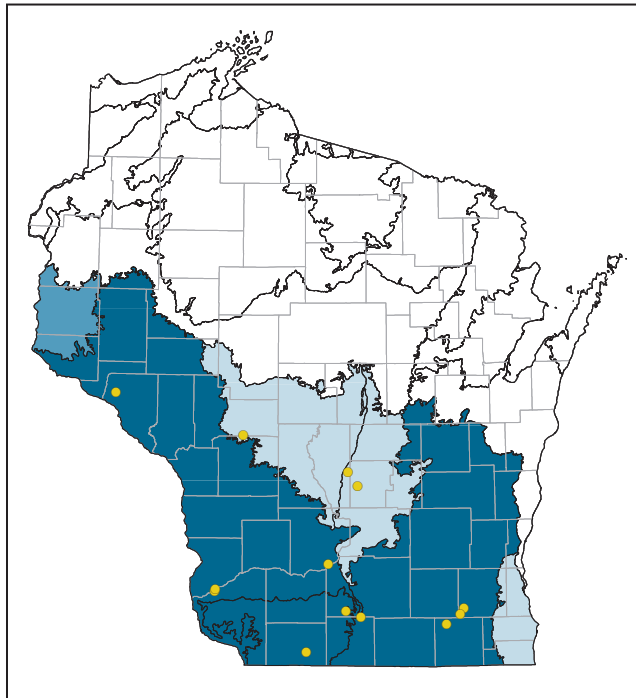


Oak Woodland (Global Rank GX; State Rank S1)

Overview: Distribution, Abundance, Environmental Setting, Ecological Processes

Oak Woodland is an integral part of the fire-dependent oak ecosystem complex, which also includes oak-dominated savannas and forests. Structurally, canopy cover in Oak Woodland is greater than that characteristic of the true savanna communities such as the more open, sparsely timbered Oak Opening and somewhat less than or approaching the more densely canopied Southern Dry and Southern Dry-mesic Forests. Canopy cover in Oak Woodland exceeds 50% and may approach 100%. Though this community shares many attributes with savannas and dry forests, a key point in defining Oak Woodland is that the higher canopy cover in remnants or restored stands is not simply due to fire suppression and the subsequent proliferation of fire-sensitive woody species. Besides the higher density of trees and greater canopy cover, the trees in an Oak Woodland lack the short, large diameter boles prevalent in well-developed oak savanna, and the crowns do not exhibit a limb architecture characterized by widely spreading branches, nor will they necessarily have the same form as the narrow crowns entirely lacking the spreading upper limbs of an oak forest.



Locations of Oak Woodland communities in Wisconsin. The deeper hues shading the ecological landscape polygons indicate geographic areas of greatest abundance. An absence of color indicates that the community has not (yet) been documented in that ecological landscape. The dots indicate locations where a significant occurrence of this community is present, has been documented, and the data incorporated into the Natural Heritage Inventory database.

It is thought that frequent fires of low-intensity maintained the understory in an open condition, free of dense growths of shrubs and saplings. It is possible that browsing by large herbivores such as elk and white-tailed deer also played a role in maintaining open understory conditions in this type prior to settlement by Euro-Americans. Though little is known about the historical extent or composition of Oak Woodland, it appears that at least some of the characteristic understory plant species (certain legumes, composites, and grasses among them) may reach their greatest abundance here.

The historical range of this type would have basically coincided with the range of other Oak Savannas, especially Oak Openings and perhaps dry hardwood forests dominated by white oak, which occurred mostly south of the Tension Zone in the Central Sand Hills, Southeast Glacial Plains, Southwest Savanna, and Western Coulees and Ridges ecological landscapes.

Community Description: Composition and Structure

Because so few intact examples have been identified and even fewer described in detail, information on composition is somewhat speculative. The canopy dominants on dry-mesic, mesic, and some dry sites in southern Wisconsin are oaks, commonly including white oak (*Quercus alba*), bur oak (*Q. macrocarpa*), northern red oak (*Q. rubra*), and shagbark hickory (*Carya ovata*). Black oak (*Quercus velutina*) and/or northern pin oak



Oak woodland features high canopy closure, but the dominant oaks retain distinctive limb architecture, and the oaks' leaf mosaic allows more light to reach the ground than in stands being invaded by shade tolerant trees such as maples. Such stands are somewhat transitional between more open savannas and true forests. In some situations, they can be managed and maintained to help accommodate both forest interior animals and light-demanding understory plants that tolerate high filtered shade. Kettle Moraine State Forest – South Unit, Jefferson County, Southeast Glacial Plains Ecological Landscape. Photo by Drew Feldkirchner, Wisconsin DNR.

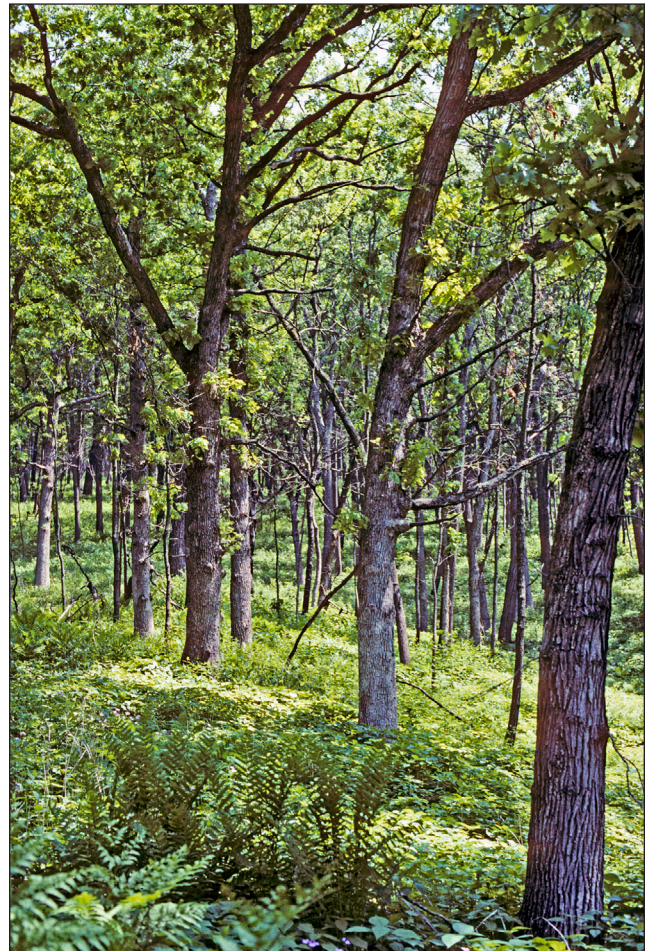
(*Q. ellipsoidalis*) would have been less common, and perhaps absent, on more mesic sites due to their shade intolerance and the competitive advantages some of the other oaks would have had in these environments.

The floristic associates documented by those collecting data that were later analyzed and presented in *The Vegetation of Wisconsin* (Curtis 1959) were compiled about seventy years ago. This was well after fire suppression policies had been widely implemented across the state, and therefore it is thought by some researchers that more of the understory plants representative of an Oak Woodland situation (higher canopy closure and less light reaching the surface) would still have been present and relatively easy to observe. Table VII-3 in Curtis (1959) (Appendix for Chapter 5, "Prevalent Groundlayer Species of Southern Dry Forest") would be worth taking a hard look at for clues to the composition of some oak woodlands during the mid-20th century.

Some members of the Oak Woodland flora are thought to belong to genera or families that are also common in other communities in the oak ecosystem group but represented by a different set of species (belonging to genera that include as members composites, grasses, legumes, mints, and snapdragons). Examples of species observed in and thought to be possibly representative of oak woodland environments include figwort giant hyssop (*Agastache scrophulariaefolia*), poke milkweed (*Asclepias exaltata*), American bellflower (*Campanula americana*), wood thistle (*Cirsium altissimum*), long-bracted green orchid (*Coeloglossum viride*), bracted tick-trefoil (*Desmodium cuspidatum*), purple Joe-Pye-weed (*Eupatorium purpureum*), bottlebrush grass (*Elymus hystrix*), forest bedstraw (*Galium circaezans*), broad-leaved panic grass (*Dichanthelium latifolium*), Solomon's-seal (*Polygonatum biflorum*), Short's aster (*Symphotrichum shortii*), and yellow-pimpernel (*Taenidia integerrima*).



This white oak-red oak-black oak woodland has been "thinned from below," and several prescribed burns have reduced the heavy shade created by the previously dense understory of deciduous shrubs and saplings. Legumes, composites, and other light-demanding herbs are now thriving in the understory. Rush Creek State Natural Area, Crawford County, Western Coulees and Ridges Ecological Landscape. Photo by Eric Epstein, Wisconsin DNR.



Mixed stand of white, black, and red oaks is now managed with prescribed fire to restore and maintain open understory conditions and allow for the habitat needs of the more light-demanding herbs. Oak woodland is an important part of the continuum of fire-dependent communities occurring in southern Wisconsin. Rush Creek State Natural Area, Crawford County, Western Coulees and Ridges Ecological Landscape. Photo by Eric Epstein, Wisconsin DNR.

Understory plants associated with oak savannas such as large-flowered yellow false foxglove (*Aureolaria grandiflora*), wild lupine (*Lupinus perennis*), and starry campion (*Silene stellata*) are also of potential or even likely occurrence within some oak woodlands. Species more often found in oak forest situations such as rough-leaved sunflower (*Helianthus strumosus*) and black-seeded rice grass (*Oryzopsis racemosa*) may also occur in Oak Woodland. Keep in mind that light conditions and the degree of shading may vary considerably within different parts of an oak savanna, oak forest, or oak woodland.

Plant species of high conservation significance owing to rarity or for other reasons would probably overlap with those more often associated with Oak Openings, at least to some degree. Examples include great Indian-plantain (*Arnoglossum reniforme*), purple milkweed (*Asclepias purpurascens*), yellow giant hyssop (*Agastache nepetoides*), violet bush-clover (*Lespedeza violacea*), snowy campion (*Silene nivea*), hairy meadow parsnip (*Thaspium chapmanii*), purple meadow-parnsnip (*T. trifoliatum*), and white camas (*Zigadenus elegans*).

Characteristic animals may include not only typical savanna associates such as the Orchard Oriole (*Icterus spurius*), Eastern Bluebird (*Sialia sialis*), Northern Flicker (*Colaptes auratus*), and the declining Red-headed Woodpecker (*Melanerpes erythrocephalus*) but also species more often associated with hardwood forests, such as Great-crested Flycatcher (*Myiarchus crinitus*), Eastern Wood-pewee (*Contopus virens*), Red-bellied Woodpecker (*Melanerpes carolinus*), Blue-gray Gnatcatcher (*Poliophtila caerulea*), and Yellow-throated Vireo (*Vireo flavifrons*). Several area-sensitive forest interior birds, such as Cerulean Warbler (*Setophaga cerulean*), Hooded Warbler (*Setophaga citrina*), and Acadian Flycatcher (*Empidonax virescens*), have been documented in Oak Woodland during their breeding seasons. Where stand size is sufficient, community structure is appropriate, and where Oak Woodland adjoins extensive areas of dry-mesic or mesic hardwood forest, it may be possible to maintain populations of these species.

Conservation and Management Considerations

Oak Woodland occurred south of the Tension Zone where it most often occupied a position in the continuum of fire-dependent, fire-maintained natural communities between oak savannas and closed hardwood forests. In the absence of fire or other disturbances, the ground layer was quickly overtaken by shrubs and saplings, and characteristic forbs and grasses were either suppressed and reduced in vigor or disappeared altogether.

Among the numerous obstacles preventing or impeding the conservation and maintenance of Oak Woodland are fire exclusion, logging of the large canopy oaks, livestock grazing, leaf litter build-up, and an increase in shrubs, saplings, and small trees, especially infestations of species formerly excluded or suppressed because of their sensitivity to periodic fire. Colonization by highly invasive species, many of them nonnative, is also a significant problem for managers. The

lack of basic information on this segment of fire dependent oak ecosystems is another problematic factor.

The conservation focus will be on restoration, as remnants are either overgrown with woody understory plants or have lost their most characteristic understory species due to periods of prolonged grazing or the proliferation of invasive plants. Among the benefits to be gained by restoring and maintaining oak woodland is a clearer understanding that many of the native plant species that are currently declining in unburned oak “forests” will ultimately be lost from many parts of southern Wisconsin. Managing proactively for Oak Woodland using prescribed fire could alleviate or forestall this situation, at least locally.

As community stability is inherently low (or nonexistent) in the absence of periodic fire, there is a significant lack of information on the fire regime needed to restore and maintain an understory composed of native herbs in the Oak Woodland community. As a practical consideration, identifying and mapping stands of Oak Woodland using remote sensing imagery alone would be difficult or impossible. Canopy cover alone is not a criterion that will permit the planner, researcher, or natural resource manager to delineate occurrences of Oak Woodland with much confidence.

There are several factors that will aid in the differentiation of Oak Woodland from other fire dependent oak-dominated communities, such as oak savanna or oak forest. Among the potentially important clues to consider are composition of both the canopy and understory, limb architecture of the canopy trees, position in the local landscape with respect to physical features and other plant communities (which are the sources for recolonization of lost or depleted plants and animals from nearby woodland remnants), and perhaps most critically, the amount of light that reaches the soil surface.

The Oak Woodland type is NOT meant to simply indicate an overgrown Oak Opening in need of crown thinning—though that could be an appropriate, even necessary, management action for stands where more mesophytic tree species such as red maple, cherries, ashes, or ironwood have become part of the canopy.

More field inventory is needed to better characterize the community and identify restorable sites, especially those that occupy strategic locations bordered by oak savanna and oak forest. Managers of landscapes in which oak ecosystems are prevalent may be excellent sources of information, especially in areas such as the southern Kettle Moraine in southeastern Wisconsin or at scattered locations within the Driftless Area where management to maintain and restore savannas is an ongoing activity. This may be especially true in the vicinity of rough terrain bordering big rivers where the full complement of southern Wisconsin's fire-dependent natural communities is either present or could potentially be restored to functionality. Ideally these sites will be situated so that they can be managed with prescribed fire and, as needed and appropriate, by other methods such as brushing, judicious cutting, and limited herbicide use.

A potentially significant advantage to managers and conservationists when recognizing and managing Oak Woodland is that it can bridge the gap between stands managed to maintain or restore open savanna conditions with low tree cover of 10% to 50% and closed canopy forest. At some sites, this may mimic historical conditions and at others provide habitat for at least some sensitive forest interior species (Cerulean Warbler would be one of those). It would also mitigate some of the negative impacts associated with “hard,” high contrast edge (such as excessive white-tailed deer (*Odocoileus virginiana*) browse, increased rates of brood parasitism and predation, and more competition from already abundant edge-adapted species).

It is possible, even likely, that important variants of Oak Woodland occur on wet-mesic, mesic, and very dry sites. However, at this time there is a lack of data sufficient to allow for the adequate description of additional oak woodland communities. Stands on extremely dry, droughty, low nutrient sites with coarse textured soils in which the dominant oaks are mostly black oak or northern pin oak may experience somewhat different disturbance regimes (for example, more frequent, catastrophic, stand-replacing fires) and require other management approaches—especially on sites that historically supported open barrens communities. These were most often in the sand country of central Wisconsin and on the broad sandy terraces bordering major rivers in southwestern Wisconsin.

Additional Information

Information on related vegetation types can be found in the natural community descriptions in this chapter for Oak Openings, Oak Barrens, Southern Dry Forest, and Southern Dry-mesic Forest. The U.S. National Vegetation Classification type most closely resembling Oak Woodland on dry-mesic to mesic sites is CEG002142 White Oak – Bur Oak – Northern Red Oak / American Hazelnut Woodland (Faber-Langendoen 2001). However, CEG002134 Central Midwest White Oak – Mixed Oak Woodland, though described for areas south of Wisconsin, and a wet-mesic type CEG002140 Burr Oak Bottomland Woodland may also fit some Wisconsin occurrences with a bit of modification.

Special thanks to Wisconsin DNR botanist Rich Henderson for shedding light on many of the unknowns and other difficulties associated with this often-ignored and somewhat nebulous segment of the fire-dependent oak ecosystem continuum.

Also see:

Bray (1958)
DeLong and Hooper (1996)
Gilbert and Curtis (1953)
Grossman and Mladenoff (2007)
Leach and Ross (1995)
Packard (1993)
WDNR (2010)

FROM: Epstein, E.E. Natural communities, aquatic features, and selected habitats of Wisconsin. Chapter 7 in *The ecological landscapes of Wisconsin: An assessment of ecological resources and a guide to planning sustainable management*. Wisconsin Department of Natural Resources, PUB-SS-1131H 2017, Madison.

For a list of terms used, please visit the [Glossary](#).

For a reference list, please see the [Literature Cited](#).