City of Shorewood Audit

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Executive Summary

The City of Shorewood passed a resolution in 2014 to become the first City in Minnesota to become a Bee Safe City.

In spring of 2022, the City of Shorewood asked the IPM Institute of North America and its Midwest Grows Green (MGG) sustainable landscaping initiative to audit their current landscape maintenance practices, assess if they comply to the 2014 Bee City resolution and make recommendations to help the city comply and exceed the resolution.

In Phase I of this project, MGG audited all pesticide, fertilizer and cultural practices applied on their six parks of Badger, Cathcart, Freeman, Manor, Silverwood, Southshore Community and Gideon Glen. MGG categorized these fields by use, functionality and community expectations: Class A fields, highest priority, included Freeman and Badger parks, Class B fields, moderate priority, included Manor and Cathcart parks and Class C fields, lowest priority, included Silverwood, Southshore Community and Gideon Glen parks.

MGG selected a park in each Class to further track, assess and recommend alterations for management. The three parks were the Class A Freeman Park, Class B Manor Park and Class C Silverwood Park. The Summary and Review section details all cultural practices as well as weed and pest control applied on each of the three parks between 2019 and 2021. The Summary and Review section, also, states the six Shorewood pollinator resolution clauses and details if the city's landscape management practices align with these clauses.

Of most concern, Shorewood informed MGG that it applies Armor Tech's Threesome herbicide on all parks at or near the same time annually. This systemic herbicide violates the city's pollinator resolution. Also, based on MGG product safety criteria detailed in the Pest and Weed Control methodology on page 5 of this report, MGG tiered this herbicide product in the RED class or products that the natural lawn care approach restricts or avoids the most.

To reduce the amount of class RED products used, MGG recommends that Shorewood establishes tolerance thresholds for weeds, increases cultural practices of aeration, mowing and overseeding when able, chooses reduced-risk or organic herbicides and designates more bee-safe zones. This audit's appendices include records and templates to help the City of Shorewood implement MGG's recommendations.

This report includes five sections: (1) Introduction to Shorewood's Pollinator Resolution, (2) Definitions, (3) The Audit Methodology, (4) Summary and Review of the City of Shorewood Practices and (5) Recommendations.

Introduction to Shorewood's Pollinator Resolution

In 2014, Shorewood passed a resolution endorsing "Bee-Safe" policies and procedures throughout the city.

The resolution included the following clauses:

1. The City shall undertake its best efforts to become a Bee-Safe City by undertaking best management practices in the use of plantings and pesticides in all public places within the City.
2. The City shall refrain from the use of systemic pesticides on Shorewood City property including pesticides from the neonicotinoid family.
3. The City shall undertake its best efforts to plant flowers favorable to bees and other pollinators in the City's public spaces.
4. The City shall designate Bee-Safe areas in which future City planting are free from systemic pesticides including neonicotinoids.
5. The City shall undertake best efforts to communicate to Shorewood residents the importance of creating and maintaining a pollinator-friendly habitat.
6. The City shall publish a Bee-Safe City Progress report on an annual basis.

The "Audit Methodology" and "Summary and Review" sections will evaluate Shorewood's progress towards achieving this resolution based on the practices and product application records Shorewood staff provided MGG.

Definitions

"Pests" means any unwanted insects, plants, fungus (molds) and rodents.

"Pesticide" means any substance or mixture of substances designed or intended for use to prevent, destroy, repel or mitigate pests, or to be used as a plant growth regulator. Pesticides include, but are not limited to, insecticides, herbicides, fungicides and rodenticides, and certain pest-specific compounds of biological origin aimed at disrupting the life-cycle of the pest.

"Systemic" means any pesticide product absorbed by and transported through plants.

"Broadcast" means the application of pesticides to broad expanses of surfaces. An example includes application of pesticides to lawns.

"Biological Controls" means the use of a pest's natural predators or parasites to eliminate or reduce its population.

"Cultural Controls/Practices" means the management of pests and weeds by altering the environment's natural characteristics to favor desirable vegetation development over its competitors; examples include improving soil health, altering soil pH, increasing mowing height and aerating.

"Natural Controls" means the use of any method that does not employ synthetic substances as a way to eliminate or reduce pest populations and which may draw upon elements common to the environment. Examples include companion planting and attracting beneficial insects to reduce pest problems in gardens.

"Mechanical/Physical Controls" means the use of controls that physically inhibit pests' ability to inhabit an area by modifying their environment. Examples of physical controls include using traps and barriers, influencing temperatures, controlled burning or hand-pulling of weeds.

Audit Methodology

MGG used the following procedures to complete the "Summary and Review" section for Shorewood practices.

Field Prioritization

At the start of the landscaping audit, MGG asked the City of Shorewood to tier their fields into one of three following categories:

Class A Fields- Highly used sporting fields or destination parks.

Class B Fields- Moderately trafficked sporting fields or parks.

Class C Fields- General use, low traffic parks or natural areas.

After the City tiered their parks, MGG requested product and cultural practice records for a park in each class. Shorewood staff shared data for Freeman Park (Class A), Manor Park (Class B Field) and Silverwood Park (Class C) and management of non-turf areas. This audit summarizes these management practices and offers recommendations for each of the four types of landscapes.

All MGG recommendations will be made based on a park's or area's prioritization or class. To learn more about MGG's park prioritization process, please visit **bit.ly/MGGprioritization**.

Establishing Tolerance Thresholds

MGG defines tolerance thresholds as the maximum pest or weed pressure that a location, community or crop can tolerate before control. The City of Shorewood reported using informal tolerance thresholds that MGG describes in the Summary and Review section.

Cultural Management and Fertilization

Shorewood provided MGG with a list of cultural practices applied on each field from 2019 to 2021 (see the list in Appendix A). This list recorded the location and date of each aeration and irrigation. Staff informed MGG about their mowing frequency and height. None of the parks received fertilizer applications.

Weed and Pest Control

MGG obtained EPA Labels and Material Safety Data Sheets (MSDS) for the herbicides applied on all parks between 2019-2021. MSDS include information regarding active ingredient and recommended application rate. MGG recorded information for three criteria summarized in the "Shorewood Pesticide Product and Safety Summary" spreadsheet in Appendix B:

- The signal word (DANGER, WARNING & CAUTION) that indicates acute toxicity of a product.
    - MGG recommends avoiding products with signal words of DANGER or WARNING that indicate high to moderate toxicity respectively.
- The soil half-life of the product.
    - MGG recommends products with a half-life below 31 days.
- If research from the EPA, IARC or California Proposition 65 has listed a product as a possible, probable, known or likely carcinogen, reproductive toxicant, endocrine disruptor or nervous system toxicant.
    - MGG recommends avoiding any product linked to these effects.

In the spreadsheet, MGG assigned a RED, YELLOW or GREEN highlight to each product based on the following:

- RED-The signal word is DANGER, or the product's characteristics violates two or more of MGG recommendations from above
- YELLOW-The product violates one of MGG recommendations from above
- GREEN-The product does not violate any of MGG's recommendations.

Summary and Review of the City of Shorewood Lawn Care Practices

Tolerance Thresholds at Parks

The City of Shorewood reported informal weed and pest tolerance thresholds for all fields. MGG assumed these informal tolerance thresholds are low due the City's scheduled applications of broadleaf herbicides. This audit made recommendations based on that assumption.

Cultural Management Practices and Fertilization

Cultural and Fertilization Practices on Class A Turfgrass Fields- The list in Appendix A recorded the following practices used at our example Class A fields of Freeman Park from 2019-2021.

Freeman Park did not receive any fertilization treatments.

The City has not aerated, overseeded or irrigated the park in several years.

Finally, the City mows Freeman Park once per week at a height of 3 inches.

Cultural and Fertilization Practices on Class B Turfgrass Fields- Manor Park received the same management practices as the Class A Freeman Park.

Cultural and Fertilization Practices on Class C Turfgrass Fields- Silverwood Park, Shorewood's example Class C field, received the same management practices as the Class A Freeman Park and the Class B Manor Park.

Weed and Pest Control

Weed and Grub Control on all turfgrass fields- The City of Shorewood uses mowing and herbicide to control weeds on Class A, Class B and Class C fields. The herbicide used, Armor Tech's Threesome Herbicide, is a selective synthetic that controls label-listed annual, biennial and perennial weeds. Active ingredients include 30.56% 2,4-D, 2.77% Dicamba and 8.17% MCPP. The label has the signal word DANGER, meaning the product has high acute toxicity. MGG assumed the city applied the product at the recommended rate of 3.0 to 4.0 pints per acre.

This product is a RED class herbicide due to the US EPA and EU listing the product's active ingredients as possible carcinogens, reproductive toxins, endocrine disruptors and nervous system disruptors.

There were not any recorded practices to control grubs on any of the fields.

Weed and Grub Control on Class A Turfgrass Fields- Freeman Park received Threesome herbicide applications on October 2nd, 2019 and October 20th, 2020 and July 27th, 2021.

Weed and Grub Control on Class B Turfgrass Fields- Manor Park received the same management practices as the Class A Freeman Park.

Weed and Grub Control on Class C Turfgrass Fields- Silverwood Park received the same management practices as the Class A Freeman Park and the Class B Manor Park.

Weed and Grub Control on Non-Turf areas- The City of Shorewood applies a copper sulfate product to the pond at Manor Park for algae treatment. In addition, 30 ash trees were injected every year with Arborjet's TREE-age® R10 Insecticide to control for emerald ash borer. Ingredients include 4% of the active ingredient Emamectin Benzoate and 25 – 50% of the inert ingredient Tetrahydrofurfuryl alcohol (THFA). The label has a signal word of WARNING meaning the product has moderate acute toxicity to humans.

This product is a RED class herbicide due to the Warning label, average half-life exceeding 31 days and the MSDS stating that the product is suspected of damaging the unborn child and fertility. The MSDS, also, mentions this product's toxicity to bees and groundwater.

Progress Towards Pollinator Resolution Clauses

Clause #1- Planting and Pesticide Best Management Practices taken by Shorewood in Public Places- The City of Shorewood did not report cultural, mechanical and biological control measures taken on turfgrass fields for weeds and pests outside of mowing. In natural areas, the City of Shorewood rented goats to remove buckthorn at Freeman Park in 2018 and 2019. MGG, also, found that the City purchased a Weed Wrench to manually remove buckthorn. Shorewood maintains the Gideon Glen prairie with prescribed burns every couple of years.

Clause #2- Avoidance of systemic pesticide applications on Shorewood City Property- The pesticide product Shorewood uses for broadleaf weed control (Armor Tech Threesome) is systemic. Arborjet's TREE-age R10 is, also, systemic.

Clause #3- Planting of flowers favorable to bees and other pollinators on Shorewood City Property- The City of Shorewood reported the following bee-safe and native plantings locations:

1. Manor Park: Native plant buffers established around the Manor Park pond.
2. Freeman Park: Rain garden installed and maintained to capture rain water from Eddy Station.
3. Cathcart Park: Planted a clover patch in 2014, but returned to turfgrass now.
4. Badger Park: Rain garden installed and maintained to capture and infiltrate water prior to run-off entering a treatment pond.

5. Smithtown Ponds: Planned transformation to collect, control and treat stormwater to before it runs-off into Lake Minnetonka. Undergoing construction now.
6. Gideon Glen: Shorewood restored the prairie and drainage pond with native plantings and buffers.
7. Minnetonka Country Club: Open space areas from the former country club were redeveloped in 2016 and include walking trails, stormwater ponds and wetlands.

Clause #4- Designation of Bee-Safe areas free from systemic pesticides- The City of Shorewood did not report designating Bee-Safe areas.

Clause #5- Communication of importance of creating and maintaining a pollinator-friendly habitat- MGG staff needed to ask Shorewood staff for the webpage that includes the Bee-City resolution. The webpage is not available on the City's Environment landing page. MGG staff needed to click on the "Yard and Tree Care" webpage link to access the resolution. Both the "Yard and Tree Care" and "Bee safe City" pages have minimal resources and information for native planting, sustainable landscaping, natural lawn care, etc.

Clause #6- The City shall publish a Bee-Safe City Progress Report- Shorewood informed MGG that they have not conducted an annual Bee-Safe City Progress Report, but plans to conduct an annual report each year following this report.

Recommendations

Establishing Tolerance Thresholds for Prioritized Parks

MGG recommends setting and raising formal tolerance thresholds for weeds and pests on the City of Shorewood's fields. Field visibility, traffic and community expectations should most factor into the prioritization and tolerance thresholds at each field. Without knowledge of the three aforementioned factors, MGG makes the following recommendations for classification of all seven Shorewood parks and their weed tolerance thresholds:

Class A Fields (Freeman and Badger Parks)- These fields will have a 15% or less tolerance for weeds.[1]

Class B Fields (Manor and Cathcart Parks)- These fields will have a 16-30% tolerance for weeds.[2]

Class C Fields (Silverwood, Southshore and Gideon Glen Parks)- The City of Shorewood will not control for weeds for the exception of invasive species.

[1] Assuming the average dandelion takes up .43 square feet. 15 percent or less would mean 3 dandelions or less per square yard or 35 dandelions or less for 100 square feet.
[2] Assuming the average dandelion takes up .43 square feet. 30 percent or less would mean 6 dandelions or less per square yard or 70 dandelions or less per 100 square feet.

Cultural Management Practices and Fertilization

Cultural and Fertilization Recommendations for Class A Turfgrass Fields- Freeman Park did not receive any fertilizations or cultural management of overseeding, aeration and irrigation. A deeply rooted, continuous grass system provides the best defense against weeds and pests (see bit.ly/MGGcultural). As opposed to annual herbicide applications, MGG recommends that Shorewood utilizes cultural management and fertilization to address the root cause of weed and pest pressure of poor soil quality, limited turfgrass root density and sparse turfgrass coverage. The following recommendations will improve Shorewood's soil and plant health.

To improve soil health, MGG highly recommends at least testing the soil on Class A fields. These soil tests should focus further than primary macronutrient content of N-P-K by factoring in pH, secondary macronutrients of calcium and magnesium and organic matter content.

Soil tests will identify malnourished turfgrass, which are more susceptible to pest and disease infestations.

The MGG Lawn & Land Forum Toolkit at LawnandLand.org identifies a couple of case studies that will help the City of Shorewood improve their soil testing programs. The first case study covers MGG's work with the organic-based fertilizer company EarthWorks to help the City of Grand Rapids implement four organic parks (see the study at **bit.ly/GRtesting**). This project started by conducting soil tests at all fields using the provider Logan Labs.

The second case study interviews Wilmette Park District's Kristi Solberg, formally from the Park Ridge Park District, and briefly looks at Solberg's soil testing practices (see **bit.ly/SolAeration**).

For Class A fields that cannot or do not receive a soil test, MGG recommends using organic fertilizer applications. Dense and established turfgrass stands should require two applications max per year, especially fescue dominant mixes.

MGG recommends scheduling fertilizer applications in late September or early October to set down deep roots for turfgrass. A slow-release, organic and nitrogen-based fertilizer in early fall should help the grass recover from hot, dry conditions of summer. If possible, a fall compost or biochar application best conditions the soil and can eliminate the need for spring or fall fertilization if incorporated properly.

LawnandLand.org's Soil Health webpage further details the importance of adding organic matter to sports and recreational fields and shares multiple case studies regarding our recommended fertility program (see **bit.ly/MGGsoilhealth**). The case studies include Carl Gorra's organic fertilization program for Naperville Park District (see **bit.ly/GorraFertility**), Dan Dinelli's composting program at the North Shore Country Club (see **bit.ly/DinelliComposting**) and Ron Malchiodi's application of biochar on Village of Riverside's fields (see **bit.ly/MalchiodiBiochar**).

The MGG recommended fertility program performs best in soft and porous soil that allows air, water and nutrients to travel in and out of the soil profile. The clay loam soil and high foot traffic at Freeman Park likely severely compacts soil at the sports fields. These fields currently receive no aeration. MGG highly recommends that the City of Shorewood aerate Class A parks in early fall between September 1st-30th. Fall aeration may provide the most critical step for natural lawn care implementation on high traffic parks by both reducing compaction and providing access points to the soil for fertilizer and seeding.

MGG recommends that both spring and fall aerations use a Ryan Renovaire tow behind with hollow-tines or similar equipment. Freeman Park likely receives enough traffic to warrant five or more aerations per year. MGG recommends that the City of Shorewood focus their aeration on the most trafficked parts of the sporting field (see **bit.ly/BMPtraffic**) and consider investing in slicing equipment to save costs and time. Learn about the different aeration equipment and their uses from Kristi Solberg at **bit.ly/SolAeration**. In her interview, Solberg notes that she prevents her fields from drying out during aeration by accommodating each cultivation with irrigation.

To inhibit weeds and grow a denser turfgrass stand, the City of Shorewood should increase its overseeding program to an application in late August or early September each year. Aerating fields one or two days before overseeding will ensure seed to soil contact. Kentucky bluegrass' growth pattern by rhizomes and ability to handle wear still offers the best option for high-traffic athletic fields. MGG recommends that the City of Shorewood visit the LawnandLand.org's table of high performing Kentucky bluegrass cultivars (see **bit.ly/MGGcultivars**). These tables pull data from the National Turfgrass Evaluation Program and found a couple of cultivars that could establish quickly and handle the high traffic.

The City of Shorewood's once per week mowing schedule for Class A fields aligns with MGG recommendations. Shorewood may need to increase mowing frequency to twice per week during the spring and fall to adhere to the 1/3 rule. Mowing should never take more than a 1/3 from the shoot per session. Cutting too much of the shoot can stress the grass plant leading to shallow roots, disease and other pressures. The City should evaluate the costs of their current mowing program and see if they would save on costs if they hired a private mowing contractor for just their Class A areas as Park Ridge Park District did in 2016 (see **bit.ly/SolMowing**).

Cultural and Fertilization Recommendations for Class B Turfgrass Fields- Preferably, the City of Shorewood should manage all Class B fields with similar cultural practices to MGG recommendations for Class A fields. However, MGG recognizes the City of Shorewood may face cost constraints and advises the following adjustments to Class B field management if unable to implement all of MGG's Class A field cultural practices recommendations.

First, if costs prevent the City of Shorewood from soil testing Manor Park, then the fields should follow a similar fertilization schedule to Freeman Park due to the parks likely receiving similar

traffic and community expectations. MGG recommends one or two organic fertilizations per year. Similar to Class A fields, prioritize fertilization in the fall. The second application, if necessary, should happen in late spring.

All Class B fields should perform well with one core aeration in the fall between September 1st to 30th. Overseed non-sporting Class B fields with a tall fescue dominant mix when necessary to fill bare patches in the early fall, preferably a day or two after the aeration. Overseed Manor Park with the same Kentucky bluegrass mix and schedule chosen for Class A parks.

Finally, the City of Shorewood should continue mowing their Class B fields once a week at heights no lower than three inches.

Cultural and Fertilization Recommendations for Class C Turfgrass Fields- MGG recommends limiting all fertilization and cultural practices at Class C turfgrass fields, which appears to be the current practice for Silverwood Park.

Class C fields such as Silverwood Park likely receive limited foot traffic and visibility and can maintain functionality with 0 to 1 fertilizations per year. If the City of Shorewood ever chooses to fertilize Class C areas, MGG recommends an organic fertilization in the fall if the fields have thin, patchy turfgrass stands.

Weed and Pest Control

Weed Recommendations for Class A Turfgrass Fields- MGG encourages the City of Shorewood to eliminate all scheduled pre-emergent broadcast applications of herbicides on Freeman Park and all other Class A areas. MGG's Class A turfgrass field cultural practices recommendations should help the City of Shorewood grow a dense, deeply-rooted turfgrass system to act as a pre-emergent inhibitor of weeds.

For post-emergent weed control, MGG recommends eliminating all RED class herbicides from the City of Shorewood's inventory.

The City of Shorewood should prioritize selecting GREEN class, reduced risk or organic broadleaf control alternatives such as Fiesta, Quicksilver, Tenacity, Lockup or Defendor. Learn more about these products from the Lawn & Land Forum Toolkit at **bit.ly/MGGbroadleaf**.

Weed Control Recommendations for Class B Turfgrass Fields- MGG suggests following the same protocols for "Weed Control for Class A Turfgrass Fields." MGG also recommends holding a weed tolerance threshold to 30 percent for Class B turfgrass fields.

Weed Control Recommendations for Class C Turfgrass Fields- The City of Shorewood should refrain from weed control on all Class C fields for the exception of managing an invasive weed or pest.

Recommendations to Adhere to the Bee City Pollinator Resolution- MGG developed a four-spoke Flywheel weed management plan to overcome soil, weather and human intervention conditions in many landscapes that favor invasive and undesirable vegetation growth and to grow landscapes that favor pollinators (see **bit.ly/FlywheelApproach**). The four spokes include (1) Investigation, Planning and Prevention, (2) Plant and Seed Selection, (3) Alternative Weed Control Products and Practices and (4) Evaluation and Improvement.

The site investigation, planning and prevention spoke forms the foundation of controlling weeds in garden beds, tree rings and other non-turf areas. Nick Fuller, the Chief Ecological Officer of Natural Communities, LLC, will conduct inventories of plant communities, soil texture, sunlight and other environmental factors before developing a weed management or land restoration program (see **bit.ly/FullerInvestigation**). Some critical questions Fuller and MGG recommends for these inventories include (1) Do you have any remnant plant communities on your side? (2) Do you have strictly invasive species? (3) Do you have a combination of native and invasive species? (4) Are you starting off with an agricultural field or a blank slate?

These inventories should help the City of Shorewood select desirable, adaptable and competitive plant seed mixes for the non-turf regions in their parks. Many native, low-growing or low-input plant mixes should excel in these non-turf areas. Find resources on these mixes and planting recommendations at bit.ly/FullerSeedMixes. MGG suggests that the City of Shorewood plants ground cover to replace not only bare soil, but turfgrass grown in unfavorable conditions such as shady tree corridors. One consideration for ground cover includes low-input and pollinator-friendly clover as a monocrop or incorporated in eco-lawns (see bit.ly/MGGclover).

The parks that MGG categorized as Class C of Silverwood, Southshore and Gideon Glen Parks are ideal candidates for fulfilling Clauses #3 and #4 of the pollinator resolution, because they do not host athletic events.

The third Flywheel spoke webpage at bit.ly/FlywheelSpoke3 reviews the alternative cultural, physical, mechanical and chemical weed control the City can use to prepare garden beds and tree rings for planting. To avoid glyphosate use, the City of Shorewood will most likely need to use a combination of control strategies mentioned on that web page.

The City of Shorewood should keep the sand and dirt in baseball diamonds continually groomed, even during the summer offseason, to prevent weed establishment. This requires weekly dragging or raking the infields to pick up young weeds. The City could, also, consider liming their infields to increase the alkalinity that in turn reduces favorable conditions for weeds. Tips for baseball infield management can be found at http://bit.ly/MSUinfields.

MGG found the application of the Tree-Age EAB control product poses two primary risks for pollinators: (1) Tree-Age's active ingredient emamectin benzoate affects a broad range of plant-

feeding insects and (2) Shorewood's annual application of the product increases risk of exposure for pollinators.

The www.emeraldashborer.info FAQ factsheet provided by Davey Tree correctly states that ash trees depend on wind-pollination and do not rely on pollination from bees. However, the leaves and bark of ash trees provide forage or habitat for more than 150 species of native moth and butterfly larva.[3] The FAQ factsheet states that "emamectin benzoate has been shown to affect a broad range of plant-feeding insects". Thus, the application of Tree-Age conflicts with Shorewood's pollinator resolution's intent to protect all pollinators of butterflies, moths, native bees and more.

The second risk for pollinators revolves around Shorewood's annual applications of Tree-Age on its ash trees. This annual use increases the exposure risk to pollinators. Both Davey Tree and Arborjet brought up studies shared in the North Central IPM Center (NCIPM) white paper "Insecticide Options for Protecting Ash Trees from Emerald Ash Borer" that observed effective EAB control from emamectin benzoate for up to three years. MGG recommends applications of Tree-Age in three-year intervals as opposed to annually if Shorewood continues applications of this product.

If Shorewood chooses to replace Tree-age, MGG recommends either biocontrol or an insecticide that has the reduced risk active ingredient of Azadirachtin.

In April of 2022, IPM Institute's Ryan Anderson contacted the US Department of Agriculture's Animal and Plant Health Inspection Service (APHIS) to see if Shorewood could participate in their biocontrol program of releasing stingless wasps that kill EAB (see bit.ly/EABbiocontrol). Anderson has yet to receive a reply from APHIS. However, these stingless wasps need EAB to persist in the long-term. During Anderson's Shorewood visit on June 23, 2022, Davey Tree's Gail Nozal informed attendees that researchers just detected the first presence of EAB in the Minneapolis area this year. The lack of EAB may reduce the effectiveness of this biocontrol program.

Azadirachtin derives from the seeds of neem trees and has low toxicity to humans (see bit.ly/CSUazadirachtin). Azadirachtin products will impair EAB reproduction and kill young larvae. The NCIPM white paper shared a two-year study in Michigan of the azadirachtin product TreeAzin. The study found that TreeAzin reduced density of live EAB density by 75-80% lower than untreated control trees when applied in the first year, but not the second year. Davey Tree should not need to change their equipment, because Azadirachtin products such as Azaguard use the same trunk injection equipment as emamectin benzoate products. Some research shows that Azadirachtin may be toxic to bees and other pollinators.

[3] Tallamy, Douglas. 2007. Bringing Nature Home: How Native Plants Sustain Wildlife in Our Gardens. *Timber Press.*

Finally, MGG highly encourages the City of Shorewood to seek alternative products to glyphosate in situations where chemical control offers the most economically feasible option for weed control. LawnandLand.org lists class GREEN, non-selective organic and reduced-risk product alternatives at bit.ly/MGGnonselective.

Overall IPM and Natural Lawn Care Policy Recommendations

To ensure the implementation of MGG's recommendations, MGG highly recommends that the City of Shorewood adopt a formal IPM or sustainable landscaping policy. Formal policies help organizations deliver services more efficiently and effectively because they (1) ensure consistency in the actions of staff, (2) avoid any ambiguity for how to handle particular situations/issues and (3) increase transparency between the organization and its clients (i.e. public).

Appendix D includes two critical templates to help with establishing and implementing a formal IPM or sustainable landscaping program of (1) a "Generic Park Policy" and (2) a "Natural Lawn Care Workplan." The "Generic Park Policy" assists with forming and writing IPM into the City Shorewood maintenance policy. This document covers program implementation concepts of monitoring, pesticide selection protocols, recordkeeping and evaluations (see **bit.ly/MGGimplementation**) and sets safety standards for pesticide application, storage, disposal and notification (see **bit.ly/MGGsafety**). The "Natural Lawn Care Workplan" will help the City of Shorewood implement the "Generic Park Policy" and the recommendations from this Audit.

Appendix A

Class A: Freeman Park
Mowing Height – 3”
Mowing Frequency – 2x per week for ballfields, 1x per week for other areas
Aeration – None
Irrigation – None
Grass Type – Unknown
Overseeding – None
Fertilization – None

Class B: Manor Park
Mowing Height – 3”
Mowing Frequency – 2x per week for ballfields, 1x per week for other areas
Aeration – None
Irrigation – None
Grass Type – Unknown
Overseeding – None
Fertilization – None

Class C: Silverwood Park
Mowing Height – 3”
Mowing Frequency – 1x per week
Aeration – None
Irrigation – None
Grass Type – Unknown
Overseeding – None
Fertilization – None

Appendix B

Shorewood Pesticide Product and Safety Summary

Color Coding	Products	Number of Products
Red	Armor Tech Threesome Selective Herbicide Arborject Tree-age Insecticide	2
Yellow	N/A	0
Green	N/A	0

We make our recommendations based on three main conditions:

- The signal word (Danger, Warning & Caution) that indicates acute toxicity of a product, we recommend avoiding products with signal words of Danger or Warning that indicate high to moderate toxicity respectively
- The soil half-life of the product, we recommend products with a half-life below 31 days
- If research has linked the product as a carcinogen or reproductive, endocrine, or nervous system toxicant/disruptor, we recommend avoiding any product linked to these effects

In the attached excel you will see products highlighted in one of three colors (GREEN, YELLOW or RED). The color coding goes like this:

- RED-The signal word is Danger, or the product's characteristics violates two or more of our recommendations from above
- YELLOW-The product violates one of our recommendations from above
- GREEN-The product does not violate any of our recommendations

Implication of the Assessment:

1. Armor Tech Threesome Selective Herbicide uses the signal word of **danger** on its label (EPA registration). This product's active ingredients including 2,4-Dichlorophenoxyacetic acid, dicamba and MCPP are listed by the US EPA and/or EU as possible carcinogens, reproductive toxins, endocrine disruptors and/or nervous system disruptors. Our IPM policies stress using the least harmful product at the least amount of concentration. For this case, if the City of Shorewood must resort to chemicals, they should look for products that do not contain these active ingredients. Many other districts follow this procedure. MGG has significant concerns with dicamba (and Threesome's other chemical 2 4-D for that matter), since dicamba is highly mobile and persistent chemical that has been linked to non-hodgkins lymphoma and nervous system inhibition.

Appendix D

PARKS/FOREST/NATURAL AREAS

MODEL INTEGRATED PEST MANAGEMENT POLICY

Introduction:

This Integrated Pest Management Policy ("Policy") shall govern the adoption, implementation, and oversight of an Integrated Pest Management program for all sites under the purview of the _____ Park District ("District") effective _____(date), 1998. Specifically, all pesticide use on grounds or in buildings maintained by the District will be subject to guidelines stated herein.

Findings:

WHEREAS, pesticides are currently applied to property owned or operated and maintained by the District;

WHEREAS, it is difficult or impossible to prevent patrons and employees of the District from coming into contact with those pesticides;

WHEREAS, District is dedicated to protecting the health and welfare of its patrons and employees;

WHEREAS, scientific research indicates that no pesticide is completely safe, and that various pesticides may pose risks to human health, particularly to the health of children, the elderly and other sensitive populations as well as non-target animal and plant populations;

WHEREAS, Integrated Pest Management represents an effective, environmentally sound and economical pest control method, the goal of which is to control pest species while reducing and, where possible, eliminating dependence on chemical pest control strategies;

NOW, THEREFORE, the District shall develop and implement the following Integrated Pest Management program:

Statement of Policy:

It shall be the policy of the District that Integrated Pest Management will be used to prevent and control pest problems in or on property maintained by the District. Non-chemical controls shall be given preference over chemical controls.

Defining Integrated Pest Management:

"Integrated Pest Management" (IPM) is a sustainable process for managing pests that relies on knowledge about the plant or insect pest and its interactions with the environment and utilizes a variety of control measures, including structural, physical, cultural, biological and, only as a last resort, chemical controls, in a way that minimizes environmental, health and economic risks.

District Integrated Pest Management Program:

A. The District shall submit a detailed work plan for implementing Integrated Pest Management which will incorporate the following approach :

1. ***Monitor pest populations..*** The District shall collect baseline data on an ongoing basis to locate and determine pest population densities and rates of growth, and whether and to what extent natural enemy population(s) are present. Records shall be kept of such monitoring.

2. ***Establish Tolerance Levels.*** To decide whether treatment is warranted, an acceptable tolerance level shall be established for each pest and site by determining the type, size, and density of pest population that must be present to cause levels of unacceptable environmental, aesthetic and/or economic damage, or create a risk to human health.

3. ***Identify a range of preferred treatments.*** Non-chemical, non-biological control strategies including structural, physical/mechanical and cultural controls shall be considered first. Chemical approaches should be used only as a last resort. In selecting a treatment approach, the following criteria shall be considered:

    a. Least-hazardous to human health

    b. Least disruptive of natural controls

    c. Least-toxic to non-target organisms

    d. Least-damaging to the general environment

    e. Most likely to produce a permanent reduction in habitat conducive to pest populations above the tolerance level

    f. Cost effectiveness over a reasonable term.

4. ***Educate Staff.*** Education is a critical component of a successful IPM program. The District shall commit to providing ongoing training for employees and assisting in developing educational programs for the public.

5. ***Notify Contractors.*** The District shall inform all contractors of their obligation to comply with the IPM program.

Authorization, Review and Evaluation of the IPM Program

A. An IPM advisory committee ("Committee") shall review all IPM plans and review all pesticides used by the District. The Committee shall be governed by the following rules:

1. The Committee shall be composed of....[District representatives, members of citizen's action groups working on pesticide use reduction, other representatives of the public]

2. All members shall be in agreement with the intent of the Policy and shall seek management techniques that minimize or eliminate the use of pesticides;

3. _____ shall convene and conduct the meetings of the Committee.

B. Annual reports evaluating the IPM program shall be submitted to the Committee by the District.

C. Every two years the Committee shall conduct a review of the program's overall effectiveness in managing pest populations. This assessment shall include an evaluation of all chemical applications, including a figure reflecting the total quantities of pesticide active ingredient applied, as well as any new information on the hazards of chemical controls.

D. The Committee shall be responsible for keeping the public informed of the District's IPM program. Information requests from the public about the Policy will be directed to an appropriate member of the Committee who will answer it promptly.

Notification Requirements

The public shall be notified of any interior or exterior broadcast applications of pesticides, as well as any bombings or dusting of large exposed areas in or on any property maintained by the District as follows:

A. Signs shall be posted at the time of application of pesticides.

1. Signs shall be headed "Notice of Pesticide Application." Signs shall contain the following information: the name of the pesticide, the date of application and a telephone number that can be called for more information.

2. Signs shall be posted at the entrance to all buildings where pesticides have been applied.

3. Signs shall be posted at all park entrances where pesticides have been applied.

4. Signs shall be posted at appropriate intervals along property lines abutting residential areas.

B. Prior notification shall not be required when a situation presents a direct threat to the public health and requires immediate action.

Meeting Federal and State Regulations

No pesticide shall be used unless it is registered for its intended use under the Federal Insecticide Fungicide and Rodenticide Act ("FIFRA"), 7 U.S.C. § 135 et seq. The District shall not violate any state or federal rules and regulations relating to pesticide use, or the safety provisions set forth on pesticide labels.

Severability

If any section, sentence, or clause of this Policy is held invalid or unconstitutional, such holding shall not affect the validity of the remaining portions of the ordinance.

Effective Date

This Policy shall take effect upon passage by _____ and publication as required by law.

Definitions

"Biological Controls" means the use of a pest's natural predators or parasites to eliminate or reduce its population.

"Bombing" means a treatment that releases liquid aerosols into the air. Examples include spraying, misting or fogging.

"Broadcast" means the application of pesticides to broad expanses of surfaces. An example includes application of pesticides to lawns.

"Cultural Controls" means the use of education to effect changes in persons' perceptions and behaviors as a method of preventing pest problems, avoiding pesticide use and more broadly promoting the health and sustainability of a given area.

"Mechanical Controls" means the use of mechanical procedures to eliminate or reduce pest populations, such as mowing and aeration of lawns.

"Natural Controls" means the use of any method that does not employ synthetic substances as a way to eliminate or reduce pest populations and which may draw upon elements common to the environment. Examples include companion planting and attracting beneficial insects to reduce pest problems in gardens.

"Pests" means any unwanted insects, plants, fungus (molds), and rodents.

"Pesticide" means any substance or mixture of substances designed or intended for use to prevent, destroy, repel or mitigate pests, or to be used as a plant growth regulator. Pesticides include, but are not limited to, insecticides, herbicides, fungicides, and rodenticides, and certain pest-specific compounds of biological origin aimed at disrupting the life-cycle of the pest.

"Physical Controls" means the use of controls that physically inhibit pests' ability to inhabit an area by modifying their environment. Examples of physical controls include using traps and barriers, influencing temperatures, controlled burning or hand-pulling of weeds.

"Structural Controls" means the use of a whole systems approach to controlling pest populations, which may include addressing structural issues in both buildings and landscapes. Examples of structural controls include adopting long-term maintenance practices such as caulking and sealing, and repairing the building or landscape to remove places where pests may breed, such as removing indentations in the earth that cause puddles where mosquitoes may breed.

Natural Lawn Care Workplan

Integrated Pest Management

The IPM Institute of North America, Inc. defines Integrated Pest Management (IPM) as an environmentally sensitive and cost-effective approach to weed, insect, disease and other pest management that consolidates all available necessary techniques into an integrated program to keep pest populations at acceptable levels and to avoid adverse effects. An IPM program will utilize physical, cultural, mechanical, structural and biological controls before resorting to chemical controls.

It shall be the policy of [school district/park district/municipality] that Integrated Pest Management will be used to prevent and control pest and weed problems in or on property maintained by the District. Non-chemical controls shall be given preference over chemical controls.

Categorizing the District's Green Spaces

In line with the district's IPM policy, green spaces are broken down into three different categories based on acceptable weed pressures:

Category 1: Category "1" Areas- grounds, recreation facilities, and other school/park properties that will have a 15% or less tolerance for weeds.[4] These areas include athletic fields where quality turf is critical to player safety or turf areas around facilities that receive high public use or visibility.

Category 2: Category "2" Areas - grounds, recreation facilities and other school/park properties that will have a 16-30% tolerance for weeds.[5] Included in this category are areas where turf quality and appearance is important, but not critical. This may include areas that are lightly used, but still receive relatively high visibility.

Category 3: Category "3" areas – designated green spaces that will receive no pesticide treatments no matter the level of weed pressure. These are areas that receive minimal traffic and have low visibility.

Category 1 ground management plan

Cultural management:

- Proper cultural practices should be implemented prior to using chemical pest controls. The facility will follow the cultural management instructions below to the best of its ability for Category 1 grounds.

[4] Assuming the average dandelion takes up .43 square feet. 15 percent or less would mean 3 dandelions or less per square yard or 35 dandelions or less for 100 square feet.
[5] Assuming the average dandelion takes up .43 square feet. 30 percent or less would mean 6 dandelions or less per square yard or 70 dandelions or less per 100 square feet.

- *Mowing*- Mowing height should be set between between 2 ½ and 3 ½ inches for the entire season. Remove only 1/3 of the leaf blade or less at a time. Mowing frequency will vary based on numerous conditions, but will often be conducted once a week or more during the middle of the summer. Mulch grass clippings in place rather then bag and remove to add nitrogen back into the soil.
- *Aeration*- Aerate areas that have compacted/hard soil, a thatch layer greater than ½ inches or bare soil. Reduce the compaction and thatch by aerating in the fall after the heat of the summer has subsided (September 1 to 30). Severe soil compaction or thatch development may require a second aerification in the late spring (May 1 to June 15). Core aeration should be conducted using a machine-driven, piston-type aerifier. The aerifier should be set to take out cores ¼ - ½ inches in diameter and reach 3 to 4 inches deep. The cores should remain on the lawn and mowed over after one to two days. Deep tine aeration may be required for soils with a high clay or rock content. Deep tine treatments work effectively in the spring and fall using a solid tine 5-10" deep.
- *Overseeding*- Thin or bare areas can benefit from overseeding, especially when paired with a fall or spring aerification. If paired with aerification, overseed 1 to 2 days after aerating. Overseed using the same or a similar mixture of grass species already present on the site. If possible, overseed prior to a forecasted rain event or irrigate to provide moisture for the new seeds to germinate. Use the NTEP database (www.ntep.org) to select high quality grass seed that fits site needs

Fertilization for Category 1 grounds:

- *Soil testing*: All category 1 grounds should receive a soil test to determine fertility needs. The soil test should inform about nutrients, pH, and organic matter content in the soil. From this data, the district can make informed decisions about the amount, frequency and type of fertilizer to apply.
- *Fertilizer applications*: Most soil tests will offer recommendations for the amount, frequency, and type of fertilizer to apply. In the cases that they do not, however, we recommend that Category 1 should receive around 2 to 3 applications of nitrogen fertilizer per year. If turf is very dense, established, and does not receive frequent foot traffic, gravitate towards two or less applications. If the primary turf species present is tall fescue or a mixture of fine fescues, then gravitate towards two or less fertilizer applications. The best time to fertilize is with a slow-release, organic fertilizer in early fall to help the grass recover from hot, dry conditions of summer.

  If the manager determines that three fertilizer applications are needed, they should implement the two additional applications once in late May and once in mid fall (i.e. late September or early October). For highly trafficked areas with poor spring density, a synthetic fertilizer can be used for the spring application to encourage rapid nutrient uptake by the plant in cooler conditions.

  If using biosolids, the district should only need to do one application per year in the fall. Most school and park districts have reported not needing complementary fertilizations for the biosolids, so the district should avoid additional fertilizations to the biosolids if grass is performing well. All fertilizations will work best if they follow a core aeration.

Weed and Pest Control

- In cases where turf damage occurs and the causal agent is unclear, an accurate diagnosis of the problem should be obtained prior to implementing any pest control measures. Accurate diagnoses can be obtained from your local extension office or at many land-grant universities.
- In cases where weeds exceed the desired threshold, use a certified natural or EPA reduced-risk weed control product. For turfgrass, options include Fiesta, Tenacity, Quicksilver, and Defendor. Applications of these products cannot exceed twice per year. Perennial weeds are most effectively controlled using herbicides in the fall, which is, also, a time when the grounds are being used less often and will result in lower risk for public exposure. Carefully follow all label directions, even for certified natural products.
- Attempt to increase irrigation or reseed the area to encourage recovery if damage from insects, in particular root damage from white grub feeding, exceeds the desired threshold. Insect damage on turfgrass is often sporadic and may not occur every year. However, a facility can consider a preventative insecticide if they have observed severe damage multiple years in a row. Avoid selecting insecticides that the EPA has identified as 'harmful to bees' (i.e. indicated by a 'bee icon' within a red diamond on the product label). Carefully follow all label directions.
- Fungal diseases rarely cause widespread damage on lawn and sports turf and are typically controlled through proper cultural practices. Fungicides are almost never recommended for use in lawn and sports turf.

Category 2 ground management plan

Cultural Management:

- If possible, all Category 2 fields should be managed with similar cultural practices as Category 1. If the district faces cost constraints or other pressures, however, the management for Category 2 fields can be changed to the following:
- *Mowing*: Mow at a height between 2 ½ to 3 ½ inches and frequently enough so that only 1/3 of the plant or less is removed during each mowing. In the middle of the summer, this will typically be once per week.
- *Aeration*: Aerate once in the fall (September 1 to 30). Same depth and procedure as Category 1 fields.
- *Aerating and Overseeding*: Aerate and overseed as often as possible when needed and given budgetary constraints. Follow the same procedures as Category 1 fields.

Fertilization:

- Category 2 grounds should receive a soil test once every three years to identify underlying problems and identify fertilization needs. If unable to get a soil test, Category 2 grounds should receive 1 to 2 applications of nitrogen fertilizer per year. Similar to Category 1 grounds, prioritize the fertilization in the fall. The second application, if necessary, should happen in the late spring.

Weed and Pest Control

- In cases that weed pressure exceeds the desired threshold, the district can use a certified natural or EPA reduced-risk weed control product. For turfgrass, options include Fiesta,

Tenacity, Quicksilver, and Defendor. Carefully follow all label directions, even for certified natural products. Applications of these products cannot exceed twice per year.
- Insecticide and fungicide applications should be avoided unless the damage is extreme.

Category 3 Ground Management Plan

Cultural Management:
- Follow similar cultural management to Category 2 grounds. In most cases, Category 3 areas will be 'mow only' and will not receive aeration or overseeding.

Fertilization:
- Consider Category 3 grounds as "Good Desired Quality" fields labeled in the above table that should receive 1 to 0 applications of nitrogen fertilizer per year. The IPM Institute advises to avoid fertilization completely if grass is established, mature and healthy in appearance.

Weed and Pest Control
- As these areas have been deemed of low importance due to their minimal traffic and low visibility, pesticides should not be applied.

Marie Darling

From: Ryan Anderson <randerson@ipminstitute.org>
Sent: Tuesday, August 2, 2022 12:48 PM
To: Larry Brown; Marie Darling; Twila Grout
Subject: Fw: Shorewood Budget

Here were Alec's cost estimates. Please let me or Alec know if you have any questions.

Thank you,

Ryan

From: Alec McClennan <alec@whygoodnature.com>
Sent: Friday, July 15, 2022 11:51 AM
To: Ryan Anderson <randerson@ipminstitute.org>; Sydney Lezaic <sydneyl@whygoodnature.com>
Cc: Leah McSherry <LMcSherry@ipminstitute.org>; Larry Brown <lbrown@ci.shorewood.mn.us>
Subject: Shorewood Budget

Folks,

Hope you are each having a great Summer! Wanted to reach out and get you some numbers to look at for the parks. In this FIELD PRICING WORKSHEET you'll find a tool that we can use to help create a program to meet your expectations and budget. It is currently populated with our recommendations but is just a starting point.

We've split the numbers a few ways and can do more splitting as needed to get into a budget that will work for Shorewood. The numbers here include material cost estimates and not the cost of application. If you contract out the applications, there will be a charge to apply. It is possible that Shorewood can purchase the materials and hire someone to apply them. If you have equipment to apply materials or are interested in purchasing equipment to do the applications, we are happy to advise.

The spreadsheet might look a little intimidating at first but I promise it makes sense :). Happy to jump on a call today to go over it if you like Larry.

We've differentiated the program levels at each park as A,B,C.

Area Classifications

Class A
High Profile, high use areas. Get the full treatments.

Class B
Moderate use and doesn't need to be perfect.

Class C
Very Low Priority, minimal treatments each year.

On the spreadsheet, sheet one (Shorewoods Classifications) considers the entire park area as shown in the maps you provided us as class A. If cost is a concern, we suggest treating only the playing field areas themselves as Class A wherever possible (GN Classifications Tab). In the GN Classifications Tab we considered playing areas as Class A and

areas around the playing surfaces as Class B. Many communities we work with consider the playing field portions of the parks as Class A and everything outside the playing fields as Class C. We can adjust however you like. The Spreadsheet is set up so that we can change the classification of each field area and it will calculate how that impacts the overall cost.

Please don't hesitate to reach out with questions. Also, a full report is forthcoming but wanted to get this to you sooner...

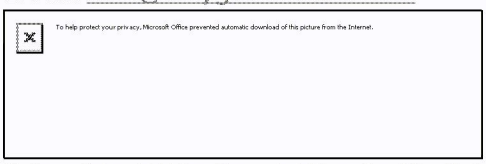
Bottom line: Materials costs for the proposed applications range from $45k - $84k for all the parks combined. We can adjust as needed to hit a target budget.

Thanks!

Alec

Alec McClennan

Good Nature Founder
Office: 216.641.9800
Cell: 216.570.5346
Email: alec@whygoodnature.com



Refer a Friend | Why Organic | How Are We Doing?

				Field Class	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
				Acres	15.77	16.01	0	1.13	1.17	0	2.54	0.81	0	4.03	0	0	2.04	0	0	2.25	0	0
Fields	Full Organic Fertility		unit / 1000	Cost / Acre	FREEMAN	FREEMAN	FREEMAN	BADGER	BADGER	BADGER	CATHCART	CATHCART	CATHCART	MANOR	MANOR	MANOR	SOUTH SHORE	SOUTH SHORE	SOUTH SHORE	SILVERWOOD	SILVERWOOD	SILVERWOOD
A,B,C	Early Spring	Corn Gluten Meal (lb)	10	$387.59	$ 6,112.22	$ 6,205.24	$ -	$ 437.97	$ 453.47	$ -	$ 984.47	$ 313.94	$ -	$ 1,561.97	$ -	$ -	$ 790.67	$ -	$ -	$ 872.07	$ -	$ -
A	Late Spring	Sustane 9-0-2 (lb)	10	$338.87	$ 5,343.90	$ -	$ -	$ 382.92	$ -	$ -	$ 860.72	$ -	$ -	$ 1,365.63	$ -	$ -	$ 691.28	$ -	$ -	$ 762.45	$ -	$ -
A,B	Early Fall	Sustane 8-0-4 (lb)	10	$338.87	$ 5,343.90	$ 5,425.23	$ -	$ 382.92	$ 396.47	$ -	$ 860.72	$ 274.48	$ -	$ 1,365.63	$ -	$ -	$ 691.28	$ -	$ -	$ 762.45	$ -	$ -
A	Late Fall	Sustane 4-6-4 (lb)	15	$319.07	$ 5,031.77	$ -	$ -	$ 360.55	$ -	$ -	$ 810.44	$ -	$ -	$ 1,285.86	$ -	$ -	$ 650.91	$ -	$ -	$ 717.91	$ -	$ -
	Pesticide Free Fertility																					
A	Early Spring	Custom Blend 10-15-15 (lb)	10	$326.25	$ 5,144.96	$ -	$ -	$ 368.66	$ -	$ -	$ 828.68	$ -	$ -	$ 1,314.79	$ -	$ -	$ 665.56	$ -	$ -	$ 734.06	$ -	$ -
A,B	Late Spring	Corn Gluten Meal (lb)	10	$326.25	$ 5,144.96	$ 5,223.26	$ -	$ 368.66	$ 381.71	$ -	$ 828.68	$ 264.26	$ -	$ 1,314.79	$ -	$ -	$ 665.56	$ -	$ -	$ 734.06	$ -	$ -
A	Early Fall	Custom Blend 10-15-15 (lb)	10	$326.25	$ 5,144.96	$ -	$ -	$ 368.66	$ -	$ -	$ 828.68	$ -	$ -	$ 1,314.79	$ -	$ -	$ 665.56	$ -	$ -	$ 734.06	$ -	$ -
A,B,C	Late Fall	Custom Blend 16-2-8 (lb)	8	$261.00	$ 4,115.97	$ 4,178.61	$ -	$ 294.93	$ 305.37	$ -	$ 662.94	$ 211.41	$ -	$ 1,051.83	$ -	$ -	$ 532.44	$ -	$ -	$ 587.25	$ -	$ -
	Micronutrient Treatments																					
A,B	Early Spring	Chelated Iron Treatment (oz)	20	$174.00	$ 2,743.98	$ 2,785.74	$ -	$ 196.62	$ 203.58	$ -	$ 441.96	$ 140.94	$ -	$ 701.22	$ -	$ -	$ 354.96	$ -	$ -	$ 391.50	$ -	$ -
A,B	Mid Spring	Chelated Iron Treatment (oz)	15	$130.50	$ 2,057.99	$ -	$ -	$ 147.47	$ -	$ -	$ 331.47	$ -	$ -	$ 525.92	$ -	$ -	$ 266.22	$ -	$ -	$ 293.63	$ -	$ -
A	Late Spring	Chelated Iron Treatment (If Needed) (oz)	10	$87.00	$ 1,371.99	$ -	$ -	$ 98.31	$ -	$ -	$ 220.98	$ -	$ -	$ 350.61	$ -	$ -	$ 177.48	$ -	$ -	$ 195.75	$ -	$ -
	Cultural Practices																					
A	In Season	Slice Aeration Whenever Possible																				
A,B,C	Late Season	Core Aeration																				
A	Late Season	Overseeding (lb)	5	$652.50	$ 10,289.93	$ -	$ -	$ 737.33	$ -	$ -	$ 1,657.35	$ -	$ -	$ 2,629.58	$ -	$ -	$ 1,331.10	$ -	$ -	$ 1,468.13	$ -	$ -
	Pesticide Free + Micronutrient Treatments + Cultural Practices per Class				$ 36,014.74	$ 12,187.61	$ -	$ 2,580.64	$ 890.66	$ -	$ 5,800.73	$ 616.61	$ -	$ 9,203.51	$ -	$ -	$ 4,658.85	$ -	$ -	$ 5,138.44	$ -	$ -
	Pesticide Free Total						$ 48,202.35			$ 3,471.30			$ 6,417.34			$ 9,203.51			$ 4,658.85			$ 5,138.44
	Full Organic Total						$ 52,711.88			$ 3,797.60			$ 6,697.47			$ 9,786.40			$ 4,953.91			$ 5,463.87
	GRAND TOTAL Pesticide Free Total		$ 77,091.79																			
	GRAND TOTAL Full Organic Total		$ 83,611.13																			

Option 1

				Field Class	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
				Acres	7.74	8.03	16.01	0	1.13	1.17	0.75	1.79	0.81	2.45	1.58	0	0	2.04	0	0	2.25	0
Fields	Full Organic Fertility		unit / 1000	Cost / Acre	FREEMAN	FREEMAN	FREEMAN	BADGER	BADGER	BADGER	CATHCART	CATHCART	CATHCART	MANOR	MANOR	MANOR	SOUTH SHORE	SOUTH SHORE	SOUTH SHORE	SILVERWOOD	SILVERWOOD	SILVERWOOD
A,B,C	Early Spring	Corn Gluten Meal (lb)	10	$387.59	$ 2,999.91	$ 3,112.31	$ 6,205.24	$ -	$ 437.97	$ 453.47	$ 290.69	$ 693.78	$ 313.94	$ 949.59	$ 612.38	$ -	$ -	$ 790.67	$ -	$ -	$ 872.07	$ -
A	Late Spring	Sustane 9-0-2 (lb)	10	$338.87	$ 2,622.82	$ -	$ -	$ -	$ -	$ -	$ 254.15	$ -	$ -	$ 830.22	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
A,B	Early Fall	Sustane 8-0-4 (lb)	10	$338.87	$ 2,622.82	$ 2,721.09	$ -	$ -	$ 382.92	$ -	$ 254.15	$ 606.57	$ -	$ 830.22	$ 535.41	$ -	$ -	$ 691.28	$ -	$ -	$ 762.45	$ -
A	Late Fall	Sustane 4-6-4 (lb)	15	$319.07	$ 2,469.62	$ -	$ -	$ -	$ -	$ -	$ 239.30	$ -	$ -	$ 781.73	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Pesticide Free Fertility																					
A	Early Spring	Custom Blend 10-15-15 (lb)	10	$326.25	$ 2,525.18	$ -	$ -	$ -	$ -	$ -	$ 244.69	$ -	$ -	$ 799.31	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
A,B	Late Spring	Corn Gluten Meal (lb)	10	$326.25	$ 2,525.18	$ 2,619.79	$ -	$ -	$ 368.66	$ -	$ 244.69	$ 583.99	$ -	$ 799.31	$ 515.48	$ -	$ -	$ 665.55	$ -	$ -	$ 734.06	$ -
A	Early Fall	Custom Blend 10-15-15 (lb)	10	$326.25	$ 2,525.18	$ -	$ -	$ -	$ -	$ -	$ 244.69	$ -	$ -	$ 799.31	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
A,B,C	Late Fall	Custom Blend 16-2-9 (lb)	6	$261.00	$ 2,020.14	$ 2,095.83	$ 4,178.61	$ -	$ 294.93	$ 305.37	$ 195.75	$ 467.19	$ 211.41	$ 639.45	$ 412.38	$ -	$ -	$ 532.44	$ -	$ -	$ 587.25	$ -
	Micronutrient Treatments																					
A,B	Early Spring	Chelated Iron Treatment (oz)	20	$174.00	$ 1,346.76	$ 1,397.22	$ -	$ -	$ 196.82	$ -	$ 130.50	$ 311.46	$ -	$ 426.30	$ 274.92	$ -	$ -	$ 354.96	$ -	$ -	$ 391.50	$ -
A,B	Mid Spring	Chelated Iron Treatment (oz)	15	$130.50	$ 1,010.07	$ -	$ -	$ -	$ 152.69	$ -	$ 97.88	$ 105.71	$ -	$ 319.73	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
A	Late Spring	Chelated Iron Treatment (If Needed) (oz)	10	$87.00	$ 673.38	$ -	$ -	$ -	$ -	$ -	$ 65.25	$ -	$ -	$ 213.15	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Cultural Practices																					
A	In Season	Slice Aeration Whenever Possible																				
A,B,C	Late Season	Core Aeration																				
A	Late Season	Overseeding (lb)	5	$652.50	$ 5,050.35	$ -	$ -	$ -	$ -	$ -	$ 489.38	$ -	$ -	$ 1,598.63	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Pesticide Free + Micronutrient Treatments + Cultural Practices per Class				$ 17,676.23	$ 6,112.84	$ 4,178.61	$ -	$ 1,012.90	$ 305.37	$ 1,712.81	$ 1,468.34	$ 211.41	$ 5,595.19	$ 1,202.78	$ -	$ -	$ 1,552.95	$ -	$ -	$ 1,712.81	$ -
	Pesticide Free Total						$ 27,967.67			$ 1,318.27			$ 3,392.57			$ 6,797.96			$ 1,552.95			$ 1,712.81
	Full Organic Total						$ 32,231.57			$ 1,623.67			$ 3,852.74			$ 7,372.26			$ 1,836.92			$ 2,026.01
	GRAND TOTAL Pesticide Free Total		$ 42,742.23																			
	GRAND TOTAL Full Organic Total		$ 46,943.17																			

Option 2

Using the Flywheel Approach to Maintain Algae and a Healthy Manor Pond

Investigation, Planning and Prevention

Algae need nutrients, mainly phosphorus, to bloom. MGG recommends first inspecting the pond to identify potential sources of nutrients and sediment and then controlling them. Potential sources include trees on banks, erosion, soggy banks and excessive aquatic vegetation. Simple prevention solutions include removing aquatic vegetation and small trees on banks, installing edge buffer strips, fixing erosion fences, limiting fertilizer use and using aeration units to increase oxygen.

Plant Selection

Consider installing a riparian buffer around Manor Pond. Penn State Extension has a useful Riparian Buffer webpage at bit.ly/RipBuffers.

Alternative products to copper sulfate

Alternative products to consider include GreenClean Liquid 2.0, GreenClean Liquid 5.0, GreenClean Pond Block, TLC Products and Organic Pond Products.

Evaluation and Improvement

Recommended to inspect Manor Pond at least once a year for potential nutrient and sediment sources and to evaluate the effectiveness of products and approaches used.

Bee City Resolution Implementation Plan City of Shorewood Fall 2022

By Alec McClennan, Sydney Lezaic and Ryan Anderson
Good Nature Organic Lawn Care & Midwest Grows Green

Content

1 Overview

The City of Shorewood selected Midwest Grows Green's (MGG) Technical Assistance Program (TAP) to audit their current landscape maintenance practices, assess if they comply with the 2014 Bee City Resolution and make recommendations to help the city comply and exceed the resolution. In the Spring of 2022, Good Nature Organic Lawn Care's Alec McClennan & Sydney Lezaic assessed management at seven Shorewood parks: Badger Park, Cathcart Park, Freeman Park, Manor Park, Silverwood Park, South Shore Community Park, and Gideon Glen.

Good Nature assessed turfgrass characteristics and extracted soil samples from different sections of each location. TAP and Good Nature used the soil test results, site assessments and maintenance records provided by the City of Shorewood to create an organic based maintenance guide for each location.

The maintenance guide includes suggestions for cultural practices, such as aeration, irrigation, overseeding, mowing, fertilizations and soil amendments and pest suppression. Weekly and yearly calendars for the maintenance team have been provided to help make the transition to organic as straightforward as possible. This respective report does not cover Shorewood's natural area management or offer recommendations for these natural areas. For natural area management recommendations, please refer back to MGG's Phase I Shorewood Sustainable Landscape Management Audit.

2 Introduction

Shorewood, Minnesota selected several park locations to receive feedback on sustainable park management from MGG's Technical Assistance Program (TAP). These locations include Badger Park, Cathcart Park, Freeman Park, Manor Park, Silverwood Park, Southshore Community Park and Gideon Glen. Alec McClennan, CEO and Founder of Good Nature Organic Lawn Care, and Sydney Lezaic, Research and Development Specialist at Good Nature, created an organic turfgrass management program using past data on park maintenance, feedback from the City of Shorewood's Parks and Recreation Department and their own assessment of the parks.

The TAP team collected data and assessed the parks in late April of 2022. This report provides a cost-effective maintenance program for the City of Shorewood to implement on all parks that avoids the use of chemicals potentially harmful to pollinators, pets and people. The report

discusses the initial site assessment and soil test findings collected from multiple sections of the park. Finally, Good Nature developed schedules for cultural practices, fertilization, soil amendment applications and weed and pest control to transition management to completely organic.

3 Summary of Expectations

To help develop cost-effective sustainable landscape management plans for Shorewood, MGG asked the City of Shorewood to prioritize each park into Category A, B, & C areas. Category A parks, the highest priority locations, are Freeman Park and Badger Park. Category B parks, moderate priority locations, are Manor Park and Cathcart Park. Finally, Category C parks, the lowest priority locations, are Silverwood Park, South Shore Community Park and Gideon Glen.

While each location has a general categorization, they, also, have classifications within themselves. Category A locations have the highest level of foot traffic and are considered the most important areas for maintenance and product treatment. Category B locations have moderate foot traffic and are, also, ideal locations for maintenance and treatment. Category C locations are low priority and can receive the least amount of attention when it comes to fertilizations and other maintenance.

This report used weed tolerance thresholds set by MGG, since the City of Shorewood did not provide their own tolerance thresholds. Category A locations can tolerate no more than 15% weed density. Category B locations can tolerate between 16% and 30% weed pressure. Category C locations have no desired level of weed control.

This report created a spreadsheet where the city can change the size of each location's A, B, & C fields to better suit whatever budget the city can allocate for this project. Good Nature, also, developed a budget-friendly scenario by providing their own categorizations of A, B, & C fields (reducing the size of A & B). This scenario grouped most recreational areas in categories B & C and allocated most fertilization treatments to sports fields (A fields).

4 Methodology

Soil Compaction Assessments

Good Nature used a soil penetrometer to measure compaction at each park. Soil compaction causes most turfgrass field performance issues by limiting root growth. A soil penetrometer is a useful device to compare compaction in soils managed under the same conditions or similar soils managed under different conditions. Soil penetrometers measure the pounds per square inch it would take for plant roots to grow through the soil. Root growth decreases linearly with increasing penetration resistance until practically stopping at 300 psi.

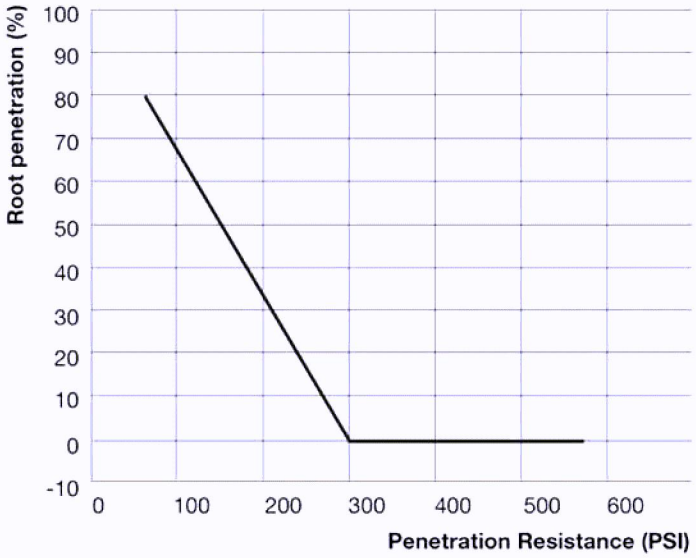


Chart from Penn State relating root penetration (%) versus penetration resistance (PSI).

Soil Testing

Soil testing provides an in depth look at the essential elements and other factors that contribute to overall soil health. Good Nature Organic Lawn Care focused on the following key indicators for Shorewood parks:

Exchange capacity: Exchange capacity reflects the availability of nutrients in the soil, and how well plants uptake the nutrients. **Exchange rates over 25** means that the soil has a good rate of cation exchange, and nutrients are able to move from within the soil to the plant.

Water pH: Water pH, also, influences the availability of nutrients in the soil. Turf does well in **neutral pH soil, 6.5 to 6.9,** and often turns yellow in high pH soils.

Organic material/matter: Organic matter, such as lawn clippings and compost, provide oxygen, carbon and other nutrients to the soil. This feeds healthy soil biota such as fungi, bacteria, and decomposers like worms.

Primary macronutrients of nitrogen, phosphorus, and potassium: All three primary macronutrients promote soil and plant health. Nitrogen serves as a building block for plant proteins, nucleotides and other cellular components. Phosphorus facilitates energy transfer, regulates protein synthesis and stimulates root growth. Potassium triggers the activation of enzymes for many basic functions.

Secondary macronutrients of sodium, sulfur, calcium and magnesium: Sodium activates enzymes for basic functions. Sulfur converts sunlight energy into plant growth. Calcium ensures proper cell division. Magnesium aides in photosynthesis.

Essential micronutrients of boron, iron, manganese, copper, zinc, aluminum: These nutrients help plant growth, overall health and cation exchange in the soil. These nutrients are needed at much smaller levels. We recommend first correcting the macronutrient deficiencies or surplus, because these micronutrients usually follow suit.

For further information regarding soil testing indicators, please visit LawnandLand.org's soil testing section at bit.ly/LLFsoiltesting

5 Description of Assessed Parks

Community Field Use

For most of the year, sports associations book fields at Freeman, Cathcart, Manor and Badger each weeknight for practices and each weekend day for games. All these fields receive heavy use due to this practice and game schedule.

Badger Park

Badger Park is located at 5745 Country Club Road in Shorewood, Minnesota, and sits next to Shorewood City Hall. The City of Shorewood reports that the park spans approximately 8.64 acres (376,000 square feet) and that the City maintains 4.72 acres (205,000 square feet). The park contains an artificial turf lacrosse field, two tennis courts, a playground and a small pond.

Figure 1 shows the image provided by the city and their categorizations of Badger Park. The area outlined in red shows the highest priority fields (Category A). Areas outlined in yellow are moderate priority (Category B). Areas outlined in green are the lowest priority (Category C). Figure 2 shows Good Nature's recommendations for categorizations of Badger Park for a more budget friendly approach. Category A fields measure approximately 50,000 square feet and Category B fields measure approximately 32,000 square feet. The City of Shorewood reports that the Category A areas have the heaviest foot traffic, Category B areas have moderate foot traffic, and Category C areas have the least amount of traffic annually.

Figure 1: Badger Park aerial map and priority categorizations provided by the City of Shorewood.

Figure 2: Badger Park aerial map with Good Nature's budget friendly priority categorizations.

Cathcart Park

Cathcart Park is located at 26716 West 62nd Street in Shorewood, Minnesota. The City of Shorewood reports that the park spans approximately 4.54 acres (198,000 square feet) and that the City maintains all 4.54 acres. The park has a hockey rink, ballfield, tennis courts, a sports court and a playground. Figure 3 shows the image provided by the city and their categorizations of Cathcart Park. The area outlined in red shows Category A fields, areas outlined in yellow are Category B, and areas outlined in green are Category C. Figure 4 shows Good Nature's recommendations for categorizations of Cathcart Park for a more budget friendly approach. Category A fields measure approximately 88,000 square feet with approximately 17,000 square feet belonging to the hockey rink, approximately 2,500 square feet belonging to the baseball infield, and approximately 30,000 square feet belonging to the baseball outfield. The Category B fields measure approximately 36,000 square feet.

Figure 3: Cathcart Park aerial map and priority categorizations provided by the City of Shorewood.

Figure 4: Cathcart Park aerial map with Good Nature's budget friendly priority categorizations.

Freeman Park

Freeman Park is located at 6000 Eureka Road in Shorewood, Minnesota. The City of Shorewood reports that the park spans approximately 61.41 acres (2,675,000 square feet) and that the City manages 31.78 acres (1,384,000 square feet). The park has six ballfields, three batting cages, a concessions area, an area dedicated to soccer fields, a volleyball court, two playgrounds, a community garden and several paths that lead through wooded areas of the park. The areas outlined in red show Category A fields, areas outlined in yellow are Category B and areas outlined in green are Category C. Figure 5 shows the image provided by the city and their categorizations of Freeman Park. Figure 6 shows Good Nature's recommendations for categorizations of Freeman Park for a more budget friendly approach.

The following measurements are all approximations. The Category A fields measure a total of 877,000 square feet. About 279,000 square feet of the Category A fields belong to areas that are not sports fields: the concession area is 122,000 square feet, the area surrounding the northern parking lot is 16,000 square feet, the area surrounding the northern baseball fields is 23,000 square feet, the area surrounding the playground is 52,000 square feet, and the area around the southern baseball fields is 66,000 square feet. About 621,000 square feet of the category A fields belong to sports fields. The outfields of fields 4-6 (northern fields) are all 52,000 square feet, the area dedicated to soccer fields is 295,000 square feet, the outfield for the two little league fields are 30,000 square feet and the infields are 5,000 square feet, and the large baseball field in the southern portion of the park measures at 65,000 square feet for the outfield and 12,000 square feet for the infield.

The Category B fields measure approximately 123,000 square feet, with 84,000 square feet belonging to the northern parking lot area, 15,000 square feet belonging to the parking lot in the middle of Freeman Park, and 24,000 square feet belonging to the southern parking lot area.

Figure 5: Freeman Park aerial map and priority categorizations provided by the City of Shorewood.

Figure 6: Freeman Park aerial map with Good Nature's budget friendly priority categorizations.

Manor Park

Manor Park is located at 20600 Manor Road in Shorewood, Minnesota. The City of Shorewood reports that the park spans approximately 6.39 acres (278,000 square feet) and that the city maintains the entire location. The park contains a ballfield, a tennis court, a volleyball court, a shelter, a playground and a pond. Figure 7 shows the image provided by the city and their categorizations of Manor Park. The area outlined in red shows Category A fields, areas outlined in yellow are Category B, and areas outlined in green are Category C. Figure 2 shows Good Nature's recommendations for categorizations of Manor Park for a more budget friendly approach. Category A fields measure approximately 176,000 square feet with approximately 44,000 square feet belonging to the soccer field, approximately 63,000 square feet belonging to the baseball infield, and approximately 69,000 square feet belonging to the area surrounding the playground and tennis court. The park has no category B fields according to the City of Shorewood's categorizations.

Figure 7: Manor Park aerial map and priority categorizations provided by the City of Shorewood.

Figure 8: Manor Park aerial map with Good Nature's budget friendly priority categorizations.

Silverwood Park

Silverwood Park is located at 5755 Covington Road in Shorewood, Minnesota. The City of Shorewood reports that the park spans approximately 7.47 acres (325,000 square feet) and that the city maintains 2.25 acres (98,000 square feet) of the park. The park contains a sports court, a playground and a pond. Figure 9 shows the image provided by the city and their categorizations of Silverwood Park. The area outlined in red shows Category A fields, areas outlined in yellow are Category B, and areas outlined in green are Category C. Figure 2 shows Good Nature's recommendations for categorizations of Silverwood Park for a more budget friendly approach. Category A fields measure approximately 56,000 square feet. The park has no category B fields according to the City of Shorewood's categorizations. The park is used for mostly recreational activities. Silverwood Park was under construction during park assessments causing Good Nature to not select soil samples.

Figure 9: Silverwood Park aerial map and priority categorizations provided by the City of Shorewood.

Figure 10: Silverwood Park aerial map with Good Nature's budget friendly priority categorizations.

South Shore Community Park

South Shore Community Park is located at 5355 St. Albans Bay Road in Shorewood, Minnesota. The park has a community garden. Figure 11 shows the image provided by the city and their categorizations of South Shore Community Park. The areas outlined in red show Category A fields, areas outlined in yellow are Category B and areas outlined in green are Category C. Figure 2 shows Good Nature's recommendations for categorizations of South Shore Community Park for a more budget friendly approach. Category A fields measure approximately 89,000 square feet. The park does not have any category B fields according to the City of Shorewood's categorizations.

Figure 11: South Shore Community Park aerial map and priority categorizations provided by the City of Shorewood.

Figure 12: South Shore Community Park aerial map with Good Nature's budget friendly priority categorizations.

Gideon Glen

Gideon Glen is a natural area located at 5620 Country Road 19 in Shorewood, Minnesota. The City of Shorewood prioritized the entire park in Category C. Good Nature did not conduct soil

tests for the park, because it does not contain turfgrass. Figure 13 shows the image provided by the city and their categorizations of Gideon Glen.

Figure 13: Gideon Glen aerial map and priority categorizations provided by the City of Shorewood.

6 Site and Field Management Assessment for All Parks

Good Nature gathered vegetation quality and landscape management data for each Shorewood park by both visiting the parks and receiving information from City of Shorewood staff. This section (#6) groups records of irrigation, fertilization and mowing practices for all Shorewood parks together, because Good Nature observed the same or similar practices for each.

Good Nature discusses vegetation quality and density and weed pressure individually in Sections #7 through 9, since we observed variability between Shorewood parks.

Current Irrigation Practices for all Shorewood Parks

The City of Shorewood does not have an irrigation system in place at any of the parks and the City did not report irrigating by hand. Turfgrass performs best when irrigated at approximately 1 inch of water a week. This can be done all at once or split into two ½ inch waterings or three ⅓ inch waterings each week. Kentucky Blue and Perennial Rye (the two dominant grass types) can sustain with 1 inch of water a week during most of the year, but the city should increase watering in higher temperatures. The City can, also, consider watering the artificial turf to cool it down given that the turf can reach dangerous temperatures for athletic events in the summer months.

Current Fertility Practices for all Shorewood Parks

The City of Shorewood did not report any fertilization applications, overseeding or aeration at Shorewood parks in the past six years.

Current Mowing Practices for all Shorewood Parks

The City of Shorewood mows each park once a week at approximately three inches. Athletic fields are mowed twice a week at approximately three inches. Good Nature measured grass at three inches height during our park visits. The grass height was relatively uniform throughout all parks. Frequent and high mowing minimizes stress on the turf by avoiding the removal of too much of the grass blade at one time.

7 Badger Park Site and Field Assessment

Turf Quality and Density

Good Nature observed a mix of Kentucky Bluegrass and Perennial Ryegrass at Badger Park. Most of the grass seems to grow in a bunch-like pattern (see figure 14) suggesting that Perennial Ryegrass is the dominant species. The City of Shorewood reported not overseeding Badger Park recently. Seeding with a grass type that has rhizomes, or underground plant stems, Shorewood can fill in the bare areas observed around the park by seeding with a rhizomatous grass type that spreads laterally.

The park has a considerable amount of trees, forested areas and structures that shade the turf. Shorewood should consider more shade tolerant grass types such as fine fescue in these heavy shade areas, because Perennial Ryegrass and Kentucky Bluegrass grow better in full sun areas.

We observed many large bare turf areas surrounding the parking lot, shelter, and playground (see figures 14 through 19). The bare areas in the turf surrounding the shelter (inside the circular pathway) showed signs of cleat damage, heavy compaction and a lot of small stones (see figures 15 & 16). The park's many spaces for children to play and the large artificial athletic turf field likely brings in a lot of foot traffic causing these compacted and bare soil areas.

Bare areas around paved pathways are common (see figures 18 & 19), because foot traffic frequents near pathways and the pavement can increase temperatures near the ground in the summer. The added foot traffic and temperatures can stress the grass that lines the pavement and allow weeds to overtake the grass.

Figure 14: Bare areas that show bunch type growth in Badger Park.

Figure 15: Bare areas near shelter with cleat marks visible in Badger Park.

Figure 16: Bare areas between shelter and parking lot in Badger Park.

Figure 17: Bare areas near artificial field in Badger Park

Figure 18: Bare areas between parking lot and artificial field in Badger Park.

Figure 19: Bare areas near parking lot in Badger Park.

Current Weed Pressure

Badger Park is considered a Category A location. MGG suggests 15% or less tolerance for weeds in these areas. The current weed pressure seems to be between 16% and 30%. Proper cultural practices of fertilizations, mowing, irrigation, aerating and overseeding should help reduce the weed pressure to below 15%.

Good Nature observed weeds of broadleaf plantain, clover, chickweed, veronica, and dandelions. Unsurprisingly, most of these weeds are established in bare turfgrass areas. Most weeds are opportunistic. They will spread into dirt areas, because they face limited competition for resources. Thick turfgrass areas in the park observed low weed pressure.

Broadleaf weed control applications have been performed once a year since 2015, excluding 2018. The city's broadleaf weed control product is Armor Tech Threesome Selective Herbicide, which has the signal word "Danger". MGG recommended avoiding this product in future application in their Phase I sustainable landscaping audit, because this signal word indicates a product with the highest acute toxicity.

Figure 20: Veronica, chickweed, and clover in Badger Park.

Figure 21: Heavy clover area in Badger Park.

Figure 22: Badger Park Dandelion that looks like it was recently treated with a chemical spray.

Current Soil Properties

Good Nature inferred hard surface firmness at both the A & B sections of Badger Park, because it was very difficult to take soil cores at these sites. Staff could not obtain soil cores in the B sections of Badger Park due to the hardness of the surface.

Soil penetrometer tests confirmed that the majority of the park has compacted soil. The soil penetrometer showed levels of over 400 pounds per square inch (psi) when trying to test the soil. Please find further discussion of the soil penetrometer values on Page 43.

8 Cathcart Park Site and Field Assessment

Turf Quality & Density

Good nature observed a mix of Kentucky Bluegrass, Perennial Ryegrass, and Tall Fescue at Cathcart Park. Tall Fescue has excellent heat and wear tolerance but struggles over the winter in poorly drained soil. Good Nature observed significant turf damage from snow mold during the site assessment at the end of April (see figures 23 & 24). Large amounts of snow piling on the turf prevents airflow and can cause small heated pockets to form under the snow creating ideal conditions for snow mold. Snow mold infested turf will look brown and yellow in color and appear matted down once the snow melts. Shorewood can avoid future snow mold pressure by lightly raking the affected turf to improve the conditions. Some turfgrass discoloration could, also, be from dormancy over the winter.

Figure 23: Large area affected by snow mold in Cathcart Park.

Figure 24: Close up of snow mold in Cathcart Park.

Overall, Cathcart Park has very thin turfgrass (see figures 25 through 27). The park would greatly benefit from overseeding in the late summer or early fall. Good Nature observed most of bare soil in high foot traffic areas of the infield and outfield of the ballfield, the hockey rink and around the paved paths throughout the park. Heavy foot traffic, especially from cleats, can rip up the turfgrass and make it harder for grass to grow. Increased temperatures near pavements can, also, make a more inhospitable environment for most grass types.

Figure 25: Bare areas near the playground in Cathcart Park.

Figure 26: Bare areas in the infield of the ballfield in Cathcart Park.

Figure 27: Bare areas in the outfield of the ballfield in Cathcart Park.

Current Weed Pressure

Cathcart Park is considered a Category B location. MGG suggests 16% and 30% tolerance for weeds in these areas. The current weed pressure seems to be between 16% and 30%. Proper cultural practices of fertilizations, mowing, irrigation, aerating and overseeding should keep the weed pressure in the 16% to 30% range and maybe even below 15%.

Most of the weeds in Cathcart Park concentrate around the playground area. The borders around the paths leading to the playground have heavy clover and ground ivy presence (see figures 28 & 29).

Weeds have not taken over bare soil areas in and around the ballfield, despite the ballfield possessing the majority of the park's bare areas. About a dozen bunches of hairy bittercress were noted by the ballfields, but hairy bittercress is a winter annual and should disappear as the temperatures increase in spring each year.

Good Nature observed tall fescue grasses in Cathcart Park (see figure 30). Tall Fescue can sometimes look undesirable when it grows in areas with other grass types such as Perennial Ryegrass and Kentucky Bluegrass, because Tall Fescue's thick, coarse blades and patchy growth pattern can stand out compared to the other grass types. Tall Fescue, also, tends to not handle Minnesota winters very well.

Figure 28: Ground ivy and clover along paved paths in Cathcart Park.

Figure 29: Ground ivy and clover by the playground in Cathcart Park.

Figure 30: Patches of tall fescue near the ballfield in Cathcart Park.

Current Soil Properties

Soil penetrometer testing showed that the majority of Cathcart Park had compacted and hard soil firmness. Overall, the soil firmness did not become nearly impenetrable for roots until about nine inches in depth, but the soil above the nine inches depth showed readings near or greater than 300 psi, which is considered root limiting for turfgrass.

As Good Nature expected, the hockey rink section of the park had the highest level of compaction. The weight of the ice and the rink's water freeze thaw cycles can easily compact soils. The ballfield and playground exhibited moderate compaction in comparison to the hockey field. The soil penetrometer values will be discussed further in the soil testing discussion section. Please find further discussion of the soil penetrometer results on page 43.

9 Freeman Park Site and Field Assessment

Due to Freeman Park's large size, this report will discuss each of the park's sections individually.

Freeman Park has six ballfields: three in the park's southern section (1-3) and three in the park's northern section (4-5).

Turf Quality & Density in the Southern Section

The park's southern section has two little league fields and one large field. Similar to Badger Park and other Shorewood Parks, Good Nature identified snow mold pressure on the section's southern little league field (see figures 31 & 33). Shorewood's heavy snowfall and lack of airflow in pockets under the heavy snow likely caused this snow mold problem.

The vast majority of this field's turfgrass has good density and color outside of the far outfield (see figure 32). The far outfield's proximity to shade from surrounding trees and poor drainage due to a slight grading issue are probably turf quality issues.

Figure 31: Snow mold in the outfield in the north ballfield in the southern section of Freeman Park.

Figure 32: Turf color and density in the north ballfield in the southern section of Freeman Park.

Figure 33: Snow mold in the infield in the north ballfield in the southern section of Freeman Park.

The southern portion's large baseball field has many bare areas due to heavy foot traffic from games and practices (see figure 34). The infield has expected wear, large bare areas and discoloration from cleats and heavy use (see figure 36). The outfield has great color and density (see figure 35). This field seems to have some of the best management practices. Overseeding on the bare areas should help manage the size of the bare spots.

Figure 34: Bare areas on the sidelines of the large southern ballfield in Freeman Park.

Figure 35: Turf color and density of the outfield for the large southern ballfield in Freeman Park.

Figure 36: Turf color and density of the infield for the large southern ballfield in Freeman Park.

The southern section's second little league field in the north experiences heavy bare areas on the sidelines because of spectator use (see figure 37). The far outfield of this little league field has low turf density similar to the first little league field (see figure 38). Heavy shade and grading issues probably caused these issues. The infield and outfield has a small snow mold issue, but otherwise has good color and density (see image 39).

Figure 37: Sideline of the southern ballfields in Freeman Park.

Figure 38: Bare areas and damage in the far back outfield of the southernmost ballfield in Freeman Park.

Figure 39: Color and density of the outfield in the southernmost ballfield in Freeman Park

This report prioritized the southern portion's parking lot as a Category B location. It has bare areas consistent with heavy foot traffic and stress from the pavement. As mentioned earlier in this report, increased pavement temperatures in the summer can overheat the soil and make it difficult for turf to grow, allowing an area for weeds to take over (see figure 52). Overseeding the bare areas where spectators congregate for games could help to increase the turf density (see figure 53).

Figure 52: Bare areas near the southern parking lot in Freeman Park.

Figure 53: More bare areas near the southern parking lot in Freeman Park.

Turf Quality & Density in the Northern Section

Freeman Park's northern section has an area dedicated to soccer fields, three large baseball fields and a concession area. The baseball fields have physical signs numbered 4-6. Outfield #4 had slightly discolored grass, but had good density. Dormant grasses seemed to cause the discoloration (see figure 40). Good Nature identified some disease issues (see figure 41), but proper fertilization should provide the nutrients needed for proper defense against disease. Field #4's infield is all sand. Heavy wear caused patchy grass in the border between the sand and turf (see figure 42). Overseeding should help increase the turf density in these border areas.

Figure 40: Color and density of the outfield for field 4 in Freeman Park.

Figure 41: Upclose photo of turn in the outfield for field 4 in Freeman Park.

Figure 42: Bare areas near the diamond in field 4 in Freeman Park.

Field #5 has very large bare areas along the sidelines in the outfield (see figure 43 & 44). The density of the turfgrass looked healthy outside of these areas. The turfgrass had a slight yellow coloration similar to other fields dormancy (see figure 45). Field #5's infield is all sand. Good

Nature found patchy turfgrass when transitioning from sand to turf again, because of the change in soil availability and heavy wear.

Figure 43: Bare areas in the outfield of field 5 in Freeman Park.

Figure 44: Discoloration in the outfield of field 5 in Freeman Park.

Figure 45: Color and density of the outfield of field 5 in Freeman Park.

Snow mold appeared to cause a few bare spots along the border of the outfield of Field #6 (see image 46 & 47). Raking these matted areas of turf once the snow melts for the year can help bring oxygen back to the turfgrass and quicken the recovery process. Otherwise, most of the outfield had good density. The outfield had some discoloration that will likely recover once the turf exits dormancy (see figure 48). Good Nature found patchy turfgrass when transitioning from sand to turf again, because of the change in soil availability and heavy wear.

Figure 46: Bare areas in the outfield of field 6 in Freeman Park.

Figure 47: Snow mold in the outfield of field 6 in Freeman Park.

Figure 48: Color and density of turf in the outfield of field 6 in Freeman Park.

The area surrounding the concessions building has very thin and patchy turfgrass. The turfgrass that did successfully grow was severely discolored (see figures 49 through 51). Further inspection of these areas revealed extremely compacted soil and a lot of stone. This section's central location between fields 4, 5 & 6 and the small playground probably attracts the heaviest foot traffic in Freeman Park. This constant use has severely compacted the soil and made it

nearly impossible for turfgrass to properly form roots in some areas. Turfgrass visibly recovered further away from the concessions building. Shorewood should follow this report's cultural practice recommendations rigorously if they want to establish turfgrass in this area. Shorewood should, also, consider planting a more wear resistant grass type in this area.

Figure 49: Turf color and density of the area surrounding the concessions building in Freeman Park.

Figure 50: Bare areas surrounding the concessions building in Freeman Park.

Figure 51: Turf color and density of the area surrounding the concessions building in Freeman Park.

The northern parking lot near the ballfields has been prioritized as a Category B location like the southern parking lot. This area has relatively dense turf, but discoloration caused by snow mold (see figures 54 & 55). Snow mold frequently establishes in locations that get heavy snowfall for extended periods of time. Shorewood can rake the matted sections to hasten the grass recovery from the snow mold.

Figure 54: Density and color of turf near northern parking late in Freeman Park.

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Figure 55: Discoloration of turf near northern parking late in Freeman Park.

Freeman Park's soccer field section had several discoloration issues (see figures 56 through 60). A couple of factors contributed to discoloration. First, the constant running of soccer, lacrosse and other players and their cleats likely ripped up both turf roots and blades. Second, the grass may have stayed dormant during Good Nature's site visit in the spring. Finally, disease issues and irrigation problems caused the remaining discoloration.

Good Nature observed large sections of turf with distinct discoloration lines (see figure 58). The combination of poor drainage and regular tearing of the grass blades and roots likely caused fungi to enter and overtake the turf's internal systems. A lack of proper water drainage can, also, pull nutrients out of the soil disproportionately.

Some smaller sections in the soccer fields, mostly concentrated around goal posts and the midfield lines, struggled with heavy foot traffic. Overseeding these areas could help reduce the problem.

Figure 56: Color and density of the soccer fields in Freeman Park.

Figure 57: Close up of the discoloration on the soccer fields in Freeman Park.

Figure 58: Discoloration of the turf in the soccer fields in Freeman Park.

Figure 59: Snow mold near paths in Freeman Park.

Figure 60: Discolored patches in the soccer fields in Freeman Park.

The Category B playground in Freeman Park's northern section experienced low turf density and general discoloration likely due to the heavy shade provided by the trees and compacted soil (see figures 61 through 63). More shade tolerant grass types and aeration could help increase the turf density and overall health.

Figure 61: Color and density of the turf near the playground in Freeman Park.

Figure 62: Color and density of the turf near the playground in Freeman Park.

Figure 63: Up close photo of the color and density of the turf near the playground in Freeman Park.

Current Weed Pressure

Freeman Park's weed density varied between different sections. The thicker turf on most athletic fields seemed to result in less bare areas and relatively low weed densities. Some broadleaf weeds grew in the transition areas between the infield sand and the turf and, also, the exposed dirt around the borders of the fields. The overall weed density of the soccer fields and baseball fields fell within the weed tolerance level of less than 15%.

Good Nature observed higher weed density in the areas around the parking lots, the concession building and the playground. The parking lot and playground areas have a weed density of 16% to 30%. Weeds overtook more than 30% of the concessions area, due to the low density level of grass.

Good Nature found ground ivy and clover in each section of Freeman Park (see figures 64 & 65). Other weeds noted in smaller concentrations include ajuga, flatweed and the dried root systems of old crabgrass (see figures 66 through 68). Crabgrass is a summer annual and because the park assessment was performed in late April, it was not in season.

Figure 64: Ground ivy in Freeman Park.

Figure 65: Clover in Freeman Park.

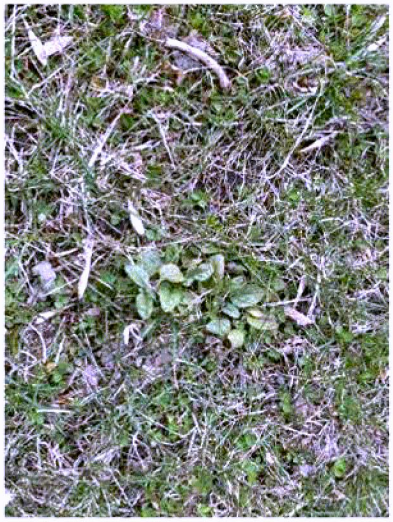


Figure 66: Ajuga in Freeman Park.

Figure 67: Flatweed in Freeman Park.

Figure 68: Dead crabgrass in Freeman Park.

Current Soil Properties

Soil penetrometer testing indicated moderate surface firmness across the majority of Freeman Park. Good Nature staff only had difficulty pulling soil cores in the shelter and playground sections of the park. Please find further discussion of the soil penetrometer results on Page 44.

10 Manor Park Site and Field Assessment

Turf Quality & Density

Manor Park had higher turfgrass quality and density, a Category B location, compared to Badger, Cathcart and Freeman Parks most likely due to lower foot traffic. The extended spring

2022 cold temperatures likely caused the grass discoloration observed throughout the park (see figures 69 through 71).

Figure 69: Turf color and density on soccer fields in Manor Park.

Figure 70: Turf color and density on the playground area in Manor Park.

Figure 71: Turf color and density on the ballfield in Manor Park.

Concentrated foot traffic resulted in some bare soil areas throughout the park. The shelter area seemed to have the most bare areas, due to more use and the shade provided by the building (see figure 72). The ballfield and soccer fields, also, had obvious signs of damage from the cleats worn for games (see figures 73 and 74). Overseeding with appropriate grass types, fertilization and aerations would help to reduce these bare areas.

Figure 72: Bare areas near shelter at Manor Park.

Figure 73: Bare areas near the ballfield at Manor park.

Figure 74: Bare areas in the soccer field at Manor park.

Current Weed Pressure

Manor Park is considered a Category B location, MGG suggests 16% to 30% tolerance for weed density in these areas. Good Nature observed the weed density below 15% at the time of assessment. Identified weeds include ground ivy, clover, tall fescue (which is not necessarily a weed, but can look out of place when it grows in bunches) and some small patches of bentgrass (see figures 75 through 77). Shorewood should keep track of the small amount of bentgrass at Manor Park, because bentgrass spreads very rapidly and can get out of hand quickly.

The assessment only found one type of broadleaf weed in the ballfield area: Flatweed, more commonly known as cat's ear. Correct cultural practices should reduce weed density.

Figure 75: Ground ivy patches in Manor Park.

Figure 76: Clover patches in Manor Park.

Figure 77: Tall fescue patches in Manor Park.

Current Soil Properties

Manor Park has a relatively soft soil composition. The soil around the shelter has a higher compaction rate than the remainder of the park, probably due to a heavier concentration of foot traffic. The remainder of Manor Park has an ideal firmness for grass growth. Please find further discussion of the soil penetrometer results on page 46.

11 Silverwood Park Site and Field Assessment

Construction at Category C Silverwood Park prevented Good Nature from assessing the park. South Shore Community Park recommendations can be applied to Silverwood Park, since the parks have similar characteristics and issues with only a few differences. The parks are in different locations, so it is understood that the parks will have some differences, but it is clear that most of the parks in Shorewood have similar characteristics and issues.

12 South Shore Community Park Site and Field Assessment

Turf Quality & Density

Good Nature found a fairly dense mix of Kentucky Bluegrass and Perennial Ryegrass at Category C South Shore Community Park. Some of the grass was dormant and affected by snow mold at the time of assessment in late April. Most snow mold damage was concentrated around the parking lot (see figures 78 & 79), probably due to plowing the snow from the pavement onto the grass. Snow likely did not concentrate near the turf farther away from the parking lot that looked healthy and thick for that time of the year (see figure 80). The lower level of foot traffic at South Shore Community Park and lack of athletic activity results in less wear and tear on the turf and a higher quality and density. Turf density did thin a bit in the shaded areas under some of the trees where Kentucky Bluegrass and Perennial Ryegrass struggle to grow. Overseeding the bare soils with shade tolerant grass types such as Fine Fescue can help to increase density.

Figure 78: Density and color of the turf in South Shore Community Park.

Figure 79: Snow mold in South Shore Community Park.

Figure 80: Density and color of the turf in South Shore Community Park

Current Weed Pressure

MGG recommends exercising no tolerance thresholds for weed pressure in Category C parks such as South Shore Community Park. Overall, South Shore had limited weed pressure. Ground ivy and clover invaded the bare areas in turf (see figures 83 & 84). A handful of dandelions established throughout the park as well (see figure 85). Cultural practices of seeding, aerating and fertilizations should manage the weed pressure in the park.

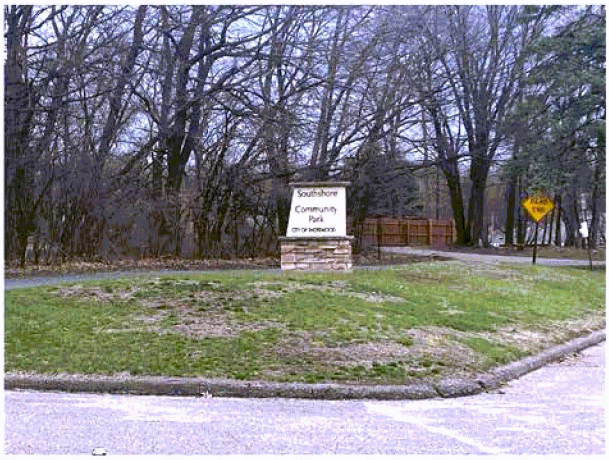


Figure 81: Bare areas near the parking lot of South Shore Community Park.

Figure 82: Ground ivy invading bare areas of South Shore Community Park.

Figure 83: Clover in a low turf density area of South Shore Community Park.

Figure 84: More clover in a low turf density area of South Shore Community Park.

Figure 85: Dandelions in a low turf density area of South Shore Community Park.

Current Soil Properties

South Shore Community Park has a relatively soft soil composition. The many trees in the park and their roots stopped the penetrometer reading completely. These roots will do the same for grass roots. The heavy shade and increased availability for organic matter provided by the trees makes the soil more susceptible to fungus, disease and moss growth. South Shore Park has an ideal

firmness for grass growth. Please find further discussion of the soil penetrometer results on Page 47.

13 Gideon Glen Site and Field Assessment

Gideon Glen has been classified as a Category C field by the City of Shorewood. After performing the assessment, Good Nature agrees that this is a Category C location. The location is mostly natural, with tall grass surrounding the pond. No treatment seems necessary for Gideon Glen.

14 Soil Testing Analysis

This analysis lists soil test figures in parenthesis and the specific order of soil tests will be listed at the top of each section.

Badger Park:

- **Exchange Capacity**: (24.20) Exchange capacity is indicative of a loam soil with relatively normal levels of organic matter .
- **Water pH**: (7.6) pH is **higher** than the desired level of 6.8. This is due to the excessively **high levels of calcium**. Our recommendation is to add a pH reducer to help with this.
- **Organic Material**: (5.89%) the percentage of organic matter is **within the desired range**.
- **Soluble Sulfur**: (133ppm) the level of soluble sulfur is **above the desired range,** but not so high that we need to attempt to reduce the sulfur level**.**
- **Phosphorus**: (78lbs/ac easily extractable & 284lbs/ac Bray II) These two numbers are both considered to determine the available phosphorus. The Bray II level we consider slightly more important than the easily available. This shows that the park is **deficient in phosphorus** and some will need to be added to reach the desired amount.
- **Calcium**: (7684lbs/ac) **Calcium levels are high**, and we recommend a pH reducer to try to break up the excess calcium.
- **Magnesium**: (838lbs/ac) Magnesium is **within the desired range.**
- **Potassium**: (180lbs/ac) Potassium is about **13 lbs per 1000 sqft deficient** in the soil. This is a major concern as Potassium is particularly important for wear tolerance, and will be one of the main focuses of the soil balancing recommendations.
- **Sodium**: (158lbs/ac) Sodium is **above the desired range,** in order to combat this, we suggest focusing on potassium applications. Potassium and sodium are close to the

same molecular size and have the same charge. Adding potassium to the soil will help to push the excess sodium out.

- **Boron**: (1.04ppm) Boron is **within the desired range**.
- **Iron**: (513ppm) Iron is **higher than desired**. Past experience has shown that balancing the major elements in the soil corrects Iron levels.
- **Manganese**: (47ppm) Manganese is **slightly lower than desired**. Past experience has shown that balancing the major elements in the soil allows for the Manganese level to correct itself.
- **Copper**: (2.57ppm) Copper is **slightly lower than desired.** Past experience has shown that balancing the major elements in the soil allows for the Copper level to correct itself.
- **Zinc**: (7.04ppm) Zinc is within the **desired range**.
- **Aluminum**: (67ppm) Aluminum levels are **lower than desired**. Past experience has shown that balancing the major elements in the soil corrects Aluminum levels.

Cathcart Park:

This analysis lists soil test figures in parenthesis with the following format *(hockey figure / infield figure / outfields figure / other figure)*

- **Exchange Capacity**: (16.89 / 17.65 / 16.37 / 18.22) Exchange capacity is indicative of a loam soil with relatively normal levels of organic matter .
- **Water pH**: (7.8 / 7.7 / 7.5 / 7.6) pH is **higher** than the desired level of 6.8. This is due to the excessively **high levels of calcium**. Our recommendation is to add a pH reducer to help with this.
- **Organic Material**: (3.46% / 4.00% / 4.37% / 3.95%) the percentage of organic matter is **slightly lower than the desired range**. Adding organic matter should help to increase the exchange capacity as well as reduce compaction by introducing more soil biota.
- **Soluble Sulfur**: (5ppm / 6ppm / 7ppm / 4ppm) the level of soluble sulfur is **below the desired range.**
- **Phosphorus**: (110lbs/ac easily extractable & 298lbs/ac Bray II / 82lbs/ac easily extractable & 179lbs/ac Bray II / 119lbs/ac easily extractable & 215lbs/ac Bray II / 82lbs/ac easily extractable & 270lbs/ac Bray II) These two numbers are both considered to determine the available phosphorus. The Bray II level we consider slightly more important than the easily available. This shows that the park is **deficient in phosphorus** and some will need to be added to reach the desired amount.

- **Calcium**: (5310lbs/ac / 4796lbs/ac / 4476lbs/ac / 5264lbs/ac) **Calcium levels are high**, and we recommend a pH reducer to try to break up the excess calcium.
- **Magnesium**: (628lbs/ac / 1096lbs/ac / 994lbs/ac / 934lbs/ac) Magnesium is **above the desired range** and we recommend a pH reducer or aeration to try to break up the excess magnesium.
- **Potassium**: (200lbs/ac / 226lbs/ac / 204lbs/ac / 268lbs/ac) Potassium is about **7 lbs per 1000sqft deficient** in the soil. This is a major concern as Potassium is particularly important for wear tolerance, and will be one of the main focuses of the soil balancing recommendations.
- **Sodium**: (62lbs/ac / 68lbs/ac / 62lbs/ac / 60lbs/ac) Sodium is **within the desired range.**
- **Boron**: (0.73ppm / 0.79ppm / 0.73ppm / 0.64ppm) Boron is **slightly below the desired range**. Past experience has shown that balancing the major elements in the soil corrects Boron levels.
- **Iron**: (202ppm / 172ppm / 173ppm / 135ppm) Iron is **slightly below the desired range**. Past experience has shown that balancing the major elements in the soil corrects Iron levels.
- **Manganese**: (145ppm / 92ppm / 89ppm / 110ppm) Manganese is **slightly lower than desired**. Past experience has shown that balancing the major elements in the soil allows for the Manganese level to correct itself.
- **Copper**: (1.83ppm / 1.83ppm / 1.67ppm / 3.18ppm) Copper is **lower than desired**. Past experience has shown that balancing the major elements in the soil allows for the Copper level to correct itself.
- **Zinc**: (2.38ppm / 1.66ppm / 2.47ppm / 2.69ppm) Zinc is **lower than desired**. Past experience has shown that balancing the major elements in the soil allows for the Copper level to correct itself.
- **Aluminum**: (273ppm / 365ppm / 319ppm / 332ppm) Aluminum levels are **lower than desired**. Past experience has shown that balancing the major elements in the soil corrects Aluminum levels.

Freeman Park:

This analysis lists soil test figures in parenthesis with the following format *(shelter figure/ baseball infields 1-3 figure/ baseball outfields 1-3 figure/ baseball infields 4-6 figure/ baseball outfields 4-6 figure/ soccer figure/ B fields figure)*

- **Exchange Capacity**: (26.37 / 24.37 / 20.96 / 25.00 / 22.28 / 25.69 / 28.71) Exchange capacity is indicative of a loam soil with relatively normal levels of organic matter .
- **Water pH**: (7.9 / 7.7 / 7.6 / 7.9 / 7.9 / 7.7 / 7.7) pH is **higher** than the desired level of 6.8. This is due to the excessively **high levels of calcium and magnesium**. Our recommendation is to add a pH reducer to help with this.
- **Organic Material**: (4.91% / 5.43% / 3.91% / 4.03% / 4.44% / 5.11% / 5.21%) the percentage of organic matter is **slightly lower than the desired range**. Adding organic matter should help to increase the exchange capacity as well as reduce compaction by introducing more soil biota.
- **Soluble Sulfur**: (8ppm / 9ppm / 6ppm / 6ppm / 7ppm / 6ppm / 8ppm) the level of soluble sulfur is **below the desired range.**
- **Phosphorus**: (92lbs/ac easily extractable & 256lbs/ac Bray II / 78lbs/ac easily extractable & 224lbs/ac Bray II / 92lbs/ac easily extractable & 252lbs/ac Bray II / 50lbs/ac easily extractable & 224lbs/ac Bray II / 73lbs/ac easily extractable & 234lbs/ac Bray II / 60lbs/ac easily extractable & 206lbs/ac Bray II / 78lbs/ac easily extractable & 151lbs/ac Bray II) These two numbers are both considered to determine the available phosphorus. The Bray II level we consider slightly more important than the easily available. This shows that the park is **deficient in phosphorus** and some will need to be added to reach the desired amount.
- **Calcium**: (7880lbs/ac / 7224lbs/ac / 6068lbs/ac / 7224lbs/ac / 6384lbs/ac / 7664lbs/ac / 5986lbs/ac) **Calcium levels are high**, and we recommend a pH reducer to try to break up the excess calcium.
- **Magnesium**: (1262lbs/ac / 1162lbs/ac / 1098lbs/ac / 1336lbs/ac / 1224lbs/ac / 1238lbs/ac / 1080lbs/ac) **Magnesium levels are high** and we recommend a pH reducer or aeration to try to break up the excess magnesium.
- **Potassium**: (270lbs/ac / 316lbs/ac / 228lbs/ac / 272lbs/ac / 246lbs/ac / 208lbs/ac / 266lbs/ac) Potassium is about **9 to 13 lbs per 1000sqft deficient** in the soil. This is a major concern as Potassium is particularly important for wear tolerance, and will be one of the main focuses of the soil balancing recommendations.
- **Sodium**: (64lbs/ac / 66lbs/ac / 60lbs/ac / 68lbs/ac / 58lbs/ac / 70lbs/ac / 64lbs/ac) Sodium is **within the desired range.**
- **Boron**: (0.74ppm / 1.11ppm / 0.67ppm / 0.72ppm / 0.77ppm / 0.74ppm / 0.76ppm) Boron is **below the desired range**. Past experience has shown that balancing the major elements in the soil corrects Boron levels.

- **Iron**: (135ppm / 201ppm / 172ppm / 155ppm / 169ppm / 151ppm / 129ppm) Iron is **below the desired range**. Past experience has shown that balancing the major elements in the soil corrects Iron levels.
- **Manganese**: (62ppm / 94ppm / 839ppm / 87ppm / 71ppm / 62ppm / 111ppm) Manganese is **lower than desired**. Past experience has shown that balancing the major elements in the soil allows for the Manganese level to correct itself.
- **Copper**: (2.63ppm / 2.34ppm / 2.07ppm / 2.59ppm / 6.8ppm / 2.6ppm / 1.95ppm) Copper is **lower than desired**. Past experience has shown that balancing the major elements in the soil allows for the Copper level to correct itself.
- **Zinc**: (2.57ppm / 2.79ppm / 2.20ppm / 1.61ppm / 2.38pm / 2.26ppm / 3.56ppm) Zinc is **lower than desired**. Past experience has shown that balancing the major elements in the soil allows for the Copper level to correct itself.
- **Aluminum**: (139ppm / 123ppm / 319ppm / 142ppm / 270ppm / 213ppm / 277ppm) Aluminum levels are **lower than desired**. Past experience has shown that balancing the major elements in the soil corrects Aluminum levels.

Manor Park:

This analysis lists soil test figures in parenthesis with the following format *(soccer figure / outfield figure / playground figure)*

- **Exchange Capacity**: (16.41 / 16.78 / 17.68) Exchange capacity is indicative of a loam soil with relatively normal levels of organic matter .
- **Water pH**: (7.5 / 7.7 / 7.5) pH is **higher** than the desired level of 6.8. This is due to the excessively **high levels of calcium**. Our recommendation is to add a pH reducer to help with this.
- **Organic Material**: (3.61% / 3.97% / 3.80%) the percentage of organic matter is **lower than the desired range**. Adding organic matter should help to increase the exchange capacity as well as reduce compaction by introducing more soil biota.
- **Soluble Sulfur**: (7ppm / 6ppm / 9ppm) the level of soluble sulfur is **below the desired range.**
- **Phosphorus**: (156lbs/ac easily extractable & 270lbs/ac Bray II / 179lbs/ac easily extractable & 307lbs/ac Bray II / 124lbs/ac easily extractable & 238lbs/ac Bray II) These two numbers are both considered to determine the available phosphorus. The Bray II level we consider slightly more important than the easily available. This shows that the

park is **deficient in phosphorus** and some will need to be added to reach the desired amount.

- **Calcium**: (4530lbs/ac / 4458lbs/ac / 5378lbs/ac) **Calcium levels are high**, and we recommend a pH reducer to try to break up the excess calcium.
- **Magnesium**: (960lbs/ac / 1082lbs/ac / 754lbs/ac) Magnesium is **above the desired range** and we recommend a pH reducer or aeration to try to break up the excess magnesium.
- **Potassium**: (250lbs/ac / 324lbs/ac / 210lbs/ac) Potassium is about **5 to 8 lbs per 1000sqft deficient** in the soil. This is a major concern as Potassium is particularly important for wear tolerance, and will be one of the main focuses of the soil balancing recommendations.
- **Sodium**: (56lbs/ac / 42lbs/ac / 62lbs/ac) Sodium is **within the desired range.**
- **Boron**: (0.84ppm / 0.60ppm / 0.66ppm) Boron is **slightly below the desired range**. Past experience has shown that balancing the major elements in the soil corrects Boron levels.
- **Iron**: (144ppm / 144ppm / 231ppm) Iron is **below the desired range**. Past experience has shown that balancing the major elements in the soil corrects Iron levels.
- **Manganese**: (135ppm / 168ppm / 103ppm) Manganese is **lower than desired**. Past experience has shown that balancing the major elements in the soil allows for the Manganese level to correct itself.
- **Copper**: (2.17ppm / 1.69ppm / 2.31ppm) Copper is **lower than desired**. Past experience has shown that balancing the major elements in the soil allows for the Copper level to correct itself.
- **Zinc**: (4.33ppm / 3.91ppm / 3.12ppm) Zinc is **lower than desired**. Past experience has shown that balancing the major elements in the soil allows for the Copper level to correct itself.
- **Aluminum**: (406ppm / 337ppm / 257ppm) Aluminum levels are **lower than desired**. Past experience has shown that balancing the major elements in the soil corrects Aluminum levels.

South Shore Community Park:

- **Exchange Capacity**: (17.21) Exchange capacity is indicative of a sandy loam soil with relatively normal levels of organic matter .

- **Water pH**: (8.0) pH is **higher** than the desired level of 6.8. This is due to the excessively **high levels of calcium**. Our recommendation is to add a pH reducer to help with this.
- **Organic Material**: (3.95%) the percentage of organic matter is **within the desired range**.
- **Soluble Sulfur**: (13ppm) the level of soluble sulfur is **below the desired range.**
- **Phosphorus**: (78lbs/ac easily extractable & 261lbs/ac Bray II) These two numbers are both considered to determine the available phosphorus. The Bray II level we consider slightly more important than the easily available. This shows that the park is **deficient in phosphorus** and some will need to be added to reach the desired amount.
- **Calcium**: (5216lbs/ac) **Calcium levels are high**, and we recommend a pH reducer to try to break up the excess calcium.
- **Magnesium**: (762lbs/ac) Magnesium is **above the desired range.**
- **Potassium**: (192lbs/ac) Potassium is about **8 lbs per 1000sqft deficient** in the soil. This is a major concern as Potassium is particularly important for wear tolerance, and will be one of the main focuses of the soil balancing recommendations.
- **Sodium**: (74lbs/ac) Sodium is **above the desired range,** in order to combat this, we suggest focusing on potassium applications. Potassium and sodium are close to the same molecular size and have the same charge. Adding potassium to the soil will help to push the excess sodium out.
- **Boron**: (0.76ppm) Boron is **below the desired range**.
- **Iron**: (128ppm) Iron is **lower than desired**. Past experience has shown that balancing the major elements in the soil corrects Iron levels.
- **Manganese**: (138ppm) Manganese is **higher than desired.** Past experience has shown that balancing the major elements in the soil allows for the Manganese level to correct itself.
- **Copper**: (2.65ppm) Copper is **lower than desired.** Past experience has shown that balancing the major elements in the soil allows for the Copper level to correct itself.
- **Zinc**: (6.35ppm) Zinc is **lower than desired**. Past experience has shown that balancing the major elements in the soil allows for the Copper level to correct itself.
- **Aluminum**: (239ppm) Aluminum levels are **lower than desired**. Past experience has shown that balancing the major elements in the soil corrects Aluminum levels.

15 Soil Physical Properties

Good Nature performed Physical Analysis tests on each park to determined each soil's categorization based on the percentages of sand, silt, and clay for each sample.

BROOKSIDE LABORATORIES, INC.
** PHYSICAL ANALYSIS REPORT **

Badger Park
5745 Country Club Rd
Shorewood, MN 55331

File Number: 88042
Date Received: 08/18/2022
Date Reported: 08/22/2022

Submitted By: A C Zander, Inc. - Good Nature

SAMPLE LOCATION: LAWN

NBR	FIELD	DESCRIPTION	Clay (%)	Silt (%)	Sand (%)
003	WHOLE	51	18.74	29.82	51.44

Figure 101 (above): Badger Park Physical Analysis from Brookside Labs.

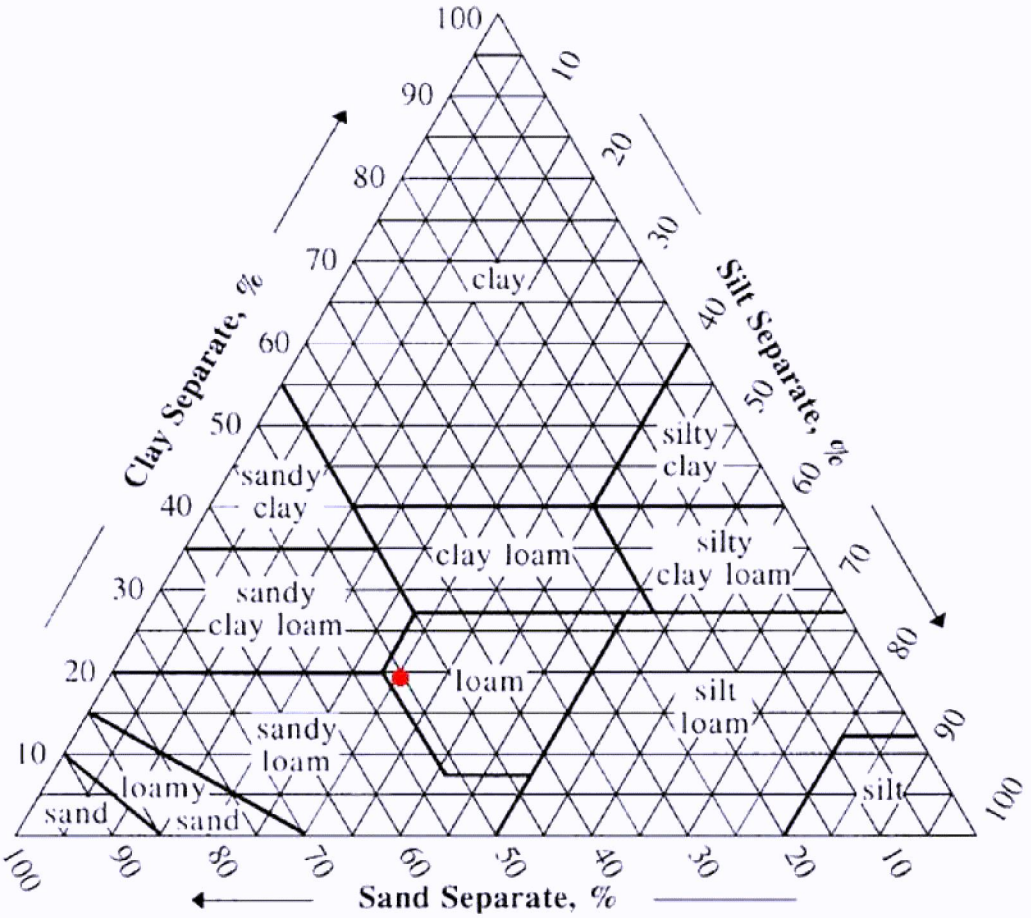


Figure 102 (above): Badger Park Sand-Silt-Clay triangle derived from Physical Analysis Results. This shows that Badger Park is classified as a loam soil.

BROOKSIDE LABORATORIES, INC.

** PHYSICAL ANALYSIS REPORT **

Cathcart Park
26716 W 62nd St.
Shorewood, MN 55331

File Number: 88044
Date Received: 08/18/2022
Date Reported: 08/22/2022

Submitted By: A C Zander, Inc. - Good Nature

SAMPLE LOCATION: LAWN

NBR	FIELD	DESCRIPTION	Clay (%)	Silt (%)	Sand (%)
004	WHOLE	111	21.40	30.84	47.76

Figure 103 (above): Cathcart Park Physical Analysis from Brookside Labs.

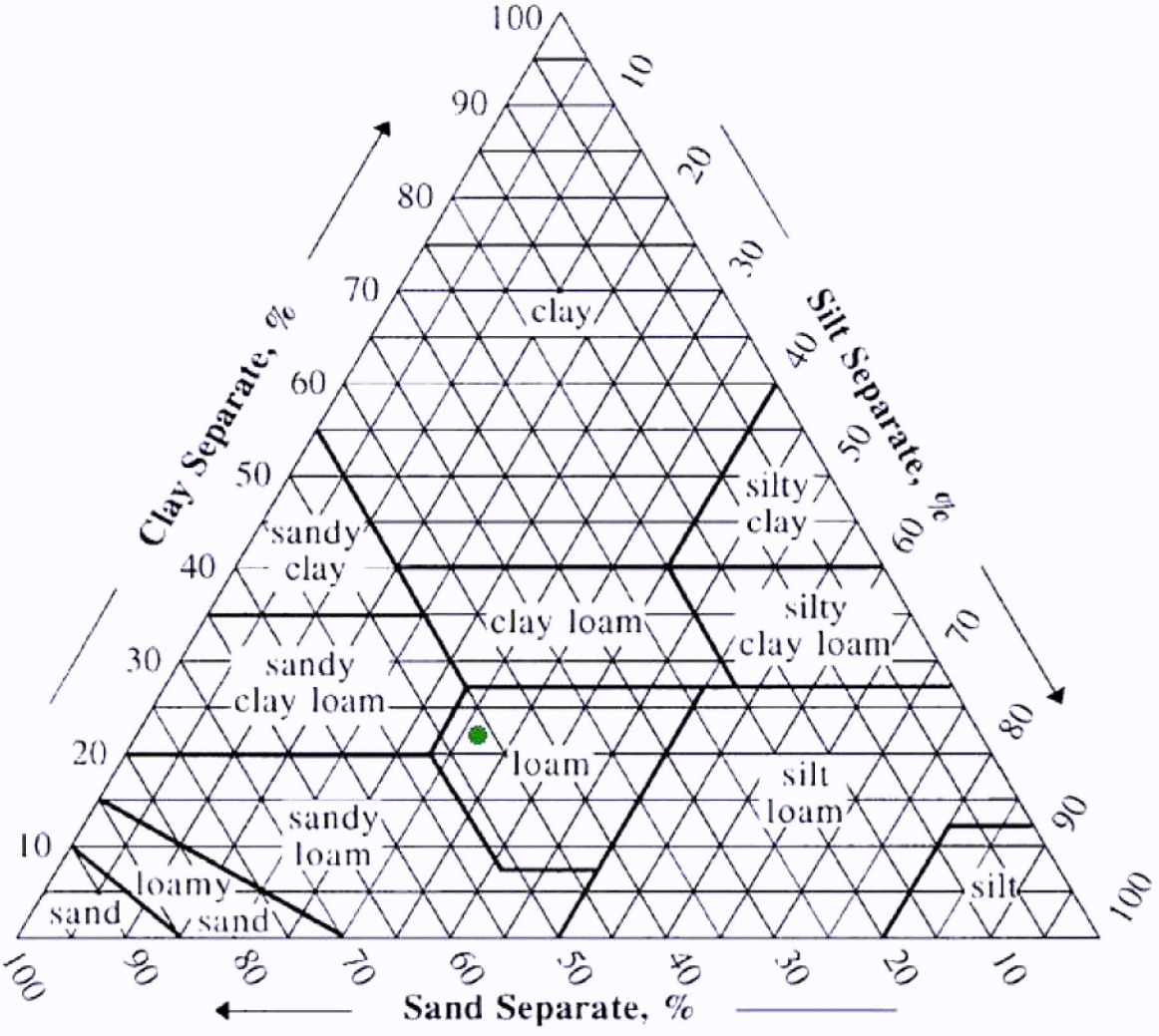


Figure 104 (above): Cathcart Park Sand-Silt-Clay triangle derived from Physical Analysis Results. This shows that Cathcart Park is classified as a loam soil.

BROOKSIDE LABORATORIES, INC.

** PHYSICAL ANALYSIS REPORT **

Freeman Park
6000 Eureka Road
Shorewood, MN 55331

File Number: 88045
Date Received: 08/18/2022
Date Reported: 08/22/2022

Submitted By: A C Zander, Inc. - Good Nature

SAMPLE LOCATION: LAWN

NBR	FIELD	DESCRIPTION	Clay (%)	Silt (%)	Sand (%)
001	WHOLE	835	25.50	44.93	29.57

Figure 105 (above): Freeman Park Physical Analysis from Brookside Labs.

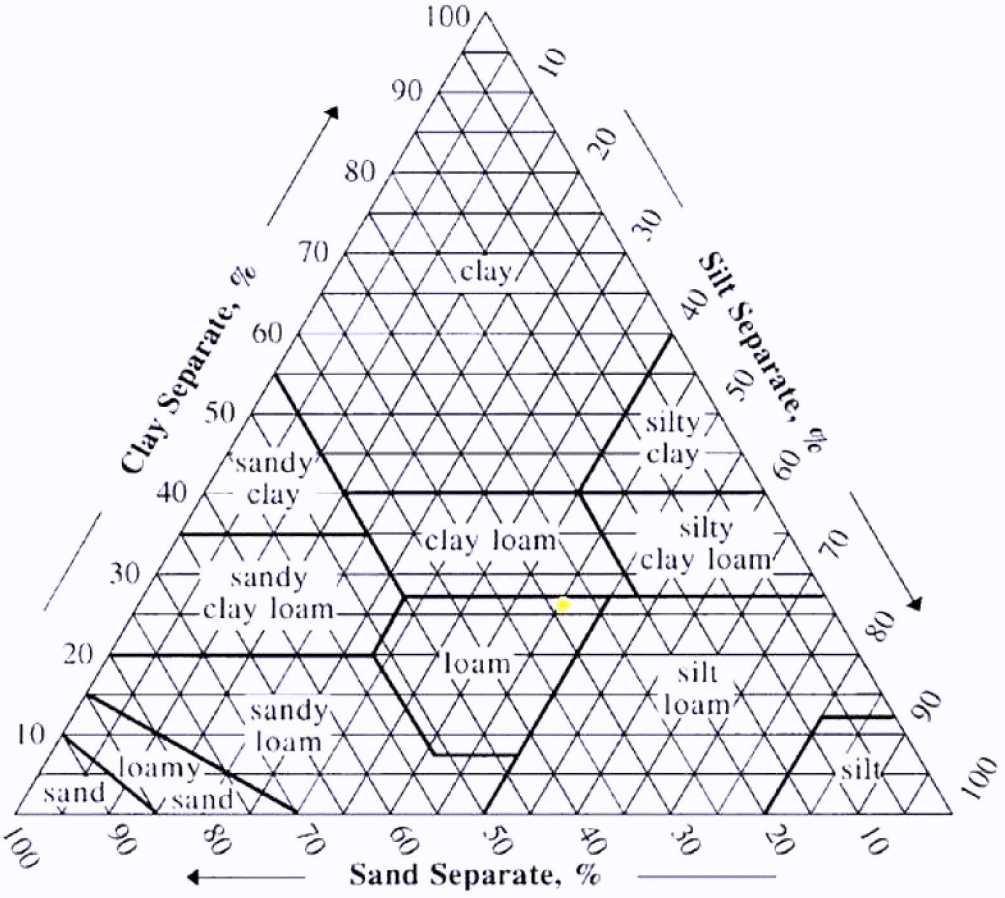


Figure 106 (above): Freeman Park Sand-Silt-Clay triangle derived from Physical Analysis Results. This shows that Freeman Park is classified as a loam soil.

BROOKSIDE LABORATORIES, INC.

** PHYSICAL ANALYSIS REPORT **

Manor Park
20600 Manor Park Rd.
Shorewood, MN 55331

File Number: 88043
Date Received: 08/18/2022
Date Reported: 08/22/2022

Submitted By: A C Zander, Inc. - Good Nature

SAMPLE LOCATION: LAWN

NBR	FIELD	DESCRIPTION	Clay (%)	Silt (%)	Sand (%)
002	WHOLE	172	22.08	33.19	44.73

Figure 107 (above): Manor Park Physical Analysis from Brookside Labs.

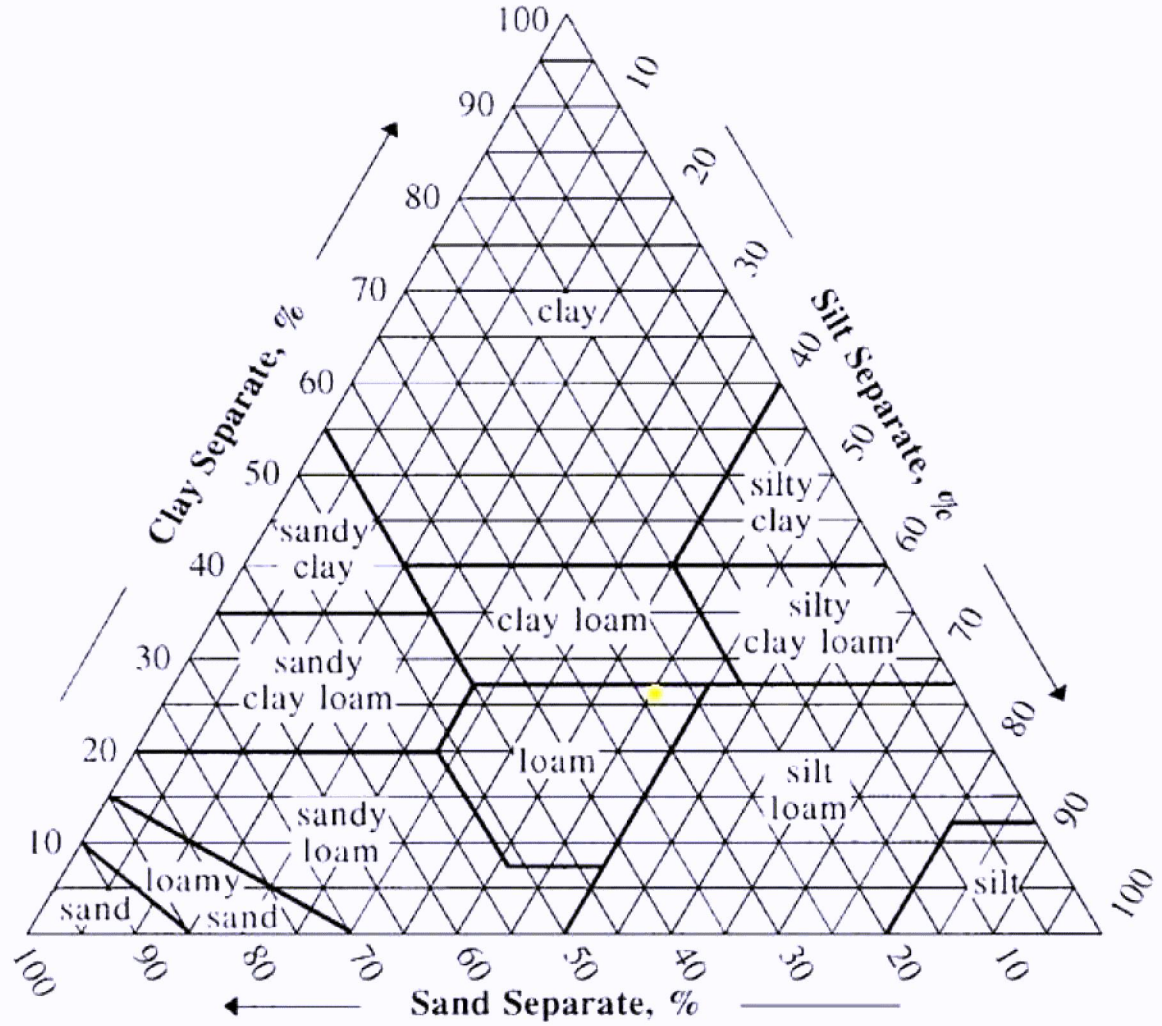


Figure 108 (above): Manor Park Sand-Silt-Clay triangle derived from Physical Analysis Results. This shows that Manor Park is classified as a loam soil.

BROOKSIDE LABORATORIES, INC.

** PHYSICAL ANALYSIS REPORT **

Southshore Park
5355 St. Albans Bay Rd.
Shorewood, MN 55331

File Number: 88041
Date Received: 08/22/2022
Date Reported: 08/25/2022

Submitted By: A C Zander, Inc. - Good Nature

SAMPLE LOCATION: LAWN

NBR	FIELD	DESCRIPTION	Clay (%)	Silt (%)	Sand (%)
003	WHOLE	89	16.81	21.08	62.11

Figure 109: South Shore Community Park Physical Analysis from Brookside Labs.

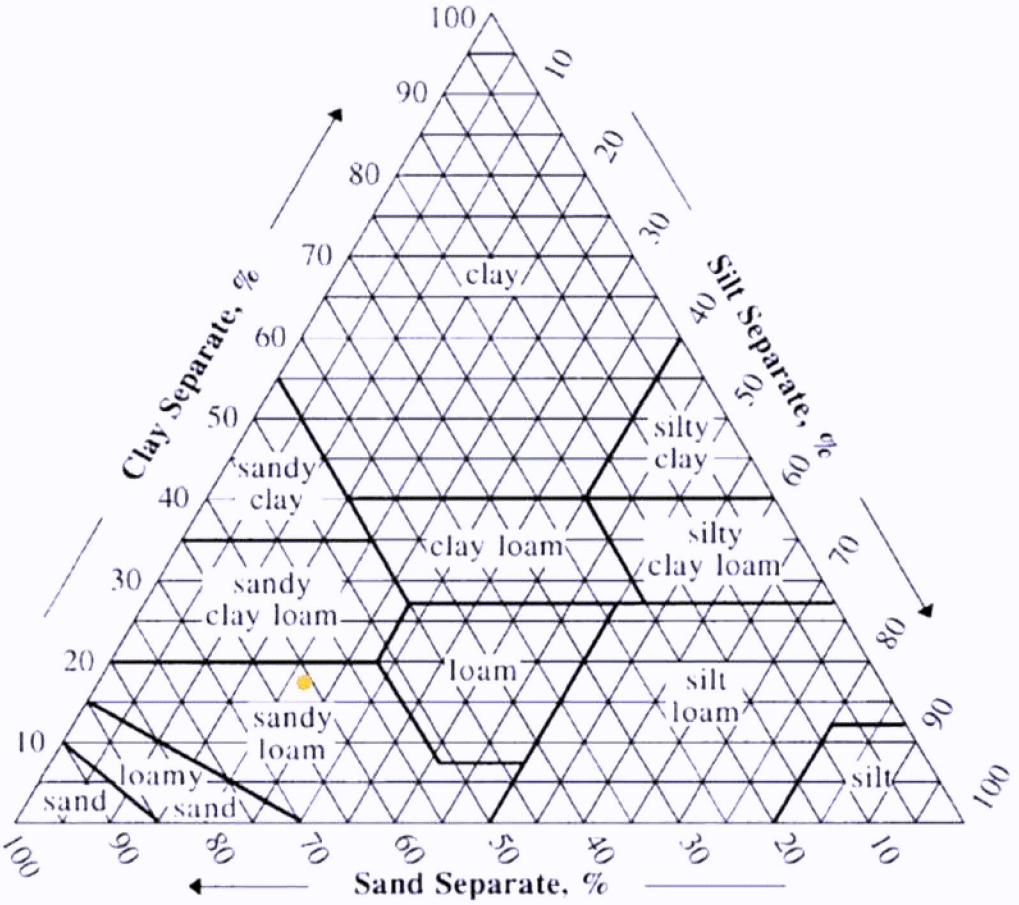


Figure 110: South Shore Community Park Sand-Silt-Clay triangle derived from Physical Analysis Results. This shows that South Shore Community Park is classified as sandy loam.

16 Soil Penetrometer Results

Badger Park

Figure 112 shows that the soil compaction in A areas of Badger Park exceed levels considered limiting to turf root growth (>300 psi). Two inches into the soil will only allow about 35% to 10% of root growth. Figure 113 indicates further compaction in the B areas of Badger Park, with some sections not allowing root penetration. Aerating the soil should help increase root infiltration and overall turf density and health.

Badger Park A Areas	Location 1	Location 2	Location 3	Location 4	Location 5	Location 6
2 inches	275	275	250	200	200	200
4 inches	275	275	250	250	250	250
6 inches	300	275	250	300	300	300
12 inches	>300	275	300	>300	>300	>300

Figure 112 (above): Soil penetrometer results at 2, 4, 6, and 12 inches for the A areas in Badger Park. The locations were randomly selected to get an accurate mapping of the park.

Badger Park B Areas	Location 1	Location 2	Location 3	Location 4
2 inches	250	300	300	250
4 inches	300	>300	>300	300
6 inches	>300	>300	>300	>300
12 inches	>300	>300	>300	>300

Figure 113 (above): Soil penetrometer results at 2, 4, 6, and 12 inches for the B areas in Badger Park. The locations were randomly selected to get an accurate mapping of the park.

Cathcart Park

Figure 114 shows that the soil compaction level in the infield and outfield in Cathcart Park range from moderate to high enough compaction to cause a significant decrease in turf root growth. Two inches into the soil will only allow about 50% to 25% of root growth. Figure 115, also, shows compaction in the hockey field and playground areas of Cathcart Park, only allowing 40% to 15% of grass roots to penetrate the soil at 2 inches. Aerating the soil should help increase root infiltration and overall turf density and health.

Cathcart Infield	Location 1	Location 2	Location 3	Cathcart Outfield	Location 1	Location 2	Location 3
2 inches	200	225	175	2 inches	150	200	200
4 inches	250	275	200	4 inches	200	250	250
6 inches	300	300	250	6 inches	275	275	300
12 inches	>300	>300	250	12 inches	300	300	>300

Figure 114 (above): Soil penetrometer results at 2, 4, 6, and 12 inches for the infield and outfield in Cathcart Park. The locations were randomly selected to get an accurate mapping of the park.

Cathcart Playground	Location 1	Location 2	Location 3	Cathcart Hockey	Location 1	Location 2	Location 3
2 inches	200	175	175	2 inches	200	250	200
4 inches	300	275	275	4 inches	275	300	275
6 inches	>300	275	300	6 inches	300	>300	300
12 inches	>300	275	>300	12 inches	>300	>300	>300

Figure 115 (above): Soil penetrometer results at 2, 4, 6, and 12 inches for the playground area and hockey rink area in Cathcart Park. The locations were randomly selected to get an accurate mapping of the park.

Freeman Park

Figures 116 through 118 show moderate soil compaction levels in the infield and outfield of fields 1-3 in Freeman Park. This compaction will minorly affect turf root growth rate. Two inches into the soil will allow about 80% to 35% of root growth.

Figures 119 through 121 show moderate soil compaction levels in the infield and outfield of fields 4-6 in Freeman Park and will minorly affect the rate of turf root growth. Two inches into the soil will allow about 80% to 45% of root growth.

The concessions area has higher levels of compaction, only allowing for about 45% of root penetration at two inches. The soccer fields only have mild compaction, allowing 70% to 40% root penetration at two inches. Aerating the soil should help increase root infiltration and overall turf density and health in all areas of Freeman Park.

Freeman Infield 1	Location 1	Location 2	Location 3	Freeman Outfield 1	Location 1	Location 2	Location 3
2 inches	150	200	175	2 inches	100	125	50

4 inches	150	200	200	4 inches	150	175	75
6 inches	200	225	250	6 inches	200	200	75
12 inches	200	250	250	12 inches	250	200	100

Figure 116 (above): Soil penetrometer results at 2, 4, 6, and 12 inches for the infield and outfield of field 1 in Freeman Park. The locations were randomly selected to get an accurate mapping of the park.

Freeman Infield 2	Location 1	Location 2	Location 3	**Freeman Outfield 2**	Location 1	Location 2	Location 3
2 inches	100	200	150	2 inches	100	50	50
4 inches	250	225	250	4 inches	250	200	125
6 inches	300	300	300	6 inches	300	300	200
12 inches	>300	>300	>300	12 inches	>300	>300	250

Figure 117 (above): Soil penetrometer results at 2, 4, 6, and 12 inches for the infield and outfield of field 2 in Freeman Park. The locations were randomly selected to get an accurate mapping of the park.

Freeman Infield 3	Location 1	Location 2	Location 3	**Freeman Outfield 3**	Location 1	Location 2	Location 3
2 inches	175	200	200	2 inches	100	100	150
4 inches	275	300	275	4 inches	200	200	150
6 inches	300	>300	300	6 inches	250	225	175
12 inches	>300	>300	>300	12 inches	300	250	250

Figure 118 (above): Soil penetrometer results at 2, 4, 6, and 12 inches for the infield and outfield of field 3 in Freeman Park. The locations were randomly selected to get an accurate mapping of the park.

Freeman Infield 4	Location 1	Location 2	Location 3	**Freeman Outfield 4**	Location 1	Location 2	Location 3
2 inches	225	175	200	2 inches	200	225	200
4 inches	275	225	250	4 inches	250	300	235
6 inches	300	250	275	6 inches	300	>300	275
12 inches	>300	300	300	12 inches	>300	>300	300

Figure 119 (above): Soil penetrometer results at 2, 4, 6, and 12 inches for the infield and outfield of field 4 in Freeman Park. The locations were randomly selected to get an accurate mapping of the park.

Freeman Infield 5	Location 1	Location 2	Location 3	**Freeman Outfield 5**	Location 1	Location 2	Location 3
2 inches	100	100	175	2 inches	100	150	100

4 inches	200	100	200	4 inches	150	200	175
6 inches	250	200	250	6 inches	200	250	300
12 inches	275	250	300	12 inches	275	300	>300

Figure 120 (above): Soil penetrometer results at 2, 4, 6, and 12 inches for the infield and outfield of field 5 in Freeman Park. The locations were randomly selected to get an accurate mapping of the park.

Freeman Infield 6	Location 1	Location 2	Location 3	**Freeman Outfield 6**	Location 1	Location 2	Location 3
2 inches	100	100	200	2 inches	150	175	200
4 inches	200	200	200	4 inches	175	200	250
6 inches	275	300	250	6 inches	250	225	300
12 inches	300	>300	250	12 inches	300	275	>300

Figure 121 (above): Soil penetrometer results at 2, 4, 6, and 12 inches for the infield and outfield of field 6 in Freeman Park. The locations were randomly selected to get an accurate mapping of the park.

Freeman Concessions	Location 1	Location 2	Location 3	**Freeman Playground**	Location 1	Location 2	Location 3
2 inches	200	200	175	2 inches	175	200	175
4 inches	225	275	250	4 inches	200	200	200
6 inches	275	300	275	6 inches	275	225	250
12 inches	300	>300	300	12 inches	300	225	275

Figure 122 (above): Soil penetrometer results at 2, 4, 6, and 12 inches for the concessions area and the playground area in Freeman Park. The locations were randomly selected to get an accurate mapping of the park.

Freeman Park Soccer	Location 1	Location 2	Location 3	Location 4	Location 5	Location 6
2 inches	100	175	100	100	175	175
4 inches	175	200	200	200	200	225
6 inches	200	225	275	275	225	250
12 inches	250	250	300	300	275	250

Figure 123 (above): Soil penetrometer results at 2, 4, 6, and 12 inches for the soccer field area in Freeman Park. The locations were randomly selected to get an accurate mapping of the park.

Manor Park Soil Penetrometer Results:

Manor Park has minor compaction issues. Compaction is heavy near the shelter area, so focusing on that area for aeration is all that Manor Park needs.

Manor Playground	Playground	Tennis Courts	Shelter	Soccer 1	Soccer 2
2 inches	100	100	200	75	125
4 inches	125	150	200	250	175
6 inches	150	150	>300	300	275
12 inches	175	175	>300	>300	>300

Figure 124 (above): Soil penetrometer results at 2, 4, 6, and 12 inches for Manor Park. The locations were randomly selected to get an accurate mapping of the park.

South Shore Community Park:

South Shore Community Park does not have compaction issues like some of the other parks in Shorewood. Aeration does not seem necessary.

South Shore Community Park	Location 1	Location 2	Location 3	Location 4	Location 5	Location 6	Location 7
2 inches	75	100	100	75	100	100	75
4 inches	125	175	175	75	150	100	100
6 inches	150	200	175	125	175	150	100
12 inches	175	250	250	225	250	150	150

Figure 125 (above): Soil penetrometer results at 2, 4, 6, and 12 inches for South Shore Community Park. The locations were randomly selected to get an accurate mapping of the park.

17 Cultural Practices Recommendations

Shorewood should implement the following recommendations to adhere to their Bee Safe City Resolution and adopt a more organic landscaping approach. First and foremost, Shorewood should minimize pesticide use on the fields where children play by balancing the soil and applying less toxic weed and pest control strategies. This assessment recommends fully organic fertilizers, but understands these products can far exceed constrained city budgets. So, the assessment, also, recommends a mix of organic and traditional fertilizers. The recommended "traditional" or synthetic fertilizer materials will help balance the soil and not affect it negatively. The recommendations below are a starting point, but we can help advise you on how to best work within your budget.

Mowing

The City of Shorewood mows its parks once a week at three inches and twice a week at three inches for their athletic fields. We recommend continuing this excellent practice for athletic fields. Longer blades help grass roots grow deeper into the soil. Longer roots absorb more water and nutrients and outcompete weeds with shallower roots. Also, taller turfgrass shades small weed seeds preventing germination. Taller turf will help the lawn to look less thin and bare as well. There is a common misconception that you start the season at a two inch mowing height and gradually increase it to three inches. We highly recommend that you start mowing slightly higher than your sports programs would prefer (3-4") in the Spring to encourage roots to move deeper into the soil prior to the heat of Summer.

We recommend that the city follows the ⅓ rule that states: mowing should never cut more than ⅓ of the grassblade at a time. Cutting a significant part of the grass blade causes the grass to discolor and wilt, because the plant needs to rapidly readjust to a lack of chlorophyll supply. The ⅓ rule applies to the frequency of mowing as well. Turfgrass grows at different rates throughout the year. Turf tends to grow faster in the spring while slowing down in the summer. Shorewood's mowing schedule should factor the rate at which grass grows. Mowing twice per week at three inches should work well for the spring and fall. The City may be able to decrease mowing frequency in the summer, because turf grows slower in the heat and under drought stress. Also, the City should cut shorter (two inches) as the grass stops growing in the fall to prevent winter diseases such as Snow Mold. This mowing schedule removes warm pockets for diseases to incubate when the snow begins to fall and cover the grass.

Irrigation

Irrigation levels and schedules vary depending on many factors such as soil type, tree roots, shade levels, slopes and organic matter levels. Each park has different features and may subsequently need different watering schedules. Generally, turfgrass only needs one inch of water each week during spring and fall, but may need as much as two inches in the summer to fight drought and heat stress. Currently, Shorewood reports not irrigating any of their parks.

In general, the less frequently you can water, the better. Frequent watering contributes to increased weed and disease pressure and decreased turf quality. Frequent watering is necessary in sandy soils, but the loam soil should be able to do well with less frequent irrigation.

We would recommend irrigating early in the morning and choosing days that will have the least traffic on them that afternoon.

Ideally, installing sprinkler systems in each park would make watering the turf easier and faster to manage, but we understand that the costs for such a project would be very expensive. Overall, Shorewood should observe a visible increase in turf health and density if they can allocate the time and labor to water each park once a week. If impractical to irrigate all fields, Shorewood can help keep the grass from suffering drought stress by watering the class A parks (Freeman, Manor, & Badger) once a week in the summer.

Core Aeration

The City of Shorewood has reported that they have not aerated their parks for the past 6 years. Badger Park, Cathcart Park, Freeman Park, and Manor Park would all benefit from some form of core aeration. Compaction in most areas may not limit turf density significantly. However, aeration increases both root density and player safety by reducing tripping hazards making the soil surface softer for falls.

Compaction has reached turf growth limiting levels in some locations such as the area surrounding the concession stand in Freeman Park. A mixture of liquid and core aerations can prevent other areas in the parks from facing these same compaction issues.

The Physical Analysis (see figures 101 through 110) test results from Brookside Laboratories identified loam soils at all parks. Loam soils contain ideal proportions of sand, silt and clay particles for turfgrass root growth. Despite the desirable soil, the athletic fields and the surrounding areas have a higher probability of compaction because of their frequency of use. Aerating the soil before severe compaction should keep the turfgrass healthy and dense.

Core or hollow-tine aerators effectively break-up the upper layers of soil and obtain an immediate result. Aeration, also, better incorporates soil amendments, fertilizers and seeds into the soil. Liquid aeration reaches deeper into the soil when properly watered into the turf, requires less labor and does not harm underground equipment like sprinkler systems and underground cables.

We suggest that Shorewood aerates its Category A athletic fields at least twice a year to keep soil at a reasonable level of hardness and compaction. Shorewood should liquid aerate as often as possible. Hollow-tine core aeration should be performed at least once per season in the Fall and or Late Fall and works best when combined with seeding. Slicing aeration or shatter tine aeration can reduce compaction with minimal impact on playability during the season.

Overseeding

The City of Shorewood reported no overseeding for any of their parks from 2015 to 2021. Most of the parks have some thin or bare areas in the turf on the athletic fields, around the paved paths and along any other areas that have concentrated heavy foot traffic. To fill these areas, we recommend seeding every year. Shorewood should focus overseeding on the athletic fields in particular.

There are 3 ways to introduce seed to your parks:

1. Broadcast Overseeding with Spreader (Allow Players to Cleat in - Ok)
2. Core Aeration and Broadcast Seeding with Spreader (Better)
3. Core Aeration and Slice Seeding (Very Good)
4. Aer A Vator Power Seeding (Very Good)

Slit Seeding in addition to core aeration improves the effectiveness of the seeding. An alternative would be to use a power seeder such as the Aeravator from First Products.

Shorewood can seed its fields as often as desired. Ideally, Shorewood can schedule a dormant slit seeding in conjunction with a core aeration at the end of each season. This dormant seeding will ensure quicker germination than seeding in the spring alone. If labor and budget allow, Shorewood can improve athletic field performance by broadcast or slice seeding Perennial Ryegrass into high wear areas in April, May, September, and October.

Seeding entire parks would get expensive. To reduce costs, this report highly suggests only seeding athletic fields and the struggling grass areas at Badger Park. Implementation of proper cultural practices should strengthen and thicken the turf and reduce small bare spots. We recommend focusing seeding on athletic fields, and in Badger Park. Introducing microclover (see section below), into your seeding practices would, also, help to make the fields appear thicker and greener.

Seed Selection

The parks in Shorewood currently consist mainly of Kentucky Bluegrass and Perennial Ryegrass. These grass types best fit the locations, foot traffic stress and Shorewood field maintenance program. Continuing to seed with a high quality Kentucky Bluegrass seed will maintain the uniform turf appearance and limit labor and product costs. If Dormant Seeding, choose a mix of Kentucky Bluegrass and Perennial Ryegrass. Seed with Perennial Ryegrass in the Spring.

Microclover

Microclover is an excellent addition to low maintenance or athletic field turf. Microclover fixes nitrogen and helps feed the grass while keeping the overall appearance greener. Shorewood should broadcast microclover seed in the early spring every 2-3 years for best results. No special seeding equipment required. A starter fertilizer such as Earthworks 3-4-3 will help the microclover establish. Once established, Shorewood can reduce fertilizer rates by 50%. MGG recommends microclover as a viable option for some of Shorewood's fields that struggle with bare areas and thin turf. Microclover will feed the turf naturally and decrease long term maintenance costs and manpower needs that come with regular fertilization. Microclover tolerates lower mowing than turfgrass and flowers less than traditional clover. It will keep Shorewood's fields looking greener and healthier too.

Figure 126: Test areas showing the difference in density and color of turf using microclover.

18 Fertility Recommendations & Calendar

Fertility

The following applications are divided into two options: the fully organic approach and the pesticide free approach. The fully organic approach only uses Organic Materials Review Institute listed products. Implementing a fully organic program on all parks can lead to a very high fertilization budget. To keep costs down, Good Nature developed an additional pesticide free approach calendar that avoids harsh additives found in chemical applications. Some of these fertility recommendations include custom blended mixes that the Parks and Recreation department can source locally.

Reducing the size of Category A & B areas can further reduce costs. The maintenance calendar and the budget calculator on page 55 visualizes how Shorewood can cost-effectively implement this report's fertility recommendations and calendar on all parks.

Fully Organic Approach:

Early Spring (April):
Corn Gluten Meal (A, B, & C areas)
- 450 lbs per acre
- Approximately $390 per acre

Late Spring (Late May/ Early June):
Sustane 9-0-2 (A areas)
- 450 lbs per acre
- Approximately $340 per acre

Early Fall (September):
Sustane 8-0-4 (A & B areas)
- 450 lbs per acre
- Approximately $340 per acre

Late Fall (October):
Sustane 4-6-4 (A & B areas)
- 675 lbs per acre
- Approximately $320 per acre

Pesticide Free Approach:

Early Spring (April):
Custom Blend 10-15-15 (A areas)
- 450 lbs per acre

- Approximately $325 per acre

Late Spring (Late May/ Early June):
Corn Gluten Meal (A & B areas)
- 450 lbs per acre
- Approximately $390 per acre

Early Fall (September):
Custom Blend 10-15-15 (A areas)
- 450 lbs per acre
- Approximately $325 per acre

Late Fall (October):
Custom Blend 16-2-9 (A, B & C areas)
- 360 lbs per acre
- Approximately $260 per acre

Liquid Aeration & Biological Mix:

If Shorewood balances its soil chemistry, the biology will start to follow. For Category A Fields, adding beneficial biological treatments will help to improve things faster and reduce disease pressure. The following mix will improve water infiltration and mitigate the effects of the compacted soil. The Oaysis Ultra and Thatch Relief act as a liquid aeration while the Turf Tech Bio supplies beneficial microorganisms to feed your soil. This mix can be added to the chelated iron and applied at the same time. We recommend applications of these products in April, June, and September if possible.

Recommended Biological Mix

Oasys Ultra & Thatch Relief (Soil Technologies Corp)
- 3 Gallons / Acre of Each Product (25 gallons of each product per application)
- 55 gal drum is $2,211.00

Turf Tech Bio
- 4 Ounces / Acre (32 ounces per application)
- 4 lb case is $839.00

19 Weed Suppression Recommendations and Calendar

Growing healthy and dense turfgrass through fertility, overseeding and aeration will best suppress weeds. If weeds persist, however, the following applications can help minimize the appearance of some weeds and keep the turf at a generally acceptable standard.

Early April - Chelated Iron Product (Class A & B)

- 20 ounces concentrate per 1000 s.f. In 2 gallons of water (50 Gallons Concentrate)
- Fiesta: $0.47 / Ounce. Chelated Iron: $0.28 / Ounce

Mid to Late April - Chelated Iron Product (Class A & B)

- 20 ounces concentrate per 1000 s.f. In 2 gallons of water (50 Gallons Concentrate)
- Fiesta: $0.47 / Ounce. Chelated Iron: $0.28 / Ounce

Early May - Chelated Iron Product - Baseball Infield & Dugout Areas Priority (Class A)

- 20 ounces concentrate per 1000 s.f. In 2 gallons of water (50 Gallons Concentrate)
- Fiesta: $0.47 / Ounce. Chelated Iron: $0.28 / Ounce

Late Fall - Consider Chemical Spot Treatment If Needed (Class A athletic areas)

The City can consider spot treating the reduced-risk herbicide Tenacity on areas with high weed pressure if they remain unsatisfied with greenspace performance. Tenacity applications should occur in October, or as soon as the playing season ends, to minimize the chance of contact with young athletes. This is a last resort option.

20 Natural Pest Suppression

It may make sense to avoid any pest suppression treatments and plan to solve any pest issues that arise with grass seed. During the time of the assessment, it was difficult to find any pest damage. There were some small areas that had animal digging marks, which can indicate an elevated presence of grubs. If you can core aerate in September, you will likely physically kill a number of grubs and reduce their populations to below soil damaging levels. Natural grub control products are expensive and would likely be uneconomical to apply as a blanket preventative, so core aeration makes a lot of sense to do in September as weather permits to both loosen the soil and act as a physical grub control. Often the soil cores left on the surface do not cause an issue with playability for long. If that is a concern though perhaps you can core aerate, overseed, and use a drag mat or slice seeder to break up the cores.

GrubGone by Phyllom BioProducts applied at 10 lbs per 4,000 square feet provides effective prevention if budget is no issue. If budget is an issue, we recommend applying this product in areas where a grub problem is suspected. In general, it is probably more cost effective to seed any areas damaged by grubs than to use a grub treatment.

Organic Neem Oil would be effective in helping to minimize grub activity as well as turf disease but it would require monthly applications over the summer which is likely more effort and higher cost than manageable for such a large collection of land. If you are interested, we will provide more details.

21 Maintenance Calendar

Shorewood Monthly Calendar

This spreadsheet can be used as a general calendar for when Shorewood can perform the aforementioned maintenance recommendations. This calendar accounts for fertilizations, aerations, seedings, and weed treatments.

22 Budget Calculator

Shorewood Budget Calculator

This spreadsheet can be used to adjust the size of A, B, and C treatment areas to better fit the City's budget. The first page of the spreadsheet gives pricing for the City's categorizations and the second gives a reduced price for Good Nature's recommended categorizations.

Good Nature considers A areas as athletic fields and the immediate surrounding areas. Then, Good Nature recommends reprioritizing the remaining Category A areas as Category B areas. Good Nature recommends eliminating fertilization and weed treatments to any Category B and C areas. This reprioritization should reduce costs and focus on the high traffic areas. See figures 2, 4, 6, 8, & 10 for diagrams of our reduced budget treatment suggestions.

23 Additional Reading Material

Kentucky Bluegrass Maintenance:
All You Need to Know About Kentucky Bluegrass

Perennial Ryegrass Maintenance:

All You Need to Know About Perennial Ryegrass

Microclover:

Microclover

24 Key Takeaways

- Shorewood can reduce the need for chemical weed treatments by investing the correct cultural practices, particularly on seeding and fertilization practices.
- One fertilization schedule applied to all locations can effectively grow turfgrass, since all Shorewood parks have similar nutrient needs. The frequency of applications depends on the prioritization of each location.
- Reducing prioritization of “Category A” areas to athletic fields and their immediate areas can help to reduce costs.
- Shorewood should consider incorporating Microclover into your seeding schedule. It will help to both thicken and green struggling turfgrass areas. Microclover will, also, outcompete broadleaf weeds for space.
- Focus seeding on areas that Shorewood considers unsightly. For example, Badger Park could benefit from seeding and aeration.
- Good Nature can set aside time to discuss any questions that Shorewood may have and adjust the proposed treatment plan to better fit the City’s budget.

Appendix A: Soil Testing Results

Badger Park

GoodNature™

Badger Park
5745 Country Club Rd
Shorewood, MN 55331

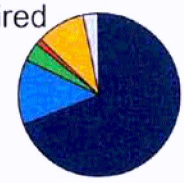
Soil Test Results

Sample Location: WHOLE PARK -- LAWN **Report Date: 6/9/2022** **Area: 50.87**

	Result	Desired Result	Deficit-Sufficiency	Deficit-Sufficiency lbs/1000 sq ft	Graphical Result
Exchange Capacity	24.20				
Water pH (1:1)	7.6	6.5	+1.1		Very Low Low Desired Excess
Organic Matter (%)	5.89	6.0	-0.11		Very Low Low Desired Excess
Soluble Sulfur (ppm)	133	37.5	+95.5	4.39	Very Low Low Desired Excess
Easily Extractable P as P2O5 (lbs/ac)	78.0	200.0	-122	-2.80	Very Low Low Desired Excess
Bray II P as P2O5 (lbs/ac)	284	400.0	-116	-2.67	Very Low Low Desired Excess
Calcium (lbs/ac)	7684	6582.0	+1102	25.33	Very Low Low Desired Excess
Magnesium (lbs/ac)	838	755.0	+83	1.91	Very Low Low Desired Excess
Potassium (lbs/ac)	180.0	755.0	-575	-13.22	Very Low Low Desired Excess
Sodium (lbs/ac)	158	111.3	+46.7	+1.07	Good Ok Alert Problem

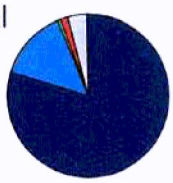
Base Saturation

Desired



Element	Desired Result
Calcium%	68.0
Magnesium%	13.0
Potassium%	4.0
Sodium%	<1.0
Hydrogen%	10.0
Other%	3.0

Actual



Element	Actual Result
Calcium%	79.4
Magnesium%	14.4
Potassium%	0.9
Sodium%	1.4
Hydrogen%	0.0
Other%	3.8

Minor Elements

Boron (ppm)	1.04	1.5	-0.46	-0.02	Very Low Low Desired Excess
Iron (ppm)	513	225.0	+288	13.24	Very Low Low Desired Excess
Manganese (ppm)	47	112.5	-65.5	-3.01	Very Low Low Desired Excess
Copper (ppm)	2.57	3.5	-0.93	-0.04	Very Low Low Desired Excess
Zinc (ppm)	7.04	8.0	-0.96	-0.04	Very Low Low Desired Excess
Aluminum (ppm)	67	600.0	-533	-24.51	Very Low Low Desired Excess

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Analytical Services By
BROOKSIDE LABORATORIES, INC.

Figure 86 (above): Soil test results for Badger Park.

Cathcart Park - Hockey Rink

GoodNature™

Cathcart Park
26716 W 62nd St.
Shorewood, MN 55331

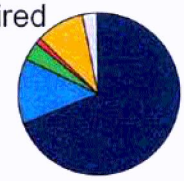
Soil Test Results

Sample Location: HOCKEY -- LAWN **Report Date: 6/9/2022** **Area: 16.96**

	Result	Desired Result	Deficit-Sufficiency	Deficit-Sufficiency lbs/1000 sq ft	Graphical Result
Exchange Capacity	16.89				
Water pH (1:1)	7.8	6.5	+1.3		Very Low Low Desired Excess
Organic Matter (%)	3.46	6.0	-2.54		Very Low Low Desired Excess
Soluble Sulfur (ppm)	5	37.5	-32.5	-1.49	Very Low Low Desired Excess
Easily Extractable P as P2O5 (lbs/ac)	110.0	200.0	-90	-2.07	Very Low Low Desired Excess
Bray II P as P2O5 (lbs/ac)	298	400.0	-102	-2.34	Very Low Low Desired Excess
Calcium (lbs/ac)	5310	4594.0	+716	16.46	Very Low Low Desired Excess
Magnesium (lbs/ac)	628	527.0	+101	2.32	Very Low Low Desired Excess
Potassium (lbs/ac)	200.0	527.0	-327	-7.52	Very Low Low Desired Excess
Sodium (lbs/ac)	62	77.7			Good Ok Alert Problem

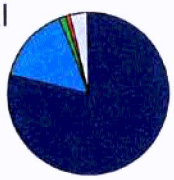
Base Saturation

Desired



Element	Desired Result
Calcium%	68.0
Magnesium%	13.0
Potassium%	4.0
Sodium%	<1.0
Hydrogen%	10.0
Other%	3.0

Actual



Element	Actual Result
Calcium%	78.6
Magnesium%	15.5
Potassium%	1.5
Sodium%	0.8
Hydrogen%	0.0
Other%	3.6

Minor Elements

Boron (ppm)	0.73	1.5	-0.77	-0.04	Very Low Low Desired Excess
Iron (ppm)	202	225.0	-23	-1.06	Very Low Low Desired Excess
Manganese (ppm)	145	112.5	+32.5	1.49	Very Low Low Desired Excess
Copper (ppm)	1.83	3.5	-1.67	-0.08	Very Low Low Desired Excess
Zinc (ppm)	2.38	8.0	-5.62	-0.26	Very Low Low Desired Excess
Aluminum (ppm)	273	600.0	-327	-15.03	Very Low Low Desired Excess

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BROOKSIDE

Figure 87 (above): Soil test results for hockey rink section of Cathcart Park.

Cathcart Park - Infield

GoodNature™

Cathcart Park
26716 W 62nd St
Shorewood, MN 55331

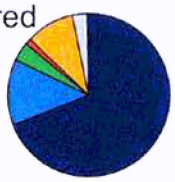
Soil Test Results

Sample Location: INFIELD -- LAWN **Report Date: 6/9/2022** **Area: 2.65**

	Result	Desired Result	Deficit-Sufficiency	Deficit-Sufficiency lbs/1000 sq ft	Graphical Result
Exchange Capacity	17.65				
Water pH (1:1)	7.7	6.5	+1.2		Very Low Low Desired Excess
Organic Matter (%)	4.00	6.0	-2		Very Low Low Desired Excess
Soluble Sulfur (ppm)	6	37.5	-31.5	-1.45	Very Low Low Desired Excess
Easily Extractable P as P2O5 (lbs/ac)	82.0	200.0	-118	-2.71	Very Low Low Desired Excess
Bray II P as P2O5 (lbs/ac)	179	400.0	-221	-5.08	Very Low Low Desired Excess
Calcium (lbs/ac)	4796	4801.0	-5	-0.11	Very Low Low Desired Excess
Magnesium (lbs/ac)	1096	551.0	+545	12.53	Very Low Low Desired Excess
Potassium (lbs/ac)	226.0	551.0	-325	-7.47	Very Low Low Desired Excess
Sodium (lbs/ac)	68	81.2			Good Ok Alert Problem

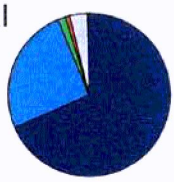
Base Saturation

Desired



Element	Desired Result
Calcium%	68.0
Magnesium%	13.0
Potassium%	4.0
Sodium%	<1.0
Hydrogen%	10.0
Other%	3.0

Actual



Element	Actual Result
Calcium%	67.9
Magnesium%	25.9
Potassium%	1.6
Sodium%	0.8
Hydrogen%	0.0
Other%	3.7

Minor Elements

Boron (ppm)	0.79	1.5	-0.71	-0.03	Very Low Low Desired Excess
Iron (ppm)	172	225.0	-53	-2.44	Very Low Low Desired Excess
Manganese (ppm)	92	112.5	-20.5	-0.94	Very Low Low Desired Excess
Copper (ppm)	1.83	3.5	-1.67	-0.08	Very Low Low Desired Excess
Zinc (ppm)	1.66	8.0	-6.34	-0.29	Very Low Low Desired Excess
Aluminum (ppm)	365	600.0	-235	-10.80	Very Low Low Desired Excess

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Figure 88 (above): Soil test results for infield section of Cathcart Park.

Cathcart Park - Outfield

GoodNature™

Cathcart Park
26716 W 62nd St.
Shorewood, MN 55331

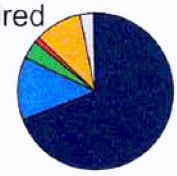
Soil Test Results

Sample Location: OUTFIELD -- LAWN **Report Date: 6/9/2022** **Area: 29.91**

	Result	Desired Result	Deficit-Sufficiency	Deficit-Sufficiency lbs/1000 sq ft	Graphical Result
Exchange Capacity	16.37				
Water pH (1:1)	7.5	6.5	+1		Very Low Low Desired Excess
Organic Matter (%)	4.37	6.0	-1.63		Very Low Low Desired Excess
Soluble Sulfur (ppm)	7	37.5	-30.5	-1.40	Very Low Low Desired Excess
Easily Extractable P as P2O5 (lbs/ac)	119.0	200.0	-81	-1.86	Very Low Low Desired Excess
Bray II P as P2O5 (lbs/ac)	215	400.0	-185	-4.25	Very Low Low Desired Excess
Calcium (lbs/ac)	4476	4453.0	+23	0.53	Very Low Low Desired Excess
Magnesium (lbs/ac)	994	511.0	+483	11.10	Very Low Low Desired Excess
Potassium (lbs/ac)	204.0	511.0	-307	-7.06	Very Low Low Desired Excess
Sodium (lbs/ac)	62	75.3			Good Ok Alert Problem

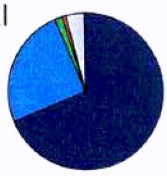
Base Saturation

Desired



Element	Desired Result
Calcium%	68.0
Magnesium%	13.0
Potassium%	4.0
Sodium%	<1.0
Hydrogen%	10.0
Other%	3.0

Actual



Element	Actual Result
Calcium%	68.4
Magnesium%	25.3
Potassium%	1.6
Sodium%	0.8
Hydrogen%	0.0
Other%	3.9

Minor Elements

Boron (ppm)	0.73	1.5	-0.77	-0.04	Very Low Low Desired Excess
Iron (ppm)	173	225.0	-52	-2.39	Very Low Low Desired Excess
Manganese (ppm)	89	112.5	-23.5	-1.08	Very Low Low Desired Excess
Copper (ppm)	1.67	3.5	-1.83	-0.08	Very Low Low Desired Excess
Zinc (ppm)	2.47	8.0	-5.53	-0.25	Very Low Low Desired Excess
Aluminum (ppm)	319	600.0	-281	-12.92	Very Low Low Desired Excess

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Figure 89 (above): Soil test results for outfield section of Cathcart Park.

Cathcart Park - Playground

GoodNature™

Cathcart Park
26716 W 62nd St
Shorewood, MN 55331

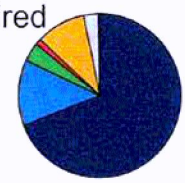
Soil Test Results

Sample Location: OTHER -- LAWN **Report Date: 6/9/2022** **Area: 61.26**

	Result	Desired Result	Deficit-Sufficiency	Deficit-Sufficiency lbs/1000 sq ft	Graphical Result
Exchange Capacity	18.22				
Water pH (1:1)	7.6	6.5	+1.1		Very Low Low Desired Excess
Organic Matter (%)	3.95	6.0	-2.05		Very Low Low Desired Excess
Soluble Sulfur (ppm)	4	37.5	-33.5	-1.54	Very Low Low Desired Excess
Easily Extractable P as P2O5 (lbs/ac)	82.0	200.0	-118	-2.71	Very Low Low Desired Excess
Bray II P as P2O5 (lbs/ac)	270	400.0	-130	-2.99	Very Low Low Desired Excess
Calcium (lbs/ac)	5264	4956.0	+308	7.08	Very Low Low Desired Excess
Magnesium (lbs/ac)	934	568.0	+366	8.41	Very Low Low Desired Excess
Potassium (lbs/ac)	268.0	568.0	-300	-6.90	Very Low Low Desired Excess
Sodium (lbs/ac)	60	83.8			Good Ok Alert Problem

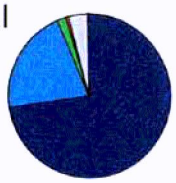
Base Saturation

Desired



Element	Desired Result
Calcium%	68.0
Magnesium%	13.0
Potassium%	4.0
Sodium%	<1.0
Hydrogen%	10.0
Other%	3.0

Actual



Element	Actual Result
Calcium%	72.2
Magnesium%	21.4
Potassium%	1.9
Sodium%	0.7
Hydrogen%	0.0
Other%	3.8

Minor Elements

Boron (ppm)	0.64	1.5	-0.86	-0.04	Very Low Low Desired Excess
Iron (ppm)	135	225.0	-90	-4.14	Very Low Low Desired Excess
Manganese (ppm)	110	112.5	-2.5	-0.11	Very Low Low Desired Excess
Copper (ppm)	3.18	3.5	-0.32	-0.01	Very Low Low Desired Excess
Zinc (ppm)	2.69	8.0	-5.31	-0.24	Very Low Low Desired Excess
Aluminum (ppm)	332	600.0	-268	-12.32	Very Low Low Desired Excess

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Figure 90 (above): Soil test results for playground section of Cathcart Park.

Freeman Park - Shelter and areas surrounding upper ballfields

GoodNature™

Freeman Park
6000 Eureka Road
Shorewood, MN 55331

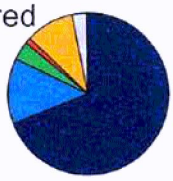
Soil Test Results

Sample Location: SHELTER -- LAWN **Report Date: 6/9/2022** **Area: 100**

	Result	Desired Result	Deficit-Sufficiency	Deficit-Sufficiency lbs/1000 sq ft	Graphical Result
Exchange Capacity	26.37				
Water pH (1:1)	7.9	6.5	+1.4		Very Low Low Desired Excess
Organic Matter (%)	4.91	6.0	-1.09		Very Low Low Desired Excess
Soluble Sulfur (ppm)	8	37.5	-29.5	-1.36	Very Low Low Desired Excess
Easily Extractable P as P2O5 (lbs/ac)	92.0	200.0	-108	-2.48	Very Low Low Desired Excess
Bray II P as P2O5 (lbs/ac)	256	400.0	-144	-3.31	Very Low Low Desired Excess
Calcium (lbs/ac)	7880	7173.0	+707	16.25	Very Low Low Desired Excess
Magnesium (lbs/ac)	1262	823.0	+439	10.09	Very Low Low Desired Excess
Potassium (lbs/ac)	270.0	823.0	-553	-12.71	Very Low Low Desired Excess
Sodium (lbs/ac)	64	121.3			Good Ok Alert Problem

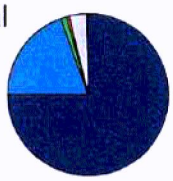
Base Saturation

Desired



Element	Desired Result
Calcium%	68.0
Magnesium%	13.0
Potassium%	4.0
Sodium%	<1.0
Hydrogen%	10.0
Other%	3.0

Actual



Element	Actual Result
Calcium%	74.7
Magnesium%	19.9
Potassium%	1.3
Sodium%	0.5
Hydrogen%	0.0
Other%	3.5

Minor Elements

Boron (ppm)	0.74	1.5	-0.76	-0.03	Very Low Low Desired Excess
Iron (ppm)	135	225.0	-90	-4.14	Very Low Low Desired Excess
Manganese (ppm)	62	112.5	-50.5	-2.32	Very Low Low Desired Excess
Copper (ppm)	2.63	3.5	-0.87	-0.04	Very Low Low Desired Excess
Zinc (ppm)	2.57	8.0	-5.43	-0.25	Very Low Low Desired Excess
Aluminum (ppm)	139	600.0	-461	-21.20	Very Low Low Desired Excess

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Figure 91 (above): Soil test results for shelter section of Freeman Park.

Freeman Park - Ballfields 1-3 infields

GoodNature™

Freeman Park
6000 Eureka Road
Shorewood, MN 55331

Soil Test Results

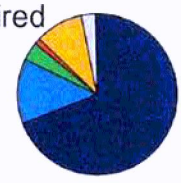
Sample Location: BASEBALL INFLD 1-3 -- LA **Report Date: 6/9/2022** **Area: 11.7**

	Result	Desired Result	Deficit-Sufficiency	Deficit-Sufficiency lbs/1000 sq ft	Graphical Result
Exchange Capacity	24.35				
Water pH (1:1)	7.7	6.5	+1.2		Very Low Low Desired Excess
Organic Matter (%)	5.43	6.0	-0.57		Very Low Low Desired Excess
Soluble Sulfur (ppm)	9	37.5	-28.5	-1.31	Very Low Low Desired Excess
Easily Extractable P as P2O5 (lbs/ac)	78.0	200.0	-122	-2.80	Very Low Low Desired Excess
Bray II P as P2O5 (lbs/ac)	224	400.0	-176	-4.05	Very Low Low Desired Excess
Calcium (lbs/ac)	7224	6623.0	+601	13.82	Very Low Low Desired Excess
Magnesium (lbs/ac)	1162	760.0	+402	9.24	Very Low Low Desired Excess
Potassium (lbs/ac)	316.0	760.0	-444	-10.21	Very Low Low Desired Excess
Sodium (lbs/ac)	66	112.0			Good Ok Alert Problem

Base Saturation

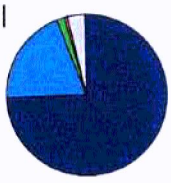
Desired

Element	Desired Result
Calcium%	68.0
Magnesium%	13.0
Potassium%	4.0
Sodium%	<1.0
Hydrogen%	10.0
Other%	3.0



Actual

Element	Actual Result
Calcium%	74.2
Magnesium%	19.9
Potassium%	1.7
Sodium%	0.6
Hydrogen%	0.0
Other%	3.7



Minor Elements

Boron (ppm)	1.11	1.5	-0.39	-0.02	Very Low Low Desired Excess
Iron (ppm)	201	225.0	-24	-1.10	Very Low Low Desired Excess
Manganese (ppm)	94	112.5	-18.5	-0.85	Very Low Low Desired Excess
Copper (ppm)	2.34	3.5	-1.16	-0.05	Very Low Low Desired Excess
Zinc (ppm)	2.79	8.0	-5.21	-0.24	Very Low Low Desired Excess
Aluminum (ppm)	123	600.0	-477	-21.93	Very Low Low Desired Excess

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Figure 91 (above): Soil test results for infields of fields 1-3 of Freeman Park.

Freeman Park - Ballfields 1-3 outfields

GoodNature™

Freeman Park
6000 Eureka Road
Shorewood, MN 55331

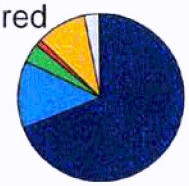
Soil Test Results

Sample Location: BASEBALL OUTFLD 1-3 -- L **Report Date: 6/9/2022** **Area: 129**

	Result	Desired Result	Deficit-Sufficiency	Deficit-Sufficiency lbs/1000 sq ft	Graphical Result
Exchange Capacity	20.96				
Water pH (1:1)	7.6	6.5	+1.1		Very Low Low Desired Excess
Organic Matter (%)	3.91	6.0	-2.09		Very Low Low Desired Excess
Soluble Sulfur (ppm)	6	37.5	-31.5	-1.45	Very Low Low Desired Excess
Easily Extractable P as P2O5 (lbs/ac)	92.0	200.0	-108	-2.48	Very Low Low Desired Excess
Bray II P as P2O5 (lbs/ac)	252	400.0	-148	-3.40	Very Low Low Desired Excess
Calcium (lbs/ac)	6068	5701.0	+367	8.44	Very Low Low Desired Excess
Magnesium (lbs/ac)	1098	654.0	+444	10.21	Very Low Low Desired Excess
Potassium (lbs/ac)	228.0	654.0	-426	-9.79	Very Low Low Desired Excess
Sodium (lbs/ac)	60	96.4			Good Ok Alert Problem

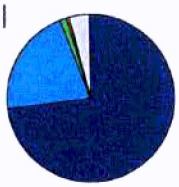
Base Saturation

Desired



Element	Desired Result
Calcium%	68.0
Magnesium%	13.0
Potassium%	4.0
Sodium%	<1.0
Hydrogen%	10.0
Other%	3.0

Actual



Element	Actual Result
Calcium%	72.4
Magnesium%	21.8
Potassium%	1.4
Sodium%	0.6
Hydrogen%	0.0
Other%	3.8

Minor Elements

Boron (ppm)	0.67	1.5	-0.83	-0.04	Very Low Low Desired Excess
Iron (ppm)	172	225.0	-53	-2.44	Very Low Low Desired Excess
Manganese (ppm)	83	112.5	-29.5	-1.36	Very Low Low Desired Excess
Copper (ppm)	2.07	3.5	-1.43	-0.07	Very Low Low Desired Excess
Zinc (ppm)	2.20	8.0	-5.8	-0.27	Very Low Low Desired Excess
Aluminum (ppm)	319	600.0	-281	-12.92	Very Low Low Desired Excess

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Figure 92 (above): Soil test results for outfields of fields 1-3 of Freeman Park.

Freeman Park - Ballfields 4-6 infields

GoodNature™

Freeman Park
6000 Eureka Road
Shorewood, MN 55331

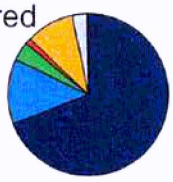
Soil Test Results

Sample Location: BASEBALL INFLD 4-6 -- LA **Report Date: 6/9/2022** **Area: 22.5**

	Result	Desired Result	Deficit-Sufficiency	Deficit-Sufficiency lbs/1000 sq ft	Graphical Result
Exchange Capacity	25.00				
Water pH (1:1)	7.9	6.5	+1.4		Very Low Low Desired Excess
Organic Matter (%)	4.03	6.0	-1.97		Very Low Low Desired Excess
Soluble Sulfur (ppm)	6	37.5	-31.5	-1.45	Very Low Low Desired Excess
Easily Extractable P as P2O5 (lbs/ac)	50.0	200.0	-150	-3.45	Very Low Low Desired Excess
Bray II P as P2O5 (lbs/ac)	224	400.0	-176	-4.05	Very Low Low Desired Excess
Calcium (lbs/ac)	7224	6800.0	+424	9.75	Very Low Low Desired Excess
Magnesium (lbs/ac)	1336	780.0	+556	12.78	Very Low Low Desired Excess
Potassium (lbs/ac)	272.0	780.0	-508	-11.68	Very Low Low Desired Excess
Sodium (lbs/ac)	68	115.0			Good Ok Alert Problem

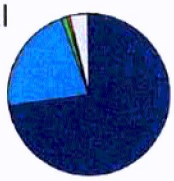
Base Saturation

Desired



Element	Desired Result
Calcium%	68.0
Magnesium%	13.0
Potassium%	4.0
Sodium%	<1.0
Hydrogen%	10.0
Other%	3.0

Actual



Element	Actual Result
Calcium%	72.2
Magnesium%	22.3
Potassium%	1.4
Sodium%	0.6
Hydrogen%	0.0
Other%	3.5

Minor Elements

Boron (ppm)	0.72	1.5	-0.78	-0.04	Very Low Low Desired Excess
Iron (ppm)	155	225.0	-70	-3.22	Very Low Low Desired Excess
Manganese (ppm)	87	112.5	-25.5	-1.17	Very Low Low Desired Excess
Copper (ppm)	2.59	3.5	-0.91	-0.04	Very Low Low Desired Excess
Zinc (ppm)	1.61	8.0	-6.39	-0.29	Very Low Low Desired Excess
Aluminum (ppm)	142	600.0	-458	-21.06	Very Low Low Desired Excess

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Figure 93 (above): Soil test results for infields of fields 4-6 of Freeman Park.

Freeman Park - Ballfields 4-6 outfields

GoodNature™

Freeman Park
6000 Eureka Road
Shorewood, MN 55331

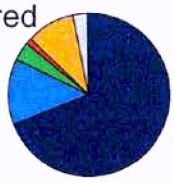
Soil Test Results

Sample Location: BASEBALL OUTFLD 4-6 -- L **Report Date: 6/9/2022** **Area: 155.5**

	Result	Desired Result	Deficit-Sufficiency	Deficit-Sufficiency lbs/1000 sq ft	Graphical Result
Exchange Capacity	22.28				
Water pH (1:1)	7.9	6.5	+1.4		Very Low Low Desired Excess
Organic Matter (%)	4.44	6.0	-1.56		Very Low Low Desired Excess
Soluble Sulfur (ppm)	7	37.5	-30.5	-1.40	Very Low Low Desired Excess
Easily Extractable P as P2O5 (lbs/ac)	73.0	200.0	-127	-2.92	Very Low Low Desired Excess
Bray II P as P2O5 (lbs/ac)	234	400.0	-166	-3.82	Very Low Low Desired Excess
Calcium (lbs/ac)	6384	6060.0	+324	7.45	Very Low Low Desired Excess
Magnesium (lbs/ac)	1224	695.0	+529	12.16	Very Low Low Desired Excess
Potassium (lbs/ac)	246.0	695.0	-449	-10.32	Very Low Low Desired Excess
Sodium (lbs/ac)	58	102.5			Good Ok Alert Problem

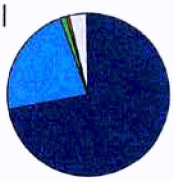
Base Saturation

Desired



Element	Desired Result
Calcium%	68.0
Magnesium%	13.0
Potassium%	4.0
Sodium%	<1.0
Hydrogen%	10.0
Other%	3.0

Actual



Element	Actual Result
Calcium%	71.6
Magnesium%	22.9
Potassium%	1.4
Sodium%	0.6
Hydrogen%	0.0
Other%	3.5

Minor Elements

Boron (ppm)	0.77	1.5	-0.73	-0.03	Very Low Low Desired Excess
Iron (ppm)	169	225.0	-56	-2.57	Very Low Low Desired Excess
Manganese (ppm)	71	112.5	-41.5	-1.91	Very Low Low Desired Excess
Copper (ppm)	6.80	3.5	+3.3	0.15	Very Low Low Desired Excess
Zinc (ppm)	2.38	8.0	-5.62	-0.26	Very Low Low Desired Excess
Aluminum (ppm)	270	600.0	-330	-15.17	Very Low Low Desired Excess

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Analytical Services By
BROOKSIDE LABORATORIES, INC.

Figure 94 (above): Soil test results for outfields of fields 4-6 of Freeman Park.

Freeman Park - Soccer fields

GoodNature™

Freeman Park
6000 Eureka Road
Shorewood, MN 55331

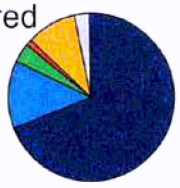
Soil Test Results

Sample Location: SOCCER -- LAWN **Report Date: 6/9/2022** **Area: 267**

	Result	Desired Result	Deficit-Sufficiency	Deficit-Sufficiency lbs/1000 sq ft	Graphical Result
Exchange Capacity	25.69				
Water pH (1:1)	7.7	6.5	+1.2		Very Low Low Desired Excess
Organic Matter (%)	5.11	6.0	-0.89		Very Low Low Desired Excess
Soluble Sulfur (ppm)	6	37.5	-31.5	-1.45	Very Low Low Desired Excess
Easily Extractable P as P2O5 (lbs/ac)	60.0	200.0	-140	-3.22	Very Low Low Desired Excess
Bray II P as P2O5 (lbs/ac)	206	400.0	-194	-4.46	Very Low Low Desired Excess
Calcium (lbs/ac)	7664	6988.0	+676	15.54	Very Low Low Desired Excess
Magnesium (lbs/ac)	1238	802.0	+436	10.02	Very Low Low Desired Excess
Potassium (lbs/ac)	208.0	802.0	-594	-13.66	Very Low Low Desired Excess
Sodium (lbs/ac)	70	118.2			Good Ok Alert Problem

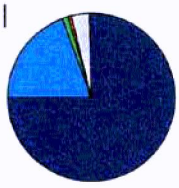
Base Saturation

Desired



Element	Desired Result
Calcium%	68.0
Magnesium%	13.0
Potassium%	4.0
Sodium%	<1.0
Hydrogen%	10.0
Other%	3.0

Actual



Element	Actual Result
Calcium%	74.6
Magnesium%	20.1
Potassium%	1.0
Sodium%	0.6
Hydrogen%	0.0
Other%	3.7

Minor Elements

Boron (ppm)	0.74	1.5	-0.76	-0.03	Very Low Low Desired Excess
Iron (ppm)	151	225.0	-74	-3.40	Very Low Low Desired Excess
Manganese (ppm)	62	112.5	-50.5	-2.32	Very Low Low Desired Excess
Copper (ppm)	2.60	3.5	-0.9	-0.04	Very Low Low Desired Excess
Zinc (ppm)	2.26	8.0	-5.74	-0.26	Very Low Low Desired Excess
Aluminum (ppm)	213	600.0	-387	-17.79	Very Low Low Desired Excess

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Figure 95 (above): Soil test results for soccer field section of Freeman Park.

Freeman Park - B Fields (areas outlined in yellow on images provided by the City of Shorewood)

GoodNature™

Freeman Park
6000 Eureka Road
Shorewood, MN 55331

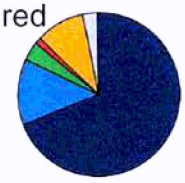
Soil Test Results

Sample Location: OTHER -- LAWN **Report Date: 6/9/2022** **Area: 150**

	Result	Desired Result	Deficit-Sufficiency	Deficit-Sufficiency lbs/1000 sq ft	Graphical Result
Exchange Capacity	20.71				
Water pH (1:1)	7.7	6.5	+1.2		Very Low Low Desired Excess
Organic Matter (%)	5.21	6.0	-0.79		Very Low Low Desired Excess
Soluble Sulfur (ppm)	8	37.5	-29.5	-1.36	Very Low Low Desired Excess
Easily Extractable P as P2O5 (lbs/ac)	78.0	200.0	-122	-2.80	Very Low Low Desired Excess
Bray II P as P2O5 (lbs/ac)	151	400.0	-249	-5.72	Very Low Low Desired Excess
Calcium (lbs/ac)	5986	5633.0	+353	8.11	Very Low Low Desired Excess
Magnesium (lbs/ac)	1080	646.0	+434	9.98	Very Low Low Desired Excess
Potassium (lbs/ac)	266.0	646.0	-380	-8.74	Very Low Low Desired Excess
Sodium (lbs/ac)	64	95.3			Good Ok Alert Problem

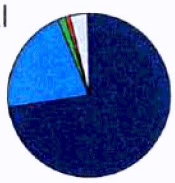
Base Saturation

Desired



Element	Desired Result
Calcium%	68.0
Magnesium%	13.0
Potassium%	4.0
Sodium%	<1.0
Hydrogen%	10.0
Other%	3.0

Actual



Element	Actual Result
Calcium%	72.3
Magnesium%	21.7
Potassium%	1.6
Sodium%	0.7
Hydrogen%	0.0
Other%	3.7

Minor Elements

Boron (ppm)	0.76	1.5	-0.74	-0.03	Very Low Low Desired Excess
Iron (ppm)	129	225.0	-96	-4.41	Very Low Low Desired Excess
Manganese (ppm)	111	112.5	-1.5	-0.07	Very Low Low Desired Excess
Copper (ppm)	1.95	3.5	-1.55	-0.07	Very Low Low Desired Excess
Zinc (ppm)	3.56	8.0	-4.44	-0.20	Very Low Low Desired Excess
Aluminum (ppm)	277	600.0	-323	-14.85	Very Low Low Desired Excess

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Figure 96 (above): Soil test results for B sections of Freeman Park.

Manor Park - Soccer

GoodNature™

Manor Park
20600 Manor Park Rd.
Shorewood, MN 55331

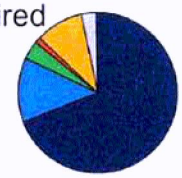
Soil Test Results

Sample Location: SOCCER -- LAWN **Report Date: 6/9/2022** **Area: 38**

	Result	Desired Result	Deficit-Sufficiency	Deficit-Sufficiency lbs/1000 sq ft	Graphical Result
Exchange Capacity	16.41				
Water pH (1:1)	7.5	6.5	+1		Very Low Low Desired Excess
Organic Matter (%)	3.61	6.0	-2.39		Very Low Low Desired Excess
Soluble Sulfur (ppm)	7	37.5	-30.5	-1.40	Very Low Low Desired Excess
Easily Extractable P as P2O5 (lbs/ac)	156.0	200.0	-44	-1.01	Very Low Low Desired Excess
Bray II P as P2O5 (lbs/ac)	270	400.0	-130	-2.99	Very Low Low Desired Excess
Calcium (lbs/ac)	4530	4464.0	+66	1.52	Very Low Low Desired Excess
Magnesium (lbs/ac)	960	512.0	+448	10.30	Very Low Low Desired Excess
Potassium (lbs/ac)	250.0	512.0	-262	-6.02	Very Low Low Desired Excess
Sodium (lbs/ac)	56	75.5			Good Ok Alert Problem

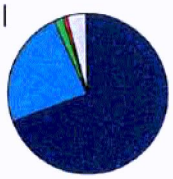
Base Saturation

Desired



Element	Desired Result
Calcium%	68.0
Magnesium%	13.0
Potassium%	4.0
Sodium%	<1.0
Hydrogen%	10.0
Other%	3.0

Actual



Element	Actual Result
Calcium%	69.0
Magnesium%	24.4
Potassium%	2.0
Sodium%	0.7
Hydrogen%	0.0
Other%	3.9

Minor Elements

Boron (ppm)	0.84	1.5	-0.66	-0.03	Very Low Low Desired Excess
Iron (ppm)	144	225.0	-81	-3.72	Very Low Low Desired Excess
Manganese (ppm)	135	112.5	+22.5	1.03	Very Low Low Desired Excess
Copper (ppm)	2.17	3.5	-1.33	-0.06	Very Low Low Desired Excess
Zinc (ppm)	4.33	8.0	-3.67	-0.17	Very Low Low Desired Excess
Aluminum (ppm)	406	600.0	-194	-8.92	Very Low Low Desired Excess

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Figure 97 (above): Soil test results for soccer field section of Manor Park.

Manor Park - Outfield

GoodNature™

Manor Park
20600 Manor Park Rd.
Shorewood, MN 55331

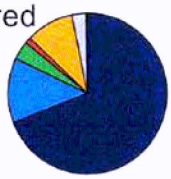
Soil Test Results

Sample Location: OUTFIELD -- LAWN **Report Date: 6/9/2022** **Area: 65.5**

	Result	Desired Result	Deficit-Sufficiency	Deficit-Sufficiency lbs/1000 sq ft	Graphical Result
Exchange Capacity	16.78				
Water pH (1:1)	7.7	6.5	+1.2		Very Low Low Desired Excess
Organic Matter (%)	3.97	6.0	-2.03		Very Low Low Desired Excess
Soluble Sulfur (ppm)	6	37.5	-31.5	-1.45	Very Low Low Desired Excess
Easily Extractable P as P2O5 (lbs/ac)	179.0	200.0	-21	-0.48	Very Low Low Desired Excess
Bray II P as P2O5 (lbs/ac)	307	400.0	-93	-2.14	Very Low Low Desired Excess
Calcium (lbs/ac)	4458	4564.0	-106	-2.44	Very Low Low Desired Excess
Magnesium (lbs/ac)	1082	524.0	+558	12.83	Very Low Low Desired Excess
Potassium (lbs/ac)	324.0	524.0	-200	-4.60	Very Low Low Desired Excess
Sodium (lbs/ac)	42	77.2			Good Ok Alert Problem

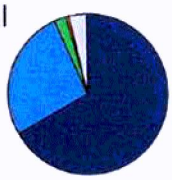
Base Saturation

Desired



Element	Desired Result
Calcium%	68.0
Magnesium%	13.0
Potassium%	4.0
Sodium%	<1.0
Hydrogen%	10.0
Other%	3.0

Actual



Element	Actual Result
Calcium%	66.4
Magnesium%	26.9
Potassium%	2.5
Sodium%	0.5
Hydrogen%	0.0
Other%	3.7

Minor Elements

Boron (ppm)	0.60	1.5	-0.9	-0.04	Very Low Low Desired Excess
Iron (ppm)	144	225.0	-81	-3.72	Very Low Low Desired Excess
Manganese (ppm)	168	112.5	+55.5	2.55	Very Low Low Desired Excess
Copper (ppm)	1.69	3.5	-1.81	-0.08	Very Low Low Desired Excess
Zinc (ppm)	3.91	8.0	-4.09	-0.19	Very Low Low Desired Excess
Aluminum (ppm)	337	600.0	-263	-12.09	Very Low Low Desired Excess

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Figure 98 (above): Soil test results for outfield section of Manor Park.

Manor Park - Playground

GoodNature™

Manor Park
20600 Manor Park Rd.
Shorewood, MN 55331

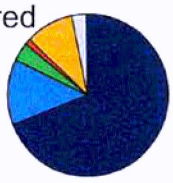
Soil Test Results

Sample Location: PLAYGROUND -- LAWN **Report Date: 6/9/2022** **Area: 68.5**

	Result	Desired Result	Deficit-Sufficiency	Deficit-Sufficiency lbs/1000 sq ft	Graphical Result
Exchange Capacity	17.68				
Water pH (1:1)	7.5	6.5	+1		Very Low Low Desired Excess
Organic Matter (%)	3.80	6.0	-2.2		Very Low Low Desired Excess
Soluble Sulfur (ppm)	9	37.5	-28.5	-1.31	Very Low Low Desired Excess
Easily Extractable P as P2O5 (lbs/ac)	124.0	200.0	-76	-1.75	Very Low Low Desired Excess
Bray II P as P2O5 (lbs/ac)	238	400.0	-162	-3.72	Very Low Low Desired Excess
Calcium (lbs/ac)	5378	4809.0	+569	13.08	Very Low Low Desired Excess
Magnesium (lbs/ac)	754	552.0	+202	4.64	Very Low Low Desired Excess
Potassium (lbs/ac)	210.0	552.0	-342	-7.86	Very Low Low Desired Excess
Sodium (lbs/ac)	62	81.3			Good Ok Alert Problem

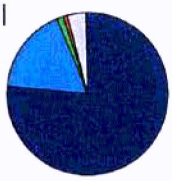
Base Saturation

Desired



Element	Desired Result
Calcium%	68.0
Magnesium%	13.0
Potassium%	4.0
Sodium%	<1.0
Hydrogen%	10.0
Other%	3.0

Actual



Element	Actual Result
Calcium%	76.1
Magnesium%	17.8
Potassium%	1.5
Sodium%	0.8
Hydrogen%	0.0
Other%	3.9

Minor Elements

Boron (ppm)	0.66	1.5	-0.84	-0.04	Very Low Low Desired Excess
Iron (ppm)	231	225.0	+6	0.28	Very Low Low Desired Excess
Manganese (ppm)	103	112.5	-9.5	-0.44	Very Low Low Desired Excess
Copper (ppm)	2.31	3.5	-1.19	-0.05	Very Low Low Desired Excess
Zinc (ppm)	3.12	8.0	-4.88	-0.22	Very Low Low Desired Excess
Aluminum (ppm)	257	600.0	-343	-15.77	Very Low Low Desired Excess

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Analytical Services By
BROOKSIDE

Figure 99 (above): Soil test results for the playground section of Manor Park.

South Shore Community Park

GoodNature™

Southshore Park
5355 St. Albans Bay Rd
Shorewood, MN 55331

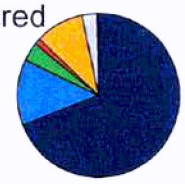
Soil Test Results

Sample Location: WHOLE PARK -- LAWN **Report Date: 6/9/2022** **Area: 88.7**

	Result	Desired Result	Deficit-Sufficiency	Deficit-Sufficiency lbs/1000 sq ft	Graphical Result
Exchange Capacity	17.21				
Water pH (1:1)	8.0	6.5	+1.5		Very Low Low Desired Excess
Organic Matter (%)	3.95	6.0	-2.05		Very Low Low Desired Excess
Soluble Sulfur (ppm)	13	37.5	-24.5	-1.13	Very Low Low Desired Excess
Easily Extractable P as P2O5 (lbs/ac)	78.0	200.0	-122	-2.80	Very Low Low Desired Excess
Bray II P as P2O5 (lbs/ac)	261	400.0	-139	-3.20	Very Low Low Desired Excess
Calcium (lbs/ac)	5216	4681.0	+535	12.30	Very Low Low Desired Excess
Magnesium (lbs/ac)	762	537.0	+225	5.17	Very Low Low Desired Excess
Potassium (lbs/ac)	192.0	537.0	-345	-7.93	Very Low Low Desired Excess
Sodium (lbs/ac)	74	79.2			Good Ok Alert Problem

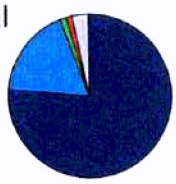
Base Saturation

Desired



Element	Desired Result
Calcium%	68.0
Magnesium%	13.0
Potassium%	4.0
Sodium%	<1.0
Hydrogen%	10.0
Other%	3.0

Actual



Element	Actual Result
Calcium%	75.8
Magnesium%	18.5
Potassium%	1.4
Sodium%	0.9
Hydrogen%	0.0
Other%	3.4

Minor Elements

Boron (ppm)	0.76	1.5	-0.74	-0.03	Very Low Low Desired Excess
Iron (ppm)	128	225.0	-97	-4.46	Very Low Low Desired Excess
Manganese (ppm)	138	112.5	+25.5	1.17	Very Low Low Desired Excess
Copper (ppm)	2.65	3.5	-0.85	-0.04	Very Low Low Desired Excess
Zinc (ppm)	6.35	8.0	-1.65	-0.08	Very Low Low Desired Excess
Aluminum (ppm)	239	600.0	-361	-16.60	Very Low Low Desired Excess

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Figure 100 (above): Soil test results for South Shore Community Park.

Gideon Glen

No samples were collected for this natural location.

Silverwood Park

No samples were collected. The park was closed for construction while in Shorewood to perform the assessment and we were unable to reach anyone from the Parks and Recreation department to get permission to enter the location.

4B

CITY OF SHOREWOOD

5755 Country Club Road • Shorewood, Minnesota 55331
952-960-7900 • www.ci.shorewood.mn.us • cityhall@ci.shorewood.mn.us

To:	Park Commission
From:	Marie Darling, Planning Director
Reviewed by:	Ed Shukle, Interim City Administrator
Meeting Date:	August 16, 2021
Re:	Introduction and Transmittal of the IPM Pesticide Audit and Plan
Attachments:	Resolution 14-066 Plan Consultant's Email and Product Estimates

---

The City Council commissioned this study after staff found that the Bee-Safe Policy and Procedure adopted in 2014 (resolution 14-066) was violated and there were several instances where systemic pesticides and herbicides have been used. The use was documented in a report for the January 24, 2022 City Council worksession (available on the City's website).

On March 14, 2022, the City Council authorized an agreement with the 501(c)3 non-profit IPM Institute of North America, Inc. to assist the City in developing an integrated pest management plan to provide direction and options on pollinator friendly products and procedures for maintaining the city's properties.

Attached is the Audit and Plan developed by the IPM Institute.

This plan is designed to recommend changes to the city's pesticide and herbicide practices that would be consistent with the 2014 resolution and provide cost estimates for the products that could be used in the parks and other city properties. It does not include the cost of applying the products (either for new hires in the public works department or contracts with outside firms) or purchasing of equipment included (such as aerating equipment and the like).

The consultants have given the city two options on the types of products proposed, either Pesticide Free products or Full Organic. They have also arranged the costs considering how much of each park we propose to treat, all of the high use areas (Option 1) or just the most prominent fields (Option 2). The city could also choose hybrid options. These options will be determined by the residents' weed tolerance.

The cost of the new products and applications would need to be addressed in the park maintenance budget. Equipment costs would likely be high enough that the Capital Improvement Budget would need to include the items.

Next Steps:
Staff recommends that you review the plan and estimates submitted by the IPM Institute over the next month. At the September 13th Park Commission meeting, IPM Institute staff will be in-person to present their plan and answer any questions that you may have.

CITY OF SHOREWOOD

RESOLUTION NO. 14-066

A RESOLUTION ENDORSING "BEE-SAFE" POLICIES AND PROCEDURES

WHEREAS, the Shorewood City Council and Park Commission have undertaken several work sessions dedicated to the study and understanding of promoting a healthy natural environment through the reduction and elimination of harmful pesticides; and

WHEREAS, bees and other pollinators are integral to a wide diversity of essential foods including fruit, nuts, and vegetables; and

WHEREAS, native bees and honey bees are threatened due to habitat loss, pesticide use, pathogens and parasites; and

WHEREAS, recent research suggests that there is a link between pesticides that contain neonicotinoids and the die-off of plant pollinators, including honey bees, native bees, butterflies, moths, and other insects; and

WHEREAS, neonicotinoids are synthetic chemical insecticides that are similar in structure and action to nicotine, a naturally occurring plant compound; and

WHEREAS, the City Council finds it is in the public interest and consistent with adopted City policy for the City to demonstrate its commitment to a safe and healthy community environment through the implementation of pest management practices in the maintenance of the city parks, open spaces and city property.

NOW, THEREFORE, BE IT RESOLVED by the City Council of the City of Shorewood:

1. The City shall undertake its best efforts to become a Bee-Safe City by undertaking best management practices in the use of plantings and pesticides in all public places within the City.

2. The City shall refrain from the use of systemic pesticides on Shorewood City property including pesticides from the neonicotinoid family.

3. The City shall undertake its best efforts to plant flowers favorable to bees and other pollinators in the City's public spaces.

4. The City shall designate Bee-Safe areas in which future City plantings are free from systemic pesticides including neonicotinoids.

5. The City shall undertake best efforts to communicate to Shorewood residents the importance of creating and maintaining a pollinator-friendly habitat.

6. The City shall publish a Bee-Safe City Progress Report on an annual basis.

ADOPTED BY THE CITY COUNCIL OF THE CITY OF SHOREWOOD this 28th day of July, 2014.

Scott Zerby, Mayor

ATTEST:

Jean Panchyshyn

Jean Panchyshyn, City Clerk

4. NEW BUSINESS

A. Pest Management Report – Public Works Director, Larry Brown

Public Works Director Brown explained that this was the first phase of the Integrated Pest Management report and plan. He noted that the City had contracted with the IPM Institute of North America to prepare a guiding document for the City regarding alternatives to chemicals and pesticides. He noted that there are three phases to this document and tonight is just intended to cover the first phase. He introduced Ryan Anderson of IPM to go over the first phase of the Pest Management Report.

Ryan Anderson, IPM Institute of North America, gave an overview of Phase 1 of the Pest Management Report that they have completed for the City. He noted that much of the work has happened through Midwest Grows Green (MGG) whose mission is to educate and empower citizens to take sustainable landscaping action that reduces harmful water run-off into the waterways, protects the health of the most vulnerable citizens, and reduces negative impacts of pesticides on non-targeted species such as pollinators. He explained that Phase 1 is a sustainable landscaping audit; Phase 2 is the three year sustainable landscape management plan; and Phase 3 is implementation of all the recommendations from the earlier phases. He noted that IPM was brought in to evaluate the City and their adherence to the Bee-Safe policy. He reviewed the clauses from the Bee-Safe policy along with their audit findings. He stated that one thing the City does well is, that they mow no lower than three inches; hired goats to remove buckthorn; have prescribed burns every few years in some areas; and have no recorded use of glyphosate for invasive or noxious weed management. He noted that there are areas where there is room for improvement, such as turf grass being dependent on annual applications of systemic pesticides and annual emerald ash borer control applications. He reviewed the definition of 'systemic pesticides' and noted that the City has been using two products that they consider 'systemic' that are in the red or danger classification from MGG. He reviewed the best practices in the City related to planting flowers that are favorable to bees and other pollinators and gave examples of native plant buffers around Manor Park Pond; rain gardens at Freeman and Badger Parks; restored prairie at Gideon Glen; redevelopment of Minnetonka Country Club in 2016 into walking trails, stormwater ponds, and wetlands. He stated that areas that have room for improvement in this area include, clover patch at Cathcart Park in 2014; a number of areas that MGG would classify as 'Category C' areas which means low priority areas that could be turned into pollinator friendly vegetation. He stated that communication with residents will be important regarding the importance of creating and maintaining pollinator friendly habitats. He noted that the City does have web pages for yard and tree care as well as information on a Bee-Safe city, however, they are very hard to find. He stated that their recommendation is for the City to make them a bit more prominent and increase the resources that the City has for native planting, natural lawn care, and sustainable landscaping. He noted that the City has not conducted an annual Bee-Safe City progress report but there are plans to do that in the future.

Mr. Anderson reviewed the specific recommendations for how the City can adhere to and work on the areas that still have room for improvement. He stated that their first recommendation is to prioritize the City parks and set management schedules based on a park or fields prioritization. He stated that they also want to increase cultural controls and practices and also use data for any fertility needs or weed and pest control. He gave an overview of how the prioritization can occur for the different areas within the parks and reviewed the different category classifications. Class A Fields: Freeman and Badger Parks; Class B Fields: Manor and Cathcart Parks; Class C Fields: Silverwood, Southshore and Gideon Glen Parks. He stated that their recommendation includes

increasing cultural practices on all fields, but at the very least, on the Class A fields. He explained that this includes mowing at least once a week at 3 inches, but also the possibility of increasing the frequency in the spring and the fall in order to not take off over 1/3 of the grass blade at a time. He reviewed irrigation, aeration, and overseeding recommendations. He explained the use of data points for product purchasing for fertilization, such as soil testing and for weed control the use of tolerance thresholds. He explained that their overall recommendations were geared towards turf grass management because the City's most used areas for systemic pesticides has been on turf grass. He stated that they have also included recommendations for developing more pollinator friendly landscaping. He stated that for the Bee-Safe zones, they are recommending consideration of native plantings at Silverwood, Southshore, and Gideon Glen. He explained that they took a look at the City's emerald ash borer treatments and noted that their concern is the annual use of the product the City is using can get into the trees and the bark and can harm the 150 species of native moth and butterfly larvae. He stated that the City wants to preserve the ash trees from the emerald ash borer, but the question becomes whether they are effecting the lives of other pollinators by these applications, but noted that this will need further evaluation. He noted that IPM just came out of the Phase 2 report yesterday, however, he cannot share too much information from it yet, but a few quick take-aways are that the City should invest in the cultural practices, specifically overseeding and fertilization efforts. He explained that when this gets to Phase 3 they will be holding quarterly meetings with staff and will develop some kind of community engagement support.

Commissioner Heinz thanked Mr. Anderson for his presentation and noted that he felt that there was a lot of thought that went into the recommendations.

Chair Hirner asked about the classification of Silverwood Park as a Class C and noted that the large field area is used by many families with smaller children and also has a new playground. He asked if there may be a way to split the recommendations that would apply some Class B principles to the field area and everything else around it as Class C.

Mr. Anderson reviewed some information from Phase 2 of the report related to Cathcart Park and explained that they have split the ballfield area as Class A and the ice rink and tennis courts as Class B and the tree line area as Class C so they can categorize within the parks within different classifications. He explained that most of their assessment is based on the various uses of the areas within the parks which sometimes needs communicate engagement to see how they are really being used.

Chair Hirner asked how they determine the usage of the different areas from a community perspective.

Mr. Anderson stated that they discovered the most effective way to collect this data was found when they worked with a community near Madison, WI where they actually walked through the fields with the community members and through that input came up with the classifications into the various categories. He noted that they found this approach to be very effective but noted that the City could also try to gather the same information through a survey.

Chair Hirner asked Public Works Director Brown what the City's mowing height was on the sports fields compared to the rest of the parks.

Public Works Director Brown stated that all are at 3 inches.

Chair Hirner asked about the emerald ash borer, the City's thoughts on the ash trees, and the danger at this point.

Public Works Director Brown explained that the City had completed a tree inventory of significant trees on the public land. He stated that they are not planning on injecting all the ash trees, but are counting on significant removal over time. He stated that following conversations with Davey Resource Group, they have decided that if there are specific ash trees that are really significant whose loss would create a void for the community, they have decided to try to protect those. He stated that the practice has been injecting 30 trees per year every other year. He noted that as Mr. Anderson mentioned there appears to be new data that shows that injecting every three years may also be effective.

Patricia Houser, 5805 Minnetonka Drive, asked if there has ever been any consideration for not doing any injections of the ash trees. She stated that the report mentioned the potential toxicity to humans, unborn children, bees and ground water. She gave a brief overview of what she has found about the eating needs and habits of baby birds and the decreasing bird population. She reiterated whether the City has ever considered just letting the trees go. She stated that she feels that if the public knew about the toxicity and potential danger of the pesticides, they would be more willing to let the trees go.

Chair Hirner asked Park and Recreation Director Grout to add this feedback to things for the Park Commission to consider as this moves forward.

Ms. Houser asked about soil half-life of products and what Mr. Anderson meant when he said they want it below 31 days.

Mr. Anderson explained that soil half life is in aerobic conditions with access to oxygen. He stated that all products eventually break down and at 31 days half of the product potency has decreased. He noted that he believes glyphosate has a half-life of above 80 days.

Paula Callies, 20465 Radisson Road, stated that she serves on the City Council and explained that she felt that this was a very good report. She stated that she felt the information was presented very clearly and likes the recommendations for the City related to soil testing and communication with residents. She noted that she agreed with Chair Hirner's questions about Silverwood Park because it is a very heavily used park for its size and she thinks there are areas which could be categorized in a higher classification. She stated that it is a very complex topic and just putting labels that are red, yellow, or green may be a bit too basic. She noted that the word 'danger' may be used on a chemical but it may just be telling you not to drink it. She stated that she thinks the City needs to understand how the chemicals are used and what the warning labels mean because everything isn't 'dangerous' in the same way. She stated that she also did not think the International Standards were the same as the United States standards but noted that she was looking forward to further information on other alternatives because this needs to be realistic and there has to be a balance or it won't work.

Mr. Anderson explained that many people do not understand how pesticide products are approved by the United States EPA. He explained that the EPA does a different study than what the International Association for the Research on Cancer or the World Health Organization would do. He gave the example of glyphosate which is labeled as a probable carcinogen by the International Association for the Research on Cancer, and noted that EPA conducted different studies but noted that their studies do not include inert ingredients.

Ms. Callies stated that she was not saying that there wasn't something to be concerned about, but when you are talking about agricultural applications versus somebody putting it in their yard or in the parks without a huge broadcast agricultural sprayer, she feels that is a significant factor that should be considered.

Mr. Anderson noted that he was not intending to argue for either way but wanted to clarify that the EPA handles their assessments in a different manner than the other organizations.

Commissioner Gallivan stated that when it comes to Class A, he asked if their approach was for the entire park or just the athletic fields.

Mr. Anderson stated that Phase 1 is for the entire park and Phase 2 will be individual fields.

Commissioner Gallivan asked if for Class B if they envision treating the fields the same as they would in Class A parks, but not the grounds.

Mr. Anderson stated that would be correct but explained that what they are really focusing on for the Class A, B, and C is the cultural practices which means they want to avoid, when possible, pesticide application and replace them with cultural practices.

Commissioner Gallivan confirmed that the cultural practices was the mowing, aeration, overseeding, and fertilization.

Chair Hirner asked how much usage there was for the fields during the fall months.

Park and Recreation Director Grout stated that they are used every single day.

Chair Hirner stated that there are discussions now about overseeding and aerating and with the fields being heavily used, he questioned when the City could find the 'sweet spot' to be able to do some of these things without impacting the usage.

Mr. Anderson stated that he feels there are a few options and explained that with the overseeding program, players wear cleats, so they will just cleat it into the soil and it will start germinating. He noted that their assessment saw a lot of Kentucky Blue Grass which spreads laterally. He stated that if the City cannot do the core aeration frequently, they can consider slicing equipment that would basically make the Kentucky Blue Grass tell itself to grow outwards.

Commissioner Gallivan explained that he was having trouble reading the spreadsheet for the different options and pricing.

Mr. Anderson stated that the spreadsheet information is probably best not in a visual form on paper and is better used on-line. He explained that it is also for the Phase 2 report, so he did not develop it and would be better explained by their turf scientist, Alec McClennan.

Commissioner Gallivan stated that he is curious, moving forward, on how the numbers change if just the playing fields were treated as Class A but the others were treated in a different fashion.

Mr. Anderson stated that he thinks it will work out and noted that Alec McClennan has done two different types of estimates with fully organic and also organic based. He reiterated that their main focus is eliminating pesticides.

Chair Hirner asked if the overall goal is to be able to define Shorewood as a 'Bee Friendly' City and if so, whether there was a potential timeline for that accomplishment.

Public Works Director Brown stated that the Phase 1 report has been very comprehensive, but there is a lot of information still forthcoming. He stated that everything he has observed, thus far, is that this takes time to establish. He stated that he would estimate the City would see these efforts start to pay off in about three years.

Mr. Anderson stated that he would agree with the three-year time period and explained that was why they term it a three year sustainable landscape management plan. He stated that it will not be perfect and it will not be weed free which is why there is community engagement for education purposes. He stated that if the City follows all those cultural management practices they will be able to manage very healthy grass and vegetation.

Public Works Director Brown stated that it will ultimately be a cultural shift because having people have a higher tolerance for weeds will take a lot of education, which will take time. He stated that it needs to be made clear that if the City is going to be a pollinator-friendly City, then this will be the trade-off. He stated that it will also come with a higher cost, which will equate to taxes. He stated that overall, he would say the City is on a 3-5 year spectrum for the timeline.

Ms. Houser asked what would happen if the City included the public in getting this information and be able to really see what has been happening and what is being proposed. She stated that she thinks a huge part of this will be education and it is important for people to learn this information.

Chair Hirner noted that this report and this conversation will be available to the public through the meeting minutes.

Public Works Director Brown noted that the report will be available on the City website.

Commissioner Gallivan asked if Mr. Anderson had seen, with other clients, a phased approach in terms of trying it in one area first and overtime transitioning the complete area. He stated that he believes the City should definitely get away from the use of pesticides, but the parks serve a purpose with the ballfields and the City doesn't want people showing up and having to deal with weeds when they are playing the game.

Mr. Anderson stated that he encouraged the Commission to take a look at Elgin, IL and gave a brief overview of what was done in that situation initially with one area and noted that they have just recently put out a press release that they have added another 10 pesticide free zones. He noted that there is another community in Illinois called River Forest Park district where they have done work and are now being brought back to hold a sustainable landscaping workshop to explain what was done.

Public Works Director Brown explained that one of the issues that the City is coming up against is that there is a very active weed inspection program which must meet the statutory requirements

for removal and control of, for example, garlic mustard. He asked what approaches IPM has had outside of park land, such as along roadsides.

Mr. Anderson referenced the flywheel from his presentation that was developed by Natural Communities, LLC that outlines how they can limit their glyphosate use in natural areas. He stated that he cannot use the word 'eliminate' because there are strategies to maintain these weeds without glyphosate but if it is used at a very targeted level with a licensed applicator, the risk of exposure is very low. He reviewed information from the flywheel and how to have continual management. He reiterated that they do not want to see the use of glyphosate because it is a probable carcinogen, but if it is the only effective means for some of the harder to get invasive weeds, then they want to make sure that they don't ever establish themselves again, so they do not ever need to use the application of glyphosate again.

Ms. Houser stated that when she and her husband walk through the park they have noticed a lot of volcano-ing. She stated that she has read information from the University of Minnesota that if there is too much mulch around the base of a tree it can kind of end up suffocating it.

Mr. Anderson admitted that trees were not his area of expertise but explained that they do have Green Shield Certified standards for landscaping and volcano mulching is not allowed because it isn't healthy for the trees.

Chair Hirner stated that this Phase 1 report was just the beginning of this process and was for informational purposes so the Commission was not being asked to make a recommendation to the Council yet.

Public Works Director Brown explained that the Phase 2 report will lay out the 'meat and potatoes' of how the City can begin to put these practices to use. He stated that it will also define the costs and will also let them begin to formulate a communication plan. He stated that because there are budget pressures right now, from an implementation standpoint, the City's focus will probably be on the ballfields so they can ease into the costs. He stated that this endeavor will be an extended adventure and the goal is to get it out in bite sized pieces.

Chair Hirner thanked Mr. Anderson for his presentation and noted that he looks forward to seeing him again to discuss the additional phases.