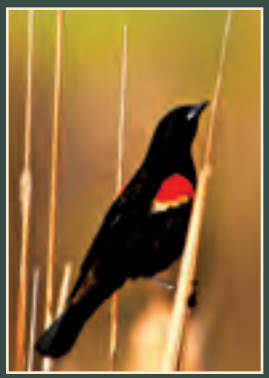
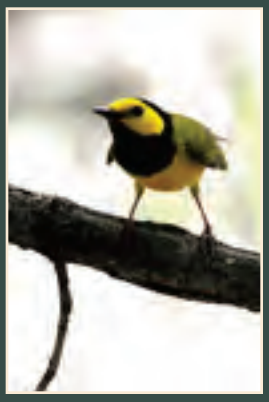
Thomas Sadler Roberts Bird Sanctuary

MANAGEMENT PLAN





Minneapolis Park & Recreation Board
Environmental Operations

MISSION

MINNEAPOLIS PARK & RECREATION BOARD

The Minneapolis Park & Recreation Board
shall permanently preserve, protect, maintain, improve and enhance
its natural resources, parkland, and recreational opportunities
for current and future generations.

The Minneapolis Park & Recreation Board
exists to provide places and recreation opportunities for all people
to gather, celebrate, contemplate, and engage in activities
that promote health, well-being, community, and the environment.

Source: Bell Museum of Natural History

Thomas Sadler Roberts
1858-1946

"To know the birds by name, to watch for them to learn their habits and songs, and to regard them as valued friends, brings the wish to protect them and to throw around them all possible safeguards. In this direction, rather than in multiplying laws, which are difficult to enforce, lies the promise that the waste of our wild life may be effectively checked, and that conditions resembling, in some degree at least, those of former days may be restored."

Thomas Sadler Roberts, *The Birds of Minnesota*, 1932

SUMMARY

The Thomas Sadler Roberts Bird Sanctuary (Sanctuary) is located in Lyndale Park, part of Minneapolis' popular Chain of Lakes Regional Park in Southwest Minneapolis. It is bordered by Lake Harriet to the south and Lakewood Cemetery to the north. The 31-acre Sanctuary is public parkland managed by the Minneapolis Park and Recreation Board (MPRB or Park Board).

In 1890, the land that is now the Sanctuary was donated to the Park Board by the Lakewood Cemetery Association. The land was designated a bird sanctuary in 1936 by the Board of Park Commissioners. In 1946, the Sanctuary was renamed to memorialize Dr. Thomas Sadler Roberts (1858-1946).

The Sanctuary is a mixture of upland forest, wetland and three small dredged ponds. The ecology of the Sanctuary has been greatly altered by dredging, filling of surrounding lands, DED elm disease (DED), catastrophic wind damage, and invasive species.

In 2010, representatives of the Audubon Chapter of Minneapolis (ACM) and the Linden Hills Neighborhood Council (LHiNC) approached the MPRB with the desire to revitalize the condition of the Sanctuary. This revitalization has three key components: developing a management plan, identifying and implementing volunteer stewardship project, and developing educational opportunities.

In August 2010, the MPRB Board of Commissioners approved a Resolution Authorizing Staff to "work with the Audubon Chapter of Minneapolis (ACM), East Harriet– Farmstead Neighborhood Association (EHFNA), and Linden Hills Neighborhood Council (LHINC) on a Management Plan for Roberts Bird Sanctuary" (Appendix XX).

The Management Plan documents the results of a natural resources and infrastructure inventory of the area. Recommendations for management and enhancement of the Sanctuary are based on these inventories as well as the goals of the project partners and the information gathered during public meetings and surveys.

In October 2012 ACM and MPRB Environmental Operations staff met with designees from ACM to develop a vision statement for the Sanctuary as well as management goals and a list of needs for the Sanctuary.

As part of the Management Plan, a vision statement was developed, outlining an overall vision for the Sanctuary:

> *The Thomas Sadler Robert Bird Sanctuary is a public bird sanctuary treasured by visitors as a place of beauty and quiet in the urban environment, supporting a diversity of resident and migrating birds in a natural and undeveloped setting while providing environmental education opportunities to a broad audience.*

Three goals were developed for improving the condition of the Sanctuary:

1) Protect, preserve, and enhance the bird habitat and native plants contained within the Sanctuary for present and future generations of people and wildlife;

2) Educate and inspire people about birds and their habitats, Minnesota native plants, and the natural world;

3) Provide a minimal infrastructure for the Sanctuary that honors the integrity of this undeveloped natural area as a bird sanctuary and a place that connects people with nature.

Sanctuary Needs

The partners in the plan have identified several needs to improve the condition of the Sanctuary:

- Repair or replace the perimeter fencing;
- Replace the boardwalk to include sections that are ADA compliant;
- Develop educational resources for the visitor's shelter that support the vision and goals of the Sanctuary;
- Replace existing signage at both entrances to provide important notices to visitors;
- Identify and implement ways to ensure uses of lands immediately adjacent to the Sanctuary boundaries complement and support the vision and goals of the Sanctuary;
- Provide a trail network consistent with the Sanctuary's vision;
- Improve the ecological health of the Sanctuary's woodland and wetland areas;
- Implement woodland and wetland enhancements based on feasibility and funding.

Minneapolis Park & Recreation Board (MPRB) Mission and MPRB Comprehensive Plan 2007-2020

The Roberts Bird Sanctuary Revitalization and Management Plan seeks to incorporate Mission of the MPRB and the four main Vision Themes of the MPRB's Comprehensive Plan 2007-2020. The MPRB Comprehensive Plan's vision for the future of Minneapolis' park system is to "continue the long tradition of preserving land and connecting people to the land and to each other" (MPRB P. 2 comp plan).

CONTENTS

1.0 OVERVIEW

Sanctuary Location

The Thomas Sadler Roberts Bird Sanctuary (Sanctuary) located in Southwest Minneapolis is 31 acres of public parkland owned and managed by the Minneapolis Park & Recreation Board (MPRB or Park Board). The Sanctuary is located in the Chain of Lakes Regional Park, a park area that includes: Brownie and Cedar Lakes, Lake of the Isles, and Lakes Harriet and Calhoun. The Sanctuary is bordered by Lake Harriet to the south and the Lakewood Cemetery to the north.

Figure 1.
Thomas Sadler Roberts Bird Sanctuary's location in Southwest Minneapolis on the north shore of Lake Harriet and abbutting Lakewood Cemetery.
(Source: MPRB GIS)

Participants in the Plan

In August 2010, the MPRB Board of Commissioners approved a Resolution Authorizing Staff to "work with the Audubon Chapter of Minneapolis (ACM), East Harriet– Farmstead Neighborhood Association (EHFNA), and Linden Hills Neighborhood Council (LHiNC) on a Management Plan for Roberts Bird Sanctuary" (Appendix XX). These organizations developed online and paper surveys (Appendix XX), and advertised and facilitated the three community meetings held in August –September 2010. They also developed an informational brochure regarding the need for revitalizing the Sanctuary to complement the surveys (Appendix XX).

Stakeholders also reviewed the Draft Management Plan. Information on these organizations involved in the Sanctuary revitalization can be found in Appendix XX of this document.

Metropolitan Council Environmental Services (MCES), Minnesota Department of Natural Resources (MN DNR) and the Minnehaha Creek Watershed District (MCWD) are agencies involved in permitting that will affect work in the Sanctuary. These agencies have contributed information to the plan concerning their jurisdictions in the Sanctuary.

Purpose of the Plan

The MPRB and the partners in the development of this plan seek to revitalize the condition of the Sanctuary. This revitalization has three key components: developing a management plan, identifying and implementing volunteer stewardship projects, and developing educational opportunities.

Sanctuary Vision and Goals

MPRB Environmental Operations staff had meetings in October 2012 with designees from ACM to develop a vision statement for the Sanctuary as well as goals and needs for the Sanctuary.

Vision for the Sanctuary

The Thomas Sadler Robert Bird Sanctuary is a public bird sanctuary treasured by visitors as a place of beauty and quiet in the urban environment, supporting a diversity of resident and migrating birds in a natural and undeveloped setting while providing environmental education opportunities to a broad audience.

Three broad goals were developed to improve the condition of the Sanctuary:

1) Protect, preserve, and enhance the bird habitat and native plants contained within the Sanctuary for present and future generations of people and wildlife;
2) Educate and inspire people about birds and their habitats, Minnesota native plants, and the natural world;
3) Provide a minimal infrastructure for the Sanctuary that honors the integrity of this undeveloped natural area as a bird sanctuary and a place that connects people with nature.

Sanctuary Needs

The partners in the plan have identified several needs to improve the condition of the Sanctuary:

1. Repair or replace the perimeter fencing;
2. Replace the boardwalk to include sections that are ADA compliant;
3. Develop educational resources for the visitor's shelter that support the vision and goals of the Sanctuary;
4. Replace existing signage at both entrances to provide important notices to visitors;

5. Identify and implement ways to ensure uses of lands immediately adjacent to the Sanctuary boundaries complement and support the vision and goals of the Sanctuary;
6. Provide a trail network consistent with the Sanctuary's vision;
7. Improve the ecological health of the Sanctuary's woodland and wetland areas;
8. Implement woodland and wetland enhancements based on feasibility and funding.

Sanctuary Funding Sources

The Sanctuary is within the Chain of Lakes Regional Park. As part of the Metropolitan Regional Park System, it is eligible for several funding sources designated for regional parks. Currently this includes capital and operating funding distributed through the Metropolitan Council and the Parks and Trails Legacy funding.

Infrastructure Inventory and Wetland Documentation

There are several notable infrastructure components within the Sanctuary. The MPRB, as the landowner, seeks to identify and document information regarding these items. Sanctuary improvement and enhancement activities need to take into account the infrastructure.

The City of Minneapolis and MCES contributed valuable information on storm water and the sanitary sewer interceptor infrastructure in the Sanctuary. MN DNR provided information concerning development of the fish spawning area in 1960 and subsequent agreements to maintain these structures. The history of these structures and their associated agreements are documented in the Management Plan.

This Management Plan also serves to document the current wetland work-permitting process in order to work in the Sanctuary wetland and maintain the existing ponds as open water. Roles of agencies (MN DNR and MCWD) with jurisdiction in the Sanctuary are also documented in this Management Plan.

2.0 PRINCIPLES GUIDING THE PLAN

The MPRB as the landowner and local government body operates and manages the land under its jurisdiction according to its Mission Statement, Comprehensive Plan and Board adopted Ordinances.

Minneapolis Park & Recreation Board Mission

The Minneapolis Park & Recreation Board's Mission is to:

permanently preserve, protect, maintain, improve, and enhance its natural resources, parkland, and recreational opportunities for current and future generations.

The Minneapolis Park & Recreation Board exists to:

provide places and recreation opportunities for all people to gather, celebrate, contemplate, and engage in activities that promote health, well-being, community, and the environment

Minneapolis Park & Recreation Board Comprehensive Plan 2007-2020

Community involvement in decision-making has enhanced the City's parks and recreational facilities, programs, and services. The Minneapolis Park & Recreation Board's Comprehensive Plan 2007-2020 was developed through a community outreach and development process that included town meetings, questionnaires, focus groups and phone surveys (MPRB, 2007). The comprehensive plan outlines the vision for what the organization hopes to become by 2020 and gives guidance to the work of the agency. This Management Plan for the Sanctuary supports the four main vision themes within the Comprehensive Plan.

MPRB Community Engagement Ordinance and Policy

The Board of Commissioners amended the MPRB Code of Ordinances and approved a new policy on community engagement to better implement the ordinance requirements in 2011 (Appendix xx). This policy was developed through an extensive community research, outreach and engagement process and aligns with goals and strategies of the 2007-2020 MPRB Comprehensive Plan.

The policy goals establish the expectations of effective community engagement for the MPRB and complement the core principles of community engagement adopted by the Minneapolis City Council. MPRB Staff and Commissioners follow this ordinance and policy to provide consistent practice in working and communicating with Minneapolis residents and park users, especially for projects funded within the MPRB Capital Improvement Program.

Ecological Principles Applied in the Plan

Given the highly disturbed ecological condition of the Sanctuary, ecological restoration, for the purposes of this plan, refers to improving the ecological function of the Sanctuary and to improve the habitat value, particularly for birds. It is not used as a term that designates returning the Sanctuary to its pre-European settlement condition. Restoration, in the context of the Sanctuary, needs to take into consideration the restrictions of the site including infrastructure components such as the sanitary sewer interceptor line, storm water piping and changes to the hydrologic regime due to historic land shaping activities.

The time frame for this document is 10 years, 2013-2023. The MPRB realizes that a future re-assessment of the plan will be necessary. Potential changes may occur in the Sanctuary such as: unexpected introductions of new invasive species, tree canopy changes due to storms or disease, major sanitary sewer line repairs, or other unforeseen events that would necessitate changes to management of the Sanctuary.

The Sanctuary, being located in a popular urban park, can provide the important connection between people and the environment. While this is primarily an ecologically based land management plan, a variety of improvement needs have been identified in this document to improve this connection between people and the environment.

3.0 COMMUNITY ENGAGEMENT PROCESS

Revitalization of Roberts Bird Sanctuary and the Management Plan incorporate the visions and goals of the MPRB's Comprehensive Plan 2007-2020 (MPRB, 2007). These goals seek to develop sustainable and sound management strategies for natural resources and to include community participation and input into park projects.

Community Engagement Methods

ACM, EHFNA and LHiNC developed online and paper surveys, and advertised and facilitated the three community meetings held August - September 2010. They also developed an informational brochure regarding the need for revitalizing the Sanctuary to complement the surveys. Detailed documentation of the process and its findings can be found in "The Roberts Bird Sanctuary Revitalization Project: Community Input Summary" document prepared by the ACM and neighborhood partners. This document along with the supporting informational brochure can be found in Appendix XX and XX of this document.

Summary of Public Meetings and Survey Data

Three public meetings were held in 2010 to gather community input regarding the Sanctuary revitalization. The August 9th meeting, held at Lyndale-Farmstead Recreation Center, had 11 participants. Fifteen people attended the August 19th

meeting at the Linden Hills Community Center. The September 7th meeting at Mayflower Congregational Church was part of the ACM's regularly scheduled monthly meeting, with 35 attendees.

Several re-occurring themes emerged from the three public input meetings that were held. Following are the major suggestions and concerns voiced (not listed in any type of priority order):

Improve trails in the Sanctuary

- Trails should be better maintained and marked
- Improve the habitat of the Sanctuary
- Remove invasive species
- Reintroduce native plants as invasive species are removed
- Stop spraying for mosquitoes to provide food for birds

Need for better signage in the area

- Inform people of what activities are and are not allowed in the Sanctuary
- Use signage to direct people to nearby dog parks and trails so the Sanctuary is not used for these activities
- Signage for the trails

Utilize the shelter more

- Include displays on historical and ecological information

Improve educational information and opportunities

- Provide information on the Sanctuary, its history and ecology
- Develop interpretive signage
- Develop guidebook and have information on the web
- Involve local schools and youth for activities in the Sanctuary

Audubon Chapter of Minneapolis Priorities and Recommendations

As part of the public input process, ACM submitted to the MPRB their "Priorities and Recommendations for the Revitalization of the Sanctuary". A summary of the survey information and the complete ACM document can be found in Appendix XX of this Management Plan.

ACM details three "overlapping goals" for the revitalization of the Sanctuary. These three goals are:

1. Conservation—
   To protect birds and bird habitat and demonstrate effective bird conservation practices.
2. Recreation—
   To provide the public with a quality wildlife-watching experience.
3. Education—
   To provide public educational opportunities about birds, their role in eco-systems, and their conservation needs.

MPRB Open House

The MPRB hosted a public open house to review the Sanctuary's Management Plan, proposed trail improvements and capital improvement program opportunities. The open house was held at the Sanctuary on September 12, 2013.

4.0 DESCRIPTION OF THE SANCTUARY

Thomas Sadler Roberts Bird Sanctuary is located within Lyndale Park, part of Minneapolis' popular Chain of Lakes Regional Park in Southwest Minneapolis. Metropolitan Council statistics indicate that the Chain of Lakes Regional Park is the most popular Regional Park in the seven county metro area, with estimates of over 5,100,800 visits annually to this urban park area (Metropolitan Council, 2011).

Historic Land Use

The Chain of Lakes area has been a place of human habitation and subsequent alteration of the landscape for centuries. Native people had a long history in the area prior to European settlement in the 1800s. The United States' Indian Agent for the area near Fort Snelling, Lawrence Taliaferro, sponsored an "agricultural village" in 1829 on the southeast side of Lake Calhoun with Dakota Chief Cloud Man (Dielnch M., 2001). The village was an effort to teach European agricultural methods to the Dakota people, whose hunting and fishing grounds were disappearing after European settlement. The agricultural village, by 1832, had approximately 80 acres of plowed land and a population of 125 native Dakotas. Gideon and Samuel Pond, two missionary brothers from New England, were the first white settlers to the area in 1830s and established themselves near Lake Calhoun. A few years later Reverend Jedediah Stephens arrived and established a mission near Lake Harriet (Hennepin County Historical Society, 1934).

Figure 2.

Thought to be Dakota Chief Cloud Man's village on the on the East side of Lake Calhoun, presently Lakewood Cemetery. Painted by American artist George Catlin, ca 1835.

(Source: Minnesota Historical Society)

Figure 3.

There was a dedicated bike path around Lake Harriet in the 1890's, similar to today's path.

(Source: MPRB archives)

The Minneapolis Park system was founded in 1883. Most of the lands around Lake Harriet had been added to the park system by this time and a road had been built to encircle the lake by 1886 (Wirth T., 1945. p118/83). In the 1890s the land that is now the Sanctuary, *"35 acres of woodland and swamp facing Lake Harriet, on the south property line of Lakewood Cemetery"*, was donated to the Board of Park Commissioners by Lakewood Cemetery Association (Wirth, T., 1945. P.63).

In 1918, one of the first sanitary sewer lines in Minneapolis was installed in what one day would be considered the Sanctuary. The sewer line runs east west across the Sanctuary paralleling the property line of Lakewood Cemetery. "Bossen Lane", which serves as a path through the Sanctuary, lies just a few feet south of the sanitary line. This path is part of the original parkway around the lake and today serves as access through the Sanctuary for sewer line servicing.

Figure 4.
Party of day excursionists brought to Lake Harriet by the Motor Line on August 9, 1888.
(Source: Minnesota Historical Society)

Figure 5.
The area in the forground is the current bandshell seating area and the road at right was Interlachen Boulevard, currently William Berry Parkway.
(Source: MPRB archives)

The Sanctuary was established in 1936 during the term of Superintendent Christian Bossen and at the time was named the Bird Sanctuary in Lyndale Park (BPC, 1936). The Sanctuary was renamed in 1947, at the request of the Twin City Bird Club, to the Thomas Sadler Roberts Bird Sanctuary. This action was to memorialize Dr. Roberts (1858-1946), who was a University of Minnesota professor of ornithology and Director of the Museum of Natural History at the University of Minnesota (BPC, 1947). Dr. Roberts' book, *The Birds of Minnesota*, published in 1936, was a comprehensive study of Minnesota bird life at that time

In 1959, the Park Board and the Minnesota Conservation Department (Minnesota Department of Natural Resources or MN DNR) entered into an agreement to develop a fish spawning area in the Sanctuary. The project consisted of dredging a small pond, constructing a pump building adjacent to the pond, and providing electrical service to the pump. A pipeline was installed under Lake Harriet Parkway to provide intake water from Lake Harriet to the pond (BPC, 1960).

Figure 6.
Sanctuary location within the Minneapolis Chain of Lakes Regional Park system. Green shading shows regional park land.

In 1987, the original pond developed for fish spawning was expanded to improve wildlife habitat. Grant funding from the Legislative Commission on Minnesota Resources (LCMR) provided funding for the dredging of two additional ponds in the early 1990s. Grant funding from LCMR was also used to relocate the east entrance and build a shelter with interpretive signage. The plastic boardwalk through part of the wetland area was also installed during this same time period with additional grant funding from LCMR.

Current Land Use and Community Context

Lyndale Park

The Sanctuary is located within Lyndale Park, part of Minneapolis' Chain of Lakes Regional Park (Figure 6). Lyndale Park's Rose and Peace Gardens attract thousands of visitors annually. This popularity attracts many people and organizations interested in participating in volunteer projects. The Sanctuary provides an excellent opportunity for volunteers to connect with nature through participation in ecologically-based restoration activities and environmental education programs.

The Lyndale Park Peace Garden is immediately adjacent to the Sanctuary on the east. Initially developed in 1929 as a rock garden, this garden fell into disrepair in the 1940s. It was forgotten until the 1980s when it was rediscovered and redeveloped into the Lyndale Park Peace Garden. The Peace Garden is an official International Peace Site, containing relic stones from Hiroshima and Nagasaki, Japan. The Spirit of Peace, a bronze sculpture by local artist Caprice Glaser, and the Peace Garden bridge, designed by Kinji Akagawa and Jerry Allan, are two focal points of this special garden.

Figure 7.
Thomas Sadler Roberts memorial rock. Stone carving reads "Roberts Bird Sanctuary in memory of Thomas Sadler Roberts."

MPRB Ordinances and Bird Sanctuary Designation

In 1936, at the recommendation of Superintendent Bossen, the Board of Park Commissioners (BPC) established a bird sanctuary at Lyndale Park (BPC, 1936. P10). The BPC's annual report for 1936 states that "suitable signs were posted at Lyndale Park and many additional signs have been prepared for placing in other parks, indicating those areas as refuges for birds and wild life in general." At this time it was also suggested "as a matter of protection and of supervision" that a fence be built around the Lyndale Park bird refuge. Fencing was installed as part of a Works Progress Administration (WPA) project in 1936.

In 1947, the Lyndale Park Sanctuary was renamed the Thomas Sadler Roberts Bird Sanctuary. The BPC annual report for 1947 (BPC, 1947) refers to the area as "ideal habitat for birds" and was set aside for the "propagation and protection of bird life." Those last six words are the closest the MPRB has come to defining a bird sanctuary. The MPRB has no designation or land use classification that specifically defines a bird sanctuary.

Bird sanctuaries are considered "undeveloped park areas" within the MPRB's Ordinances (Park Board Ordinance 2-33 and Pk. Bd. Ord. No. 89-103 § 1,7-5-89). "Undeveloped park areas" are places in the Park system where there may be developed and maintained pathways but they are not lighted. "Undeveloped park areas" are closed between the hours of 10 p.m. and 6 a.m. unless otherwise signed. Minneapolis Park Police enforce these ordinances.

Figure 8.

West entrance to the Sanctuary—near the Lake Harriet bandshell.

The Minneapolis Park and Recreation Board's Code of Ordinances delineates the activities that are allowed and prohibited in the various types of park lands within MPRB jurisdiction. For the park system's bird sanctuaries, the MPRB has excluded dogs (Park Board Ordinance 2-18) and biking (Park Board Ordinance 9-94) from these areas by posting the appropriate signage at the entrances to the Sanctuaries.

In 2010, the MPRB passed a Tobacco Use Policy (Appendix XX) that governs the use of tobacco on certain park properties such as: playgrounds, beaches, gardens and bird sanctuaries, beaches and playgrounds. The policy states that no person "shall smoke or use any tobacco product anywhere in the… Roberts Bird Sanctuary." This policy also "directs that any person found violating this policy may be subject to immediate ejection from the Minneapolis Park and Recreation Board facility and/or program." From a policing standpoint, police officers do not issue citations based on a policy. People found using tobacco products and violating the policy will be asked to stop using tobacco or leave the Sanctuary.

Survey of Infrastructure

Entrances and Trail Systems in the Sanctuary

The Sanctuary consists of two entrances: an entrance on the east side near the Lyndale Park Gardens (Peace Garden and Rose Garden) and a west entrance near the Lake Harriet Bandshell. A plastic boardwalk allows for access to the wetland portions of the Sanctuary. There are numerous natural surface trails both official and un-official in the Sanctuary. Neither the entrances nor the paths in the Sanctuary are currently maintained for winter access. Entering the Sanctuary with equipment for maintenance or emergency purposes is very difficult. A pick-up truck is the largest type of equipment that is able to access the area. This section documents the various trail systems and entrance points into the Sanctuary.

Sanctuary Entrances

The west entrance to the Sanctuary is near the Lake Harriet Bandshell. This entrance consists of a series of steps down into the Sanctuary from Lake Harriet Parkway (Figure 9). The fence opening is designed to prohibit bicycles.

There are two original east entrances to the Sanctuary. One is a double chain link gate that opens directly onto the Bossen Lane pathway (Figure 10), which provides maintenance access to the MCES sanitary sewer interceptor. The other entrance is an old entrance gate made to accommodate pedestrians (Figure 11). This pedestrian entrance has been permanently locked. Neither of these gates is currently used for visitor access.

Figure 9.
Stairs leading into the Sanctuary—West entrance.

Figure 10.
Maintenance gate on the East end of the Sanctuary.

Figure 11.
Former pedestrian entrance gate on the East end of the Sanctuary.

In 1991, the eastern entrance was moved further south, just off the parking lot near the Lyndale Park Peace Garden. The 1991 construction included installing interpretive panels and a wooden ramp into the Sanctuary. The current shelter building was built in 1992 and placed adjacent to the wooden ramp. The shelter building enclosed the interpretive panels.

The eastern entrance to the Sanctuary, with its shelter building and wooden ramp was intended to

meet American's with Disabilities Act (ADA) standards for access. However, there is an asphalt pad between the shelter building and the wooden ramp. This asphalt pad experiences annual settling, as it is built on fill soils. This settling has negated ADA access to the Sanctuary (Broderick, 2011).

Figure 12.
East Sanctuary entrance at the Grand Opening, 1991.

Figure 13.
Shelter building at the East entrance to the Sanctuary.

The wooden ramp is 46 inches wide and has a 90-degree turn at its midpoint and ends with a connection to the plastic boardwalk in the Sanctuary. The ramp is lightly weathered and is generally in good condition. The ramp is still appropriate for ADA access (Broderick, 2011). The ramp makes access to all Sanctuary visitors treacherous, as it is slippery in wet weather and in autumn after leaf fall.

Existing Trail Systems

The existing trails in the Sanctuary are laid out in a natural manner. There are many unofficial foot trails throughout the Sanctuary. Several of these trails lead out to the open water ponds. A plastic boardwalk goes through the saturated wetland soils.

The plastic boardwalk consists of approximately 1,500 feet of "Superdeck", a plastic segmented floating boardwalk that was installed in the early 1990s by crews participating in a summer youth employment project. The decking is currently in poor condition. Tree roots have heaved up and cracked sections of the path (Figure 14). The textured surface of the plastic has been worn off. As leaves fall off the trees in autumn, wet leaves on the plastic surface make

for slick surfaces that make walking unsafe. Settling of the wetland soils has caused some of the boardwalk sections to sink and separate from other sections (Figure 14). At the time of their installation, the plastic boardwalk was designed to comply with ADA standards. Due to soil settling, tree roots, and weathering, the Superdeck does not meet current ADA standards. A map of the existing trails can be found in Appendix XX.

Figure 14.
Superdeck in the Sanctuary is in poor condition.

Bossen Lane (Figure 15) is a path that runs east-west along the property line with Lakewood Cemetery. The path is referred to as "the Bridal [Bridle] Path in the 1928 Minneapolis storm sewer schematic diagrams (Appendix XX) and was one of the original pathways near Lake Harriet. In 1957, it was named to honor Christian Bossen, the second Superintendent of Parks (1935-1945)-(Smith, P. 152). The east end of the path ends at the former entrance to the Sanctuary near the Lyndale Park Peace Garden. A large boulder with a bronze plaque is located at this entrance to denote Bossen Lane (Figure 16).

Bossen Lane parallels and crosses a Metropolitan Council sanitary sewer interceptor line that was constructed in 1918 to service the Linden Hills neighborhood. Further discussion of the sewer line and its condition follows in the "Sanitary Sewer Infrastructure and Storm Water Infrastructure" section of this plan (page X).

Figure 15.
Bossen Lane path in the Sanctuary.

Figure 16.
Bossen Lane plaque reads "Bossen Lane Minneapolis Board of Park Commissioners."

Perimeter Fencing

A six-foot chain link fence installed in 1936 by Works Progress Administration (WPA) crews surrounds the Sanctuary. The fence was installed to delineate the boundaries of the Sanctuary “as a matter of protection and of supervision” (BPC Annual Report 1936). The fence on the northern boundary of the Sanctuary is owned and maintained by Lakewood Cemetery (Figure 17). Damaged fencing on the north side of the sanctuary was repaired in 2010 by the Cemetery and the old fencing that had fallen down was left in the Sanctuary. The MPRB fence is in poor repair and some sections have actually fallen down (Figure 18).

Figure 17.
Fencing along Lakewood Cemetery property line.

Figure 18.
MPRB fencing is in poor condition.

Figure 19.
Minnesota DNR
Pump House.

Pump House and Electrical Service

On the east end of the Sanctuary a fish spawning area was developed in 1960. The pump house for this project still stands near the southeast corner of the Sanctuary (Figure 19). There is an access gate off Lake Harriet Parkway to access the pump house. Originally this pump moved water from Lake Harriet into the spawning area. The pump was powered by electricity and, in the 1980s, the electrical line was buried (Lerman M., 2011).

The original August 18, 1959 agreement with the MN DNR for the spawning pond and pump system was for a period of 10 years. The agreement states that the MN DNR owns and maintains the pump house. The Board of Park Commissioners, at that time was to pay for electricity to the pump and maintain the landscaping and fencing. The 1987 plan to dredge and enlarge the original fish-spawning pond to improve wildlife habitat revisited the original agreement by adding amendments. In the 1987 amended agreement, the MPRB agreed to construct a screen in the water level control structure (pipe to Lake Harriet) to keep fish from going into the Sanctuary. MPRB also agreed to maintain and operate the pumping system, pay utility costs and insure that water levels are maintained to provide wildlife habitat. The pump house and pump system continue to be the property of the MN DNR. Information on these agreements was provided by Jack Gleason, MN DNR hydrologist, and can be found in Appendix XX and XX of this document (Gleason, J., 2011). At this time, we have not found a current signed agreement with MN DNR regarding the pump house and do not know whether the pipe that goes between the lake and the Sanctuary is still functional.

Sanitary Sewer Interceptor Line

Bossen Lane parallels a large sanitary sewer line that was built in 1918 to provide sewer services to this area of the city. It is a main sewage interceptor line that services south Minneapolis and St. Louis Park. Ultimately this line carries effluent to the MCES' sewage treatment facility in St. Paul. The width and construction of Bossen Lane is necessary to service this sewer interceptor line.

The sewer line is a 39-inch pipe built of poured-in-place concrete with the bottom of the pipe lined with brick (Figure 20). The pipe was built on pilings,

Figure 20.
Location of MCES Sanitary Sewer Interceptor in the Sanctuary.
(Source: City of Minneapolis Public Works)

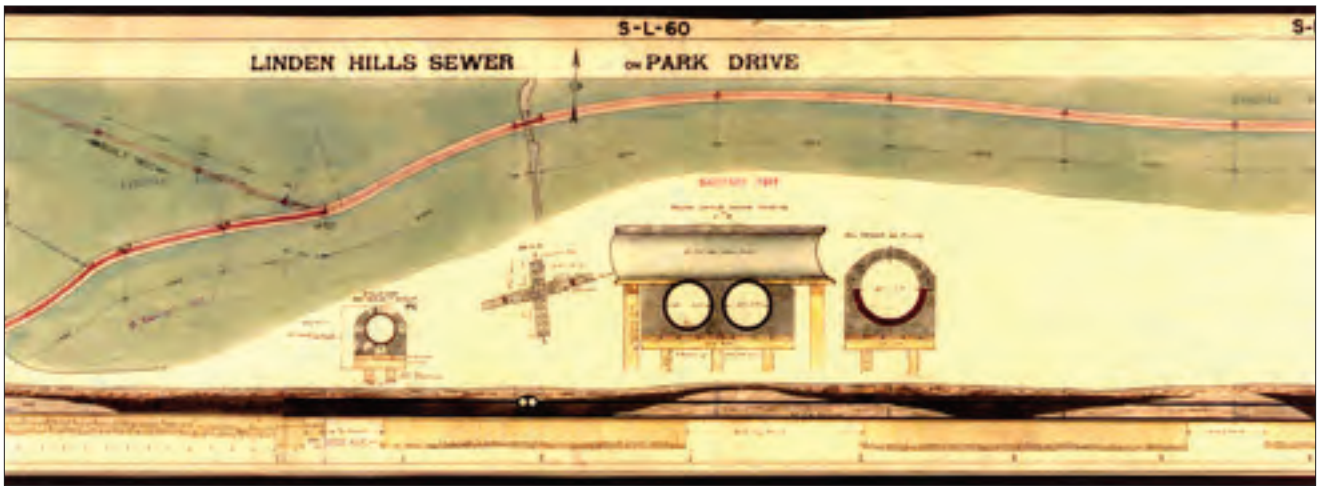


Figure 21.
Original Sanitary Sewer construction documents.
(Source: City of Minneapolis Public Works)

as the soil types found in this area of the Sanctuary are unsuitable for building. The pilings are up to 20 feet deep in order to reach more stable sand. The soft soils of the area and the piling construction make the pipe vulnerable to stress and weight from vehicle traffic.

MCES staff, during their 2011 inspection, found that the pipe was in good condition considering its age. They noted that the pipe is holding up well thanks to the construction techniques employed by the craftsmen and the fact that there has been no vehicle traffic on top of the pipe. MCES states that these older pipes can be difficult to maintain and repair because they were entirely handmade and require specialized methods of rehabilitation (Met Council, 2011).

Storm Water Infrastructure and Storm Water Inputs into the Sanctuary

Storm water inputs into the Sanctuary come from catch basins located in Lakewood Cemetery and along Lake Harriet Parkway. These and other points of drainage into the Sanctuary are noted in Figure 22.

Figure 22.
Pipes and water flow in the Sanctuary

Roberts Boundary

Surface Water Pipe Line

Ephemeral Stream

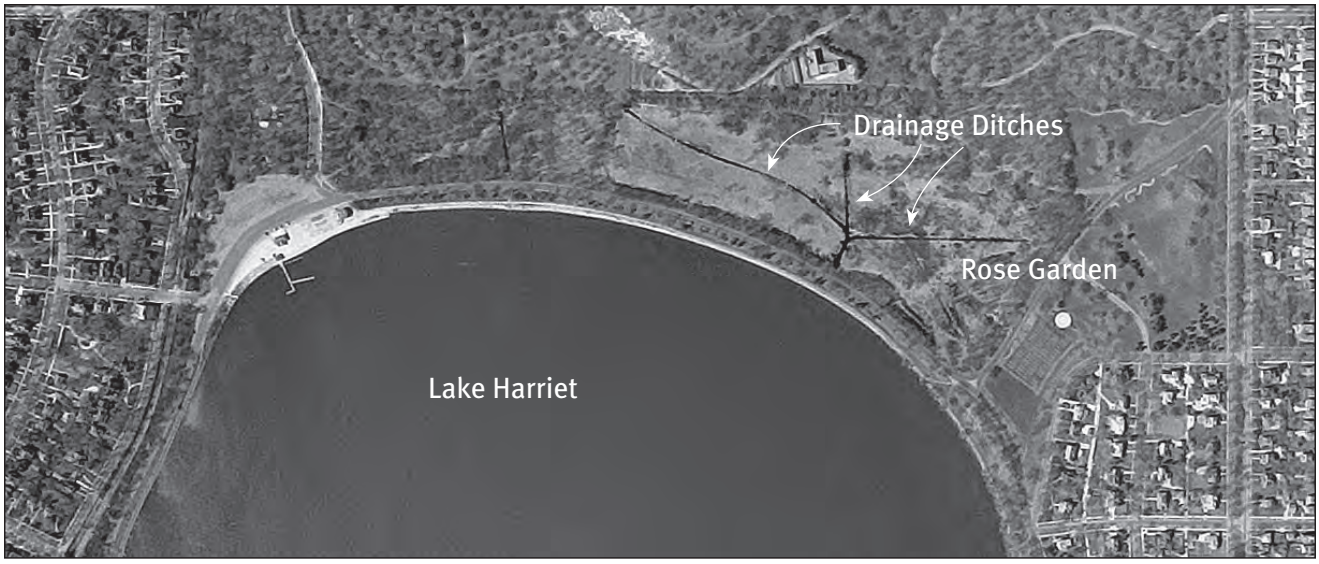
Sanitary Sewer Line

Figure 23.
Ephemeral stream on the West side of the Sanctuary.

The drainage area at the far west end of the Sanctuary comes from the Cemetery, passes directly through the Sanctuary as a small ephemeral stream (Figure 23), and enters Lake Harriet near the west end of the beach through a culvert and pipe that is beneath the parkway, pedestrian and bicycling paths.

Other storm water drainage points off of the Cemetery and Lake Harriet Parkway are located toward the east end of the Sanctuary. These drainage areas can be easily seen in the 1947 USGS aerial survey (Figure 24). Storm water on this side of the Sanctuary slowly infiltrates into the ground over time. The pipe that was installed between Lake Harriet and the pump house for the fish spawning facility was used to pump water into the Sanctuary and does not appear to have the ability to flow from the Sanctuary directly into the lake. Discussion of the Sanctuary's hydrology can be found in the Natural Resources Inventory on pages XX-XX

Figure 24.
1947 Aerial photo of the Sanctuary showing drainage ditching.
(Source: USGS Aerial Photography)



Management of the Area to Date

This section documents various management and improvement activities that have occurred in the Sanctuary from 1981 to the present. A significant event that shaped the condition of the Sanctuary was the 1981 tornado. Planting, trail improvements and construction of the shelter building occurred in an effort to assist recovery of the Sanctuary after the tornado.

This section also documents MPRB forestry procedures as they pertain to tree care in park areas such as the Sanctuary. Additionally, several volunteer activities have contributed to improve and better understand the ecological health of the Sanctuary. These contributions are briefly discussed with more detailed information included in noted appendices.

Pond Dredging

Dredging of the ponds by the MPRB occurred in 1960, 1987 and 1991. Dredging information is discussed in this document on page XX and documented in Appendix XX.

Invasive Species Removal Efforts

Several large buckthorn removal events have occurred in the Sanctuary. MPRB forestry crews started the first buckthorn removal efforts during the winter months of 1989. This was followed by removal efforts in 1998, 2001 and 2002. Grant funding from a MN DNR Conservation Partners grant and USDA invasive species removal grant funded Forestry's work in the Sanctuary in 2001 and 2002. A small seasonal Environmental Operations crew was started by the MPRB in the summer of 2004 to maintain native plant communities and shoreline plantings throughout Minneapolis' park system. This crew has worked each year since 2005, removing buckthorn and other invasive and non-native shrubs from the Sanctuary as time allows.

A successful purple loosestrife biological control program started in the Sanctuary in 1987. At present there is only a small patch of purple loosestrife, which is difficult to access because of standing water. Continued monitoring of this area continues to date and the quantity of plants has not increased over time.

Many volunteer groups have assisted with invasive species removal in the Sanctuary. Several large corporate volunteer events with Target and Best Buy Corporation have been involved with these removal activities. ACM has had a volunteer partnership agreement with the MPRB since 2010 to hand pull buckthorn and garlic mustard from the Sanctuary.

Figure 25.
Volunteers planting trees and shrubs in the Sanctuary.

Planting Events

Tree and shrub plantings were implemented in the Sanctuary to assist with the recovery of the area after the 1981 tornado. Hundreds of trees and shrubs have been planted into the Sanctuary since that time including plantings in 1984, 1988, 1992, 1993 and 2003. MPRB staff and volunteers participated in these planting. Funding for these plantings came from various sources, including Metropolitan Council grants, Neighborhood Revitalization, and MPRB budgeted funds. A partial listing of what was planted can be found in Appendix XX.

Plantings of native shrubs and herbaceous species were done in the 1990s as part of the pond dredging process. A wet prairie seed mix and several varieties of shrubs were planted on the open soils left after dredging (Lee J., 2011).

ACM volunteers planted trees and shrubs within the Sanctuary in 2012 in coordination with the Minneapolis Men's Garden Club. Native wildflowers, grasses and shrubs were planted by ACM volunteers near the shelter building in 2012 and 2013.

MPRB Forestry Department Practices in the Sanctuary

The Minneapolis Park and Recreation Board's Forestry Division is responsible for all City-owned trees in Minneapolis. It monitors the planting, pruning and removal of trees on public property, which includes city boulevard trees and 6,732 acres of parkland.

Figure 26.
2010 Storm damage in the Sanctuary.

MPRB Forestry Division determines when it is necessary to remove trees in the Sanctuary for a number of reasons, including disease, insect infestations, structurally hazardous, dead and declining trees. The following discusses the typical situations that either have occurred or will occur relating to tree work in the Sanctuary.

Hazardous Tree Removal

MPRB foresters make park areas safe by removing or pruning hazardous trees. A hazardous tree is defined as a tree that is defective and could cause personal injury and/or property damage if the tree or a part of the tree fell and injured people and/or property (e.g. park benches, designated trails, the shelter building, etc.). Therefore, a tree near a path may be hazardous but a tree that does not have the potential to fall on a path, may not be considered hazardous.

Significant numbers of tree species are found in the Sanctuary that are known for having structurally weak wood and are prone to dropping limbs or are susceptible to trunk and root decay. These trees include box elder, silver maple and cottonwood. MPRB Forestry staff will make hazardous tree situations safe by pruning or cutting so the tree and/or branches rest safely on the ground. Trees that are not hazardous (do not pose a threat to personal safety or property) can be left alone. These non-hazardous trees can be left to provide benefits to wildlife.

Pruning for Safety

There are occasions when trees or shrubs are pruned to eliminate personal safety issues in the Sanctuary. All pruning is completed in accordance with the standards of the National Arborists Association. The need for such removal originates from the review of Crime Prevention through Environmental Design (CPTED) and may be initiated by Minneapolis Park Police. The intent of CPTED to improve safety of public areas and reduce crime through the use of applied design principles.

Improving sightlines and visibility in public areas is one of the CPTED design concepts. This is particularly important in and around walking paths, park benches, the entrances into the sanctuary, the shelter building and the adjacent parking lot on the east side of the Sanctuary. Plantings in and around these areas need to be purposeful and consider public safety in their design.

Diseased and Infested Tree Management in the Sanctuary

There are three tree pest problems that are either occurring or will likely occur in the Sanctuary. These are DED, oak wilt, and emerald ash borer. Invasive tree pests, such as gypsy moth and Asian longhorned beetle, may also eventually affect trees in Minneapolis and the Sanctuary, but do not currently pose an imminent threat.

MPRB Forestry Division is responsible for implementing procedures and policies regarding control of disease and insect infestations of trees on park lands. The practices in place for handling DED disease and oak wilt can be found in more detail in Appendix XX of this document.

Emerald Ash Borer

Emerald ash borer (EAB) is an invasive insect pest that was first discovered in Minneapolis in 2010 in the area in and around Tower Hill Park (55 Malcom Avenue Southeast). In January 2013, EAB was found immediately adjacent to the Sanctuary in Lakewood Cemetery. Cemetery staff promptly removed the trees and disposed of the wood in accordance with Minnesota Department of Agriculture (MDA) quarantine rules. A copy of the MDA rules can be found in Appendix XX.

EAB is species specific and only affects ash trees in the *Fraxinus* genus. It is believed that moving firewood out of infested areas has accelerated the spread of EAB throughout the country. As its population increases, EAB is expected to kill significant numbers of ash trees throughout Minnesota and in Minneapolis.

The adult form of the beetle is not what kills ash trees. It is the immature or larval stage that does the damage. EAB larvae feed on the living tissue of the tree that is just below the bark. In so doing, they disrupt the flow of water and nutrients within the tree. As larvae numbers increase, this disruption becomes enoughto eventually kill the tree.

EAB can be present in ash trees for several years before being discovered. As larvae populations increase, woodpeckers begin feeding on them. This has become the most reliable method for determining the presence of EAB. The Forestry Division's Tree Inspectors have been trained to look for the signs of woodpecker activity so that suspect trees may be reported to the MDA for confirmation. Eventually EAB will be found in the Roberts Bird Sanctuary where the loss of ash trees will cause a noticeable impact.

Once confirmed in the Sanctuary, infested ash trees will be removed by the Forestry Division. Such removals will be performed as long as doing so helps slow the increase in the population of EAB. While populations are relatively low it is believed that removing infested trees helps reduce the number of adult beetles that would otherwise be infesting more and more trees.

Ash removals and pruning will be performed in the dormant season when adult beetles are inactive. The dormant season takes place after Labor Day and before May 1st. The Forestry Division will reduce the spread of EAB to areas not yet infested by not removing or trimming ash trees during summer months.

As EAB begins to kill ash trees in increasingly larger numbers in Minneapolis, the need for prompt removals will become less important as a control measure. This is because the number of infested trees will eventually exceed those that can be removed in a timely manner. When this point is reached, dead ash trees will be treated just like any other dead tree in the Sanctuary.

A pest management plan to strategically plan and implement for ash tree losses throughout the City has been developed by MPRB forestry staff. This information can be found in Appendix XX.

i-Tree Analysis of Sanctuary Trees

To better understand the composition of the forest canopy, MPRB staff worked with volunteers to implement an i-Tree analysis of the trees in the Sanctuary. i-Tree is a software suite from the USDA Forest Service that provides urban forestry analysis and tree benefit assessment tools. i-Tree Tools are in the public domain and are free for public use. The i-Tree Tools assist with urban forest management by quantifying the structure of community trees and the environmental benefits that trees provide. Some of the environmental benefits quantified through i-Tree include carbon storage, carbon sequestration, removal of air pollutants, and oxygen production. The complete i-Tree report showing the analysis of the Sanctuary can be found in Appendix XX.

The goal of the i-Tree study for the Sanctuary was to determine the quantity of ash in the Sanctuary. Knowing that EAB is present in Minneapolis and that the tree canopy in the Sanctuary is comprised of a significant number of green ash, EAB could potentially impact the tree canopy of the area.

Thirty randomly selected plots were placed in the Sanctuary. Volunteers identified all trees within each plot and the data was analyzed using the i-Tree Eco model developed. For the purposes of the i-Tree inventory, buckthorn was considered a tree and is included as a component of the forest canopy.

The study found that the entire Sanctuary has an average 75.8 percent tree cover. Canopy cover is not contiguous throughout the Sanctuary as the wetland and open water areas do not have trees in abundance.

The i-Tree study found that, of the trees in the sanctuary, 75.6 percent have diameters less than 6 inches (i-Tree p. 4). Glossy buckthorn is the most common species in the Sanctuary (22.3 percent). Green ash comprises 17.1 percent and Boxelder 12.7 percent of the tree cover (iTree p. 7).

Wetland Health Evaluation Program

The Wetland Health Evaluation Project (WHEP) is a volunteer based wetland monitoring program, which the MPRB has participated in since 2002. The Sanctuary serves as the reference wetland for Minneapolis. This means that other sites in Minneapolis are compared to the Sanctuary's wetland. The Sanctuary's wetland was designated as the reference wetland for Minneapolis as it has been monitored since 2002 and has the longest record of study. Wetlands monitored by WHEP in Minneapolis are all considered disturbed due to urbanization (dredging, storm water inputs). The reference wetland

designation of the Sanctuary wetland does not refer to an undisturbed wetland but refers to the continual monitoring of the Sanctuary over the length of the Minneapolis WHEP monitoring program.

WHEP utilizes teams of trained volunteers to collect and analyze wetland data to characterize wetland health. Volunteers for the project are trained in three sessions by MPCA staff. Training sessions cover monitoring methods, macro invertebrate identification, and vegetation identification. Spot checks and quality control checks are conducted by other citizen teams and by a technical expert for quality assurance purposes. Hennepin County Environmental Services staff then cross-check, analyze, and report the collected data back to the partner organizations and to the public.

Figure 27.
WHEP volunteer monitoring in summer 2011.
(Source: Anne Journey, WHEP)

Data collected from the wetlands included vegetation and invertebrate sampling. All wetland evaluation and sampling protocols followed the *Vegetation Method for Wetland Evaluation* (Gernes M., 2005). A vegetation survey was performed in a 100 square meter plot considered representative of the entire wetland for each site. Additionally, an invertebrate survey was completed with two samples from a dip-net within the emergent vegetation zone, near the shoreline, and in six overnight bottle-trap samples.

The information was then used to evaluate the wetland's biological health based on metrics developed by the Minnesota Pollution Control Agency. An index of biotic integrity (IBI) has been developed by the MPCA, including both vegetation and invertebrate metrics. Roberts Bird Sanctuary typically scores as moderate to excellent in the invertebrate metric and as moderate to poor in the vegetation metric. The data collected by the WHEP program is noted in the MPRB's Water Resources Annual Report (MPRB, 2012). The most recent WHEP data can be found in Appendix XX of this document.

Wildlife and Bird Conservation in and around the Sanctuary

The Sanctuary is part of Minneapolis' green corridor of urban parks, lakes, and forested natural areas. These green corridors serve as habitat for a variety of wildlife. Ecologically speaking, the park system's forested natural areas would be considered fragmented: broken into small patches by road ways, paths and maintained park lands.

Lake Harriet, Lyndale Park and Lakewood Cemetery together total well over 300 acres of land. This acreage and the contiguous link to other parklands provide an important corridor of forest and waterways for wildlife, resident

and migrating birds. White-tailed deer, turkey, fox and coyote have all been seen in and around the Sanctuary area, as well as common urban wildlife such as raccoons and gray squirrels.

National Audubon Society's Important Bird Area Designation

Realizing the important role Minneapolis' parkland corridor provides for bird life, representatives from Minneapolis' Audubon Society and ACM, with approval and support of the MPRB, applied for and obtained National Audubon Society's Important Bird Area (IBA) designation Minneapolis' Chain of Lakes Regional Park in 2009. The application document submitted to the National Audubon Society is included in Appendix XX.

Figure 28.
Great-Horned Owls nesting in the Sanctuary, 2011.
(Source: Jeff Fischer, Eco-birder)

The IBA program is a global initiative that seeks to

> *"identify and conserve areas that are vital to birds and other biodiversity. ... by working with Audubon chapters, landowners, public agencies, community groups, and other non-profits, Audubon endeavors to interest and activate a broad network of supporters to ensure that all Important Bird Areas are properly managed and conserved"*
>
> National Audubon Society, 2010

U.S. Fish and Wildlife Service's Urban Migratory Bird Treaty

The U. S. Fish and Wildlife Service (USFWS) declared in July 2011 that the City of Minneapolis, the MPRB, the City of Saint Paul, and Audubon Minnesota were successful in their application to be part of the Urban Migratory Bird Treaty (UMBT) program. A major goal of the program is to raise awareness and improve the conditions for birds as they are migrating through urban areas (Appendix XX).

The focus area for Minneapolis and Saint Paul's UMBT is the Mississippi River corridor. Principles of this bird treaty align with the goals of the Sanctuary's Management Plan goals and include:

- Enhancing bird habitat by removing invasive species and planting native species,
- Providing educational information on bird conservation in urban areas.

Figure 29.
Wood Duck house near a Sanctuary pond.

Figure 30.
Canada Goose nesting platform.

Figure 31.
Bird feeding station.

Bird Observations in the Sanctuary

To the best of MPRB's knowledge there have been no scientific bird studies done in the Sanctuary showing how birds actually use the Sanctuary proper. ACM submitted to the MPRB in November 2010 their "ACM Priorities and Recommendations" report. This list of birds observed in the Sanctuary by ACM members can be found on pages 8-12 of the Audubon Document (Appendix XX). An observation list does not confirm that a particular bird is present, breeding and nesting specifically in the area; an observation list states that a bird was seen in the Sanctuary at a given time.

Osprey Re-Introduction Program

In the early 1990s, an osprey re-introduction program was initiated by the MPRB, and a nesting platform was placed on power poles in the Sanctuary. The program was not successful, and the platform has since been taken out.

Wood Duck Boxes

Currently the MPRB has four wood duck boxes located in the Sanctuary. Wood duck boxes were first placed in the Sanctuary in the 1970s and have been maintained and monitored annually by MPRB staff. Records of nesting success have been kept by the MPRB since the 1990s. Maintenance and monitoring procedures include the following:

Mid-November—

Houses are cleaned out for the winter and the bottoms are taken out or left open for winter. At this time, nest success is determined. A nest is considered successful if it has down, shells, and most importantly membranes.

Early March—

Nest boxes are closed up and filled with fresh wood shavings.

Canada Goose Nesting Platform and Bird Feeding station

Goose nesting platforms have also been installed in the larger (easternmost) wetland ponds (Figure 30). They are not currently monitored or maintained.

A bird feeding station is located on the highest point in the Sanctuary. It is surrounded by a chain link fence with a gate to access the feeder (Figure 31). The feeder is currently maintained by volunteers.

MCES Sanitary Sewer Interceptor Repair Work

MCES is doing major restoration work of the sanitary lines in Southwest Minneapolis. The Sanctuary is within this project area. As part of this process, MCES began holding community stakeholder meetings the winter of 2012-2013 to inform residents of the work that is being done and the phasing of the projects. MCES is responsible for all stages of the project including community notifications and actual work in the area. MCES and MPRB staffs are working cooperatively to ensure stakeholders are notified and the work is done with as little impact to vegetation and bird life in the Sanctuary as possible.

At the time of this document, the time frame for MCES work in the Sanctuary will be in 2014-2015. Work in the Sanctuary will consist of lining the sanitary sewer interceptor and reconstruction of the handmade brick manhole structures (Figure 32).

Figure 32.
Manholes constructed from handmade brickwork.

Work will include removal of trees in the MCES work zone. At the request of the MPRB, tree work in the Sanctuary will commence in the fall after the nesting and breeding times of Sanctuary birds. An inventory of trees has been completed by an MCES sub-contractor in coordination with MPRB staff. Due to the potential for EAB in this area (see forestry practices p. XXX), ash trees will be removed in the work zone as part of the project.

MCES will require that there is permanent access to the sanitary sewer interceptor in the Sanctuary. Their requirements will be that Bossen Lane, the official access path, will need to be maintained in order to accommodate a full sized pickup truck. The trail surface should be at least 8 feet wide and made of materials that can withstand the weight of the occasional truck.

When the MCES project is complete, the MCES and the MPRB will enter into an easement agreement. Plantings and any other type of work within this easement will require consideration of MCES requirements for sanitary sewer interceptor lines.

5.0 NATURAL RESOURCES INVENTORY AND ECOLOGICAL CONCERNS

Figure 33.
Bossen Lane.

The inventory of infrastructure components and human impacts on the Sanctuary combined with the natural resources inventory of the site is critical in understanding the functioning of the Sanctuary. Combining this knowledge with the enhancement desires of the partners, helps to develop a knowledge-based management plan that is achievable and sustainable through purposeful planning.

Geology and Soils

The landscape of Minneapolis is a story written by the glaciers. The last glacial period, the Wisconsinan stage, was the latest series of glacial advances and retreats that began some 70,000 years ago and ended only 10,000 years ago, which is recent history on a geological timeline. As the glaciers melted and retreated they covered the landscape with sediment hundreds of feet thick. Minneapolis' Chain of Lakes, wetlands and undulating topography are evidence of these landscape altering events (Ojakangas R., 2009).

Geology determines the soils and hydrology of any given area. It is also a major factor influencing the composition of vegetation found on a site. The upland and wetland soils found in the Sanctuary are soils formed on glacial outwash plains, large areas of sand and gravel left behind by glacial melt waters. Wetland soils comprise over half of the land in the Sanctuary.

Following is a brief discussion of the soil types based on the 2003 Soil Survey of Hennepin County data. A detailed soil report (USDA, 2011) of the site can be found in appendix XX.

Figure 34.

Soil types of the Sanctuary based on Soil Survey of Hennepin County – NRCS.

(Source: http://soildatamart.nrcs.usda.gov)

Upland soils

Rasset sandy loam (L3B and L3C) – Rasset soils were formed on glacial outwash plains. Depth to the bedrock is more than 60 inches. Rasset soils are well drained. The soil has a sandy loam surface layer of about 15 inches thick over subsurface layers of loamy sand and sand that extends to limestone and shale bedrock. The soil has an available water capacity of 6.1 inches to a depth of 60 inches. Organic matter content in the upper 10 inches is 3%.

Wetland Soils

Medo soils, depressional (L30A) – These soil types occur in depressional areas that formed in outwash plains. They are very poorly drained soils, with up to 80 inches of organic matter. Organic matter in the upper 10 inches is 70%. The soil profile has a 27-inch surface layer of muck transitioning to muck loam and sandy clay loam. At a depth of 39-80 inches there is a restrictive layer of gravelly loamy coarse sand. The available water capacity to a depth of 60 inches is 14.3 inches.

Soil moisture is highest and at the surface during the months of April, May and June. Wet soil moisture status is lowest in the month of February. Ponding is deepest during the months of March, April and May: a depth of 1 foot is the normal range during these months.

Disturbed soils

Udorthents, wet substratum (U2A) – Udorthents consist of soil fill in depressions. Detailed interpretations of the soils are not available without further field study, as the soils in these fill areas are so variable. Most likely the soils in this area of the Sanctuary consist of dredged materials placed after land shaping and lake dredging activities in the vicinity.

Hydrology, Wetlands and Wetland Ponds

Theodore Wirth was the second Superintendent of the Park System from 1906 to 1935. During this time period most of the dredging of Minneapolis' Chain of Lakes and filling of wetlands and of low lying areas was accomplished.

Wirth notes in his history of the Minneapolis Park system that water moved from Cedar Lake towards Lake of the Isles (a 4 foot elevation difference) by the water "simply percolating through wetlands" (Wirth T., 1945. P92). It can be seen on old public land surveying maps from 1854 (Figure 35) that the situation between Lake Calhoun and Lake Harriet was somewhat similar. The lake level of Lake Harriet was 7 feet lower than that of Calhoun (Wirth T., 1945. P92). Wetlands and a small creek are shown on the map connecting the two lakes. Around 1918, significant changes were made to the landscape between Lake Harriet and Lake Calhoun. Fill was brought in to elevate the roadbed and provide an overpass for the street cars.

Figure 35.
Public land survey of the area c. 1854.
(Source: Original land survey plat maps of Minnesota web site – 1854)

As a result of these activities, hydrology of this area changed. The creek between the two lakes is still present today but is piped below Calhoun parkway and is day lighted to the north of William Berry Parkway. The creek goes underground again near the trolley tracks, entering Lake Harriet through a 36 inch concrete pipe near the present-day boat launch. The construction of Lake Harriet Parkway has added storm water drainage directly into the Sanctuary.

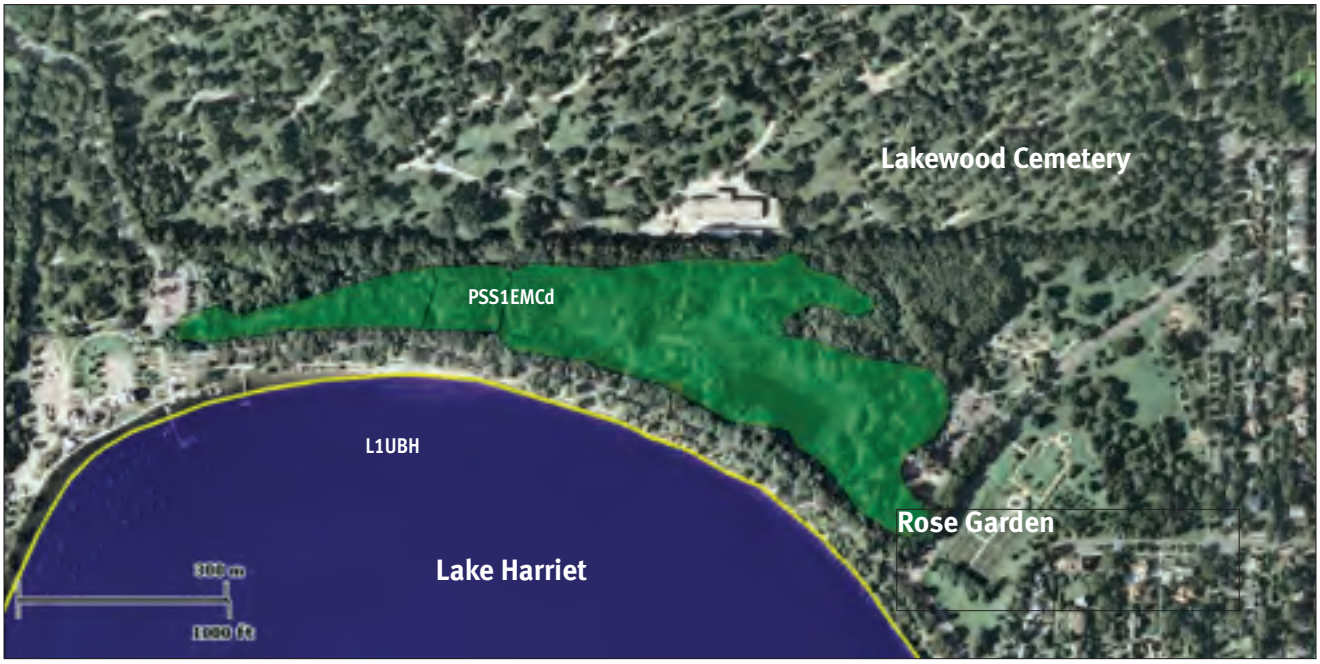


Figure 36.
U.S. Fish and Wildlife Survey Wetland Inventory.
(Source: USFWS)

Wetland Designation

The Sanctuary's wetland is designated by the MN DNR as a water of the State (public water number 27-665p). The USFWS's National Wetlands Inventory, based on aerial photography from 1980, identifies a large portion of the Sanctuary as wetland (Figure 36). Approximately 17 acres of the site were identified as a freshwater wetland and seasonally flooded wetland dominated by scrub-shrub and broad-leaved deciduous vegetation with areas of emergent herbaceous wetland vegetation and a hydrologic regime that has been altered by ditching (PSS1/EMCd). Two acres of the site were identified as a freshwater wetland that is seasonally flooded and forested with broad-leaved deciduous trees (PFO1C).

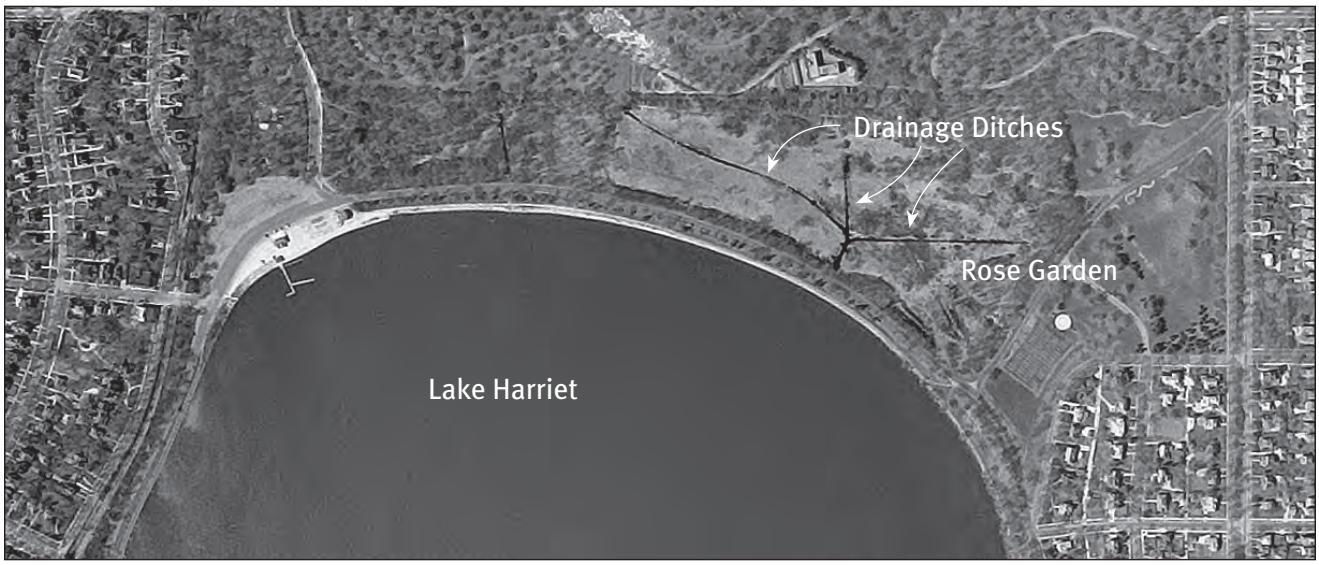


Figure 37.
1947 Aerial photo showing ditching in the Sanctuary.
(Source: USGS Aerial Photography)

Wetland Ponds

The most notable of the features at the Sanctuary are the three wetland ponds. In aerial photos from 1947 (Figure 37), it can be seen that the Sanctuary had no open water. Sometime before the 1947 aerial photo was taken, ditches were constructed from the Lakewood Cemetery property line into the Sanctuary, draining the roadways and upland areas of the cemetery to the Sanctuary. The development of the fish spawning area in 1960 consisted of dredging a small pond and installing a pump house and pipe system to provide water from Lake Harriet to the pond. In 1987, the 1960 pond was re-dredged and enlarged. Adding two smaller ponds to provide wildlife habitat occurred in 1991 and 1992 (Figure 38). The two smaller (western-most) ponds are linked together with a culvert.

Figure 38.
Dredging wildlife ponds in 1991.

Storm Water and the Sanctuary

Storm water flows into the Sanctuary from Lakewood Cemetery and also from catch-basins in Lake Harriet Parkway (Figure 34). Storm water from Lake Harriet Parkway and Lakewood Cemetery that enters the western portion of the Sanctuary can outlet to Lake Harriet via an ephemeral stream that flows into a submerged pipe. The pipe enters the lake west of the main beach. On the eastern side of the Sanctuary, storm water from catch basins on Lake Harriet Parkway and Lakewood Cemetery flows into the Sanctuary and slowly infiltrates into the ground over time

Figure 39.
Stormwater and piping in the Sanctuary.
(Source: MPRB GIS)

Roberts Boundary

Surface Water Pipe Line

Ephemeral Stream

Sanitary Sewer Line

In 2008, as part of the City of Minneapolis' storm water and rain-leader disconnect program, pipes in the Lakewood Cemetery were studied to determine if they were connected to the sanitary sewer system. A bright red, non-toxic dye, called rhodamine dye, was used to color the water flowing in the storm sewer to determine its routing. Some of the Sanctuary's ponds turned pink during the testing and a pink plume was seen at Robert's outlet to Lake Harriet near the main beach. It was found that some of the storm water from the Cemetery was routed through the Sanctuary. Lakewood Cemetery disconnected several storm water connections from the sanitary sewer line after this testing was done. Now that these disconnections are completed, it is likely that slightly more storm water now flows to Roberts Bird Sanctuary than prior to the disconnect project.

Ecological Context and Historic Native Plant Communities

Ecologists use the historic vegetation records of a site combined with the understanding of the existing plant community to identify what native plant community a site can be restored to. The MN DNR has done extensive research work and developed classification resources to assist ecologists and land managers in determining the native plant community type of an area.

Frederick Marschner's compilation of the maps and notes of the1850s Public Land Survey resulted in a map of the general historic vegetation patterns of Minnesota (Marschner F. J., 1974). The MN DNR combined Marshner's historical land records with data from present day data vegetation plots to develop its *Field Guide to Native Plant Communities* (MN DNR, 2005). This classification system uses associations of biotic and environmental factors, including climate, geology, topography, soils, hydrology, and vegetation, to identify native plant communities in Minnesota.

Minneapolis' Native Forest Areas

The Minneapolis area is located within an ecological province (Figure 40) known as the Eastern Broadleaf Forest Region that covers the central and southeast portions of the state. This province is a transitional area between western areas of the state, which were historically prairie, and the mixed conifer-deciduous forests that are to the northeast. The eastern boundary of this province in Minnesota would be the Mississippi and St. Croix Rivers.

Figure 40.
Ecological provinces of Minnesota.
(Source: Minnesota DNR)

The MN DNR further classifies Minneapolis as being in the Minnesota and Northeastern Iowa Morainal (MIM) Ecological Section (MN DNR, 2005). The MIM Ecological Section is a stretch of deciduous forest and prairie that stretches from northwestern Minnesota to the Iowa border.

Further classification of native plant communities within the MIM Section is made based on geology, soils, topography, climate, and distribution of trees and other plants. Minneapolis' historic vegetation consisted of both oak savanna and mixed oak, maple-basswood plant community types. Oak savanna is a plant community that depends on fire for its existence. Oak savanna is a transitional area between prairie and forest that consists of scattered fire-resistant oaks with prairie grasses. Maple-basswood forest types were found in Minneapolis where there was more protection from fire.

The existing upland forest plant community of the Sanctuary has been greatly altered by DED elm disease, storm events and land shaping activities. Despite the many changes that have occurred, the upland forest could be considered a remnant plant community in the context of the Sanctuary. There are large maple and oak in portions of the woodland and small patches of wildflowers that are commonly associated with Minnesota's native oak forests.

The William Berry Park woodland, which is located north and west of the Sanctuary, between Richfield Road and William Berry Parkway, is most likely similar to what the Sanctuary's woodland (see MLCCS #32150 on page 15) was in the past. The William Berry woodland has not experienced the storm and land shaping events to the extent that the Sanctuary has. The William Berry woodland consists of mature red oak, white oak and sugar maple. The woodland's understory of small trees and shrubs includes: ironwood, prickly ash, gooseberry and red-berried elder. Soil types of the two areas are similar: well-drained, sandy-loam soils that formed on glacial outwash. The William Berry woods would be considered a reference plant community that can serve as a model for re-vegetation of the Sanctuary's upland forest. A list of native tree, shrub and herbaceous plants that would be typically found in a oak forest plant community can be found in Appendix XX.

Figure 41.
William Berry Woodland in relation to the Sanctuary.
(Source: MPRB GIS)

Native Wetland Plant Communities

Prior to European settlement, the landscape of Minneapolis was a patchwork of wetlands, lakes, streams, forests, prairie and oak savanna. It is thought that the Sanctuary's wetland was a tamarack bog at one time. It is difficult to determine at this point whether or not this is exactly true due to the significant dredging, grading and filling activities that have occurred since the land was acquired in 1890s.

Restoration activities and management goals for the wetland areas of the Sanctuary are not specifically discussed in this document due to the complexity of wetland restoration. Restoring or enhancing the wetland would require a wetland delineation and hydrological study. Permitting through government agencies such as the MNDNR and the MCWD is necessary to do work in the wetland area that would involve disruption or moving of wetland soils (Appendix XX).

Plant Community Inventory

Plant Community Analysis Methodology

The Minnesota Land Cover Classification System (MLCCS) was used to identify and analyze the plant communities in the Roberts Bird Sanctuary. The MLCCS is a MN DNR classification system that *"integrates [the] classification of cultural features, non-native vegetation, natural and semi-natural vegetation into a comprehensive cover classification systems"* (MN DNR – MLCCS, 2004). It is a hierarchal classification system that assigns numbers to each land cover type based on vegetation cover and impervious surfaces in an area. The MLCCS is a technical tool used by land managers to develop natural resource management plans, assess ecological quality of sites, identify ecological corridors for conservation and model the impacts of impervious surfaces on water resources.

MLCCS also provides Geographical Information System (GIS) based land cover mapping. The MLCCS GIS data layers show the numeric codes and their associated color-coded polygons. This GIS data can be over-layed onto aerial maps to assist with the inventory of natural resources and graphically present the vegetation cover of the area being analyzed as seen in Figure 42.

Figure 42.
MLCCS map of the Sanctuary.
(Source: MN DNR and MPRB GIS)

For this document, the MLCCS GIS data was downloaded from the MN DNR Data Deli website. The information was checked in the field for accuracy by Marcia Holmberg, MPRB Natural Resources Coordinator, in late September 2010. A second field check was done in May 2011, to make note of any early spring and summer plants that had senesced at the time of the September 2010 field check.

The plant lists for these field checks can be found in Appendix XX. These are not comprehensive lists for all plants found in each plant community surveyed, but they constitute a general overview to determine the accuracy of the MLCCS and denote plants found in each land cover type. Each plant community polygon was walked through to determine invasive species present and assess natural quality. This information assists in determining enhancement activities that will improve ecological functions and bird habitat in the Sanctuary.

Existing Plant Communities of the Sanctuary

This section gives brief descriptions of each land cover classification found in the Sanctuary as identified by the MN DNR's MLCCS data. Following each classification there is a brief discussion of observations of what was found in each area of the Sanctuary.

MLCCS Classification # 32150 – Maple Basswood Forest.

An upland forest where sugar maples, basswoods, and elms dominate the canopy or where they dominate along with oaks (with <60% oak cover).

Discussion: While the MLCCS categorizes this area as a maple basswood forest, the majority of trees found in this area are the fast-growing opportunistic trees that come in after a disturbance in the tree canopy (box elder, green ash, cottonwood). An "altered/non-native deciduous forest" (MLCCS #32170) would be a more accurate description of the current plant community:

Boxelder, green ash and cottonwood are typical canopy dominants, sometimes together and sometimes singly. Elms are common associates. Hackberries, aspens, oaks, and basswoods may also be present. The shrub layer is often dominated by buckthorn and Tartarian honeysuckle, but gooseberries and elderberries can also be common. The ground layer is also dominated by species tolerant of disturbances, including white snakeroot, motherwort, and garlic mustard.

This area illustrates the great vegetation change that came about from DED elm disease losses in the 1970s and the 1981 tornado. The species composition of ash, box elder and hackberry illustrate how opportunistic tree species quickly establish themselves in the forest canopy openings made by storm events. These trees now have completely matured and make for a completely closed canopy.

Large sugar maple, basswood, white and red oaks, over 20 inches DBH (diameter at breast height), are present as scattered trees throughout this plant community. These large trees are most likely remnants from the oak-maple-basswood forest types that were historically found in this area and throughout the City prior to European settlement. While this plant community has been altered by DED and windstorms, this upland forest area is the best representation of the historic woodland vegetation of the Sanctuary and could be considered a remnant plant community in the context of the Sanctuary.

Sugar maples are successfully regenerating on the hilly upland area in the western section of the Sanctuary. The oaks are not regenerating as well as the sugar maple due to the dense shade of canopy trees and invasive shrubs.

The shrub layer in this area has the common invasive species found in most Minneapolis' woodlands including: common buckthorn, glossy buckthorn, Tatarian honeysuckle, white mulberry, and Norway maple. There are native shrubs found in this area, most notably the red berried elder.

Native herbaceous species are few in the Sanctuary. Desirable herbaceous species such as large-flowered bellwort, early meadow rue, and spikenard are found in this plant community. The MLCCS field check was done in late September 2010. Another field check was done in this area in May 2011, as a second check to identify any spring wildflowers or other plants that may not have been observed in the fall. The spring 2011 field check did not find any additional species.

MLCCS Classification # 32220 – Lowland hardwood forest.

> *Greater than 30% tree cover. Growing just above an active floodplain… or at the upper edge of a wetland basin. More than two tree species and diverse understory vegetation. Mineral soils rather than peat.*

Discussion: This area forms the edge of the wetland area and is dominated by green ash, boxelder, willow and cottonwood. Silver maple and American elm are also present. Tamarack trees were planted into the area in 1988 and again in 2003 by MPRB staff and volunteers. The shrub layer is predominantly glossy buckthorn with common buckthorn and white mulberry as well. Many of the glossy buckthorn are multi-stemmed shrubs. Herbaceous plants, grasses and sedges are sparse and patchy in this area. Jewelweed, an annual native plant, occurs in large patches.

MLCCS Classification # 61480 – Saturated altered/nonnative gramminoid vegetation.

> *A wetland on saturated soils with < 30% tree cover and < 50% shrub cover that's dominated by non-native species, especially reed canary grass. This type also includes monotypic cattail stands with few (or no) other species*

Discussion: The dominant plant species of this area is reed canary grass. Purple loosestrife is also found in this area.

Water in this area comes from the Lakewood Cemetery pond and storm water and outflows from the Cemetery. This water moves through the Sanctuary

as an ephemeral stream that enters Lake Harriet through a submerged pipe at the west end of the beach. Standing water was observed from September 2010 through May 2011 due to significant rain and snowfall.

MLCCS Classification # 61630 – Semi permanently flooded altered/ non-native dominated vegetation.

Wetland on semi permanently flooded soils with <30% tree cover and <50% shrub cover that is dominated by non-native species such as purple loosestrife. Type also includes monotypic cattail stands.

Discussion: This vegetation type comprises almost half of the Sanctuary. Late September 2010 experienced heavy rainfall amounts: in one four-day period rainfall totaled 3.5 inches. At the time of the vegetation survey there was standing water in this area. Heavy snowfall during the winter of 2010-2011 maintained high water levels. Standing water was observed in this area until May 2011.

Reed canary grass comprises over 90 percent of the vegetation in this area, and Canada thistle is intermixed with the reed canary grass. Hybrid cattails encircle the open water areas. Glossy buckthorn, willow, and dogwood are found growing on the edges of this plant community. Several native tree and shrub plantings occurred in this area after the 1981 tornado. Tamaracks noted in the plant inventory are from volunteer planting events in 1988 and 2003.

Ecological Concerns

Land shaping activities, DED elm disease, catastrophic wind damage and presence of invasive species have greatly altered the ecology Sanctuary. In general, the Sanctuary would be considered in poor ecological health:

- The upland forest canopy is completely closed and is dominated by early - successional native tree species.
- The shrub and herbaceous layers of the forest are dominated by weedy or exotic species.
- Wetland areas and hydrologic regimes have been significantly disturbed by land shaping activities.
- Wetland areas are completely dominated by invasive species.
- Hybrid cattails have almost completely filled in the westernmost pond.

The following sections discuss in more detail the major ecological challenges the Sanctuary faces with respect to its plant communities.

Invasive Species Found throughout the Sanctuary

The invasive species present in the Sanctuary are those typical of highly disturbed areas. Garlic mustard, buckthorn, Siberian elm, Norway maple, white mulberry and Tatarian honeysuckle are exotic invasive species found in the Sanctuary's upland forest. Reed canary grass, Canada thistle and glossy buckthorn are dominant in the wetland areas.

More detailed descriptions of the major invasive species and their general locations within the Sanctuary can be found in appendix XX of this document.

Invasive species are also noted in the MLCCS field check data found in appendix XX of this document.

The understanding of invasive species and best management strategies for their control is a dynamic science: new research and management strategies are evolving. Invasion biologists recognize that all invasive species have the same process by which they invade. There are four steps to this process:

Figure 43.
Distribution of Buckthorn in the United States.
(Source: USDA Plants Database www.USDA)

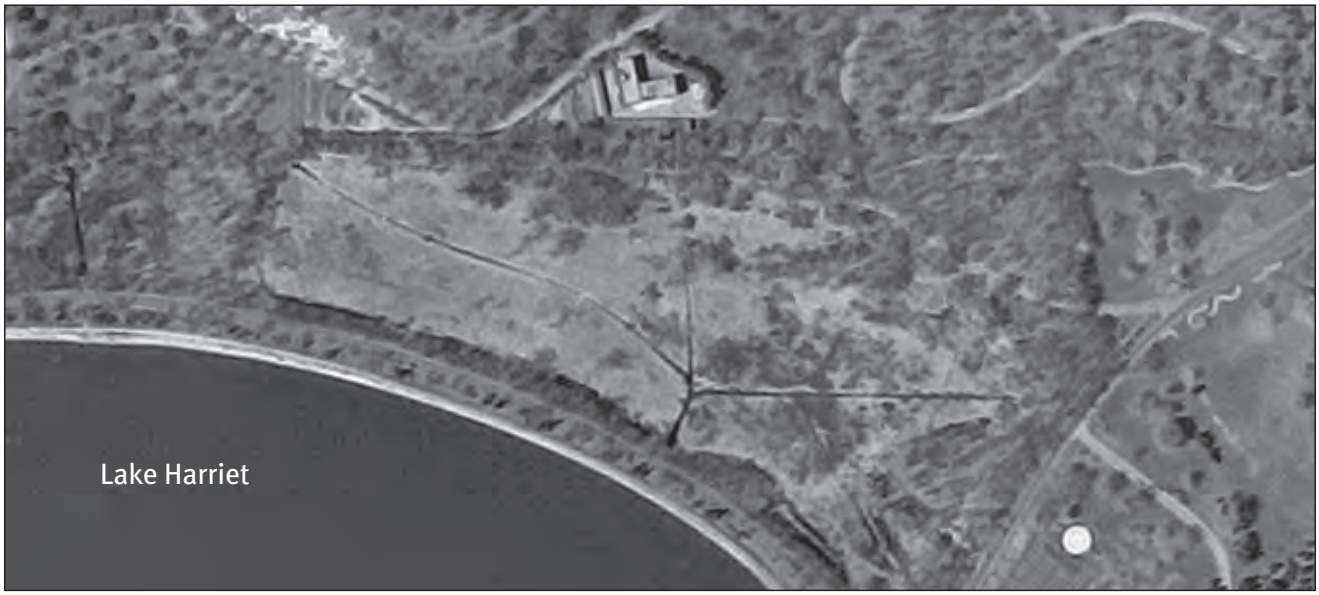
1. Arrival;
2. Establishment;
3. Integration into the ecosystem;
4. Spread.

Invasive species are a global problem and are being addressed at state, national and international levels. Current research and management efforts are now focused on prevention and eradication strategies that can be implemented when new invasive species are arriving and just becoming established (steps 1 and 2 above). Invasive species found in the Sanctuary fall into category 4: they are widespread throughout large geographic areas of the United States (Figure 43). When invasive species are widespread, it is no longer possible to eradicate them, and control is the long-term management goal.

Upland Forest Tree Canopy Changes due to Storm Damage and Disease

Aerial photos from 1947 and 1961 show the changes in vegetation of the Sanctuary over time. The United States Geological Survey photo from 1947 (Figure 44) shows an open meadow and ditching on the east side of the Sanctuary. Photos from 1961 (Figure 45) show deciduous trees, most likely American elm, green ash and box elder, that have filled in on the east end of the Sanctuary.

Figure 44.
1947 Aerial photo showing open meadow vegetation.
(Source: USGS Aerial Photography)



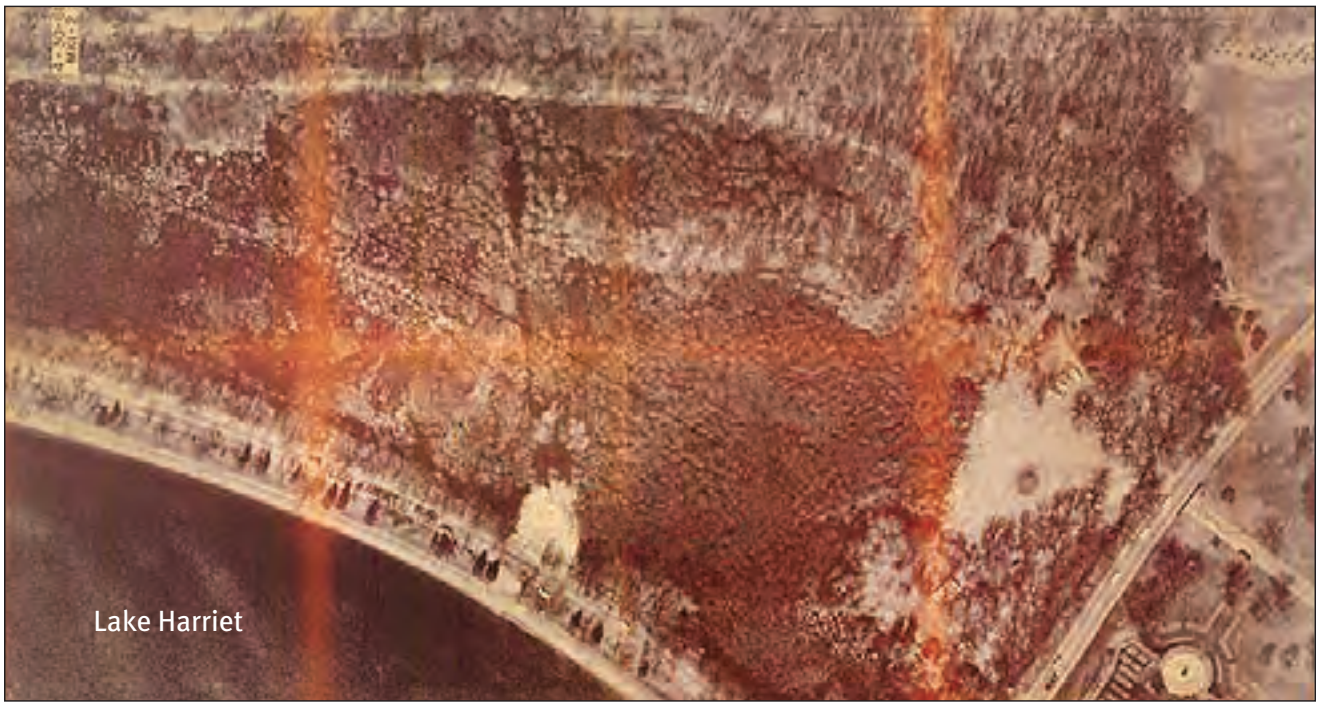


Figure 45.

1961 Aerial photo showing mature tree cover. Orange lines are fold lines on paper map.

DED elm disease and catastrophic windstorms have greatly altered the structure and composition of the plant communities in the Sanctuary. There are records of major wind damage occurring in 1925 and again in 1981. Many of the trees in the 1961 aerial photo were large American elms that were lost to DED elm disease in the 1970s (Hendrickson, D., May 2011) and also the 1981 tornado.

The MLCCS maple basswood forest designation is not quite accurate. The mature tree canopy does consist of some mature (20+ DBH) sugar maple, white and red oak. However, due to DED elm disease and storm damage, the majority of trees found in the upland forested area are opportunistic early successional trees that came in after canopy disturbance. These tree species include: green ash, box elder, silver maple, and cottonwood.

These mostly even-aged trees have formed a completely closed canopy in the upland forest portion of the Sanctuary. This heavily shaded woodland situation limits the establishment and survival of desirable native trees, which require sunlight to regenerate and thrive. Oaks are an example of this type of tree.

Box elder, silver maple, ash and cottonwood are trees that are prone to shedding branches. The soft organic soils in the wetlands of the Sanctuary provide a soil structure where tree roots are poorly anchored to the ground, resulting in root lifting, and fallen or leaning trees. Trails, a shelter building and park benches surrounded by trees prone to hazardous defects present a potential hazardous tree situation. MPRB's hazardous tree procedures are outlined on page XX

Poorly Developed Shrub Layer Dominated by Invasive Species

i-Tree analysis found that buckthorn (glossy and European) comprise 31.7 percent of the forest (i-Tree p.7). While this does provide cover, it is an exotic invasive species whose fruits do not provide a good food source for birds.

Shade tolerant shrub species, mainly non-native buckthorn and native red-berried elder and gooseberries, comprise the majority of shrubs in the Sanctuary. The buckthorns and a completely closed mature tree canopy contribute to a heavily shaded forest floor. This dense shade limits the quantity and diversity of shrub species that can establish themselves and thrive in the Sanctuary. Having a poorly developed shrub layer results in less cover and nesting habitat for birds that use the shrub layer.

Figure 46.
Sanctuary wetlands in spring.
(Source: Jeff Fischer, Eco-birder)

Disrupted Wetland Functions and Invasive Species Dominated Wetland Vegetation

References have been made to the Sanctuary as being a tamarack bog at one time. It is difficult to determine at this point whether or not this is exactly true. The Sanctuary may have a similar history as the tamarack bog in the Eloise Butler Wildflower Garden and Bird Sanctuary. The original tamarack trees in the Wildflower Garden bog were lost to a tornado in 1925. The trees that replaced the tamaracks in the Wildflower Garden were American elm. The American elms were in turn lost to DED elm disease in the 1970s.

The Sanctuary wetland also lost large numbers of elm to DED elm disease in the 1970s. However, the Sanctuary wetland has also been altered by dredging, grading and filling activities in and around the Sanctuary. The existing wetland at the Sanctuary would be considered isolated, with its hydrology affected by storm water and ground water.

The wildlife ponds have provided open water features desirable for water fowl and wetland birds and are also an aesthetic amenity to the area. Unfortunately, the ponds are surrounded by hybrid cattail and reed canary grass. The aggressiveness of these species means that maintaining the ponds as open water will be an ongoing maintenance task.

Reed canary grass and hybrid cattails are adaptable to a variety of hydrological regimes, allowing them to increase their colonies in the wetland despite varying water levels. This competitive advantage allows these plants to outcompete native wetland emergent vegetation filling in the ponds with vegetation. The small pond at the western-most edge of the sanctuary, is illustrative of this. This pond has significantly filled in with cattails and reed canary grass.

6.0 MANAGEMENT PLAN GOALS, STRATEGIES AND IMPLEMENTATION

The Sanctuary's location, in the midst of a popular urban park, can provide the important connection between people and the environment. While the vegetation and ecology of the area has been significantly impacted, its ecological functioning can be enhanced to benefit bird life and provide educational opportunities to the public.

Based on the survey data, the desires of the MPRB and the partners, three management goals were developed for the Sanctuary:

1) Protect, preserve, and enhance the bird habitat and native plants contained within the Sanctuary for present and future generations of people and wildlife.

2) Educate and inspire people about birds and their habitats, Minnesota native plants, and the natural world.

3) Provide a minimal infrastructure for the Sanctuary that honors the integrity of this undeveloped natural area as a bird sanctuary and a place that connects people with nature.

Management Goals and Strategies

This section outlines the strategies involved in implementation of each of the three management goals. The general implementation of these goals and general time lines are outlined in the charts found on pages XX- XX of the Management Plan.

GOAL 1	**Protect, preserve, and enhance the bird habitat and native plants contained within the Sanctuary for present and future generations of people and wildlife.**

▶ Forest Management to Improve Bird Habitat

Park forested areas, including that of the Sanctuary, from an ecological standpoint, are described as fragmented forests. Fragmented forests are larger tracts of forest that have been broken into small tracts of woodland by roads, pathways and actively maintained park spaces (mowed turf areas, beaches, etc) and residential and commercial uses. Fragmented forests consist of more edge, which acts as the transition zone between the forest and another land use type.

The edge consists of shrubs and small trees adjacent to the forest of mature trees. The Sanctuary serves as nesting habit for birds that use the forest edge (edge species) and birds that can use small sized wood lots (Moriarity 2011). Lakewood Cemetery provides an additional 250 acres of significant canopy-sized shade trees that can enable mature canopy nesting species, such as the red-eyed vireo, to nest in the Sanctuary (Gillette 2012). Great-horned owls have been observed using both the Sanctuary and the Cemetery as nesting habitat.

The Sanctuary's existing forest is maturing. This means that edge species will be seen less frequently due to the maturing canopy, competition from shade and also buckthorn removal. Loss of trees due to storms, disease and invasive species management provides an opportunity to develop a diverse forest both structurally and botanically. A diverse forest of native species will be attractive to birds that use the different forest layers: canopy, sub-canopy and shrub.

Removal and Control of Upland Forest Invasive Species

Seed sources for invasive species can be found throughout adjacent properties around the Sanctuary. The MPRB removes invasive species from its property as much as practicable. However, the MPRB and City of Minneapolis have no jurisdiction over removal of invasive species from private properties. This means that control of invasive species in the Sanctuary will be an on-going maintenance task as people and wildlife using the area will continue to bring in seeds from neighboring seed sources.

The MPRB's preferred approach for invasive species control is Integrated Pest Management (IPM). The MPRB's IPM policy can be found in Appendix XX of this document (MPRB, 2008). IPM is an adaptive management approach which requires ongoing dedication and allows for flexibility in methods appropriate to the current situation and adapts to changes in control methods based on scientific research. IPM involves selecting from a range of manual, mechanical, chemical, and biological control methods that best meet management requirements of a plant, given the conditions in which it is growing. IPM goals seek to maximize effective control methods and to minimize negative environmental, economic and social impacts. When herbicides are used on a site the area treated is posted for 48 hours as per City of Minneapolis ordinance (appendix XX). Herbicide application records are kept on record by the MPRB.

Specific strategies for control of individual invasive species are not discussed in this Management Plan. Control methods for any given invasive species are complex and include multiple strategies for control (manual, mechanical, chemical, biologic, or a combination of treatments). Control methods are also weather and seasonally dependent. A summary chart of various management strategies for common parkland-invasive species is included in appendix XX of this document.

Common buckthorn, white mulberry and Tatarian honeysuckle are the common invasive shrubs in the Sanctuary's upland forest. Controlling these shrubs to limit seed supply is a high priority for invasive species control in the Sanctuary.

Norway maple and Siberian elm can also be removed from the Sanctuary over time. Removing these canopy- sized non-native trees will

assist to improve the structure of the forest to one that favors native tree species. This removal would need to be done by contractors or MPRB forestry staff that have large-tree removal experience.

The biological control for garlic mustard is not yet available for release from the Minnesota Department of Agriculture. Control of this species will need to be done in the meantime by either hand pulling or select herbicide applications. Trail areas, where there is a high potential for people assisting in the dispersal of seed, are the primary areas for garlic mustard removal. Removing garlic mustard along the trails will slow the further spread of the plant by seed. Garlic mustard pulls should be done in the spring before the plant is seeding

Tree Removals due to MCES Sanitary Interceptor Work and EAB

A high percentage of green ash in the Sanctuary presents a potential for loss of these trees to EAB. The extent of this loss cannot be predicted at this time. Ash and other trees will be removed in the MCES easement when repairs are made to the sanitary sewer interceptor in 2014-2015.

Trees removed due to the MCES work and potential losses due to EAB can actually be beneficial in improving the habitat of the Sanctuary for birds. At present the upland areas of the Sanctuary have a completely closed canopy, which results in tall mature trees with little understory (shrub layer), due to the dense shade of mature trees. Loss of trees due to disease and removals can provide gaps in the canopy allowing shrubs to establish themselves and thrive in the increased sunlight reaching the forest floor.

Planting in the Upland Forest to Improve Tree Canopy Composition

Loss of trees to storm damage, disease and removal of exotic species (Norway maples, Siberian elm) provides an opportunity to improve the structure of the forest for birds. Removal and loss of mature trees will provide more sunlight to the forest floor, which allows for more space to plant a variety of native trees.

Increased sunlight due to tree removals, however, will also lead to an increased growth response from both garlic mustard and buckthorn. Monitoring and control of these invasive species and their ongoing removal will be needed so they do not dominate the planting areas.

Planting to Diversify the Forest Shrub Layer after Invasive Shrub Removals

Planting shrubs and herbaceous plants into the Sanctuary is a desirable task that will add to the species diversity of the area and provide diverse forest structure and food sources for birds. A list of native tree, shrub and herbaceous plants appropriate to the Sanctuary can be found in Appendix XX.

Invasive species found in the Sanctuary have seed that is viable in the soil for a number of years. This needs to be taken into consideration when planting (e.g. buckthorn seeds are viable in the soil for 5-7 years). The pervasiveness of the invasive seed bank and the lack of sunlight reaching the forest floor (due to the shade provided by mature trees) are major restrictions in successfully planting into forested areas of the Sanctuary to improve forest structure.

Poor Sanctuary access makes watering plantings in the Sanctuary challenging. Aggressive, fast-growing trees such as Norway maple, silver maple, green ash and box elder as well as exotic invasive shrubs (mainly buckthorn) have out-competed many of the native species that were planted. Without consistent ongoing maintenance, there was poor plant survival of some species.

Tree and Shrub Planting Locations

Tree and shrub plantings can be initially implemented in open sunny areas with low quantities of invasive species. Planting could be done initially in the upland forest areas and will be done as part of the MCES sanitary sewer interceptor work.

In areas where invasive species dominate, plantings have the best chance of success after several years of invasive species removal based on the viability of the seed in the soil (e.g., Buckthorn seeds are viable in the soil for a period of 5-7 years). If new plantings are put into areas immediately after invasive species are removed, invasive seeds, still viable in the soil, will exert extreme pressure on the new plantings. All plantings will need ongoing maintenance to ensure success, including hand weeding, watering and mulching. Select herbicide application may need to be done to control invasive species in planting areas.

Plantings that highlight native plants attractive to birds and native pollinators are particularly desirable near the main shelter entrance. These types of plantings can also be planned for the interpretive trail system and around the perimeter of the Sanctuary. While these plantings are desirable, it is imperative to keep in mind that the Sanctuary is located in a busy regional park. Plantings near the shelter, at Sanctuary entrances, and along the trail system should be carefully planned with visibility and the safety of park users in mind, using Crime Prevention through Environmental Design (CPTED) principles and the recommendations of MPRB staff.

▶ Wetland Area Management

Control of Wetland Invasive Plants

Glossy buckthorn control in the wetland areas is a major concern at this time. Seasonal fluctuations in water levels are the determining factor of when this work can be done. Removals of large tree-sized buckthorn have been done by MPRB staff either during the winter months when wetland soils are frozen or in late fall if there has been little summer rainfall. Using herbicides appropriate for winter use and in wetlands is necessary to completely kill the plant. In dry years, hand pulling small trees and seedlings could be done by trained volunteers. Continued monitoring for re-sprouts and seedlings will be an ongoing task for both volunteers and staff far into the future.

Efforts to control wetland invasive species will be an intensive long-term management effort that will involve professional contractors, MPRB staff, and volunteers. Suggested management techniques to control reed canary grass could include dredging, prescribed burning, and select herbicide applications (Shaw personal communication, 2011).

Wetland Enhancement and Maintaining Ponds as Open Water

Recommendations for implementing wetland enhancement projects is beyond the scope of this document and would need to be done by a professional contractor experienced with monitoring and modeling shallow groundwater in wetlands and restoring highly modified urban landscapes.

A wetland delineation and complete hydrological study would need to be done as part of any enhancement project to determine the exact wetland areas and the water regime of the Sanctuary.

It is the desire of the MPRB and the partners to maintain the wetland ponds for wildlife purposes. Fortunately, the storm water inputs into the Sanctuary are not as significant as that of storm water ponds that serve residential streets and larger watershed areas. Storm water ponds that serve city streets often require more frequent dredging for sediment removal. Low storm water inputs into the Sanctuary means that maintaining the Sanctuary ponds would involve only occasional dredging.

Dredging of the Sanctuary ponds requires obtaining appropriate wetland work permits through the MCWD. This process is documented in Appendix XX.

Dredge spoils from previous dredging work were placed in various locations throughout the Sanctuary. Since dredging to keep the ponds open is a desired future maintenance task, it is advisable to dispose of the materials off site, as the small size of the Sanctuary and the many trees will limit where future dredge spoils can be placed. Hiring a contractor who has the work experience and equipment appropriate to this type of work is necessary.

Dredging to maintain the open water features needs to be followed by a long-term integrated management approach that includes invasive species control and careful planning in the development of planting and maintenance plans for all disturbed areas.

GOAL 2

Educate and inspire people about birds and their habitats, Minnesota native plants, and the natural world.

A goal of this Management plan, the MPRB and the partners is to improve visitors' experiences in the Sanctuary and to welcome a diverse audience of both experienced and "fledgling" birders. Currently, the educational and interpretive opportunities within the Sanctuary and near its entrances are not fully utilized.

There is tremendous opportunity to incorporate educational and interpretive information at both entrances and within the Sanctuary as its infrastructure is improved. Interpretive information should be provided in many formats, such as permanent signs, printed materials, smart-phone applications, and web-based information, and should be available in other languages and formats as well.

Following are examples of the types of activities that can enhance environmental education activities in the Sanctuary:

- **Self-Directed Educational Activities**

  Examples include:

  - Provide birding lists that can be down-loaded from the MPRB web site.
  - Develop subtle signage within the sanctuary to provide interpretation. For example, interpretive signage focused on waterfowl identification information could be incorporated into a railing on a dock or boardwalk.
  - Develop innovative birding & environmental education teaching opportunities for the Sanctuary.
  - Update printed information on the Sanctuary (e.g., informational brochures, guidebook). Provide both printed copies and online versions.
  - Improve the trail system to include birding benches that give visitors a view of high bird-use areas.

- **Guided Educational Activities**

  Examples include:

  - Improve promotion of existing guided programs such as the MPRB's owl prowls and Minneapolis Audubon Society's spring warbler walks.
  - Develop new partnerships to help provide programming opportunities for school groups, senior citizen facilities, and others.

- Actively promote volunteer stewardship activities associated with vegetation restoration activities (invasive removals, native plantings, monitoring, etc).
- Partner with the annual Urban Birding Festival of the Twin Cities.
- Deepen the existing partnership with Minneapolis Public Schools with the goal of bringing more youth to the Sanctuary.
- Draw attention to effective conservation practices within the Sanctuary.

▶ Educational Opportunities at the Shelter Building

Examples include:

- Add the Sanctuary's name and a welcome message to the shelter building.
- Develop permanent signage highlighting site history and ecosystem, a sanctuary map, common birds of the Sanctuary, actions people can take to support birds, and ways the public can participate in monitoring programs.
- Provide feeding stations around perimeter and visible through shelter "windows."
- Highlight native plants attractive to birds and native pollinators.
- Develop interpretive displays that highlight: recent bird sightings, blooming plants, and restoration efforts that are currently being implemented in the Sanctuary. Update these displays on a regular basis.

▶ Technology Appropriate to the Sanctuary

Examples include:

- Improve Sanctuary information and images found on MPRB website.
- Work with existing birding groups to create a means for people to post and share bird sightings through the internet and other technologies (cell phones, smart phones, etc).
- Explore the potential to include QR codes on signage and printed material.
- Develop an on-site cell-phone tour.
- Develop a smart phone application specific to the Sanctuary.

GOAL 3

Provide a minimal infrastructure for the Sanctuary that honors the integrity of this undeveloped natural area as a bird sanctuary and a place that connects people with nature.

When the Sanctuary was established in 1936, the intent was to provide an area of protection and refuge "for birds and wild life in general" (BPC, 1936 P.10). Fencing was installed at this time along the Sanctuary's perimeter to assist with protecting the area. Subsequent trail improvements in the 1990s were developed for ADA access as well as protection of the natural resources of the Sanctuary. Well designed trail systems within the Sanctuary will provide acess for visitors to a variety of habitats, including the wetland areas.

▶ Fencing Repair

Repair and replacement of the existing fencing is a desirable activity that will help to protect the Sanctuary. While wildlife, domestic pets and people can enter at any time through gateway access points, the fencing serves to establish a boundary between the Sanctuary and adjacent land uses.

▶ Trails and Entrances

Development of Sanctuary trails and entrances should meet the following guidelines:

- Trails developed will respect the naturalistic setting of the Sanctuary.
- ADA accessible route and entrance points will be incorporated into the site.
- Signage will direct visitors through the path system and to areas accessible to different ability levels.
- Trails will allow access to the different habitat types (wetland, open water ponds, upland forests) found within the Sanctuary, providing different bird watching experiences for visitors.
- Trails will take MPRB maintenance capacity into consideration.
- Equipment access points will be established to enable maintenance of the wetland ponds.
- MCES guidelines will be followed as they pertain to path improvements and work done near or within the MCES easement.

Accessible Trails

The MPRB seeks to "provide and maintain trails...that serve people of all ranges of ability" (p. 13 MPRB Comprehensive Plan 2007-2020). The close proximity of the Sanctuary to the popular Lyndale Park Gardens and Lake Harriet provides an excellent opportunity to develop an accessible experience in the heart of the city.

The Eloise Butler Wildflower Garden and Bird Sanctuary (Wildflower Garden) and the Thomas Sadler Roberts Bird Sanctuary are the two named bird sanctuaries in the park system. The Wildflower Garden has:

. . . multiple trails which exceed a 30% slope, beyond the range required for accessibility. Meeting accessible trail standards in the Wildflower Garden would require so much grading that the integrity of the site would be damaged (Weber, 2012).

Therefore, the Wildflower Garden cannot be made accessible without dramatically altering the experience for all visitors visiting this area.

An equivalent accessible experience can be provided at Robert's Bird Sanctuary, where topography is relatively flat. This is why it is important for the MPRB to ensure that there are accessible entrance points and trails in the Roberts Bird Sanctuary.

What are accessible trails? What do they look like? Accessible 'trails' can be any surface that is firm, stable and slip resistant. Trail surfaces can be constructed of either natural or man-made materials. Trails that are developed also need to take into consideration maintenance requirements and capabilities.

▶ Entrance Points into the Sanctuary

Entrances into the Sanctuary are in need of repairs. Improving entrances into the Sanctuary will create a more safe and welcoming feeling for the Sanctuary. Proper design techniques should ensure that bike use is discouraged and ADA access is maintained.

MCES work on the sanitary sewer interceptor line provides an opportunity to partner with MCES to replace or improve entrance into the Sanctuary. At the writing of this document the 2014-15 MCES work is still in planning phases. As this project progresses MPRB and MCES staff will be in negotiation as to remediation work in the Sanctuary. MCES and MPRB will communicate to partners on the final development of the interceptor repair process.

Management Goal Implementation

Implementation activities associated with each of the three management goals are outlined in the charts (diagram XX) found on pages XX-XX. Details are given in the implementation charts as to who may be implementing the work and the general time frame of the task. In developing the implementation time frame, timing of the work and who actually implements the work are important delineations. Assessment is an additional component considered in the implementation of the management goals.

Timing of Work to Avoid Nesting and Breeding Time for Birds

Consideration has been given to the breeding and nesting requirements of the birds noted in the Sanctuary by ACM in their 2010 report to the MPRB (Appendix XX) Removals of invasive trees (e.g. Siberian elm, Norway maple) as well as woody invasive shrubs are best done in the fall and winter months. This timing is beneficial to the nesting uses of the Sanctuary by birds. Planned enhancement activities are dependant upon available funding.

Restoration Tasks

Restoration activities in the implementation charts are broken down as to what can be accomplished by contractors or MPRB staff and what can be done by volunteers.

Removing larger sized invasive shrubs (> 2 inches in diameter) is best accomplished by cutting the stem and treating with an herbicide. This procedure reduces soil disturbance which can lead to erosion and does not allow the invasive seed bed to become disturbed and exposed (which leads to increased seed germination). This type of removal work would need to be done by contractors or MPRB staff. Treatments with herbicide need to follow Minnesota Department of Agriculture and City of Minneapolis herbicide application requirements (Appendix XX)

The MPRB does not allow volunteers to use power equipment or apply herbicides (MPRB Volunteer Manual appendix XXX). Once large-sized invasive trees and shrubs are removed, volunteers can continue to monitor and remove plants from the Sanctuary as they sprout from seeds. Removal of smaller invasive shrub seedlings can be done by volunteers through hand pulling or use of weed wrenches (Appendix XX). Garlic mustard can easily be hand pulled by volunteers in the spring prior to flowering.

Planting into the area needs to be purposeful and must follow CPTED safety guidelines for public park areas. MCES sanitary sewer interceptor work being done in 2014- 2015 will impact parts of the upland forest area. Plantings into the easement area once the work is completed needs to follow MCES guidelines and need to be approved by the MCES and MPRB.

Management activities accomplished by staff and volunteers will be documented in the MPRB's Environmental Operations Vegetation database. A current site report from this database can be found in Appendix XX.

Funding Sources for Implementing the Management Goals

The Sanctuary is within the Chain of Lakes Regional Park. As part of the Metropolitan Regional park system, it is eligible for several funding sources designated for regional parks. Currently this includes capital and operating funding distributed through the Metropolitan Council and Parks and Trails Legacy funding. The Board's 2011 budget identified $300,000 in funds for improvements to the Sanctuary in 2015.

Assessment and Volunteer Stewardship Agreements

Assessment is an important component of ecologically based land management and is inherent in the restoration process. The MPRB's Comprehensive Plan encourages the engagement of "volunteers in the restoration, maintenance, and preservation of the system's natural resources" (p. 14, MPRB 2007). Community participation and volunteerism are important elements in the revitalization of the Sanctuary

The annual renewal of the MPRB Volunteer Stewardship Agreement with Audubon Chapter of Minneapolis will provide the platform for discussion and assessment of the work accomplished over the past year. This will also be the time to outline goals for the upcoming year. This agreement renewal should be completed during the winter months (December-March) in order to allow adequate planning time for the upcoming year. Advance planning will also provide an opportunity to advertise events in local publications, partner newsletters, and on the MPRB website. Staff from the MPRB's Environmental Operations and Volunteer and Community Partnership sections along with partner organizations can determine a schedule of events for the upcoming year during this process.

GOAL: 1 PROTECT, PRESERVE, AND ENHANCE THE BIRD HABITAT AND NATIVE PLANTS CONTAINED WITHIN THE SANCTUARY FOR PRESENT AND FUTURE GENERATIONS OF PEOPLE AND WILDLIFE

UPLAND PLANT COMMUNITY ACTIVITIES	IMPLEMENTATION BY:	GENERAL TIMEFRAME	SEASONAL TIMEFRAME SPRING Mar/Apr/May	SUMMER Jun/Jul/Aug/Sept	FALL Oct/Nov	WINTER Dec/Jan/Feb
Tree Canopy Improvement						
Canopy improvement-	MPRB	To be determined by inventory			Oct-Mar	
removal of mature trees	*MCES/Contractor	time, funding & disease				
(EAB, storm damage,		management (EAB) needs				
removal of invasives p.46- 47)		*MCES work will also be involved in this process				
Invasive Species Control and Monitoring						
Invasive shrub removals	MPRB	2-4 years			L Oct-Nov	
plants over 2" in diameter	Contractor	As staffing and weather permit				
P. 46						
Invasive shrub removals	Volunteers	Monitor after initial lg. tree			Oct -E Nov	
seedlings P. 46-47		removals to determine when and where seedlings are to be removed				
		Ongoing				
Garlic mustard removal	Volunteers	Ongoing	Prior to seed development in June			
p 46-47						
Upland Forest Plantings						
Shrub plantings**	MPRB	Dependent on invasive species	April-May		Sept-Oct	
P. 48	Volunteers	and seed viability length*				
		As funding permits				
Herbaceous plantings**	MPRB	Dependent on invasive species	April-May		Sept-Oct	
P. 48	Volunteers	seed viability length*				
		As funding permits				
Weeding and watering of plantings P. 48	Volunteers	ongoing				

* MCES work will involve some tree removals in the Sanctuary.
In the winter of 2013, MCES began stakeholder meeting informing the community of the work involved with the interceptor line.

**Invasive species seed viability ranges
planting into areas should be done after successive years of removal & monitoring taking into consideration of the seed bank that may be in the soil

Plant Species	Seed viability in soil
Buckthorn	5 to 7
Garlic mustard	4 years

GOAL: 1 PROTECT, PRESERVE, AND ENHANCE THE BIRD HABITAT AND NATIVE PLANTS CONTAINED WITHIN THE SANCTUARY FOR PRESENT AND FUTURE GENERATIONS OF PEOPLE AND WILDLIFE

WETLAND PLANT COMMUNITY ANALYSIS	IMPLEMENTATION BY	GENERAL TIMEFRAME	SEASONAL TIMEFRAME SPRING Mar/Apr/May	SUMMER Jun/Jul/Aug/Sept	FALL Oct/Nov	WINTER Dec/Jan/Feb
Wetland Study						
Hydrological analysis and recommendation	Contractor*	3-5 years				
Wetland delineation	Contractor*	for analysis				
Vegetation analysis and recommendation	Contractor*	As funding is				
Engineering study for pond rehabilitation	MCWD/contractor*	available				
P.49						

* MPRB will involve multiple contractors in this process.
The analysis and rehabilitation recommendations will be developed over a number of years and implementation is dependant on available funding.
As the wetland areas are waters of the State, MCWD has jurisdiction over this work and would have input into work in the wetland areas (p.49)

GOAL 2: EDUCATE AND INSPIRE PEOPLE ABOUT BIRDS AND THEIR HABITATS
MINNESOTA NATIVE PLANTS, AND THE NATURAL WORLD

ENVIRONMENTAL EDUCATION ACTIVITIES	IMPLEMENTATION BY	GENERAL TIMEFRAME	SEASONAL TIMEFRAME SPRING Mar/Apr/May	SUMMER Jun/Jul/Aug/Sept	FALL Oct/Nov	WINTER Dec/Jan/Feb
Shelter/Visitor Entrance Information						
*Development of interpretive signs	MPRB	As funding is available				
p. 50-51	Contractor	potentially in 2015*				
Phenonlogy and bird observation postings in shelter	MPRB	On-going				
	Volunteers					
*Develop printed and electronic information	MPRB	As funding is available				
on the Sanctuary	Contractor	potentially in 2015*				
(example: guidebook, birding lists, etc)						
p. 50-51						
Web Information Development						
Bird lists and activities on MPRB	MPRB	As MPRB website is				
website	Volunteers	updated				
p. 50- 51						
Examples of Guided Programming						
**Frog and Toad Survey	MPRB	On-going	Apr 15-30			
	Volunteers	multiple years	May 20-Jun 5			
			Jun 25-Jul 10			
***Earthworm monitoring	MPRB	one season				
	Volunteers					
Canopy and shrub layer composition	MPRB Forestry	1 season				
analysis	Volunteers	iTreeCompleted in 2013				
Spring warbler walk programs	MPRB	On-going	Apr- mid Jun primarily			
	Volunteers					
Existing Citizen Science and Environmental Programs						
WHEP wetland monitoring	MPRB	Program has been				
	WHEP	ongoing since 2002				
Urban Birding Festival Partnership	MPRB	2012 and ongoing				
	Festival staff					
	and volunteers					

* 2015 Capital Improvement funds have not been designated for a specific project within the Sanctuary.

**Follows Minnesota Frog and Toad Program protocol
is water temperature dependent

*** Follows Earthworm Monitoring Program protocol

GOAL 3: PROVIDE A MINIMAL INFRASTRUCTURE FOR THE SANCTUARY THAT HONORS THE INTEGRITY OF THIS UNDEVELOPED NATURAL AREA AS A BIRD SANCTUARY AND A PLACE THAT CONNECTS PEOPLE WITH NATURE

	IMPLEMENTATION BY	GENERAL TIMEFRAME	SEASONAL TIMEFRAME SPRING Mar/Apr/May	SUMMER Jun/Jul/Aug/Sept	FALL Oct/Nov	WINTER Dec/Jan/Feb
Trail, Entrance and Signage Improvements						
Improvements to trail system and entrances. Trail system to include directional signage (P. 52-53)	MPRB Planning staff/Community Engagement staff	As funding is available				
	Contractor	potentially 2015				
Fencing Repair and/or Replacement						
Repair and/or replace fencing	MPRB Planning staff/Community Engagement staff	As funding is available				
(p. 52-53)	Contractor	potentially 2015				

** 2015 Capital Improvement funds have not been designated for a specific project within the Sanctuary.