UNIVERSITY OF MINNESOTA
EXTENSION
MINNESOTA MASTER NATURALIST

Rivers' Bend Park Conservation Management Plan

Lucas Groskreutz
Master Naturalist Volunteer
University of Minnesota Extension
Submitted June 2020

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The Conservation Management Plan for the City of Ramsey's Rivers' Bend Park is designed to advise the City of Ramsey Parks and Recreation Board, land managers, and interested park users in managing and conserving the ecological resources and aesthetic beauty of Rivers' Bend Park and its enjoyment by visitors.

Conservation values and prioritized goals are established that guide the proposals for management with a focus on ecological restoration and didactic potential. Through the strategies laid out within this plan, park managers, partner organizations, and volunteer groups can collaboratively preserve the natural and recreational features of the site.

Rivers' Bend Park was established in 1989 and contains about 60 acres of land. This includes a significant amount of undisturbed riparian forest along the Rum River as well as 6 to 7 acres of restored prairie, both of which are of vital ecological importance. Of Minnesota's original prairie, which covered a third of the state, less than two percent remains as remnants across the landscape.[1] The habitat corridor created by the restored tallgrass prairie on site and nearby native prairie remnants is an invaluable resource for a wide range of prairie-dependent organisms. Along with the riparian forest, the land cover of the site is vital to the continued health of the surrounding wetlands. Furthermore, up to 20 Species of Greatest Conservation Need (SGCN) have validated records of occurrences within the township that the park resides resides in.[2] One such species is the rusty patched bumble bee (*Bombus affinis*), whose primary dispersal zone includes the site.[3] With so much urbanization and development in the surrounding area, the park holds many resources that could be protected to help combat habitat fragmentation and degradation. Overall, there is vast potential value in committing to ecologically restoring the site and using it as a means to educate the general public about these natural systems.[4, 5, 6]

DESIRED MANAGEMENT OUTCOMES

- Maximize biodiversity of native Big Woods Big Rivers species while improving ecological health and productivity
    - Contribute to habitat connectivity by providing habitat and increasing habitat value for native species, especially Species of Greatest Conservation Need (SGCN) and native pollinators
    - Restore some of the native land cover (prairie, river bottom forest, wetland) by reducing the amount of land being maintained and removing invasive species to encourage natives to further populate the area
- Increase the park's usability for recreational, didactic, scientific and interpretive purposes (birders, students, researchers, those looking to connect with nature, etc.)
    - Foster increased appreciation for the natural environment in visitors of the park

SITE DESCRIPTION

Historical climate, geology, hydrology and human activity are critical determining factors of the distribution and abundance of particular resource elements in an area as well as the organisms

that reside there. This section discusses how these forces have impacted the present day composition of natural communities and the landscape in Rivers' Bend Park.

Natural History

Bedrock Geology and Glacial Landscapes

"The majority of the region is mantled by debris left by glaciers and glacial rivers; beneath this, the bedrock that is closest to the surface in Ramsey is of the Cambrian System, which is some 500-600 million years old."[4] This includes Cambrian and Ordovician dolomite, sandstone, and shale.[7]

"The topography of the area was most heavily influenced by the last period of glaciation which ended in east-central Minnesota about 10,000 years ago. During this event, glaciers sculpted the landscape and left behind a variety of deposits, including drift/till and outwash composed of sand and gravel, and windblown deposits of very fine sands. During the last glaciation, the Superior Lobe ice sheet advanced into the region from the east, and finally retreated about 20,000 years ago. With each advance and retreat, the melting ice sheet deposited immense piles of sand and gravel along its margins, and massive rivers of glacial meltwater carried additional sand and sediment across the area. These riverine, or fluvial, deposits cover much of the city and resulted in the Anoka Sand Plain.

Direct glacial modification of the landscape, such as the deposition of till and moraine, and the influence of periglacial processes such as outwash, have formed the vast majority of the landforms in this region. Most of the deposited materials associated directly with glaciers, such as till and moraine are unsorted. These consist of mixed materials, which range in size from clay and fine sand to large boulders. Overall, the materials deposited in the City tend to form well-drained to very well-drained landscapes with sands and gravels common."[4] Specifically, the majority of Rivers' Bend Park's soils are sandy in nature.

Vegetation at the Time of Settlement

According to the original land survey notes (compiled in Minnesota between 1850's and 1900's), the presettlement vegetation of [Rivers' Bend Park] was an area of riverbottom or floodplain forest along the Rum River surrounded mostly by oak openings and barrens, but also bordering prairie to the southeast. Original species included elm, ash, cottonwood, boxelder, silver maple, willow, aspen, and hackberry.[4, 8]

Influence of Humans on the Landscape

Ideas about the history of Native Americans and their influence on the local landscape are still evolving. Native Americans have probably inhabited and hunted in the area for over 10,000 years. The impacts of Native Americans on the land were caused by their use of a wide variety of plants and animals for food, altering vegetation patterns for cultivation and by setting fire to broad expanses of landscape. Native Americans (and European fur traders) used fire to hunt game; create desired habitat; clear the landscape for travel, communication and defense; and obtain firewood. While some fires in the region would have occurred naturally, the activities of Native Americans undoubtedly accounted for the vast majority of fires. Prairies, savannas, and oak forests are fire-dependent plant communities, and would most likely not have been present in the Twin Cities Area at the time of European settlement without these fires.[4]

During early European settlement, logging had an impact on the Rum River Basin. In 1820 logging began in the area to support the construction of Fort Snelling. Logs were floated down the Rum River to the Mississippi River. Heavier logging started around 1848 and lasted about 40 years. In 1853 the first dam on the Rum River was built in its current location and a sawmill was constructed the following year. Because Rivers' Bend Park is near this Anoka dam site and the confluence with the Mississippi River, it has historical significance.[5]

As the City of Ramsey developed, increasingly intense human activities began to change the landscape and natural communities. In the city of Ramsey today, approximately 80-90% percent of the native landscape has been substantially impacted by human activities. Examples of changes since European settlement include the roads and the railroads fragmenting forests and other communities. Urbanization continues to fragment natural communities further with the addition of more roads, streets and utilities. Construction of all types alters and compacts soils, and changes the local hydrology. Large areas of impervious surface and drainage of wetlands increases the amount of stormwater runoff and pollutants carried to local waters. Agriculture affected hydrology by draining wetlands and altering creeks. Vegetation was altered through clearing, plowing, cessation of regular fires, and grazing. These effects are evident in the reduction of native vegetation diversity in meadow and forest understory and substitution of communities of low diversity dominated by non-native plants. Soil erosion increased where native cover was removed, adding sediments to creeks, wetlands and lakes. Non-native, aggressive species like common buckthorn have been added as landscape materials. Changes in habitat and the increasing presence of humans in the landscape has brought changes in animal populations, decreasing or eliminating some species like bluebirds and bison, and favoring others such as English sparrows and white-tail deer.[4]

Existing Landscape Conditions and Features

Climate

The climate in east-central Minnesota is considered to be continental and subhumid, with long, cold winters and relatively brief, warm summers. Wide fluctuations in temperature and precipitation strongly influence the plant communities present in the region and cause plants to be adapted to extremes, rather than averages.[4] Total annual precipitation ranges from 27 inches to 29 inches, with growing-season precipitation ranging from 12 to 13 inches. The growing season length ranges from approximately 136 to 156 days.[7]

Land Cover

In terms of land cover classification there is a significant portion of floodplain forest along the southeast bank of the park. The remaining area of the southern portion of the park is planted and maintained vegetation, but reminiscent of prairie, including 6-7 acres of restored, dry tallgrass prairie with some shrubland along the oxbow lake shore.

Wetlands

The site is contained in the Rum River Major Watershed, which lies within the Mississippi River Basin and borders the Rum River to the east. Headwaters of the Rum River originate from Lake Mille Lacs and it acts as one of the largest tributaries to the Mississippi River north of the Twin Cities. The Rum River is listed as an ecoregional priority by The Nature Conservancy, deemed a wild and scenic river, and listed by the MN DNR as having at least two species in greatest conservation need.[9] At some point, the Rum River developed a chute along the eastern bank of Rivers' Bend Park, cutting off its former meander along the north, west and south sides of the

park and creating the current oxbow lake. The neighboring oxbow is slowly being filled with detritus, accumulating nutrients and increasing in productivity. It may eventually become a swamp or bog. Fluctuating water levels of the Rum River affect the seasonally flooded deciduous floodplain forest on the eastern edge of the park. The area is considered very highly sensitive to water-borne contaminants affecting the uppermost aquifer.[10]

Property Uses

Currently the park is open to the public. The assortment of trails, park shelter with picnic tables, river access, and intact ecosystems bring in visitors participating in recreational activities such as hiking, jogging, bird watching, group gatherings, fishing, canoeing and kayaking. It is also a valuable resource for Anoka High School, which is located across county highway 116 to the south. Teachers and students use the property as a natural history laboratory for ecological studies.[5]

Ecological Quality

Based on the DNR's Natural Heritage's Element Occurrence Ranking Guidelines, nearby inventoried areas were given a natural quality ranking of C, which designates a moderate condition natural community with obvious past disturbance but is still clearly recognizable as a native community. Not dominated by weedy species in any layer. Minimally, the site must be visited from the edge to accurately assess its natural quality at this level. This level of quality is likely indicative of the natural quality in the southern portion of Rivers' Bend Park.[6]

Walkthrough Assessment Findings and Concerns

A walkthrough assessment of the park was conducted to identify areas of concern and assess ecological quality. The following is a summary of the observations that were made.

Flora

During a field visit on May 28, 2020, Aaron Soltau and Nathan Hartman, prairie restoration experts from Prairie Restorations, Inc., identified the following herbaceous native prairie species in the dry, tallgrass prairie.

Native Flowers			
Scientific Name	**Common Name**	**Layer**	**Ecosystem**
Rosa arkansana	Prairie rose	Shrub	Floodplain Forest/Prairie
Rubus occidentalis	Black raspberry	Shrub	Floodplain Forest/Prairie
Achillea millefolium	Common yarrow	Ground	Floodplain Forest/Prairie
Agastache foeniculum	Blue giant hyssop	Ground	Floodplain Forest/Prairie
Asclepias syriaca	Common milkweed	Ground	Floodplain Forest/Prairie
Asclepias tuberosa	Butterflyweed	Ground	Prairie
Dalea candida	White prairie clover	Ground	Prairie
Dalea purpurea	Purple prairie clover	Ground	Prairie
Fragaria virginiana	Wild strawberry	Ground	Floodplain Forest/Prairie
Helianthus pauciflorus	Stiff sunflower	Ground	Prairie
Lespedeza capitata	Round-headed bush clover	Ground	Prairie
Lupinus perennis	Wild lupine	Ground	Floodplain Forest/Prairie
Monarda fisulosa	Wild bergamot	Ground	Floodplain Forest/Prairie

Rudbeckia hirta	Black-eyed Susan	Ground	Floodplain Forest/Prairie
Solidago rigida	Stiff goldenrod	Ground	Prairie
Solidago speciosa	Showy goldenrod	Ground	Floodplain Forest/Prairie
Thalictrum dasycarpum	Tall meadow rue	Ground	Floodplain Forest/Prairie
Verbena stricta	Hoary vervain	Ground	Prairie
Zizia aurea	Golden Alexander	Ground	Floodplain Forest/Prairie
Native Grasses			
Scientific Name	**Common Name**	**Layer**	**Ecosystem**
Andropogon gerardii	Big bluestem	Ground	Floodplain Forest/Prairie
Bouteloua gracilis	Blue grama	Ground	Prairie
Elymus canadensis	Canada wild rye	Ground	Floodplain Forest/Prairie
Panicum virgatum	Switchgrass	Ground	Floodplain Forest/Prairie
Schizachyrium scoparium	Little bluestem	Ground	Floodplain Forest/Prairie
Sorghastrum nutans	Indian grass	Ground	Floodplain Forest/Prairie
Spartina pectinata	Prairie cordgrass	Ground	Prairie

During the same field visit, Soltau and Hartman took a brief inventory of the riparian zone on site and identified the following native species.

Scientific Name	**Common Name**	**Layer**	**Ecosystem**
Acer saccharinum	Silver maple	Canopy	Floodplain Forest
Quercus rubra	Northern red oak	Canopy	Floodplain Forest
Quercus ellipsoidalis	Northern pin oak	Canopy	Floodplain Forest/Prairie
Tilia americana	American basswood	Canopy	Floodplain Forest
Prunus sp.	A species of plum	Subcanopy	Floodplain Forest/Prairie
Salix sp.	A species of willow	Subcanopy/Shrub	Floodplain Forest/Prairie
Rosa sp.	A species of wild rose	Shrub	Floodplain Forest/Prairie
Achillea millefolium	Common yarrow	Ground	Floodplain Forest/Prairie
Carex sp.	A species of sedge	Ground	Floodplain Forest/Prairie
Maianthemum racemosum	False Solomon's seal	Ground	Floodplain Forest
Zizia aurea	Golden Alexander	Ground	Floodplain Forest/Prairie

Invasive Species of Concern

Invasive plants can be found in many areas of the site, the most apparent being a handful of woody invasive species: Siberian elm (*Ulmus pumila*), Tartarian honeysuckle (*Lonicera tatarica*) and common buckthorn (*Rhamnus cathartica*). These woody invasives are somewhat sparsely infesting the prairie and shrubland on the north, south and west sides of the park along the border of the oxbow lake. Most of the restored prairie contained within the trails is free from woody invasives except for a sapling or two of Siberian elm. The northernmost and southernmost portions of the floodplain forest seemed to be the most densely populated with woody invasives, primarily with buckthorn, while the central portion was somewhat less dense.

The understory does include a number of other species, but buckthorn was apparent as the dominant understory species of the floodplain forest.

Spotted knapweed (*Centaurea stoebe*) was present in the southern portion of the restored prairie. Leafy spurge (*Euphorbia esula*) was found to be along the southern edge of the floodplain forest and in the shrubland on the southeast corner of the site. Significant amounts of poison ivy (*Toxicodendron radicans*) inhabited the understory of the floodplain forest and the quaking aspen grove in the northern portion of the site, including at the edges of these areas near trails. There were a few volunteer trees in the prairie that have persisted through burns and some beginnings of cool season turfgrasses invading the edges of the prairie. Other species of potential concern present include perennial sow thistle (*Sonchus arvensis*), yellow goatsbeard (*Tragopogon dubius*), riverbank grape (*Vitis riparia*), prickly ash (*Zanthoxylum americanum*), Canada goldenrod (*Solidago canadensis*), field horsetail (*Equisetum arvense*), common mullein (*Verbascum thapsus*) and amur maple (*Acer ginnala*).

Ecologically Sensitive Areas

Several areas on the property should be considered ecologically sensitive. These areas either have diverse populations of plants or are important areas in the life cycle of animals. Public use should be monitored or restricted to best protect the quality of these areas.[5]

The entire eastern border of the property is considered sensitive because it borders the Rum River. Since the property provides direct access to the river, there is an inherent risk imposed to the waterway by public use. Excessive use along the riverbank can cause bank instability and erosion issues that could negatively affect water quality and should be monitored closely.[5] Additionally, this wooded area is an ecologically sensitive riparian zone. Undisturbed riparian zones are considered reservoirs of diversity that act as key habitat to species that depend on these areas, such as nesting and migrating birds as well as certain woody plant communities. They provide spatial heterogeneity to a landscape through edges and ecotones while also creating beneficial habitat corridors. A critical part of watersheds, riparian zones reduce the delivery of runoff and pollutants to water bodies, contribute to stream bank stability and sediment control, incorporate nitrogen from shallow groundwater, provide shade that reduces stream temperature, and provide allochthonous inputs that drive river ecosystems.[11, 12]

The restored dry, tallgrass prairie is undoubtedly sensitive as this type of land cover has become so uncommon in Minnesota. Prairie ecosystems have been in serious decline due to fragmentation, invasive species, and surrounding land uses, resulting in less than two percent of the original native prairie area remaining in Minnesota while continuing to experience decreasing plant diversity. These sites are ecologically critical because they contribute so much to pollinator and wildlife habitat and connectivity, allow for increased animal and plant dispersal, and contain concentrated, unique biodiversity. The vegetation communities present in native prairie have dense root systems that anchor and build nutrient rich soil through their contribution to biogeochemical cycling and storage. Within the landscape, they link upland and wetland sites for organisms that utilize both habitats and act as key sites for the transfer of energy between trophic levels.[1]

If managed properly, the site could become habitat for Minnesota Species of Special Concern regal fritillary (*Speyeria idalia*) and U.S. Fish and Wildlife Service Endangered Species listed rusty patched bumble bee (*Bombus affinis*). Any area that could increase habitat connectivity for such

threatened species should be deemed sensitive. Conservation guides for these species detail just how critical habitat fragments are for these species: "The survival of the regal fritillary in Minnesota probably depends upon concentrations of remnants within the dispersal capabilities of adults that can collectively support larger populations"[13] and "conservation of the rusty patched bumble bee will ultimately depend in part on connecting patches of high quality habitat."[3] Rivers' Bend Park's native prairie remnants offer the regal fritillary the only habitat it is able to survive in within Minnesota[13, 14] and is already listed as within the primary dispersal zone of the rusty patched bumble bee. Additionally, all three habitat features necessary for rusty patched bumble bees are present within Rivers' Bend Park: the duff layer of the riparian forest is key overwintering habitat, native bunch grasses in the woodlands and prairie as well as abandoned rodent tunnels in the prairie are potential nesting areas, and the abundant forbs of the prairie and spring ephemerals of the woodlands offer necessary floral resources.[3]

Structures and Improvements
In an effort to contribute to eastern bluebird (*Sialia sialis*) trails, bluebird houses were erected throughout the park to act as potential nesting sites within a habitat corridor. Encroaching shrub and understory growth has crowded out some of these houses.

A large bat house is located on the west side of the park, near the shore of the oxbow lake. The site has seen a lot of human traffic with a well-worn footpath going underneath the house from the paved path to the oxbow lake shore and no apparent bat activity.

Erosion
Erosion has continued to affect the shore in front of the swing river outlook located on the east side of the park due to use for fishing. The dock on the east side of the park has also become uneven due to the river current causing erosion of the sediment underneath, creating a potential tripping hazard at the entrance to the dock.

Boundary Issues
Potential boundary issues for the site include noise pollution from the bordering roads, chemical pollution from salts used on roads and paths, and air pollution from passing traffic. A line of mature spruces has been planted along St. Francis and Bunker Lake Boulevards to provide some cover for noise pollution and aesthetic appeal within the park. Some deciduous trees are beginning to encroach on the area where the spruces are growing.

MANAGEMENT RECOMMENDATIONS

The following management recommendations are intended to offer the Ramsey Parks and Recreation Board potential strategies to address the park's primary areas of concern while accomplishing the desired management outcomes:

Invasive Species Control

In order to successfully increase native species biodiversity and improve ecological health of the native prairie and floodplain forest, all invasives present must be monitored to determine whether they reach a density that threatens the natural dynamics of the site. Due to the level of prominence of the woody invasive species, buckthorn, Tartarian honeysuckle, and Siberian elm must be eradicated. This process involves several elements: treatment of invasive species with herbicide, removal of undesirable woody biomass, and supplemental plantings if necessary. The

latter element will be postponed to observe natural regeneration and to provide ample time for site preparation through the removal of undesirable woody vegetation.[15]

Woody Invasives Treatment
Efforts will start in the areas of the park where infestations are sparse, and work towards areas of heavier infestation. This way a "front" will be developed that can be extended as the project progresses.[15]

The first year's goal will be to address all of the woody invasives along the oxbow lake, starting on the northwestern side of the park and continuing south along the shore. Volunteers thoroughly trained in species identification and treatment methods are proposed to assist with this portion of the site. Educational reference materials developed by Peter Leih should be utilized to help with proper volunteer training (Appendix A). Due to the severe degree of density of buckthorn within the floodplain forest, contracting specialists for woody invasive removal in this portion of the site will be necessary. Beginning on the southern edge of the floodplain forest and continuing north, removal of about 10% of the woody invasives each year is proposed. This incremental approach is important in order to avoid denuding the forest or disrupting the proper functioning of the riparian zone, including the production of allochthonous inputs, shading of the river, and stream bank stabilization.

The woody invasives being removed will be cut off 8-10 inches above the ground. Cut stump application of 25% Garlon 3A, a triclopyr based herbicide, mixed with water is proposed as it is recommended for use near aquatic areas. Subsequent years will treat any new growth or vegetation that was missed in the initial treatment. Whenever potentially hazardous chemical treatment is proposed near areas of frequent use, signage should be displayed along paths every 50-100 yards denoting the area that has been recently treated. Treatments will be done in late fall or early winter when buckthorn, Tartarian honeysuckle and Siberian elm are easy to identify and damage from overspray can be minimized. This also prevents damage to spring ephemerals, which are critical early foraging for the Rusty Patched Bumblebee. Additional sunlight reaching the ground will encourage the growth of more desirable species. Unfortunately, it will also allow for a flourish of buckthorn seed that has built up in the soil to germinate. A multi-year treatment approach is critical to address this problem. At least three years of treatment with herbicide will be necessary. Follow up treatments every three years thereafter are desirable.[15]

Woody Biomass Removal
Woody biomass of the treated common buckthorn, Tartarian honeysuckle, and Siberian elm will be gathered, removed from the site and burned. The remaining stumps and root systems will be left to decompose. Extra precautions during removal should be taken for any of the invasives that have the potential to spread seed, such as buckthorn with berries. Any such specimens should be transported via plastic tarps to prevent seed dispersal. Removal of woody biomass is desirable because it will accelerate restoration activities, remove fire hazards, and reduce conflict with the public who find the dead trees unsightly.[15]

Vegetation Enhancement
A list of desirable vegetation for the site, developed by consulting references from the City of Ramsey Natural Resources Inventory and Board of Water and Soil Resources Native Vegetation Establishment and Enhancement Guidelines can be found in Appendix B. Natural regeneration

of desirable species, combined with continued treatment of undesirable species may make supplemental planting unnecessary. If it becomes clear after three years of active site preparation that the seed bank is insufficient to produce the desired result, supplemental seeding and planting will be pursued. If and when supplemental planting becomes necessary, plant materials of local ecotype will be sought and protocols used consistent with the Board of Water and Soil Resources Native Vegetation Establishment and Enhancement Guidelines or other protocol recommended at the time.[15, 16] As regrowth and potential reseeding occur, it is important to manage for establishing some areas of open understory, which promotes the growth of spring ephemerals and improves potential overwintering areas for the rusty patched bumble bee.[3]

Long-Term Maintenance

Maintenance of the project once it is completed should be minimal. In riparian forest removal sites a fall foliar spray, naturally sourced if possible, conducted a year after removal is recommended to help new growth get established by providing nutrients, especially nitrogen. Buckthorn seed remains viable for up to five years in the soil, so a sweep of the park to identify and treat any woody invasive re-growth once a year will keep populations under control and provide the opportunity for native species to become re-established. We will use the initial project to train volunteers on proper identification and treatment methods to ensure long-term maintenance activities have sufficient labor resources and are carried out adequately.[15]

Remaining Invasive Plants of Concern

To combat the infringement of cool season turfgrass on the native prairie, a selective cool season spray is proposed that will control the problem species while avoiding damage to Canada wild rye. It is recommended that spotted knapweed, leafy spurge, and poison ivy be immediately addressed as well. At this time, the effects of the remaining species of concern on ecological function and stability should be monitored to determine whether they should be controlled or removed in the future. Resources for removal and control guidelines can be found on the Minnesota Department of Natural Resources Invasive Terrestrial Plants page and the Minnesota Department of Agriculture Noxious Weed page.

Native Prairie Creation

Located near a few of the scarce remaining pockets of native prairie in the Big Woods, Big Rivers biome and already containing six acres of restored prairie, the park's currently maintained turfgrass area holds vast potential ecological value as an expansion of the restored prairie area. Reconstructing a native dry mixed grass prairie community provides native flora that actively attracts invertebrate species critical to the site's food chain stability and natural functioning in addition to secondary species such as birds, herptiles and small mammals. Considering the current plight of invertebrates, specifically designing habitat to attract native species, especially pollinators, is a project worth high prioritization. Further benefits include production of natural aesthetic beauty that requires little maintenance, promotion of a prairie habitat corridor that connects the prairie remnants in the area, decreased long-term costs, and decreased emissions from mowing.[17]

Preparing the Site

Four portions of the maintained area to the north, northwest and northeast of the current restored prairie are the proposed sites for construction of mixed grass prairie (Maps 1-3). Any existing grass and weeds must be removed. The easiest way to do this is to treat the site with a

systemic, broad-spectrum herbicide such as glyphosate sprayed directly onto the turfgrass and any other species present. Rodeo Broad Spectrum Aquatic Herbicide is suggested, as it is safe to use near wetlands, doesn't bioaccumulate in the food chain, and has no residual soil activity. Two sessions of application are recommended, the first occurring in late summer. After the grass is dead which should be about 25-30 days after herbicide application the site should be harrowed. Following the harrowing, allow the site to regreen until it is about shin to knee height, at which point the second round of herbicide should be sprayed. When 25-30 days have elapsed, a controlled burn of the sites is proposed using appropriate procedures, equipment and permits.[17]

Vegetation Enhancement

Once the site is prepared, it will be seeded and planted with plugs the following spring (May 15-June 15). To sow the seed, mix with some inert material such as sand or loose potting soil and broadcast the mixture over the area. The seeds must be pressed into the soil by rolling or by pressing a board down onto the seedbed. You can walk over the entire area to pack down the soil. The objective is to have good contact between the soil and seeds to allow them to gain and retain moisture. Some seeds will still be visible when you are done. Add the proposed seedling plugs immediately after completing seeding. The area needs to be kept moist for four to six weeks to ensure germination and allow the plants to establish themselves. Do not allow the area to dry out while the seeds are germinating. Do not saturate the soil either as this can drown the seedlings. Once the plants are established (one to two inches), you can gradually reduce watering to only when the plants begin to show stress.[17] The newly planted sites should be mown at the end of the first growing season to give all species a chance to establish themselves. If it becomes clear after three years of active site preparation that the initial seeding is insufficient to produce the desired vegetation (Appendix B), supplemental seeding and planting will be pursued.

Species selection was made with ecological and aesthetic considerations in mind, aiming to create an ecosystem with a high diversity of grasses and wildflowers that will produce blooms from spring through fall, offering pollinators quality foraging habitat while fostering aesthetic beauty throughout the year. Specific consideration was given to key vegetation for regal fritillary and rusty patched bumble bee habitat, including a maximal variety and density of *Viola* species as regal fritillary larvae feed only on them.[13, 14] The proposed list also includes super foods and immune building foods for the rusty patched bumble bee diet and native bunch grasses for its nesting.[3, 18]

The seed mixes will consist of the following species and amounts:

Short Dry Grass Seed Mix *- 10-12 Pure Live Seed (PLS) lbs/acre*		
Scientific Name	**Common Name**	**Amount (%)**
Bouteloua curtipendula	Side-oats grama	38
Bouteloua gracilis	Blue grama	12
Danthonia spicata	Poverty oatgrass	3
Elymus canadensis	Canada wild rye	3
Koeleria macrantha	June grass	3
Schizachyrium scoparium	Little bluestem	35

Sporobolus cryptandrus	Sand dropseed	3
Sporobolus heterolepis	Prairie dropseed	3

Short Dry Wildflower Seed Mix *- 1.5 PLS lbs/acre*		
Scientific Name	**Common Name**	**Amount (%)**
Agastache foeniculum	Blue giant hyssop	1
Allium stellatum	Prairie onion	2
Amorpha canescens	Leadplant	9
Asclepias syriaca	Common milkweed	4
Astragalus canadensis	Canada milkvetch	4
Calylophus serrulatus	Toothed evening primrose	1
Coreopsis palmata	Prairie coreopsis	1
Dalea candida	White prairie clover	8
Dalea purpurea	Purple prairie clover	15
Desmodium canadense	Canada tick trefoil	1.5
Lespedeza capitata	Round-headed bush clover	4
Monarda fisulosa	Wild bergamot	0.5
Oenothera biennis	Evening primrose	1
Penstemon grandiflorus	Large beardtongue	4
Rudbeckia hirta	Black-eyed Susan	12
Solidago nemoralis	Gray goldenrod	2
Solidago ptarmicoides	Upland goldenrod	1
Solidago rigida	Stiff goldenrod	4
Solidago speciosa	Showy goldenrod	0.5
Symphyotrichum laeve	Smooth blue aster	0.5
Symphyotrichum oolentangiense	Sky-blue aster	0.5
Tradescantia occidentalis	Western spiderwort	0.5
Verbena stricta	Hoary vervain	14
Zizia aptera	Heart-leaved Alexander	6

Additional Wildflower Seed		
Scientific Name	**Common Name**	**Amount (PLS lbs/acre)**
Agastache foeniculum	Blue giant hyssop	0.5
Asclepias tuberosa	Butterflyweed	1
Dalea villosa	Silky prairie clover	1
Echinacea angustifolia	Narrow-leaved purple coneflower	1
Helianthus pauciflorus	Stiff sunflower	1
Heliopsis helianthoides	Common oxeye	0.5
Lupinus perennis	Wild lupine	1
Penstemon grandiflorus	Large beardtongue	1.5

Ratibida pinnata	Gray-headed coneflower	1
Tradescantia occidentalis	Western spiderwort	0.5

A mixture of the below plants will be planted individually in appropriate microhabitats throughout the project. Within shady areas in particular, *Elymus hystrix* should be used. A total of 1000 plugs per acre of the site is proposed. Additional plant can be planted if budget allows.

Grass, Sedge and Bulrush Plugs	
Scientific Name	**Common Name**
Carex brevior	Plain's oval sedge
Carex pensylvanica	Pennsylvania sedge
Elymus hystrix	Bottlebrush grass
Juncus greenei	Greene's rush
Juncus tenuis	Path rush

A mixture of the below plants will be planted individually in appropriate microhabitats throughout the project. A total of 500 plugs per acre of the site is proposed. Additional plant can be planted if budget allows. From the following list, a minimum of 15 species will be used: at least five species that bloom during spring, summer and fall. Highest priority should be given to species denoted with an XX (most critical to the habitat of the Species of Greatest Conservation Need being managed for in the plan - Regal Fritillary and Rusty Patched Bumblebee), followed by those with an X (critical to SGCN habitat) and finally those without.

Wildflower Plugs			
Scientific Name	**Common Name**	**Bloom Time**	**SGCN**
Ranunculus fascicularis	Early buttercup	Spring	
Baptisia alba	White wild indigo	Spring/Summer	**X**
Fragaria virginiana	Wild strawberry	Spring/Summer	
Geum triflorum	Prairie smoke	Spring/Summer	
Lithospermum carolinense	Carolina puccoon	Spring/Summer	
Lupinus perennis	Wild lupine	Spring/Summer	**X**
Penstemon grandiflorus	Large beardtongue	Spring/Summer	**X**
Viola palmata var. pedatifida	Prairie birdfoot violet	Spring/Summer	**XX**
Viola sororia	Downy blue violet	Spring/Summer	**XX**
Zizia aptera	Heart-leaved Alexander	Spring/Summer	
Tradescantia occidentalis	Western spiderwort	Spring/Summer/Fall	
Allium stellatum	Prairie onion	Summer	
Amorpha canescens	Leadplant	Summer	**XX**
Anemone cylindrica	Thimbleweed	Summer	
Asclepias syriaca	Common milkweed	Summer	**X**
Astragalus canadensis	Canada milkvetch	Summer	
Calylophus serrulatus	Toothed evening primrose	Summer	
Coreopsis palmata	Prairie coreopsis	Summer	

Delphinium virescens	Prairie larkspur	Summer	
Ratibida pinnata	Gray-headed coneflower	Summer	**XX**
Thalictrum dasycarpum	Tall meadow rue	Summer	
Veronicastrum virginicum	Culver's root	Summer	**X**
Agastache foeniculum	Blue giant hyssop	Summer/Fall	**XX**
Artemisia ludoviciana	Prairie sage	Summer/Fall	
Asclepias tuberosa	Butterflyweed	Summer/Fall	**X**
Asclepias verticillata	Whorled milkweed	Summer/Fall	**X**
Chelone glabra	White turtlehead	Summer/Fall	**XX**
Echinacea angustifolia	Narrow-leaved purple coneflower	Summer/Fall	**XX**
Helianthus maximiliani	Maximilian sunflower	Summer/Fall	**XX**
Helianthus pauciflorus	Stiff sunflower	Summer/Fall	**XX**
Heliopsis helianthoides	Common oxeye	Summer/Fall	
Heterotheca villosa	Prairie goldenaster	Summer/Fall	
Liatris aspera	Rough blazing star	Summer/Fall	**X**
Liatris cylindracea	Cylindric blazing star	Summer/Fall	**X**
Liatris punctata	Dotted blazing star	Summer/Fall	**X**
Pycnanthemum virginianum	Virginia mountain mint	Summer/Fall	**X**
Solidago flexicaulis	Zigzag goldenrod	Summer/Fall	**XX**
Solidago nemoralis	Gray goldenrod	Summer/Fall	**XX**
Solidago ptarmicoides	Upland goldenrod	Summer/Fall	**XX**
Solidago rigida	Stiff goldenrod	Summer/Fall	**XX**
Solidago speciosa	Showy goldenrod	Summer/Fall	**XX**
Symphyotrichum ericoides	Heath aster	Summer/Fall	**XX**
Symphyotrichum laeve	Smooth blue aster	Summer/Fall	**XX**
Symphyotrichum novae-angliae	New England aster	Summer/Fall	**XX**
Symphyotrichum oolentangiense	Sky-blue aster	Summer/Fall	**XX**
Symphyotrichum sericeum	Silky aster	Summer/Fall	**XX**
Symphyotrichum urophyllum	Arrow-leaved aster	Summer/Fall	**XX**

Long-Term Maintenance

No herbicide should be applied for the duration of the first year after planting. Remove any unwanted weeds or grasses as they appear. Hand pulling of weeds is an effective strategy for smaller plantings. This is often most effective after rainfall when weeds are easier to pull. Any significant leaf litter accumulation on the edges of prairie sites should be removed. Prescribed burning is often initiated the third year after planting and can help to maintain diversity and to control woody species. Subdivide the tallgrass prairie into two halves and in the early spring of every second year rotate conducting controlled burns on one of the halves of the tallgrass prairie along with two of the four portions of new, mixed grass prairie to promote floral diversity and minimize impact to pollinators and other small animals dependent on these prairie ecosystems. Patchy burns are ideal to provide areas of refuge. In a year following a burn, conduct a dormant mow in early spring on the sites that were burned at a cutting height of at least 8 inches if possible.[3, 13, 14, 16, 18]

Species Surveillance

Create an ongoing species inventory of the area through regular species surveys every three years to identify any pressing concerns of future infiltration by invasive species as well as monitor biodiversity progress and presence of SGCN. Not only will this allow us to measure how successful management of the park has been by assessing the ecological quality and health of the area, it will produce valuable data for organizations trying to study anything from population counts and species distribution to migration patterns.[2]

Habitat Maintenance

Bluebird Houses

To encourage the use of the bluebird trail through the area, move any houses enveloped by vegetation to the edge of shrubland or understory they currently occupy to provide unobstructed access.

Bat House

Maintain a 10-foot clear zone around the bat house to the south, southeast, and southwest to prevent any vegetative obstruction of solar heating of the house. Move some logs into the worn footpath between the house and the paved path to discourage human traffic. These measures will ideally allow for a higher likelihood of use by and increased benefit for native bats.

Erosion Control

Address erosion in front of the swing outlook through addition of more rock. Use a boat with some rigging to level the dock affected by erosion and add any rock or sand as needed to maintain stability. Ensure the onramp to the dock is not a tripping hazard through grading and addition of soil or gravel.

Border Maintenance

Drawing on the same pool of volunteers assisting with removal of woody invasives, maintain the spruce screen through the removal of infringing deciduous trees. In the area just southwest of the parking lot on site, push back the tree line 15 feet by removing any deciduous trees (mostly quaking aspen) that occur between the line of spruces and the paved path. The same cut stump treatment that was used to address the woody invasives is recommended. The site should be monitored to determine any future need for further removal.

Didactic Signage

In addition to the volunteering opportunities mentioned above, developing interpretive signage that highlights the park's ecological significance would allow visitors to further engage with their local natural history and increase their awareness of the importance of environmental stewardship. Hiring a graphic designer or enlisting one as a volunteer to help develop signage is recommended. Topics to feature include: benefits of an intact prairie ecosystem, invasive species, native species, SGCN, habitat corridors and connectivity, ecological importance of the riparian area and oxbow lake, bluebird houses, bat house, biodiversity, and lifecycle habitat.

Timeline[15]

Activity	Description	Element	Date
Herbicide spray of new prairie sites	First herbicide treatment of sites	Site Preparation	July 2020
Address spotted knapweed, leafy spurge and poison ivy	Take appropriate removal measures	Site Preparation	July 2020
Harrow new prairie sites	Once the vegetation has died	Site Preparation	August 2020
Move bluebird houses	Move to edge of their respective vegetation	Maintenance	August 2020
Block footpath under bat house	Obstruct worn path with logs	Maintenance	August 2020
Second spray of new prairie sites	Once the area has regreened to shin height	Site Preparation	September 2020
Address erosion sites	Add rock and gravel, level dock and onramp	Maintenance	September 2020
Controlled burn of new prairie sites	Once the vegetation has died	Site Preparation	October 2020
Buckthorn/honeysuckle/elm treatment along oxbow lake	Initial treatment done with volunteers	Site Preparation	October 2020
Removal of deciduous trees near spruce line	Move vegetation line back 15 feet with volunteers	Maintenance	October 2020
Buckthorn treatment in floodplain forest	Initial treatment of 10% of buckthorn in south portion by specialists	Site Preparation	October 2020, recurring annually in October
Shipping of woody biomass	Removal of treated invasives and any other woody biomass accumulated	Site Preparation	November 2020
Cool season spray	Selectively spray cool season grasses	Maintenance	November 2020

Develop didactic signs and find graphic designer	Create content for park signage	Project Development	November 2020-March 2021
Erect didactic signs	Install the newly developed signs	Environmental Interpretation	May 2021
Broadcast seed and plant plugs	Add plants to the treated new prairie sites	Vegetation Enhancement	May 2021 - June 2021
Mow new prairie sites	Once growing season is over	Maintenance	October 2021
Maintain clear zone around bat house	Remove any vegetation south of house within 10 feet	Maintenance	October 2021, recurring every third year
Buckthorn/honeysuckle/elm retreatment along oxbow lake	Follow-up treatment of missed vegetation / germination	Maintenance	October 2021, 2022, 2023
Fall foliar spray	Spray any invasive removal areas in floodplain forest	Maintenance	November 2021, recurring annually in November
Controlled burn of tallgrass prairie	Mow a dividing line and burn half the prairie	Maintenance	March 2022 - April 2022
Hand-pull weeds in new prairie sites	Remove any unwanted vegetation present	Maintenance	May 2022 - June 2022
Mow burned prairie	Mow the area burned the previous year	Maintenance	March 2023 - April 2023
Controlled burn of prairies	Burn the other half of the tallgrass prairie and two of the new prairie sites	Maintenance	March 2024 - April 2024, recurring every second year in early spring
Vegetation assessment of prairie and floodplain forest	Inventory to determine if diversity goals are met	Plant Establishment	June 2024 - August 2024 recurring every third year in summer
Vegetation enhancement plan	Prepare plan to supplement species if necessary	Enhancement	September 2025 and beyond
Mow burned prairie	Mow the areas burned the previous year	Maintenance	March 2025 - April 2025

FINAL COMMENTS

The goals and strategies detailed in this document could be accomplished with the help of trained volunteers. Potential sources of volunteers include natural science students from the nearby high school and local environmentalist groups.

Undeveloped riparian zones and native prairie remnants are rare bastions of biodiversity and ecological value. Already established and newly proposed efforts to provide habitat to priority species creates a unique opportunity to allow the land to return closer to an ecological equilibrium with its surrounding landscape. Higher levels of biodiversity strengthen the overall landscape's ability to cycle nutrients, support water quality, and reinforce food chains while adding to the site's aesthetic beauty. Not only does this accomplish our conservation goals, it also fosters opportunities for the general public to connect with and appreciate the natural systems of their community. The continued quality and improvement of the natural resources of Rivers' Bend Park increase the beneficial effects of connectivity within the landscape of the Anoka Sand Plain.

RESOURCES

Sources

1. https://www.nature.org/media/minnesota/mn-prairie-conservation-plan.pdf
2. https://files.dnr.state.mn.us/assistance/nrplanning/bigpicture/cwcs/profiles/anoka_sand_plain.pdf
3. https://www.fws.gov/midwest/endangered/insects/rpbb/pdf/ConservationGuidanceRPBBv1_27Feb2018.pdf
4. http://cityoframsey.com/DocumentCenter/View/246/Natural-Resources-Inventory-Report-PDF?bidId=
5. https://www.anokaswcd.org/images/AnokaSWCD/Projects/Active_Projects/Anoka_Nature_Preserve/RRNA_ManagementPlan.pdf
6. https://www.lanecounty.org/UserFiles/Servers/Server_3585797/File/Government/County%20Departments/Public%20Works/Parks/Howard%20Buford%20Recreation%20Area%20Habitat%20Management%20Plan/Executive_Summary_Proposed_HBRA_Habitat_Management_Plan_V3_02012018.pdf
7. https://www.dnr.state.mn.us/ecs/222Mc/index.html
8. https://files.dnr.state.mn.us/eco/mcbs/maps/anoka_ramsey.pdf
9. http://files.dnr.state.mn.us/assistance/nrplanning/bigpicture/cwcs/chapters_appendix/appendix_i.pdf
10. https://conservancy.umn.edu/bitstream/handle/11299/59762/RHA1P3%5b1%5d.pdf?sequence=2&isAllowed=y
11. https://www.leg.state.mn.us/docs/2015/other/150681/PFEISref_2/MDNR%202015a.pdf
12. https://www.nrcs.usda.gov/wps/portal/nrcs/detail/?cid=nrcs143_014206
13. https://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=IILEPJ6040
14. https://link.springer.com/article/10.1007/s10841-017-9968-0
15. https://www.anokaswcd.org/images/AnokaSWCD/Projects/Active_Projects/Anoka_Nature_Preserve/ANP_Ecol_Resto_Mgmt_Plan.pdf
16. https://bwsr.state.mn.us/sites/default/files/2019-07/Updated%20guidelines%20Final%2007-01-19.pdf

17. https://www.rosenet.org/DocumentCenter/View/2611/Conservation-Management-Plan?bidId=

18. https://www.fws.gov/midwest/endangered/insects/rpbb/plants.html

Map 1

Map 2

Map 3

Appendix A

UNIVERSITY OF MINNESOTA
EXTENSION
MINNESOTA MASTER NATURALIST

Buckthorn and Buckthorn Removal

1. Introduction

   Common buckthorn (Rhamnus cathartica) and other variants of buckthorn plants have aggressively taken over portions of Minnesota's forested areas. Once a desired plant for

hedging and ornamental value, and even distributed through the garden and nursery industry, buckthorn is now considered a "restricted noxious weed" by the state Department of Natural Resources. Since 1999, it has been illegal to import, sell, or transport buckthorn in Minnesota.

2. A Little History…and Why Does This Matter?

Common, or European, buckthorn (Rhamnus cathartica) is a woody understory shrub or tree that was imported to North America from Europe as popular hedging plants in the 19th Century, but escaped from the confines of America's yards and gardens long ago. Buckthorn has encroached upon Minnesota's natural areas, establishing itself in our forests and oak savannahs. As happens with many introduced species, buckthorn found no natural controls in its new environment, such as insects and disease, or even native browsing. It quickly became an aggressive, invasive, nuisance plant, taking over the mid-layer of our Minnesota Big Woods Big Rivers areas and habitats. As a thriving flora, why is Buckthorn such a big deal? Common buckthorn has many competitive advantages over our native vegetation. It is extremely hardy, grows vigorously in almost any soil, and tolerates a variety of light conditions. Buckthorn leafs early in the spring, and doesn't drop its leaves until very late in the season, allowing it to photosynthesize well before and well after much of the native understory vegetation, outcompeting other native plants for resources. Despite looking like a lush, green, thriving layer of understory to human eyes, buckthorn offers little to the natural environment. Insects don't eat the leaves, and the deer do not browse on buckthorn either, which puts additional pressure on the already straining native vegetation. Birds will eat the berries, but usually only when desperate for forage, as they offer little in nutrition, however, do act as a powerful laxative, allowing the plant to effectively disperse seeds to new areas.

3. Proper Identification

One of the first, and most important, steps in buckthorn removal is proper identification. Buckthorn bark can look very similar to native plums, juneberry, or cherry, so care must be taken to only remove the invasive, but leave behind the beneficial. Autumn is a great time for buckthorn removal processes. Because it holds its leaves much longer than other woody vegetation, it is often easier to identify in the late fall. Buckthorn bark is smooth and gray with small white bumps on young plants, changing to a ragged, flaky bark as the plant gets older with occasional sharp protrusions. A cut in the bark will reveal yellow/orange sapwood underneath. Branches often end in a sharp thorn. Leaves are a broad elliptic, growing slightly alternate from the stem, almost opposite, with a deeply veined, dark, glossy green color, very small edge serrations. Small nodules, where the leaf stem meets the branch, that some say look like a deer's hoof print, and may be a part of how the plant got its name, are also an identifier.

4. Removal and mitigation strategies

In large tracts of buckthorn infestation, large mature plants should be removed first through a cut and chemical procedure. After the large plants have been cleared from an area, smaller plants and saplings can much more easily be removed through pulling.

- Tagging and cutting the plant Using a non-toxic marking paint, mark plants to be cut 8-10" off the ground, and cut with a saw or sturdy pruners. Cut above the mark, so that the stumps can still be identified for herbicide application after cutting.

- Berries Because buckthorn seeds can remain viable in soil for many years before sprouting, extra care should be taken when working with plants that have fruited to keep these seed bearing fruits on the plant, and off the ground.

- Removal of woody and leafy material While male, or non-berry bearing plants may be removed from the site and set aside to be disposed of without further precautions, plants with berries should be carefully extracted from the site, taking special care to not drop the berries on the ground, then collected on a tarp, sheet, or other material that would prevent berries from dropping off the plant on to the ground. If working with a Natural Resources or Forestry department, arrangements should already have been made for the cut trees to be collected and disposed of properly by staff. The Minnesota Department of Natural Resources guide to the removal and disposal of noxious weeds has guidelines for the appropriate destruction of removed material if you are an individual not working with a formal organization.

- Chemical herbicide on stumps Chemical control for cut stumps include treating the stump immediately after cutting (within 2 hours) with an herbicide containing triclopyr (Garlon 3A/Vastlan, Garlon 4, or other brush killers with triclopyr) or glyphosate (Roundup) to prevent re-sprouting. Herbicides can be applied to cut stumps with a paint-brush, wick applicator such as a dauber, or a low volume sprayer.

- Returning to the site Seeds from the fruit stay viable in soil for many years, so repeated treatments and long-term monitoring are required. Without follow-up control, buckthorn will come back.

5. Conclusion

Common Buckthorn, and its relatives such as Glossy Buckthorn, which was widely distributed through the plant and nursery industry, have run roughshod through Minnesota's forests, wreaking ecological havoc on our precious natural environments. Though care must be taken in any invasive species eradication project, the degree in which buckthorn can impair the forest understory, and the vigor in which it thrives under myriad conditions, demands extra care be taken in order to permanently end this woody shrub's dominance where it doesn't belong.

UNIVERSITY OF MINNESOTA
EXTENSION
MINNESOTA MASTER NATURALIST

Sources:

Minnesota Department of Natural Resources:
https://www.dnr.state.mn.us/invasives/terrestrialplants/woody/buckthorn/index.html
https://www.mda.state.mn.us/plants-insects/minnesota-noxious-weed-list
https://www.dnr.state.mn.us/invasives/terrestrialplants/woody/buckthorn/control.html
https://www.mda.state.mn.us/plants/pestmanagement/weedcontrol/disposalnoxweed

Friends of the Mississippi River:
https://fmr.org/conservation-updates/buckthorn-how-can-shrub-be-so-harmful

City of Burnsville, Minnesota:
http://www.burnsville.org/1092/How-to-Identify

Appendix B

A total of 50-70 of the following native plant species is desired.

Desirable Vegetation			
Scientific Name	**Common Name**	**Layer**	**Ecosystem**
Acer saccharinum	Silver maple	Canopy	Floodplain Forest
Quercus ellipsoidalis	Northern pin oak	Canopy	Floodplain Forest/Prairie
Quercus macrocarpa	Bur Oak	Canopy	Floodplain Forest/Prairie
Quercus rubra	Northern red oak	Canopy	Floodplain Forest
Tilia americana	American basswood	Canopy	Floodplain Forest
Prunus pensylvanica	Pin cherry	Subcanopy	Floodplain Forest
Salix amygdaloides	Peach-leaved willow	Subcanopy	Floodplain Forest
Salix nigra	Black willow	Subcanopy	Floodplain Forest
Amelanchier interior	Inland serviceberry	Shrub	Floodplain Forest
Amorpha canescens	Leadplant	Shrub	Floodplain Forest/Prairie
Ceanothus americanus	New Jersey tea	Shrub	Floodplain Forest
Cornus sericea	Red osier dogwood	Shrub	Floodplain Forest
Prunus americana	Wild plum	Shrub	Floodplain Forest
Ribes americanum	Wild black currant	Shrub	Floodplain Forest
Ribes missouriense	Missouri gooseberry	Shrub	Floodplain Forest
Rosa arkansana	Prairie rose	Shrub	Floodplain Forest/Prairie
Rosa blanda	Smooth wild rose	Shrub	Floodplain Forest
Rubus occidentalis	Black raspberry	Shrub	Floodplain Forest
Vaccinium angustifolium	Lowbush blueberry	Shrub	Floodplain Forest
Viburnum trilobum	Highbush cranberry	Shrub	Floodplain Forest
Achillea millefolium	Common yarrow	Ground	Floodplain Forest/Prairie
Agastache foeniculum	Blue giant hyssop	Ground	Floodplain Forest/Prairie
Allium stellatum	Prairie onion	Ground	Prairie
Andropogon gerardii	Big bluestem	Ground	Floodplain Forest/Prairie
Anemone cylindrica	Thimbleweed	Ground	Floodplain Forest/Prairie
Aquilegia canadensis	Red columbine	Ground	Floodplain Forest
Artemisia ludoviciana	Prairie sage	Ground	Prairie
Asclepias syriaca	Common milkweed	Ground	Floodplain Forest/Prairie
Asclepias tuberosa	Butterflyweed	Ground	Prairie
Asclepias verticillata	Whorled milkweed	Ground	Floodplain Forest/Prairie
Astragalus canadensis	Canada milkvetch	Ground	Floodplain Forest/Prairie
Baptisia alba	White wild indigo	Ground	Floodplain Forest/Prairie
Bouteloua curtipendula	Side-oats grama	Ground	Floodplain Forest/Prairie
Bouteloua gracilis	Blue grama	Ground	Prairie
Bromus ciliatus	Fringed brome	Ground	Floodplain Forest

Bromus kalmii	Kalm's brome	Ground	Floodplain Forest/Prairie
Calylophus serrulatus	Toothed evening primrose	Ground	Prairie
Carex brevior	Plain's oval sedge	Ground	Prairie
Carex pensylvanica	Pennsylvania sedge	Ground	Floodplain Forest/Prairie
Chelone glabra	White turtlehead	Ground	Floodplain Forest/Prairie
Coreopsis palmata	Prairie coreopsis	Ground	Prairie
Dalea candida	White prairie clover	Ground	Prairie
Dalea purpurea	Purple prairie clover	Ground	Prairie
Dalea villosa	Silky prairie clover	Ground	Prairie
Danthonia spicata	Poverty oatgrass	Ground	Prairie
Delphinium virescens	Prairie larkspur	Ground	Prairie
Desmodium canadense	Canada tick trefoil	Ground	Floodplain Forest/Prairie
Dicentra cucullaria	Dutchman's breeches	Ground	Floodplain Forest
Echinacea angustifolia	Narrow-leaved purple coneflower	Ground	Prairie
Echinacea pallida	Pale purple coneflower	Ground	Prairie
Elymus canadensis	Canada wild rye	Ground	Floodplain Forest/Prairie
Elymus hystrix	Bottlebrush grass	Ground	Floodplain Forest/Prairie
Elymus trachycaulus	Slender wheatgrass	Ground	Floodplain Forest/Prairie
Fragaria virginiana	Wild strawberry	Ground	Floodplain Forest/Prairie
Geranium maculatum	Wild geranium	Ground	Floodplain Forest
Geum triflorum	Prairie smoke	Ground	Prairie
Helianthus maximiliani	Maximilian sunflower	Ground	Prairie
Helianthus pauciflorus	Stiff sunflower	Ground	Prairie
Heliopsis helianthoides	Common oxeye	Ground	Floodplain Forest/Prairie
Heterotheca villosa	Prairie goldenaster	Ground	Prairie
Hydrophyllum virginianum	Virginia waterleaf	Ground	Floodplain Forest
Juncus greenei	Greene's rush	Ground	Prairie
Juncus tenuis	Path rush	Ground	Prairie
Koeleria macrantha	June grass	Ground	Floodplain Forest/Prairie
Lespedeza capitata	Round-headed bush clover	Ground	Prairie
Liatris aspera	Rough blazing star	Ground	Floodplain Forest/Prairie
Liatris cylindracea	Cylindric blazing star	Ground	Prairie
Liatris punctata	Dotted blazing star	Ground	Prairie
Lithospermum carolinense	Carolina puccoon	Ground	Floodplain Forest/Prairie
Lupinus perennis	Wild lupine	Ground	Floodplain Forest/Prairie
Maianthemum racemosum	False Solomon's seal	Ground	Floodplain Forest
Monarda fisulosa	Wild bergamot	Ground	Floodplain Forest/Prairie
Oenothera biennis	Evening primrose	Ground	Floodplain Forest/Prairie
Panicum virgatum	Switchgrass	Ground	Floodplain Forest/Prairie
Pedicularis canadensis	Wood betony	Ground	Floodplain Forest/Prairie
Penstemon grandiflorus	Large beardtongue	Ground	Prairie

Physostegia virginiana	Obedient plant	Ground	Floodplain Forest
Pycnanthemum virginianum	Virginia mountain mint	Ground	Prairie
Ranunculus fascicularis	Early buttercup	Ground	Floodplain Forest/Prairie
Ratibida pinnata	Gray-headed coneflower	Ground	Prairie
Rudbeckia hirta	Black-eyed Susan	Ground	Floodplain Forest/Prairie
Sanguinaria canadensis	Bloodroot	Ground	Floodplain Forest
Schizachyrium scoparium	Little bluestem	Ground	Floodplain Forest/Prairie
Solidago flexicaulis	Zigzag goldenrod	Ground	Floodplain Forest/Prairie
Solidago nemoralis	Gray goldenrod	Ground	Floodplain Forest/Prairie
Solidago ptarmicoides	Upland goldenrod	Ground	Floodplain Forest/Prairie
Solidago rigida	Stiff goldenrod	Ground	Prairie
Solidago speciosa	Showy goldenrod	Ground	Floodplain Forest/Prairie
Sorghastrum nutans	Indian grass	Ground	Floodplain Forest/Prairie
Spartina pectinata	Prairie cordgrass	Ground	Prairie
Sporobolus cryptandrus	Sand dropseed	Ground	Prairie
Symphyotrichum ericoides	Heath aster	Ground	Floodplain Forest/Prairie
Symphyotrichum laeve	Smooth blue aster	Ground	Floodplain Forest/Prairie
Symphyotrichum novae-angliae	New England aster	Ground	Prairie
Symphyotrichum oolentangiense	Sky-blue aster	Ground	Floodplain Forest/Prairie
Symphyotrichum sericeum	Silky aster	Ground	Floodplain Forest/Prairie
Symphyotrichum urophyllum	Arrow-leaved aster	Ground	Floodplain Forest/Prairie
Thalictrum dasycarpum	Tall meadow rue	Ground	Floodplain Forest/Prairie
Tradescantia occidentalis	Western spiderwort	Ground	Floodplain Forest/Prairie
Verbena stricta	Hoary vervain	Ground	Prairie
Veronicastrum virginicum	Culver's root	Ground	Floodplain Forest/Prairie
Viola canadensis	Canadian white violet	Ground	Floodplain Forest
Viola lanceolata	Lance-leaved violet	Ground	Floodplain Forest
Viola palmata var. pedatifida	Prairie birdfoot violet	Ground	Floodplain Forest/Prairie
Viola pedata	Birdfoot violet	Ground	Floodplain Forest/Prairie
Viola pubescens	Downy yellow violet	Ground	Floodplain Forest
Viola sororia	Downy blue violet	Ground	Floodplain Forest/Prairie
Zizia aurea	Golden Alexander	Ground	Floodplain Forest/Prairie