SECTION IV

Natural Resources

Introduction

This report describes current environmental conditions at Bend in the River Regional Park and identifies high priority natural resources in the park. The Park, located near Rice in Benton County, Minnesota, is situated on a terrace composed of glacial outwash (predominantly sands) deposited several thousand years ago by the glacial-era Mississippi River (Figure 1). From that time to the present, climatic conditions and the area's sandy soils and excessive drainage created conditions that were prone to the ignition and spread of wildfire. As a result, the natural plant communities of the Park and its surroundings consist of native plant species that could tolerate drought and fire. Plant species that were less tolerant of fire grew on steep slopes, in river bottomlands, and at places where wetlands, lakes and streams created fire breaks.

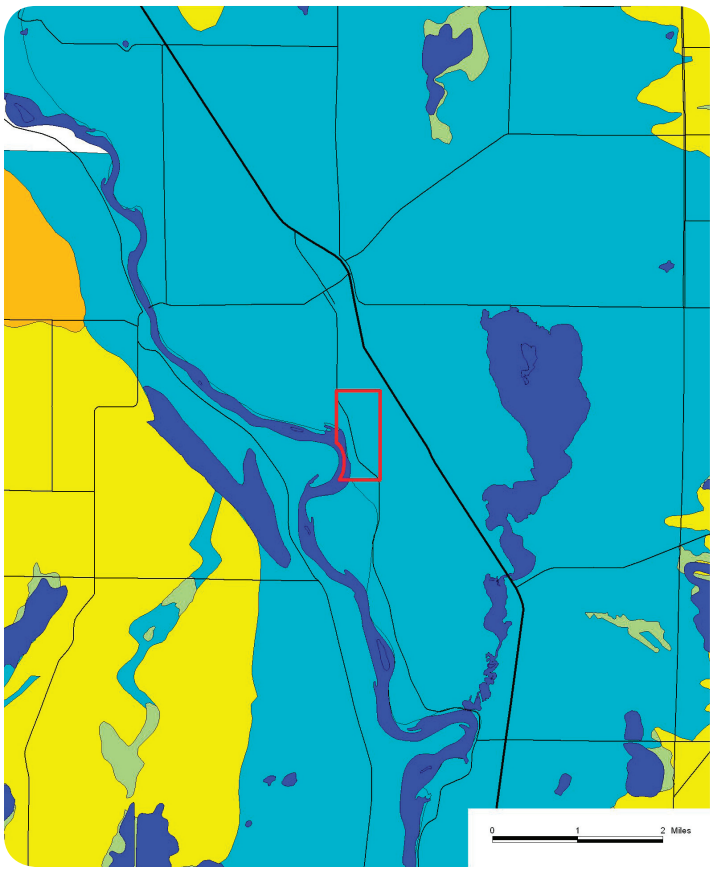
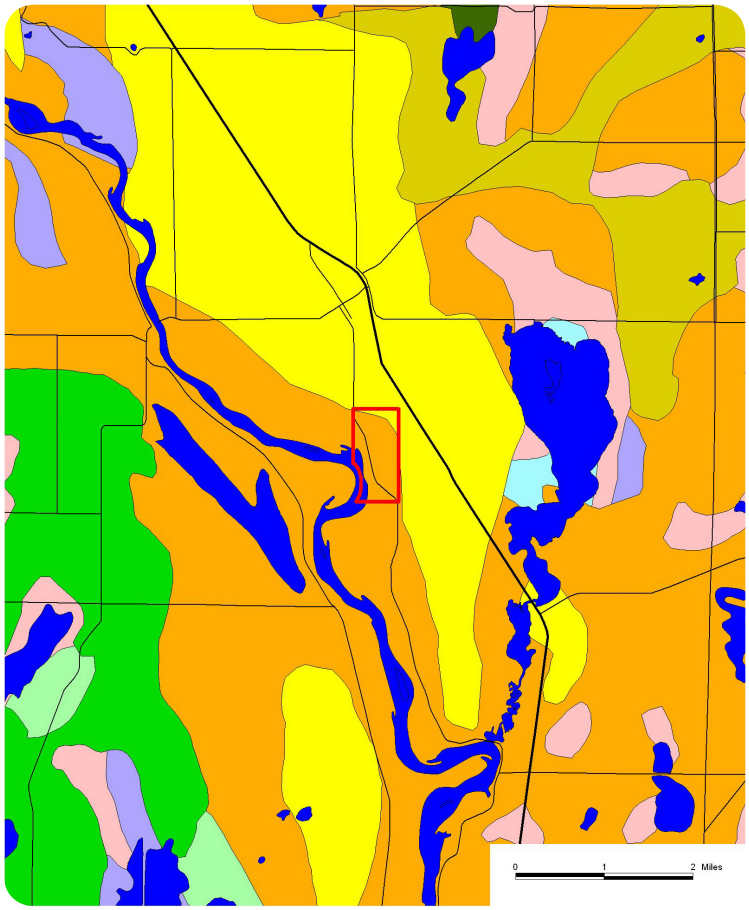


Figure 1. Geological setting of Bend in the River Regional Park (outlined in red). The glacial Mississippi River deposited the immense sandy outwash plain (blue) where the park is located. Till plains (yellow and orange) laid down by the retreating glacier form the edges of the outwash plain. The edges of the outwash plain are 4-5 miles east of the park and 2 miles west of it.

A Red River ox-cart trail that is believed to have traversed what would become the Park, would have provided traders with a first glimpse of the land in the 1840's. In 1851 the Point Douglas-Fort Ripley Military Road was constructed, giving settlers access to the region. In the 1850's, oak savanna would

have occurred along the road and the river bluffs, and dry prairie would have been at the east edge of the Park (Figure 2). Settlers used the terms "oak openings" and "barrens" to describe this type of vegetation where, because of varying light conditions, plants of open prairies mingled with those of closed forests.



Historically, oak savanna and prairie were dominant features of the Mississippi outwash plain. Natural fire breaks such as rivers, lakes, wetlands, and steep slopes slowed the spread of wildfires, and oak savanna or dense forest developed at these locations. Fires were more intense on the most level terrain, preventing trees from becoming established and resulting in development of open prairie at these locations.

Figure 2. Historical vegetation of Bend in the River Park and surroundings circa 1850. The river reduced the intensity of fires, promoting the development of savanna (orange). To the east fire intensity was presumably more intense, allowing prairie (yellow) to persist.

Historically, floodplain forest, marsh, and wet meadows occupied the Mississippi River bottomlands below the bluffs, and these communities persist today. The bluffs represent a transition zone between the fire-prone river terrace and the fire-protected river bottoms. Consequently, this was the only location where basswood (*Tilia americana*) and other trees of the rich "Minnesota Big Woods" were found.

After settlement, the prairie and oak savanna were largely converted to cropland and hay meadows. Lands that were not cleared for cropland became livestock pastures. Settlement also reduced the number of wildfires, and lands that were not pastured quickly developed an understory of young trees that increased in size and density over time, creating forest cover. However, because the region's historical vegetation was mostly savanna and prairie, the rich groundcover characteristic of maple-basswood forests is not present. Instead, forest succession has reduced the abundance and diversity of sun-requiring native plants that grew in the savannas prior to 1850.

To reduce wind erosion of topsoil in the early to mid-20th century, farmers planted windbreaks at close intervals throughout the Park. Initially floodplain forest trees – cottonwood (*Populus deltoides*), black willow (*Salix nigra*), American elm (*Ulmus americana*), green ash (*Fraxinus pensylvanica*),

and hackberry (*Celtis occidentalis*) – were taken from the Mississippi bottomlands to plant the windbreaks. Later, Scotch pine, red pine, white pine, and white spruce became widely available and were used in windbreak plantings.

In the 1920's or 1930's farmers dug three parallel ditches in the floodplain below the bluffs. The ditches ran north-south. These ditches were connected by culverts and broken up by east-west dikes. The purpose of this ditch-dike system was to prevent floodwaters from eroding the east bank of the Mississippi river. This was the outside bank of the big "bend in the river" and subject to the full force of floodwaters. The ditches and dikes are visible today.

Natural Resource Inventory

Bend in the River Regional Park represents a typical midwestern agricultural property that has been acquired for recreational and preservation purposes. While conditions are dramatically different than they were in 1851 when the Military Road was constructed, there still remain significant natural resource values that can be preserved and enhanced through ecological restoration and management.

The Park is 289 acres, including 54 acres along the river acquired with a Natural and Scenic Area Grant. The remainder of the Park was acquired in part with a DNR Regional Park Grant. The northwest portion of the Park adjoins Michaelson Wildlife Management Area, and west across the river is Stearns County Mississippi River Park. U.S. Highway 10 is visible and audible from the east portions of the park.

East of County Road 55, cropland continues to be used for income, as it has for over 100 years. The farmers allowed less productive or inconvenient locations to go fallow, or they purposely planted them with smooth brome (*Bromus inermis*), timothy (*Phleum pratense*) and other Eurasian forage grasses. Wind breaks, straight field edges, old fencing and barbed wire, are signs of past farming activity. The use of non-native plants for specific purposes including hay, wind breaks, and hedges, has introduced species which require control so that the recreational and preservation uses of the Park can be implemented. Lands that were not cultivated or hayed were put into livestock production. This included the savanna areas along the river bluffs. The steep slope above the river and the river bottom itself were difficult to use, except for harvesting wood. Building materials, fencing, and fuel wood were harvested from the wooded portions of the property; however, the settlers valued shade and as a result did not remove the large bur oak trees (*Quercus macrocarpa*) still standing today.

The upland soils of the Park are predominantly Hubbard loamy sand, a very deep sandy soil derived from glacial outwash. It is excessively drained and the water table is 6 feet deep or more. Despite that, the organic content is moderate due to thousands of years of grass growth. The abundant deep grass roots added organic material to the soil when they died. With adequate moisture, this soil produces good crops. The bottomland soils of the Park are predominantly the Fordhum-Winterfield complex, a floodplain soil that is composed of mixed materials.

Slopes are gentle throughout the majority of the Park. Slopes along the river are greater than 18% and therefore not suitable for building, and difficult to traverse with a road or trail without significant earth-moving. The bottomlands flood periodically, especially in spring, but by mid-summer are typically dry enough to walk through.

AES completed a field survey of Bend in the River Regional Park on August 18, 2005. At the time of the survey, the vegetation showed no sign of drought. It rained periodically during the survey. Prior to the field visit, AES obtained a 2002 color aerial photograph of the Park and mapped the ecological cover types. Ecological cover types were confirmed in the field. Lists of plant species

were compiled and representative photos taken for each ecological cover type. Additionally, signs of wildlife were recorded and all birds seen or heard were noted. The mapped cover types are shown on Figure 3 *(Page IV.7)* This map of ecological cover types will guide future preservation, restoration, and management work. The ecological cover types identified at the Park are outlined and described below:

Developed/residential – This includes the Grave's homestead, outbuildings, and mowed lawns.

Cropland – Under cultivation for over 100 years, the cropland was originally prairie and, west of Highway 55, oak savanna. Soybeans and corn are planted in rotation, with soybeans growing in 2005. The northernmost field was fallow in 2005.

Old field – Formerly cultivated areas planted with smooth brome grass (*Bromus inermis*) for hay or pasture. Non-native trees of the windbreaks (e.g., Scotch pine *Pinus sylvestris*) non-native invasive trees (e.g., Siberian elm *Ulmus pumila*), eastern red cedar (*Juniperus virginiana*), and native prairie plants are colonizing the old fields. Colonizing native herbs and grasses include stiff goldenrod (*Solidago ridiga*), old field goldenrod (*S. nemoralis*), white sage (*Artemisia ludoviciana*), prairie ragweed (*Ambrosia psilostachya)*, pussytoes (*Antennaria sp.*), few-seeded panic grass (*Panicum oligosanthes*), Bicknell's sedge (*Carex bicknellii*), and thimbleweed (*Anemone cylindrica*).

Restored prairie – 9.2 acres of former cropland was restored to dry prairie in Spring 2004 by Prairie Restorations, Inc. The restored dry prairie was machine planted, and small inclusions of mesic prairie were also planted by hand. The plantings appear successful, with a continuous cover of black-eyed Susan (*Rudbeckia hirta*) and rows of native grasses that were 3-4 inches tall. Weeds were few. Following the 10-year management plan prepared by Prairie Restorations, Inc. (February 2005) will ensure the success of this planting.

Old field prairie – Old fields that have been fallow for many years and have been colonized by native plants. While smooth brome is a dominant species, the edges of the fields and scattered patches inside the fields support over 30 species of native grasses, sedges, and wildflowers, in addition to non-native weeds and invading shrubs and trees. Most of the native species are able to colonize bare soil. Other more conservative native prairie species that would be found in high quality prairies are missing because these plants did not survive the decades of active farming.

Roadside prairie – Roadsides and field roads that have been fallow for many years and have been colonized by native plants, including those found in the old field/prairie locations. The roadsides have undergone less disturbance than the old field/prairie locations. As a result, smooth brome grass has been replaced by native prairie grasses, including big bluestem (*Andropogon gerardii*), Indian grass (*Sorghastrum nutans*), little bluestem (*Schizachyrium scoparium*), and porcupine grass (*Stipa spartea*) in many locations.

Planted windbreak – Tree windbreaks established in the 1950's and 1960's to reduce wind erosion of the sandy soils. Most of the windbreaks are dominated by Scotch pine (Pinus sylvestris). The windbreak along the north Park boundary is a mixture of Scotch pine, jack pine (Pinus banksiana) and species from the floodplain forest: cottonwood, black willow, American elm, Box elder, and hackberry. In the southern half of the Park, red pine (Pinus resinosa) was used. The planted windbreaks are being colonized by native and non-native trees and shrubs. Northern pin oak

Figure 3. Ecological Land Cover at Bend in the River Regional Park.

(Quercus ellipsoidalis), a common tree of the region's oak savannas, occurs scattered throughout the windbreaks as young trees, saplings, and seedlings. Scotch pine is also reproducing well. The windbreaks are becoming havens for the highly invasive, non-native shrubs European buckthorn (Rhamnus cathartica) and Tartarian honeysuckle (Lonicera tatarica). At the same time, native shrubs are thriving, such as choke cherry (Prunus virginiana), red raspberry (Rubus strigosus), and red-berried elder (Sambucus pubens). Black locust (Robinia pseudoacacia) and Siberian elm also grow commonly in the windbreaks, and these non-native species have the potential to spread by seed and underground rhizomes and are capable of colonizing prairies and old field.

Red pine plantation – A single area of red pines densely planted in the 1950's and 1960's with a groundlayer of smooth brome grass. This plantation supports large numbers of non-native plants that are capable of spreading, colonizing, and overtaking other habitats on the property. These plants include leafy spurge (*Euphorbia esula*), European buckthorn, and thistle (*Cirsium sp.*).

Red pine-white spruce plantation – Red pine and white spruce (*Picea glauca*) were planted in dense rows over large areas in the 1950's and 1960's. The understory is sparse and the groundcover consists predominantly of pine and spruce needles. In canopy gaps and at the edges of the plantations, native trees and shrubs are becoming established (e.g., northern pin oak, choke cherry, red raspberry). In some locations, native prairie grasses and forbs are colonizing bare soil, while smooth brome grass dominates in other locations.

Red pine-white spruce plantation/savanna – A single area of red pine and white spruce planted in the 1950's and 1960's. Many openings in the tree canopy afford sun-loving native prairie plants enough light to grow. These plants include many already mentioned, as well as sand dropseed (*Sporobolus cryptandrus*), hairy puccoon (*Lithospermum caroliniensis*), frostweed (*Helianthemum canadense*), stiff goldenrod, golden-aster (*Chrysopsis villosa*), and sand penstemon (*Penstemon grandifloris*). Northern pin oak is colonizing throughout the area.

Bur oak woodland/savanna – This habitat is a remnant of the original oak savanna reported 150 years ago by General Land Office surveyors. Sun-loving plants here originally were sustained by frequent surface fires, which killed trees and shrubs that naturally tended to colonize oak savanna. However, the moderate level of disturbance, including periodic grazing, mowing, and trail and roadside maintenance, allowed the plants of this historic oak savanna to persist. Prior to 1850, annual fires would have maintained open conditions beneath the oak canopy, causing it to resemble the grazed oak savanna adjacent to the northwest Park boundary, except that the trees were smaller. Aerial photographs taken in the 1930's show this area as the only woodland in the Park, with the remainder of the Park consisting of cropland and homesteads.

The bur oak woodland/savanna area is divided into four types:

- *Bur oak savanna* near the Grave's homestead; the trees are over 120 years old and the understory is mowed.
- *Young bur oak woodland* between and next to the prairie restorations; the closely spaced trees produce deep shade, preventing the groundlayer from fully developing, but indications from the edges of the woods are that native plants may be present in the groundlayer.
- *Bur oak woodland/savanna* on level ground above the bluff top and along the existing trails and old roadbed of Highway 55. These locations contain many native groundlayer plants that characterize savanna. Plants of sun and shade co-mingle in this plant community due

to openings in the canopy and the open branching pattern of oak trees. Regeneration of bur oak and northern pin oak was observed. In addition to native plants of open prairies already mentioned, plants of semi-shaded habitats are present.

- *Oak-basswood* woodland on the steep bluff slope. This plant community contains a mingling of forest plants and plants that require full sun. The 1967 aerial photographs show this as open woodland with patches of bare soil visible. Since then multiple layers of trees and shrubs have grown up beneath the oaks and basswoods. These are largely trees of the floodplain forest, but in addition eastern red cedar has become a dominant plant in the woodland canopy. European buckthorn (*Rhamnus cathartica*) is present in this woodland.

Silver maple floodplain forest – Silver maple dominates the canopy of this mostly closed forest. Green ash, cottonwood, box-elder, and hackberry also grow here. The understory is dominated by wood nettle (*Laportea canadensis*), a native plant abundant in midwestern floodplain forests. A wide variety of other native plants were present. Plants typical of marshes and open wetlands grow in the sloughs and swales of the floodplain forest. The floodplain forest is flooded frequently.

Animal Life

The Park is very productive for a wide range of upland animals which prefer savannas, grasslands, and sandy soil, including bird species that have experienced population declines in the Upper Midwest over the past 30-40 years (e.g., Field Sparrow). Because the field survey took place outside the breeding season for most species, and during intermittent rain, this animal list is preliminary. A visit during the spring-early summer bird breeding season, and periodic visits to document butterflies and dragonflies, would greatly add to this list. Animals were distributed among the ecological land cover types as follows:

General

Turkey Vulture, Wild Turkey, Red-tailed Hawk, White-tailed Deer

Old fields, cropland edges, and roadsides

Field Sparrow, Eastern Bluebird, Pocket Gopher, possible sightings of Badger diggings and Bullsnake burrows

Wind breaks and pine plantations

Black-capped Chickadee, Blue Jay, American Robin, White-breasted Nuthatch, Downy Woodpecker, Red Squirrel

Oak savanna and woodland

Leopard Frog, Eastern Wood Pewee, Eastern Phoebe

Conservation Priorities

Establishing conservation priorities for a park helps to guide future development activities, including habitat restoration and nature preservation, construction of trails and interpretive facilities, locations of roads and parking areas, and siting of playgrounds and ball fields. Field data were evaluated with knowledge of the ecological needs of plants and animals using the Park to develop conservation priorities for the Park (Figure 4 - *page IV.11*).

These conservation priorities are presented for discussion purposes, as a starting point for creating different development alternatives. The conservation priorities shown here do not represent a maximum or minimum protection scenario for natural resources. Instead they represent a moderate approach to natural resource conservation with the assumption that other uses of the Park will take place in addition to conservation. The priorities are:

Significant Natural Resource Area

These locations contain the most valuable plant communities on the property including old fields and roadsides that have been colonized by prairie plants, oak savannas and woodlands that have good potential for restoration to healthier ecological conditions, the floodplain forest, and the pine-spruce plantation which supports a variety of native prairie plants in the groundlayer. The grassland animals seen and expected in the Park will likely be most plentiful in these areas.

Natural Resources Enhancement Area

These locations provide additional habitat for animals that are using the significant natural resource areas. It is assumed that the natural resource enhancement areas will be improved over time (Figure 4 - *page IV.11*). Conservation priorities at Bend in the River Regional Park.

These locations provide additional habitat for animals that are using the significant natural resource areas. It is assumed that the natural resource enhancement areas will be improved over time by planting native plant species, removing unwanted invasive plants, and increasing the variety of native plant species. Grassland animals especially will benefit from the enhancement area. All things being equal, the larger and rounder a grassland, savanna, or forest habitat is, the greater the chances that it will meet all the needs of the animals that live there. These include food and shelter, and freedom from predators, disease, and other problems. Vehicles are especially dangerous to ground-dwelling grassland animals, such as the bullsnake, and should be kept as far away from the natural resources areas being established and enhanced.

Biological Connection

This area creates a broad linkage among significant natural resources at the Park. It connects natural resource areas along the river to those east of Highway 55. The wider the link, the better habitat it provides for animals moving through the park. Biological linkages help prevent inbreeding in populations of animals. Inbreeding in animal populations is an outcome of habitat fragmentation, in which pieces of habitat are broken up and kept separate by roads, subdivisions, and other developments. Eventually, inbreeding can lead to the local extinction of an animal population. Biological connections help facilitate interbreeding of populations of snakes, reptiles, amphibians, and small mammals.

Remainder of Park

The remainder of the park is less significant for natural resource conservation and interpretation. However, some of these lands may become more significant under an alternative scenario for locating trails, interpretive areas, farm demonstration areas, etc. As previously stated, the conservation priorities represent a moderate approach that allows for additional uses, and is a starting point for conversations about alternative master plan designs.

Figure 4. Conservation priorities at Bend in the River Regional Park.

Summary

Bend in the River Regional Park contains important natural resources that represent the savanna and prairie landscape of 150 years ago. A variety of plant and animal life is found at the Park. Given a moderate level of commitment, the existing plant communities and animal habitats can be improved dramatically over time. Restoration of more open savanna and prairie is a realistic goal that would protect and enhance the natural resources of the park, provide interpretive and recreational opportunities, and preserve the natural history while enhancing the significant cultural aspects of the park.