



## Open-Oak Woodland and Savanna Birds Central Hardwoods and Eastern Tallgrass Prairie Region



**Central Hardwoods  
Joint Venture**  
*partnerships for conservation*

The CHJV is a partnership of state and federal agencies and non-governmental organizations whose purpose is to develop and implement science-based conservation measures to secure bird populations in the Central Hardwoods Bird Conservation Region.

For more information,  
see [www.chjv.org](http://www.chjv.org)



Prepared by staff of the Central  
Hardwoods Joint Venture, 2015;  
layout and design by ABC

Open oak-woodlands and savannas are natural ecosystems that depend on disturbance, especially periodic drought and fire of varying frequency and intensity, to persist. These disturbances maintain an open canopy, which allows sunlight to reach the ground and allows a diverse array of prairie grasses, forbs, and shrubs to grow in the understory.

In their natural state, savannas and woodlands are spatially complex and temporally diverse, with a structure that naturally oscillates between disturbances, yet always possesses a richness of species and community associations.

Once common in central North America, these open woodlands provided essential habitat for numerous species of birds. Unfortunately, many of these species are in decline due to habitat loss from agricultural conversion and long term fire suppression. The continued decline of these woodland birds has increased awareness of this unique habitat and the importance of restoring and maintaining it to conserve birds and other species.

This publication introduces the management requirements of open oak-woodland birds, and can assist landowners and managers in developing comprehensive management plans for their properties in the central U.S. (Figure 1).

Successful open-woodland management requires that managers consider the present habitat conditions on the property and surrounding landscape, then identify management opportunities to enhance habitat quality where appropriate.

## Open Oak-Woodlands and Savannas of the Central U.S.

Savannas and woodlands are terms which have been used to describe habitat with open-grown, fire-resistant trees more or less widely interspersed in a well-developed herbaceous ground layer composed of native grasses and forbs. Dominant tree species vary according to soil type and geographic location, but typically include fire-resistant species such as bur oak, shortleaf pine, post oak, chinkapin oak, blackjack oak, and white oak.

These habitats are disturbance-mediated, relying primarily on fire to maintain open canopy conditions, and favoring fire-tolerant species such as oaks and prairie grasses. Without disturbance, the canopy closes, herbaceous understory is lost, and encroachment by mesophytic tree species such as maples and other fire-intolerant species proceeds.

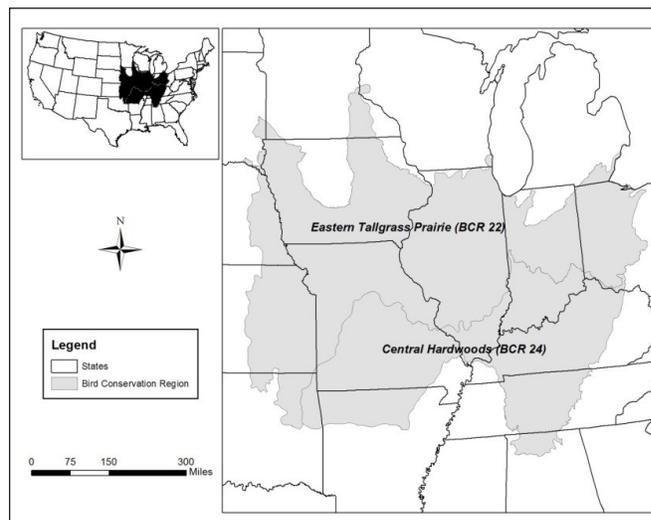
Though the definition of savannas and woodlands has varied, recent refinements use the term savanna for canopy cover less than 30%, and open oak-woodland in the range of 30-50%. However, canopy cover will vary within a site or across a landscape depending on the management intensity and how topographic, climatic, and other abiotic factors affect fire behavior. Thus, savannas and woodlands may best be distinguished by landscape context.

Savannas were typically found within a prairie matrix on nearly level to dissected plains, such as those that dominate the Eastern Tallgrass Prairie Bird Conservation Region (Figure 1). In contrast, open woodlands were commonly found within a forested matrix or comprising the transition zone between grasslands and forest. This community was typical in more dissected plains on ridges or south to west facing slopes or in areas where droughty or poor soil conditions restrict tree growth. These conditions were more common in the Central Hardwoods Bird Conservation Region (Figure 1).

## Bird Conservation Regions in the Central U.S.

Prior to European settlement, it is estimated that 27 to 32 million acres of savanna and woodland were present across the central region of North America. These vast stands varied depending upon topographic patterns, fire frequency, fluctuations in climate, and population densities of Native Americans, who used fire to alter landscapes. These variables influenced the proportion

Figure 1. Location of the Eastern Tallgrass Prairie and Central Hardwoods



of woody-to-herbaceous plants along savanna/woodland/forest gradients. Frequent and more intense fires, for example, resulted in more open conditions by killing or suppressing canopy trees, limiting woody regeneration, and setting back other woody vegetation. During longer, fire-free intervals, savannas and woodlands probably had a well-developed shrub component in the understory.

Unfortunately, few of these natural communities remain. More than 99% of the original 32 million acres has been so altered that they no longer provide usable habitat. In areas with remnant woodlands, decades of fire suppression have allowed them to become over-stocked, shading out the native grass and forb understory. Remaining habitats are small and isolated. Without active restoration and ongoing management, including the use of fire, these sites will function as closed-canopy forest, and the decline in oak-woodland and savanna habitats and their associated birds will continue.

## Declines in Open-Oak Woodland Bird Populations

The disappearance of open oak-woodland and savanna habitats is considered responsible, in part, for the decline of open woodland bird species. Although these species have found other habitat types maintained by periodic disturbance (e.g. shrub land, regenerating forest) to be suitable, populations are still declining, suggesting these substitutes are insufficient in terms of quantity and/or quality.

Of the 187 breeding songbird species in the Midwest, 95 use shrub-sapling or young forest habitat such as open woodlands to some degree during breeding. Many of these open oak-woodland species are of national and regional conservation concern, with fifteen species in the Eastern Tallgrass Prairie and Central Hardwoods Bird Conservation Regions considered in need of management attention by Partners in Flight (Table 1). The U.S. 2009 State of the Birds Report notes four of those (Prairie Warbler, Eastern Towhee, Field Sparrow

and Northern Bobwhite) exhibited significant population declines as well. In addition, recent research has shown that adults and juveniles of Ovenbirds and other interior forest species use shrub land or young forest during the post-fledging period. Restoration and improved management of open oak-woodland and savanna ecosystems will directly contribute to the conservation of these priority species as well as a broad suite of other birds.

**Table 1. Partners in Flight (PIF) priority birds in Open Oak-Woodland communities of the Eastern Tallgrass Prairie (ETGP) and Central Hardwoods (CH) Bird Conservation Regions**

| Species                  | BBS Trend Score (percent) | PIF Action Code ETGP BCR | PIF Action Code CH BCR  |
|--------------------------|---------------------------|--------------------------|-------------------------|
| Northern Bobwhite        | -3.8                      | IM                       | MA                      |
| Red-headed Woodpecker    | -2.8                      | IM                       | MA                      |
| Field Sparrow            | -2.3                      | IM                       | MA                      |
| Prairie Warbler          | -2.1                      | Not a regional priority  | MA                      |
| Eastern Wood-Pewee       | -1.4                      | Not a regional priority  | MA                      |
| Eastern Towhee           | -1.4                      | Not a regional priority  | MA                      |
| Brown Thrasher           | -1.1                      | MA                       | MA                      |
| Eastern Kingbird         | -1.1                      | MA                       | MA                      |
| Orchard Oriole           | -0.8                      | MA                       | MA                      |
| Bewick's Wren            | -0.5*                     | CR                       | IM                      |
| Yellow-breasted Chat     | -0.3                      | IM                       | MA                      |
| Blue-winged Warbler      | -0.2                      | PR                       | MA                      |
| Great Crested Flycatcher | 0.0                       | MA                       | Not a regional priority |
| White-eyed Vireo         | 0.6                       | Not a regional priority  | MA                      |
| Northern Flicker         | *                         | IM                       | MA                      |

BBS Trend score: refers to range-wide trend unless denoted by an \*; Bewick's Wren declined 0.6% per year in the Central BBS region and 13.1% in the Eastern BBS region. Northern Flicker declined by 2.5% per year in the Central BBS region and 1.5% in the Eastern BBS region.

PIF Action code: Action code indicating the type of conservation action most needed for improving or maintaining current population status of each species. CR= Critical Recovery; IM=Immediate Management; MA= Management Attention; PR= Planning and Responsibility.

**Table 2. Vegetation strata used by Open Oak-Woodland bird species for foraging (F), nesting (N), or escape/thermal cover (C)**

| Species                  | Ground cover | Shrub layer grass-dominated | Canopy | Comments   |
|--------------------------|--------------|-----------------------------|--------|--|
| Northern Bobwhite        | N, F         | C                           |        |  |
| Red-headed Woodpecker    |              |                             |        | Nests in cavities in relatively large trees; hawks insects; gleans from bark and foliage; sometimes feeds on fruit.  |
| Northern Flicker         | F            |                             |        | Nests in tree cavities. Forages on the ground feeding on ants and probes for insects on tree trunks and limbs.   |
| Eastern Wood-Pewee       |              |                             | N      | Aerial insectivore   |
| Great Crested Flycatcher |              |                             |        | Nests in cavities; sallies after flying insects, usually in the canopy; hovers over vegetation to take caterpillars, other insects, occ. fruits and berries. |
| Eastern Kingbird         |              |                             | N      | Aerial insectivore   |
| White-eyed Vireo         | N, F         |                             |        |  |
| Bewick's Wren            | F            |                             |        | Cavity or ledge nesting, often in farm equipment, sometimes a barn or shed; very rare and declining in the Midwestern and Eastern U.S.                       |
| Brown Thrasher           | F            | N, F                        |        |  |
| Blue-winged Warbler      | N            | F                           |        |  |
| Prairie Warbler          | N, F         |                             |        |  |
| Yellow-breasted Chat     | N, F         |                             |        |  |
| Eastern Towhee           | N, F         | N, F                        |        | Scratches in leaf litter to expose insects to glean.   |
| Field Sparrow            | N, F         | N, F                        |        |  |
| Orchard Oriole           | N, F         |                             |        |  |



Northern Bobwhite by Gary Kranner, National Fish and Wildlife Foundation



Bewick's Wren by Greg Homel, Natural Elements Productions

---

## HABITAT REQUIREMENTS

### The Importance of Open Oak Woodlands and Savanna Habitats

Bird community composition and structure in savanna and woodland has been shown to differ significantly from open-grassland and forest habitats. The diverse structure of natural woodland and savanna communities, which include scattered mature trees, standing dead trees and snags, and the native shrubs and grasses, supports a distinct and varied suite of bird species.

While several forest and shrub land birds are generalists and will use both forest and open woodland sites, many bird species have unique habitat requirements that woodlands and savannas provide.

Some species will use regenerating forests resulting from silvicultural practices such as clear cuts, shelter-wood regeneration cuts, and forest thinning, but these habitats may be available for only a few years, and lack the diversity of more natural communities.

Natural forest shrubland communities remain in early successional stages for multiple reasons (including shallow soils, xeric conditions, and periodic fire) and thus persist for longer periods than do regenerating forest sites. Understanding habitat use of these birds across habitat types is essential to effective conservation efforts because these species are linked to ephemeral, disturbance-dependent vegetative communities largely mediated by land management activities.

Some species, such as the Orchard Oriole and Great Crested Flycatcher, are more closely associated with the open-canopy trees and gaps they provide; others, such as Prairie and Blue-winged Warblers and Whippoorwills, use the shrub layer. Northern Bobwhite Quail and American Woodcock forage and nest in the herbaceous layer, while Red-headed Woodpecker and Northern Flicker require the nesting and foraging structure provided by snags and woody debris.

Many birds utilize more than one strata for nesting, foraging or cover (Table 2). Recent studies have shown the presence and density of shrubs (multi-stemmed, low growing woody plants) is predictive of bird densities, and the lack of shrubby vegetation could negatively affect several bird species.

For woodland or savanna to support a full complement of bird species, management activities must consider each component needed by each species in the suite.

Without appropriate management, the kinds of habitats in which these species reach their highest relative densities will continue to be compromised. This doesn't mean that all components need to be present within every stand, but they should be available somewhere in the landscape to accommodate species that depend upon them.

### Food Resources

Open oak-woodland and savanna birds requires a diversity of food resources. Insects and other terrestrial invertebrates are the primary food for most woodland species, and the remainder feed on seeds or other plant matter. However, most woodland insectivores supplement their diets with fruits, seeds, acorns, or nectar when these resources are abundant. Similarly, insects are an important source of protein during breeding and chick-rearing periods for seed-eaters such as the Northern Bobwhite.

It is important to manage woodlands for a diverse native plant community, because woodland birds consumes all types and stages (egg, larva or adult) of invertebrates, plus a wide variety of wild berries and native grass and forb seeds.

Food resources are partitioned among species based on the habitat strata where feeding generally occurs (Table 2), as well as by the method of feeding. Most woodland birds are gleaners, picking their food off leaves and stems while perched or moving. Some use multiple approaches, including flycatching, hovering, pouncing, and scratching the ground.

### Landscape Factors

Habitat value for most terrestrial bird species is influenced by factors in the surrounding landscape. In addition to site-scale habitat factors like percent canopy and shrub cover, plant species composition, and the presence of snags or nesting cavities, landscape-scale factors such as adjacent land uses and proportion of forest cover are important for woodland species. Landscape-scale factors can impact the abundance of nest predators and Brown-headed Cowbirds (a nest parasite). Based on data from across the Midwest U.S., birds nesting in open woodland sites within agricultural or pastoral landscapes will likely suffer lower nest success rates than at sites in more forested landscapes.

## Area-Sensitivity/Minimum Habitat Area

Unlike many forest interior species, most woodland birds have not been shown to be area-sensitive. For most, site occupancy is likely driven by habitat quality (structural requirements and food resources) as long as the site is large enough for the birds to set up and maintain a breeding territory (typically 1-1.5 ha or 2-4 ac). Of course, the general rule that larger is better still applies; Yellow-breasted Chats were more abundant in larger patches of early successional forest than smaller ones in Ohio and Prairie Warblers nested in shrubs that were more than 20 m (60 ft.) from an edge in Missouri.

## Open Oak-Woodland and Savanna Management for Woodland Birds

Periodic introduction of fire and/or mechanical thinning are essential for retaining open woodland habitats, and can be incorporated into an overall forest resource management system to enhance the wildlife value of the entire forest stand.

Although primary efforts should focus on the restoration of degraded oak-woodland and savanna sites, well-timed and sited thinning and other manipulations in closed-canopy oak forest sites can temporarily provide the vegetative structure and composition required by many open woodland bird species. However, compared to restored open-woodlands, these forest management practices are less diverse and resilient and lack the species richness found in restored natural communities.

## Habitat Inventory and Assessment

Management of open oak-woodland and savanna is a long-term commitment, and careful planning is required for success. Planners must consider site conditions, determine long-term management capabilities, and assess whether restoration efforts will result in the desired habitat conditions.

Soil type and hydrology, topography, and floristic traits generally determine the restorability of a site. The size of the restoration is often constrained by management logistics and surrounding land use and ownership. Vegetation structure, i.e. spacing of trees and the amount and arrangement of mid-story and shrub layers, is considered more important than tract size.

Temporal and spatial requirements for targeted bird species must also be considered. Restoration practices that allow for the continued presence and regeneration of shrubs, retention of decaying and standing dead



Yellow-breasted Chat by Greg Lavaty

trees, and an understory with a diverse stand of native grasses and forbs are recommended. Shrub presence and density is also an important habitat characteristic.

Efforts to restore degraded woodlands should begin with proper site selection and the reintroduction of fire, coupled with thinning if needed, to rapidly reduce overstory density to the desired condition (<50% canopy closure). The presence of problematic invasive species should be assessed, and any necessary treatment practices implemented prior to burning, thinning, or herbicide treatments for restoration.

Initially, sites may require several years of annual or biennial fires to further reduce canopy density and control subsequent hardwood sprouting. After these objectives are met, burning frequency, timing and intensity can be reduced to maintain the woodland structure, composition and vigor of the herbaceous understory.

## Management Tools

**Prescribed Burning:** Prescribed burning is commonly used for open oak-woodland and savanna restoration on sites that once supported woodland vegetation, but have since grown into a closed- canopy condition. Burn timing, frequency, and intensity are used to reduce overstory tree density and basal area, open the canopy to allow sunlight to penetrate to the understory, and facilitate the development of an herbaceous layer of native grasses and forbs.

Woodlands may require multiple treatments to achieve the desired conditions, with many sites requiring burns at 1-2 year intervals during the restoration phase. Once established, most sites can be maintained by applying fire on a 3-7 year frequency.

Because of the complexity of using fire for woodland restoration and maintenance, burn prescriptions should be prepared by individuals or agencies trained in using prescribed fire for the restoration of wooded habitats.

Although beneficial, prescribed fire is a highly regulated activity, and should only be conducted in cooperation with state fish and wildlife agencies and with assistance from licensed burners. Qualified agencies, nongovernment organizations and individuals can help in the development of a burn plan, provide necessary tools, equipment, supervision, and assist in obtaining all required permits.

**Thinning:** Thinning, both mechanical and through the use of herbicides, is an effective management tool for restoring open conditions in woodland habitats which have reverted to closed-canopy forests. It should be considered a complimentary management tool to prescribed burning, and can seldom achieve desired woodland habitat results alone.

Thinning allows land managers to rapidly reduce tree stand density and basal area, selectively remove individual trees based on species and crown morphology, limit accidental damage from falling trees and reduce future fuel loads. Prescriptions for basal area removal during thinning operations must account for the future loss of overstory trees to fire mortality and wind throw and should be adjusted accordingly.

During thinning operations woody material may be harvested, but care must be used to limit soil disturbance on the project site. Land managers should also consider leaving standing dead snags and cavity trees within the project area to provide nesting and foraging sites for woodpeckers and other woodland bird species.

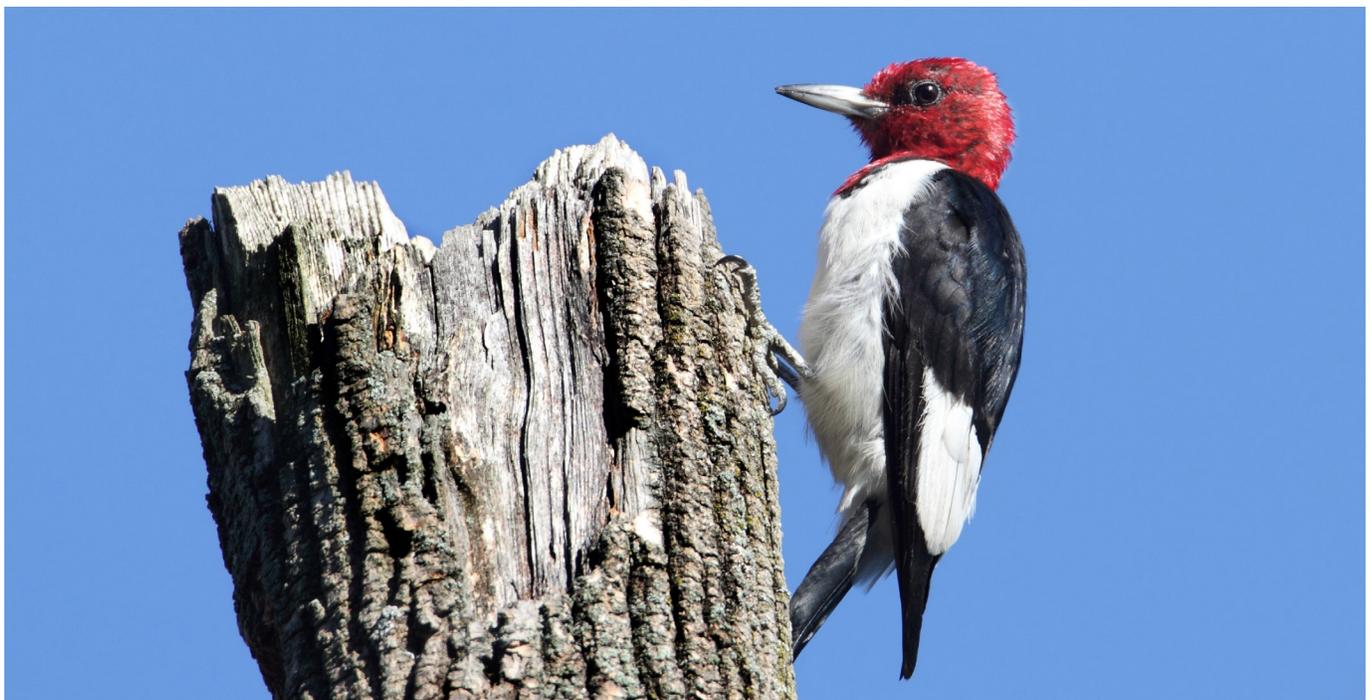
Thinning practices should occur during the fall and winter months (e.g., November through March) to avoid the primary nesting season for woodland birds and the maternity roost period for bat species that use standing dead trees or living trees with exfoliating bark (e.g., federally endangered Indiana Bat and Northern Long Eared Bat).

## Management Prescriptions

**Savanna Management:** Savannas are predominately grasslands with scattered, open-grown, widely spaced trees and topography conducive to frequent, high-intensity fires. Savanna structure is primarily two-layered, with scattered orchard-like groves of trees and an understory dominated by flora adapted to full sun. Shrub thickets can occur but are limited to fire-protected areas. Canopy cover is usually less than 30% (Table 3).

**Woodland Management:** Woodland sites can vary but generally have a three-layered structure: an overstory of trees ranging from 30 to 80% canopy closure, a sparse mid-story, and a ground layer rich in forbs and scattered grasses. The ground layer has patchy to dense cover throughout the growing season and usually exhibits more forbs and less grasses than savannas due to the increase in shading from the heavier canopy cover.

Fire regimes are low to moderate intensity and occur at 3 to 15 year intervals (Table 3).



Red-headed Woodpecker by Steve Byland, Shutterstock

**Table 3. The Woodland and Savanna Continuum\***

| Attributes                               | Dry-mesic Woodlands   | Dry Woodlands   | Savannas  |
|--|---|---|---|
| Vegetation layers                        | Overstory trees, understory trees shrubs, mixed forbs, grasses and sedges                                 | Overstory trees, shrubs grasses and forbs   | Open grown large trees, shrubs, grasses and forbs                     |
| Canopy Height                            | 60-90 ft.   | 20-60 ft.   | 20-60 ft.   |
| Tree Form                                | Somewhat spreading crowns, some lower spreading branches  | Spreading crowns, some lower spreading branches   | Wide-spreading crowns, lower branches typical                         |
| Canopy closure                           | 50-80 percent   | 30-50 percent   | 10-30 percent   |
| % Mid story Cover                        | 30-50, patchy   | 10-30, scattered  | 5-10, sparse  |
| Ground Layer Cover                       | Dense to patchy in spring, patchy to dense by mid-summer  | Patchy to dense all season  | Dense all season  |
| Ground Layer Plants                      | Moderate to low diversity of spring ephemerals, and ferns; abundant C3 grasses, sedges, summer/fall forbs | C3 and C4 grasses, sedges, diversity of forbs all season                                    | C4 grasses, sedges, diversity of forbs all season                     |
| Topography and Landform                  | Mid and upper slopes of southerly aspects, fire-prone landscapes  | Steep upper slopes of southerly aspects, narrow ridges, broad ridges, fire-prone landscapes | Level to gently rolling topography, steep loess hills, broad ridges   |
| Soils                                    | Moderate depth (20-36") silt loams, moderate organic matter, shallow leaf litter                          | Shallow depth (<20"), droughty, often rocky or nutrient poor; fragipans or claypans         | Wide range of soil types from shallow to deep, variably rocky         |
| Fire Regime - (Restoration/ Maintenance) | Low to moderate intensity fires (2-3 years / 3-10 years)  | Low to moderate intensity fires (1-3 years / 3-7 years)                                     | Moderate intensity fires (1-4 years/3-5 years)                        |
| Dominant Trees                           | White, black, scarlet, chinkapin oaks, hickories, shortleaf pine  | Post, blackjack, chinkapin, bur, white oaks, shortleaf pine                                 | Bur, chinkapin, post, swamp white, and white oaks                     |
| Characteristic Plants                    | Bristly Sunflower, Asters, Goldenrods, Bee Balm, Sedges, Native C3 Grasses                                | Leadplant, Asters, Wild Quinine, Goldenrods, Pale Purple Coneflower, Native Lespedezas      | Compass Plant, Rattlesnake Master, Rigid Goldenrod, Native C4 Grasses |
| Basal Area (ft2/ac)                      | 50-80   | 30-60   | <30   |

\* Note: This chart describes idealized conditions for stands that best represent their pre-settlement character. For most sites, these will be the desired future conditions in terms of structure.

---

## References and Suggested Reading

- Brawn, J. D. 1998. Effects of oak savanna restoration on avian populations and communities in Illinois. Final report to the Illinois Natural History Survey.
- Brawn, J. D., S. K. Robinson, and F. R. Thompson III. 2001. The role of disturbance in the ecology and conservation of birds. *An Annual Review of Ecology and Systematics* 32:251-276.
- Brawn, J. D. 2006. Effects of restoring oak savanna on bird communities and populations. *Conservation Biology* Vol 20 No. 2, pages 460 -469.
- Davis, Mark A. 2000. Restoring Savanna using fire: Impacts on the breeding bird community. *Restoration Ecology* Vol. 8 No.1 pages 30 – 40.
- Ehrlich, P. R., D. S. Dobkin and D. Wheye. 1988. *The birder's handbook: a field guide to the natural history of North American birds*. Simon and Schuster/Fireside Books, New York, NY.
- McCarty, K., 2002. Fire Management for Missouri Savannas and Woodlands. Proceedings of the SRM 2002 Savanna and Woodland Symposium.
- McClain, W. E., and S. L. Elzinga. 1994. The occurrence of prairie and forest fires in Illinois and other Midwestern states, 1679-1854. *Erigenia* 13:79-90.
- McPherson, G. R. 1997. *Ecology and Management of North American Savannas*. Univ. of Arizona Press. 200pp.
- NatureServe. 2009. International Ecological Classification Standard: Terrestrial Ecological Classifications. NatureServe Central Databases. Arlington, VA, U.S.A. Data current as of 06 February 2009. (See pages 183, 185 and 216 for oak woodland community types.)
- Nelson, Paul W. 2010. *The Terrestrial Natural Communities of Missouri*. The Natural Areas Committee, Jefferson City, Missouri. 550 pages.
- North American Bird Conservation Initiative, U.S. Committee. 2009. *The State of the Birds, United States of America, 2009*. U.S. Department of Interior: Washington, DC. 36 pages.
- Nuzzo, V. A. 1985 The extent and status of Midwest oak savanna: Presettlement and 1985. *Natural Areas Journal* 6:6-36.
- Packard, S. 1988. Just a few oddball species: restoration and rediscovery of the tallgrass savanna. *Restoration and Management Notes* 6:13-22.
- Packard, S. 1991. Rediscovering the tallgrass savanna of Illinois. Pgs. 55-66 In G. V. Burger, J. E. Ebinger, and G. S. Wilhelm, eds. *Proceedings of the Oak Woods Management Workshop*. Eastern Illinois University, Charleston.
- Packard, S. 1993. Restoring oak ecosystems. *Restoration and Management Notes* 11:5-16.
- Poole, A. (Editor). 2005. *The Birds of North America Online*: <http://bna.birds.cornell.edu/BNA/>. Cornell Laboratory of Ornithology, Ithaca, NY.
- Probst, J.R., and F.R. Thompson, III. 1996. A multi-scale assessment of the geographic and ecological distribution of Midwestern neotropical migratory birds. Pgs. 22-41, In F.R. Thompson, III, ed. *Management of midwestern landscapes for the conservation of Neotropical Migratory birds*. USDA Forest Service, General Technical Report NC-187.
- Robinson, S.K.; Thompson, F.R., III; Donovan, T.M.; Whitehead, D.R.; Faaborg, J. 1995. Regional forest fragmentation and the nesting success of migratory birds. *Science* 267(5206): 1987-1990.
- Rodewald, A.D.A.C. Vitz. 2005. Edge- and area-sensitivity of shrubland birds. *Journal of Wildlife Management* 69(2): 681-688.
- Sauer, J.R., J.E. Hines, J.E. Fallon, K.L. Pardieck, D.J. Ziolkowski, Jr., and W.A. Link. 2011. *The North American Breeding Bird Survey, Results and Analysis 1966-2010*. Version 12.07.2011. USGS Patuxent Wildlife Research Center, Laurel, MD.
- Streby, H.M., S.M. Peterson, T.L. McAllister, and D.E. Andersen. 2011. Use of early-successional managed northern forest by mature-forest species during the post-fledging period. *Condor* 113(4):817-824.
- Taft, J. B. 1997. Savanna and open woodland communities. Pgs. 24-54 In M. W. Schwartz, ed. *Conservation in highly fragmented landscapes*. Chapman and Hall, New York.
- Woodward, A.A., A.D. Fink, F.R. Thompson, III. 2001. Edge effects and ecological traps: effects on shrubland birds in Missouri. *Journal of Wildlife Management* 65(4):668-675.