



## Prairie Moraine County Park Vegetation Management Plan July 2019

### 1. Public-Use Statement

The park is divided in half by two primary use areas, separated by a fence: an off-leash dog exercise area to the south and a more primitive Ice Age Trail hiking corridor to the north, the latter of which requires dogs to be kept on-leash.

The dog exercise area is heavily used for walking and off-leash dog exercise and contains an extensive system of trails that wind through natural areas at the base and side slope of the terminal moraine. The undulating topography, natural vegetation, wildlife viewing opportunities, and overall natural feel of this dog exercise area are highly valued by park users as most other dog exercise areas in the area are on flat ground with mowed grass and contain very few natural elements. There is growing interest among users of the dog exercise area to control exotic and noxious species and to restore native vegetation on this side of the park.

The Ice Age Trail side of the park is used primarily for hiking, wildlife viewing, enjoying views of the surrounding landscape, and ecological restoration activities conducted primarily by volunteers which includes such tasks as tree and brush removal, brush pile burning, invasive weed control, prescribed burning, and seeding/planting. This side of the park includes the moraine itself, providing park users dramatic views of the landscape and an opportunity to observe and appreciate this prominent glacial feature.

### 2. Broad vegetation goals, describing the desired physical/biological appearance of the site upon completion.

- Park will include three primary natural communities (Prairie, Oak Savanna/Opening, Oak Woodland) in accordance with the Prairie Moraine Master Plan (2002). Communities will transition naturally into each other providing a seamless landscape that is biologically diverse and offers a varied experience for the park user. Figure 1 provides a map of target vegetation community types. Table 1 provides a brief summary of each community. Appendices 1-3 provide detailed descriptions of each community.
- Exotic/invasive species will be controlled in accordance with the Prairie Moraine Master Plan (2002). Table 2 lists common exotic/invasive species that occur at Prairie Moraine.
- Vegetation will allow views of significant geologic features, underlying terrain, and scenic vistas.
- Vegetation will assist in the prevention of soil erosion to protect geologic features and biological resources.
- Vegetation will provide habitat for wildlife and viewing opportunities for park visitors, including rare and sensitive species that have been declining regionally.
- Shade and specimen trees will remain at periodic locations along trails and gathering points to provide shelter for park users and dogs.

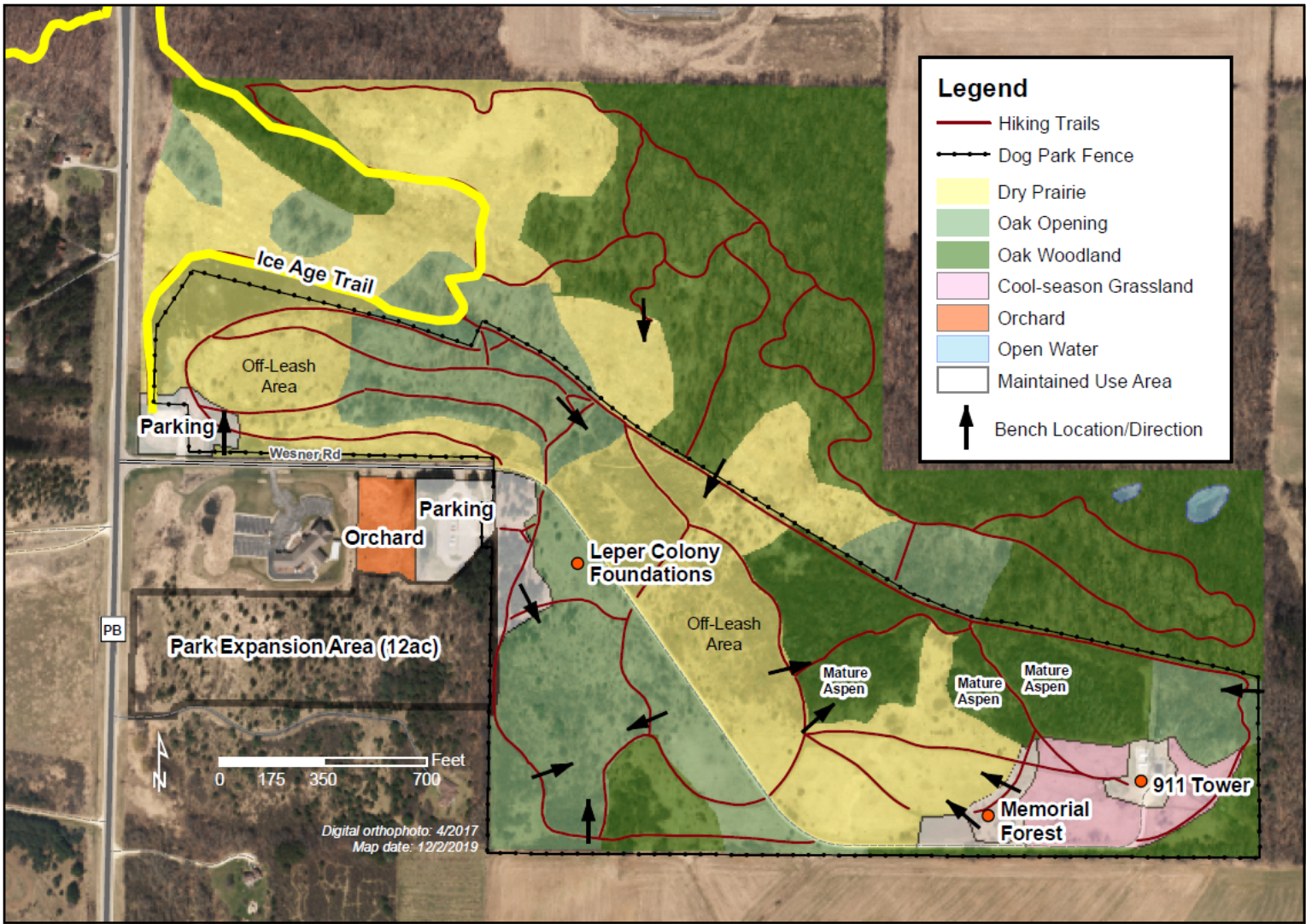


Figure 1. Target Vegetation Community Types at Prairie Moraine County Park

Table 1. Summary of characteristics and common native species in dry prairies, oak savanna/opening, and oak woodlands.

<b>Dry Prairie</b>	<b>Oak Savanna/Opening</b>	<b>Oak Woodland</b>
<i>Short to medium stature grasses with a variety of flowers</i>	<i>Wide-spaced oaks, at least 1 tree/acre but less than 50% canopy cover by trees</i>	<i>Oak dominated, 50-95% canopy cover with shade tolerant flowers and grasses</i>
Common Native Species: <ul style="list-style-type: none"> <li>• Little bluestem</li> <li>• Side-oats grama</li> <li>• Prairie dropseed</li> <li>• Lead plant</li> <li>• Pasque flower</li> <li>• Bird’s-foot violet</li> <li>• Silky aster</li> <li>• Heath aster</li> <li>• Flowering spurge</li> <li>• Purple prairie clover</li> </ul>	Common Native Species: <ul style="list-style-type: none"> <li>• Bur oak</li> <li>• White oak</li> <li>• Black oak</li> <li>• Shagbark hickory</li> <li>• American hazelnut</li> <li>• New Jersey Tea</li> <li>• Lead plant</li> <li>• Big bluestem</li> <li>• Wild bergamot</li> <li>• Shooting stars</li> </ul>	Common Native Species: <ul style="list-style-type: none"> <li>• White oak</li> <li>• Bur oak</li> <li>• Red oak</li> <li>• Shagbark hickory</li> <li>• Figwort giant hyssop</li> <li>• Poke milkweed</li> <li>• American bellflower</li> <li>• Purple Joe-Pye-weed</li> <li>• Solomon’s seal</li> <li>• Yellow pimpernel</li> </ul>

Table 2. Summary of common exotic, invasive, or adventitious native species found at Prairie Moraine County Park requiring management. E=Eradiate; R=Reduce

<b>Herbaceous plants:</b>	<b>Shrubs:</b>	<b>Trees</b>
<ul style="list-style-type: none"> <li>• Bidens (R)</li> <li>• Bird’s foot trefoil (E)</li> <li>• Burdock (E)</li> <li>• Canada thistle (E)</li> <li>• Exotic biennial thistles (E)</li> <li>• Garlic mustard (E)</li> <li>• Greater celandine (E)</li> <li>• Leafy spurge (E)</li> <li>• Reed Canary Grass (E)</li> <li>• Stickseed (R)</li> <li>• Teasels (E)</li> <li>• Wild Parsnip (E)</li> <li>• Yellow and white sweet clover (E)</li> </ul>	<ul style="list-style-type: none"> <li>• Aspen sprouts (E)—retain mature trees</li> <li>• Autumn and Russian Olives</li> <li>• Burning Bush (E)</li> <li>• Bush Honeysuckles (E)</li> <li>• Common Buckthorn (E)</li> <li>• Gray dogwood (R)</li> <li>• Multiflora Rose (E)</li> <li>• Staghorn and smooth sumac (R)</li> </ul>	<ul style="list-style-type: none"> <li>• Apple (R)—retain scattered specimen trees along trails</li> <li>• Bitternut hickory (R)</li> <li>• Black cherry (R)</li> <li>• Boxelder (R)</li> <li>• Elms (R)</li> <li>• Green or white ash (R)</li> <li>• Red Cedar (R)</li> <li>• Shagbark hickory (R)</li> <li>• White Mulberry (E)</li> </ul>

3. Identify and describe noteworthy resources and unique opportunities.

- Dry prairie remnants with rare and sensitive vegetation present on site.
- Highly restorable prairie and oak communities.

- Extraordinary geologic features including terminal moraine and outwash gorges.
- Multiple scenic vistas and views of geologic features and the surrounding landscape.
- Unique and popular off-leash dog exercise area occurring within a natural area.
- Ice Age Trail corridor.
- Excellent wildlife viewing opportunities including rare grassland and oak opening birds such as meadowlark, red-headed woodpecker, and eastern bluebird.
- Historic location of leper colony containing remnants of building foundations.

4. Identify threats/concerns that are likely to be impediments to success.

- Encroachment of woody vegetation and invasive shrubs in all communities.
- Obstruction of scenic vistas by tall woody vegetation and invasive shrubs.
- Invasion of aggressive exotic weeds in all communities.
- Poor natural recruitment of oaks in areas with dense invasive species and heavy shade.
- Unsustainable trails and soil erosion.
- Conflicts and safety concerns between vegetation management activities and park users/dogs.

5. Priority management recommendations

Management of prairie, oak opening, and oak woodland communities

- Cut, treat, pile, and burn trees and invasive shrubs that are not compatible with the target natural community. Table 1 summarizes the dominant desirable species for each community and Table 2 lists common weeds, shrubs and trees that should be eradicated or reduced.
- Utilize fire as a management tool to suppress invasive weeds and woody growth and encourage recruitment of native vegetation.
- Stack and burn or remove previously cut brush, firewood, and storm damage (heavy fuels) along trail sides to help ensure safe and effective breaks for prescribed burning. Heavy fuels toward the interior of the unit should also be reduced.
- Control and suppress invasive weeds through multiple methods (hand weeding, selective herbicide applications, and mowing/cutting) focusing on garlic mustard, celandine, sweet clover, wild parsnip, teasels, and birds-foot trefoil. Care should be taken that control methods do not damage sensitive and rare vegetation. Special efforts should be made to ensure birds-foot trefoil and teasels are surveyed for and treated annually.
- Prioritize invasive weed control efforts by focusing on the protection of key resources and/or starting control on scattered individuals at the leading edge of the invasion and working in towards the most established part of the population.
- Do not remove or encourage mature aspen in woodland units indicated on map of Figure 1. Saplings or aspen extending beyond trail boundaries or into adjacent natural communities should be removed.
- Scatter native seeds and plant trees or shrubs to increase diversity and habitat quality.
- Maintain dead snags and dead limbs for wildlife where safety to trail users and prescribed burning operations is not a concern.



### Scenic vistas and geology

- Maintain scenic vistas identified on the map by removing species that are not core components of the target natural community, especially invasive shrubs.
- Maintain ability of park user to appreciate the geological significance of the park by removing dense trees and brush that obscure views of prominent features and obscure visibility of the terrain.

### Management of soil erosion

- Remove dense cover of invasive shrubs that prohibits the growth of low-growing native grasses and forbs, which act to slow runoff and limit erosion.
- Seed or plant low-growing native grasses and forbs when necessary.
- Ensure trail system is sustainable, minimizing stormwater channelization and soil erosion.

### Wildlife habitat management

- Remove invasive trees and brush and invasive weeds to promote healthy and diverse natural communities.
- Seed or plant a diversity of native wildflowers to provide floral resources for pollinators.
- Protect snags and dead wood, where safe and appropriate, to promote species that require dead standing and fallen wood.

### Shade and specimen trees

- Identify and mark desirable trees to be preserved for shade and enjoyment by trail users.
- Specimen trees must NOT be species listed for eradication in Table 2 or are otherwise known to be invasive.
- Retain conifers in maintained use area east of parking lot but do not allow conifers to expand into surrounding natural communities.
- Do not remove or encourage mature aspen in woodland units indicated in Figure 1. Saplings or aspen extending beyond trail boundaries or into adjacent natural communities should be removed.

### Ensuring safety to park users and dogs

- Volunteers should observe policies and procedures identified in the Dane County Parks Natural Areas Volunteer Handbook including section on work in dog exercise areas. Handbook contains guidance on use of herbicides, power tools, driving on trails, and working safely in groups.
- Dog exercise area should be closed when applying herbicides.
- Stumps should be cut close to the ground to minimize risk to dogs.
- When power tools are being used, sign should be placed at entrance of park notifying park users to location of activities.
- Park users must maintain control of their dogs at all times and have dogs under voice control.
- Lead volunteers should obtain Land Steward Certification as described in the Natural Areas Volunteer Handbook.
- Install fence and open to the public twelve acres of new park land on the southwest side of the park to disperse visitors over a larger area.

6. Coordination and approval of volunteer activities

- Volunteer activities should be consistent with the Prairie Moraine County Park Master Plan and the Vegetation Management Plan.
- Volunteers should observe policies and procedures identified in the Dane County Parks Natural Areas Volunteer Handbook including section on work in dog exercise areas.
- Volunteers should develop a work plan every year in coordination with Dane County Parks Natural Areas staff, who will be responsible for review and approval. Plans outside of the scope of the work plan should be discussed with staff beforehand. Volunteers are encouraged to check in with staff regularly or when questions arise.

7. Implementation, methods, and site maintenance

A proposed cycle of vegetation management activities is provided in Table 3, detailing how projects will be completed and maintained. The table includes method of completing tasks, including equipment involved and entity completing the task.

Table 3. Propose cycle of vegetation management activities

<b>Activity</b>	<b>Timeframe</b>	<b>Entity</b>	<b>Method</b>
Tree and shrub removal	October-March	Volunteers and/or staff	Volunteers and staff: chainsaw, brushcutter (spot treating stumps w/ herbicide); Staff: mowers, skid loader
Prescribed burning	March-May; August-November	Staff led, volunteer supported	Burn crew with fire-fighting equipment (hand tools, water cans, UTVs, trucks)
Weed control	April-July	Volunteers and/or staff	Volunteers: Shovels, brushcutters, small mowers, herbicides Staff: mowers, herbicides
Native Seed collection	August-October	Staff led, volunteer supported	Hand collect seed from several parks in the system during regular county parks hosted workdays
Seed processing and packaging	September-December	Staff led, volunteer supported	Clean, weigh, and package seed for planting in parks throughout the county
Planting seeds	November-March	Volunteers	Hand scatter seeds in project areas
Plant trees and shrubs	October-November; April-June	Volunteers	Plant county-grown or nursery purchased container plants
Water and maintain container plants	May-September	Volunteers	Provide water to container plants, maintain caging, remove weeds

8. Identify potential partners /collaborators.

- Friends of Prairie Moraine County Park
- Blue Bird Society
- Madison Audubon Society
- Ice Age Trail Alliance
- Verona Area Historical Society
- Madison Area Permaculture Guild

Appendix 1. Dry Prairie Community Description

Appendix 2. Oak Savanna/Opening Community Description

Appendix 3. Oak Woodland Community Description

# Dry Prairie (Global Rank G3G4; State Rank S3)

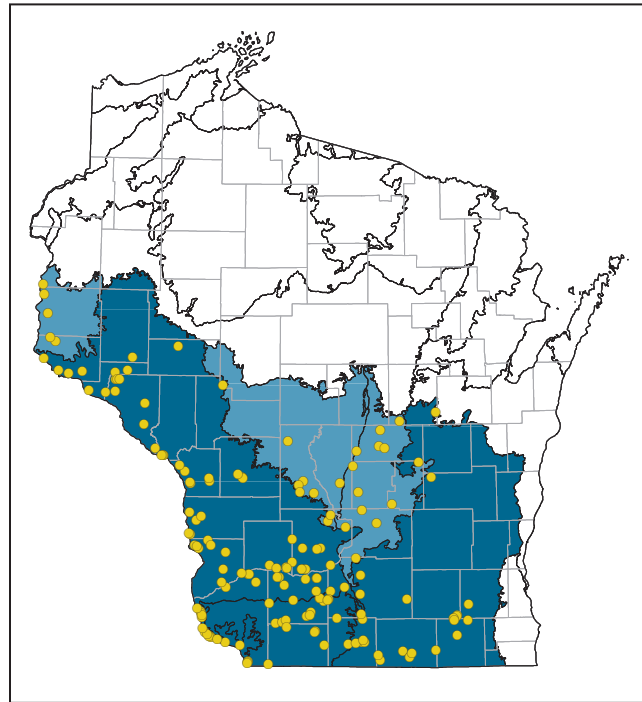
## Overview: Distribution, Abundance, Environmental Setting, Ecological Processes

Dry Prairie (also known as “goat prairie,” “dry lime prairie,” or “bluff prairie”) is a native grassland community that is especially well represented on steep southwest-facing slopes in the Driftless Area of southwestern Wisconsin and neighboring states. The soils are often derived from loess of varying depth, though dolomite or sandstone bedrock may occur at or just beneath the surface. Along some of the major river valleys of western and southwestern Wisconsin bedrock outcroppings are prominent features that may form impressive cliffs tens of meters in height. These provide habitat for specialized plants as well as hunting, basking, and denning sites for herptiles. Rock fragments often occur on the prairie surface, in some areas aggregating into accumulations of talus. The severe environmental conditions on the steep, rocky, exposed bluffs are among the factors that have played a role in maintaining remnants of this formerly much more extensive prairie community despite many decades of fire suppression and the widespread agricultural and residential development throughout southern Wisconsin. Other prairie communities, such as those on sites with deep, productive soils and level or more subdued topography, have now been almost eliminated from the state’s landscapes.

In the glaciated parts of Wisconsin, Dry Prairie occurs on gravelly, or sometimes sandy, knolls in the Kettle Moraine region of southeastern Wisconsin and along and near the St. Croix River on the Minnesota-Wisconsin border. More intensive vegetation sampling of Dry Prairies is needed in these areas as the occurrences may warrant recognition as subtypes. Irrespective of unanswered classification questions, Dry Prairies outside of the Driftless Area should be evaluated and included in state and regional prairie conservation plans.

Historically, Dry Prairie occurred within a vegetation mosaic that included other prairie communities, oak savanna, oak woodland, and oak forest. All of these communities are adapted to and somewhat dependent on periodic fire. Effective conservation of the entire suite of native plants and animals associated with Dry Prairie will require restoration of some of these adjoining plant communities, many of which are now severely overgrown with shrubs and sapling trees, or they’ve been converted to other land uses. The transition from open prairie to adjoining wooded habitats (often this is now dense forest rather than semi-open savanna or oak woodland) is often abrupt, and this may not provide for the needs of species requiring multiple habitats to complete their life cycles or allow for these dynamic entities to expand, contract, or shift their ranges as environmental conditions change.

Patch sizes for Dry Prairie are limited by physiographic factors, woody encroachment, and development. Typical stands sizes are small to moderate (single acres to tens of acres), and the prairie patches become increasingly isolated



Locations of Dry Prairie 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.

as bluffs are developed (often for residential use) and related infrastructure is installed. The deep draws and ravines separating the prairies are typically heavily wooded, creating barriers to dispersal for some organisms.

## Community Description: Composition and Structure

The dominant grasses are of short to medium stature, usually less than one meter in height, and include little blue-stem (*Schizachyrium scoparium*), side-oats grama (*Bouteloua curtipendula*), hairy grama (*B. hirsuta*), and prairie dropseed (*Sporobolus heterolepis*). Prairie satin grass (*Muhlenbergia cuspidata*) is abundant in some Dry Prairies on the Mississippi River bluffs along the state’s western edge. Several panic grasses (*Dicanthelium* spp.) are widespread in and characteristic of dry prairie communities, though these are seldom, if ever, among the dominant graminoids. When present, tall grasses such as big blue-stem (*Andropogon gerardii*), yellow Indian grass (*Sorghastrum nutans*), and needle grass (*Stipa spartea*) tend to occupy slightly more moist habitats, either on the lower slopes or in draws.

Among the common or characteristic shrubs and forbs are lead-plant (*Amorpha canescens*), American pasqueflower



(*Anemone patens*), bird's-foot violet (*Viola pedata*), silky aster (*Symphyotrichum sericeum*), heath aster (*S. ericoides*), flowering spurge (*Euphorbia corollata*), purple prairie-clover (*Dalea purpurea*), cylindrical blazing-star (*Liatris cylindracea*), false boneset (*Kuhnia eupatorioides*), prairie coreopsis (*Coreopsis palmata*), upland white goldenrod (*Solidago ptarmicoides*), and gray goldenrod (*Solidago nemoralis*).

A number of rare plants and animals are strongly associated with the Dry Prairie community, which provides critical habitat for some of these species, especially among the invertebrates and herptiles. Rare herptiles include the six-lined racerunner (*Aspidoscelis sexlineata*), prairie ring-necked snake (*Diadophis punctate armyi*), North American racer (*Coluber constrictor*), and timber rattlesnake (*Crotalus horridus*). Among the invertebrates, rare butterflies, moths,

leafhoppers, and land snails have been documented in these habitats, including the globally rare ottoe skipper butterfly (*Hesperia ottoe*).

Rare or otherwise noteworthy vascular plants include Wilcox's panic grass (*Dichanthelium wilcoxianum*), ground-plum (*Astragalus crassicaarpus*), prairie-turnip (*Pediomelum esculentum*), pale purple coneflower (*Echinacea pallida*), Carolina anemone (*Anemone caroliniana*), and silver bladder-pod (*Lesquerella ludoviciana*).

## Conservation and Management Considerations

Brush encroachment due to successional changes in the absence of periodic fire and increased patch isolation as residential and agricultural uses increasingly dominate the adjoining lands above and below the steeper and rockier slopes are



Southwest-facing bluffs above the Mississippi River support an impressive series of dry prairies, one of the largest such concentrations in the Upper Midwest. Remnant oak forest, oak woodland, and oak savanna add ecological value to this exceptional natural features complex. Rush Creek State Natural Area, Crawford County, Western Coulees and Ridges Ecological landscape. Photo by Eric Epstein, Wisconsin DNR.



This series of fine dry prairies occupies south-facing bedrock bluffs not far from the Rush River. Wisconsin has exceptional representation of bluff (or "goat") prairies, which provide key habitat for numerous native plants, invertebrates, and herptiles. Photo by Eric Epstein, Wisconsin DNR.



The Hogback is a striking Driftless Area landform, a long curvilinear ridge with steep slopes rising from level croplands that now occupy an abandoned meander of the Kickapoo River. The knife-edged ridge is highly unusual in that it supports prairie vegetation on both its west and east slopes. This diverse prairie is inhabited by rare plants and animals. Shrub thickets and a potentially restorable oak savanna complement the prairie by providing habitat for additional species of conservation concern. Hogback Prairie State Natural Area, Crawford County, Western Coulees and Ridges Ecological Landscape. Photo by Thomas Meyer, Wisconsin DNR.





*The upper, west-facing slopes of Battle Bluff support native prairie vegetation with very little encroachment of woody species. Battle Bluff State Natural Area, Vernon County, Western Coulees and Ridges Ecological Landscape. Photo by Eric Epstein, Wisconsin DNR.*

the greatest current threats. Appropriate management actions for Dry Prairie communities include the use of prescribed fire, mechanical removal of woody vegetation (shrubs, saplings, and small trees), and judicious application of herbicides to control unwanted plants, especially nonnative invasive species such as leafy spurge (*Euphorbia esula*) and spotted knapweed (*Centaurea biebersteinii*). Comprehensive planning and good communications among managers and with nearby landowners are essential to determine how, how often, when, and exactly where to use prescribed fire, ultimately the single most important management tool for restoration and maintenance of this prairie community. Paradoxically, not every species dependent on or strongly associated with dry prairie as a primary habitat (e.g., certain invertebrates) is adapted to survive the direct impacts of fire. Because of the small size and isolation of many of our best remnants, an investment of extra care in conservation design and implementation of management activities is warranted, especially when rare species are present. Controversies can be resolved (or at least clarified) via research and adaptive management, to the benefit of all stakeholders interested in the conservation of prairie ecosystems.

Other management issues include grazing, tree planting on or around prairie openings, and residential construction (wherein the prairie is likely to be destroyed and replaced with a monotypic lawn). The loss of sensitive species from isolated prairies (due to rarity, small population size, absence of a key pollinator, competition, unfavorably changing habitat

conditions, and distance from a source population, etc.) is a significant threat at some sites, and this will only be effectively addressed by planning and monitoring, followed by appropriate management adjustments and actions.

A number of the largest and least disturbed Dry Prairie sites in the Driftless Area have been identified and designated for protection. Many are now under conservation management by public agencies, NGOs, and private individuals. Expansion and connection of patches of open prairie is possible at some locations and should be a management priority whenever possible. Where the opportunities exist, there is a great need to manage surrounding areas to restore and promote other terrestrial fire-dependent communities such as Sand Prairie, Dry-mesic Prairie, and oak-dominated savannas, woodlands, and forests.

From a global perspective, Wisconsin has an especially important role to play in the conservation of the Dry Prairie community. No other state in the Upper Midwest has equivalent conservation opportunities for this community and its associated vegetation mosaic. Most of the dry bluff prairies of the Upper Midwest occur within the Driftless Area, almost three-fourths of which is within Wisconsin. Southeastern Wisconsin's glaciated southern Kettle Moraine region contains a significant concentration of xeric gravel prairies embedded within a matrix of overgrown oak savanna. More detailed floristic studies are needed to determine whether or not these prairies should be recognized as distinct community types. Until then, conservationists and managers of public lands supporting Dry Prairie occurrences should consider their restoration and management wherever they occur.

### Additional Information

For information on similar communities, see the descriptions for Sand Prairie, Dry-mesic Prairie, Dry Cliff, and Bedrock Glade. In the U.S. National Vegetation Classification, Dry Prairie corresponds most closely to CEG002245 Little Bluestem - Sideoats Grama Bedrock Bluff Herbaceous Vegetation (Faber-Langendoen 2001).

#### Also see:

Anderson (1954)  
Foote (1966)  
Kraszewski and Waller (2008)  
Steele and Hartman (2015a)  
Steele and Hartman (2015b)  
Theler (1997)  
Thomson (1940)

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**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](#).

# Oak Opening (Global Rank G1; State Rank S1)

## Overview: Distribution, Abundance, Environmental Setting, Ecological Processes

Historically, Oak Openings occurred on dry to wet-mesic sites across much of southern and western Wisconsin. Patch size and configuration varied greatly, and the community was found as isolated groves, in draws between ridges, on tongue-like peninsulas, on steep slopes partially protected by waterbodies or wetlands, and sometimes as extensive ecotonal areas separating open prairie from closed forest. According to the interpretations of Curtis (1959) and Finley (1976), Oak Openings covered approximately 5.5 million acres in southern Wisconsin at the time of the federal public land survey in the mid-19th century. Only the vast (and variable) Northern Mesic Forests in the northern part of the state were more extensive.

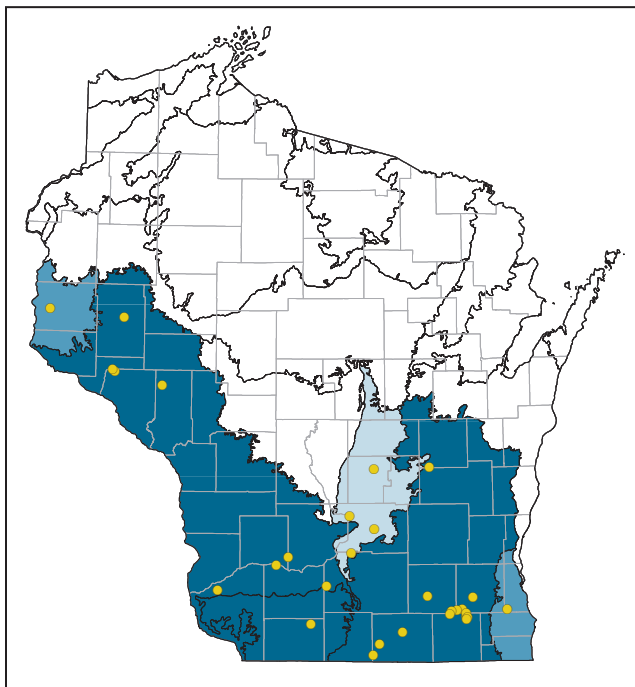
In 1959 Curtis wrote that “an oak savanna with an intact ground layer is the rarest plant community in Wisconsin today.” This statement applies throughout the continental range of the type (Nuzzo 1986) and is even more apt now than it was a half century ago. Virtually all present conservation efforts to maintain and reestablish this type are restorations, wherein prescribed fire, mechanical removal of shrubs and saplings, mowing, and herbicides are employed to eliminate

or control unwanted woody growth and invasive herbs and encourage suppressed native groundlayer plants. In some restoration efforts, it has been deemed necessary to reintroduce native plant species that have been lost.

As defined by Curtis (1959), Oak Openings are oak-dominated savanna communities in which there was at least one tree per acre but where total tree cover was less than 50%. However, he also noted that the “density (of trees) per acre was the most variable of all characteristics,” a key point for managers and restoration planners. It’s also worth noting that Oak Openings could grade seamlessly into communities still influenced by and ultimately dependent on periodic wild-fire but characterized by increasing levels of canopy closure. A continuum of the fire-dependent “oak ecosystem” could grade from open and park-like oak openings, to a more closed oak woodland, and finally to closed canopy oak forest.

By 2012 wildfire suppression in much of the state had been policy for a century or more throughout the former range of these savannas. As a result, canopy cover is not by itself a useful criterion to define an Oak Opening, nor is it necessarily useful to identify a remnant. Multiple factors, such as the spacing and limb architecture of the dominant oaks, stand disturbance history, landscape position with respect to past fire behavior, and floristic associates (if they haven’t been shaded or grazed into oblivion) are arguably of greater importance in identifying stands that have retained some savanna attributes and possess the highest restoration potential (Leach and Givnish 1998).

Few extant remnants are in good condition, and these are now mostly limited to dry, often steep, rocky or gravelly sites. Remnant condition is typically poor owing to explosive



Locations of Oak Opening 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.



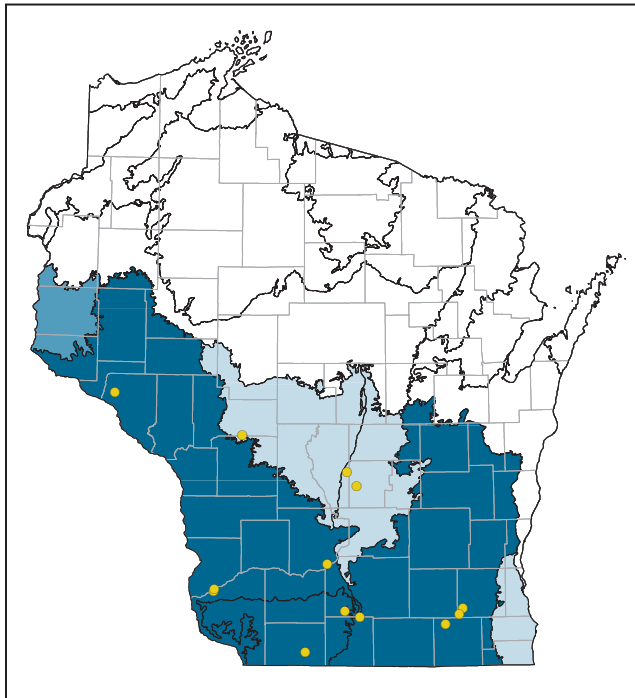
This morainal ridge in Waukesha County supports a remnant oak opening. The dominant trees are large open-grown bur oaks, with scattered white oak and shagbark hickory also present. A long history of grazing has maintained savanna structure, but the understory is now composed almost entirely of nonnative cool season grasses. Southeast Glacial Plains Ecological Landscape. Photo by Eric Epstein, Wisconsin DNR.



# 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.



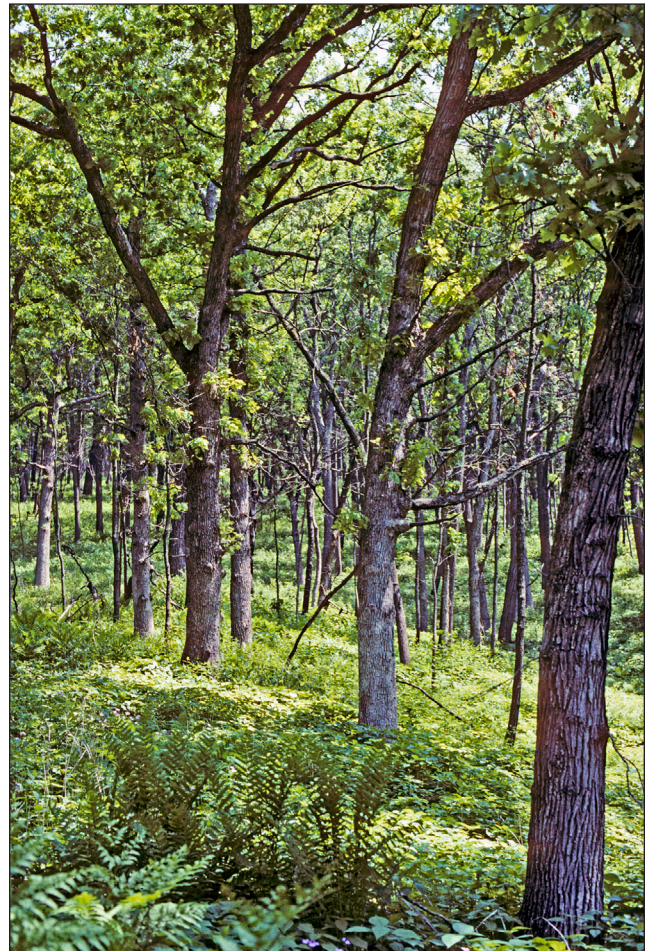
(*Q. ellipsoidalis*) would have been less common, and perhaps absent, on more mesic sites due to their shade intolerance and the competitive advantages some of the other oaks would have had in these environments.

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)

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**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.

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increases in woody growth, the dominance of invasive plants, the past and present impacts of grazing, and removal of the large oaks for timber or firewood. Oak Openings on mesic sites were formerly abundant, but these have essentially been extirpated, not only from southern Wisconsin but from the entire midwestern range of the community. Lowland savannas (these would occur on alluvial river terraces above the true floodplain) are now extremely rare, and known remnants are weedy and/or badly overgrown with shrubs and saplings.

The loss of the Oak Openings has been primarily due to four factors: the implementation of widespread fire suppression policies leading to an increase in the abundance and cover of woody plants at the expense of the native herbs; conversion of lands supporting savannas to other uses and cover types; prolonged periods of heavy grazing, which maintained savanna structure but caused the decline or loss of many native floristic associates; and recent increases in the abundance of invasive plants.

Fragmentation and the great changes in the vegetation mosaic within which the Oak Openings historically occurred have undoubtedly been significant factors in this formerly abundant natural community's demise, but the absence of intact remnants and the destruction and outright loss of the associated tallgrass prairies make the Oak Openings difficult to describe with precision, let alone manage with accurately predicted outcomes.

## Community Description: Composition and Structure

Bur oak (*Quercus macrocarpa*) was the dominant tree on many mesic and dry-mesic sites in southeastern Wisconsin, with white oak (*Q. alba*) a dominant or co-dominant in some stands. Black oak (*Quercus velutina*) and shagbark hickory (*Carya ovata*) were the most important associates. The bur oaks were capable of achieving great girth, and the spreading crowns were often wider than the trees were high. No other upper midwestern plant community featured this unique stand physiognomy.

Shrub cover is highly variable and is often based on the time elapsed since the last fire. Important members of the shrub layer include American hazelnut (*Corylus americana*), gray dogwood (*Cornus racemosa*), New Jersey tea (*Ceanothus americanus*), leadplant (*Amorpha cansescens*), and several native roses (*Rosa* spp.).

The herbaceous layer has the potential to support high floristic diversity as it may include plants associated with open oak woodlands, more densely canopied oak-dominated hardwood forests, and treeless prairies. Historically, representative herbs were big blue-stem (*Andropogon gerardii*), little blue-stem (*Schizachyrium scoparium*), needlegrass (*Stipa spartea*), Leiberg's panic grass (*Dichanthelium leibergii*), flowering spurge (*Euphorbia corollata*), wild bergamot (*Monarda fistulosa*), thimbleweed (*Anemone cylindrica*), American pasqueflower (*A. patens*), northern bedstraw (*Galium boreale*), bird's-foot violet (*Viola pedata*), eastern shooting-star (*Dodecatheon*

*meadia*), Solomon's-seal (*Polygonatum biflorum*), early buttercup (*Ranunculus fascicularis*), and yellow-pimpernel (*Taenidia integerrima*). Diverse and colorful displays of composites, especially among the asters, sunflowers, and blazing stars, were noted by observers who encountered the Oak Openings prior to the widespread settlement of southern Wisconsin by Euro-American immigrants.

A relatively small number of plants and animals reach their optimal abundance in the somewhat ecotonal Oak Openings. Some of the better known examples include kitten-tails (*Besseyia bullii*), yellow giant hyssop (*Agastache nepetoides*), cream gentian (*Gentiana alba*), smooth phlox (*Phlox glaberrima*), white camas (*Zigadenus elegans* var. *glaucus*), and purple milkweed (*Asclepias purpurascens*), all of which are now rare in Wisconsin. Among other plants that are known to occur in Oak Openings but that are either too rare to be useful as indicators of any particular community assemblage or structure, or which have been more strongly linked to other natural communities, are woolly milkweed (*Asclepias lanuginosa*), great Indian-plantain (*Arnoglossum reniforme*), wild hyacinth (*Camassia scilloides*), violet bush-clover (*Lespedeza violacea*), slender bush-clover (*L. virginica*), and one-flowered broom-rape (*Orobanche uniflora*).



One of the native plants adapted to the filtered shade and patchy canopy conditions of the oak opening is the globally rare kitten-tails. Photo by Robert H. Read, Wisconsin DNR.



Animals of conservation interest that have a substantial association with Oak Openings are Eastern Screech Owl (*Megascops asio*), Red-headed Woodpecker (*Melanerpes erythrocephalus*), Eastern Bluebird (*Sialia sialis*), and Orchard Oriole (*Icterus spurius*). Trees with cavities can be important maternity sites for bats and also provide cover for other species. In years when the acorn crop is heavy, species such as Wood Duck (*Aix sponsa*) and eastern fox squirrel (*Sciurus niger*) may be common.

## Conservation and Management Considerations

Because of its current rarity and the highly degraded condition of most remnants, conservation of the globally imperiled Oak Openings will be almost entirely dependent on efforts to restore heavily disturbed examples, most of them with greatly impaired, diminished, or missing components of the community's characteristic composition, structure, and function.

Frequent fires of low intensity are appropriate prescriptions for this community once the maintenance stage has been achieved, but initially, mechanical removal of unwanted competing shrubs and trees, augmented by the judicious use of herbicides, are critical steps. Once the surplus woody growth has been brought under control (this may be more effectively accomplished in stages, rather than in a rapid, massive reduction of woody cover) and reestablishment of a native ground layer is underway, the reintroduction of periodic fire will be the single most important step taken in the restoration process. Stands undergoing restoration will need to be monitored closely to assess ongoing needs to control invasive species (which are now present in virtually all remnants, including managed stands), set back shrubs and saplings, and determine whether or not there is a need to reintroduce missing elements of the native ground layer, ideally from similar habitats nearby.

The list of problematic invasive plants in the degraded, weed-infested remnants is long and includes Canada thistle (*Cirsium arvense*), garlic mustard (*Alliaria petiolata*), spotted knapweed (*Centaurea biebersteinii*), black swallow-wort (*Vincetoxicum nigrum*), common buckthorn (*Rhamnus cathartica*), multiflora rose (*Rosa multiflora*), Japanese barberry (*Berberis thunbergii*), and the Eurasian honeysuckles (especially *Lonicera tatarica* and the hybrid *Lonicera x bella*). Exotic cool season grasses often dominate the ground layer of stands with a long history of livestock grazing. Prevalent among these are Canada bluegrass (*Poa compressa*), Kentucky bluegrass (*P. pratensis*), and smooth brome (*Bromus inermis*).

Native shrubs can become abundant in remnant Oak Openings, and managers may seek to control or even eradicate them from sites undergoing restoration. Examples include several of the sumacs (*Rhus* spp.), blackberries (*Rubus* spp.), and common prickly-ash (*Zanthoxylum americanum*).

Oak Opening restoration and management will likely be most successful where other natural communities belonging to the mosaic of fire-dependent vegetation comprising the oak ecosystem are also present (such as oak woodland and



Open-grown bur oaks dominate this remnant oak opening in western Waukesha County. Grazing has maintained savanna stand structure, but the understory is now dominated almost entirely by nonnative plants. Southeast Glacial Plains Ecological Landscape. Photo by Eric Epstein, Wisconsin DNR.

oak-dominated forest types) or where the Oak Opening remnant can be embedded within native or surrogate grasslands. Opportunities to accomplish this are best offered by sites in the Driftless Area in both the Western Coulees and Ridges and Southwest Savanna ecological landscapes. Unlike many of the remnants in southeastern and south central Wisconsin (the southern Kettle Moraine being the exception), the steep slopes, shallow soils, and rougher topography of the Driftless Area have retained areas with unplowed sod, which may harbor seeds and other propagules of native species but also the native microflora and fauna associated with the uncropped substrate.

The southern portion of southeastern Wisconsin's Kettle Moraine region is especially significant as savanna and prairie restoration activities have been occurring there for several decades, a substantial core of public lands well suited (really critical) to these activities exists, and public interest and support for doing work of this nature is high. Excellent partnerships have developed there between public agencies and NGOs (The Nature Conservancy, Waukesha County Land Trust, Friends of the Mukwonago River, and The Prairie Enthusiasts are just a few examples) as well as with many private individuals. Somewhat parallel situations exist in parts of the Driftless Area, though a majority of the public land base there is centered on the larger river corridors. At some of the sites undergoing restoration, the Oak Openings occur within a mosaic of vegetation types that included Wet-mesic Prairie, Southern Sedge Meadow, Calcareous Fen, and Emergent Marsh.

Among the subjects needing additional research are the importance of stand size and connectivity; variability in the spatial and temporal representation of mature trees; compositional differences across the community's Wisconsin range; demographics of the prevalent oak species; representation of native shrubs; the intensity, frequency, and timing of prescribed burns; and differentiating savannas (e.g., those from

which fire has been excluded for many decades) from oak woodland and oak forest. The significance and ecological roles of animals that had been present historically but that are now absent from the range of the Oak Openings such as elk (*Cervus canadensis*), Greater Prairie-chicken (*Tympanuchus cupido*), Sharp-tailed Grouse (*Tympanuchus phasianellus*), and Passenger Pigeon (*Ectopistes migratorius*) also need to be better understood. The Northern Bobwhite (*Colinus virginianus*) might be placed with this group of extirpated species as well.

Savannas on sandy or gravelly alluvium apparently existed on outwash terraces or islands within or in close proximity to several of the major river floodplains, especially in southwestern Wisconsin. To date, documentation of the composition, structure, and function of such alluvial savannas has been very limited, but this is an item that merits further investigation in the near future as good restoration opportunities may exist on some of the public lands bordering rivers such as the Mississippi, Wisconsin, Chippewa, Black, St. Croix, and others.

Wisconsin has a major role to play in the restoration and management of this globally imperiled natural community and is a legitimate focus of land management activities at appropriate sites scattered across southern and central Wisconsin.

### Additional Information

For additional information, see the descriptions of Oak Woodland, Oak Barrens, Pine Barrens, Southern Dry Forest, Southern Dry-mesic Forest, Sand Prairie, Dry Prairie, Dry-mesic Prairie, and Mesic Prairie. In parts of southeastern Wisconsin, the descriptions of Wet-mesic Prairie, Southern Sedge Meadow, Calcareous Fen, and Emergent Marsh might also offer information of interest. The U.S. National Vegetation Classification (US NVC) type most closely corresponding to Wisconsin's Oak Openings is GEGL02020 North-central Bur Oak Openings (Faber-Langendoen 2001).

The US NVC type CEGL005284 Chinquapin Oak Limestone – Dolomite Savanna is generally found farther south, e.g., in Missouri, but there is at least one good quality occurrence in Wisconsin on dolomite bluffs near the Mississippi River.

Michigan and Ontario have described CEGL005120 Lakeplain Wet-mesic Oak Openings. This extremely rare natural community is possible in the southeastern corner of Wisconsin and northeastern Illinois within the Chiwaukee Prairie-Illinois Beach complex. There is also at least one occurrence of a wet-mesic savanna in south central Wisconsin, south of Madison (obviously this stand would not fit the “lakeplain” concept). More study is needed to appropriately describe and classify this stand. The proposed state name is Wet-mesic (Alluvial) Swamp White Oak Savanna with a state rank of S1.

#### Also see:

Bowles and McBride (1998)  
Brawn (2006)  
Bray (1960)  
Bronny (1989)  
Haney and Apfelbaum (1990)  
Haney and Apfelbaum (1994)  
Henderson (2005)  
Henderson and Epstein (1995)  
Hujik (1995)  
Kline (1997)  
Leach and Ross (1995)  
Leach and Givnish (1999)  
Nuzzo (1986)  
O'Connor et al. (2009)  
Packard (1988)  
Packard (1993)  
Stout (1946)  
WDNR (2010)  
White (1986)

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**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.

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