MINNESOTA'S WILDLIFE ACTION PLAN 2025-2035

CONSERVING HABITATS AND BIODIVERSITY

SAVANNA

DEPARTMENT OF NATURAL RESOURCES

NONGAME WILDLIFE PROGRAM

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Cover Photos: Oak savanna restoration at Myre-Big Island State Park, Emily Peters; St. Croix Savanna Scientific and Natural Area, David Minor

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Savanna

Habitat Description

Savannas typically have scattered trees, sometimes clumps of trees, above a layer of prairie grasses and forbs. Bur oak (*Quercus macrocarpa*) is the most common and widespread tree, but Northern pin oak (*Quercus ellipsoidalis*) and, in the extreme southeastern part of the state, black oak (*Quercus velutina*) are also typical. Small, open-grown, often gnarled bur oaks are the most distinctive savanna tree species. Jack pine (*Pinus banksiana*) is the predominant savanna tree species on deep sand substrates in the northern half of the state.

Savannas in Minnesota are classified as part of the Upland Prairie Ecological System (see also the Prairie and Other Grasslands sub-chapter). Savannas typically occur where fire frequency or intensity is somewhat lower than in prairie landscapes, yet higher than in forested areas. At such sites, more fire-tolerant shrubs and trees can persist, forming brush-prairie and savanna communities.

Habitat Map

To depict savanna habitat (see Figure 3.7), we compiled spatial data from several sources: DNR's Native Plant Communities and the Midwest Terrestrial Habitat System created by the USFWS Midwest Landscape Initiative (for more information, see Habitat Map Methods in Chapter 3: Habitats). We note included sub-types below; underlined items have links to online descriptions.

Photo: St. Croix Savanna Scientific and Natural Area, David Minor

Associated Native Plant Community Classes by Ecological Systems

Upland Prairie (UP)

UPn13 Northern Dry Savanna (PDF)

UPn24 Northern Mesic Savanna (PDF)

UPs14 Southern Dry Savanna (PDF)

UPs24 Southern Mesic Savanna (PDF)

Midwest Terrestrial Habitat System

From the Midwest Terrestrial Habitat System we included this group: Midwest Woodland and Savanna.

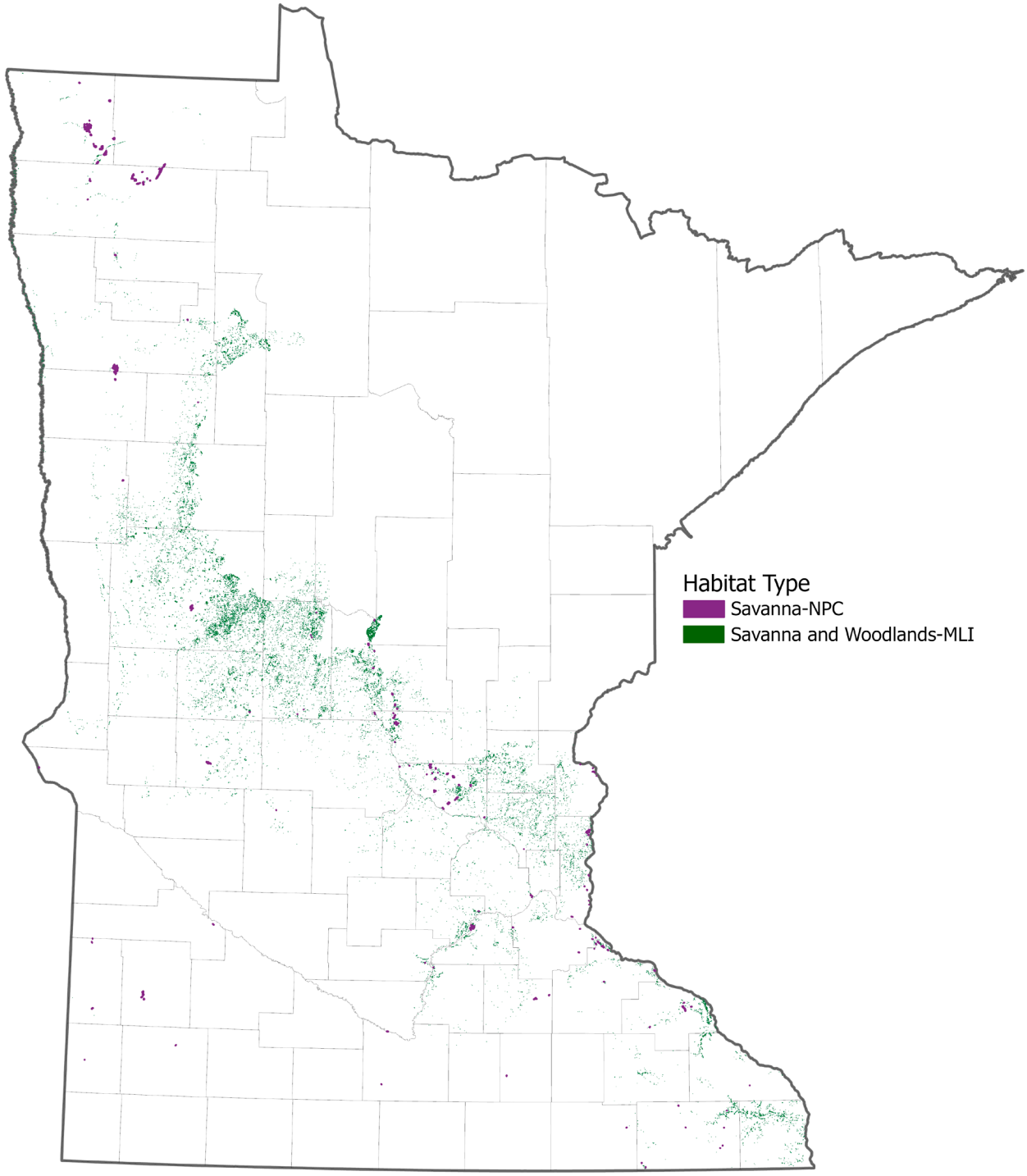

Figure 3.7. A map depicting Savanna habitat in Minnesota, including four savanna DNR Native Plant Community Classes in the Ecological Systems of Upland Prairie as well as Midwest Woodland and Savanna from the Midwest Terrestrial Habitat System.

Conservation Overview

Oak savanna is one of Minnesota's rarest wildlife habitats. Prior to European settlement, oak savanna was one of the more common ecosystems in Minnesota, covering roughly 10 percent of the state. Fire suppression, agriculture, and urban growth have reduced the extent of oak savanna coverage to approximately 0.02% of its former range in the Midwestern United States (DNR). Statewide, it is estimated that approximately 9,800 to 11,100 acres of the State's original extent of Oak Savanna (all subtypes) remains. Dry Barrens Oak Savanna in Minnesota is even rarer, with acreage totaling less than 5400 acres. Owing to its' rarity, Dry barrens oak savanna is considered Critically Imperiled to Imperiled (S1S2) at the State level and Imperiled at a global level (G2). The savanna is a transitional ecosystem between the tallgrass prairie and woodland environments, so it is an important habitat for both woodland and prairie wildlife (see also the Prairie and Other Grasslands sub-chapter for relevant information on stressors and actions). Before European settlement, native grazers, including bison (*Bison bison*), elk (*Cervus canadensis*) and white-tailed deer (*Odocoileus virginianus*) contributed to the disturbance and maintenance of oak savanna habitats (Hartman and Steele, 2015). As elk and bison were extirpated and white-tailed deer populations significantly reduced, intermittent grazing was taken over by domesticated livestock including sheep, cattle, and goats (Hartman and Steele, 2015).

Climate Profile

The anticipated effects of climate change on savanna ecosystems were profiled in the report "Effects of Climate Change on Midwestern Ecosystems: Central Interior Oak Forest, Woodland and Savanna" published by the Midwest Climate Adaptation Science Center (Ratcliffe et al., 2025). This Climate Profile section is derived from that report, focused on Central Midwest Oak Openings National Vegetation Classification habitat type (please see the report for source citations). These structurally open, fire-maintained habitats typically occur on well-drained soil and represent an ecotone between grassland and woodland. Historically, this habitat type was aided by indigenous fire practices, and frequent, low intensity fires maintained open canopies, restricted woody encroachment, and stimulated warm season prairie grasses and forbs (Ratcliffe et al. 2025).

In addition to exposure to a projected increase in annual temperature of 5.8 degrees F under a moderate emissions scenario for late century (2070-2099), the most impactful changes in climate for this habitat are increasing droughts and commensurate changes in fire behavior and frequency (Ratcliffe et al. 2025). Vapor deficit, which takes into account temperature and water use by evapotranspiration, is projected to increase on average by 33% or 72% over historical levels in the late century, under moderate or high emissions, respectively. This increases the probability of conditions for extreme fire danger (based on low fuel moisture), which could be favorable to this habitat type, unless the fires are too extreme, destroying the canopy and damaging the soil (Ratcliffe et al. 2025).

Key Climate Change Effects (from Ratcliffe et al. 2025; please reference for the source citations):

- **Habitat structure** can be altered by drought that reduces herbaceous cover, soil microbial activity and decomposition, which can lead to reduced nutrient availability and

increased erosion, particularly on sandy soils. High-intensity fire would also exacerbate these effects on soil structure and erosion.

- **Community composition** may shift toward more xeric species such as drought-tolerant warm-season grasses although extreme drought or drought with an absence of fire may favor shrubs and encroaching trees. Drought conditions will likely be more favorable for oaks over maples and birches, although extreme drought may inhibit oak recruitment and cause canopy failure.
- **Invasive species** with broad tolerances and rapid recovery strategies can be favored by drought, such as brome (*Bromus*) species. Fire can be effective in suppressing some invasive shrubs, but is not thought to be effective in suppressing some, such as invasive honeysuckles (*Lonicera* spp.), common buckthorn (*Rhamnus cathartica*), and autumn olive (*Elaeagnus umbellata*) that are persistent in the seed bank and recover readily after fire.
- **Pests and pathogens** may become more prevalent as trees are stressed by drought, such as oaks becoming more susceptible to oak borer species. Rising temperatures may increase outbreaks in some pathogens such as moths and bark beetles. Root rots may be diminished by drought or may flourish under fluctuating moisture regimes.
- **Herbivory** could be expected to increase if warming winters support higher populations of white-tailed deer. Increased browsing pressure could inhibit the reproduction of oaks and reduce forb diversity. In addition, drought can inhibit plants investments in chemical defenses.

Species in Greatest Conservation Need

Savannas provide habitat for 100 animal and 8 plant SGCN as primary or secondary habitat (see Table 3.7).

Table 3.7. Numbers of SGCN associated with Savanna as either primary or secondary habitat.

Species Groups	Primary Habitat	Secondary Habitat	Total
Birds	3	4	7
Mammals	5	13	18
Reptiles	12	0	12
Bees	-	-	4
Beetles (terrestrial)	-	-	6
Butterflies	-	-	8
Moths	-	-	40
Spiders	-	-	5
Plants	8	-	8
Total	**28**	**17**	**108**

Habitat associations for insects were not differentiated into primary and secondary habitats and are shown in the total column. For plants, only a single primary habitat was identified per species. Primary habitats are those that species rely on and use most consistently; loss or degradation of these habitats would have the most significant negative effect on their populations. Secondary habitats are used by the species less frequently. Animals with more general habitat requirements are associated with multiple habitat types, while specialists are associated with one or few. Detailed tables associating each SGCN with the 15 habitats identified in the 2025-2035 SWAP can be found in Appendix D (animals) and Appendix E (plants). Examples of selected SGCN are described below; state-listed species are linked to their account in the Rare Species Guide.

Birds

Native savanna that meets native plant community criteria (native prairie with scattered native trees or shrubs) is now rare in Minnesota because of conversion to other land uses or through succession to oak woodland due to fire suppression. Most SGCN birds that historically occurred in savanna also make use of non-native surrogate habitats with savanna-like structure. Native savanna often has a range of woody cover, and bird SGCN will vary along this gradient. Open areas dominated by grassland, with scattered shrub or small trees, may support typical grassland birds, while larger patches of trees can provide suitable habitat for woodland or forest species.

Red-headed woodpeckers (*Melanerpes erythrocephalus*) are dependent on large dead trees and snags without bark. Typically, suitable dead trees are adjacent to open areas. Eastern whip-poor-wills (*Antrostomus vociferus*) nest in savanna with a semi-open tree canopy, sand or gravel soils, and an open ground layer. Loggerhead shrikes (*Lanius ludovicianus*) require areas of shorter grass adjacent to scattered trees for perches and nesting. Shrikes are now found more often in savanna-like habitat, often along roadsides or fencelines.

Savannas that are predominantly grassland, with only widely-scattered small trees or shrubs, are preferred by field sparrows (*Spizella pusilla*), lark sparrows (*Chondestes grammacus*), and Eastern meadowlarks (*Sturnella magna*), and may be suitable for other grassland bird SGCN (see Prairie/Grassland sub-chapter). Bell's vireos (*Vireo bellii*) breed in dense, shrubby thickets, primarily in southeastern Minnesota.

Suitable shrub thickets may occur within upland savanna, prairie, shrub swamps, or along forest or wetland edges. However, Bell's vireos are restricted to shrub patches within or at the edges of open landscapes, rather than under a forest canopy.

Photo: Red-headed woodpecker, Earl Bye

Mammals

The open landscape of savannas provides primary habitat for five SGCN mammals. Considered a sentinel or keystone species of grasslands and savannas, the American badger has a significant impact on the surrounding landscape. Residing in underground burrows, and digging through loose, loamy or sandy soils for prey, its excavations provide numerous benefits including aerating the soil, creating shelters for other animals, and improving

nutrient cycling. Three other mammals are closely associated with savanna habitats, including the least weasel (*Mustela nivalis*), the plains pocket mouse (*Perognathus flavescens*), and the plains spotted skunk (*Spilogale interrupta*); prairies and other grasslands are primary habitats for each of these species as well. Despite intensive surveys for the spotted skunk in the 1990s, only 4 animals were found resulting in the species listing as a state threatened.

Reptiles

Savannas are especially important habitats for reptiles; 12 of the 13 reptile SGCN use these open habitats of oaks and jack pine. Common five-lined skinks (*Plestiodon fasciatus*), six-lined racerunners (*Aspidoscelis sexlineatus*), Eastern hog-nosed snakes (*Heterodon platirhinos*), milk snakes (*Lampropeltis triangulum*), and lined snakes (*Tropidoclonion lineatum*) are most common in and around woodland edge habitats and savannas. Five-lined skinks use rock fissures and cracks in bedrock outcrops as hibernacula, but the suitability of this habitat is threatened by the encroachment of Eastern red cedar (*Juniperus virginiana*). Several of these reptiles (six-lined racerunners, north American racers (Coluber constrictor), and lined snakes) prefer more open areas. Other species (common five-lined skinks, eastern hog-nosed snakes, and milk snakes) prefer edges, using openings as basking areas. Key habitat features for these species include down woody debris (for cover, nesting sites, and basking sites) and burrows or crevices as overwintering sites. An iconic species of these open habitats is the gophersnake (*Pituophis catenifer*), which typically favor the loose, sandy soils of savannas which also support a rich abundance of burrowing small mammals for food (Moriarty and Hall, 2014).

Photo: Gophersnake, Leslie Parris

Plants

Savanna communities with their herbaceous prairie ground layer support many of the same endangered, threatened, and special concern plant species found in respective open prairie habitats (see Prairie and Other Grasslands sub-chapter), such as spike oat (*Avenula hookeri*), plains reedgrass (*Calamagrostis montanensis*), blunt sedge (*Carex obtusata*), and others. Dry barrens communities, with sand soils and arid conditions also host a number of annual and perennial species adapted to, and dependent on these conditions. Annuals such as seaside three-awn (*Aristida tuberculosa*), annual skeletonweed (*Shinnersoseris rostrata*), and purple sandgrass (*Triplasis purpurea*) require shifting sands and this habitat can be threatened by encroaching vegetation (often native) that stabilizes the sands. Some rare perennial species are also primarily found in barrens and dune communities in Minnesota, including Indian ricegrass (*Achnatherum hymenoides*), winter bentgrass (*Agrostis hyemalis*), slender hairgrass (*Deschampsia flexuosa*), beach heather (*Hudsonia tomentosa*), narrow-leaved pinweed (*Lechea tenuifolia*), and Drummond's campion (*Silene drummondii*). Some of the rare species found in savanna barrens are at the edge of their ranges in Minnesota, and in the state only savanna barrens satisfy their habitat requirements. Indian ricegrass, for example, is a western species of dry plains that only finds suitable habitat at a few barrens locations in Minnesota.

Primary Stressors in this Habitat

Throughout Minnesota, habitats have been lost and degraded due to pressures associated with human settlement, subsistence, livelihoods, and recreation. Indeed, habitat loss or alteration remains the primary threat to most, if not all, SGCN. In this section, we identify key "stressors" that may continue to contribute to habitat degradation and loss. The list is adapted from a globally recognized threats lexicon developed by the International Union for the Conservation of Nature (Salafsky et al., 2024). For additional details, see the Stressors Section in Chapter 1: Species in Greatest Conservation Need.

It is important to note that some of the factors listed as "stressors" can also be used to advance conservation goals. Broad terms such as "fire management" reflect the dual nature of these factors as they may function as stressors in some contexts while serving as valuable conservation tools in others. For example, an intense wildfire following prolonged fire suppression may cause significant stress for the habitat and species affected, while prescribed fire, when planned appropriately, can enhance ecosystem health and resilience.

Information about a subset of primary stressors specifically affecting this habitat is included below, followed by a set of conservation actions addressing those stressors.

Development

A large extent of savanna and upland shrublands have been affected by development for housing and agricultural use, particularly as these habitats ranged across parts of the state with the highest density of human development.

Crop Production

Conversion of savanna habitat to agriculture in conjunction with other forms of human development is a historical and potential future concern.

Tree Plantations

Pine plantations are present in some areas formerly occupied by savanna habitat. Care should be taken to avoid pressure on this sensitive habitat from tree planting campaigns, including for carbon sequestration.

Livestock Management

As elk and bison were extirpated and white-tailed deer populations significantly reduced, grazing by livestock including sheep, cattle, and goats increased from the early to mid 1900s and likely became very intensive during the droughts of the 1930's as farmers struggled to find enough forage (Hartman and Steele, 2015). Some savanna habitats likely became overgrazed and became subject to varying degrees of erosion.

Timber Harvest

Timber harvest is a forest management tool that can affect wildlife habitat by changing forest and woodland structural and compositional diversity. Forest management decisions, including inaction, typically have positive effects for some species and negative effects for others.

Fire Management

Historically the open environment of oak savanna was maintained largely by fire. Savannas occurred in physical proximity to prairies, but where features such as streams, lakes, and steep topography impeded the spread of those fires. Savannas form where fire occurs frequently enough to prevent trees and shrubs from dominating and shading out sun-loving herbaceous plants, but where frequency and severity are low enough to allow fire-tolerant trees to become established and sometimes reach maturity. All savannas are highly sensitive to fire suppression, quickly succeeding to woodland and eventually to forest in the absence of fire. In the absence of fire, woodland species and invasive shrubs gradually fill the savanna, closing the canopy and shading the prairie grasses and forbs.

Invasive Species (Problematic Non-native Species)

Invasive woody species include common buckthorn (*Rhamnus cathartica*), bush honeysuckle (*Lonicera* sp.), and multiflora rose (*Rosa multiflora*). Forbs such as sweetclover (*Melilotus officinalis*) and grasses such as kentucky bluegrass (*Poa pratensis*) and smooth brome (*Bromus inermis*) are also common invasive species in this habitat type.

Diseases and Pathogens

Bur oak blight is a native fungal disease that affects some bur oaks causing leaves to brown and die. Over time, bur oak blight may weaken the tree, promoting infestation by two lined chestnut borer or Armillaria root disease. Wetter springs may increase the prevalence and severity of this disease as fungal spores spread from the diseased leaves by rainwater, exacerbated by earlier spring rainstorms brought on by Minnesota's changing climate. Oaks in open upland areas are more at risk, and the disease is most problematic for stressed bur oak; healthy bur oaks can tolerate bur oak blight for a decade or more.

Changes in Temperature related to Climate

Minnesota has experienced a clear warming trend over the past century. Between 1895 and 2020, average statewide temperatures increased by 3.0 degrees Fahrenheit (°F; Climate Trends). This warming has become more pronounced in recent decades and during the winter months. Since 1985, average winter temperatures in Minnesota have risen by 5.4°F, with average winter low temperatures increasing even more significantly by 6.8°F (Climate Change in Minnesota). These changes have led to a shortened season of snow cover and a reduction in lake ice duration by 10-14 days over the past 50 years (MPCA 2025)).

Furthermore, these shifts in thermal regimes are ecologically significant. Many species are adapted to narrow temperature ranges, and such rapid changes can result in increased thermal stress, the spread of invasive species, and heightened disease and pathogen risks (Ratcliffe et al. 2025).

Looking ahead, this warming trend is expected to continue. By mid-century (2040-2059), Minnesota's average annual temperature is projected to rise by an additional 3.8 - 4.5 °F, depending on future greenhouse gas emissions scenarios (Liess et al., 2022; Climate Change in Minnesota). Climate change does not act in isolation, interacting with invasive species dynamics, land-use change, and shifts in water quality and quantity, compounding ecological effects (He et al., 2019; Finch et al., 2021). For additional context and resources, refer to the Climate Adaptation section in Chapter 6: Implementation.

Changes in Precipitation and Hydrology related to Climate

From 1895 to 2020, Minnesota's average annual precipitation increased by 3.4 inches (Climate Trends). The state has also seen a notable rise in the frequency and intensity of heavy precipitation events. Since 2000, very heavy rains (6 inches or more in a single day) have occurred two to three times more frequently than during the 20th century (Williams-Sether & Sanocki, 2025; NOAA National Centers for Environmental Information State Climate Summaries 2022: Minnesota). These extreme events have led to a corresponding increase in flooding, which can disrupt ecosystems, human infrastructure, and water quality (Williams-Sether & Sanocki, 2025).

Future projections indicate continued increases in annual precipitation, especially during the winter and spring months, which are likely to exacerbate flooding risks. The same climate models also forecast an increase in late summer drought events, underscoring the variability and unpredictability of hydrologic

patterns under a changing climate (Climate Change in Minnesota). By mid-century (2040-2059), average annual precipitation is projected to increase by up to 1.2 inches, depending on emissions scenario (Liess et al. 2022; Climate Change in Minnesota). This seemingly counterintuitive pattern — wetter winters and springs, punctuated by hotter, drier late summers — has profound implications for water availability, wetland health, soil stability, and species dependent on seasonal hydrologic cycles (Runkle et al. 2022). For more information and resources for climate-adapted management strategies, see the Climate Adaptation section in Chapter 6: Implementation.

Photo: Uncas Dunes Scientific and Natural Area, Kelly Randall

Case Study: Restoration of Oak Savannas in Southern Minnesota

Prior to European settlement, oak savannas covered roughly 10% of Minnesota's land base, however, today less than 0.1% of the original oak savannas remain. Primary threats contributing to the loss or degradation of oak savannas include the exclusion of fire, agricultural and residential development and the establishment of invasive species including both common buckthorn and honeysuckles. The Oak Savanna Subsection alone, which covers portions of Fillmore, Goodhue, Rice, Dakota, Mower, Freeborn, Steele and Waseca Counties, is home to at least 93 species of greatest conservation need (SGCN).

Myre-Big Island State Park, which is located in Freeborn County, had a number of potential candidate sites for oak savanna restoration. In 2022, staff from the DNR Division of Parks and Trails Resource Management Program selected three sites, which encompassed over 75 acres. The sites retained some structural characteristics of oak savannas. These included the presence of widely-spaced, open-grown bur oaks. Intensive grazing throughout the first half of the 20th century, the cessation of fire, and the encroachment of woody invasives and more mesic native hardwood species had resulted in a closed overstory, and the loss of the native grasses and forbs that once dominated the ground layer.

To date, through a combination of selective tree and brush removal, forestry mowing, targeted prescribed grazing/browsing, prescribed burning and inter-seeding, both structural and functional characteristics of the oak savanna are returning to these sites. Similar projects are occurring across Southern Minnesota on both public and private lands, including those administered by the DNR Division of Wildlife. With the goal of creating more connectivity between remnant and restored sites across the landscape, the hope is to improve habitat for a variety of species, including red-headed woodpeckers, Blandings turtles and a variety of migratory songbirds. Work for this project could not have been accomplished without assistance from the Conservation Corps of Minnesota and Iowa and financial support from the Clean Water Land and Legacy Amendment. For more information on the Oak Savanna Subsection see Oak Savanna Subsection ECS.

Photo: Oak savanna restoration at Myre-Big Island State Park, Emily Peters

Priority Habitat Conservation Strategies

To implement the Habitat Goal of this Plan (Protect and enhance the resilience, function, and ability of habitats to support biodiversity, especially for SGCN), five strategies were identified:

Strategy 1. Protect, buffer, and connect high quality habitats to optimize biodiversity, SGCN, and landscape benefits, particularly across the Conservation Action Network.

Strategy 2. Restore, enhance, and maintain lands and waters to benefit SGCN, biodiversity, and ecosystem resilience.

Strategy 3. Collaborate with conservation partners and landowners to enhance conservation delivery, particularly in the Conservation Action Network and Conservation Opportunity Areas.

Strategy 4. Monitor SGCN, native plant communities, habitats, and ecosystems for changes through time including responses to natural disturbances, conservation actions, and climatic conditions.

Strategy 5. Connect to develop, innovate, incentivize, and disseminate evidence-based habitat management practices to benefit SGCN.

Examples of conservation actions are grouped below under these five strategies and tagged with icons for the stressor(s) that they address. Some of these actions are widely in place as best practices while others may be more novel. Some actions will combine multiple strategies, in which case we present it under the one it fits best. Also note that some strategies, such as Strategy 3, collaborating with partners, could truly be applied to all actions to most broadly and effectively implement them. Other actions, such as those related to monitoring, might be difficult to relate to a specific stressor, in which case they are marked as not applicable (NA).

Potential Conservation Actions for Savannas

Strategy 1. Protect, buffer, and connect high quality habitats to optimize biodiversity, SGCN, and landscape benefits, particularly across the Conservation Action Network.

Stressor	Action
	Due to their rarity on the landscape, priority should be given to protecting savannas from development.
	Encourage the application of habitat conservation funds towards the protection, restoration, and enhancement of savanna and woodlands, which are highly imperiled but because they are less extensive might not have the emphasis that prairies and forests do in some funding programs.

Strategy 2. Restore, enhance, and maintain lands and waters to benefit SGCN, biodiversity, and ecosystem resilience .

Stressor	Action
	To address fire suppression, seek to restore fire to overgrown savannas and brush-prairies, by increasing fire frequency on public lands (and potentially on private lands) and conducting prescribed fires. To address limited agency budgets and lack of capacity and trained personnel, support inter-agency groups working to restore fire and cost-shared 'strike-teams' that send fire crews across lands held by multiple land management entities. Coordinate and collaborate with indigenous people and Tribes restoring fire.
	To effectively restore sites degraded by invasive species, such as Kentucky bluegrass, smooth brome, buckthorn, honeysuckle, and multiflora rose, a combination of several conservation actions will most likely be needed (Hartman and Steele, 2015). Monitor the understory and edges of your savanna for these invasive species and take fast action to control them through prescribed fire, hand or mechanical removal, or selective/spot herbicide treatment, all of which can help the system to be as healthy and resilient as possible. The goal for conservation actions should be to reintroduce disturbance regimes that would have naturally kept woody species in check. This may include prescribed fire or grazing. However, persistent or particularly dense stands of non-native woody species may require a combination of mechanical and chemical treatments to effectively re-establish these natural disturbance regimes. Even as natural disturbance regimes are re-established, ongoing monitoring may be needed to spot treat non-desirable species. See also the Woodlands of Minnesota Landowner Handbook: Oak Savanna.

Strategy 3. Collaborate with conservation partners and landowners to enhance conservation delivery, particularly in the Conservation Action Network and Conservation Opportunity Areas.

Stressor	Action
	Enhance education for natural resource professionals on how to identify savanna remnants and appropriate management scenarios for mitigating the threat of inappropriate tree planting within savanna habitat.
	Reintroduction of elk and bison to these natural systems may be difficult due to societal reasons, but the reintroduction of domestic livestock may be more manageable and with conservation grazing practices, could help to mimic the natural grazing patterns of their native counterparts.
	Encourage managers of savannas, including in urban and suburban parks, to maintain dead trees and trees with dead branches to provide habitat for insects and cavity nesting birds

Strategy 4. Monitor SGCN, native plant communities, habitats, and ecosystems for changes through time including responses to natural disturbances, conservation actions, and climatic conditions.

Stressor	Action
	Monitor the effects of fire suppression and prescribed fire.

Strategy 5. Connect to develop, innovate, incentivize, and disseminate evidence-based habitat management practices to benefit SGCN

Stressor	Action
	Distribute and encourage the use of the following technical resources for managing high quality oak savannas: 1) the High Value Conservation Forests for Dry Barrens Oak Savanna, part of Forest Certification, which outlines, based on the condition of the site, best practices for prescribed fire, forestry, grazing, and restoration; and 2) the Woodlands of Minnesota Landowner Handbook – Oak Savanna which is more directed at private landowners.
	Increased spring and early summer rain can increase the prevalence of burr oak blight. As stressed trees are more susceptible to burr oak blight, sometimes only some trees in an area will become affected and can be removed or treated (see this handout for more information). However, if an area has a lot of burr oak blight, possibly consider other strains or types of trees may be better adapted to the changing climatic conditions (additional resources on forests and climate change can be found here.)

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