]. Its range extends from New England and Pennsylvania southward mostly in the mountains through Virginia and the Carolinas to northwestern Florida, westward to northern Mexico, south-central Texas, and Oklahoma, and north to Minnesota, Wisconsin, southern Ontario, and southern Michigan [23,26].





Distribution of chinquapin oak. 1971 USDA, Forest Service map digitized by Thompson and others [79].

Local and disjunct populations occur in western Texas, New Mexico, and northeastern Mexico [36,69]. In the eastern United States, chinquapin oak is relatively rare throughout much of the Atlantic and Gulf coastal plains [32]. It is uncommon or rare in Pennsylvania [32] and in New England [58]. Chinquapin oak reaches greatest abundance in the Mississippi and Ohio valleys [23,32].

ECOSYSTEMS:

FRES15 Oak - hickory
 FRES18 Maple - beech - birch
 FRES28 Western hardwoods
 FRES39 Prairie

STATES:

AL AR CT DE FL GA IL IN IA KS
 KY LA MD MA MI MN MS MO NE NJ
 NM NY NC OH OK PA RI SC TN TX
 VT VA WV WI ON MEXICO

BLM PHYSIOGRAPHIC REGIONS:

13 Rocky Mountain Piedmont
 14 Great Plains

KUHLER PLANT ASSOCIATIONS:

K038 Cedar glades
 K089 Black belt
 K100 Oak - hickory forest
 K103 Mixed mesophytic forest
 K104 Appalachian oak forest

SAF COVER TYPES:

- 14 Northern pin oak
- 27 Sugar maple
- 40 Post oak - blackjack oak
- 42 Bur oak
- 52 White oak - black oak - northern red oak
- 57 Yellow poplar
- 60 Beech - sugar maple
- 236 Bur oak

SRM (RANGELAND) COVER TYPES:

NO-ENTRY

HABITAT TYPES AND PLANT COMMUNITIES:

Chinquapin oak grows as a codominant with bur oak (*Quercus macrocarpa*) and hackberry (*Celtis occidentalis*) in gallery forests of the Konza Prairie in northeastern Kansas [3]. In most other locations it occurs as scattered individuals within a mixed overstory.

MANAGEMENT CONSIDERATIONS

SPECIES: *Quercus muehlenbergii*

WOOD PRODUCTS VALUE:

Wood of chinquapin oak is dark brown with a narrow, pale sapwood; it is hard, heavy, strong, and durable [66]. These characteristics make it a valuable wood for many uses [48]. It is commonly used as sawtimber and is considered a member of the select white oak group [49].

When properly dried and treated, oak wood glues well, machines very well, and accepts a variety of finishes [43]. It is widely used for cabinets, furniture, pallets, and containers [43,53]. Oak wood was traditionally used for railroad ties [53] and is commonly cut for firewood [17].

IMPORTANCE TO LIVESTOCK AND WILDLIFE:

Browse and acorns of chinquapin oak are important to a wide variety of birds and mammals [23]. Oak browse is often eaten by deer and rabbits; rabbits sometimes girdle small trees [28]. Beaver feed on the bark and twigs [23], and porcupines consume the bark [71].

The acorns of chinquapin oak are a high quality, dependable food source [30,52]. Mice, squirrels, voles, other small mammals, and white-tailed deer consume the acorns of chinquapin oak [13,52,65]. Acorns are an especially important fall food item for the black bear [54]; the relative abundance of fall mast crops can affect black bear reproductive success during the following year [21].

The acorns of chinquapin oak are a particularly important food item for the red-headed woodpecker, red-bellied woodpecker, northern bobwhite, and blue jay [64]. Other bird species that feed on acorns include the ruffed grouse, sharp-tailed grouse, ring-necked pheasant, wild turkey, common crow, northern flicker, grackle, blue jay, brown thrasher, tufted titmouse, starling, lesser prairie chicken, chickadees, nuthatches, and waterfowl [38,52,71].

PALATABILITY:

Browse: In general, the palatability of oak browse is relatively high for livestock and many wildlife species. Eastern oaks are preferred browse of white-tailed deer in some locations [71]. New growth is

particularly palatable to deer and rabbits [28].

Acorns: The acorns of chinquapin oak are sweet and highly palatable to many species of birds and mammals [23].

NUTRITIONAL VALUE:

Browse: Nutrient content of oak leaves has been reported as follows [45]:

Dry matter	Ash	Crude fiber	Ether extract	N-free extract	Protein
-----percent dry matter-----					
100	56	27.4	2.5	54.3	10.2

Acorns: Most acorns are nutritious [28] and high in carbohydrates [29]. Acorns of the white oaks are generally low in lipids (5 to 10 percent) and tannins (0.5 to 2.5 percent) [62].

COVER VALUE:

Chinquapin oak provides good cover for a variety of bird and mammal species. Young oaks with low branches serve as particularly good winter cover [59]. Oak leaves often persist longer than those of many other plant associates, and in some areas, young oaks may represent the only brushy winter cover in dense pole stands [59]. In the pine-oak zone of Texas, species such as chinquapin oak provide shade for pronghorns [16]. Oaks frequently serve as perching or nesting sites for various species of songbirds [18]. The well-developed crowns provide shelter and hiding cover for tree squirrels and other small mammals. Many species of birds and mammals use twigs and leaves as nesting material [39]. Large oaks provide denning sites for a variety of mammals [18].

VALUE FOR REHABILITATION OF DISTURBED SITES:

Chinquapin oak can be readily propagated through seed. Attempts to root stem cuttings or propagate through budding have been largely unsuccessful [23]. Details on propagation techniques are available [9,23,46].

OTHER USES AND VALUES:

Acorns were an important food source for Native American peoples [71]. The acorns of chinquapin oak are sweet and edible when roasted [11]. Chinquapin oak is an attractive shade tree [48]; it was first cultivated in 1822 [46].

OTHER MANAGEMENT CONSIDERATIONS:

Silviculture: Oaks often regenerate poorly after timber harvest. Hannah [28] reported that the use of natural seedbeds and standard hardwood silvicultural practices are often ineffectual in promoting oak regeneration. Vigorous, advanced regeneration is essential for producing good stands of oak after timber harvest [18,47,57]. For adequate regeneration of oaks, advanced regeneration at least 4.5 feet (1.4 m) in height should number at least 435 per acre (176/ha) prior to harvest. A series of selection cuts can produce stands with several age classes and can generate sufficient advanced regeneration for well-stocked, postharvest stands. Initial cuts should reduce overstory densities to no less than 60 percent stocking. Reduction of competing understory species may be necessary in some instances [57].

Chemical control: Oaks often produce basal sprouts in response to herbicide treatments [24]. Herbicides such as tebuthiuron and triclopyr can reduce crowns of chinquapin oaks by 88 to 98 percent and kill 74 to 94 percent of chinquapin oak trees [67].

Insects/disease: Chinquapin oak is relatively resistant to insects and disease [48]. It is, however, susceptible to attack by oak wilt, acorn weevils, and the gypsy moth [23].

BOTANICAL AND ECOLOGICAL CHARACTERISTICS

SPECIES: *Quercus muehlenbergii*

GENERAL BOTANICAL CHARACTERISTICS:

Chinquapin oak is a spreading, medium to large, deciduous tree which generally reaches 16 to 52 feet (5-16 m) in height [50] but occasionally grows to 80 or 90 feet (24-27 m) [46,66]. On exceptional sites in the lower Wabash and Ohio valleys, individuals can reach 160 feet (48 m) in height and up to 4 feet (1.2 m) in diameter [23]. Chinquapin oak typically has large, low branches and a rounded crown [66]. In closed forest stands it develops a straight, columnar trunk, a dense rounded crown, and fairly small branches [23]. In the open, plants usually develop a short trunk and broad crown. Grayish-brown twigs are rigid and glabrous [66]. The thin bark is light gray to silvery, and rough or scaly [50,66]. The alternate, simple leaves are coriaceous and variable in shape [66].

RAUNKIAER LIFE FORM:

Phanerophyte

REGENERATION PROCESSES:

Chinquapin oak is monoecious. Staminate catkins form from the base of new growth or from lateral buds on the previous year's growth. Pistillate flowers grow from the axils of the current year's growth [66]. Flowers are wind pollinated [52]. Acorns are borne singly or in pairs, and are dark brown to nearly black [23]. About half of the nut is enclosed by the cup [27]. Acorns mature in one season [23].

Most eastern oaks produce good seed crops at variable intervals [28]. Best seed crops are generally produced by large trees (> 20 inches [51 cm] d.b.h.) with vigorous crowns. Cold or wet weather during flowering can result in poor seed production [28,47]. Acorns are disseminated by gravity, and rodents and birds [66]. Groups of seedlings commonly originate from the caches of blue jays [30]. Although effective dispersal agents, birds and mammals also consume many seeds. In some areas, 90 to 100 percent of the annual acorn crop may be lost to seed predators [71].

Acorns of chinquapin oak germinate soon after falling to the ground [47]. Stratification is not required [46]. Acorns of chinquapin oak remain viable for only short periods, even when properly stored. Bonner and Vozzo [9] reported that germination of fresh acorns was 91.3 percent, but that germination declined to 39.0 percent after 1 year in storage and to only 2.0 percent after 2 years.

Seedlings of chinquapin oak develop best on well-drained calcareous soil [23]. They can tolerate moderate shrub-tree cover [23] but require sufficient light for good early growth. Seedlings are rare in gallery forests of Kansas but are common at nearby prairie-forest borders [5]. Roots of developing seedlings must quickly reach mineral soil; in many areas, establishment is limited by the presence of a thick organic layer [3,55].

Vegetative regeneration: Chinquapin oak sprouts readily after disturbance [23]. Stump sprouting often occurs [48], but in many areas,

it is less common than root sprouting [65]. Hannah [28] reported that the best sprouts often develop at or below the ground level. Small poles, saplings, and even seedlings can sprout when cut or burned [28]. Repeated sprouting is also common [74]. Seedlings often develop an "s"-shaped curve at ground level, which helps protect dormant buds from fire. After repeated fires, these stems may develop "stools" or areas comprised of callus tissue filled with dormant buds [55]. Epicormic buds located beneath the bark of older oaks commonly sprout when these trees are damaged [74].

Bud dormancy in oaks is largely controlled by auxins rather than by levels of carbohydrate reserves [74]. Apical dominance can restrict the development of belowground buds when buds survive on aboveground portions of the plant. Sprouting is reduced by low light levels [74] and decreases as the stand ages [41]. McIntyre [41] reported that the number of sprouts per group tends to decrease from poor to good sites. Initial sprout growth is typically rapid [55].

SITE CHARACTERISTICS:

Chinquapin oak grows on dry, rocky sites [11], such as calcareous bluffs, rocky hillsides, and protected slopes and canyons [20]. It also occurs in glades and valleys, and along rocky streambanks [26,27,66]. In parts of the Midwest, chinquapin oak grows in rich forests and on stabilized dunes [70]. Chinquapin oak is particularly common near forest margins [27]. It is fairly tolerant of shade and drought [5,19].

Plant communities: Chinquapin oak is common in only one cover type, the post oak (*Quercus stellata*)-black oak (*Q. velutinus*) type [23]. Elsewhere, it grows as scattered individuals or in relatively isolated groves. It occurs in a variety of communities, including gallery forests along stream channels and ravines in the southern and central Great Plains at the edge of eastern deciduous forests [1]. It is also present in the Cross Timbers, Blackland prairies, post oak savannas, and pine-oak forests of Texas [48,61].

In the eastern United States, chinquapin oak grows in a number of mixed mesophytic or submesic woodlands, including beech (*Fagus* spp.)-maple (*Acer* spp.), maple-basswood (*Tilia* spp.), oak-hickory (*Carya* spp.), oak-chestnut (*Castanea dentata*), chestnut oak (*Quercus prinus*), and northern red oak (*Q. rubra*)-basswood [6,23,26,39,49,60]. In parts of southern Indiana, it occasionally codominates the crown canopy with northern red oak. In Ohio, chinquapin oak commonly grows in areas transitional from swamp forest to mesophytic forests [23]. Chinquapin oak was a prominent species in several presettlement, open woodland communities of the Midwest and middle South, including portions of Inner Bluegrass region of Kentucky [15].

Plant associates: Common plant associates in different geographic locations include:

Midwest - Common associates in gallery forests of the prairies include hackberry, American elm (*Ulmus americana*), bur oak, and sycamore (*Platanus occidentalis*) [3,63]. Bur oak, white oak, black oak, northern red oak, and shagbark hickory (*Carya ovata*) grow with chinquapin oak in parts of the upper Midwest [12].

Texas - In pine-oak forests of Texas, chinquapin grows in association with ponderosa pine (*Pinus ponderosa*) and Douglas-fir (*Pseudotsuga menziesii*) [16,48]. Other common associates in Texas include American elm, hackberry (*Celtis* spp.), blackjack oak (*Quercus marilandica*), Shumard oak (*Q. shumardii*), western soapberry (*Sapindus saponaria* ssp. *drummondii*), and black cherry (*Prunus serotina*) [61].

South - Chinquapin oak occurs with white oak, black oak (*Quercus velutinus*), sugar maple (*Acer saccharum*), hickory, black cherry, ash (*Fraxinus* spp.), Arizona walnut (*Juglans major*), yellow-poplar

(*Liriodendron tulipifera*), and cucumbertree (*Magnolia acuminata*) in the Southeast [23]. In remnants of open woodlands common in portions of the Inner Bluegrass region of Kentucky during presettlement times, chinquapin oak occurs with bur oak, blue ash (*Fraxinus quadrangulata*), Shumard oak, shellbark hickory (*Carya laciniata*), shagbark hickory, sugar maple, black cherry, yellow-poplar, and red mulberry (*Morus rubra*) [15]. In the deep South, it grows with holly (*Ilex* spp.) and other oaks in stands dominated by beech and magnolia (*Magnolia* spp.) [23]. In Arkansas, butternut (*Juglans cinera*), Arizona walnut, and other oaks are particularly common associates [23].

Soils: Chinquapin oak commonly occurs on calcareous soils which are derived from limestone [23]. It also grows on deep, well-drained soils of river and creekbottoms [61] and on limestone outcrops [23]. Soils are often of low fertility and deficient in nutrients such as phosphorus [33]. Chinquapin oak grows on medium acidic to highly alkaline soils [23] but reaches greatest abundance on basic soils [50]. In parts of the Midwest, it is absent in relatively level areas where soil leaching has resulted in an acidification of a glacial till mantle [23]. Edaphic factors can greatly influence growth rate of chinquapin oak [1].

Climate: Chinquapin oak grows in moist subhumid to humid zones throughout most of its range but grows in dry subhumid conditions at the southwestern edge of its range [23]. Growing-season precipitation ranges from 10 inches (25 cm) in Texas to 80 inches (203 cm) in the southern Appalachians. The length of the growing season ranges from 120 to 240 days [23].

Elevation: Chinquapin oak grows from 400 to 3,000 feet (122-914 m) [79]. It is absent or rare at higher elevations in the Appalachian Mountains [23].

SUCCESSIONAL STATUS:

Chinquapin oak is a climax tree on dry soils, particularly those of limestone origin. It is seral on more moist sites [23]. Chinquapin oak is moderately shade tolerant when young, but becomes increasingly intolerant of shade with age.

Upper Midwest: Chinquapin oak and bur oak commonly dominate oak savannas of the upper Midwest. Evidence suggests that tree density in these oak savannas increased after settlement [12]. Fire frequencies were presumably much reduced at this time, enabling chinquapin oak to reach extremely large sizes. With continued fire suppression, these oak savannas are being replaced by more shade-tolerant species such as elm (*Ulmus* spp.), sugar maple, and buckeye (*Aesculus* spp.) [42]. In the absence of disturbance, sugar maple assumes dominance in climax stands [42].

Central Midwest: In oak-hickory forests of southern Indiana, chinquapin oak stands are seral to climax beech-ash-maple forests. Chinquapin oak grows in the final successional stages of Ozark floodplain communities which are dominated by sugar maple and bitternut hickory (*Carya cordiformis*) at climax. On south- and west-facing slopes near these communities, it is considered a subclimax or seral species [23].

Southeast: Chinquapin oak and bur oak dominate certain early seral forests in Mississippi Valley lowlands [3]. These forests are replaced first by black oak, then northern red oak-shagbark hickory, and finally American basswood (*Tilia americana*)-eastern hophornbeam (*Ostrya virginiana*) forests [3]. Chinquapin oak also grows in certain climax floodplain oak-hickory communities in the lower Mississippi Valley [60]. Hickories and the rapidly growing southern red oak (*Quercus falcata*) develop first following disturbance on sites in this region. Seedlings of chinquapin oak generally appear 75 to 100 years after the initial disturbance [60]. Martin and DeSelm [39] reported that in eastern Tennessee, chinquapin oak occasionally occurs in old-growth forests in

limestone valleys.

Middle South: In presettlement times chinquapin oak grew as an overstory codominant in certain unique open woodland communities of the Inner Bluegrass region of Kentucky [15]. Evidence suggests that these communities were maintained by a combination of factors such as soil, climate, grazing, and fire history. With changes in fire frequency and increased grazing brought about by settlement, these communities declined and were ultimately replaced by cultivated fields and pastures dominated by cool-season grasses [15].

Eastern Great Plains: During settlement times, reductions in fire frequency enabled woody species, such as chinquapin oak, to expand westward into parts of the prairie [3,10]. However, with further reductions in fire frequency, oak woodlands dominated by chinquapin oak and bur oak are being replaced by maple-basswood forests [3]. Historically, these narrow oak forests burned periodically as fires from grasslands spread into adjacent woodlands.

In the Kansas prairie, chinquapin oak is a component of early seral forests [5]. In many of these forests, this oak apparently grew and reproduced beneath the overstory canopy until approximately 50 years ago [3]. At this point, development of a thick organic seedbed, attributed to fire exclusion, may have limited oak establishment. Continued overstory development within the past 10 to 30 years has led to the proliferation of more shade-tolerant species [3]. Species such as hackberry ultimately replace the oaks on moist sites, whereas redbud (*Cercis* spp.) assumes dominance on more xeric sites [3,52]. A return to more frequent fires could permit the oaks to assume dominance on these sites [52].

SEASONAL DEVELOPMENT:

Chinquapin oak leafs out in mid-spring [52]. Plants flower when leaves are approximately 25 percent grown [23]. Fruit ripens at the end of the first growing season [27]. Generalized flowering and fruiting dates by geographic location are as follows:

Location	Flowering	Fruiting	Authority
WI	May	----	Curtis 1959
New England	May 21-June 8	----	Seymour 1985
n-c Great Plains	early May	September	Stephens 1973
NC-SC	April	October	Radford and others 1968
Great Plains	April-May	----	Great Plains Flora Association 1986
KS	May	----	Reichman 1987
Blue Ridge Mtns.	April-May	----	Wofford 1989

FIRE ECOLOGY

SPECIES: *Quercus muehlenbergii*

FIRE ECOLOGY OR ADAPTATIONS:

Chinquapin oak often sprouts from the stump or root crown after fire [23]. Reestablishment through seed may occur on favorable sites in good years. Rouse [55] reported that seedling establishment of oaks is often favored on mineral seedbeds produced by fire.

Mean fire intervals in gallery forests of northeastern Kansas have been estimated at approximately 11 to 20 years [2]. These fires most likely originated in adjacent prairies which historically burned every 2 to 3

years. Since settlement times, gallery forests have expanded into prairie because of increased fire suppression [3] [See Successional Status]. Litter in gallery forests presumably decomposes more rapidly, and the areal extent of fire may have been limited by the lower fuel accumulations typical of these sites [2]. Killingbeck [33] observed that patches of chinquapin oak predominate on infertile, phosphorus-deficient sites in gallery forests. Intense, damaging fires are unlikely to occur on these sites because biomass and litter accumulations are low. Increased cattle grazing may also have led to reduced fuels and less destructive fires [10]. Oak woodlands are currently being replaced by maple-basswood forests because of reductions in fire frequencies [3].

FIRE REGIMES:

Find fire regime information for the plant communities in which this species may occur by entering the species name in the [FEIS home page](#) under "Find Fire Regimes".

POSTFIRE REGENERATION STRATEGY:

survivor species; on-site surviving root crown or caudex
survivor species; on-site surviving roots
off-site colonizer; seed carried by animals or water; postfire yr 1&2

FIRE EFFECTS

SPECIES: *Quercus muehlenbergii*

IMMEDIATE FIRE EFFECT ON PLANT:

The fire resistance of chinquapin oak has not been well documented [15]; the results of several studies have been somewhat contradictory. Abrams [3] observed no fire-caused overstory mortality in gallery forests of northeastern Kansas. Many large individuals were scarred from recurrent fires [2] but still exhibited good growth and vigor. Killingbeck [33], however, reported that chinquapin oak is very susceptible to fire in gallery forests. These observed differences in fire effects on chinquapin oak may be attributable to variation in fire severity and intensity, site characteristics, plant age or size, form, vigor, season of burn, and stocking levels [55].

Saplings and pole-sized chinquapin oaks are easily damaged by fire [23]; trees become more fire resistant as the bark thickens with age [28]. Most acorns are characterized by a relatively high moisture content. As the moisture within the acorns is heated, the seeds swell and often rupture [55]. Therefore, few acorns present on a site survive fire.

DISCUSSION AND QUALIFICATION OF FIRE EFFECT:

Oaks tend to be less susceptible to fire during the dormant season. Weak individuals are less likely to heal than healthy, vigorous ones. Oaks growing in overstocked stands typically exhibit lower vigor and are more susceptible to fire-caused damage. Crooked or leaning trees are particularly vulnerable to damage since the flames are more likely to be directly below the stem, thereby increasing the amount of heat received at the bark's surface. Basal injuries often permit the entry of insects or decay that may ultimately kill the tree [55].

PLANT RESPONSE TO FIRE:

Chinquapin oak commonly sprouts after aboveground portions of the plant are damaged or destroyed [23]. Specific response is presumably related fire severity and intensity, season of burn, and plant age and vigor. Most oaks sprout from the stump after moderate fires [28], and from underground portions when completely top-killed [55]. Hannah [28]

reported that the best sprouts often originate from buds located at or below ground level. These sprouts may be more vigorous and less susceptible to rot or other damage.

Seedlings, saplings, and small pole-sized trees commonly sprout if girdled by fire. Damaged seedlings often sprout several times and may ultimately grow beyond the fire-susceptible stage [28]. Sprouting ability appears to decrease as plants age. Large trees are much less likely to sprout when severely damaged by fire.

Large oaks that survive fire frequently serve as seed sources [28]. Dying trees often produce a massive seed crop [55]. Also, some seed is transported from adjacent, unburned areas by birds and mammals. Fire may favor seedling establishment because it exposes mineral soil, creating an optimal seedbed [55].

DISCUSSION AND QUALIFICATION OF PLANT RESPONSE:

Vegetation in a gallery forest on the Konza Prairie in northeastern Kansas was surveyed before and after 2 years of annual prescribed burning in April. The number of chinquapin oak seedlings increased from 100 per hectare before burning to 250 per hectare after 1 year of burning, but no chinquapin oak seedlings or saplings were present on the plots after 2 years of burning [4].

FIRE MANAGEMENT CONSIDERATIONS:

Prescribed fire: Prescribed fire can be an important tool for regenerating oak stands because it tends to promote vigorous sprouting, reduce competing vegetation [55], and expose mineral soil, which favors seedling establishment. A series of low-intensity prescribed fires prior to timber harvest can promote advanced regeneration in oaks [72]. [See Management Considerations]. The effects of fire on oaks may vary; in some cases fire can kill or injure oaks, but in others fire has little effect [55]. In the southern Appalachians, biennial summer burns are often effective in promoting advance regeneration, while single preharvest or postharvest burns generally have little effect [72].

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