

Long-Term Sustainability of Natural Resources in Brooklyn Park



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Resilient Communities Project

UNIVERSITY OF MINNESOTA

Driven to DiscoverSM

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Long-Term Sustainability of Natural Resources A Resilient Communities Project

In Partnership with
The University of Minnesota and
The City of Brooklyn Park
January 6, 2017



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Introduction

Brooklyn Park, Minnesota is a diverse peri-urban community located on the west bank of the Mississippi River, northwest of the Twin Cities metropolitan area. As the sixth-largest city in the state and the fourth-largest city in Hennepin County, Brooklyn Park covers approximately 27 square miles, approximately 85 percent of which is developed land. The city is unique in that more than half of its residents identify as people of color- its population already resembles the diversity that Minnesota expects to see statewide by 2040. Because of the opportunities and challenges being home to a range of cultures present, the city government has taken great strides to engage diverse voices in its decision making processes (Kimble 1). As a proponent of equity and community engagement in both word and action, Brooklyn Park's mission is to be "a thriving community inspiring pride where opportunities exist for all."

Brooklyn Park was named this year's partner for the University of Minnesota's Resilient Communities Project (RCP). Each year, the Center for Urban and Regional Affairs reviews multi-project proposals from local communities and selects one city to assist in the effort to further its strategic planning priorities using resources offered by the university, as well as the 48 other organizations that have volunteered to partner with the project. The mission of the RCP is "to connect communities in Minnesota with the wide-ranging expertise of University of Minnesota faculty and students to address pressing local issues in ways that advance sustainability and resilience." Brooklyn Park, whose population of color grew from 1 in 10 people to 1 in 2 over just the past 25 years, continues to experience demographic change today. And as the extension of major roads is expected to create more traffic through the area, new projects to expand development (primarily north of the city center) are already underway. Now is a crucial time to ensure that planning for growth and ecological protection is being approached in the most conscientious and forward-thinking possible way. Brooklyn Park, having recognized this opportunity, is seeking to develop in a way which is socially, financially, and environmentally sustainable.

The Long-Term Sustainability of Natural Resources Project was proposed to mitigate Brooklyn Park's absence of a natural resource management plan as one of twenty-five projects that constitute the 2016 RCP. Aimed at improving management of the 60 well-loved parks and public lands within its borders, our goal as participants in this project was to research and compile best practices specific to Brooklyn Park's existing infrastructure and resources, as well as its future needs and aspirations ("Resilient Communities Project: Proposal 2016" 2, 30). As students in the graduate level course "Sustainable Land Use Planning and Policy (Environmental Sciences Policy and Management 5245)" in the Natural Resource Science and Management Department at the University of Minnesota, we developed an integrated framework designed to help Brooklyn Park create inclusive natural environments that will better endure biological threats like development and climate change while also acting as equitable recreational space for the community.

Introduction

Summary of Recommendations

This document will focus on two goals the city is interested in pursuing: “Planning for Protected Areas” and “Promoting Equity and Accessibility in Parks and Trails”. For each goal, we focused on several components of natural resource management that were selected based on discussions with parks and trails staff and other area managers, as well as our own expertise and interest areas. The Planning section will contain information on protecting riparian areas, prairie restoration guidelines, and a case study on controlling Canada geese impacts. The Equity and Accessibility section will address preservation of cultural connections, creation of a river trail, and multi-use trail development.

Planning for Natural Areas

Areas of significance relating to natural resources are complex and ever changing. It is under an adaptive natural resource management approach that these uncertainties can be properly addressed, monitored, and adjusted for accordingly. By utilizing an evaluation system that ranks areas based on both ecological and cultural significances, in addition to building steps for more intimate collaborations among various agencies and levels, maintenance of those natural areas can be better planned for the long-term benefit and enjoyment of the community. The components of natural resource management that we focused on for the Planning for Protected Areas goal—protecting riparian areas and restoring prairie—are summarized below.

Protecting Riparian Areas

Brooklyn Park is required by Executive Order 79-19 and the Department of Natural Resources to include the Mississippi River Corridor Critical Area in its planning process and is encouraged to adopt ordinances to regulate protection of the land adjacent to the river (EO 79-19, 1973). While the DNR is currently establishing a new rule, requirements of the city remain the same. The majority of land within Brooklyn Park that is in the corridor is private, though Coon Rapids Regional Park and River Park are significant features within the corridor. Brooklyn Park should target private landowners within the corridor to conserve and restore riparian zones on their property to best protect the Mississippi River.

Restoring Prairie Areas

Overall the key to maintaining a diverse prairie is implementing a variety of treatments. If possible, the city should implement a prescribed fire rotation since the prairie will respond best to that treatment. If burning is unfeasible, part of the prairie ($\frac{1}{4}$) should be mowed each year. The timing should be varied each year so that a particular species or group is not favored. A partnership with Three Rivers Park district should be established so that they can provide future technical expertise about managing natural areas with Brooklyn Park.

Promoting Equity and Accessibility in Parks and Trails

The four components of natural resource management that we focused on for the Promoting Equity and Accessibility in Parks and Trails goal—preserving and celebrating cultural connections, encouraging equitable access of parks and trails, developing a river trail, and selecting surfaces for accessible multi-use trails—are summarized below.

Preserving and Celebrating Cultural Connections

Through the implementation of placemaking strategies and the identification of culturally significant sites in the Brooklyn Park area, equity in Brooklyn Park will improve. Adhering to equity frameworks that align with Thrive 2040 best principles is key to future planning decisions. Identifying culturally significant sites through tribal consultation of the Dakota tribes and the Anishinaabe tribes of Minnesota to better represent indigenous values and cultural practices. This tribal consultation would lead to a designation of a Brooklyn Park Tribal liaison who would be the contact person when working with tribes in Minnesota, improving their commitment to equity and cultural significance in the Brooklyn Park area.

Encouraging Equitable Access To Parks and Trails

By studying demographic data and actively involving community members in the process, parks and be planned and designed to accommodate and encourage users of diverse backgrounds. Parks and public spaces have long served as meeting points for communities, gathering spaces for families, and respites from the hustle and bustle of urban life. For parks to continue serving these needs, parks must adapt to their users and ensure that all are welcome and able to enjoy park space. This study examines River Park as a case study and makes recommendations for a new planning process that involves community members, and new amenities intended to serve the surrounding neighborhoods.

Developing a River Trail

Developing water recreation opportunities on and adjacent to the Mississippi River through the creation of a water trail can increase public access and engagement with the river and familiarize the Brooklyn Park community with the river's natural resource benefits. The section of the river within the boundary of Brooklyn Park offers a unique natural setting between the suburban pool above Coon Rapids Dam and the urban development ten miles downriver in downtown Minneapolis (NPS, 2014). With a relatively small effort, Brooklyn Park can tap into existing resources and develop a water trail to increase local access to and stewardship of the Mississippi River.

Selecting Surfaces for Accessible Multi-Use Trails

Brooklyn Park is dedicated, more than ever before, to planning its public spaces in a way which reflects a commitment to both equitable access and sustainable natural resource management. To ensure that Brooklyn Park's suburban trails are constructed and managed with these objectives in mind, it is crucial that the city of Brooklyn Park adopt practices toward trails that orchestrate the least possible ecological disturbance. After meeting the base requirements that trails adhere to realistic budgetary restrictions and offer use to people of all cultural backgrounds, recreational interests, and physical abilities, there remain countless ways that we as humans can more consciously occupy natural spaces.



Summary

Brooklyn Park's Recreation and Parks Department has created a highly dynamic park and natural area system that promotes community livability and resident health, provides education and support, and contributes to both the character and beauty of the City. Tasked with managing and maintaining not only the City's 60+ parks and natural areas, the facilities and maintenance crew also cares for the City's greenspaces and road right-of-ways. Eighteen full-time and 10 summer seasonal workers strive to meet the expectations of both the department as well as members of the community. After conducting multiple interviews, we learned that maintenance staff face numerous challenges regarding natural resource management due to limited technical expertise, logistical and financial constraints, as well as higher prioritized items taking precedence. This can lead to prolonged periods without proper maintenance resulting in degraded systems that are even more challenging to restore.

It is the long-term care of the resources that exhibit a city's commitment to providing natural places and experiences that add to the quality of life for its residents. With limited opportunities and numerous constraints, it is of the utmost importance that maintenance staff have a management system that promotes efficiency and effectiveness, as well as links networks of existing resource professionals in Brooklyn Park with other agencies.

Goals

- Goal: Acquire, protect, and plan for enhancement/conservation of Brooklyn Park's natural areas.
- Rationale: As development surges forward in Brooklyn Park, inclusion of natural resources within long-term plans regarding acquisition, protection, and enhancement are more important than ever.

- Goal: Promote efficiency, effectiveness, and expertise from within the city of Brooklyn Park and through collaboration with partnering agencies, especially during the planning process.
- Rationale: Opportunities for development and designation of natural areas increase through partnerships and where multiple jurisdictions overlap. However, once projects have been implemented, the task of monitoring and maintenance is left up to an already overburdened crew.

Recommendations

- Adopt and use an Adaptive Natural Resource Management approach on publicly-owned open space as well as natural areas that includes evaluations based on program monitoring within its framework.
- Identify a common purpose for managing resources and natural areas through the development of a Memorandum of Understanding in areas where multiple agencies have jurisdiction. Ideal opportunities to implement this strategy occur during the planning process and must include maintenance and management to ensure tasks can be properly assigned and realistic time frames scheduled.
- Re-evaluate how parks and greenspaces are prioritized to include factors that represent the value of natural resources developing criteria that identifies and establishes priority in natural areas for the acquisition, protection, restoration, and long term viability of the plants, wildlife, and the natural processes found there.

Supporting Information

Adaptive Natural Resource Management

Sustainable design and maintenance is any practice that protects and enhances natural resources while providing a realistic expectation for outcomes based on pre-defined goals, existing conditions and measureable changes, and available resources (Lyle 1999). An adaptive natural resource management approach complements sustainable practices, as it is an unending revolving door of design, implementation, monitoring for evaluation, and adjusting as necessary. The basic concept of this approach follows the assumption that uncertainty within the system exists (i.e. natural resource systems, decision-making systems, political systems), and attempts to systematically gather and integrate information with the goal of overall improvement (Williams 2011). Learning is the key output of the adaptive management process and implies that the production of knowledge (through policy and management actions) is distributed among various factions and

lastly, that it is carried out (Stankey et al 2005). This acknowledgement of uncertainty is one of the reasons this management strategy is effective and widely used within natural resources. Continuous information gathering and adjustment ensure that the cyclical motion necessary to fulfil natural resource goals isn't broken (Figure 1).

A starting point to begin integrating this process in natural resource systems requires baseline data on the current state of natural resources available (natural resource inventory), an understanding of how to effectively manage these resources (Best Management Practices), and the ability to evaluate efforts through monitoring programs (research and surveys). These steps depend on the availability of trained staff as well as the designation of natural resources importance in the participating community. By utilizing this multi-step approach in conjunction with recommendations provided for natural resource enhancement, Brooklyn Park can provide recreational opportunities while fulfilling the holistic responsibility of natural resource protection at the community level.

Identifying a Common Purpose

Allocating time and resources for management can be a challenge when multiple parties assume ownership over an area, yet only one party is responsible for implementing the required practices. Logistic and financial limitations, coupled with a limited understanding of the ecological processes at hand create a working environment where objectives go unchecked, or proper management isn't applied. In the case of Brooklyn Park, maintenance struggles to find a clear and outlined purpose regarding its natural resources and natural areas which directly effects their ability to properly manage (personal communication, 2016). Clearly identifying objectives formulated through collaborative discussions including all stakeholder parties is an integral part of productive decision making and facilitates long term success. This step, commonly overlooked regarding natural resources, can be more easily interpreted as "direction setting" in the collaborative process (Shelin and Chavez 1995). It is during this stage where goals are established, ground rules are set in place, and subgroups can

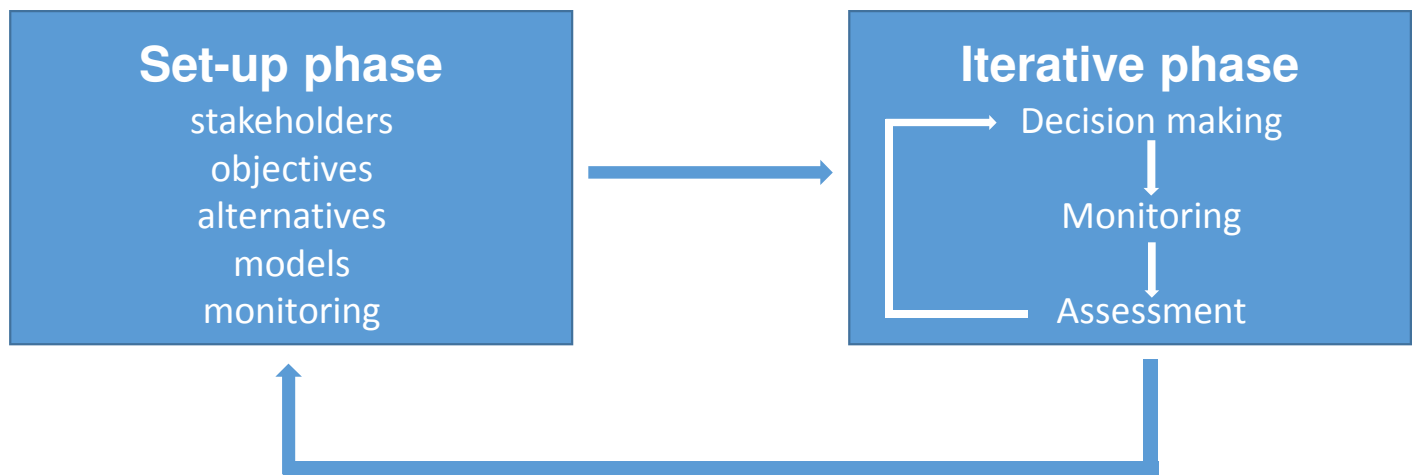


Figure 1. Two-phase learning of adaptive management. Technical learning involves the iterative sequence of decision making, monitoring, and assessment. Process and institutional learning involves periodic re-evaluation and the setup elements. Adapted from Williams 2011.

be organized to fulfil directives. Incorporating maintenance and management during the project planning process will ensure that time, money, and the expertise is available to create an efficient and effective implementation crew.

Memorandums of understanding (MOU) are a common tool used when multiple agencies work collaboratively, providing documentation that demonstrates the consultation and coordination of responsibilities to be upheld by each involved party (Trivedi 1990). While the facilities and maintenance department is not an agency in its own, inclusion of them as the executor requires their involvement and acceptance. Using the experience of individuals who have intimately worked with Brooklyn Park's natural resources, challenges associated with maintenance in the community can be highlighted early when assessing the success and longevity of a project. Development of an MOU can be a relatively easy process once the direction setting stage has been completed and the collaborative process moves into structuring (simple guidelines provided- appendix Figure 17).

A MOU Usually Includes the Following:

1. Identification of organizations and lead principals of both organizations (name and contact information).
2. Purpose of the project that is to be completed.
3. Procedures for implementing the project.
4. Timelines in which the project is to be completed.
5. Resources, if needed, to complete the project.
6. A statement allowing for adjustments or additions to the MOU.
7. Any disclaimers that should be considered as part of completing the project.
8. Signed agreement of principal leaders of each partnering organization.

Adopted from Share Academy: Guidance on Developing a Memorandum of Understanding

Brooklyn Park has a diverse arrangement of parks utilized by an even more diverse community. Through hard work, public engagement, and programs, the City has created safe recreational places for many of its residents as well as visitors from neighboring communities. Highly connected trail systems, unique parks, and progressive thinking make up the foundation for Brooklyn Park's highly recognized recreation and park system. In Brooklyn Park, over 90% of its residents consider the recreation and park system to be "excellent-good" (Parks and Recreation Master Plan 2012). There is no doubt that the City is taking necessary steps, utilizing knowledge and community engagement, to provide the community with what it desires. However, no strategy is in place to manage natural resources and natural areas aside from those distinguished as "parks". Under the current system, the management of a natural resource area is most likely to take place when multiple land use practices overlap; such as community parks and the regional parks and trail systems. When this is not the case, maintenance staff must learn to recognize areas of natural resource importance and allocate maintenance and management accordingly.

Addressing maintenance responsibilities, it is important to understand how a city associates the value of natural resources. Using the "Facility Maintenance Ranking System for Parks and Rec Areas" in the Brooklyn Park Parks and Recreation Master Plan (2012), this system identifies factors such as "visibility", "use", and "development" combined with varying degree levels (i.e. low, medium, high) to determine the level of priority assigned, and tasks are completed accordingly; high priority to low priority. Thus areas most likely to receive routine and required maintenance are associated with high levels of use and areas of high visibility, commonly being locations with heavily scheduled programmed activities. Considering natural resources fail to match such criteria, it's not until the lower levels of ranking do we find natural areas. Based on the amount of maintenance required, this ranking system is accurate; natural areas typically require less maintenance than highly groomed athletic fields and street right-of-ways therefore management need only to occur a few

times a year at these locations. However, the issue arises when maintenance staff resources become exhausted and effort fails to be allocated correctly on lower priority areas (personal communication, 2016).

To better support fulfillment of MOU expectations and cooperation under an adaptive management plan, criteria for evaluating the city's natural resources should be re-evaluated. Natural resource evaluation criteria generally fall under three categories: ecological (abiotic or biotic); cultural; and planning and management (Smith and Theberge 1986). When assessing ecological criteria, factors such as rarity, diversity, and size are most widely used as indicators of significance. Keeping scale under consideration, qualitative and quantitative approaches are undergone to assign weights to various indicators. Areas can be designated as culturally significant for a variety of reasons including scientific, historical, ethnic, public, and legal. Once the significance of an area has been established using ecological and cultural criteria, only then can an area's importance be evaluated from a planning and management standpoint.

We recommend Brooklyn Park incorporate criteria pertaining to the ecological and cultural factors associated with natural areas prior to assigning ranks for maintenance staff. Although somewhat dated, Baschak and Brown (1995) provide an easily interpretable overview regarding the framework for ecological planning, design, and management for urban river greenways. Included in the article is a case study assessing both natural and cultural resources of the South Saskatchewan River Valley in Saskatoon, Canada. A re-evaluated ranking system weighting natural resources appropriately may provide maintenance and facilities staff a better opportunity to allocate time and effort promoting the use and enjoyment of natural resource areas by active community members





Summary

Brooklyn Park is located in the Mississippi River Corridor Critical Area, which requires the city to include the area in its comprehensive plan and submit the plan to the Department of Natural Resources (DNR) and the Metropolitan Council for review. The city has made efforts to protect these areas; however, according to DNR staff, more work needs to be done to protect riparian buffer zones, particularly on private lands. The rule regarding the critical area is subject to change soon, though the impacts on Brooklyn Park will be minimal, addressing land classification along the river. Regardless of the change, the city should perform a land survey of the corridor to find the highest priority lands to focus on conservation efforts. This section also outlines two ways that the city could encourage private landowners to conserve and restore riparian vegetation: educational resources and a recognition program that acknowledges land owners that are good stewards of the river.

Goals

- Identify riparian buffer zones that require restoration or conservation within the Mississippi River Corridor
- Rationale: Conserving and restoring riparian zones is one of the more effective ways of maintaining river health

- Encourage private landowners within the corridor to plant riparian vegetation along the waterway
- Rationale: The majority of land within the Mississippi River Critical Area Corridor is privately owned and should be maintained with good stewardship practices

Recommendations

- Perform a land survey of the corridor to find highest priority lands to restore or preserve
- Develop a best practices document for private landowners installing riparian vegetation
- Develop a recognition program for landowners that install and preserve riparian vegetation

Riparian Zones

Riparian zones are considered an important component to maintain stream ecosystem health (Naiman, 1998). Some of the many benefits that riparian zones provide include stabilization of sediment, prevention of river channel widening, microclimate control, connecting biological corridors, and controlling non-point sources of pollution through sediment trapping. Maintaining and restoring these zones also improves the visual quality and recreational value of the river. Creating a landscape and site perspective will help guide what vegetation would be most effective. Perspective should include mapping past and present floodplain plant communities, analyzing soil types, characteristics, and moisture content, microclimate conditions, and topographic features (MN DNR). Riparian vegetation in Brooklyn Park homes located along the river can be designed to improve water quality, stabilize stream banks, prevent downstream flooding, or to attract wildlife (Fisher and Fischenich, 2000).

Current and Future State Regulation

Brooklyn Park's 2030 Comprehensive Plan included the Mississippi Stewardship Plan that is in compliance with the Minnesota State Legislature Executive Order 79-10, the current rule in place through the Mississippi River Corridor Critical Area. With regards to the Mississippi River Corridor, there are goals to protect surface water resources, improve natural environments, and protect significant natural features within the corridor (Brooklyn Park, 2008). The third goal in particular has an objective that references residential lands. These include working with local landowners to expand buffer zones, encouraging landowners to register properties with conservation organizations, and hosting events that build a relationship between landowners and the river. These are a good start, but the area is still assigned a mean medium health score and the lowest recorded index score is given a low health score (MN DNR, 2016). Therefore, the plan needs to be updated to improve these ratings to ensure Brooklyn Park is doing its part in maintaining the health of the Mississippi River corridor.

Under the current rule, Brooklyn Park is considered an urban developed area. The proposed rule would change the classification to River Neighborhood District and Separated from River District (MN DNR, 2016) (Figure 2). Even with this classification change, building height, river setback, and bluff setback will not change for properties in the corridor. The rule is being changed to provide more clarification on what homeowners can and cannot do on their property. Homeowners will have to obtain permits from Brooklyn Park if they plan on intensive vegetation removal or if they are in an ecologically sensitive area.

Brooklyn Park also includes the corridor in its zoning codes which currently state that "natural vegetation shall be protected wherever practical" in its code (Brooklyn Park, MN Code of Ordinances, Title XV, Chapter 151: Subdivisions). However this leaves a lot of room for judgment and does not guarantee the preservation of riparian vegetation. The DNR will be creating a model ordinance with the new rule that cities can adopt, or Brooklyn Park can update their code to more strictly manage riparian vegetation, especially for private land owners.



Figure 2, River Neighborhood Districts

Private Landowner Engagement

In order to engage private landowners in land stewardship practices, Brooklyn Park should provide resources that help guide vegetation choices and maintenance of the riparian zones. It should outline conducting a site analysis, invasive non-native species to remove, native plant mixes that would help increase biodiversity of the shoreline, appropriate width, and any required permitting (DNR, 2004).

Site analysis should include biological history, identifying existing vegetation, analysis of soil types and characteristics, topographic features, and microclimatic conditions (DNR, 2004). This will help to determine appropriate species to plant. Invasive species to monitor are black locust, Canada thistle, common buckthorn, exotic bush honeysuckle, garlic mustard, purple loosestrife, reed canary grass, Siberian elm, smooth brome grass, and spotted knapweed (NPS). Vegetation should include trees, shrubs and native herbaceous plants and should be species diverse to provide multiple benefits (Fisher and Fischenich, 2000). Width of the riparian buffer varies in scientific literature and depends on the targeted contaminant. For water quality protection a width of 5 to 30 meters is recommended and for streambank stabilization a buffer of 10 to 20 meters is recommended. Connectivity of these buffers is highly recommended because it makes individual buffers all the more effective.

Brooklyn Park should recognize good stewards for their riparian buffer projects. Programs that assign landowners as “Habitat Stewards” or “River Restorer” give a sense of accomplishment and pride in maintaining a natural resource for a greater good. Provided is a yard sign template that the city could consider printing for houses that are actively working to protect their riparian lands (Figure 3). A sign could also act as a means to shift the cultural norm of what river adjacent homes backyards should look like. Home owners landscaping decisions are highly influenced by what we think the neighbors prefer rather than what they personally want (Nassauer, 2009). There is a shared value to maintain the appearance of the neighborhood, so it is important to shift the cultural norm of neighborhood within the corridor to include riparian vegetation. A sign would help raise awareness and encourage other homeowners to maintain and restore their riparian land.

Best Management Practices for Private Landowners

Below is a guideline for the checklist that landowners can use in planning their project

- Perform site analysis to determine existing vegetation, soil characteristics, topography, and microclimate conditions
- Pick appropriate plant mix that includes shrubs, trees, and grasses
- Remove non-native invasive plants
- Plant your riparian buffer strip
- Display your “River Restorer” sign
- Encourage your neighbors to plant a buffer as well



Figure 3, Yard Sign Template



Summary

Overall the key to maintaining a diverse prairie is by implementing a variety of treatments. If possible the city should implement a prescribed fire rotation since the prairie will respond best to that treatment. If burning is unfeasible due to the constraints of being in the city, part of the prairie, approximately one quarter should be mowed each year. The timing of the mowing should be varied each year so that you don't end up favoring a group or one particular species. There is also an opportunity for the city to convert some areas of turf grass into prairie. The cost of establishing the prairie would have a up front cost, however after three years that cost would be absorbed by the savings in the reduction of management of turf grass (Tiller 2013). By establishing new prairies throughout the city, the city could reduce the amount of time park workers have to spend mowing turf grass, which would allow them to focus on other of types of natural resource management in the city. Brooklyn Park should establish a partnership with Three Rivers Park district in order to capitalize on their technical expertise. A future partnership with Three River Park district could combine their experience managing natural lands with Brooklyn Parks' manpower to achieve better management practices of natural lands within Brooklyn Park

Goals

- Maintain the prairie ecosystems that exist in Brooklyn park
- Rationale: Prairies provide a variety of habit for wildlife and numerous ecosystems services, which should be maintained.

- Provide Brooklyn Park with management practices that can be implemented on the prairies in Brooklyn Park
- Rationale: Brooklyn Park lacks the technical experience to manage prairie systems by providing them with best management practices they can start to care for the prairies within their city.

- Establish a partnership with Three Rivers Park district
- Rationale: Three river Parks district has more technical expertise in managing natural ecosystems, so establishing a partnership would be beneficial to the city.

Recommendations

- Brooklyn Park should implement a management strategy following the general guidelines outlined in this report, for the prairie located in River Park since it was deemed by Hennepin County as an area of ecological significance (Figure 5)

- At minimum Brooklyn Park should mow different sections of the prairie each year (approximately $\frac{1}{4}$)

- Start building a partnership with Three River Parks district

Introduction

Prairies are among the rarest natural communities in North America; because of their fertile soils most were converted to agriculture (Svedarsky et al 2002). What remained was frequently lost to development. Brooklyn Park is a prime example of that fact, as we see in Figure 4 (City of Brooklyn Park: Natural Resources Inventory and Minnesota Land Cover Classification Systems Mapping 2008), Brooklyn Park was composed of mainly prairie prior to European settlement. Prairies provide habitat for a variety of plants and animals and also provide ecosystem services beneficial to people such as water filtration (Minnesota Prairie Plan Working Group 2011).

According to the Natural Resource Inventory and Land cover classification report prepared by Hennepin County, herbaceous land cover types were the most prevalent of the natural and semi-natural land cover types. They accounted for 8.6% of Brooklyn Parks total land area (1457.5 acres in

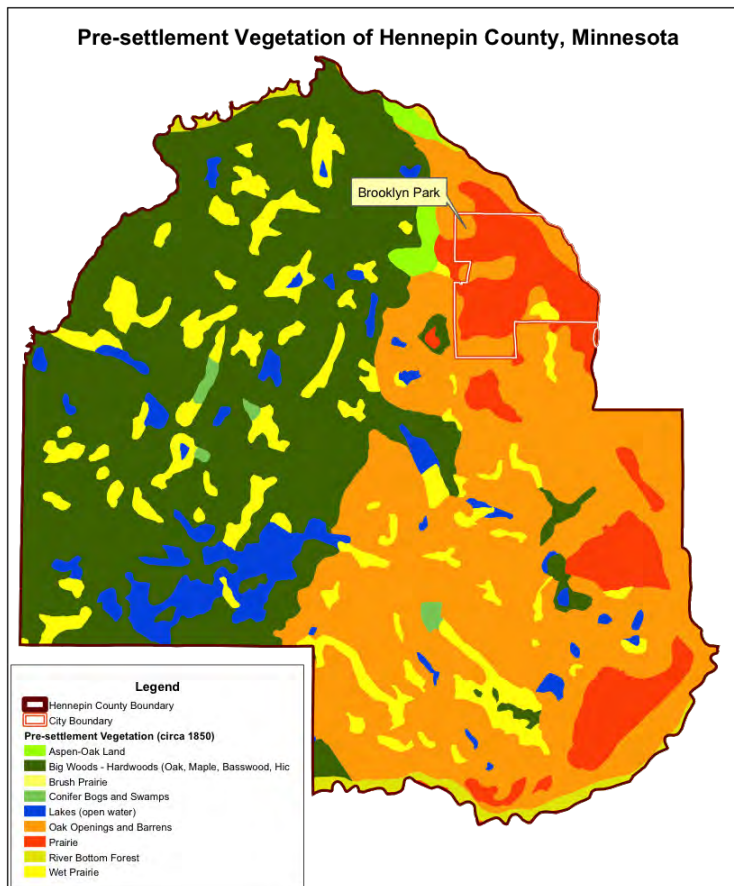
total) (City of Brooklyn Park: Natural Resources Inventory and Minnesota Land Cover Classification Systems Mapping 2008), Information gained through personal communications suggested that one of the most helpful things to be gained from this project was a guidebook on how to manage the prairies within the city, it is for this reason that I will present a list of general management practices that Brooklyn park can use to help maintain these rare ecosystems.

This section will also address the comparison between prairie establishment and management and turf grass management. This comparison will not only look at the economic costs associated with both, but it will also consider the time needed to manage each system.

Prairie Restoration

Once prairie management strategies in current prairies have been implemented the city can look forward to the creation of new prairies. The creation of new prairies throughout the city will provide a variety of ecosystem services, will reduce the time spent mowing turf grass, and will reduce the cost of management. Although there is an up front cost with prairie restoration, the project breaks even in a relatively short amount of time. Using the cost of hundreds of Applied Ecological Services projects and the cost of maintenance in several Midwestern Municipal parks Troy Anderson, the director, has compared the cost of installation and maintenance of native prairies to the cost of maintaining tuft grass. He found that the break-even point was at three years as shown in Figure 6.

It is in this phase that a partnership with Three Rivers Park district will pay dividends. Three Rivers Park district can use their expertise to help evaluate potential sites for prairie restoration, then after a site has been identified Three River Park district could provide the plan while the city can provide the manpower to implement the plan.



Pre-settlement Vegetation
City of Brooklyn Park Land Cover Classification and Natural Resources Inventory

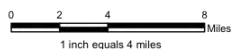


Figure 4, Pre-Settlement Vegetation

Ecologically Significant Natural Areas

City of Brooklyn Park Land Cover Classification and Natural Resources Inventory

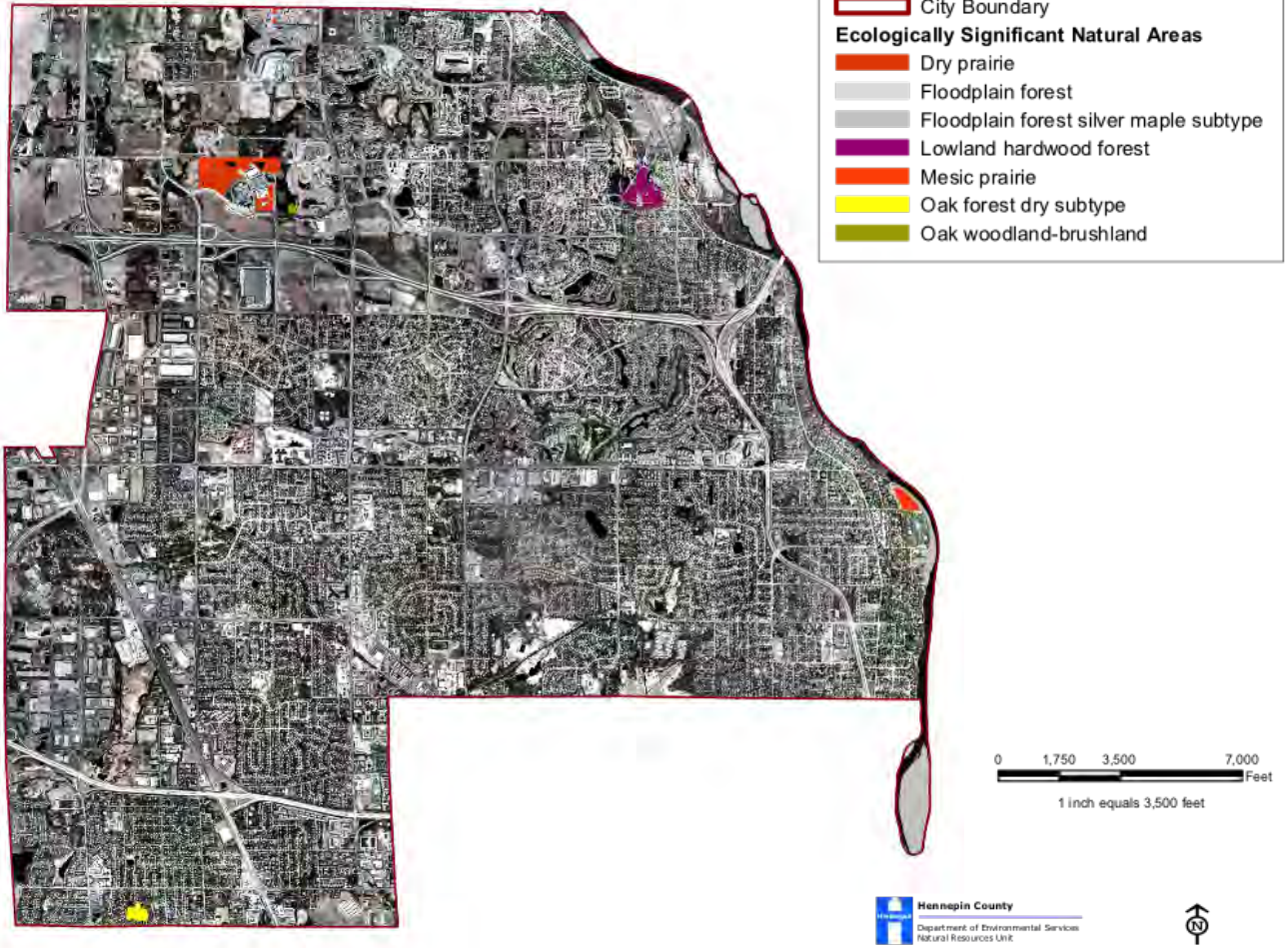


Figure 5, Ecologically Significant Natural Areas

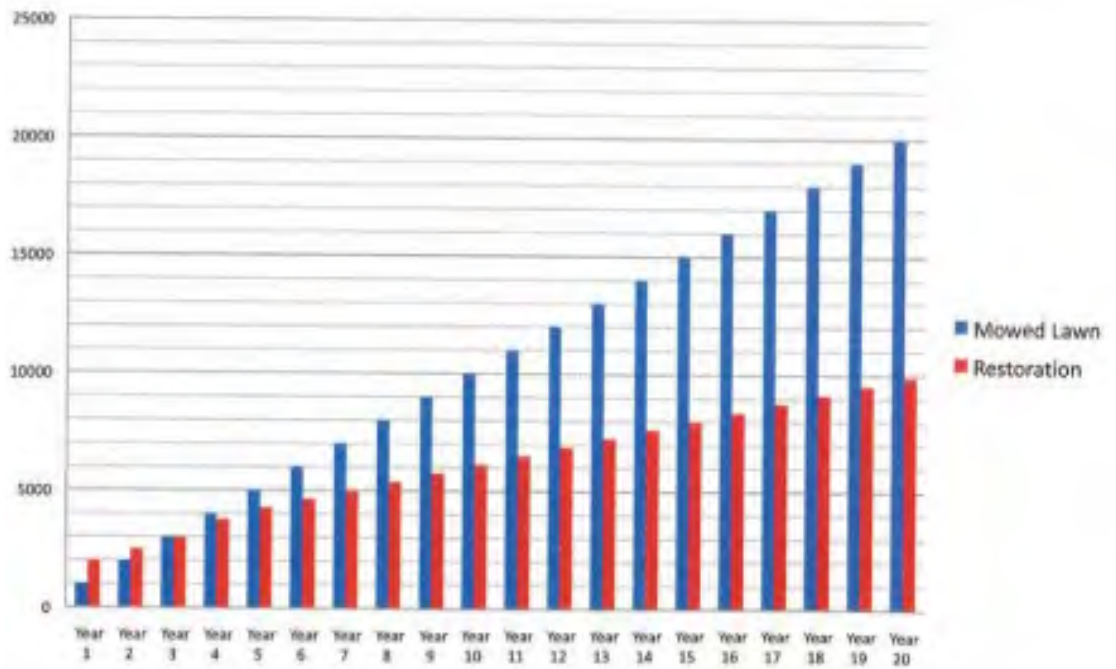


Figure 6, Yearly Cost Comparison of Mowed Lawn and Restoration Areas



Summary

Equity in parks is a concept in planning that is touched on but fully implemented. During the equity planning phase, most stakeholders are on board due to the nature of equity. It supports the collaboration and place-making of diverse communities and populations. Brooklyn Park's demographic profile has changed rapidly over the past 25 years. Recent trends show the population of whites has decreased by about 22% while most non-white populations have increased (Thrive MSP 2040 Regional Parks Policy Plan, 2015). Not only will the future makeup of Brooklyn Park change but the importance of recognizing the historical context of the area is also important for equity work. Indigenous tribes have strong ties to the Mississippi River and Brooklyn Park has a rich pre-settlement history in relation to the Dakota and Anishinaabe. These are all important aspects when it comes to engaging equity and cultural context of the Mississippi River.

Goals

- Recognize historical pre-settlement context of place
- Adhere to Thrive 2040 criteria in conjunction with similar examples for equity

Recommendations

- Create more park projects and amenities that the community wants through community organization collaboration (peoples of color and immigrant population groups)
- Utilize Project for Public Spaces criteria when planning for place-making
- Consult local Indigenous/Tribal nations about pre-settlement history (Dakota and Anishinaabe)
- Identify current historical sites as well as identify unknown sites
- Research culturally significant sites along the Mississippi River

Equity Improvement

Parks are an important factor in equity and access. Parks provide spaces for people to engage in activities that are important to their overall well-being. But communities of color historically have not had the same access to parks and green spaces. This is problematic for a city that strives to be sustainable. Furthermore, the funding that is contributed to equity and access projects often increase equity and access issues (Wolch et al., 2005).

According to a representative from the Metropolitan Council (personal communication, 2016) equity is something everyone supports in concept but struggles to implement or achieve. Equity starts with historical context. For the community to plan for the future, the community must remember their past. Providing signposts of historical significance is one way to remember the rich history of Brooklyn Park. The creation of partnerships with tribes and various community organizations provides a great way to signify equity in the community. A guide on tribal consultation is provided.

Equity also draws funding for park projects but these park projects need to serve the equity and access agenda. Recent trends show otherwise as stated by the representative of the Metropolitan Council (personal communication, 2016). Through the implementations of various recommendations, an equitable region is possible. Equity benefits all through intercultural engagement and sustainable relationships. A sustainable and just community is what equity strives for through the increased well-being of all communities. Certain goals are defined along with actions to achieving those goals. These actions are supported through various study findings and research.

Public parks provide many benefits to communities of color. According to Cohen et al. (2007) public parks provide communities of color a resource for physical activity. The study also showed that public parks are the most common places where communities of color exercise. This signifies that communities of color that have access and are near public parks will tend to have higher rates of physical activity. In order to develop a sustainably robust and equitable city, planning departments as well as park district offices must coordinate planning efforts with communities of color. One recommendation would be to include diverse community organizations that tend to be excluded or missed in the park planning process. Equity maps are important when planning for parks. Equity maps should be in the toolbox of planners when laying out the blueprints for Brooklyn Park's parks. This would help to lessen the divide between the northern and southern populations that is so distinct. Equity maps serve to show the spatial distribution of facilities and natural resources (such as green spaces) in relation to communities of color. Recent trends show that inadequate spatial distribution of open spaces and parks to communities of color contribute to chronic diseases and higher rates of health problems. Also park quality problems tend to be higher in low-income communities of color (Vaughan et al., 2013).

Placemaking

The Project for Public Spaces (PPS) is a non-profit advocacy that focuses on a sustainable future. The Project for Public Spaces offers some criteria for measurement of quality in parks and public spaces. This criterion may be consulted or implemented for future park planning decisions in regards to sustainability. Equity is important in striving for sustainability. Sustainability is inherent in plans that are developed today and into the rest of the 21st century.

Placemaking is a unique and sustainable way to approach future planning decisions. Placemaking takes community collaboration and multiple cultural identities to create a truly communal space that is the heart of the community. Placemaking supports the “connection between people and the places they share, [p]lacemaking refers to a collaborative process by which we can shape our public realm in order to maximize shared value” (Project for Public Spaces, 2009). This shared value is identified by the community’s diverse populations through collaboration. This is community which originates within the commons. Placemaking is an easy way for planners to incorporate equity and access into parks because planning starts with the open communal space of the community. By creating the community around this placemaking area, the community is inherently equitable. The first building block of planners decisions should be the placemaking then expand from there. Placemaking is a great counter option to the recurring gentrification of low-income and disadvantaged communities. The Project for Public Spaces criteria is provided below.

WHAT MAKES A GREAT PLACE?

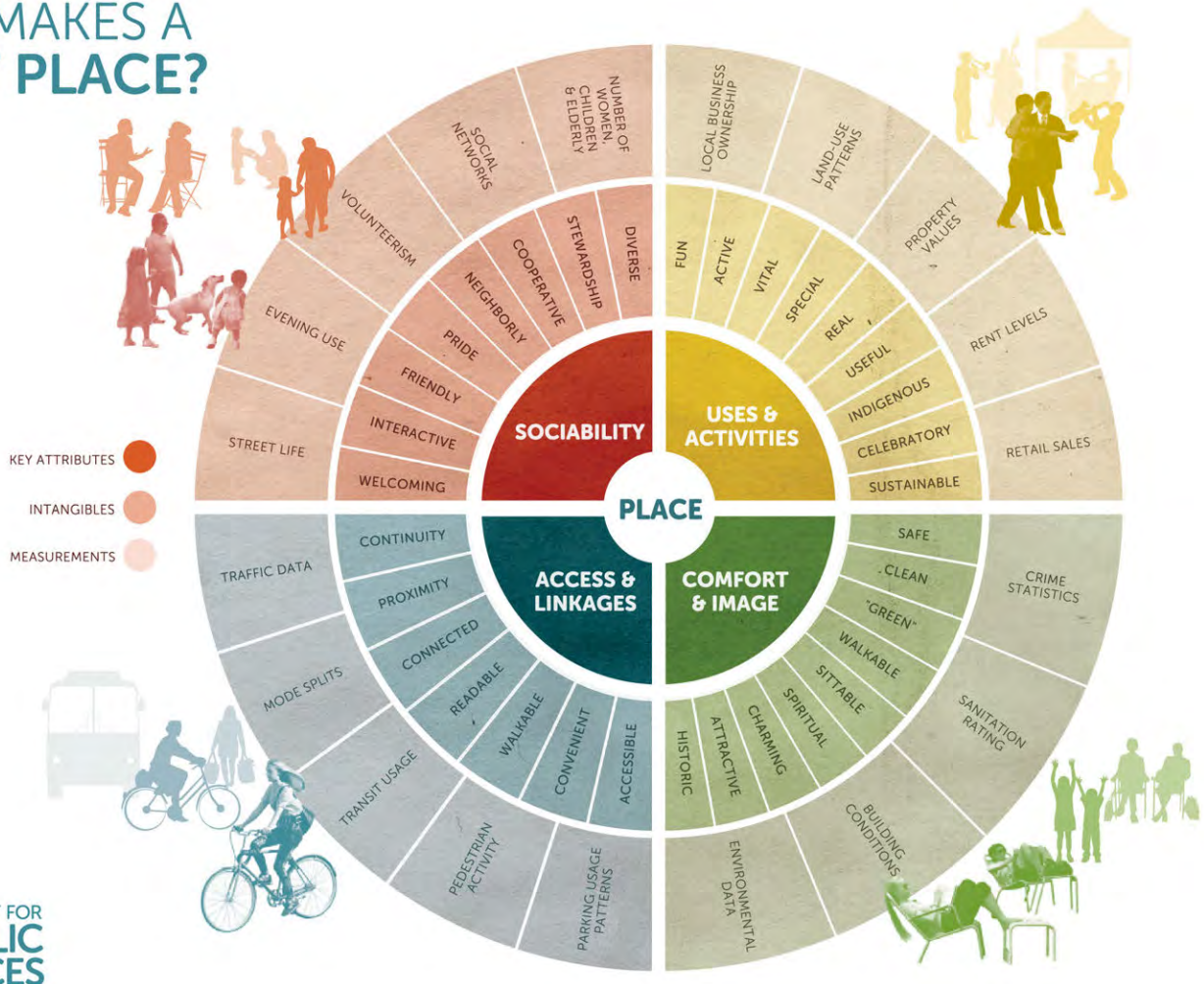


Figure 7, Project for Public Spaces Framework

Cultural Significance of Mississippi River

In an interview of a Three Rivers Parks District representative, the representative noted the importance of the historical place of the Mississippi River. The interview participant referenced the cultural diversity of the Coon Rapids Dam. The interview participant talked about how the Coon Rapids Dam was built by immigrants into the contemporary historical account of the influx of diverse immigrant populations of today. Pushed to talk about pre-settlement history of the area, the representative admitted the lack of knowledge in pre-settlement discourse. Looking at the historical and cultural context of the place is important but so is the natural history of the area. A return to the pre-settlement landscape is important to maintain the biodiversity of Brooklyn Park. The pre-settlement landscape in Figure 4 shows the original ecosystems of Oak barrens and prairies. A return to this ecosystem would complement the historical context of Brooklyn Park.

One recommendation is the need to incorporate some tribal consultation in regards to their specific area in Brooklyn Park. Consultation of various Dakota bands that have ancestral roots in the park space would be a starting point. This consultation would lead to a dedication and recognition of the peoples that were in the historical space of Brooklyn Park before the city was settled. This is important in equity and access work as it shows commitment and dedication to equity as well as context of the area.

Another recommendation that would complement tribal consultation is also, identifying significant sites in relation to the Mississippi River prior to consultation. In an interview conducted with a Dakota elder, the interview participant talked about how important waterways were to tribes and especially the Dakota of the area (Dakota Santee Sioux elder, 2016). Including the knowledge of where recorded sites are before tribal consultation would help with cultural competency of Brooklyn Park planners. The interview participant talked about the importance of waterways to Dakota life, before the horse arrived, the Dakota utilized the waterways for transportation, moving supplies, ceremony, and various other uses (Dakota Santee Sioux elder, 2016). The Dakota elder also talked about how the Brooklyn Park area was used as a base camp for the Dakota traveling to Lake Minnetonka. This is significant in that Lake Minnetonka is a very spiritual place to the Dakota. The Dakota would use the shores of the Mississippi to camp and restock supplies as they continued their spiritual journeys to Lake Minnetonka. Another reason to identify significant sites within the Brooklyn Park area is that Cloud Man, a Dakota leader, often camped in the area (Dakota Santee Sioux elder, 2016). More research needs to be done on this, in that Cloud Man is significant in Dakota history and this act would help in cultural competency as well.

The Dakota historian also recognized that the Brooklyn Park also hosted the Anishinaabe camp during the establishment of Fort Snelling. The elder stated that the US government kept the Dakota and Anishinaabe separate during Fort Snellings formation to prevent quarrels between the tribes. The Dakota Santee Sioux elder suggested consultation with the Anishinaabe tribes as well as the Dakotas on how to proceed in the recognition of the cultural context of Brooklyn Park. A guide on how to approach and consult tribes is provided for future use which refers to the “Minnesota Department of Human Rights Tribal Consultation Policy” Executive Order 13-10. This would be the first step in recognizing the historical context and importance of the Mississippi River and the Brooklyn Park area.

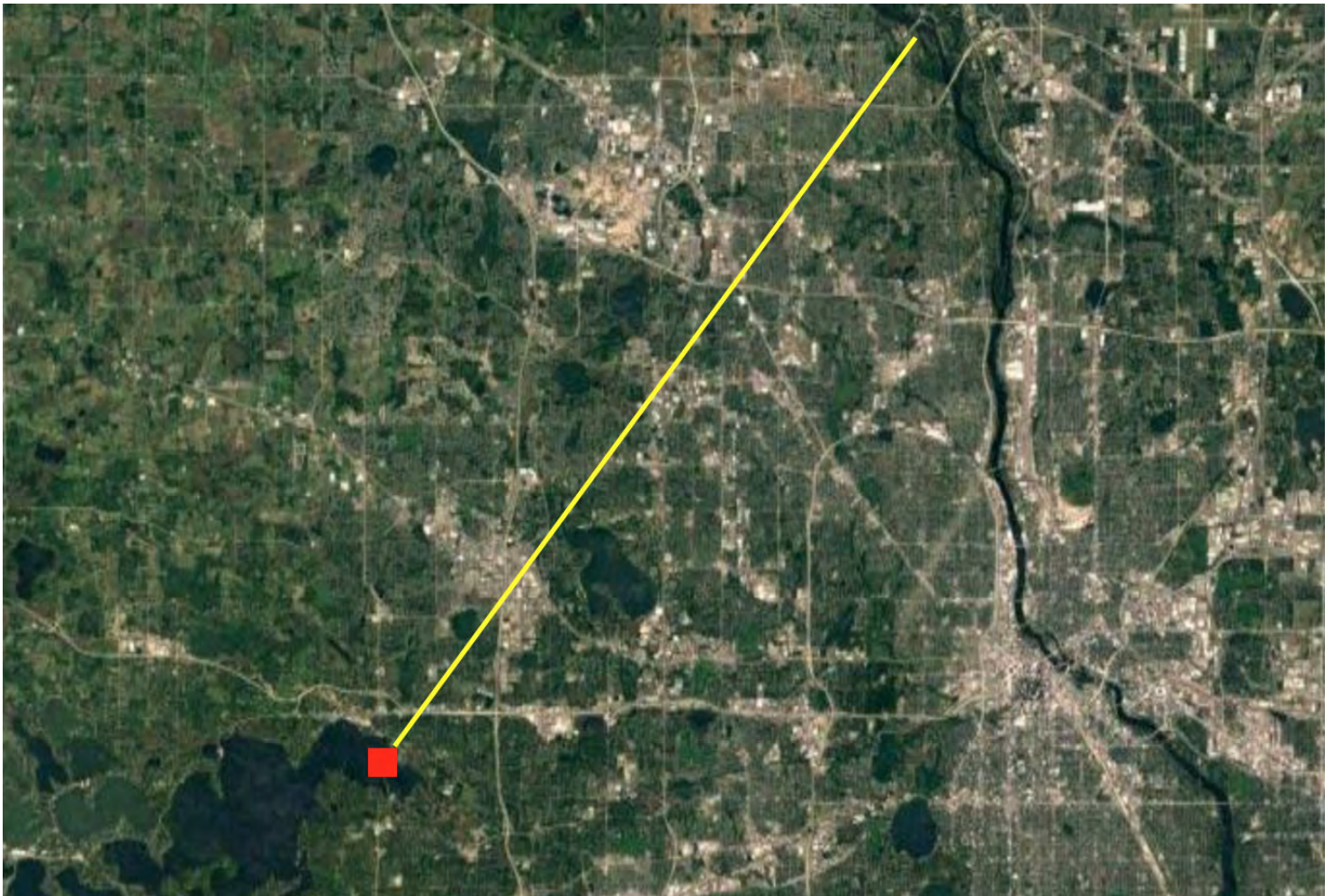


Figure 8, depicting the journey to Lake Minnetonka utilizing the shores of Brooklyn Park as a camp.

Minnesota Tribal Consultation Guide (Executive Order 13-10)

As informed by Minnesota Department of Human Rights (MDHR) Tribal Consultation Policy, Executive Order 13-10 which reaffirms the government-to-government relationship between the 11 federally-recognized tribes of Minnesota and the state of Minnesota (mn.gov, 2016).

MDHR's Executive Order 13-10 guiding principles*:

- *Minnesota recognizes and supports each Tribal Nation and its right to existence, self-government and self-determination.
- *Members of the Minnesota Tribal Nations are citizens of the State of Minnesota and possess all the rights and privileges afforded by the State.
- *When appropriate, MDHR will carry out this policy jointly with agencies created under federal law or state law.
- *MDHR will consult with honesty, integrity and with an open mind to find mutually beneficial solutions.
- *Human Rights for all are advanced when people learn about one another, work together and regularly engage in meaningful dialog.

*=taken from the MDHR's tribal consultation policy

Designation of Tribal liaison*:

- *Designating a point person to be the initial contact for consulting work with Tribes
- *Responsible for enhancing and nurturing relationships between Tribal nations and Brooklyn Park

*=taken from MDHR's tribal consultation policy



Summary

The cornerstone of inclusive design is community involvement. This allows the people who will be using the space to actively participate in the planning, design, and even construction of their parks and public spaces. Involvement leads to ownership, pride, and connectivity to place. This community involvement process starts at a high level with examining demographic data to understand the neighborhoods, and zooms in to engage people on a direct and personal level.

The city of Brooklyn Park has done a good job of collecting feedback on their comprehensive planning process, but the principles of inclusive design ask the city to go even further. This may mean community meetings, on street interviews, and hosted events in the neighborhoods involved. In short, the city should make all efforts to engage residents in a meaningful way. In the case study of River Park, neighborhoods surrounding the park have vastly different economic, racial, and home ownership rates. It is necessary to understand the diverse needs and preferences of these residents, and to ensure that as many needs as possible are met within one park space. Because of the specificity to the neighborhoods served, one approach can not be applied to all parks. Neighborhood parks must meet the needs of their neighborhoods, which requires the same intensive process in each planning process.

Planning for equity and inclusion takes time and effort for sure, but will result in park spaces that are well-utilized, respected and cared for, and a source of pride for neighborhood residents. This also allows parks to be a place where people of diverse backgrounds come together and strengthen relationships. By following culturally inclusive and accessibility guidelines, the parks of Brooklyn Park can serve all residents and become the foundation of a united community.

Goals

- Create inclusive spaces to relax, play, and gather. Create places designed with everyone in mind.
- Rationale: When people feel safe, comfortable, and included in parks they will utilize them.
- Reimagine city parks as community mixing grounds and spaces to bring together diverse residents of Brooklyn Park
- Rationale: Parks can function to bring together diverse groups of people and break down perceived barriers at a neighborhood and city scale.

Recommendations

- Include neighborhood residents in planning meetings to establish needs and wants of the community
- Monitor and evaluate parks with input from users and larger community
- Add amenities to existing parks to respond to surrounding neighborhood demographics

Neighborhood Demographics

The case study park for this section on equity and accessibility is River Park, is located on the east edge of town, south of 85th Avenue N. 85th is a perceived barrier between the north and south halves of Brooklyn Park, which have significantly different demographic characteristics. Census data was analyzed to understand these differences and identify how the park can stitch these communities together. The census block group surrounding the park is ethnically diverse, has a significant population of renters, and has a median annual household income around \$50,000. The census block group immediately north of the park is drastically different. It is primarily Caucasian, has a very small population of renters, and the median annual household income is around \$87,000. The three census block groups to the west of the park fall somewhere in between. These areas are ethnically diverse, have small renter populations and have median annual household incomes between \$75,000 - \$81,000. It is necessary to understand the characteristics of the neighborhoods surrounding a public park when considering how it will be used and what facilities may be required. (Figure 9)

Community Backyard

Because the immediately surrounding neighborhood has a high percentage of renters and less household income, the park has the opportunity to function as the backyard for the whole community and to be a mixing ground for diverse groups of people. Active and passive spaces can create opportunities for social interactions and connections while allowing people to pursue hobbies, exercise, and experience nature. Some potential amenities to implement at River Park include: a community garden, river access infrastructure, large scale urban furniture, and an amphitheater. These elements will draw people from the surrounding neighborhoods and larger Brooklyn Park area and work to make River Park a culturally inclusive and accessible place. (Figure 10)

Culturally Inclusive Design

Design for accessibility is undoubtedly important in public park spaces, and is fairly well understood. Culturally inclusive design is harder to pin down, however, because it has unending variables to navigate. Historically, parks have been intended to function as the “core of urban society” but only included certain segments of society. People have been excluded from parks based on race, economic status, and gender. In creating new parks or renovating existing ones, it is of the utmost importance to consider groups that have been overlooked and excluded in the past. Perhaps the most important component of inclusive design is understanding who will be using the park and how they want to use it. While there have been studies of how different cultural groups use parks, such as Gobster’s 2002 study of Lincoln park, planners can not assume homogenous life experiences based on race or ethnicity. The best way to learn about park users is simply to ask them. Community involvement in the planning process is crucial, and can take a variety of forms from simple communication and information exchange to active collaboration and decision making. Facilitators of these interactions must be culturally competent, and ready to accept multiple viewpoints and experiences that shape the wants and needs of park users. The design process should then be guided by the information gathered from the community. Inclusion by Design, published by the Commission for Architecture and the Built Environment in 2008, defines inclusive design, outlines the benefits, and provides recommendations. Per CABE, “Inclusive design is a process of designing, building, managing and population places and spaces that ensure that they work for as many people as possible, not just some groups.” Inclusive design is about access with dignity, treatment with respect, and relevant services. Inclusive environments are responsive to people’s needs, flexible in use, offer a choice when a single design solution cannot meet all users’ needs, are convenient, are welcoming, and accommodate without fuss or exception. CABE outlines five high priorities for the professions involved in design, and five high priorities for local authorities. These provide a useful framework for planners, designers, and the implementing bodies.

Five High Priorities for the Professions

1. Collect data on the composition of the professions, and use this evidence to broaden the diversity of representation.
2. Work collaboratively across professional teams to maximize expertise and understanding of inclusion and equality.
3. Take care to consult and involve the people most likely to be affected by any changes.
4. Do more than you need to. Work with clients to exceed the regulatory and good practice guidance on inclusive design, and comply with guidance on the provision of lifetime and wheelchair accessible homes. Exceed the public duties on race, gender and disability equality.
5. Use access specialist throughout a project – from concept to post-occupancy stages.

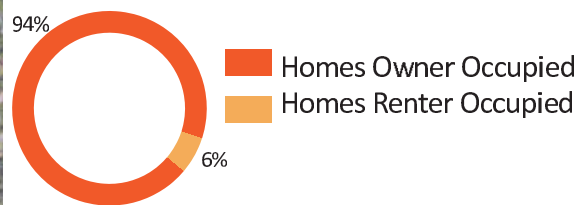
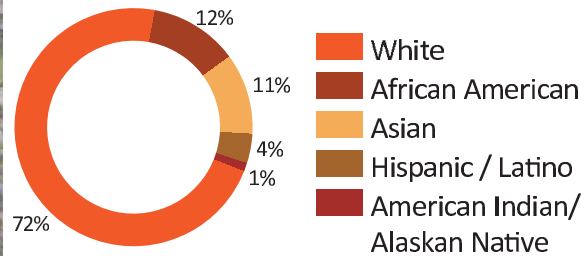
Five High Priorities for Local Authorities

1. Do more than you need to. Continue to act on the legal responsibility under the public duties on race, gender and disability to promote equality, involvement and consultation – and exceed it where you can.
2. Creating successful places means consulting people, so always involve local people in discussions about future developments. Build a track record of involvement and listening. Use imaginative methods of involvement.
3. Communicate proposals effectively, using accessible, plain language. Offer training in design and planning for access groups and people from communities and encourage people to act as ambassadors for their communities in the design processes.
4. Set up an access group for major schemes and get an access consultant on board.
5. Ensure that local investment and planning promote environmental equality and cohesive, sustainable communities.

By utilizing these principles and practices, Brooklyn Park can create a space for everyone and celebrate its diverse and multifaceted culture. Planners and city authorities must advocate for inclusivity and implement strategies to ensure it.

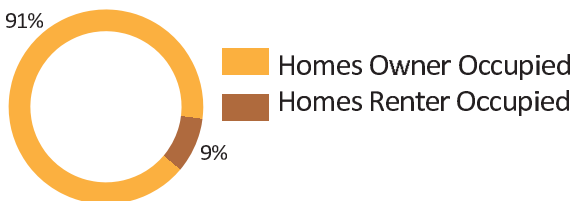
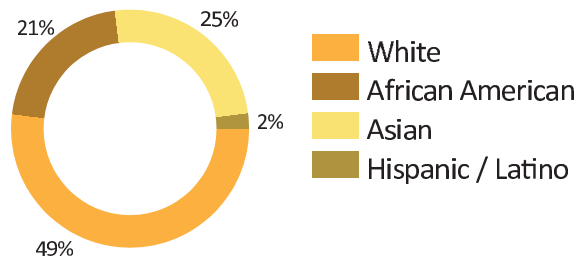
Following Pages:
Figure 9, Demographic Characteristics of Neighborhoods Surrounding River Park
Figure 10, Examples of Potential Amenities to Add to River Park

Census Block Group 270530268154



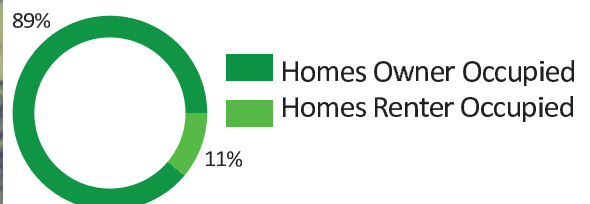
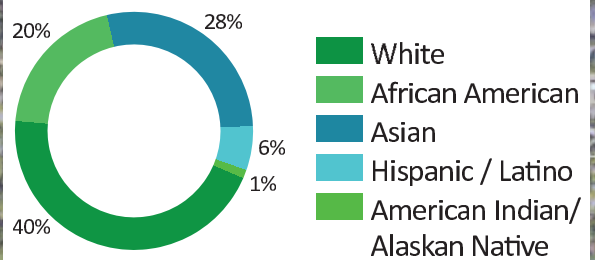
Population: 1007
 Median Household Income: \$75,851
 Total Households: 284
 Households within 150% of Poverty Line: 97

Census Block Group 270530268153



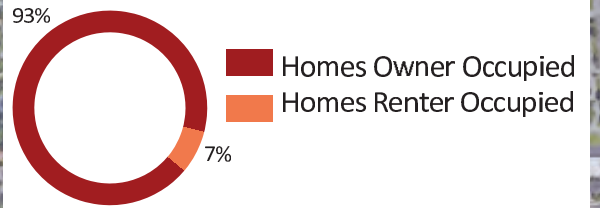
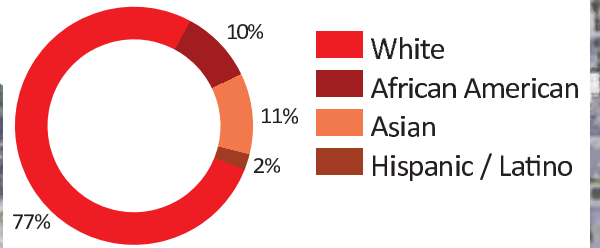
Population: 1470
 Median Household Income: \$80,625
 Total Households: 380
 Households within 150% of Poverty Line: 97

Census Block Group 270530268152



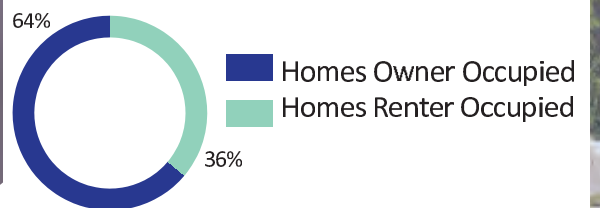
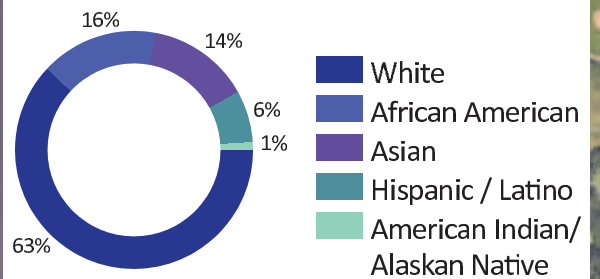
Population: 1096
 Median Household Income: \$80,750
 Total Households: 384
 Households within 150% of Poverty Line: 113

Census Block Group 270530268221



Population: 1138
 Median Household Income: \$87,750
 Total Households: 454
 Households within 150% of Poverty Line: 0

Census Block Group 270530268151



Population: 1563
 Median Household Income: \$51,346
 Total Households: 730
 Households within 150% of Poverty Line: 136



Amphitheater - host cultural events,concerts, stage productions, engage larger community.



River Access Infrastructure - ensure all residents of the area can enjoy the river



Urban Scale Furniture - provide space for informal gathering and passive park activities



Community Garden - provide space for renters to grow food and interact with neighbors





**River Park -
The Community's Backyard
Potential New Amenities**



Summary

The Mississippi River is a critical natural resource for Brooklyn Park and serves as an important corridor for connecting habitats and creating greenways within the city (Brooklyn Park, 2008). Developing water recreation opportunities on and adjacent to the Mississippi River through the creation of a water trail can increase public access and engagement with the river and familiarize the Brooklyn Park community with the river's natural resource benefits. Water trails are also consistent with the social and ecological goals of the Mississippi River Critical Area and contribute to the long-term preservation of the river's character.

The section of the river within the boundary of Brooklyn Park offers a unique natural setting between the suburban pool above Coon Rapids Dam and the urban development ten miles downriver in downtown Minneapolis (NPS, 2014). With scenic islands and bluffs, frequent wildlife sightings, and a protective tree canopy, it's easy to see why the adjacent water trail along the east bank of the river in Anoka County is recommended by the MN DNR for paddlers in the Twin Cities Metro Area (MN DNR, 2016). This area is also part of the Mississippi National River and Recreation Area Water Trail and the Minnesota State Water Trail. With a relatively small effort, Brooklyn Park can tap into these existing resources and develop a water trail to increase local access to and stewardship of the Mississippi River.

Goals

- Increase public access to, and connection with, the Mississippi River.
- Rationale: The Mississippi River is an essential part of the identity of the Twin Cities Metro Area and can provide unique opportunities for outdoor recreation and connection with both the natural environment and historical and cultural traditions.
- Protect ecological functions of the Mississippi River and encourage public stewardship of river natural resources.
- Rationale: The Mississippi River is a defining natural feature for Brooklyn Park and serves an important role for preserving wildlife and landscape connectivity. Developing a sense of public ownership and stewardship of the river helps to ensure continued protection of this corridor into the future.

Recommendations

- Develop a water trail from Coon Rapids Dam Regional Park to River Park following the best management practices recommended by the National Water Trail System.
- Improve water recreation facilities by further developing the water access site at Coon Rapids Dam Regional Park, installing canoe and kayak racks at all boat launch sites, and adding informational and navigational signs as necessary along the water trail.

Recommendations Continued

- Facilitate river accessibility for beginning paddlers by pursuing opportunities for a boat rental program as well as developing in-person education and guided recreational experiences.
- Develop partnerships with local and regional organizations to provide access to funding and expertise and to promote recreation and conservation along the water trail.
- Engage with the public and with private landowners to encourage connection with and stewardship of the river.
- Identify critical areas along the river for priority natural resource protection, viewshed preservation, and recreational access opportunities.

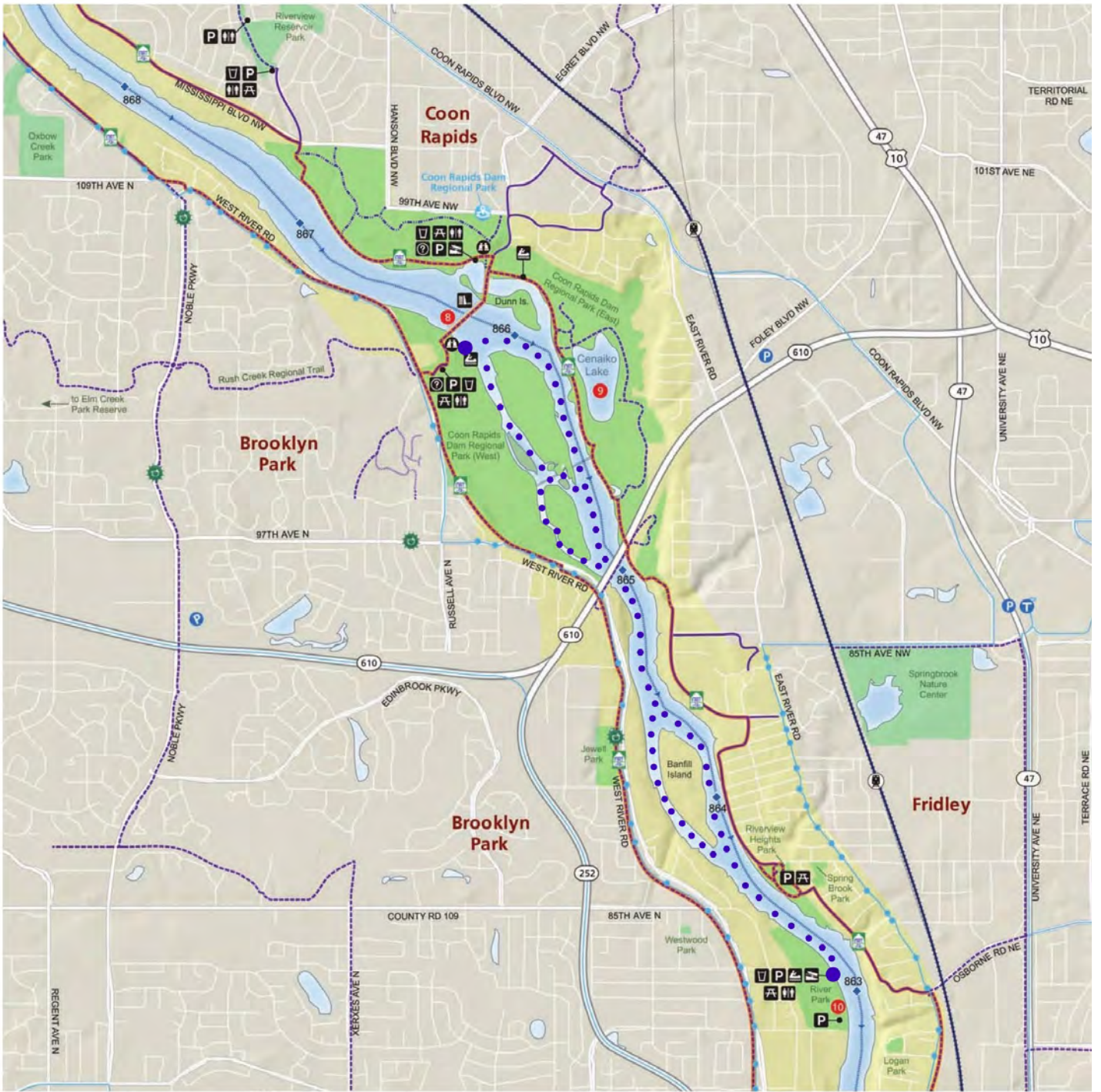
Introduction to Water Trails

The National Park Service defines water trails as “recreational routes on waterways with a network of public access points supported by broad-based community partnerships. Water trails provide both conservation and recreational opportunities.” (NPS, n.d.). Water trails have been developed at local, state, and federal levels across the country because of their importance in re-connecting modern civilization to the rich cultural and natural resources associated with rivers and lakes. As explained by the Friends of Milwaukee’s Rivers (2005): “Water trails connect people with places, both natural and humanmade, connect past to present, and bring the boater into contact with the rivers and surrounding lands. These connections help provide a ‘sense of place’ within our watersheds, promote stewardship, and bring us together as a community.”

Proposed Water Trail for Brooklyn Park

Brooklyn Park has a unique opportunity to connect with existing state and national water trails along the Mississippi River. These existing trails are well established in the Twin Cities Metro Area, and significant investments have already been made in creating maps and other educational resources, developing partnerships for both restoration and recreation, and connecting with other nodes of transportation along the river. With a relatively small effort, Brooklyn Park can tap into this network of resources and develop a water trail for their own portion of the Mississippi River. Developing such a trail would allow the Brooklyn Park community to connect with the natural resources in their city and increase recreational opportunities.

The simplest proposal for a water trail in Brooklyn Park would be to develop a route from Coon Rapids Dam Regional Park (river mile 866) to River Park (river mile 863) (Figure 11). This 3-mile trail would take approximately 45 minutes to 1.5 hours to complete (based on MN DNR calculations for a longer portion of the trail) (MN DNR, 2016), and would be ideal for paddlers and floaters interested in a short day trip. Water trail recreational facilities currently available in Brooklyn Park include the canoe access point at Coon Rapids Dam Regional Park (the proposed put-in site) and the boat launch at River Park (the proposed take-out site) (NPS, 2014). The boat launch at River Park is well developed with a wide ramp, sufficient parking space for trailers, and an area to clean off boats (Brooklyn Park, 2013). Both parks have other recreational facilities such as restrooms, potable water, and picnic areas that would also facilitate use of the new water trail (NPS, 2014). In addition, the visitor center at the Coon Rapids Dam Regional Park already provides interpretive resources and programs for users to learn about the natural resources of the Mississippi River. To complete the loop from the take-out site at River Park back to the put-in site at Coon Rapids Dam Regional Park, users could walk or bike on the Mississippi River Trail or could take the 766 northbound bus.



• 1 mile • ↑ North

Figure 11, Proposed water trail for Brooklyn Park. This map was adapted from the Mississippi River Companion (NPS, 2014). Blue dots indicate the proposed trail.

The proposed water trail would also connect with additional pedestrian, bike, and water trails—including the Rush Creek Regional Trail, Mississippi River Trail, Mississippi River State Water Trail, and Mississippi National River and Recreation Area Water Trail—for those interested in longer trips (NPS 2014).

Planning for a Water Trail:

The National Water Trails System describes seven elements of successful water trails, all of which will be important for Brooklyn Park to consider when planning for and developing their water trail (NPS, n.d.). These seven elements are described below:

- “Recreation Opportunities: The water trail route has established public access points that accommodate a diversity of trip lengths and provide access to a variety of opportunities for recreation and education.
- “Education: The water trail users are provided with opportunities to learn about the value of water resources, cultural heritage, boating skills, and outdoor ethics.
- “Conservation: The water trail provides opportunities for communities to develop and implement strategies that enhance and restore the health of local waterways and surrounding lands.
- “Community Support: Local communities provide support and advocacy for maintenance and stewardship of the water trail.
- “Public Information: The public is provided with accessible and understandable water trail information, including details for identifying access and trail routes; cultural, historic, and natural features; hazards; and water quality. The water trail is promoted to the community and broad national audience.
- “Trail Maintenance: There is a demonstrated ability to support routine and long-term maintenance investments on the water trail. Facilities are designed, constructed, and maintained by incorporating sustainability principles.
- “Planning: Maintain a water trail plan that describes a vision, desired future conditions, and strategies to strengthen best management practices.” (NPS, n.d.).

For each of these seven elements, the National Water Trails System has compiled numerous recommendations for best management practices. The following table summarize these recommendations and provides a framework of questions Brooklyn Park should consider when planning and developing their water trail.

Recreation Opportunities

Recreational Information and facilities

- Has the type of desired recreational experience (e.g. for what skill level, watercraft type, etc.) been determined?
- Have launch sites been assessed for accessibility (e.g. type of ramp or dock, walk-in distance, etc.)?
- Are there safety considerations that need to be addressed on the trail?
- Has information on all of the above considerations been made publicly available?
- Are there additional recreational facilities that need to be developed for launch sites (e.g. canoe and kayak racks, shuttle services, boat rental services, etc.)?

Rules and permitted activities

- Do regulations need to be put in place (e.g. regarding group size, motorized vs. non-motorized use, hours open, seasonal closures, etc.)?

Connectivity

- Should connections to other modes of transportation (e.g. pedestrian or bike trails, public transit, etc.) be further developed or created?

Education

Education topics

- What opportunities are there for developing education programs that cover a variety of topics (e.g. natural resources, history and culture, boating skills, etc.)?

In-person education

- What kinds of in-person educational opportunities (e.g. guided trips, classes, interpretive programs, volunteer groups, festivals or events, etc.) could be developed?

Youth programs

- Is there an opportunity to develop a relationship with one or more schools to connect children with the river and the water trail?

- What opportunities are there for youth programs to be developed for varying age groups?

Media

- Should educational signs or kiosks be installed at launch sites?
- What paper resources (e.g. maps, brochures, etc.) should be developed and provided to users?
- What information should be provided online at Brooklyn Park's website to educate users about the trail?

Conservation

Cleanups and invasive removal

- Is trash clean up along the shorelines or on the river a concern, and if so what opportunities are there for addressing it?
- Are there opportunities for shoreline invasive species removal that should be pursued?

Restoration

- Are there opportunities for restoration projects (e.g. habitat restoration, aquatic/fisheries restoration, floodplain restoration, etc.) along the river or its tributaries?

Conservation

- Have priority conservation areas along the river been identified?
- Are current buffer regulations sufficient to protect the shoreline?
- Are wetlands sufficiently protected along the river?
- Have opportunities to engage with landowners and developers been explored to protect natural resources on private lands?

Green Infrastructure

- Are there opportunities for developing green infrastructure (e.g. green roofs, infiltration planters, rain gardens or barrels, etc.) at launch sites to improve water quality and reduce runoff?
- Are there opportunities within the watershed to replace impermeable surfaces with permeable or semi-permeable options?
- Have opportunities to engage with landowners and developers been explored to incentivize the use of green infrastructure on private lands?

Monitoring, inventory, and mapping

- Is there a program for monitoring the water quality of the Mississippi River near Brooklyn Park?
- Are there opportunities for citizen science or community volunteer efforts to monitor or improve water quality in Brooklyn Park?
- Have existing vegetation types and natural communities along the river been identified?

Community Support

Public opinion

- Have local communities and the public been engaged with regarding the proposed water trail (e.g. asked their opinion of, or reaction to, the trail and the potential for increased recreational use)?
- Have local communities and the public been involved in the planning and design process (e.g. asked about what facilities, regulations, safety information, and other aspects of the trail they'd like to see added or improved, etc.)?
- Is there opposition to the trail, and if so how can it be addressed?
- Who uses the adjacent water trail from the east bank, and what suggestions do they have for developing a trail on the west bank?

Partnerships and outreach

- Have potential partner organizations (e.g. NPS MNRRA, MN DNR, Great River Greening, Friends of the Mississippi River, etc.) been contacted about the proposed water trail?
- Have opportunities for water recreation partnerships been pursued (e.g. through Wilderness Inquiry, Urban Wilderness Canoe Adventures, other programs that offer boat rentals and shuttle services, etc.)?
- Are there volunteer opportunities that could be developed?
- Has there been outreach to potential supporters (e.g. local businesses, local conservation, recreation, and tourism organizations, etc.)?

Landowner relationships

- Have landowners and developers along the river been engaged with regarding the proposed water trail?
- Is there opposition to the trail, and if so how can it be addressed?
- Do agreements need to be put in place with landowners regarding any aspect of the trail (e.g. public access, increased public use, conservation or viewshed standards for private land, etc.)?

Funding

- Have federal, state, and local funding opportunities for developing the water trail,

Public Information

Access, routes, and maps

- Has information on trip planning been made publicly available and is it easy for users to find?
- Has the water trail been added to the NPS MNRRA Mississippi River Companion book and to MN DNR Mississippi River State Water Trail information and maps?
- Are navigational maps widely available (e.g. stocked at the Coon Rapids Dam Regional Park visitor center and other locations, available online, etc.)?
- Is interpretive and navigational information provided on maps and/or on signs along the water trail?

Safety, hazards, and water quality

- Are regulations and safety information provided through a wide variety of sources (e.g. on maps, educational materials, signs or kiosks, in multiple languages, etc.)?
- Are hazards (e.g. turbulent water below the Coon Rapids Dam, areas with frequent tree snags or sweepers, etc.) clearly marked on maps and/or signs?
- Is information on current river conditions (e.g. weather, flow speed, water height, flooding status, etc.) widely available?
- In case of emergency, are there plans for communicating with and/or rescuing users from the river?
- Are there opportunities to host or advertise boating safety programs or classes?

Trail Maintenance

Launch and access site design

- Can user accessibility be improved at existing launch and access sites or designed for at new sites (e.g. launch site designs that include: firm and stable surfaces to aid in getting into and out of boats, docks or landings as close to water level as possible with no sudden drop offs, sufficient room to allow dry or sidewise entry into boats, calm water conditions to facilitate launching and landing boats, sufficient staging areas to accommodate multiple boats, etc.)?
- Do launch and access sites accommodate varying types of users (e.g. with varying skill levels, group sizes, and types of watercraft, etc.) and are there opportunities for improvement?
- Is the launch site safe (or perceived as being safe)?
- Does the launch site minimize environmental impacts (e.g. vegetation disturbance, erosion, runoff, spread of invasive species, etc.)?
- Can the launch withstand natural river variation (e.g. variation in flow levels, currents, exposure to the elements, etc.)?

Trail maintenance

- Are there volunteer or partnership opportunities for trail maintenance (river cleanup, access site cleanup, infrastructure maintenance, etc.)?

Signage

- Has the proposed trail been surveyed and sign needs identified (e.g. signs for hazard awareness, navigational directions, interpretation, etc.)?
- Is there a plan for consistent sign development and placement?

Planning

Planning

- Has a plan for the water trail been developed (either independently or as part of natural resource or other planning efforts)?
- Does the plan for the water trail include consideration of the following: (1) organizational structure, managing entities, and budget; (2) community engagement in planning and design; (3) stewardship and sustainability goals; and (4) long term management and funding?
- Is the water trail considered in other city planning efforts (e.g. recreation plans, wildlife plans, greenway plans, viewshed plans, sign plans, maintenance plans, etc.)?

Conservation planning

- Have current land use practices and conditions been surveyed and mapped for the Mississippi River and shoreline in Brooklyn Park?
- Have ideal land use practices and conditions been identified?



Summary

Brooklyn Park is home to an already extensive network of trails running throughout its parks and urban areas, and as the city grows in population and experiences demographic change, this network will likely increase to accommodate an influx of diverse new residents. The city of Brooklyn Park recognizes that the goals it chooses to prioritize over the next several years and the approach with which those goals are incorporated into its planning and maintenance practices will result in an infrastructure that must carry the city into its next era of development. As a result, Brooklyn Park is dedicated, more than ever before, to planning its public spaces in a way which reflects a commitment to both equitable access and sustainable natural resource management.

To ensure that Brooklyn Park's suburban trails (likely multi-use pathways) are constructed and managed with these objectives in mind, it is crucial that the Department of Recreation and Parks, as well as the Public Works Department, adopt practices toward trails that create the least possible ecological disturbance. After meeting the base requirements that trails adhere to realistic budgetary restrictions and offer use to people of all cultural backgrounds, recreational interests, and physical abilities, there remain countless ways that we as humans can more consciously occupy natural spaces. Below is a curation of recommended best practices aimed at offering outdoor experiences to all residents of Brooklyn Park while also mitigating the effects of development and human impact on local ecosystems.

Goals

- Wherever geographically feasible, install multi-use pathways which offer access to people of all physical abilities
- Wherever geographically feasible, install multi-use pathways which serve residents of the widest possible range of recreational interests
- While remaining cognizant of cost and budget (especially upfront), use sustainable materials in trail-building which minimize ecological impact and require little energy to produce and/or are recyclable
- Choose materials which minimize future maintenance demands in terms of labor, frequency of maintenance needs, and expense
- Ensure that all plans adhere to the guidelines detailed in the Thrive MSP 2040 Regional Parks Policy Plan, particularly with respect to the Thrive outcomes of equity, stewardship, and sustainability

Recommendations for Trail Construction

- To ensure the most current possible information is being utilized to inform decisions, a record of average costs to install viable trail surfaces should be updated yearly, or, at minimum, whenever a new project or large resurfacing is about to be undertaken.
- Plans for new trails or the resurfacing of existing trails should be communicated to their full extent to the public works department, so that maintenance administrators can comprehensively assess hypothetical adjustments in labor and monetary needs and how they would affect the proposed project budget (Best Management Practices 28).
- For universal recreation, use porous asphalt to pave all trail terrain not deemed “structurally impracticable” to fully comply to ADA standards (Department of Justice 6) (after a comparison to other common surface options [see chart below], porous asphalt proved the best compromise of accessibility, economy, and sustainability).
- Because of natural erosion, build paved trails one foot wider on either side than their intended width for use.
- In heavily wooded areas where a location-specific cost analysis of root growth and resurfacing frequency suggests that it would be beneficial long-term, install a parallel vertical trench, lined on the far wall with a permeable root barrier fabric (such as BioBarrier) to suppress root growth and then filled with natural crushed stone to redirect water into the water table, on either side of the trail (Smiley 151).
- Consult an ecologist and perform an at least informal environmental impact study prior to constructing trails that traverse wetland areas. When possible, build trails intended to enable users to enjoy wetland habitats along the perimeter of those areas.
- When trails must cross streams or span land that experiences significant seasonal wetness, wooden boardwalks with cement or recycled plastic posts (rather than treated wood posts which release toxins) should be used to provide dry, stable paths for visitors while also offering wildlife the opportunity to both commute across and reside underneath these structures.

- Do not build trails in the edge zones between distinct habitats, as some species require this hybrid habitat for survival (“Developing Trails” 1, 3).
- For trails in which accessibility is structurally practicable, construction should conform to all standards outlined in the most recent revision of the Americans with Disabilities Act for features like boardwalk guardrails, maximum trail grade and ramp grade for bridges, minimum trail width, and grade of trail shoulder:

Recommendations for Trail Maintenance

- To prevent leaves and other plant debris from compromising the trail’s traction, clear trails through forested areas more frequently in autumn months than in spring and summer (Wagner 1). The necessary frequency of trail clearing should be based on what is necessary to allow water to continue to pass through the pavement (How to Maintain Your Porous Pavement 1), as well as a minimum safety standard established by the public works department and the parks department (Best Management Practices 30).
- For the safety of trail users, clear debris and vegetation at least 1 foot from the trail’s edge on either side (Trail Construction 1). Otherwise, never prune woody plants surrounding trails without reason (Hillmer and Trevor 3). To limit a loss of biodiversity due to edge effect, and to encourage recreationalists to stay on the trail, allow dense vegetation to act as a natural barrier to natural landscapes (“Developing Trails” 2).
- Should an unnatural factor cause a disturbance to land adjacent to a trail, revegetate that land immediately to prevent further erosion (Wagner 2).
- If planting a natural barrier, use only native species, which will be more likely to prevent soil erosion and less likely to require herbicide treatment.
- Use synthetic herbicides only as a last resort for eradicating invasive species (after pulling and mowing) (“Developing Trails” 2-3).
- Whenever necessary (preferably in the late dormant or mid-growing season, when plants are fully expanded), organize volunteer trail work community events targeted toward pruning encroaching trees and shrubs that pose a hazard.

- At all volunteer pruning and pulling events, teach proper safety for the handling of pruning tools and encourage pruning strategies and techniques which will cause the least necessary damage to woody plants, as well as minimize future maintenance needs (for further direction, see The Nature Conservancy’s guide cited in the “References” section of this booklet) (Hillmer and Trevor 11).
- To minimize pollution to surrounding ecosystems and create a more pleasing aesthetic for trail users, clean trails of human trash and graffiti regularly. When general cleaning is required for a long expanse of trail, this work may also be performed by a group of community volunteers.

- Even on trails with little to no traffic throughout the winter, regularly plow and salt pavement to melt snow that could otherwise create cracks in the asphalt by way of its freeze-thaw cycle (Wagner 1-3).
- Be careful not to stockpile or administer granular substances, like sand or soil, on porous asphalt for any reason, as doing so may inhibit the asphalt’s ability to let water pass through.
- Never apply any type of sealant to porous asphalt, as that would destroy its pervious properties (How to Maintain Your Porous Pavement 1).
- Unless in a location that would otherwise pose a public safety concern, minimize the lighting of trails at night to avoid encroaching upon the livable habitat of nocturnal species near trails.

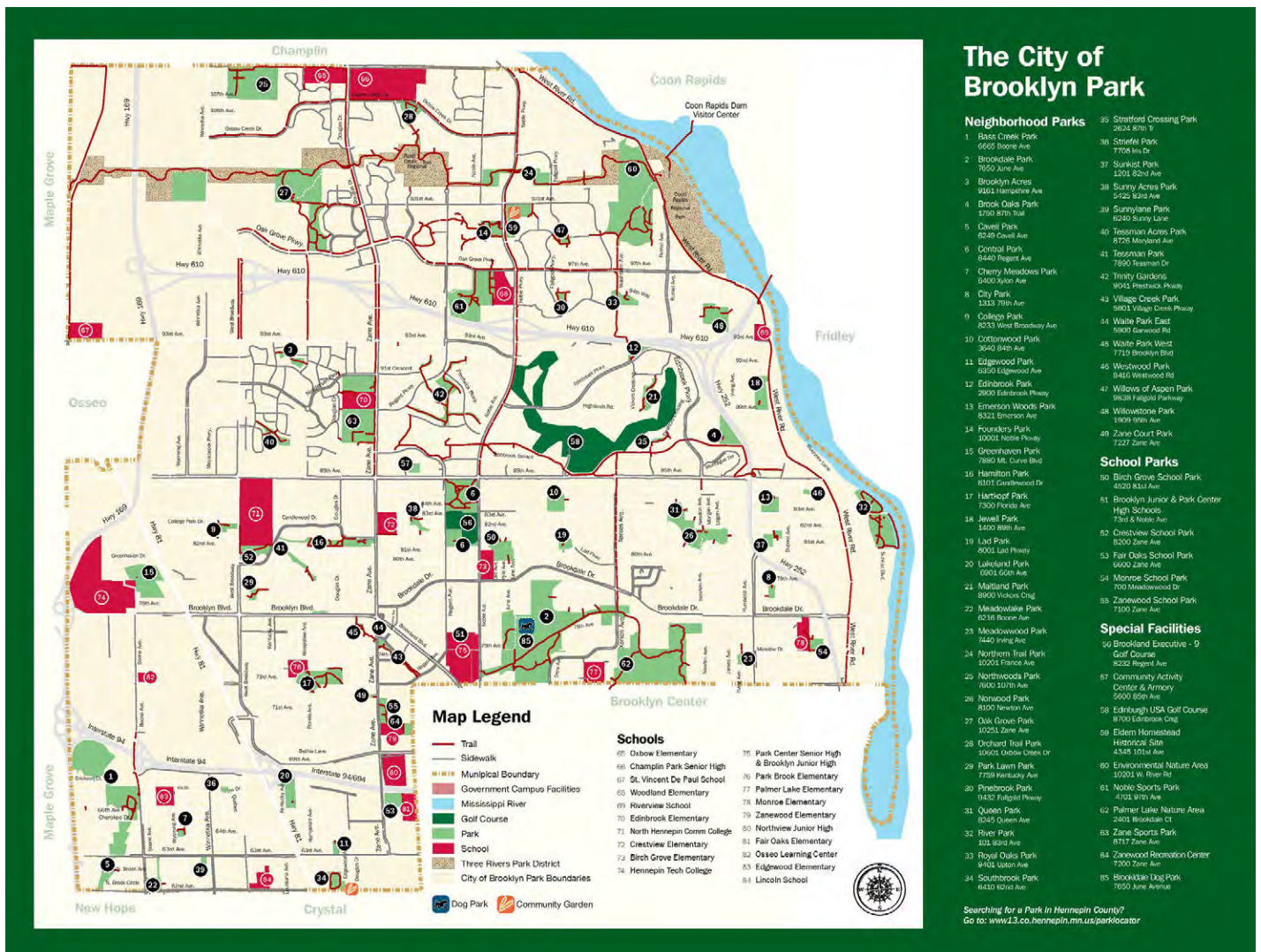


Figure 12, Map of Trails in Brooklyn Park (“Parks Trail Map”)

One of the most influential ecological decisions in constructing park trails is that of which type of trail surfacing to use. Over the course of researching best practices, 11 surface options were evaluated on their ability to serve Brooklyn Park's needs. Several options analyzed did not even meet the basic requirements of accessibility and affordability (which includes maintenance needs). Wood chips and all forms of crushed stone (gravel), while inexpensive and often made of natural materials, fail to provide access to those with disabilities in all but the most perfect circumstances. Wood chips biodegrade quickly and need to be replaced often ("Surfaces" 2), and gravel is readily washed out in storms, leaving it endowed with the potential to spread to areas outside of trail borders and form a new faux terrain that local flora and fauna are not adapted to thrive in. As a result, maintenance of these surfaces would be demanding, to the extent that initial savings would diminish over time. The only circumstances in which gravel may prove worth the savings is on handicapped-inaccessible trails that do not often flood (Saitta and Snyder 7).

Concrete pavers fell short of basic qualifications as well. While arguably the most attractive trail surface, they are by far the priciest. Not to mention, the breaks and cracks between pavers would not offer the most comfortable ride for users in wheeled vehicles (Porous Pavement Alternatives 3). Wooden boardwalks (with cement or recycled posts) serve well for creating pathways through wetlands and areas prone to flooding, but they would also be too expensive to employ in all terrain situations. Various recycled materials surfaces (such as plastic timber boardwalk, soil cement, or ground car tires mixed with a more durable material) may have the potential to offer versatility in the future, but as of yet, they have not been adequately researched to recommend widespread use across Brooklyn Park ("Surfaces" 2).

To achieve universal access in an affordable way, the best options are asphalt and concrete. But unlike natural soil, conventional cement and asphalt fail to filter water, causing toxic contaminants to flow directly into waterways and affect life downstream. Not only do these conventional surfaces fail to filter water; they also

fail to even absorb it, often trapping water into confined spaces and causing the flooding of nearby land and bodies of water. In some cases, disruptive detention ponds need to be built to mitigate some of these issues (Porous Asphalt Pavements 1-2). Since a component of Brooklyn Park's sustainability goals is environmental sustainability, it seemed more cohesive with their mission to investigate the feasibility of permeable alternatives to conventional asphalt and concrete.

Experts have indicated that the environmental impact of producing, utilizing, and disposing of pervious concrete and porous asphalt is comparable, so the next factor to consider is cost (Wood 1). Because porous asphalt has a similar durability to nonporous asphalt, the price difference between the two is typically not to be as pronounced as the price difference between pervious and impermeable concrete. Since pervious concrete is much less durable than conventional concrete, slab thickness must be increased by almost 50% for pervious concrete to have a comparable compressive strength. Conversely, should it eliminate the need for an invasive drainage system to be installed (which is often the case), porous asphalt surprisingly has the potential to be more affordable than conventional asphalt, while even more effectively minimizing the impact of the trail (porous asphalt is also regularly less expensive than conventional concrete, even without factoring in drainage needs) (Porous Pavement Alternatives 1-3).

But over the span of its estimated lifetime, pervious concrete is likely more of a money-saver. Concrete can last 20-25+ years, whereas asphalt lasts only 7-20 years ("Surfaces" 2). This means that porous asphalt costs from \$0.27-\$0.77 per square foot per year over its lifetime, and pervious concrete costs from \$0.24-\$0.47 per square foot per year. These ranges share a considerable amount of overlap, but when durability is compared in the same geographic location in which these surfaces subject to the same environmental conditions, concrete will likely be substantially less expensive (Porous Pavement Alternatives 1-3).

However, when this decision is subject to the nature of the way in which projects get funding in Brooklyn Park, the most cost-effective option may not be the most realistic one. As the city of Brooklyn Park, a local rather than county government entity, cannot receive direct funding for adhering to the principles of the Thrive MSP 2040 Regional Parks Policy Plan (in this instance, accessibility, livability, sustainability, and stewardship), much of the catalyzing money for substantially expensive projects is the product of passed levies, taxes, and referendums, rather than grants. As a result, a trail-building project may become more viable if it has a lower installation cost. While concrete is less expensive over time, the initial cost of a project could be the difference between whether it happens or does not happen (Kimble). And the probability that pervious concrete would be less expensive long-term is no guarantee- most available research on longevity on assesses sidewalks and driveways near grassy, open front yards, meaning that the difference in durability between concrete and asphalt may not be as drastic in densely wooded forests with countless encroaching root systems. So while adjustments can be made down the line to accommodate observed longevity or changes in government that render projects with large up-front costs more viable, porous asphalt is recommended to meet Brooklyn Park's needs as of now.

Fortunately, despite possessing less longevity, asphalt offers a great deal of advantages over pervious concrete. First, asphalt is a material of many lives; it is considered by both the Environmental Protection Agency and the Federal Highway Administration to be the most recycled product in the country, and greater than 99% of its materials are reused in new pavement. While concrete is also recyclable, the practice is nowhere near as widespread, and standards for what concrete can be recycled is much more constricting ("Recycling" 1). Asphalt also adapts better to colder temperatures and changes in temperature than concrete, which could speak volumes to its durability in a place with above-average climate variability and below-average temperatures like Minnesota (Wolf 1). And because of its permeable quality, porous asphalt needs only 0-25% of the salt in winter that conventional asphalt requires. While it needs to be cleaned more frequently than conventional asphalt (typically once every one half-3 years) to maintain efficacy, porous asphalt's intolerance to sealant will save the city money on supplies and labor, nullifying the added cost of surface cleaning (Porous Asphalt Pavements 5).

Existing potential for extending the longevity of porous asphalt in the most vulnerable areas with the use of a root barrier geotextile also turns porous asphalt into a more appealing paving option. Root barrier geotextiles (in the study referenced, BioBarrier Root Control Fabric) are proven to be the most effective tool for inhibiting root growth in the direction of trails. The devices which make geotextiles successful at disrupting growth are extended-release nodules filled with a chemical called trifluralin. According to a supplier website, trifluralin is a "non-systemic herbicide that is classified by the EPA as Class IV and has a lower oral toxicity than table salt" ("BioBarrier Root Control Fabric" 1). Geotextiles typically last a minimum of 15 years, meaning that, should trails be otherwise responsibly maintained, they would give porous asphalt the potential to challenge the lifespan of pervious concrete ("BioBarrier Root Control System" 1). A visual representation of the application of BioBarrier is available in Figure 15 below.

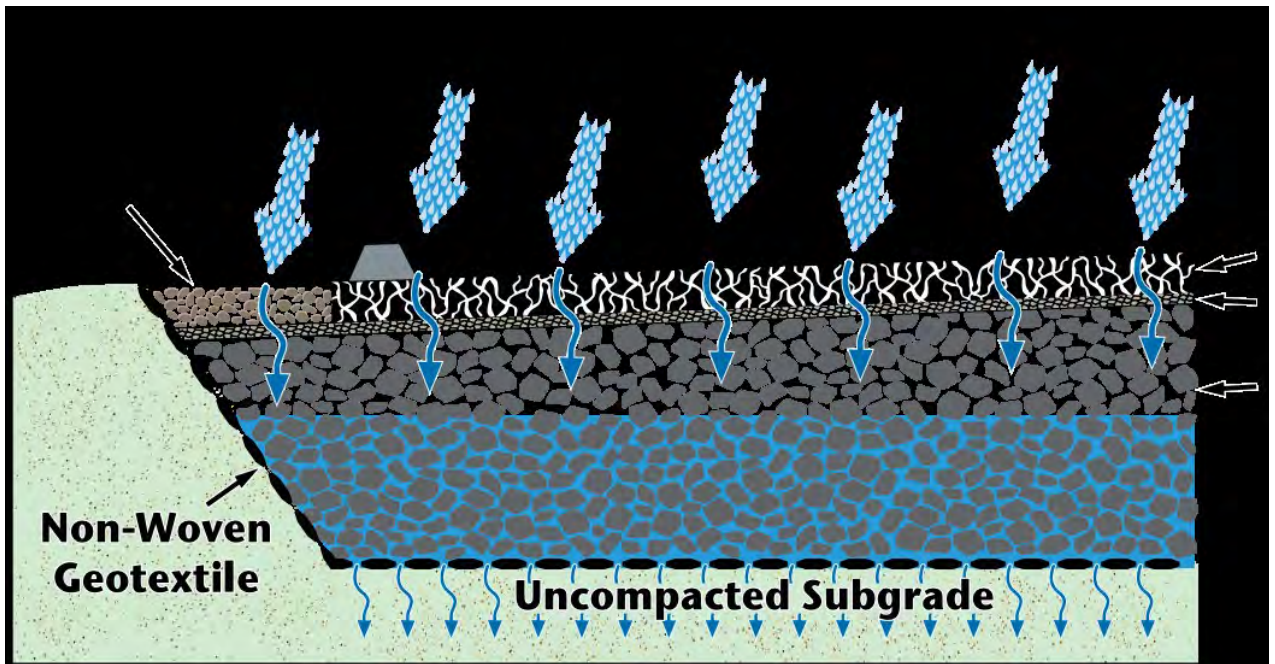


Figure 13, A diagram of the structure of a porous asphalt trail. (Porous Asphalt Pavements 3)

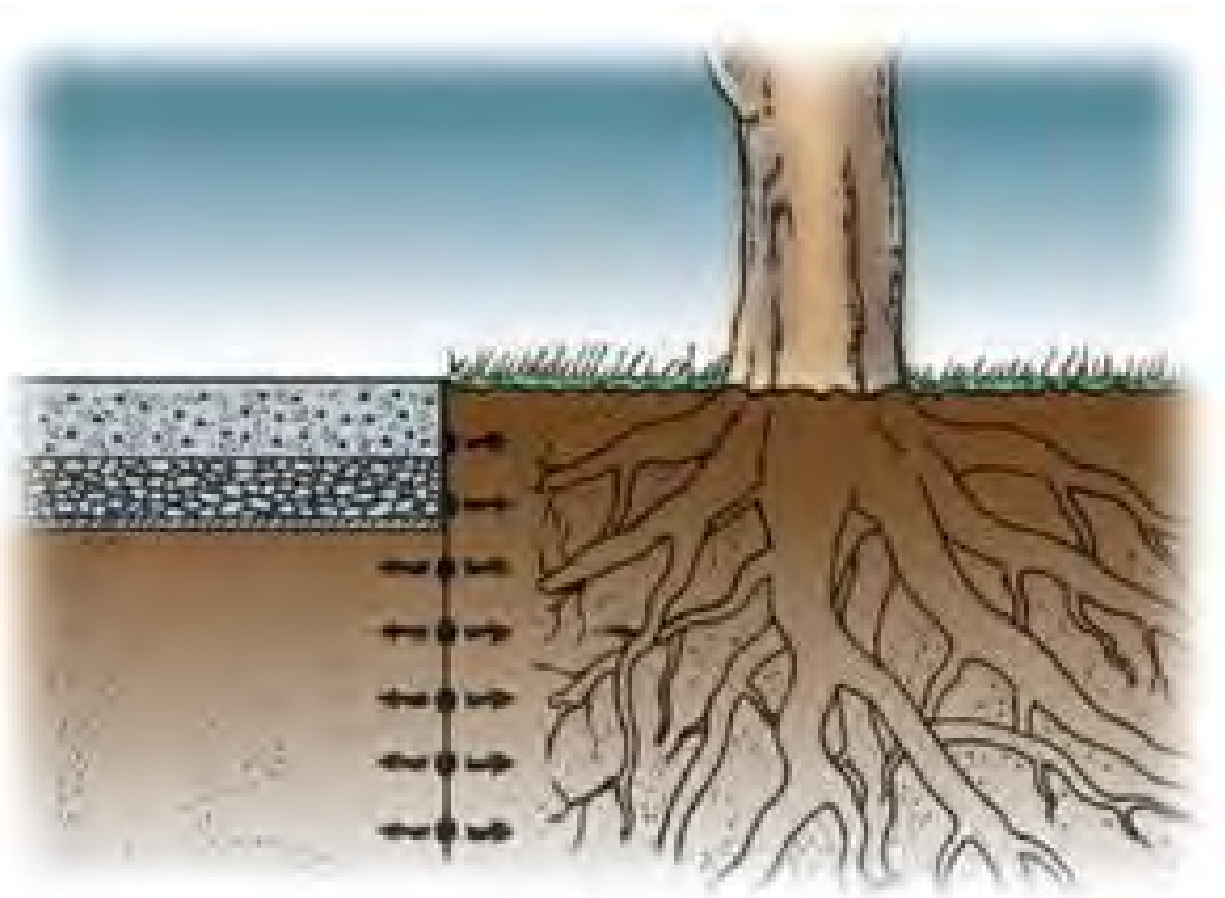


Figure 14, An illustration of how root barrier geotextiles inhibit tree growth toward trails.

	Average Installation Cost/sq. ft.	Wheelchair Accessible	Filters Water Cleanly	Recyclable	Durability/ Longevity	Frequency of Maintenance	Maintenance Difficulty
Conventional Concrete	4	X		3	20-25+ years before resurfacing	1	4
Conventional Asphalt	2	X		5	7-20 years before re-surfacing	2	2
Pervious Concrete	5	X	X	3	20-25+ years before resurfacing	1	5
Porous Asphalt (without root barrier geotextile)	3	X	X	5	20+ years before re-surfacing	2	2
Natural Crushed Stone (gravel)	1		X	4— typically made of recycled material	Can require significant yearly maintenance	4	1
Crushed Concrete	1			4— typically made of recycled material	Can require significant yearly maintenance	4	1
Wood Chips	1		X	4— typically made of recycled material	Requires more than yearly maintenance	5	1
Natural Earth	1		X	N/A	Can require significant yearly maintenance	4-5	2
Concrete Pavers/ Porous Concrete Pavers	5+	X		3	30+ years	1	2
Recycled Materials	Varies, typically fairly expensive	X	Varies	Varies	Varies, typically high	Varies— typically 1-3	Varies
Sealed Wooden Boardwalk	4-5	X	X	4	10-20 years	?	2

Figure 15- A table comparing paved and unpaved trail surface options. 5-point relative scale as follows: 1- very low; 2- low; 3- fair; 4- high; 5- very high (“Surfaces 1-2) (“Choosing the Right Trail Surface” 7, 27) (“What is the Average Lifespan of a Wood Deck?” 1) (“Boardwalk Maintenance Cost Comparison” 2) (Goering 1) (“Permeable Pavement” 3)



Stakeholder Perspectives

As part of the research process for developing this document, we conducted interviews with representatives from various stakeholder organizations. We spoke to the National Park Service, the Minnesota Department of Natural Resources, the Metropolitan Council, the Shingle Creek and West Mississippi Watershed Management Commission, the Three Rivers Park District, and the Brooklyn Park Maintenance and Facilities Department. We focused on groups that would have a specific and vested interest in parks and natural resource management and planning. The information gathered from these interviews informed our continued research and recommendations.

National Park Service

The National Park Service (NPS) manages the Mississippi National River and Recreation Area (MNRRA) to preserve the natural, aesthetic, cultural, and historical values of the river for public use, as well as to protect environmentally sensitive areas. They strive to preserve the character of the Mississippi River as a cultural, recreational, and natural resource for future generations. The MNRRA was established in the boundary of the Mississippi River Corridor Critical Area to facilitate coordinated land use decision making across administrative jurisdictions. The NPS therefore serves as a partner and resource for local planners and decision makers interested in protecting natural resources and other values along the Mississippi River and its tributaries. Although the NPS has no regulatory authority in the MNRRA, they work with local cities to review plans, provide feedback and expertise, and access funding opportunities.

Minnesota Department of Natural Resources

The Department of Natural Resources has jurisdiction over the Mississippi River Corridor Critical Area, a strip that runs through the city along the banks of the river. Local government units (LGUs) are required to address these areas in their comprehensive plans and the DNR's role is to review the rules and ordinances that are developed in these processes. Currently the rule that LGUs must meet, Executive Order 79-19 is being redeveloped and expected to change near the end of the month. There is little that would impact the planning process for Brooklyn Park, though there is expected to be a model ordinance that the city could consider adopting. Because so much of the land within the corridor is private, Brooklyn Park may want to consider strategies to impact private landowners land use practices and encourage riparian vegetation development in these areas.

Metropolitan Council

The Metropolitan Council, a planning and policy-making board local to the Twin Cities and the surrounding counties of Hennepin, Ramsey, Carver, Washington, Anoka, Dakota, and Scott, was assembled to be a “regional solution for regional problems” with the mission of fostering “efficient and economic growth for a prosperous metropolitan region”. The RCP 2016 natural resource planning graduate group had the opportunity to speak with multiple policy analysts working for the Metropolitan Council, and to more extensively interview an analyst who played a key role in the development of the Thrive MSP 2040 Plan. Recently, in accordance with state law, the Metropolitan Council created Thrive as a comprehensive development guide for Minneapolis-St. Paul and the seven-county surrounding area. With respect specifically to the parks and other natural resources of the MSP region, the Metropolitan Council produced the Thrive MSP 2040 Regional Parks Policy Plan as a part of Thrive. The Regional Parks Policy Plan “puts forward policy direction to ensure the fulfillment of outdoor recreation benefits for all residents of the metropolitan region, now and into the future”. It aims to accomplish the following:

- “Expand the Regional Parks System to conserve, maintain, and connect natural resources identified as being of high quality or having regional importance, as identified in the 2040 Regional Parks Policy Plan
- Provide a comprehensive regional park and trail system that preserves high-quality natural resources, increases climate resiliency, fosters healthy outcomes, connects communities, and enhances quality of life in the region
- Promote expanded multimodal access to regional parks, regional trails, and the transit network, where appropriate
- Strengthen equitable usage of regional parks and trails by all our region’s residents, such as across age, race, ethnicity, income, national origin, and ability”

This plan integrates previous legislation and new regulations to detail a rigorous collection of strategies for the governance of regional and local parks, addressing the following policy fields: recreation activities and facilities policy, siting and acquisition policy, planning policy, finance policy, and system protection policy. To secure future development support from Metropolitan Council, it is important that Brooklyn Park incorporate Thrive’s goals into their future parks planning.

Shingle Creek and West Mississippi Watershed Management Commission

The watershed management commission is a group of nine volunteer citizens representing each city within the watershed. The commission is responsible for reviewing plans for development within the watershed and ensuring that proper care is taken to manage stormwater runoff, encourage infiltration, and protect water quality in local waterbodies. The watershed management commission also partners with cities to restore streams and create education opportunities, such as the Shingle Creek restoration within Brooklyn Park. Any planning activities should include the input of the watershed commission, and future collaborative projects should be considered to encourage continued public access to clean, safe water bodies as an amenity within Brooklyn Park.

Three Rivers Parks District

Three Rivers Park District is a unique parks district that relies primarily in the suburban areas of the Twin Cities metro. The Three Rivers Parks District intention is park recreation and environmental education. The Parks district also has jurisdictional boundaries within the city of Brooklyn Park allowing for various partnerships to form. The park district is dedicated to inclusion and accessibility of their various parks/trails hence making sure the Park district's initiatives are in line with the city's Thrive 2040 plan is key.

Minnesota Dakota Tribes

The Dakota are recognized as original inhabitants of Minnesota. The Dakota bands of Minnesota which include the Lower Sioux Indian Community, Upper Sioux Indian Community, Prairie Island Indian Community, and the Shakopee Mdewakanton Sioux (Dakota) community are all part of the 11 federally-recognized tribes in Minnesota. The vast majority of the Dakota were removed and exiled from Minnesota following the Dakota uprising of 1862. The Santee Sioux, Flandreau Santee Sioux, Sisseton Wahpeton Oyate, Crow Creek Nation and others were relocated to territories outside of the state but still maintain deep ties to their traditional homeland. The Dakota Nation continues to have a historical, unique, and significant relationship with Minnesota lands particularly those surrounding the Mississippi River. Consultation and recognition of the tribes should be included in aspects of planning.

Brooklyn Park Maintenance and Facilities Department

The Brooklyn Park Maintenance and Facilities Department is responsible for managing the city's natural resources however their focus has been historically on turf-grass management or recreational areas and roadsides because of public interests and expertise. Outside of the city's numerous recreational parks, the more natural areas found along the river commonly fall under multiple jurisdictions yet the responsibilities associated with managing these areas falls upon the city. When planning cooperative projects with other agencies, proper management of these areas must be taken into consideration before development occurs to ensure that plans are sustainable long after the project has been successfully implemented. Without proper management, these areas can become degraded and negate the initial attempt made to conserve them.

The Brooklyn Park city forester and tree crew work with a limited budget and regularly get pulled to perform other types of maintenance around the city. Based the interviews conducted with forestry personnel, it appears that most of their training is informal and their work is primarily focused on managing trees in the parks and boulevard trees. Staff interviewed acknowledged having limited knowledge and experience managing natural areas, as that becomes a bigger focus they need help developing appropriate management practices.



Contributor Biographies

This project is the product of a collaboration between seven students enrolled in the graduate level course Sustainable Land Use Planning and Policy class at the University of Minnesota. The team was advised by Dr. Mae Davenport, Associate Professor in the Department of Forest Resources.

Kate Gurke

Kate Gurke is a Master's student in Science, Technology, and Environmental Policy at the Humphrey Institute of Public Affairs focusing on urban food systems and subjective well-being. She is interested in the intersection of design and planning of urban agriculture as multi-use spaces and policy. Working with Brooklyn Park and the Resilient Community Project has been great way to experience planning at a citywide scale.

Mike Johnson

Mike Johnson is a Master's student in the Natural Resources Science and Management program at the College of Food, Agriculture, and Natural Resource Sciences. His graduate focus is on management techniques and how they influence survival in breeding populations of waterfowl. Implementing proper management techniques to facilitate a desired outcome can be difficult in financially and logistically challenging environments. This is a common issue facing natural resource decision-makers especially in multi-use urban environments such as Brooklyn Park.

Tom Kenote

Tom Kenote is a Master's student in Natural Resources Science Management program at the University of Minnesota. His research interests are in traditional ecological knowledge, water, and natural resource management. He is interested in the equity and cultural aspects because his research is connected to diverse populations and diverse ways of knowing.

Liz Kutschke

Liz Kutschke is a Master's student in Architecture and Sustainable Design in the College of Design. Her work has focused on the relationship of the natural environment and the built environment, and how each influences and impacts the other. She is also interested in equity and social justice issues surrounding development and infrastructure. Working with the diverse city of Brooklyn Park has allowed her to investigate these issues at an urban scale.

Chad Lanoux

Chad Lanoux is an undergraduate student pursuing his degree in Forest and Natural Resource Management with a focus on parks and protected areas. Working with Brooklyn Park has provided insight into the management of parks within the city and some of the challenges that they face.

Elizabeth Mejicano

Elizabeth Mejicano is a Master's student in the Natural Resources Science and Management program at the College of Food, Agriculture, and Natural Resource Sciences. Her graduate focus is on evaluating management effectiveness in federally protected areas. She also works for the Aldo Leopold Wilderness Research Institute with a focus on federal wilderness character monitoring. Working with Brooklyn Park has allowed her to examine related fields of natural resource monitoring and management on a local scale.

Shannon Marie Werbeach

Shannon Marie Werbeach is a first-year PhD student in the Department of Geography, Environment, and Society at the University of Minnesota. Prior to coming to the U of M, she obtained her BA in Philosophy and Geography at The Ohio State University and performed research on public land use and natural resource management in Rajasthan, India. Shannon plans to pursue studies in national park-related policy and governance, as well as landscape and political ecology, as the central focus of her dissertation work. Working in Brooklyn Park on the Resilient Communities Project has provided her the opportunity to learn more about the recreational management of natural spaces.



UNIVERSITY OF MINNESOTA



Resilient
Communities Project

Appendix Contents:

1. Sample Memorandum Of Understanding agreement
2. Case Study: Urban Canada Geese Damage Control
3. Supplemental Information for Prairie Area Management

11

Appendix

SAMPLE FORMAT AND CONTENT

MEMORANDUM OF UNDERSTANDING

All *italicized* sentences are considered instructions and should be deleted prior to the submission of the final MOU.

This Memorandum of Understanding (MOU) is entered into by and between: *Provide the agency name and a brief description of each agency i.e. non-profit Domestic Violence non-shelter provider.*

A. **Purpose.** *(State the purpose of the MOU)*

A. **Roles and Responsibilities.** *Clearly describe and delineate the agreed upon roles and responsibilities each organization or agency will be providing to ensure project success. The roles and responsibilities should align with project goals, objectives and target outputs. This may be time commitment, in-kind contributions or grant funds and could include but is not limited to the following: training, workspace, volunteer hours,*

Agency A agrees to:

Responsibility/Activity	Responsible Staff

Agency B agrees to:

Responsibility/Activity	Responsible Staff

B. **Reporting Requirements.** *Describe who will be responsible for collecting, collating and submitting data as per the project target outputs and outcomes.*

C. **Funding.** *Clearly describe any grant fund, the amount and category (personnel, office supplies, contracted services, etc.) that will be provided to the non lead agency(s).*

D. Timeframe. *Clearly state the time period that this MOU will be in effect.*

This MOU will commence on _____ and will dissolve at the end of the VOCA grant funding period on _____.

F. Confidentiality. (REQUIRED)¹

In order to ensure the safety of clients, all parties to the memorandum of understanding agree to adhere to the confidentiality expectations as outlined in the VOCA Grant Agreement.

The designated lead agency accepts full responsibility for the performance of the collaborative organizations/agencies. **(REQUIRED)**

This Memorandum of Understanding is the complete agreement between _____ and _____ and may be amended only by written agreement signed by each of the parties involved.

The MOU must be signed by all partners. Signatories must be officially authorized to sign on behalf of the agency and include title and agency name.

<u>AGENCY A</u>	
Authorized Official: _____	_____
Signature	Printed Name and Title
Address: _____	
Telephone(s): _____	
E-Mail Address: _____	
<u>AGENCY B</u>	
Authorized Official: _____	_____
Signature	Printed Name and Title
Address: _____	
Telephone(s): _____	
E-Mail Address: _____	

¹ All items marked "required" must be included in the memorandum of understanding.

Case Study: Urban Canada Geese Damage Control

The status of Canada Geese (*Branta canadensis*) populations in North America have been increasing steadily since the mid 1980's except for a few subspecies and subpopulations inhabiting the coastal areas. The goose subspecies we're most familiar with here in Minnesota, the Midcontinent population of Giant Canada Geese (*B. c. maxima*), have been estimated to fluctuate between 1.8 million and 1.4 million birds over the last 30 years, 1% above the long-term 10-year trend (USFWS 2016). Due to lack of predators and substantial nesting opportunities, Canada geese (hereafter "geese") have become a prominent fixture in both urban and suburban communities such as Brooklyn Park, MN. The Minnesota Department of Natural Resources estimates the breeding population within the Twin Cities metro area to be around 17,500 birds (Smith 2015). Despite recent declines, geese in the Twin Cities continue to be a nuisance as they are known to be aggressive in nature, especially when protecting goslings. Their foraging habitats can be damaging to well-maintained lawns and excess feces as a result of localized feeding is messy to clean up and poses potential health safety threats (Kullas et al. 2002). Geese and residents alike, share a fondness for areas where well-maintained grass is in close proximity to water. Thus, abundant safe places exist for the exploitation by geese.

Limiting the damage caused by urban geese is seldom quick or easy. The amount of time it takes to fix the problem depends on the number of geese, the features attracting them to the problem site, and the length of time they have used that site. Knowing a little about the biology of these birds helps explain why the birds have become a nuisance and gives rise to what techniques may be most successful in reducing the amount of damage.

- Giant Canada geese are large birds, averaging 8-12 pounds and sometimes reaching weights in excess of 15 pounds.
- They are well-adapted for water, locomotion on dry land, as well as flight. Only the female incubates the eggs but the gander (male) is typically close, especially during brood rearing for active defense against predators.
- Goose populations are dependent on adult survival as banding records indicate, one Canada goose holding the longevity record for all waterfowl at 30 years, 4 months.
- Canada geese exhibit relatively high rates of philopatry (the likelihood an individual will return to the same breeding location year after year). During a study in 1985, adults released from a nest site returned the following year at rates of 47.1-50%, depending on sex. Juveniles released from that same nest site returned at much higher rates (79.4%).

The first step in managing goose damage is to identify what attractants are bringing the geese to the current site.

Most often, geese select foraging sites based on assessment of risks to their safety, food quality, and energetic costs of reaching the site. Conover and Kania (1991) found that urban geese selected foraging sites which provided the greatest visibility so that approaching predators could be seen well in advance. Geese avoided small lawns and lawns with hedges, shrubs, or other obstacles large enough to hide a predator. Furthermore, geese avoided sites that required a steep angle of ascent to leave (Conover 1991); that is, geese did not use lawns that were surrounded by tall trees or buildings that might impair the birds' ease in flying away.

Once the attractant is established, damage control measures fall into two categories: nonlethal and lethal.

1) Nonlethal methods:

- Most effective when multiple approaches are used in combination. Timing is often the most critical component in nonlethal deterrent.
- Control techniques include: elimination of food handouts, exclusion, landscape modification, removal/relocation and scare tactics such as hazing, repellants.

2) Lethal methods

- Removal of geese through legal hunting (more effective in less urban areas).
- Permitted culling of geese out of season or egg destruction.

The key to long-term damage control is making the problem site less attractive than other sites available. Removal of urban geese is a complex problem that has a diverse number of solutions. Using biological information in combination with current knowledge of the issue in Brooklyn Park, we make recommendations on how to decrease the amount of damage caused by geese under an adaptive management approach.

Given the current land use practices in Brooklyn Park, we recommend a combination of lethal and non-lethal approaches to lessen goose damage. If properly implemented, declines in nuisance geese will be observed and over the long term, lethal action will no longer be necessary.

Steps to facilitate removal:

1. Identify areas where geese have been known to cause damage and nuisances exist for multiple years.
 - Rank/prioritize areas based on the extent of damage accrued, the number of geese occupying the area, and number of years' geese have been a problem at specific site.
2. Contract lethal removal of birds at the most problematic sites. Current pricing is expensive so areas must be chosen carefully.
3. In areas where bird damages are relatively recent (fewer years) or of a lesser extent, apply non-lethal techniques to deter birds.
 - Eliminate food handouts if this occurs at certain sites. Geese quickly habituate to locations where food is readily available and situations where geese come in close contact with humans only creates more problems.
 - Assess areas for the potential to eradicate geese through landscape modification; these approaches are most effective long-term and environmentally sound. Reducing convenience is the key and making access from dry land to water for geese inconvenient, can deter them from using the area.
 - Bordering with boulders 2+ feet in diameter.
 - Placing a short fence in the cattails so fence is hidden from view but still impedes movement of geese.
 - Results from Conover's research indicate that geese can be discouraged from using a foraging site by planting hedges and bushes, and by surrounding the area with tall trees.
 - Planting alternative grass species to replace Kentucky bluegrass, a favored forage species, with a less palatable species (Conover 1992).
 1. Most recommend nonnative invasives, however they can have significant impacts on surrounding area, insects, and pets.
 2. Colonial Bentgrass (*Agrostis tennensis*), native to west coast, shade tolerant.
 3. Creeping red fescue (*Festuca rubra*), shade tolerant (photo Credit GardenWeb).
 - Hazing and frightening devices are an option but they require persistent and vigilant action. These techniques have been tested for effectiveness (Aguilera et al. 1991) but only up to 15-days post treatment. Birds often habituate to devices and effectiveness diminishes over time.
 - Pyrotechnics such as shellcrackers, screamers, bangers, etc.
 - Balloons and flagging are least invasive but least effective.
4. Monitor effectiveness of control practices on the short term basis.
 - Did birds stop using the area all together?
 - How long did it take for birds to return to site where control technique was utilized?
5. Adjust techniques to turn short term successes into long-term success by increasing the influence of strategies such as landscape modification.

Because geese quickly habituate to one type of control, the full range of control measures should be considered. Canada geese are persistent and adaptable. Therefore, it is necessary to be diligent and aggressive when implementing damage-control procedures.

Supporting info:

Smith, A.E., Craven S.R. and C.D. Paul. 2000. "Managing Canada Geese in Urban Environments: A technical Guide". 40 pages.

This manual helps wildlife professionals, turf-grass managers, and homeowners select appropriate management strategies for alleviating problems caused by resident, non-migratory geese. This manual complements the video, Suburban Goose Management, Searching for Balance, which can be obtained from the Cornell University Resource Center. Phone 607-255-2080 or email resctr@cornell.edu. A print on demand of these books and articles can be obtained from Cornell Business Services (CBS) Digital Services by sending e-mail to digital@cornell.edu or calling 607.255.2524. In the body of the message include the identifier.uri for the book or article, and ask to be contacted regarding payment.

Supporting Information - Prairie Management

The following information about prairie management techniques was gathered through research in order to be able to provide the city of Brooklyn Park with general management guidelines. Below are a list of General management guidelines and specific directions for the use of fire, mowing/haying, the removal of woody vegetation, and alien weeds.

General Management Guidelines (Hamilton 1997)

A biological survey should be taken of all major plant and animal groups, and updated regularly. Contact state DNR natural areas staff for individuals to help with surveys.

1. A Specific plan with goals should be established for each prairie. Take into account management need, problems, alien species, threatened and endangered species, availability of help (manual labor, equipment), and adjacent land use. Make maps.
2. Treat only small portions of the prairie (fire, mowing, grazing). Avoid single universal treatment of a prairie tract so as to avoid extirpation of species and to minimize other negative effects on susceptible species.
3. More specifically, divide the prairie into biological communities. Allow only a fraction of each community to receive disturbance (by fire, grazing, mowing) each year. The purpose of this action is to leave a refuge for species which may not be harmed by the given management technique.
4. Diversify treatments. Treatment techniques as well as time of application should be varied, from year to year, for each given community.
5. Gain control over unwanted woody vegetation by manual removal so that subsequent re-growth can be more efficiently controlled by use of a tractor mounted mower (and grazing and occasional burning).
6. Record past and present influences and management techniques. Record the effects of management. Evaluate and revise the management plan regularly.
7. Some prairies have a low need for management and should be left alone as a type of management.
8. Plant and animal specimen collection and seed collection should be regulated so that it does not harm the prairie community. Legitimate benefits of specimen collection include enhancement of local native prairies, and research that will provide increased public knowledge.
9. Do not introduce wildlife cover, food plots, or alien trees.
10. Introduction of native species; Introduced genetic material should be locally derived as well as site and soil specific. The side of origin should be recorded.

Fire (Hamilton 1997)

1. Use small segmental burns. The prairie should be broken down into biological communities. Each biological community should be divided into five or six patches with representative biological components in each patch. Burn one patch (subsection) per year, maximum. For example, a prairie with a dry knoll and a mesic plateau should have only a small portion of the knoll and a small portion of the plateau burned on a given year. Utilize strips which traverse the small portions of each community.
2. How often should you burn? Consider every 10 years combined with mowing and grazing. Standard burn cycles are often 2 or 3 years; however, negative effects of fire and possibility of species extirpation have resulted in suggestion of 10 to 30 year cycles. Leave some sections burn free permanently. Black soil prairies with high biomass production may require more frequent fires than dry, sandy, or rocky low biomass prairies.
3. Burn in long linear shapes. This method provides a longer border for slow-moving species with several year recovery times to repopulate.
4. Avoid burning contiguous parcels in consecutive years. This play allows species to repopulate. Use multiple strips.
5. Avoid re-lighting areas that were skipped by burns. These areas provide a natural refuge for species harmed by fire.
6. Minimize backfires since these may result in a longer exposure to a hotter fire at the surface.
7. Create firebreaks by mowing the breaks the summer before the burn. This practice allows for disintegration of debris and hence cleaner breaks and less labor into raking away debris. Firebreaks can be created by mowing, hand brush cutting, plowing adjoining non-prairie land, or by using roads, creeks, paths, etc.

8. Vary the timing of burns. Invading alien cool season species are commonly battled with a spring burn after the alien species have leafed out and greened up. Consider varying the time of burns, so as not to artificially select spring burn favored communities.

9. Consult other sources for specific burning techniques.

The use of fire is recommended over mowing since prairie ecosystems are dependent on fire. Since the prairie is located near residential housing, the prairie could be mowed before performing a prescribed burn. This would reduce flames height and minimize the risks associated with the fire.

Mowing / Haying (Hamilton 1997)

Mowing and haying simulate some features of grazing and are helpful and efficient in treating large areas of woody vegetation and alien weed overgrowth. Consider occasional mowing and haying during the growing season on small subsections as delineated under "FIRES". Prairie hay is desirable for livestock feeding.

Woody Vegetation (Hamilton 1997)

1. General Issues: Cut or mow after plants have been fully leafed out (energy stores above the ground) but before they have translocated significant winter stores to roots- perhaps mid June through August. This cutting can be achieved by use of chain saw, brush cutter, pruning shears or a mower on a tractor. Setback of woody species can be maximized by cutting and re-cutting sprouts more than once per year as well as re-cutting in successive years. Removal of larger trees should be done in that winter with frozen ground and snow cover in order to protect the suppressed understory species.
2. The suppressed understory vegetation may be only sparsely visible initially; however, it will rebound nicely in subsequent years with proper management.
3. Trees and medium diameter brush: Ring trees with a chainsaw or remove the cambium manually in the summer, and leave standing. Remove trees in the winter.
4. Small brush and re-sprouts: Cut and re-cut in summer. Remove from prairie if dense so as not to cover under-laying vegetation, otherwise may leave in place. Consider herbicides for difficult species such as sumac and black locust.
5. Cedars: Cut and remove in winter. No herbicides needed. Cedars are easily killed by fire.
6. Brush piles: Create piles on disturbed ground. Do not place on grassy areas or on adjacent brushy areas since such areas may spring back to prairie when cleared and managed. If brush is piled there it will sterilize the existing native vegetation, soil, and seed bank and the area will fill with weeds.
7. Vines (on trees to be removed): Consider stump treatment with herbicides before the tree is removed so that they don't spread horizontally on the ground after the tree is removed.
8. Leave some woody plants untouched since they may provide a different local environment for unusual species.

Alien Weeds (Hamilton 1997)

1. Annuals and Biennials (bull thistle, sweet-clover, etc.): Cut at the time of flowering in order to remove the reseeding potential. Properly timed fire or cutting may be appropriate. "Pulling weeds by roots" can be effective for isolated weeds; however, keep in mind that disturbed ground left by this maneuver can invite more weeds.
2. Perennial weeds: Routine prairie management (mowing, burning) will conquer many weeds.
3. Perennial weeds with underground stolons (Canada thistle, leafy spurge, etc.): Stump treatment with 33% Roundup is efficient for small populations. Leafy spurge is a serious problem that can completely overtake grasslands. It aggressively colonizes disturbed areas. Roundup 1 to 2% spray is effective. Some prairie managers use Tordon 22K or a 10% solution of Tordon RTU topically. Yearly vigilance is required.
4. Cool season grasses and weeds: Use late spring burns after the aliens have leafed out. Routine management and succession to prairie will set back these species.

Determining the Health of the Prairie and Success of Management Practices

Following are a list of attributes that workers at Brooklyn Park can use to determine the health and success of their management of the prairie at River Park.

Biological Attributes of a Functional Prairie System (Minnesota Prairie Plan Working Group 2011).

1. Supports moderate to high diversity of vegetation types and native species within predominantly native prairie and associated habitats
2. Maintains viable populations of prairie landscape dependent fauna and flora
3. Is of adequate scale to support animal species that have large home ranges or require a variety of different habitat types throughout their life cycle (e.g., greater prairie-chicken, American badgers, and many amphibians)
4. Provides connectivity between grassland sites for plant and animal populations by facilitating movement and gene flow, including for species with relatively low capacity for movement
5. Provides linkages between upland and wetlands for animals that utilize both habitats
6. Has a natural disturbance regime (e.g., fire, grazing, and changing water levels)
7. Represents grasslands and wetlands with different histories of fire and grazing and time since disturbance (different successional stages)
8. Contains a complex of different habitat types including savannas, brush prairie, groundwater seepages, and a variety of wetlands that can range from temporary wetlands to shallow lakes
9. Exhibits ecosystem stability, adaptability, and resilience to environmental change

Physical Attributes of a Functional Prairie System (Minnesota Prairie Plan Working Group 2011).

1. Cycles, transforms, and stores elements and nutrients (e.g., carbon, oxygen, nitrogen, and phosphorus)
2. Transfers energy between trophic levels
3. Filters and stores water
4. Anchors and builds soil



Figure 17. "Urban Prairie Coming Soon" The urban prairie plot in Benson Park has been seeded, and temporary signage has been installed.

Brooklyn Park

Unique. United. Undiscovered.

Dear Residents,

You will be seeing a change in some of your local parks. The city will be refocusing some of its energy into managing more natural areas, prairies specifically. This aligns with goals laid out in Hennepin County's Natural Resource Strategic Plan to protect and enhance natural areas. Prairies are one of the rarest natural ecosystems left in North America; this is due to their highly fertile soil. As a result, most of the prairies no longer exist and have been converted into farmland or have been otherwise developed.



Before European settlement, Brooklyn Park was covered predominantly by prairies, which make the land well suited for prairie restoration. Prairies provide a number of ecosystem services beneficial to humans including the filtration of water and some species found within prairies even have medicinal values.

You will see various management strategies taking place at different times of the year including prescribed burns and mowing. Each year only a portion of the prairie will be treated which will maintain the biodiversity and functioning of each system. The partial treatment also ensures that there is still habitat for wildlife that utilize the prairie.

At this time we ask that you express any concerns you might have regarding prescribed burns within the city limits. Please drop off any comments at the City Hall

Figure 18, Example Letter To Residents

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