Heartland
ECOLOGICAL GROUP INC

Ecological Assessment Report

Sauk Creek Greenway

City of Madison, Dane County, Wisconsin

May 16, 2024

Project Number: 20241227

506 Springdale Street | Mount Horeb, WI 53572 | www.heartlandecological.com

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Prepared for:

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1.0 Introduction

Heartland Ecological Group, Inc. ("Heartland") completed an ecological assessment of the Sauk Creek Greenway (the "Study Area") on April 9-10, 2024, at the request of the City of Madison Engineering Division (the "City"). Fieldwork was completed by Sarah Kraszewski, a Senior Ecologist and Professional Wetland Scientist (PWS) at Heartland. The Study Area is approximately 34.5 acres and is located southeast of the intersection of Old Sauk Road and North High Point Road, in Section 23, T7N, R8E, City of Madison, Dane County, WI (Figure 1, Appendix A). The Study Area follows City-owned greenway that is associated with Sauk Creek, which is identified in the Wisconsin Department of Natural Resources (WDNR) Surface Water Data Viewer (SWDV) as an unnamed tributary to Pheasant Branch.

The City is currently assessing the entire stormwater corridor to develop a conceptual corridor management plan to serve as a framework for future planning and construction phases of the greenway. The City has been conducting conditions assessments of the greenway since 2017. Assessments have included tree inventories, wetland delineations, a topographic survey, and a channel survey. The City is conducting public engagement to understand how the community values the corridor and to identify issues and opportunities for improvement which can be integrated into the corridor management plan.

The purpose of Heartland's ecological assessment was to describe the existing plant communities, describe the probable ecological trajectory of the landscape without intervention, and provide an opinion on the concerns or threats to ecological health and functionality of the Sauk Creek Greenway. This assessment is intended to supplement the previous assessments completed by the City and its consultants and is not intended to replicate tree inventories nor consist of comprehensive plant surveys. The field work occurred during the early growing season; therefore, field observations of herbaceous vegetation presence and abundance were limited to species with early growing season emergence.

This report provides a description of the Study Area based on publicly available resources, historic documents and aerial imagery, and previous assessments. Field assessment methods, results including a description of the woodland plant communities and quality as observed in the field, a discussion providing an opinion on the concerns and threats to the

ecological trajectory of the woodland communities, representative photographs, and figures depicting the identified woodland communities are provided.

2.0 Site Characteristic Assessment

Publicly available resources were utilized including the Original Public Land Survey notes (Appendix B), Wisconsin Land Economic Inventory ("Bordner Survey") from 1939 (Appendix B), U.S. Geological Survey's (USGS) *WI 7.5 Minute Series (Topographic) Map* and the WNDR's *24k Hydro Flowlines (Rivers and Streams)* data layer (Figure 2, Appendix A), the U.S. Department of Agriculture (USDA) Natural Resource Conservation Service's (NRCS) Soil Survey Geographic Database (SSURGO) *Web Soil Survey* (Figure 3, Appendix A), Color-Stretch Digital Elevation Model (DEM) (Figure 4, Appendix A), and aerial imagery available through the USDA Farm Service Agency's (FSA) National Agriculture Imagery Program (NAIP) and Dane County's Land Information Office (Appendix B).

The WDNR's *Rivers and Streams* data layer depicts Sauk Creek as an unnamed intermittent waterway that initiates southwest of the Study Area at State Highway 12. This waterway has Waterbody Identification Code (WBIC) 5035724 and is a tributary to Pheasant Branch, which is located approximately 5 miles to the north of the Study Area. Based on the topographic map and Dane County one-foot contours, the Study Area appears to be located at lower elevations when compared to the surrounding areas. The Study Area also appears to receive drainage from the south, west, and east. Drainage continues to the north of the Study Area under Old Sauk Road along Sauk Creek.

Soils mapped by NRCS within the Study Area consist of a variety of loams and silt loams including Batavia silt loam (BbB), Dresden loam (DrD2), Dresden silt loam (DsC2), Griswold loam (GwC), Ringwood silt loam (RnC2), and Troxel silt loam (TrB) (Appendix A, Figure 3). All the soil units mapped within the Study Area are considered non-hydric.

2.1 Historic Evolution of Landscape

The Study Area is located in the western portion of the Southeast Glacial Plains Ecological Landscape of Wisconsin (WDNR 2015). The Southeast Glacial Plains historically consisted of a mix of prairie, savanna, and oak forest that experienced consistent low-medium severity

surface wildfires, with maple-basswood forests common in areas experiencing less wildfire. Oak species are believed to have dominated this landscape, with bur oak (*Quercus macrocarpa*), white oak (*Quercus alba*), and black oak (*Quercus velutina*) having the highest relative importance values (RIVs) of all tree species found here. The WDNR indicates that agricultural and urban land use practices have drastically changed the landscape with agricultural cropland now the dominant land cover. Remaining forests are extensively fragmented as a result. Widespread fire suppression has allowed for the spread of mesic and shade tolerant woody plants such as elms (*Ulmus* sp.) and maples (*Acer* sp.) into oak-dominated savannas, woodlands, and forests which historically had less tree density due to consistent low-medium severity surface wildfires. Oak species have declined dramatically from historical levels while northern hardwood and elm species have increased.

The Original Public Land Survey notes for the northern boundary of the Study Area between Sections 14 and 23 described rolling land, second rate bur and white oak timber, and undergrowth of oak and potentially grass (unable to fully decipher notes). Land in the area near the western boundary of the Study Area between Sections 14 and 23 was described as first-rate timber composed of bur and white oak with similar undergrowth to the northern boundary. Based on these descriptions, the Study Area appeared to consist of oak savanna and/or oak woodland. There was no reference to a waterway; however, the surveyors did not walk directly within the Study Area limits.

The Bordner Survey from 1939 indicated three dominant land cover types within the Study Area (Appendix B). The northern portion of the Study Area was designated as an oak-hickory medium density timber stand with an average diameter at breast height (DBH) of 6-12 inches (D1, 6-12, two lines). The central portion of the Study Area was primarily designated as pasture (P) and permanent pasture (PP) with cleared cropland (C) extending beyond. The southern portion of the Study Area was designated as an oak-hickory timber stand with poor density and an average DBH of 0-6 inches (D1, 0-6, 3 lines). A drainage ditch is depicted flowing north through the Study Area that appears similar to the current channel location.

A review of available historic aerial imagery of the Study Area and surrounding landscape is provided below and the imagery is provided in Appendix B.

- 1937: Wooded areas in the northern and southern portions are narrower than existing conditions due to cropland clearing. The tree canopy in the wooded areas is more open than current conditions. The central portion of the Study Area has denser woodland. The surrounding area is primarily cropland.
- 1979: Recent residential development has occurred on the eastern Study Area boundary with some cropland remaining to the north. Cropland remains to the west of the Study Area. Tree Lane is being constructed to the south of the Study Area boundary. Forested areas in the Study Area have expanded compared to the 1937 aerial.
- 1985: Mass grading occurring to the northeast of the Study Area boundary. Parkland is established to the east. Tree Lane is fully constructed to the south.
- 1988: Residential development construction occurring on the western Study Area boundary.
- 1998: Residential development around Study Area matches current conditions.
- 2004: Construction of the northern stormwater pond.
- 2004-2022: Imagery appears similar within Study Area and surrounding landscape. There may be an increase in canopy density within the Study Area; however, the canopy was already very dense by 2004 except for the pond areas.

In summary, the Study Area historically appeared to consist primarily of oak savanna and/or oak woodland dominated by bur oak, white oak, and hickory that was initially impacted by cropland conversion and pasture prior to the 1930s. As residential development replaced agricultural land use, there was an increase in tree density and canopy closure within the greenway. There is currently dense residential development as well as some parkland surrounding the entire Study Area.

3.0 Field Assessment Methods

The field assessment was completed via a pedestrian meander survey across the Study Area. Areas of mowed lawn, primarily from residential lawn expansion into the greenway, or other forms residential uses and encroachments into the greenway such as ornamental flower gardens and landscaping, were mapped in the field. Distinct woodland areas were identified based on dominant canopy species, dominant species in the shrub and herbaceous layers, landscape characteristics such as topography, and ecological quality and/or

degradation. Observations regarding dominant species and composition, native wildflowers, soil disturbance, invasive species, and other ecological threats were recorded for each woodland area.

Woodland area boundaries, mowed lawn, and residential uses were mapped using a Global Positioning System (GPS) in the field and then digitized onto recent aerial photography using Geographic Information System (GIS) technology at the office.

Representative photographs were taken across the Study Area and wildlife observations were recorded.

4.0 Results

Collected field data, the existing sanitary access path, and wetland and waterway data delineated by other consultants is provided on Figure 5 (Appendix A). Representative photographs were taken from photo points depicted on Figure 5 and are provided in Appendix C.

Overall, the Study Area consists primarily of woodland associated with the Sauk Creek corridor. A total of fifteen (15) woodland areas were characterized within the Study Area and are described in more detail below and in Table 1 (Appendix D). A small unmaintained meadow is located at the southwest end of the Study Area abutting Haen Family Park. Invasive species observed in the meadow included multiflora rosa (*Rosa multiflora*), reed canary grass (*Phalaris arundinacea*), dame's rocket (*Hesperis matronalis*), garlic mustard (*Alliaria petiolata*), and common burdock (*Arctium minus*). Sanitary access paths extend through most of the greenway and multiple unmaintained trails bisect the greenway that are used by the public and adjacent landowners for passive recreation.

Adjacent Landowner Usage of Greenway Corridor

Areas of mowed lawn within the Study Area are depicted on Figure 5 as well as other forms of residential usage. Residential use areas are depicted with orange cross hatching over characterized woodland areas if mature trees are present but landscaping/gardening is occurring around the trees and/or ornamental trees or shrubs have been planted. Ornamental groundcovers such as periwinkle (*Vinca minor*), ornamental bulb plants such as

orange day-lily (*Hemerocallis fulva*) and squill (*Scilla siberica*), as well as horticultural varieties of native wildflowers such as Virginia bluebells (*Mertensia virginica*) were commonly observed to be spreading from residential lawns into the greenway. In addition to the areas marked as lawn or where adjacent properties are actively using the greenway space, yard waste and leaf piles were observed in multiple locations within the woodland areas. Leaf and brush piles dumped by adjacent landowners has resulted in dense piles of organic material that inhibits plant growth.

Sauk Creek Channel

Although this assessment did not include a thorough review of the channel health, it was apparent that the channel is not optimally providing stormwater conveyance functions and has been destabilized. Items impacting the channel include downed tree material blocking channel flow, bank erosion and cutting, erosion on the slopes above the channel that is contributing sediment within the channel, and invasive shrubs shading out native herbaceous vegetation that stabilize soil. The northern portion of the channel appears to have been completely blocked in the past or simply overtops it banks during large flow events, based on the observance of inches of sediment deposited over the soil surface that is impacting tree health and limiting the ability for herbaceous vegetation to grow. Multiple eroded channels were observed leading into Sauk Creek throughout the greenway, including areas of placed rip rap and concrete that have since been eroded around.

Stormwater Ponds

There are two existing stormwater ponds/basins within the Study Area. The northern pond appeared to be fully vegetated throughout and is dominated by cattail (*Typha* spp.) and reed canary grass with a perimeter dominated by reed canary grass and other invasive herbaceous species such as wild parsnip (*Pastinaca sativa*) and dame's rocket. The southern pond is dominated by Kentucky bluegrass (*Poa pratensis*) with brambles (*Rubus* spp.).

4.1 Woodland Areas

Woodland areas are depicted on Figure 5 (Appendix A). Table 1 (Appendix D) provides a summary of each characterized woodland area, dominant vegetation by stratum, observed threats, and the anticipated trajectory with no action. Dead and downed tree and shrub material was common and is contributing to blockages within Sauk Creek. Box elder (*Acer negundo*) is dominant across all woodland areas where it has grown up into the canopy and

box elder saplings were dominant in the shrub layer. In general, the shrub and herb layers of all woodland communities were degraded by invasive species. Common buckthorn (*Rhamnus cathartica*), an invasive shrub, was common to dominant throughout most of the woodland areas and invasive bush honeysuckles (*Lonicera* sp.) were scattered to locally common. Garlic mustard and dame's rocket, both invasive herbaceous plants, were common in the woodland understories.

Oak Woodlands

Most of the Study Area was likely oak savanna and/or oak woodland historically. In the absence of fire and disturbance, the canopy has closed. Area 1, Area 2, Area 6, Area 8, Area 9, Area 10, Area 12, and Area 13 still have large oaks prominent in the canopy but the oaks are generally declining and are being replaced by more mesic species that can tolerate lower light levels and are not fire-dependent. Young oak trees with a DBH of less than four inches were only observed in Areas 14 and 15.

Due to the level of degradation, fragmentation, and spread of invasive species, these communities do not directly match natural plant community descriptions as provided by the WDNR (Wisconsin's Natural Communities Webpage). Oak woodland, southern dry-mesic forest, and oak-hickory forest were used to describe the woodlands within the Study Area based on the dominant species in the canopy although trees recently reaching the canopy and the degraded shrub and herb layers may not match those community types. Understory species that are indicative of oak savanna and woodlands appeared to be lacking within the Study Area, likely because of historic grazing, lack of fire, and the encroachment of invasive shrubs and herbs in the understory. In general, most woodland areas may be described as degraded oak woodland and oak-hickory forest.

Area 1 has channelized erosion occurring along slopes and Area 15 had areas of soil disturbance from side channel formation. Area 12 has been significantly degraded by flooding of Sauk Creek which has deposited several inches of sediment over the ground surface, resulting in tree health decline and smothering of the herbaceous layer. Areas 9 and 10 were observed to have less soil disturbance and invasive herbs compared to other woodland communities and may fare better with restoration efforts.

Oak Savanna Restoration

Area 14 is a small area adjacent to North High Point Road that appears to have had understory clearing below bur oak trees and has some planted prairie vegetation (field visit too early in season to confirm species and abundance). Oak regeneration was observed in this area and saplings are present. The bur oaks in this area would benefit from continued canopy thinning and invasive species removal up to Sauk Creek to the east.

Pine Plantation

Area 3 consists of planted red and white pine. The red pine are generally in poor health or have already died and have fallen. The understory is sparse and appears to consist of generalist and non-native species.

Mesic and Lowland Forests

Area 11 is dominated by mesic trees such as black walnut (*Juglans nigra*), hackberry (*Celtis occidentalis*), and elm with limited oaks. Extensive encroachment including flower gardening, yard waste dumping, and spread of horticultural plants threatens the native species that remain in the understory. Area 5 consists of a degraded lowland/floodplain forest that is dominated by large eastern cottonwood (*Populus deltoides*), box elder, and scattered green ash (*Fraxinus pensylvanica*) that are dead/dying from emerald ash borer. This woodland area has been degraded by lawn encroachment, multiple eroded channels leading to Sauk Creek, as well as flooding from Sauk Creek that has deposited sediment on the ground surface.

Area 11 had only a few large trees in the 1937 aerial image and Area 5 was almost completely lacking in tree cover. This explains why there are currently few to no mature oaks observed in these units and why the current tree composition consists of more mesic species that established after cropping and pasturing practices ended.

Highly Disturbed Woodlands

Areas 4 and 7 are low quality and the vegetative assemblage is not representative of a natural woodland community (WDNR, Wisconsin's Natural Communities Webpage). The

1937 aerial image shows these areas with no trees and the areas appear pastured. Vegetation that has established following pasture use consists largely of disturbance-tolerant native and non-native species such as box elder, mulberry (*Morus alba*), common buckthorn, and burdock that provide low ecological function.

Area 4 is in the southern portion of the Study Area and is impacted by residential uses including stormwater runoff, mowing, and yard waste dumping. There is a random assortment of trees (some of which were likely planted), invading trees saplings and shrubs, and a disturbed herb layer dominated by weedy and invasive species. Area 7 is located south of Walnut Grove Park and has few desirable canopy trees and a degraded understory. Horticultural ground covers have spread into the area and sediment was observed at the soil surface in one location. An adjacent landowner appears to be cutting common buckthorn and it is possible that native herbaceous vegetation is present in this area but was not observed due to the early timing of the field visit.

4.2 Wildlife Habitat and Observations

Wildlife and signs of wildlife observed while conducting the field assessment included coyote, white-tailed deer, cottontail rabbit, grey squirrel, and fox (per neighbor communication). Red admiral butterflies were observed. Seen and/or heard birds included killdeer, blue jay, black-capped chickadee, house finch, house sparrow, American robin, northern cardinal, mourning dove, American goldfinch, eastern phoebe, American crow, red-bellied woodpecker, hairy woodpecker, pine siskin, cedar waxwing, golden crowned kinglet, wild turkey, tufted titmouse, yellow-rumped warbler, white breasted nuthatch, and red-winged blackbird. Mallards and wood ducks were observed within open water areas of the Sauk Creek channel. The greenway appears to provide valuable wildlife habitat, particularly for birds, and serves as a wildlife corridor within an urban landscape.

5.0 Discussion

This section will provide an opinion on the concerns and threats to ecological health and functionality of the greenway. The threats are largely connected and addressing these concerns will require thoughtful consideration. Specific threats to each woodland community

and the anticipated trajectory of these woodland areas with no action is included on Table 1 (Appendix D).

5.1 Replacement of Oaks

In general, large oaks remain in the canopy but they are crowded and are being replaced by other tree species, such as box elder, which are less ecologically and economically desirable. In the absence of fire, shrubs and saplings of other tree species often have a significant competitive advantage over the oaks (WDNR 2015). The introduction and spread of invasive species such as invasive bush honeysuckles, common buckthorn, and garlic mustard also contribute to oak regeneration failure. Oak health has been declining rapidly, as evidenced by tree assessments and scouting completed by the City and its consultants which documented additional oak tree mortality during the period from 2017 to 2023. Loss of large limbs, dead standing trees, and fallen trees were observed throughout the oak woodland units. Competition from other species, fire suppression, lack of regeneration, disease such as oak wilt, and erosion and sedimentation issues in the greenway are contributing to the decline in oak health.

Oaks are being replaced by trees that are more common in the landscape and provide less ecological value. Oaks are considered critical keystone species that provide an enormous contribution to our food webs, as many moths, butterflies, and insects depend on oaks to lay their eggs. These caterpillars and insects in turn are used as food for young birds, and the cycle continues (Tallamy 2021). Oaks also provide acorns that feed numerous wildlife. Humans have had cultural connections to oak, particularly large open-grown oaks, for hundreds of years. Preserving older and legacy trees, such as some of the oaks at the greenway, provides important genetics for forests to adapt to future climates (NIACS, Adaptation Strategies and Approaches).

If the City decides to pursue oak woodland restoration, it is recommended that further planning be conducted to determine areas that are more likely to be successful following canopy thinning, removal of invasive shrubs, and removal of invasive herbaceous species, as well as what resources are in place to manage those areas in the long-term. Areas that currently have less soil disturbance and the presence of some native herbaceous species should be prioritized over highly degraded areas as they are more likely to support oak

regeneration and be more resilient in the future. Restoration planning should be completed to determine what to remove, by what methods, and if native seed or plants should be installed. Long-term maintenance including invasive species treatments and prescribed burning will be needed to support native species biodiversity and reduce invasive species threats. Reducing invasive species is very important, as discussed in the section below, but there should be a clear path for what to do once the invasive species are removed.

5.2 Invasive Species

Invasive species are replacing native species, limiting the regeneration of desirable trees and shrubs, and are altering the litter layer and soil chemistry of the greenway. The most prevalent invasive species include: dame's rocket, garlic mustard, reed canary grass, common buckthorn, invasive bush honeysuckle, and horticultural species such as day-lily and periwinkle. Garlic mustard and common buckthorn are allelopathic and release chemicals into the soil that can inhibit the growth of other plants and alter the soil chemistry.

High levels of disturbance and nutrient loading can make urban forests more susceptible to invasive species. Invasive species spread may worsen with climate change, which is a significant challenge because diverse ecosystems are likely to adapt better to changing climates. A climate vulnerability assessment on savannas in Wisconsin completed by the Wisconsin Initiative on Climate Change Impacts (WICCI) and their partners specifically called attention to garlic mustard and dame's rocket as already posing a formidable threat to our forests and which may continue to benefit from climate change as the growing seasons become longer and winter snowpack is reduced. They also indicate that common buckthorn and other woody forest invasives may continue to fare well by carbon dioxide enrichment. Forests, such as those present in the greenway, will need continued help from managers to limit the spread of these invasive species that are benefitting from increased levels of carbon dioxide in the atmosphere at the detriment of native tree and shrub species.

Invasive plant species pose a significant threat to plant biodiversity, which then impacts habitat diversity and the animals and microbes that inhabit those areas. Native plants provide better pollinator benefits than non-native plants, which in turn supports functioning

food webs (NIACS). Healthy and diverse habitats can better absorb the stresses of rapidly changing climate (WICCI).

5.3 Land Use and Encroachments

Land use encroachments including mowing/allowing lawn to spread into the greenway, maintain flower gardens with horticultural plants in the greenway, and dumping of yard waste into the woodlands is exacerbating the fragmentation of the woodland and resulting in the spread of non-native species that are outcompeting native herbaceous species. As discussed above, the loss of native plant biodiversity results in reduced ecosystem services such as pollinator habitat and may leave the greenway more susceptible to the negative impacts of climate change.

5.4 Erosion

Areas of steep slopes make the greenway susceptible to erosion. Lack of cover by herbaceous perennial vegetation due to a combination of factors such as shading from invasive shrubs, dense leaf litter, yard waste dumping, and prior erosion make the slopes more susceptible to future erosion. Beyond removal of the herbaceous layer, erosion removes soil around tree roots and reduces stability of the impacted trees. Poor soil health contributes to poor tree health which can then contribute to further erosion as the trees fall over and the root structure in the soil is lost. The lost soil ultimately ends up in Sauk Creek where it contributes to sediment loads and reduces water quality. Erosion will continue to worsen overtime without repair.

5.5 Flooding and Sedimentation from Channel

Channel flooding and subsequent sediment deposition on the soil surface has negatively impacted the health of the woodlands, particularly in Area 5, Area 12, and a portion of Area 6 that is east of the channel and between Areas 5 and 7. Sedimentation has resulted in the loss of the herbaceous layer. The bases of trees have been smothered by sediment and tree health is declining as a result. These impacted areas cannot support functioning plant communities or wildlife habitat. Improvements will need to be made within the channel and basins to convey stormwater flow and minimize future flooding.

5.0 Conclusion

Heartland completed an ecological assessment at the Sauk Creek Greenway on April 9-10, 2024, to assess the existing plant communities, describe the probable ecological trajectory of the landscape without intervention (see Table 1, Appendix D), and provide an opinion on the concerns and threats to ecological health and functionality of the Sauk Creek Greenway. The ecological assessment was completed on behalf of the City of Madison Engineering Division. The information may be used to inform the development of a conceptual plan for the greenway.

The Study Area was historically oak savanna and oak woodland that was impacted by grazing and row cropping prior to the 1930s and then more recently impacted by residential development which has contributed to fire suppression, further fragmentation, introduction of invasive species, erosion and soil disturbance, and stormwater conveyance issues. Oak-dominated woodlands are still prevalent in the Study Area, but these communities are in decline and are being replaced by disturbed communities that provide less ecological function.

The greenway provides valuable wildlife habitat for birds and mammals in an urbanized landscape. The natural landscape abutting residential lots provides a calming environment that is enjoyed by people in their yards and by the public walking through the trails. Repairing and maintaining the Sauk Creek channel for stormwater conveyance, restoring and preserving some of the oak woodland history, removing invasive species where feasible, stabilizing slope erosion, limiting residential land encroachment and improper use of the greenway, maintaining and enhancing wildlife habitat, and allowing for passive recreation opportunities should all be considerations to balance in the creation of the conceptual plan for the corridor.

6.0 References

Dane County Land Information Office. (1937, 1979, 1985, 1988, 1998, 2001). [Dane County, Wisconsin aerial photographs]. Accessed March 2024 from: https://lio.countyofdane.com/.

Northern Institute of Applied Climate Science (NIACS). Adaptation Strategies and Approaches (Urban Forest Health) Webpage. Adapted from Forest Adaptation Resources: Climate Change Tools and Approaches for Land Managers. Created using the NIACS Adaptation Workbook. https://adaptationworkbook.org/niacs-strategies/urban_forest_health. Accessed 4/25/2024.

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture (USDA). (2018). *Soil Survey Geographic (SSURGO) Database*. See: http://websoilsurvey.nrcs.usda.gov/ or http://datagateway.nrcs.usda.gov/.

Soil Survey Staff, Natural Resources Conservation Service, USDA. (2018). *Web Soil Survey*. See: http://websoilsurvey.nrcs.usda.gov/.

Tallamy, D. 2021. *The Nature of Oaks: The Rich Ecology of Our Most Essential Native Trees*. Timber Press, Portland, Oregon.

United States Department of Agriculture (USDA), Farm Service Agency (FSA). (2004, 2015, 2022) [Dane County, Wisconsin aerial photographs]. National Agriculture Imagery Program (NAIP). Salt Lake City, UT: Aerial Photography Field Office.

United States Department of the Interior (USDI), U.S. Geological Survey (USGS). *Wisconsin 7.5 Minute Series (Topographic) Maps.* 1:24,000. Reston, VA.

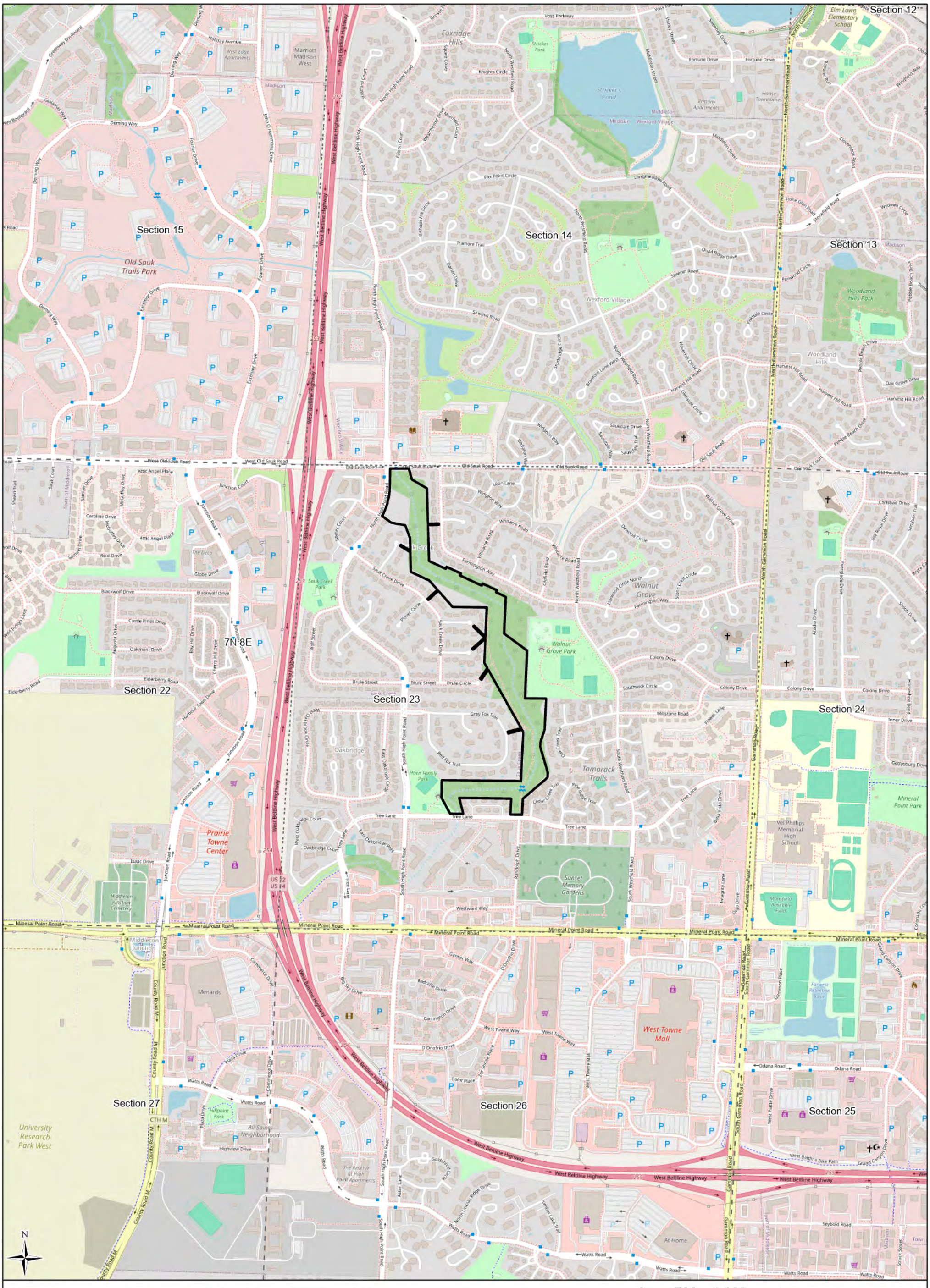
University of Wisconsin-Madison. Wisconsin Initiative on Climate Change Impacts (WICCI). https://wicci.wisc.edu/plants-and-natural-communities-working-group/. Accessed 4/25/2024.

WDNR, Open Data Portal. (2024). [24k Hydro Flowlines (Rivers and Streams]. See: https://data-wi-dnr.opendata.arcgis.com/.

WDNR, Wisconsin's Natural Communities Webpage. https://apps.dnr.wi.gov/biodiversity/Home/index/communities. Accessed 4/25/2024.

WDNR. 2015. *The Ecological Landscapes of Wisconsin: An Assessment of Ecological Resources and a Guide to Planning Sustainable Management*. Chapter 18, Southeast Glacial Plains Ecological Landscape. WDNR, PUB-55-113 IT 2015, Madison.

Appendix A | Figures



Heartland
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Figure 1. Project Location

Sauk Creek Greenway
Project #20241227
T7N, R8E, S23
C Madison, Dane Co

OpenStreetMap
ESRI
LRR: NCNE

Figure Created: 4/15/2024

Section 12
Section 15
Section 14
Section 13
7N 8E
Section 22
Section 23
Section 24
Section 27
Section 26
Section 25
N
Madison
Middleton

Study Area (34.54 ac)
Township
Section
Perennial Streams (None in Map Extent)
Intermittent Streams
Waterbodies

0 500 1,000 Ft

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Figure 2. USGS Topography

Sauk Creek Greenway
Project #20241227
T7N, R8E, S23
C Madison, Dane Co

USGSTopo
USGS
LRR: NCNE

Figure Created: 4/15/2024

Old Sauk Rd
DsC2
Loon Ln
DsB
Widgeon Way
RnC2
DsC2
Farmington Way
Canvasback Cir
BbB
BbB
ScC2
Sauk Creek Cir
Whitacre Rd
TrB
Pintail Cir
Oldfield Rd
GwC
GwC
KrD2
Plover Cir
GwC
St Lawrence Cir
RnC2
BbA
W Geneva Cir
Sauk Creek Dr
E Geneva Cir
BbB
DsC2
DrD2
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Brule Cir
DsC2
N High Point Rd
BbB
DrD2
DsC2
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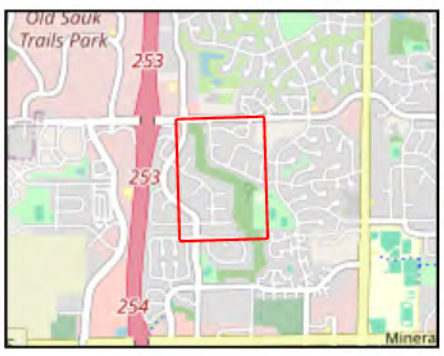
W Oakbrook Cir
Gray Fox Trl
Grey Fox Trl



Study Area (34.54 ac)

NRCS Soil Survey Data

- Hydric (100%)
- Predominantly Hydric (85-99%)
- Partially Hydric (16-84%)
- Predominantly Non-Hydric (1-15%)
- Non-Hydric (0%)

0 200 Ft

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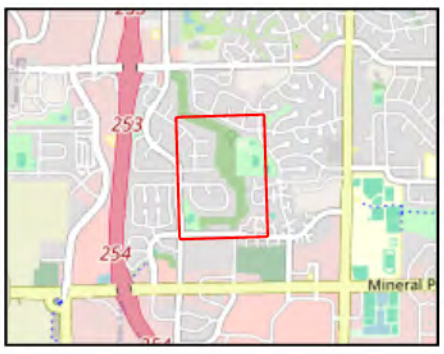
Figure 3a. NRCS Hydric Soils

Sauk Creek Greenway
Project #20241227
T7N, R8E, S23
C Madison, Dane Co

2022 NAIP
NRCS
LRR: NCNE

Figure Created: 5/21/2024



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0 200 Ft

Heartland ECOLOGICAL GROUP INC

Figure 3b. NRCS Hydric Soils

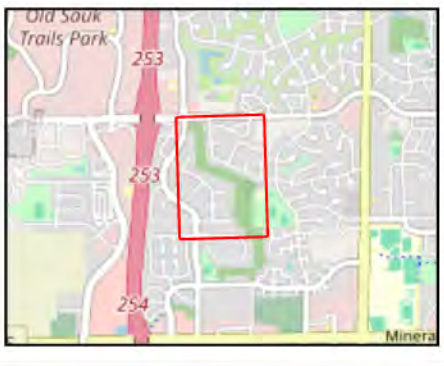
Sauk Creek Greenway
Project #20241227
T7N, R8E, S23
C Madison, Dane Co

2022 NAIP
NRCS
LRR: NCNE

Figure Created: 4/15/2024

Old Sauk Rd
Loon Ln
Widgeon Way
Farmington Way
Canvasback Cir
Whitacre Rd
Sauk Creek Cir
Pintail Cir
Oldfield Rd
Plover Cir
St Lawrence Cir
W Geneva Cir
E Geneva Cir
Sauk Creek Dr
Brule St
Brule Cir
N High Point Rd
W Oakbrook Cir
Gray Fox Trl
Grey Fox Trl

N



Study Area (34.54 ac)
Dane Co 1' Contours

0 200 Ft

Heartland ECOLOGICAL GROUP INC

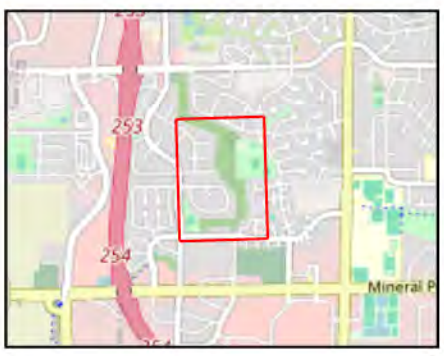
Figure 4a Color-Stretch Digital Elevation Model

Sauk Creek Greenway
Project #20241227
T7N, R8E, S23
C Madison, Dane Co

2019 DEM
Dane Co, WDNR
LRR: NCNE

Figure Created: 5/21/2024

Plover Cir
Pintail Cir
Oldfield Rd
N Westfield Rd
Farmington Way
St Lawrence Cir
W Geneva Cir
Sauk Creek Dr
E Geneva Cir
Brule St
Brule Cir
Gray Fox Trl
Grey Fox Trl
Red Fox Trl
Oak Creek Trl
Cedar Creek Trl
Pine Ridge Trl
S High Point Rd
Tree Ln
N



Study Area (34.54 ac)
Dane Co 1' Contours

0 200 Ft

Heartland
ECOLOGICAL GROUP INC

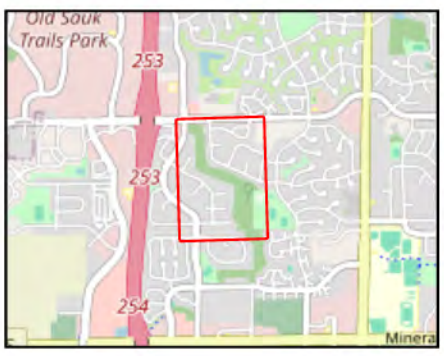
Figure 4b Color-Stretch
Digital Elevation Model

Sauk Creek Greenway
Project #20241227
T7N, R8E, S23
C Madison, Dane Co

2019 DEM
Dane Co, WDNR
LRR: NCNE

Figure Created: 5/21/2024

Old Sauk Rd
Loon Ln
Widgeon Way
Area 13
Area 14
PP22
Area 15
Area 12
PP21
Farmington Way
Canvasback Cir
PP19
Area 12
Whitacre Rd
Sauk Creek Cir
PP20
Area 12
Area 6
Area 11
PP17
Pintail Cir
Oldfield Rd
PP18
Area 11
Area 10
PP16
Plover Cir
St Lawrence Cir
PP15
W Geneva Cir
Sauk Creek Dr
E Geneva Cir
Area 8
PP10
Area 6
Area 6
Area 6
PP14
Brule St
Brule Cir
N High Point Rd
Area 7
W Oakbrook Cir
Gray Fox Trl
Grey Fox Trl
N



- Study Area (34.54 ac)
- Photo Points
- Existing Sanitary Access Path
- Woodland Areas
- Mowed Lawn
- Unmaintained Meadow
- Existing Stormwater Basins
- Residential Uses & Encroachment

Wetlands & Waterways - Delineated By Others

- Waterway
- Wetland
- Wetland - Artificial

0 200 Ft

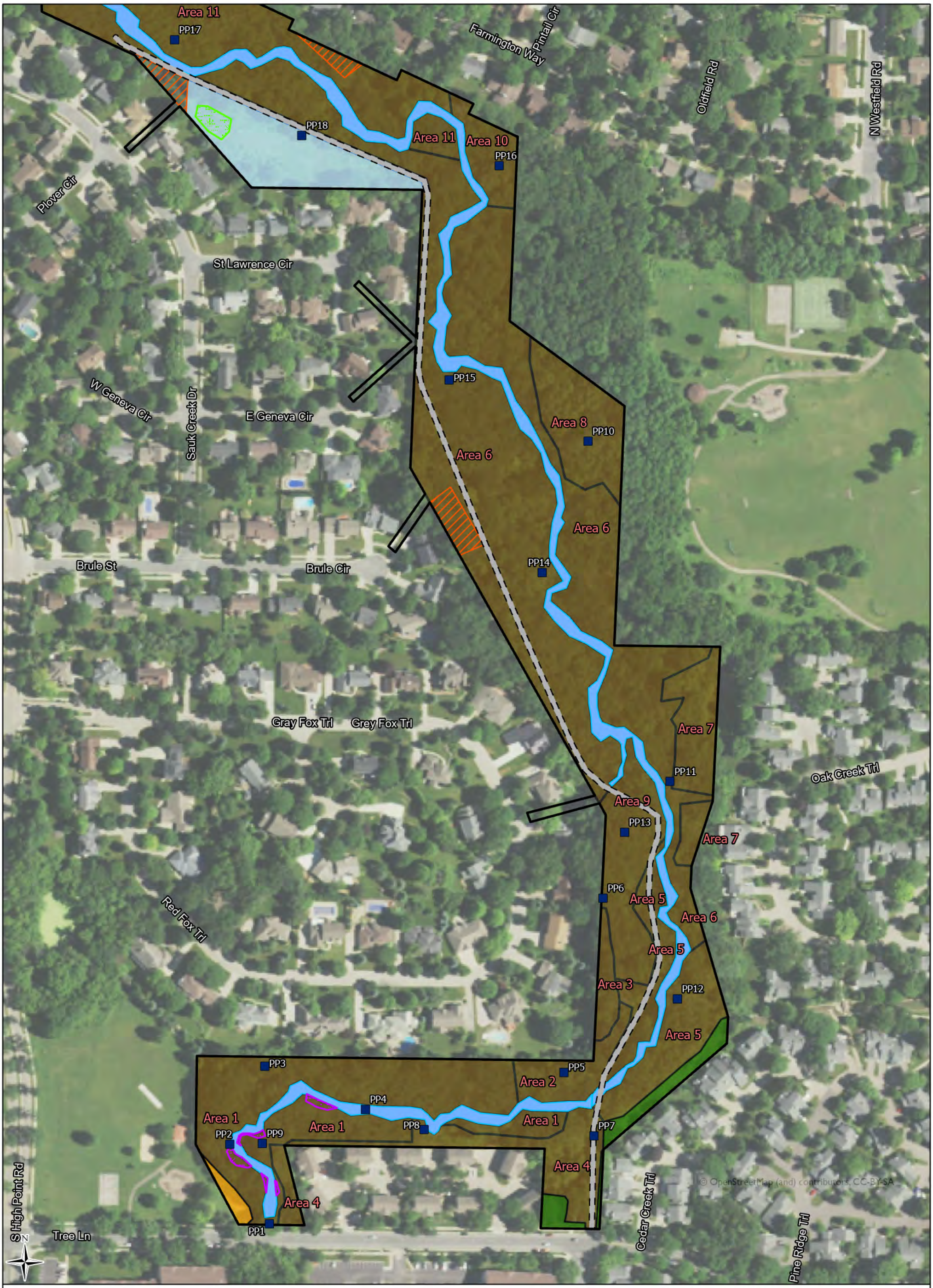
Heartland ECOLOGICAL GROUP INC

Figure 5a. Field Map

Sauk Creek Greenway
Project #20241227
T7N, R8E, S23
C Madison, Dane Co

2022 NAIP
Dane Co, C Madison, HEG LRR: NCNE

Figure Created: 5/21/2024


Area 11
PP17
Farmington Way
Pintail Cir
Oldfield Rd
N Westfield Rd
PP18
Area 11
Area 10
PP16
Plover Cir
St Lawrence Cir
PP15
W Geneva Cir
Sauk Creek Dr
E Geneva Cir
Area 8
PP10
Area 6
Area 6
PP14
Brule St
Brule Cir
Gray Fox Trl
Grey Fox Trl
Area 7
PP11
Oak Creek Trl
Area 9
PP13
Area 7
PP6
Area 5
Area 6
Red Fox Trl
Area 5
Area 3
PP12
Area 5
PP3
PP5
Area 2
PP4
Area 1
Area 1
Area 1
PP8
PP2
PP9
PP7
Area 4
Area 4
S High Point Rd
Tree Ln
PP1
Cedar Creek Trl
Pine Ridge Trl
© OpenStreetMap (and) contributors, CC-BY-SA
N
253
254
Mineral P
Study Area (34.54 ac)
Photo Points
Existing Sanitary Access Path
Woodland Areas
Mowed Lawn
Unmaintained Meadow
Existing Stormwater Basins
Residential Uses & Encroachment
Wetlands & Waterways - Delineated By Others
Waterway
Wetland
Wetland - Artificial
0
200
Ft
Heartland
ECOLOGICAL GROUP INC
Figure 5b. Field Map
Sauk Creek Greenway
Project #20241227
T7N, R8E, S23
C Madison, Dane Co
2022 NAIP
Dane Co, HEG
LRR: NCNE
Figure Created: 5/21/2024

Appendix B | Historic Documents and Aerial Imagery

T. 7. N. R. 8. E. 4th Mer. N. M. Surv

North Between Sections 22 & 23

2897 Bur Oak 9 inches diameter

5975 Set quarter Section post

20.00 bearing { White Oak 30 N 69 W 2
Bur Oak 14 S. 14. W. 65

4091 Bur Oak 12 inches diameter

7070 Bur Oak 12 inches diameter

7950 Set post corner to Sections 14 15 22 23

85-00 bearings { Bur Oak 14 S 83 E. 35
Do 14. N. 57. W. 52

Land rolling & 1st rate Timber

Bur & White Oak undergrowth

Oak & grass

T 7 N R 8 E. 4th Mer. N. M. Surv

East

8000 On Random Between Sections 14 & 23
Intersected N & S lines 4 South
of post Land rolling & 2nd rate
Timber Bur & White Oak
under growth Oak & grass

West

4000 Connected Between Sections 14 & 23
Set quarter Section post
bearing { B. Oak 8. N. 81. E. 67
Bur Oak 7. N. 56. W. 27

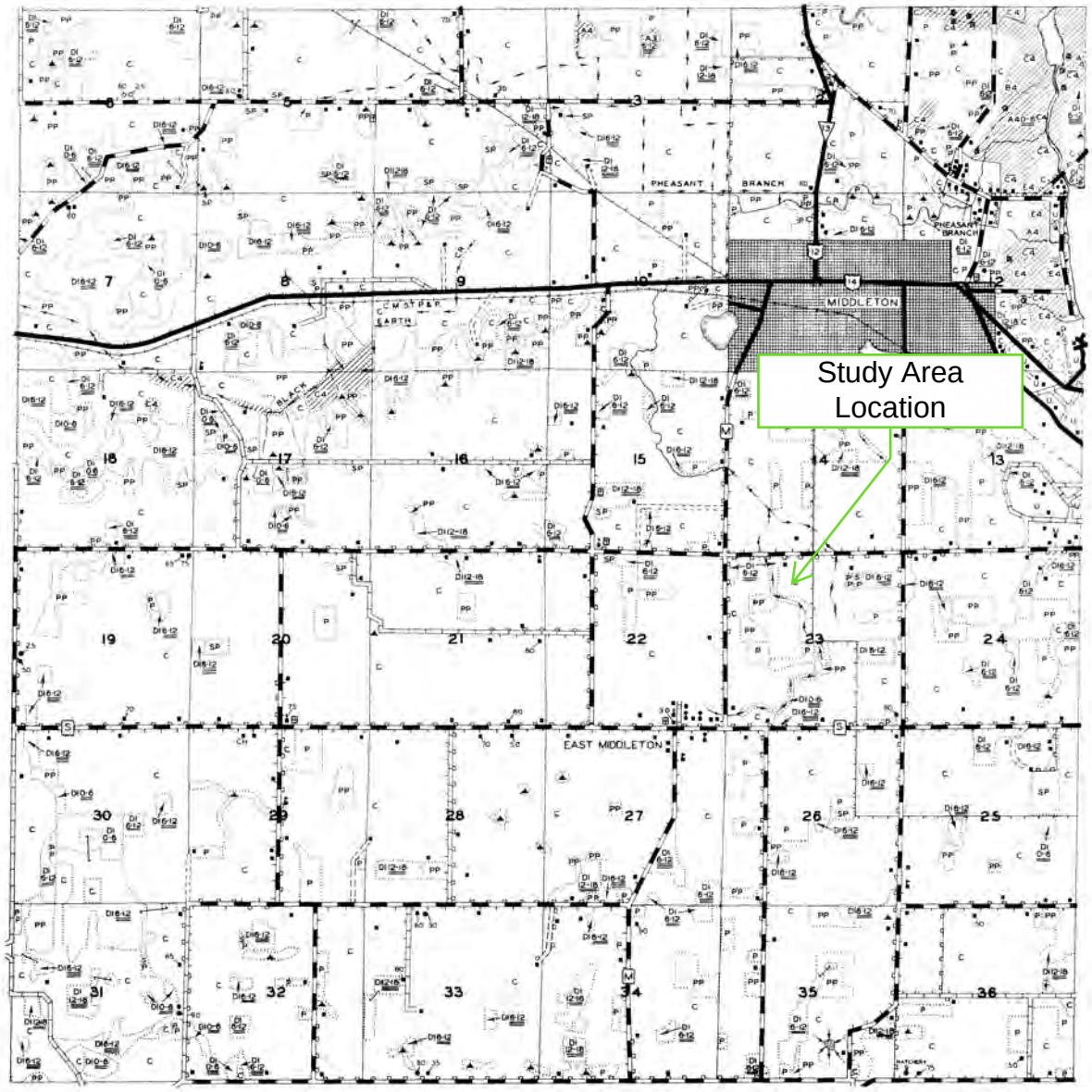
4735 Bur Oak 17 inches diameter

8000 Section corner

WISCONSIN LAND INVENTORY

LAND COVER MAP

TOWN OF MIDDLETON — T. 7 N. R. 8 E. — DANE COUNTY



LEGEND

UPLAND FOREST NUMERALS 1-2 | LOWLAND FOREST ALL NUMERALS 3 | NON-TILLABLE A-PP-CPP-SP-El-A4-C4-E4-A | INFERIOR FOREST POORLY STOCKED WOODLAND B1-C1-D5-D5 | OPEN SWAMP ALL NUMERALS 3-4 | TILLABLE LAND C-CS-P | ALL SWAMP LAND NUMERALS 3-4

FOREST PLANTING RECOMMENDED

LAND COVER

- COVER BOUNDARY
- A ABANDONED
- A1 UPLAND HARDWOODS
- A2 HEMLOCK WITH HARDWOOD
- A3 SWAMP HARDWOODS
- A4 TAGALDER, WILLOW, DOGWOOD ETC.
- B BIRCH
- B1 HARDWOOD WITH CONIFERS
- B1' INFERIOR B1
- B2 WHITE PINE
- B3 WHITE CEDAR
- B4 CAT TAIL MARSH
- C CLEARED CROP LAND
- C1 POPPLE WITH WHITE BIRCH
- C1' INFERIOR C1
- C2 NORWAY PINE
- C3 TAMARACK
- C4 GRASS MARSH
- C4' SEDGE MARSH
- CS CULTIVATED STUMP LAND
- CPP POOR LAND PREVIOUSLY CROPPED
- D SCRUB OAK
- D1 OAK-HICKORY
- D2 JACK PINE
- D3 BLACK SPRUCE
- D3 BALSAM
- D4 LEATHER LEAF
- D5 RECENT BURN
- D5 DEAD TIMBER
- E1 PIN CHERRY
- E4 WEEDY PEAT
- F4 CRANBERRY MARSH
- FP FOREST PLANTATION
- O OPEN
- P PASTURE
- PP PERMANENT PASTURE
- RC RED CEDAR
- SP STUMP PASTURE
- TG TRUCK GARDEN

ROADS

14 FEDERAL HIGHWAY — 7 STATE HIGHWAY — A COUNTY HIGHWAY

- HARD SURFACED ROAD
- IMPROVED GRAVEL ROAD
- UNIMPROVED GRAVEL ROAD
- IMPROVED DIRT ROAD
- UNIMPROVED DIRT ROAD
- TRAIL
- DRIVABLE FIRE LANE
- NON-DRIVABLE FIRE LANE
- TELEPHONE LINE
- POWER LINE
- RAILROAD
- ABANDONED RAILROAD

IMPROVEMENTS

- OCCUPIED HOUSE
- VACANT HOUSE
- SUMMER HOME
- OCCUPIED SCHOOL
- VACANT SCHOOL
- CHURCH
- TOWN HALL
- CHEESE FACTORY
- CREAMERY
- FILLING STATION OR GARAGE
- STORE
- TAVERN
- HOTEL
- SAW MILL
- GRIST MILL
- FARM BLDG LESS THAN 100 FT FROM CENTER OF ROAD
- LOGGING CAMP

INDICATES NO. OF HOUSES IN A GROUP

50 INDICATES THE NUMBER OF FEET BUILDING IS LOCATED FROM CENTER OF ROAD

MISCELLANEOUS SYMBOLS

- QUARRY
- GRAVEL PIT
- SPRING
- FUR FARM
- DRAINAGE DITCH
- CEMETERY
- NURSERY
- EROSION
- FIRE TOWER
- INTERMITTENT STREAM
- GC GOLF COURSE
- BD BEAVER DAM
- PD PUBLIC DUMP
- Y ORCHARD
- CIVIL TOWN BOUNDARY

WOODED AREAS

DENSITY OF STAND

IS INDICATED BY THE LINE OR LINES BELOW THE DIAMETER

- D1 8-12 ONE LINE = GOOD STAND
- D1 8-12 TWO LINES = MEDIUM STAND
- D1 8-12 THREE LINES = POOR STAND
- D1 8-12 FOUR LINES = SCATTERED

DIAMETER CLASSES

NUMERALS 0-3, 3-6 ETC. PLACED AFTER A TIMBER SYMBOL (D1 8-12) INDICATES IN INCHES THE AVERAGE DIAMETER OF THE TREES BREAST HIGH (4½ FT.) WITHIN A GIVEN COVER AREA

ONE MILE

WISCONSIN STATE PLANNING BOARD — W.P.A. COOPERATING

WISCONSIN LAND ECONOMIC INVENTORY DIVISION — 411 W. WING - STATE CAPITOL — MADISON WISCONSIN

1937 Dane Co. Aerial Photo

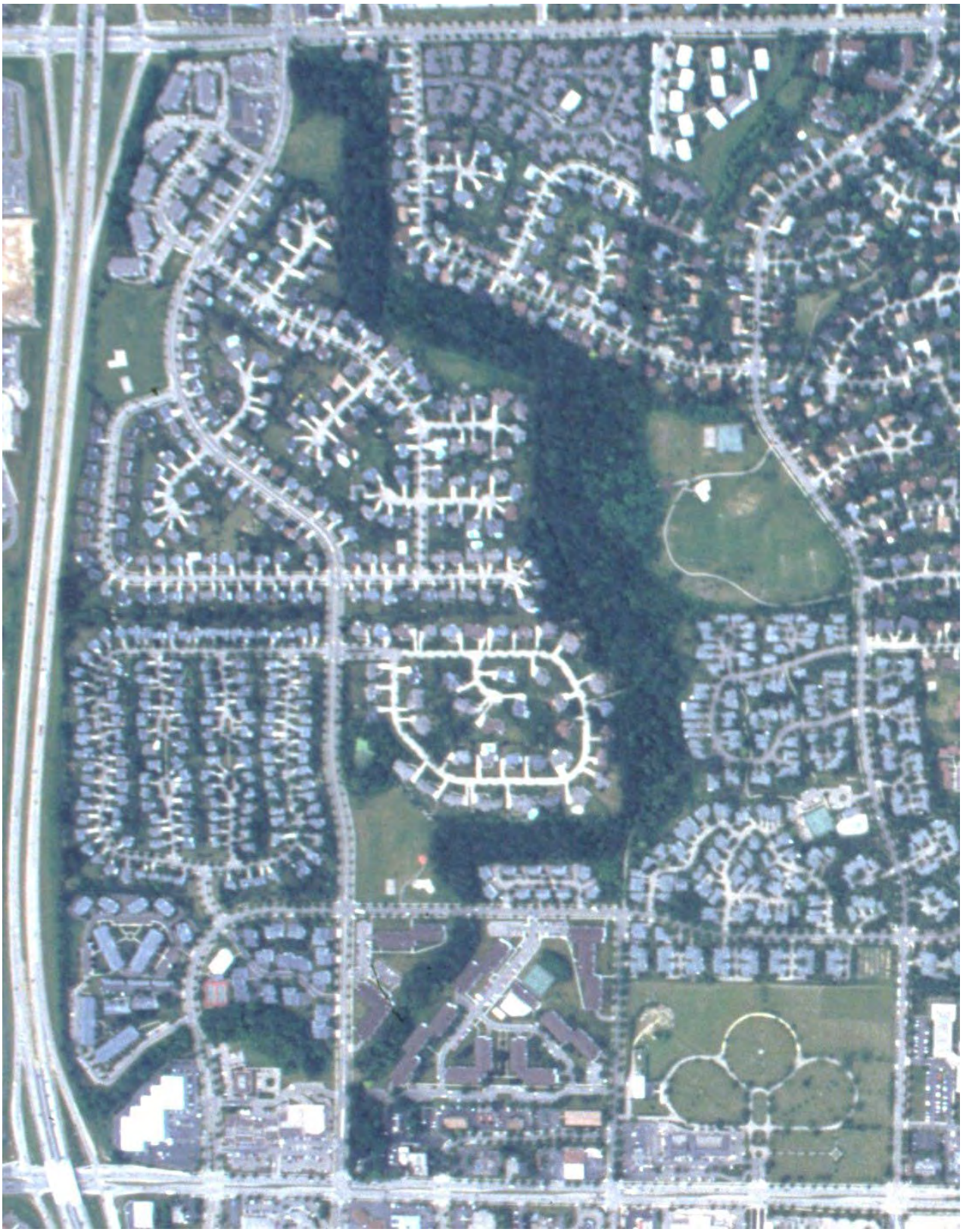
1979 FSA Slide

1985 FSA Slide

1988 FSA Slide

1998 FSA Slide

2001 FSA Slide



Heartland
ECOLOGICAL GROUP INC

Appendix: 2004-07-15
NAIP Aerial Imagery

Sauk Creek Greenway
Project #20241227
T7N, R8E, S25
C Madison, Dane Co

2004 NAIP
USDA
LRR: NCNE

Figure Created: 3/26/2024

Study Area (34.54 ac)

0 300 Ft

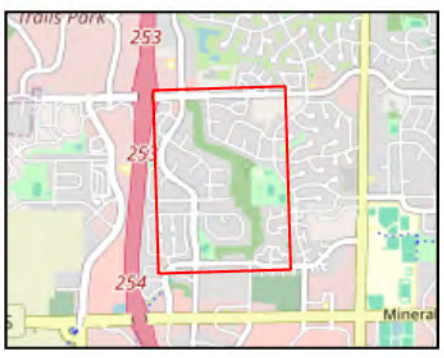
Heartland
ECOLOGICAL GROUP INC

Appendix: 2015-10-11
NAIP Aerial Imagery

Sauk Creek Greenway
Project #20241227
T7N, R8E, S25
C Madison, Dane Co

2015 NAIP
USDA
LRR: NCNE

Figure Created: 3/26/2024



Study Area (34.54 ac)

0 300 Ft

Heartland
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Appendix: 2022-06-26
NAIP Aerial Imagery

Sauk Creek Greenway
Project #20241227
T7N, R8E, S25
C Madison, Dane Co

2022 NAIP
USDA
LRR: NCNE

Figure Created: 3/26/2024

Appendix C | Photographs

Photo #1 Photo point 1, view north along Sauk Creek at southern extent of Study Area

Photo #2 Photo point 2, view south in Area 1 with eroded channels and buckthorn-dominated shrub layer

Photo #3 Photo point 2, view northeast along Sauk Creek in Area 1

Photo #4 Photo point 3, view east in Area 1 with multiple eroded channels along wooded slope

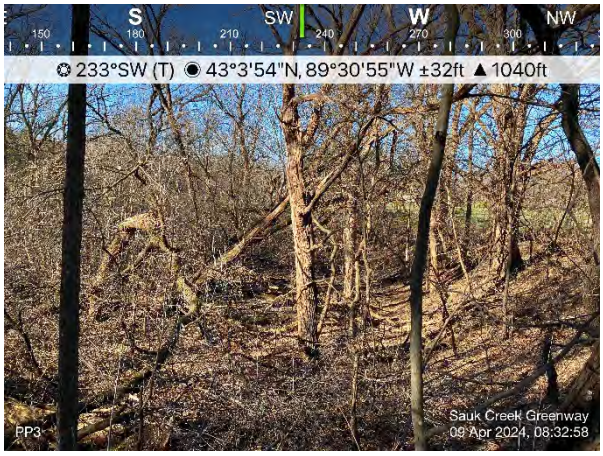

Photo #5 Photo point 3, view southwest in Area 1 of dead and downed trees

Photo #6 Photo point 4, view northwest from eroded bank of Sauk Creek toward Area 1

Photo #7 Photo point 4, view east along Sauk Creek with eroded banks and downed woody material

Photo #8 Photo point 5, view west in Area 2 of red oak and black cherry canopy with buckthorn in shrub layer

Photo #9 Photo point 3, view east of Area 2 with dead/downed trees

Photo #10 Photo point 6, view south towards planted red and white pine in Area 3

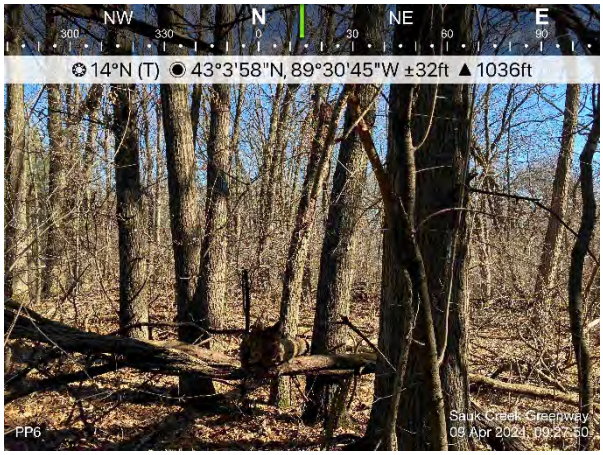

Photo #11 Photo point 6, view north towards Area 9 dominated by red oak

Photo #12 Photo point 7, view south along paved access path into greenway with Area 4 to the west (right)

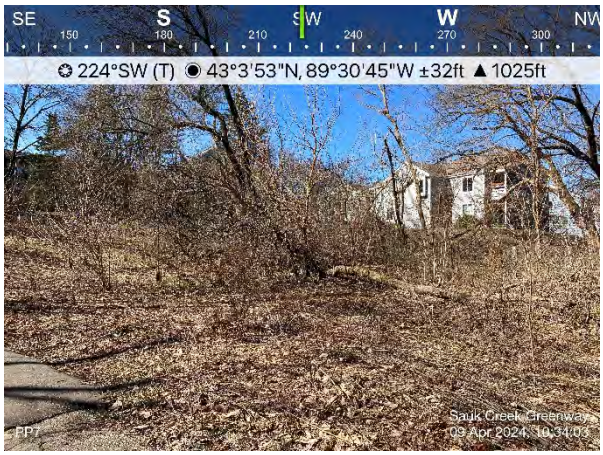

Photo #13 Photo point 7, view southwest toward Area 4 dominated by disturbance-tolerant species

Photo #14 Photo point 7, view northeast of Area 5 dominated by box elder and mowed lawn in greenway

Photo #15 Photo point 8, view east in disturbed Area 4 community and eroded banks of Sauk Creek

Photo #16 Photo point 9, view south in Area 1 of large bur oak and degraded understory

Photo #17 Photo point 10, view north in Area 8 oak-hickory forest dominated by invasive black locust in canopy

Photo #18 Photo point 11, view north in Area 6 dominated by oaks with degraded understory

Photo #19 Photo point 11, view south of degraded woodland and Sauk Creek

Photo #20 Photo point 12, view south in Area 5 dominated by cottonwood with sediment on ground surface

Photo #21 Photo point 12, view east in Area 5 of degraded understory and channel erosion

Photo #22 Photo point 13, view south in Area 9 dominated by red oak with buckthorn understory

Photo #23 Photo point 14, view northwest in Area 6 with oak canopy and dead/downed woody material

Photo #24 Photo point 14, view west in Area 6 with buckthorn removal

Photo #25 Photo point 15, view northwest in Area 6 and across Sauk Creek

Photo #26 Photo point 15, view northeast in Area 6 and across Sauk Creek

Photo #27 Photo point 16, view west of oak-hickory forest in Area 10

Photo #28 Photo point 17, view northwest of Area 11 mesic forest dominated by black walnut, hackberry, and elm

Photo #29 Photo point 18, view west facing the south pond (left) and sanitary access path (right)

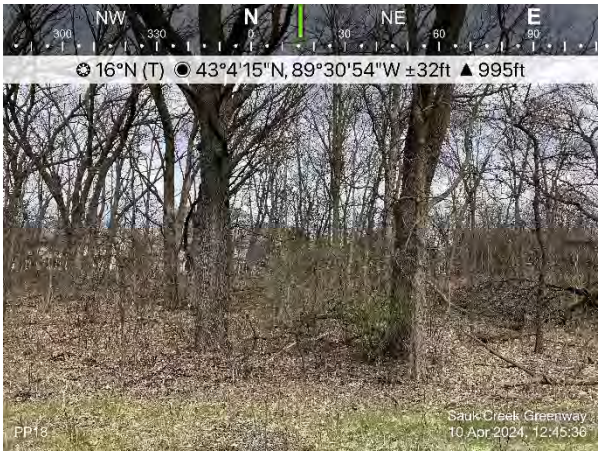

Photo #30 Photo point 18, view north towards Area 6 from the south pond

Photo #31 Photo point 19, view south in Area 12 with recent flooding along Sauk Creek and thick sediment on ground

Photo #32 Photo point 20, view south in Area 12 of secondary channel and sediment around oak trees

Photo #33 Photo point 20, view west in Area 12 of sediment on ground surface

Photo #34 Photo point 20, view north in Area 12 of secondary channel and poor tree health

Photo #35 Photo point 21, view northwest in Area 12 with disturbed ground surface

Photo #36 Photo point 21, view south in Area 12 with soil erosion and tree mortality

Photo #37 Photo point 22, view north along Area 14 oak savanna restoration

Photo #38 Photo point 22, view northeast of Area 14 with Area 15 degraded oak woodland in background

Appendix D | Table 1. Sauk Creek Greenway Woodland Area Summary

Table 1. Sauk Creek Greenway Woodland Area Summary

Area[1]	General Description	Dominant Vegetation by Stratum[2]	Threats	Anticpated Trajectory with No Action
Area 1	Degraded oak woodland/oak-hickory forest. Large bur oaks and shagbark hickory dominant. Canopy appears stressed and the understory is low quality. Dense oak leaf litter.	Canopy: bur oak (crowded), shagbark hickory, box elder, black cherry (generally poor health) Shrub: box elder, common buckthorn Herb: dame's rocket, creeping charlie, garlic mustard, stinging nettle	Multiple eroded channels have formed along upper slopes of greenway down to Sauk Creek. There is minimal vegetation to hold and protect the soils. Lots of downed and dead woody material along slopes and within channel. Yard waste dumping in north, runoff from parking lot entering woods from south.	Bur oaks and hickory will continue to decline in health over time and the canopy will likely be replaced by box elder. Fallen trees will continue to contribute to erosion, shading of the understory, and channel back-ups. Box elder and common buckthorn will continue to spread and shade out the understory. Slope erosion and sedimentation into the channel will worsen.
Area 2	Degraded southern dry-mesic forest. Contains more dry-mesic and mesic canopy trees than Area 1 and with oak species besides bur oak. Some healthy canopy trees remain but understory is degraded.	Canopy: bur oak, shagbark hickory, box elder, black cherry (several large), few red oak Shrub: box elder, common buckthorn (>50% cover), gooseberry Herb: dame's rocket, garlic mustard, periwinkle, reed canary grass near sanitary access path	Dense invasive shrub layer. Degraded understory with horticultural escapes present. Lots of dead/downed woody material.	Oak and hickory will decline in the canopy and be replaced by black cherry and box elder. Common buckthorn and invasive herbs will continue to spread.
Area 3	Pine plantation of red and white pine. Red pine is generally in poor health - many have died and fallen over and have self-pruned below 50 feet.	Canopy: planted red and white pine, few small black cherry, box elder Shrub: box elder, common buckthorn, few chokecherry Herb: sparse to no understory, few garlic mustard	Undesirable species dominate understory. Sparse herb layer provides minimal soil stabilization.	Red pine are in poor health and will continue to die and fall over. Evergreen screening for adjacent properties will continue to decline as trees self prune. Box elder and common buckthorn will spread into gaps from dead pines. Erosion may occur in the herb layer due to sparse ground cover.
Area 4	Low quality shrubby woodland that is not representative of a natural community. Random assortment of trees (some likely planted), invading tree saplings and shrubs, and disturbed herb layer that is impacted by adjacent residences. Planted saplings near paved access include 2 oaks, 2 hackberry, 1 maple.	Canopy: scattered box elder, swamp white oak (2), spruce, white pine, mulberry Shrub: box elder, common buckthorn, mulberry, elderberry, gooseberry, invasive bush honeysuckle Herb: dame's rocket, garlic mustard, day-lily, reed canary grass (dense in low-lying area in central portion), mullein, stinging nettle, burdock (dense patches)	Largely dominanted by undesirable and invasive species. Receives sediment-laden runoff from parking lot to south and eroded channels are present. Mowing, parking lot dumpsters, lawn encroachment into area. Yard waste dumping.	Yard waste, runoff, and encroachments may continue to degrade area and contribute to erosion and channel impacts. Area will continue to be dominated by undesireable species that could spread to other parts of the greenway.

Table 1. Sauk Creek Greenway Woodland Area Summary

Area[1]	General Description	Dominant Vegetation by Stratum[2]	Threats	Anticpated Trajectory with No Action
Area 5	Degraded lowland hardwood/floodplain forest associated with channel. Large cottonwood trees and box elder dominate canopy with dead/dying green ash. Eroded channels and sedimentation from flooding.	Canopy: cottonwood (large), box elder, green ash (dead/dying) Shrub: box elder, common buckthorn, gooseberry, few invasive bush honeysuckle Herb: dame's rocket, garlic mustard, squill, few day-lily patches	Understory degraded and primarily dominated by invasive species. Mowed lawn, daffodils, and day-lilies encroaching into greenway along eastern perimeter. Multiple eroded channels, some with previous repairs of rip rap and concrete that have failed. Areas of sediment on the soil surface from flooding events will inhibit understory health. Dead trees.	Erosion will continue to cut channels down the slopes to Sauk Creek and contribute additional sediment loading to the creek, additional trees may fall due to soil instability. Flooding may continue, resulting in more sediment deposition on the soil surface. Dead/dying ash trees will fall, gaps likely to be filled by box elder and common buckthorn. Lawn encroachments will continue to spread horticultural plants into greenway.
Area 6	Degraded southern dry-mesic forest. Canopy comprised of various large oaks (white, bur, red) with shagbark hickory, black cherry, and hackberry. Mesic tree species are becoming more common and the understory is degraded. Some areas may have historically been oak woodland before canopy closure. Some buckthorn clearing occuring.	Canopy: bur oak, red oak, white oak, shagbark hickory, box elder, black cherry, black walnut (few), elm (scattered and more prominent along channel), area of silver maple growing into white oak canopy Shrub: box elder, common buckthorn, gooseberry, invasive bush honeysuckle, pagoda dogwood (generally poor health), few elderberry, few grey dogwood, few chokecherry Herb: dame's rocket, garlic mustard (common), white avens, violets, large patch of periwinkle, squill patch, patch of bloodroot, Virginia bluebell patches	Numerous dead and downed small trees and shrubs littering ground as well as brush piles from shrub clearing. Horticultural ground cover encroachment, yard waste dumping. Large oaks are becoming crowded and are not regenerating - mesic species are filling in. Invasive shrubs and herbs threaten the native herbs that are present. Sedimentation at base of oak trees north of Area 5. Numerous foot paths through area contribute to erosion, compaction, and potential invasive species spread.	Bur oak, white oak, and hickory will decline over time and will be replaced by more mesic and/or less desirable species. Invasive shrubs and herbs will outcompete native understory species. Encroachment may continue.
Area 7	Low quality woodland with few desirable canopy trees and a degraded understory.	Canopy: box elder, mulberry, few black walnut, few large cottonwood Shrub: box elder, common buckthorn (landowner to east appears to be cutting) Herb: dame's rocket, garlic mustard, horticultural ground covers, violets	Area largely lacking desirable vegetation and with poor ecological function. Ground surface appears to have been disturbed, soil health appears poor, horticultural ground covers are spreading, and there is sedimentation at the soil surface in some areas.	Invasive/undesirable species likely to spread. Sediment may impact tree health.
Area 8	Southern dry-mesic/oak-hickory forest invaded by mature black locust. Black locust dominated canopy with bur oak, white oak, and shagbark hickory.	Canopy: black locust (dominant) and box elder with scattered bur oak, white oak, shagbark hickory, and black cherry Shrub: common buckthorn (dominant), gooseberry, invasive bush honeysuckle (scattered), few chokecherry Herb: bedstraw, garlic mustard (common), white avens	Invasive species in tree, shrub, and herb layer threaten ecological health.	Oak and hickory will decline in the canopy and be replaced by box elder and more mesic trending species. Common buckthorn and invasive herbs will continue to spread and outcompete native species.

Table 1. Sauk Creek Greenway Woodland Area Summary

Area[1]	General Description	Dominant Vegetation by Stratum[2]	Threats	Anticpated Trajectory with No Action
Area 9	Southern dry-mesic forest dominated by red oak with other large oaks and black cherry common. Shrub layer degraded and herb layer sparse with dense oak leaf litter.	Canopy: red oak (dominant and generally healthy), black cherry, white oak, bur oak (scattered), black walnut (northern portion), few black locust Shrub: common buckthorn, box elder, invasive bush honeysuckle Herb: sparse, periwinkle patch	Invasive/undesireable shrubs and saplings limit regeneration of oak.	Bur and white oak will be replaced by less desirable species over time. Box elder and invasive shrubs will continue to spread.
Area 10	Oak-hickory forest dominated by red oak, white oak, black cherry, shagbark hickory, box elder (scattered). Dense oak leaf litter. Less invasive herbs, soil erosion, and soil disturbance than other areas.	Canopy: red oak, black cherry (large), white oak, bur oak (scattered), shagbark hickory, hackberry Shrub: common buckthorn (dominant), pagoda dogwood, invasive bush honeysuckle (scattered), gooseberry Herb: dame's rocket, garlic mustard, wild ramp patch	Invasive shrubs and herbs threaten health of native species.	Without fire and/or invasive shrub removal, invasive species will spread in the shrub and herb layer and oaks may be replaced by more mesic or less desirable trees.
Area 11	Mesic forest dominated by elm, hackberry, box elder, and black walnut. Areas of residential encroachment and spread of horticultural plants.	Canopy: black walnut (dominant in northwest portion), elm, hackberry, bur oak (scattered near channel), few shagbark hickory, box elder Shrub: common buckthorn, invasive bush honeysuckle (few), gooseberry, few elderberry Herb: dame's rocket, violets, garlic mustard (scattered), few bloodroot, few native Virginia bluebells, Virginia bluebell cultivar, day-lily, squill, Kentucky bluegrass/turf grass (common in northern portion)	Extensive encroachment including flower gardening and raking deep into greenway; yard waste dumping; bulb plants, horticultural groundcovers, and turf prevalent. Horticultural escapes threaten native species that are still present. Invasive shrubs.	Horticultural species will continue to spread and degrade understory, yard waste dumping will inhibit plant growth, invasive shrubs will spread. Bur oak and hickory will be replaced by mesic species.
Area 12	Bur oak dominated woodland in significant decline from channel flooding and sediment deposition over ground surface. Secondary drainageway has formed in area of delineated wetland with no vegetation.	Canopy: bur oak (high mortality, poor health), elm, box elder, black walnut (few) Shrub: common buckthorn, red osier dogwood, few invasive bush honeysuckle, gooseberry, elderberry, pagoda dogwood Herb: reed canary grass (dense patches near sanitary access path), areas of turf grass, few dame's rocket, violets, Virginia bluebells	Sauk Creek appears to back-up and flood this area. Sediment build-up along the ground surface including several inches around the bases of trees. Secondary drainageways and eroded channels have formed that are removing soil and structure for vegetation to grow. Herb layer has largely been removed apart from dense invasive reed canary grass in the northern portion. Trees and shrubs generally in decline. Maintained lawn encroachment along eastern portion.	The existing issues (flooding, erosion, sedimentation) will continue to worsen if the channel is not repaired to handle flow events. Even if flooding stops, the area is likely not salvagable and most trees and shrubs are anticipated to die from existing sedimentation and erosion.

Table 1. Sauk Creek Greenway Woodland Area Summary

Area[1]	General Description	Dominant Vegetation by Stratum[2]	Threats	Anticpated Trajectory with No Action
Area 13	Degraded oak woodland with bur oak being replaced by more mesic species including box elder, black walnut, and elm. Northern portion near Old Sauk Road with less desirable tree composition. Relatively low invasive shrub cover, dead and downed trees common.	Canopy: bur oak, elm, box elder, few black locust. Northern boundary dominated by box elder with dead green ash, white pine, and river birch. Shrub: gooseberry, box elder, mulberry, grey dogwood patch along sidewalk Herb: scattered dame's rocket, motherwort	Bur oak is being replaced by less desirable mesic trees. Invasive species presence.	Bur oak will be replaced by less desirable species over time. Box elder and invasive species will continue to spread.
Area 14	Oak savanna/prairie restoration. Small area along North High Point Road with bur oaks that have been opened up and a dense herb layer that may contain prairie vegetation (survey conducted before most herbs could be identified).	Canopy: bur oak (large, canopies still crowded), one shagbark hickory, few swamp white oak, one black walnut Shrub: scattered small shrubs including bur oak saplings Herb: too early to identify most veg, reed canary grass scattered	Bur oaks are still crowded and would benefit from further canopy thinning and invasive shrub removal to the east.	Without fire or continued management, shrubs and invasive herbs are likely to invade into the area. Bur oak will die over time and be replaced by less desirable species.
Area 15	Degraded oak woodland dominated by bur oak with wet-mesic areas near channel. Several young bur oak present. Shrub and herb layers consist of a mix of native and non-native species. Area of soil disturbance/eroded channels north of northern pond.	Canopy: bur oak (with some recruitment), box elder, area of silver maple and elm along Sauk Creek, black walnut (large, scattered), black cherry (few, small) Shrub: common buckthorn (common), elderberry, box elder, gooseberry, red osier dogwood (few), pagoda dogwood (few) Herb: reed canary grass at south end, white avens, Virginia bluebells (few), dame's rocket (common), burdock (few), mayapple	Erosion within and scouring of side channels north of northern pond could worsen. Invasive shrubs and herbs threaten to replace native understory species. Invasive herbaceous species are common along the retention pond perimeter (wild parsnip, crown vetch, reed canary grass) that could spread into woodland.	Bur oak will be replaced by less desirable species over time, young bur oak may not survive to maturity if too crowded. Box elder and invasive species will continue to spread and may outcompete existing native species.

[1] Woodland Areas are depicted on Figure 5 (Appendix A).

[2] The field assessment was conducted near the beginning of the growing season and identification of herbaceous vegetation was limited to early emerging species.