

# Cedar Bend Savanna

## Management Plan



"... the chance to find a pasque flower is a right as inalienable as free speech." - Aldo Leopold



Cedar Bend Savanna  
is owned and managed by  
Black Hawk County Conservation Board

**Supervised by:**  
Vern Fish – BHCCB Director  
Jim Weimer – BHCCB Wildlife Conservationist

Adopted by the  
Black Hawk County Conservation Board



**Prepared by:**  
Mary Cox – mkcox1@gmail.com  
BHCCB Natural Resources Intern  
&  
Ecosystem Management Graduate Student  
Professional Science Masters (PSM)  
University of Northern Iowa

## RECORD OF ANNUAL REVIEW & FIVE YEAR REVISIONS

Approved by the Black Hawk County Conservation Board on

### Annual Review

Review Year	Date completed	Reviewer(s)
2011		
2012		
2013		
2014		
2015		
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2018		
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2020		
2021		
2022		
2023		
2024		
2025		
2026		
2027		
2028		
2029		
2030		

### Five-Year Revision

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# 1 Executive Summary

Management of Cedar Bend Savanna (CBS) is one component of ongoing efforts being conducted by Black Hawk County Conservation Board (BHCCB) to fulfill Performance Goal 8 of the Iowa Department of Natural Resources' 2006 State Comprehensive Outdoor Recreation Plan (SCORP). A key goal of Performance Goal 8 is to "Protect the endemic flora & fauna and provide quality recreational experiences through an ecosystem based management plan." Compliance with SCORP qualifies BHCCB for many state and federal grants.

The principle purpose of this ecosystem based management plan is to serve as a resource for BHCCB land managers responsible for the management of CBS. Management plans set forth a vision for the site's appearance and function, and detail the activities and techniques required to achieve the vision. They are an invaluable tool for land managers because they can help the manager to focus and coordinate efforts to ensure optimal results are achieved towards the goals for the site. The information presented in this plan has been compiled through extensive review of scientific literature, assessment of restoration projects throughout the Midwest, and conversations with professionals. Beyond using the plan as a source of knowledge, proper use of a management plan involves recording work and observations, adding pertinent emerging information, and regularly updating the plan to reflect necessary mid-management modifications that are determined from sound observations. Implementing an annual review of the plan will ensure that assessment of the project is taking place to discover needs for additions or modifications.

Cedar Bend Savanna is a 55 acre degraded black and bur oak sand savanna located in the north section of the Black Hawk Park Complex in Cedar Falls, Iowa. BHCCB acquired CBS in August of 1985 (Smith 1992). Following acquisition, the rate of natural succession towards an oak woodland rapidly increased due to the removal of grazing cattle. Historical maps, aerial photos and documents, personal communications, and assessment of current vegetation give evidence in support of the idea that CBS was once an oak savanna.

Since BHCCB acquisition, many volunteer groups (Cedar Prairie Group of the Iowa Sierra Club, UNI students supervised by Dr. Smith and Dr. Jackson, and boy scouts) have focused management efforts on setting back the natural succession. As woody species encroach on the openings that contain rare remnant sand prairie/savanna herbaceous species, the canopy closes which results in the loss of these species. Succession has been set back on the remaining five percent of the land that remains open; however, carefully planned and continuous management is essential to ensure that unique species such as the pasque flower and Iowa's threatened bent vetch and clustered sedge are not lost to succession.

This management plan proposes management techniques that will be implemented over a 20 year timeline to achieve the following goals for Cedar Bend Savanna:

1. *Establish a system to carefully carry out restoration and monitor the results*
2. *Initially, halt the loss of biodiversity*
3. *Return Cedar Bend Savanna to its presettlement condition*
4. *Increase Cedar Bend Savanna's resiliency*
5. *Enhance Cedar Bend Savanna for wildlife habitat, recreational and educational use*

## **2 Site Description**

### **2.1 Location**

Cedar Bend Savanna is located in Black Hawk County about four miles north of Cedar Falls, Iowa (T90N, R14W, Section 15). It is a 55 acre section of land located within the northern part of the Black Hawk Park Complex which forms a 1,490 acre greenbelt along the Cedar River (ICCS 2010) ([Appendix 6.1.1](#)). This greenbelt provides critical habitat for wildlife and a corridor for their movement. Cedar Bend Savanna can be accessed from the north at the Washington-Union Access on West Cedar-Wapsi Road, from which you can drive one-quarter of a mile to a closed-gate. Without a key to the gate, one must hike on the Access Lane one-half mile to reach the West Entrance to CBS. There is also a South Entrance to CBS, but is out of the way when approached from the north. Cedar Bend Savanna can also be accessed from the south from the Access Lane which begins in the Black Hawk Park Complex Campground.

Mary Cox, in consultation with Greg Houseal, designated the land included as part of CBS. The sections of land were chosen because they had the highest potential for restoration, which was determined by aerial photo and field analysis. Boundaries were designated according to parcel boundaries, physical boundaries such as bodies of water and the Access Lane, and the exclusion of land that was once row-cropped.

### **2.2 Ownership**

The property consists of three parcels, which are owned and managed by Black Hawk County Conservation board. Parcel 9014-15-326-001 was acquired in 1965, parcel 9014-15-376-001 was acquired in 1985, and parcel 9014-15-301-002 was acquired in 1964 (Black Hawk County, 2010). [See Appendix](#) for a map showing these parcels. These parcels were previously privately owned and used for agricultural purposes. Cattle grazing was likely employed throughout CBS prior to BHCCB acquisition.

## 2.3 Ecosystem Background

Oak savanna communities are highly diverse with a canopy of oaks and an understory of prairie, forest, and savanna specialist species. The range of species makes oak savanna ecosystems more diverse than prairie and forest ecosystems. At the time of settlement, it is estimated that this unique community once covered an estimated 11,000,000 to 13,000,000 hectares of the Midwest (Nuzzo 1985). As of 1985 only 2,607 hectares, or 0.02 percent of the presettlement coverage, of relatively high-quality oak savanna remained (Nuzzo 1985). Some savannas were directly destroyed, but others' demise came from less obvious sources. Fire cessation and settler land use patterns resulted in the decline of Midwest oak savannas as they rapidly succeeded to forests (Nuzzo 1985). Succession to forest took place within 20 to 40 years after settlement (Curtis 1959). Fire cessation occurred as settlers took measures to prevent wildfires from destroying their homesteads. Also, fires were inadvertently stopped by roads and railroads which functioned as fire breaks.

Most scientists agree that oak savannas are a fire dependent ecosystem (Abrams, 1992). Without fire, woody species are allowed to encroach into the openings of oak savannas. This natural succession to forest results in a reduction in biodiversity, system productivity, and transforms the species composition of the understory (Brudvig and Asbjornsen 2007). Many researchers can provide evidence of this and recommend that management of the woody encroachment should be a main focus. Each savanna that is discovered is critical to protect because of the devastating loss that has taken place since settlement. The loss has been so great that intact oak savannas are now one of the rarest plant communities in the world and they are the Midwest's rarest major ecosystem (Savanna Oak Foundation, Inc. 2009; Packard 1988).

It has proven difficult to determine the extent of oak savannas in Iowa due to a lack of reliable historical records, savannas not being recognized as an ecosystem until recently, and the remaining savannas having been destroyed, degraded or succeeded to forest. One of the earliest and more thorough records of oak savannas existing in Iowa was from a study by Shimek in 1910 in which he wrote an account of "oak-openings" or "oak-barrens" occurring throughout Iowa (Shimek 1910). Specifically in northern Iowa, oak savannas likely occurred on glacial ridges and on the edges of upland forests that bordered rivers (Howe et al. 1984).

## 2.4 Historical Background

### 2.4.1 Pre-settlement

Historically, CBS and the surrounding area within the Cedar River floodplain were open

canopy woodland and savanna dominated by black and bur oak (Houseal 2006). In areas of sandy soil, grasses and sedges dominated the understory of scattered fire-tolerant trees (Houseal 2006). The open nature of this area was maintained by native ungulate browsing and grazing, as well as natural and anthropogenic fire (Houseal 2006). Natural fires were started by lightning. Anthropogenic fires were ignited by Native Americans for a variety of reasons. It is believed that Native Americans may have burned as frequent as every year (Packard 2005). The frequent fires set back the invasion of fire sensitive woody species which would otherwise create a closed canopy woodland through natural succession. Fires also stimulated vigorous growth of many native prairie species. Grazing by native ungulates such as bison, elk, and deer also aided in maintaining the open nature of this area (Houseal 2006). The grazing of these animals often targeted the young shoots of woody species that would otherwise thrive and turn the open areas into a closed canopy woodland.

Historical maps, aerial photos and documents, personal communications, and assessment of current vegetation give evidence in support of the idea that CBS was once an oak savanna. Further evidence to support that CBS was an oak savanna can be viewed today in the presence of open grown “wolf” oak trees. These trees are characterized by low, wide spreading branches that grew in open conditions where there was little competition for sunlight. As succession ensued, the wolf trees became crowded and the lower branches often died and fell off leaving behind knots on the trunk. Also, by looking at the 1930’s aerial photo ([Appendix 6.1.4](#)), one can see that the trees were more spread out than they are today. The mixture of prairie, woodland, savanna, and tree species present today are also evidence that this was once a savanna.

#### 2.4.2 Post-settlement

In the mid-1800’s, the Cedar Falls area was being settled by Euro-Americans. As they settled the land, they began to alter it through agricultural practices. They turned the soil for planting, removed trees, altered drainage, introduced exotic species, and employed grazing. Specifically in Cedar Bend, the practice of cattle grazing was the most influential Euro-American agriculture practice. Grazing was often employed on the areas that were sandier and not suitable for row-cropping, which was the case for many savannas that exist (often in a degraded state) today. This grazing likely continued to maintain the openings at CBS (Smith 1992). The 1930’s aerial photo ([Appendix 6.1.4](#)) shows the open canopy of oaks that the cattle grazing helped to maintain. However, the intense grazing over many years led to the elimination of native understory species in some areas (Houseal 2006). The elimination of native understory species reduces the competition for non-native weed species which can thrive and change the ecology of the area.

#### 2.4.3 Post-acquisition

BHCCB acquired the parcels of land that make up CBS in 1964, 1965, and 1985 (Black Hawk County, 2010). Following acquisition, the rate of natural succession towards an oak woodland rapidly increased due to the removal of grazing cattle. The 1930's, 1950's, 1960's, 1979, 1990's, 2002 and 2009 aerial photos (Appendix 6.1.4) show this drastic closure of the canopy. A rough estimate of canopy cover can be determined from these photos using GIS applications. The 1930's canopy cover was roughly 38 percent, compared to the 2002 canopy cover of roughly 95 percent (Cox 2010). The canopy cover today is likely higher due to further woody encroachment into the openings since the 2002 aerial photo that this calculation was based on. This drastic increase in canopy cover has likely resulted in a loss of biodiversity in the understory. Non-Iowa-native species of grasses, trees and shrubs have also been introduced to the area and have likely caused a decline in biodiversity as well.

The 5 percent that has remained open at CBS has been the result of various volunteer efforts to save the remaining herbaceous species that are now unique in Black Hawk County. Over the years, Dr. Smith and Dr. Jackson led students in removal of woody species from the openings (Houseal 2006). In 1990, the Cedar Prairie Group of the Iowa Sierra Club assisted in removing the woody species from the openings and its margins (Smith 1992). In 1999, Ben Yates along with his Boy Scout Group 44, parents, and Billy Witt completed removal of woody species in opening 5 and the corridor leading to opening 3 (Yates, 1999). In 2006, Justin Huisman, a student from UNI, improved equipment access to CBS by removing brush in openings 1, 2, and 3 and the corridors that now connect them. Following removal of large woody species, he followed up with a rotary mower (Huisman, 2006). This project fulfilled Justin's Capstone. . The most significant and recent clearing was coordinated by Justin Huisman to clear openings one and three with chainsaws (Houseal 2006). In October 2009, Jim Weimer of Black Hawk County Conservation Board used a brush mower on in openings 1 and 2 and the corridor between them. In April of 2010, UNI Ecosystem Management students conducted a prescribed burn in opening one and initiated some clearing of woody species with stump treatment in the NW corridor. All of these efforts have succeeded in setting back the natural succession temporarily, but carefully planned and continuous management is essential to ensure that CBS is not lost to natural succession. That is the purpose of this management plan. During the spring and summer 2010, Mary Cox continued to update this plan, increase public awareness of CBS, and perform on-site groundwork that paves the way for future restoration. This groundwork included a biological survey, photo point setup, creation of test plots, collection of data, improvements of the Access Lane, and removal of brush piles.

The area adjacent to the southwest portion of CBS was altered to create wildlife habitat according to the recommendations of that era. A sleugh was dredged south of the CBS border and a semi-circle of shrubs were planted for wildlife shelter and food.

## 2.5 Abiotic Characteristics

### 2.5.1 Geomorphic

Cedar Bend Savanna is located between an abandoned oxbow channel of the Cedar River to the east and the current location of the Cedar River to the west. This position amidst a significant waterway is reflected in its alluvial soil. Cedar Bend Savanna sits on an alluvial terrace of the Iowa Erosional Surface (Smith 1992).

According to data retrieved from the United States Department of Agriculture Natural Resources Conservation Service (2009), Cedar Bend is made up of three soil types ([Appendix 6.1.3](#)). The majority of the land (about 92 percent [Cox 2010]) is made up of Finchford loamy sand, 0 to 2 percent slopes (map unit symbol 159). This soil is excessively drained (USDA NRCS 2009). Drought-tolerant grass vegetation helped to form this soil from the coarse-textured parent material which was sandy and gravelly alluvium (Smith 1992). The northeast and northwest corners (about 2 percent) of CBS consist of Spillville-Coland, channeled-Aquolls, ponded, complex, 0 to 2 percent slopes, frequently flooded (map unit symbol 1585). This soil is very poorly drained to somewhat poorly drained. The parent material is loamy alluvium to alluvium (USDA NRCS 2009). The southwest corner (about 6 percent [Cox 2010]) of CBS consists of Spillville-Coland complex, 0 to 2 percent slopes, occasionally flooded (map unit symbol 585). This soil is poorly drained to somewhat poorly drained. The parent material is loamy alluvium (USDA NRCS 2009). These last two types of soil are not well developed, because they have not had much time to develop since the sediments have recently been deposited (Smith 1992). The vegetation for these areas, according to Fouts and Highland in 1978, was mainly mixed grass, brush and timber (Smith 1992). These sandy soil types are what classify CBS as a specific type of savanna called a sand savanna.

### 2.5.2 Hydrologic

Cedar Bend Savanna lies within the ancient floodplain of the Cedar River. Portions of the floodplain experience flooding on an annual basis, and during severe floods the entire floodplain is inundated. Evidence such as a lack of deposited litter and wood at higher elevated portions of CBS suggests that these areas may escape flooding. Analysis of more precise elevation measurements may elucidate this. Although the majority of CBS remains dry during less severe flooding, the surrounding areas flood, which makes access difficult to impossible by land. In 2010, river levels, as measured by the Cedar Falls Cedar River Gage, of a maximum of 90 feet resulted in low areas retaining water and water moving eastward across the Access Lane in line with the east-west oxbow. There was not evidence of floodwaters moving across any other portions of CBS. For planning work day purposes, it is important to know that water is knee high but fordable as long as the road north of the gate is

maintained with packed rock at 86 feet. Beyond the moving water north of the gate, CBS remains high and dry and work can be accomplished on site at a river level of 86 feet. Beyond that height, it is not advisable to attempt to get into CBS.

### 2.5.3 Active Use Areas

There are no specifically designated active use areas within CBS. It is utilized by turkey and squirrel hunters, mushroom hunters, plant enthusiasts, bird watchers, and photographers. Through signage and advertisement, BHCCB hopes to increase knowledge of CBS to gain local support for their natural areas. However, due to its unique nature, it will be important to strike a balance between increased public use and preservation of the qualities that make it unique. Retaining the gate at the northern end of the fire lane will help to strike this balance.

### 2.5.4 Cultural

An official survey has not been conducted to record any cultural artifacts. However, 1930's aerial photo ([Appendix 6.1.4](#)) show a possible lane that runs through CBS. Old cedar fence posts and barbed wire can be found along CBS' borders and some central areas.

### 2.5.5 Access

The Access Lane on the western border of CBS experiences some traffic (pedestrian, horse, snowmobile [illegally]), because it runs the length of the Black Hawk Park Complex from north to south.

CBS can be accessed by two entrances, the West and South Entrance, and three approaches, the Washington-Union Access, Cornelius Access, or the Fire Lane from Black Hawk Park Campground.

## 2.6 Biotic Characteristics

Informal surveys have been conducted over the years by people such as Dr. Daryl Smith, Bill Witt, and Dick Golz. During the spring and summer 2010, Mary Cox conducted informal biological surveys and volunteers helped her to identify the species that were documented. As of August 1<sup>st</sup>, 2010, 158 plants, 36 invertebrates, 22 birds, 9 mammals and 9 fungi species had been documented. Flora were documented at the time of their blooming or when they were first noticed following their bloom time. Fauna was documented at the time of the first visual or audial observation. Surveys such as the 2010 survey should be conducted every few years (5 years) with new additions added as observed. A comprehensive survey of CBS helps to ensure that management decisions are informed in order to not do harm to the oak savanna remnant.

### 2.6.1 Flora

Cedar Bend Savanna is degraded, but there are still unique species that have endured. An indication that CBS is of high natural quality is if its species have high coefficients of conservatism. Coefficients of conservatism (C values) were first developed by Floyd Swink, Gerould Wilhelm, and Douglas Ladd for the Chicago Region in 1979 (Swink and Wilhelm 1994). An area with a mean C value of 5 indicates that the site is of high natural quality, i.e. a remnant. C values can only be applied to the area for which they were created. Species of particular interest due to their high coefficients of conservatism are *Campanula rotundifolia* (10), *Dalea candida* (10), *Sporobolus heterolepis* (9), *Gentiana puberulenta* (9), *Amorpha canescens* (8), *Asclepias quadrifolia* (8), *Potentilla arguta* (8), *Pulsatilla patens* (8), *Viola pedatifida* (8), *Anemone cylindrica* (7), *Carex grayi* (7), *Delphinium virescens* (7), *Dichanthelium oligosanthes* (7), *Helianthemum bicknellii* (7), *Lithospermum canescens* (7), *Lonicera prolifera* (7), *Sanguinaria canadensis* (7), *Scutellaria* sp. (7, 10). [Aristida sp. 2-10](#), [Dichanthelium oligosanthes spp. 5-7](#). Hopefully after a comprehensive plant survey is conducted, more species will be discovered that will reveal the uniqueness of CBS.

Informal surveys conducted in previous years documented three plant species, Carolina anemone (*Anemone caroliniana*), tiny bluet (*Houstonia minima*), and Carolina puccoon (*Lithospermum caroliniense*), which were not found during the 2010 biological survey. Species that should be carefully monitored are bent vetch (*Astragalus distortus*) and clustered sedge (*Carex aggregata*) which are listed as species of special concern in Iowa. Also, plant enthusiasts are particularly concerned about the decline in population of CBS' "poster-child", the pasque flower (*Pulsatilla patens*), which has previously been the larger of the only two known populations in Black Hawk County.

Quick but thoughtful management action is necessary to ensure that if these species do exist they are not lost to natural succession. See [Appendix 6.2](#) for the current list of CBS flora.

### 2.6.2 Fauna

A more complete survey needs to be conducted to search, as opposed to the casual observation as was the method for the 2010 survey. The following are a few of the initial documented species: barred owl (*Stryx varia*), fox squirrel (*Sciurus niger*), wild turkey (*Meleagris gallopavo*), coyote (*Canis latrans*), white-tailed deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), and beaver (*Castor canadensis*). The brown snake (*Storeria dekayi*) is of particular interest, because although it is expected to occur in Black Hawk County, there are no official records of it being found in the county. Should a specimen be found, a picture record should be obtained and sent to the Iowa Department of Natural Resources and [www.herpNet.net](http://www.herpNet.net). See [Appendix 6.3](#) for the current list of CBS fauna.

## 2.7 Primary Management Concerns

### 2.7.1 Active Use Areas

There are no specifically designated active use areas within CBS. Therefore, management concerns apply to the whole CBS proper and should focus on achieving the following active use area concerns while performing management to address the natural areas' management concerns:

- Increasing use of Cedar Bend Savanna while retaining its secluded wilderness appeal
- Managing the site to simultaneously enhance habitat for game, diversity, mushrooms, education, and human appreciation

### 2.7.2 Cultural Artifacts

- Cultural artifacts such as old cedar fence posts and barbed wire should be left as is, but no drastic measure need to be taken to preserve them

### 2.7.3 Natural Areas

The following list of management concerns is short and broad, because a comprehensive survey should be conducted to elucidate CBS' focused management concerns. These management concerns are the most immediate:

- Loss of biodiversity
  - Woody species encroachment into the openings
  - Invasive and exotic species
  - Wolf oak tree decline

### 2.7.4 Adjacent Areas

- Access Lane
  - Maintaining the lane to enable restoration equipment to reach CBS
- Surrounding Land
  - Manage the surrounding land for invasive species
- South Planting
  - Manage the south planting for herbaceous invasive species
  - Maintain the planted barrier to prohibit the spread of the more aggressive grass species in the south planting to the remnant until the remnant has had time to develop more resiliency
    - Remove the wildlife habitat planted shrubs once the remnant is showing signs of resiliency to eliminate it as a seed source for these shrubs into the remnant

## 3 Management Plan

### 3.1 Goals

#### Short term goal

1. Establish a system to carefully carry out restoration and monitor the results
2. Initially, halt the loss of biodiversity
3. Improve Access

#### Long-term goals

3. Return Cedar Bend Savanna to its presettlement condition
4. Increase Cedar Bend Savanna's resiliency
5. Enhance Cedar Bend Savanna for wildlife habitat, recreational and educational use

### 3.2 Objectives

#### Short term goal

1. Establish a system to carefully carry out restoration and monitor the results
  - A. Test plots
    - (1). Wolf oak tree release under within a deciduous canopy that was previously open as of 1975 and later
    - (2). Wolf oak tree release under within a coniferous canopy that was previously open as of 1975 and later
    - (3). Wolf oak tree release under within a coniferous canopy that was previously open as of 1937-1975
    - (4). Wolf oak tree release under within a coniferous canopy that was previously open as of 1937-1975
    - (5). Opening the canopy across areas that represent succession since last being open as of the 1930's, 1960's, 1979, 1990's, 2002 and beyond located in the southwest
    - (6). Duplicate of #5, but in the northeast
    - (7). Burn pile that experienced 5 hours of burning
    - (8). Burn pile that experience 2 hours of burning
    - (9). All permanent burn piles that have experienced recurrent and intense periods of burning
  - B. Photo monitoring

Carry out a round of photo monitoring three times throughout the growing season

Types:

    - (1). Openings
    - (2). Test plots
    - (3). Areas of interest

- C. Permanent burn piles
- D. Biological survey
  - (1). Regularly add new observations to the survey
  - (2). Repeat the 2010 survey methods for comparison
- 2. Halt the loss of biodiversity
  - A. Halt woody species encroachment into the openings
    - 1) Cut and treat woody species that are encroaching on the openings
    - 2) Initiate a regular prescribed burn schedule in the openings
- 3. Improve Access
  - A. Daylight the Access Lane
  - B. Create a solid and resilient base on the Access Lane
  - C. Consider a larger culvert and raised road/bridge north of the gate

Long-term goals

- 4. Return Cedar Bend Savanna to its presettlement condition
  - A. Oaks are the dominant canopy species
    - 1) Free wolf oak trees by cutting and treating (or girdling to reduce cost and time) non-oaks
  - B. Canopy cover is between 10 and 50 percent
    - 1) Remove trees, but retain various ages of oaks to create a 10 to 50 percent canopy cover
  - C. Tree, shrub, prairie, forest, and savanna specialist species are included
    - 1) Initiate prescribed burning and mowing to enhance these species
    - 2) Spread seed collected on site in areas recently disturbed
    - 3) Spread seed of species that are locally rare
  - D. Remove non-native species and species that are not considered to be part of the savanna
    - 1) Cut and treat woody species that are encroaching on the openings & spot spray and mow herbaceous non-native species in the openings
    - 2) Cut and treat woody species that are encroaching on the woody areas & spot spray and mow herbaceous non-native species in the woody areas
  - E. Initiate regular prescribed burns that mimic wildfires of Cedar Bend Savanna's past
    - 1) Vary timing and frequency for burn zones
- 5. Increase Cedar Bend Savanna's resiliency
  - A. Increase biodiversity
    - Tree, shrub, prairie, forest, and savanna specialist species are included

- 1) Initiate prescribed burning and mowing to enhance these species
  - 2) Spread seed collected on site in areas recently disturbed
  - 3) Spread seed of species that are locally rare
- B. Create a heterogenous landscape
- 1) Maintain canopy cover of various percentages between 10 and 50 percent throughout the site, using aerial photos as a guide for target areas
6. Enhance Cedar Bend Savanna's opportunities for wildlife habitat, recreational and educational use
- A. Ensure that Cedar Bend Savanna remains a refuge for wildlife
- 1) Maintain diverse, high-quality habitat through management
  - 2) Maintain restricted access to the public with the gate
- B. Increase biodiversity
- Tree, shrub, prairie, forest, and savanna specialist species are included
- 1) Initiate prescribed burning and mowing to enhance these species
  - 2) Spread seed collected on site in areas recently disturbed
  - 3) Spread seed of species that are locally rare
- C. Remove non-native species and species that are not considered to be part of the savanna and that create thickets or difficult areas to traverse
- 1) Cut and treat woody species that are encroaching on the openings
  - 2) Spot spray and mow herbaceous non-native species in the openings
  - 3) Cut and treat non-native trees and shrubs in the wooded areas
  - 4) Spot spray and mow herbaceous non-native species in the wooded areas
- D. Increase knowledge of Cedar Bend Savanna
- 1) Post a sign at the West Cedar-Wapsi Road Washington-Union Access entrance that notes its existence. Simply display "Cedar Bend Savanna"
  - 2) Maintain the "Restoration in Progress" posters at the gate, South and West Entrance

### 3.3 Reference Ecosystem

In order to restore CBS to its presettlement condition, it helps to have a reference site upon which to model the desired structure, composition, and function of the restoration site. A reference site also serves in the evaluation of the restoration. A useful reference site will already have a lot of site information available. However, a trip to the site may be required to gather the information needed. Helpful information would include species lists, vegetation structure, past land uses or management, soils, topography, etc. The reference site would also have many similar abiotic features to the restoration site, such as topography and soils. It should be of high quality with minimal human-caused disturbances that the manager could

recognize and exclude from the restoration plan. Finally, the reference site should be in close proximity to the restoration site.

Finding a good reference site for any ecosystem in Iowa is difficult, because many ecosystems were destroyed long ago before scientific studies were conducted. The few communities that do remain have been impacted in some way by humans. Of all of Iowa's ecosystems, the oak savanna reference sites are probably the rarest.

In a 1984 unpublished Iowa Natural Areas Inventory, Schennum only recognized three possible remnants in all of Iowa (Nuzzo 1986) (Appendix 6.1.1). They occur in Black Hawk, Clay, and Cedar counties. The Black Hawk county oak savanna is possibly CBS, but this has not been confirmed. The Clay County oak savanna remnant is a 35 acre high quality site known as Bertram Reserve (Pearson 2009). The second Schennum oak savanna remnant is in Cedar County. It is a 9.8 acre site known as the Rochester Cemetery (Pearson 2009).

John Pearson (2009), a botanist working for the Iowa Department of Natural Resources, provided seven additional oak savanna remnants that are being restored in Iowa (Appendix 6.1.1). Since they are being restored, there is likely a wealth of information to learn from their efforts despite the distance and at times dissimilar characteristics. These savannas are: Karl DeLong's savanna in Poweshiek County, Neal Smith National Wildlife Refuge bur oak savanna in Jasper County, Grinnell College's CERA (Conard Environmental Research Area) in Jasper County, Yellow Banks County Park in Polk County, Indian Creek Nature Center in Linn County, Swamp White Oak Preserve in Muscatine County, and Brown's Timberhill in Decatur County (Pearson 2009).

Mary Duritsa (1983) conducted a natural areas survey of Black Hawk County and noted sixteen savannas, of which five were sand savannas. However, Duritsa did not classify CBS as a savanna in her report, but classified it as a sparsely covered woodland of a "C" rating. The five sand savannas of Black Hawk County are or were located in Lester and Spring Creek/Big Creek townships, which are east and south east of Cedar Bend respectively (Appendix 6.1.1). Due to their proximity, it would be worth a trip to determine if they still exist.

Another option for reference sites is to use historical records from other states as models for planning the restoration. Curtis (1959) compiled information about Wisconsin oak savannas. The most relevant information would be in the "oak barren" category. Curtis would consider Cedar Bend to be an oak barren. Curtis' oak barren characteristics included having sandy soil, usually associated with alluvial river valleys, and dominated by black or northern pin oak. The benefit of using this resource is that there is a lot of information that has already been gathered and analyzed for various Wisconsin oak savanna sites (Appendix 6.4).

Although none of these sites fit all of the criteria for a good reference site, there is knowledge to be gained from them by compiling and analyzing the characteristics to make management decisions for CBS. This knowledge could be gained from a trip to the site or by contacting the managers. If nothing else, the sites could serve as a source of seed if they are not too far away. A beneficial supplement to this composite reference would be Delong's list of oak savanna species which potentially occurred in Iowa. Delong (1996) compiled a list of 252 oak savanna species, with an additional 35 listed as sand oak savanna species (Appendix 6.4).

## 3.4 Description of Tasks

### 3.4.1 Surveying

**Update** Prior to initiating significant management efforts, a comprehensive biotic survey must be conducted to record the species present at CBS. By knowing the species, managers can make informed management decisions that will benefit the greatest number of species and avoid doing harm to species that are currently unknown. Surveying will also give managers further insight into CBS' particular management concerns. The initial conditions gathered from the survey will provide a baseline for comparison with the conditions following management activities. Photo monitoring points should also be established at this time to help monitor the progress of the restoration. Although it is critical to initiate management quickly in order to halt the loss of CBS' diversity, a survey is an essential first step to avoid management mistakes and to determine if goals and objectives are being met.

A comprehensive biological survey needs to be conducted for CBS in order to facilitate sound management decisions. The survey method will be determined during the summer of 2010 and this plan will need to be updated. Casual surveys of the past have created the current biological species lists for CBS.

### 3.4.2 Test Plots

Due to CBS' unique nature and remnant status, it is critical that measures are taken to ensure that management efforts do not unknowingly do harm. The conditions to be observed over the years is the regrowth following:

### 3.4.3 Photo Monitoring

Photo monitoring will be employed for many of these test plots and should have photos taken annually (three times per growing season at best). These test plots would also be good areas to perform strategic plant surveys. Details for these surveys will be determined and added to the plan during summer 2010.

### 3.4.4 Management

To attain the ultimate goal for CBS, to return it to its presettlement condition, the following objectives should guide management efforts:

1. The canopy should be dominated by oaks with a canopy cover of 10 to 50 percent (Curtis 1959).
2. The understory should be very diverse with a variety of tree, shrub, prairie, forest, and savanna specialist species.
3. Fire should be re-introduced through regular prescribed burns to mimic the natural wildfires that were once a part of the savanna.

Initial restoration can be estimated to take about 100-110 hours per acre (Savanna Oak Foundation, Inc. 2009), but with the help of volunteers the amount of paid staff time can dramatically be reduced. Although oak savanna restoration is time-consuming and expensive, the cost of long-term management will be one-fifth to one-tenth of the restoration costs (Savanna Oak Foundation, Inc. 2009).

The wooded areas and openings ([Appendix 6.1.5](#)) will require different management approaches according to the species present and the likelihood of native and invasive species that will appear as management activities increase the sunlight that reaches the savanna floor.

All work performed at CBS, must immediately be recorded in the work record ([Appendix 6.7](#)) of the management plan at BHCCB headquarters to ensure that accurate records are kept for future reference.

[Appendix 6.8](#) contains reference information for management activities. Items included in [Appendix 6.8](#) are: potential flora list, invasive species control measures, management methods/technique details.

#### 3.4.4.1 Restoration

*\*This section needs better organization itself and in combination with reconstruction and maintenance sections*

##### 3.4.4.1.1 Openings

The first priority for restoration/management at CBS is the openings (including the corridors that connect them), because they will likely have the highest diversity of holdover herbaceous species of the former savanna since they have experienced the shortest period under successional cover. The main management concern of the openings is the woody encroachment from the surrounding wooded areas (Brudvig and Asbjornsen 2007). The “canopy” of the openings consists mostly of shrubs or young trees. Any woody

species, including *Rubus* sp., should be cut and treated. The exception would be any remaining wolf trees. The “1930’s Cover” on the figure 9 map can aid in narrowing down the locations of possible wolf trees. After removal of the woody species, a burn should be conducted as soon as there is sufficient fuel to carry a fire (Packard and Mutel 2005). Areas where there was dense woody species should be interseeded with grasses immediately after the burn (Packard and Mutel 2005). Grasses are best, because they are strong competitors against woody encroachment and provide fuel to intensify fires to further help control woody encroachment (Packard and Mutel 2005). Secondly, interseeding could be employed to increase diversity. Conservative species should be included in the seed mix and seed should be matched to the light conditions (see [Appendix 6.6 for a list of conservative species and light conditions for different species](#)). Brudvig and Mabry found that dispersal-limited species, often conservative species, especially forbs, need to be introduced to the site (Brudvig 2008). Weedy and areas of inadequate light should be avoided in order to not waste the hard-to-find and expensive conservative species. Seeding is best done in the fall or early spring to allow the seeds to naturally stratify (Packard and Mutel 2005). The fall is preferable, but it is recommended to wait until most of the sparrows have migrated through (Packard and Mutel 2005). Interseeding should follow directly after a burn to ensure contact with soil. Raking in the seed will greatly increase the success of the seeding (Packard and Mutel 2005). Depending on the density of vegetation (more dense means more frequent mowing), for the following one to three years the interseeded areas that reach a height of 12-18 inches should be mowed to 4-6 inches (Packard and Mutel 2005). Supplemental interseeding may be needed for two or more years (Packard and Mutel 2005).

For the overall openings, burns should be conducted for the first, second, and third year as long as there is sufficient fuel (Packard and Mutel 2005). Late March or early April will benefit the openings the best, because the burn will take place before many of the early bloomers bloom, which could damage them (Packard and Mutel 2005). Pasque flower, one of the earliest bloomers, is known to bloom after a fire (Packard and Mutel 2005). Burning at this time will also favor the warm-season grasses which will provide more fuel in the future. The annual burning should control any cool-season grass and woody species problems (Packard and Mutel 2005). In the following years, there should be regular monitoring and record keeping of the herbaceous layer’s response to increased sunlight and fire. Monitoring of herbaceous species composition and structure will determine if there is a need for management of non-natives with spot-mowing, spraying, or additional interseeding. From the three year mark, the focus should turn to maintenance burns every one to three years depending on the leaf litter accumulation (Oak Savannas, Inc. 2009). The season and timing of the burns should be alternated in order to avoid selection of certain species. If conditions allow, fall fires in November and

December are desirable after the oak leaves have fallen and the plants have senesced (Packard and Mutel 2005). Burns should also be conducted in a manner that leaves refuges for invertebrates, which means all of the openings should not be burned at once (Packard and Mutel 2005).

A second priority for management is to expand the openings. [See Appendix 6.1.5 for a map that indicates the areas of high priority to start the expansion.](#) These areas are of high priority, because according to the 1998 aerial photo, those areas were open. Therefore, they are most likely to have holdover species. Test areas should be cut early in the management process to observe the response of the herbaceous layer for two growing seasons (Packard and Mutel 2005). These test plots will help to determine if interseeding would be appropriate or not. After the woody species have been removed from these test plots, these areas should be managed along with the original openings. If it is determined that interseeding is not appropriate due to a lack of shrub or non-native invasion, then continue expanding the remaining areas of high priority. However, it is likely that interseeding will be appropriate. If this is true, then follow the above directions for interseeding and management. Efforts should be made to separately manage these newly opened areas with a similar burn schedule as described above since they will lag behind the schedule of the original openings.

#### 3.4.4.1.2 Wooded Areas

The first restoration priority (secondary to the first priority of the openings) of the wooded areas is to start opening the wooded areas to their historic canopy cover. For many years, the wooded areas have been under a closed-canopy. Much of these wooded areas were once part of an open canopy of about 37.6 percent in the 1930's, which is presumed to resemble the presettlement canopy cover. As of 2009, the canopy had closed to the point of 95 percent cover, and is likely higher today (Cox 2010). In order to halt the choking out of the wolf oak trees and achieve the ultimate goal of attaining the presettlement canopy cover, many trees (including adult oaks) will need to be removed. Removal of trees should be done thoughtfully and use the map of wolf oak trees and successive generation trees as a guide ([Appendix 6.1.5](#)). The resulting increase in light to the savanna floor may allow holdover species an opportunity to reestablish themselves. However, as time increases, research has shown that holdover plant reestablishment is less likely. In 1964, Vogl observed a rapid herbaceous layer response after opening the canopy, but believed that this response would be reduced with increasing time. Holtz and Howell observed successful Savanna restorations even into the early 1980's. However, by 1999, Nielsen and colleagues were not observing the same degree of response as the previous research (Nielsen et al. 2003). Therefore, the wooded areas will likely require different management from the openings since there may not be a significant, or any,

native herbaceous layer response. Early in the management process, test areas should be cut. The herbaceous layer response should be monitored for two growing seasons. Management at the test plots should include burning only (if there is sufficient fuel), mowing only, and no management. The opening of the rest of the wooded areas to presettlement canopy cover depends on the results from these test plots. It is likely that there will not be native holdover plants. Instead, without natives to start filling in the opened area, shrubby species such as *Rubus* sp. will quickly invade and become a management headache. Therefore, the process should be to remove the trees and burn if there is sufficient fuel (Packard and Mutel 2005). Then, just prior to a rainstorm the area should be broadcasted with a seed mix appropriate for the light level (Packard and Mutel 2005). Management following seeding should follow the directions given above. Since the wooded area is quite large (12.37 acres), it will be necessary to open the woods in stages. First priority should focus on day-lighting or releasing the wolf oak trees. Instead of cutting down and removing the trees, leave a few dead trees for habitat by girdling. After the natives have been established, management should adopt a one to three year burn interval; as frequent as fuel allows (Packard and Mutel 2005). Steps should be taken to encourage hot intense fires (scorch height >1m) in order to reduce the canopy cover (Haney et al. 2008). Cooler low-intensity fires at a burn interval of three per decade were found to not reduce the canopy cover (Haney et al. 2008). It is likely that fire and native plant competition will not be sufficient to keep the woody species at bay. Nielsen et al. (2003) found that fire alone is not sufficient to establish presettlement canopy cover. Therefore, winter cutting and treating of these species will be necessary. Throughout the time following tree removal, the sites should be monitored and recorded for areas in need of spot-treatment, spot-mowing, or seeding. Once the desired canopy cover is attained, burn intervals should assume a stable fire interval. Haney et al. (2008) found that low-intensity fires at three per decade are sufficient at maintaining the canopy cover results of the high-intensity fire. However, Haney et al. (2008) also found that the herbaceous layer benefitted most from one or two year burn intervals. Ideally, burn intervals should be one year. However, if this is not possible, the Savanna Oak Foundation, Inc. (2009) emphasizes that burn intervals should be no longer than three years.

South opening to the slew

A timeline of all of these activities is provided in Appendix 6.5.

#### 3.4.4.1.3 Buffer

Crown vetch?

Elm?

#### 3.4.4.2 Reconstruction

At CBS, deciding to perform reconstruction activities will need to be very carefully considered due to the remnant status. Reconstruction often involves removing (often with a blanket spray of herbicide) all vegetation and reseeding the area.

The only area that should be managed as a reconstruction site is the area directly adjacent to CBS' south border. According to aerial photos, this area was a crop field prior to being planted as "wildlife habitat." The species that were planted (e.g. red cedars, honeysuckle, autumn olive, etc.) have and will cause management problems as their seeds are dispersed by fauna. By removing this section, it will also open the area up so that fires can continuously be carried between CBS and the prairie planting to the south. The woody species should be cut and treated and the herbaceous layer should be removed with an herbicide. Immediately following the removal of vegetation the site should be burned (if possible) and seeded with seed collected from CBS. This area should be carefully monitored for woody resprouts and herbaceous invasives for many years following the original removal. Reconstruction of this area should not be performed until management practices (i.e. prescribed fire and mowing) have strengthened the remnant's resiliency, because the southern planting was planted with seed that originated outside of Iowa.

Additional reconstruction sites may be required. However, sufficient analysis of the test plot results must be obtained first to determine if native species will rebound after the tree canopy has been removed.

#### 3.4.4.3 Maintenance \*This section needs work: Burn & mowing regime, spot woody encroachment control, spot invasive species control, interseeding, etc.

#### 3.4.5 Monitoring

Continuous monitoring will be critical during and following the initial restoration process. Photo monitoring should be set up prior to major restoration work so that a baseline for comparison can be established. Following restoration activities, new photos can be taken and compared to the initial baseline photos. Monitoring during restoration also provides the opportunity to make in-project corrections; such as altering management strategies or focusing energy on specific areas. Finally, regular photo monitoring will provide easily identifiable evidence to the BHCCB that the restoration goals and objectives are being met.

Permanent photo monitoring points will have been established by the end of summer 2010. These photo points are stakes with decimeters painted on them for scale. Pictures should be taken towards the stakes from all four cardinal directions. Photo data will be placed in the picture on top of the stake to ensure that this information does not become lost. Ideally, photo monitoring should be done three times during the growing season: May, July

and September. These three time periods will catch the majority of changes throughout the growing season. All photos should immediately be added to [Appendix 6.6](#) of the BHCCB three-ring binder copy of the management plan at BHCCB headquarters and uploaded to the CBS photo monitoring digital file. All information for the photo monitoring should also be immediately added to the record sheet in [Appendix 6.6](#) of the BHCCB management plan copy. For more detailed photo monitoring instructions and a map of photo point locations see [Appendix 6.6](#).

### 3.4.6 Additional Suggestions/Considerations

#### 3.4.6.1 Poison Ivy

Cedar Bend has a lot of poison ivy, whose urushiol oil can cause irritation. During fires, special attention should be given to the location and density of poison ivy. Inhaling the smoke from poison ivy can cause serious complications in the lungs, possibly even death. When possible, burns should take place in early spring to take advantage of less actively growing poison ivy. Personnel should consider not burning areas with dense stands of poison ivy. Otherwise, personnel should avoid inhaling smoke and wear a mask or bandana over their mouth and nose. Less serious than inhaling poison ivy smoke is the oil getting on the skin, which causes an itchy rash. Personnel should be aware of this and always wear pants. Care should be taken when removing clothes and shoes to avoid handling “contaminated” parts. Wash “contaminated” clothing separate from other clothes (with bleach and twice if possible). Alcohol on a rag can help remove the oils from shoes. Mowing regularly can help to reduce poison ivy abundance.

#### 3.4.6.2 Grazing \*Need better scientific literature resources

Grazing played an important role in maintaining pre-settlement savannas. It may be appropriate to consider some type of grazing for CBS. Not only can it provide a more “realistic” alternative to mowing, it can also cut down on long term costs, provide research on using grazers for restoration, and attract the public to the site (Whiterock Conservancy).

Adding grazers is a relatively new concept for use in savanna restoration, but research has shown that rotational grazing can be beneficial for a recovering ecosystem by reducing the occurrence of brushy invasives (Corrigan). A variety of grazers can be used including cattle, sheep, goats, or horses. Sources of grazers could be a local farmer allowed to graze for free in the designated area. This would reduce cost and liabilities for BHCCB and reduce maintenance commitments to the site. BHCCB could also consider purchasing its own grazers. These grazers could also be an additional source of income if sold for meat following the grazing season.

Initial fencing should contain the animal in an area which the effects of their grazing could be monitored, but not cause severe degradation to unique species. \*This option deserves further research.

#### 3.4.6.3 Signage

Currently there are no signs to inform the public about CBS; its blessing and its curse. At the very least, CBS should be represented on BHCCB's website. Should physical signage be an option, there are at least three locations that would be appropriate. A "Cedar Bend Savanna" sign hung below the Washington-Union Access Sign would peak visitor's interest. Another sign at the gate at the head of the Fire Lane could indicate directions for how to walk to CBS. Finally, an interpretive sign, or at least an arrow pointing the direction into CBS could be placed at the cleared lane into CBS adjacent to the north end of the planted prairie to the west. Due to CBS' remote location and lack of maintained walking trails, it would be helpful to provide maps in a simple dispenser. These maps could also contain some natural interpretation to encourage discovery and support of CBS. A visitor log book might also be appropriate at this location.

#### 3.4.6.4 Access

Improve access

## 4 Acknowledgements

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## 6 Appendix

### 6.1 Maps

#### 6.1.1 Location

#### 6.1.2 GLO survey

#### 6.1.3 Soils

#### 6.1.4 Aerial Photographs

#### 6.1.5 Management

#### 6.1.6 Additional

### 6.2 Flora Survey

### 6.3 Fauna Survey

### 6.4 Reference Ecosystem

### 6.5 Task Timeline

### 6.6 Monitoring Record

### 6.7 Work Record

### 6.8 Additional

#### **“Prescribed burning” (Oak Savanna Foundation, Inc. 2009)**

With fall burns snow melt is not an issue, although if the burn is not done early enough in the season, it may be prevented by an early snowfall. However, for savanna burns one has to wait for the leaves to fall, and for the vegetation to senesce. Spring burns may be delayed in a heavy snow year, but at least all of the fuel has been well cured.

#### *Herbicide and seed*

Select a five acre site with nice open-grown oaks. Spray the whole site with glyphosate in late spring/early summer. Wait a few weeks and burn off the dead thatch. Wait a few more weeks for regrowth of the undesirable vegetation and spray again. Spray a third time in the early to mid fall. Plant the site with a mix of savanna species in late November/early December. Control undesirable weeds the following summer by hand weeding or spraying. Continue to control weeds for the next several years. Monitor several times a year for presence of desirable species.

#### *Brush Removal & Burning*

Even if the manager feels confident in the work, it may still be preferable to clear only about 10-15 acres of savanna the first winter. hazel (*Corylis americana*), gray dogwood (*Cornus racemosa*), prickly ash (*Xanthoxylum americanum*) and two species of sumac (*Rhus glabra* and *R. hirta*). Hazel is attractive and forms nuts which are favorite wildlife food. Gray dogwood is attractive and beneficial to wildlife, but is quite invasive, and left unchecked will form large clones. Prickly ash is also clonal but less attractive, and a menace when walking in an open savanna. The two sumac species are

also very invasive and should be removed. The cut stems of all shrubs should be treated with herbicide without fail. The herbicide of choice is triclopyr (Garlon 4) dissolved in oil and sprayed not only on the cut stem but down the sides of the stem (as a basal bark treatment). Glyphosate is effective on honeysuckle and gray dogwood but is not recommended for buckthorn or sumac. For that reason, triclopyr is the herbicide of choice because it is effective against all woody shrubs. There is always a seed bank of *Rubus* species, which are held back when the site was shady, but dense seed bank and the increased sunlight after opening it up provides ideal conditions for bramble growth. bramble control is to cut the plants in mid-summer, at flowering time. At this time of year, most of the nutrients are in the stems, and if these are severed the roots will be starved. does not completely eliminate the brambles. requires frequent, preferably annual, burning as well as reseeding with herbaceous savanna species, since competition from other plants is an important factor in keeping brambles from becoming reestablished.

A large pile should be at least 10 feet (preferably farther) from any desirable trees. brush piles should be no more than 10 feet high. Build brush piles into compact structures. A newly created brush pile will not burn well. Wait at least six months before burning it. If it must be burned right away, then do not make a brush pile but burn the wood as it is being cut, using drip-torch fuel to ignite the pile. It is preferable to burn brush piles early in the winter than to wait for possible snow (which may not come). Light snow cover. The best time to burn is on a day with a light misting rain. Create a limited number of well-constructed brush piles

- Construct them well inside burn units.
- Construct them well away from trees.
- If possible, burn all brush piles separately from the prescribed burn.
- Protect living trees from burning brush piles

#### *Understory*

Understory restoration should proceed in parallel with clearing the trees and brush. . It is important to get the understory started right after clearing, before invasive shrubs or brambles from the seed bank start to flourish. There should be a good layer of oak leaves on the ground to serve as fuel and the restored area should be burned the same year it is cleared. Burning will open up the bare ground so that seeds of understory plants can germinate and grow. Planting should be carried out immediately after burning. Do not wait to plant for understory restoration, as it is essential to get “good” plants started before the brambles start to take over (which they surely will).

Post removal: begin annual burning followed by handplanting with a good mix of savanna understory species. Burning followed by seeding must be repeated for yearly. Since fall planting is usually best, burn in the fall and then plant.

- A prairie seed mix for the completely open areas of the savanna
- An open savanna mix for the areas with partial shade. Here the canopy might range from 20 to 60%.
- A closed savanna mix for those areas with more dense canopy, grading into woodland.