CONSERVANCY LANDS MANAGEMENT
VEGETATION AND WILDLIFE

CONSERVATION VALUE OF CONSERVANCY LANDS

Middleton's conservancy lands serve multiple functions, including facilitating outdoor recreation, managing storm water, and protecting water quality, but are primarily managed for conservation of natural areas. Natural areas management must identify the natural resources we are seeking to protect in Middleton and surrounding communities, and must recognize and address external pressures and threats to conservancy lands, such as development and invasive species.

Internally, the multifunctionality of conservancy lands creates opportunities and constraints for management. Management of storm water facilities on conservancy lands should be done in a manner compatible with land management on surrounding conservancy land. Similarly, conservancy trails, trail policy and trail development should enhance and not diminish natural resource value of conservancy lands.

ECOLOGICAL LANDSCAPE

Topography

Middleton is located along the western edge of the Southeast Glacial Plains and is adjacent to two other landscapes: the Central Sand Hills and Western Ridge and Coulees (Figure 7-1)[21]. Each of Wisconsin's 16 ecological landscapes has unique biological and physical attributes (e.g. climate, soils, hydrology) influencing the plant and animal communities within the landscape.

The Southeast Glacial Plains ecological landscape is characterized by topography sculpted by ancient glaciation. Glacial features in the Middleton area were primarily shaped by the advance and retreat of the Green Bay Lobe, an ice sheet up to 1,600 feet tall that existed in Wisconsin 24,000-12,000 years ago. Characteristic glacial landforms include glacial till plains and moraines as well as other unique glacial features like outwash plains, drumlins, eskers, kames and kettles.

As glaciers advanced southward, they incorporated and transported enormous quantities of rock and soil. As the climate warmed over thousands of years and the glaciers slowly retreated, rocks, boulders and soil were released and deposited. Hilltop ridges, *moraines*, formed near the furthermost extent of glacial advance (e.g. terminal moraine). Depressions, or *kettles*, formed from ice melt where blocks of ice were pushed into the ground by a receding glacier. Kettle depressions that eventually filled with glacial meltwater are called *kettle ponds*. Middleton has five kettle ponds. *Glacial till plains* are expansive plains of glacial till, sediment derived from erosion and movement of material by an advancing or retreating ice sheet. *Drumlins* are elongated, often egg-shaped hills formed by either deposition of glacial sediment or erosion of bedrock material during glacial advance or retreat.

21 Finley RW. 1976. Original vegetation cover of Wisconsin. Map (scale1:500,000) and accompanying text. North Central Forest Experiment Station,US Department of Agriculture, Forest Service, St. Paul, Minnesota.

The Southeast Glacial Plains has bedrock of limestone, dolomite, or occasionally sandstone or shale that is covered by a thick layer of glacial deposits. Soils are derived from lime-rich glacial tills overlain with silt-loam loess cap. These soils are particularly suitable for agriculture. The gently rolling or flat topography and fertile soils of this landscape contributed to the conversion of natural plant communities to agricultural land following the influx of European Settlers. Remnants of endemic natural communities are often found today in areas not suitable for agriculture – such as steep slopes, bluffs, and wetlands. The Southeast Glacial Plains once supported 5 million acres of oak savannas and woodlands, prairies, sedge meadows, and other wetland communities.

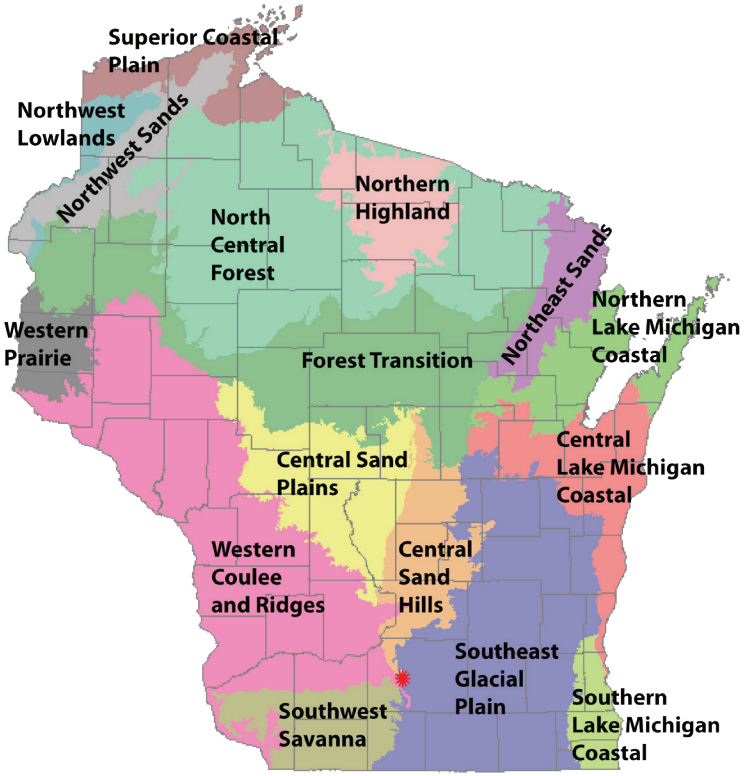

Figure 7-1. Middleton is located at the intersection of three ecological landscapes: Southeast Glacial Plain, Southwest Savanna, and Central Sand Hills. Data provided by the WDNR, 2014.

Hydrology

Middleton is in the Lake Mendota watershed, which is a sub-watershed of the Yahara River. The Yahara River drains into the Rock River, which ultimately flows into the Mississippi River. Like the surrounding landscape, the Yahara's chains of lakes was created by glaciation. The retreating glacial ice carved a valley and deposited sediments, gravel, and rocks creating drumlins and areas of poorly drained soils, where wetlands formed. Deposits also dammed the valley, creating the Glacial Lake Yahara, a lake encompassing an area double the size of all water area in the chain of lakes currently. Over time the lake reduced into smaller bodies of water creating the chain of lakes: Lakes Mendota, Monona, Waubesa and Kegonsa[22].

Middleton is geographically bordered to the east by Lake Mendota, and the 7-mile Pheasant Branch Creek and its tributaries flow into the Lake. The Pheasant Branch drains an area of over 22 acres and contributes 1,800 gallons a minute into Lake Mendota[23].

Today the landscape of Middleton and the surrounding Yahara watershed supports a variety of land uses such as urban and residential use, and agricultural land use. Non-point source runoff, particularly nutrient and sediment storm water runoff, severely impacts water quality.

Middleton's conservancy lands protect its water resources such as undisturbed wetlands, kettle ponds and creeks. The Pheasant Branch Creek and its tributaries (North Fork, South Fork) are protected by four conservancies: the Pheasant Branch Conservancy, the Pheasant Branch Creek Corridor, the North Fork of the Pheasant Branch Creek and the South Fork of the Pheasant Branch Creek. The 550-acre Pheasant Branch Conservancy is critical in protecting the Pheasant Branch Creek as well as its source springs and seeps, and wetland areas.

The Wisconsin Wetlands Association considers the Pheasant Branch Conservancy one of 7 "Workhorse Wetland Gems" in the state[24]. These wetlands demonstrate functional values of a wetland as described by the Wisconsin Rapid Wetland Assessment Methodology. The Pheasant Branch Conservancy is highlighted for its high groundwater connections[25]. Natural springs discharge 2.6 million gallons of groundwater into the Pheasant Branch wetlands daily.

Middleton's five glacial kettle ponds are additionally protected as conservancy areas (Sticker Pond, Tiedeman Pond, Graber Pond, Esser Pond, and Middleton Hills Pond, in Middleton Hills Conservancy).

Many of Middleton's conservancy areas serve dual function as both ecological resources and storm water management features. Storm water management goals include reducing sediment and suspended solids loads, in compliance with State regulations, and mitigating erosion. The City of Middleton is one of 23 participants in the Yahara WINS (watershed improvement network) watershed phosphorous reduction project organized by the Madison Metropolitan Sewerage District (MMSD), the WDNR, and partnering organizations. The project initiated in 2012 as a pilot regulatory compliance strategy called watershed adaptive management, in which all sources of phosphorus in a watershed work together to reduce phosphorus. In the first four years of the project, 29,000 pounds of phosphorous were kept from area surface water, accounting for 25% of the project's 20-year phosphorous reduction goal[26]. In 2016 the project transitioned to from a pilot project to a full-scale long-term (20+ years) project.

Vegetation

Historically, the Southeast Glacial Plains supported 5 million acres of prairie, oak savanna, oak woodlands, wetlands and other endemic communities. Today, less than 0.1% of original prairie and oak-dominated communities remain. These communities are globally imperiled due to their rarity.

22 Dane County Environmental Council. 2007. Yahara Waterways: Water Trails Guide. Madison, WI
23 Wisconsin Department of Natural Resources. 2002. Rock River Water Quality Management Plan, Lower Rock River Appendix. WT-668-2002. South Central Region, WDNR. Madison, WI
24 Wisconsin Wetlands Association. 2015. Wisconsin's Wetland Gems. Madison, WI
25 Larson J, Lehnhardt S.1998. Vegetation and Ecological Conditions of the Pheasant Branch and Belftontaine Conservancies. Applied Ecological Services, Inc. Brodhead, WI
26 Madison Metropolitan Sewer District. Accessed April 1, 2018 at <http://www.madsewer.org/Programs-Initiatives/Yahara-WINs> 2/26/2018

PLANT COMMUNITY TYPES

A community is an assemblage of different species that grow together and interact either directly or indirectly. A plant community is the vegetative component of the community. More specifically, a plant community is a local assemblage of species that develops in response to site conditions, such as soil moisture and fertility, local and regional climate, slope, aspect, and disturbance patterns[27].

Plant communities are recognizable associations of species, but do not necessarily have discrete boundaries. Where two community types overlap is called an ecotone. Some communities exist on a spectrum that is influenced by a gradient in some abiotic or biotic factor, such as disturbance. The prairie-oak savanna-oak woodland continuum is one such example. Communities range in size from less than an acre to thousands of acres. Communities are dynamic and always changing. Some change may be rapid while other change is slow and unrecognizable in a human lifespan[28].

Natural Community Types

Middleton's conservancy lands support a diversity of plant communities and unique landscape features. The Wisconsin Natural Heritage Inventory (WNHI) describes native plant communities endemic to Wisconsin[29]. Plant communities and landscape features existing in Middleton's conservancy lands, but not categorized in the WNHI are also listed in Table 7-1[30].

Several imperiled plant communities are present in Middleton, including prairie communities, oak woodland, oak opening (oak savanna), and wetland communities. Middleton's Threatened and Endangered resources are discussed later in this chapter.

27 Curtis JT. 1959. The Vegetation of Wisconsin: An Ordination of Plant Communities. The University of Wisconsin Press, Madison, WI
28 Epstein EJ, Judziewicz EJ, Spencer EA. 2011. Wisconsin Natural Heritage Inventory: Recognized Natural Communities – Working Document. Wisconsin Department of Natural Resources, PDF file.
29 Wisconsin Natural Heritage Program, Bureau of Natural Heritage Conservation, Wisconsin DNR. 2016. Wisconsin Natural Heritage Working List. Madison, WI. Accessed March 1, 2018 https://dnr.wi.gov/topic/nhi/wlist.html
30 Eggers SD, Reed DM. 2011. Wetland Plants and Plants Communities of Minnesota and Wisconsin. 3rd ed. United States Corps of Engineers, Regulatory Branch, Saint Paul District, Saint Paul, Minnesota

Table 7-1. Middleton's Natural Communities and Landscape Features

COMMUNITY OR FEATURE	DESCRIPTION	SOURCE[A]
Kettle pond	A geologic feature formed by a receding glacier. As an ice sheet retreats, chunks of ice may detach and press into a depression surrounded by mounds of soil. As the ice melts, a depression called a kettle hole remains. When water occupies the depression, it is called a kettle pond.	
Marsh communities	Marshes are characterized by permanent or temporal shallow water, and emergent aquatic vegetation. Dominant species include cattails and bulrushes among other gramanoids and forbs. These wetlands promote water quality by trapping sediments and taking up nutrients, mitigate floodwaters and shoreline erosion, and provide habitat for a variety of fishes, birds, and other wildlife.	BWSR
Mesic prairie	Prairies that occur on rich, moist but well-drained soils, where conditions may vary between wet and dry depending on the time of year and moisture conditions. Mesic prairies have a high diversity of forbs and graminoids. Prairies are adapted to frequent fires. Less than 0.1% of the original extent of prairie remains in Wisconsin.	WNHI
Mixed hardwoods	A central hardwoods community dominated by mesic hardwood species.	
Oak savanna	An oak opening is an oak-dominated savanna community in which there is at least one tree per acre but where total tree cover is less than 50%. The ground layer contains a native grass and forbs adapted to scattered sunlight. Receive varying amounts of sunlight. This community is critically imperiled in Wisconsin.	WNHI
Oak woodland	Woodlands dominated by oaks (*Quercus spp.*). The oak woodland community occupies a position on the continuum between oak openings (oak savanna) and oak forest/southern dry forest. Oak woodlands are characterized by trees that are more densely spaced and less spreading than those of savannas, and with crown closure between 50-95%. Dominant species include white oak, bur oak, and black oak, sometimes mixed with shagbark hickory. The ground layer is diverse; featuring members of the prairie, oak savanna, and oak forest communities that are adapted to highly filtered light conditions and frequent fire	WNHI
Sedge meadow	Widespread in southern Wisconsin, this open wetland community is most typically dominated by tussock sedge and Canada bluejoint grass, among other sedges, grasses and forbs. Common in glaciated landscapes, where they often border streams or drainage lakes. This community occurred with prairie, savanna, and hardwood forest communities. Threats to this community include fire suppression, drainage of wetlands, and invasive species.	WNHI
Seeps	A seep is an area where groundwater reaches the surface through permeable earth. Seeps are not as obvious as springs and are often located on hillsides	
Shrub swamps	Wetlands dominated by woody deciduous shrubs such as willows and dogwoods. Artificial drainage and fire suppression contribute to the succession of meadows to shrub communities. Includes shrub-carr.	BWSR
Springs	A spring is a point where groundwater or an underground stream reaches the ground surface.	
Stream	Middleton's streams include the Pheasant Branch Creek and its tributaries.	
Surrogate grasslands	A human-influenced landscape dominated by cool-season grass species, such as hayfields and pastures. These areas are dominated by non-native plant species, but provide habitat for grassland birds and some mammals.	WNHI

[A] Wisconsin Natural Heritage Program, 2016

[B] Minnesota Board of Water and Soil Resources (BWSR) Wetland Plants and Plant Communities of Minnesota and Wisconsin (Eggers and Reed. 2011)

Table 7-1. Middleton's Natural Communities and Landscape Features

COMMUNITY OR FEATURE	DESCRIPTION	SOURCE[A]
Wet-mesic prairie and wet prairie	Prairies occurring on moist soils. These prairies are often associated with wetland communities such as sedge meadow, emergent marshes, fens, etc. Have a high diversity of gramanoids and forbs.	WNHI
Wet/Fresh meadow	A community dominated by invasive reed canary grass. Typically in areas where sedge meadow or wet prairies would occur, but human influence such as artificial drainage, cultivation, and/or excess sediment and nutrient inputs favors establishment of reed canary grass	BWSR
Wetland communities	Areas were soils are saturated or covered with water, such as swamps, marshes, bogs, potholes, swales, glades and overflow land of rivers and valleys	

[A] Wisconsin Natural Heritage Program, 2016

[B] Minnesota Board of Water and Soil Resources (BWSR) Wetland Plants and Plant Communities of Minnesota and Wisconsin (Eggers and Reed. 2011)

THREATS AND OPPORTUNITIES

In Middleton and across the state, natural communities are impacted by past land use legacies and ongoing stressors such as habitat loss, fragmentation and degradation. Threats to natural communities are either directly or indirectly a result of human influence on the landscape.

Major threats to southern Wisconsin's natural communities include fire suppression, habitat loss, habitat fragmentation, loss of biodiversity, invasive species, changes in hydrology, and climate change (Table 7-2)[31].

Table 7-2. Threats to Wisconsin's Endemic Natural Communities

Fire suppression	Many natural communities in southern Wisconsin are adapted to fire at various frequencies and intensities, started by either natural lightning strikes or cultural practices. (Limits mesophication, can facilitate reproduction of key canopy species, e.g. oak; can deter growth of some non-native species; increases plant diversity)
Non-native plants	Non-native plants and fauna (e.g. non-native earthworms)
Ecological simplification	Loss of biodiversity, or ecological simplification. Loss of biodiversity coincides with loss of structural diversity and functionality.
Habitat loss	Habitat loss through agricultural production, development and transportation infrastructure
Habitat fragmentation	Habitat fragmentation through conversion to agricultural land or development. Many native plants and animals require large areas of contiguous habitat.
Hydrologic modifications	Changes in hydrology are human-caused. Alterations in hydrology include damming, draining (e.g. drain tiles), ditching, filling or urban storm water inputs.
Climate change	Climate change impacts natural communities in several ways: changes distribution and extent of species ranges, likely increases frequency and intensity of extreme weather events such as flooding or drought, may impact the ability to and efficacy of prescribed burning, and may indirectly promote invasive species.

31 Wisconsin Department of Natural Resources. 2015. 2015-2025 Wisconsin Wildlife Action Plan. Madison, WI.

Middleton is located at the edge of urban and suburban development pushing outward from the Madison metropolitan area. Land to the south and southwest of the City is primarily urban and residential, whereas areas to the north and northwest are primarily agricultural or undeveloped. Middleton's conservancy lands thus buffer urban development to south and provide a corridor between regional open space areas to the north, northeast, west, and to Lake Mendota. Thus, there is an opportunity for strategic acquisition of land or connection to land that strengthens contiguous environmental corridors to the north, northeast, and west of Middleton. These environmental corridors can additionally serve as recreational corridors where appropriate, for example, bike paths.

Nearby public open spaces include lands owned and managed by the WDNR, Dane County Parks, and to a lesser degree the Town of Middleton and City of Madison. Nearby Dane County Parks lands include Recreation Parks, Wildlife Areas, and Natural Resource Areas. Mendota County Park, Dorn Creek Wildlife Area, and North Mendota Prairie Unit Wildlife Area are located northeast of Middleton. Nearby Natural Resource Areas include the Dane County-owned portion of the Pheasant Branch Conservancy and the Black Earth Creek Natural Resource Area, located at the headwaters of the Black Earth Creek in the Town of Middleton. Natural Resource Areas (NRA's) are defined as lands set aside for the protection of valuable natural environments, such as water resources, wetlands, prairie, steep topography, forests, and agricultural working lands. These areas are managed primarily for natural resource value and secondarily for recreation. Dane County Parks additionally maps Natural Resource Area Boundaries (NRAB's) which are buffer areas protecting NRA's that are typically not owned by Dane County Parks. Mapping of these areas has, "no bearing on any zoning or land use decisions and participation by private landowners or local units of government to carry out any outlined resource protection initiatives is on a voluntary basis,"[32]. However, mapping of these areas highlights opportunities for protection of a larger landscape through either future acquisition, agricultural or conservation easements, or through private management (Figure 7-2).

Areas adjacent to Middleton include the North Mendota NRAB, which connects the Pheasant Branch NRA/NRAB to Dorn Creek/ Dorn Creek headwaters and to Six Mile Creek, and the Black Earth Creek NRAB to the west of Middleton, which connects the headwaters of Black Earth Creek to the Ice Age National Scenic Trail Corridor.

The Black Earth Creek NRAB includes forested and open space areas to the north and west of the Middleton Bike Park. The land to the north is being developed into a cross-country skiing Community Olympic Development Training Center and land to the west provides cross-country skiing and mountain biking access to Blackhawk Ski Club facilities. Managing these areas for silent sports recreation (cross-country skiing, biking, hiking, etc.) can be compatible with protecting these forested and open space areas.

The North Mendota NRAB encompasses the Metropolitan Refuse District property, which includes wetlands adjacent to Dorn Creek.

32 Dane County Parks. Dane County Parks Open Space Plan 2018-2013. n.d. PDF file

One of my only concerns with the conservancy system has to do with development projects that are possibly infringing on native environments. I'd hate to see our wetlands, prairies, and forests polluted because the impact can stretch beyond just Middleton - Survey respondent, 2018

The [conservancy system] is being threatened by excessive nearby development - Survey respondent, 2018

...I'd love to see more land and trails brought into the system and connect some of the disparate areas and connect to other trails and conservancy/park areas in Madison, Cross Plains, Waunakee, etc. - Survey respondent, 2018

As I see Middleton ever expanding, I hope we can continue to add or save spaces as a retreat from our urban landscape - Survey respondent, 2018

We are truly fortunate to be blessed with conservancy lands. We have the obligation to take care of them to ensure they remain in good quality for future generations of people, wildlife and plant communities - Survey respondent, 2018

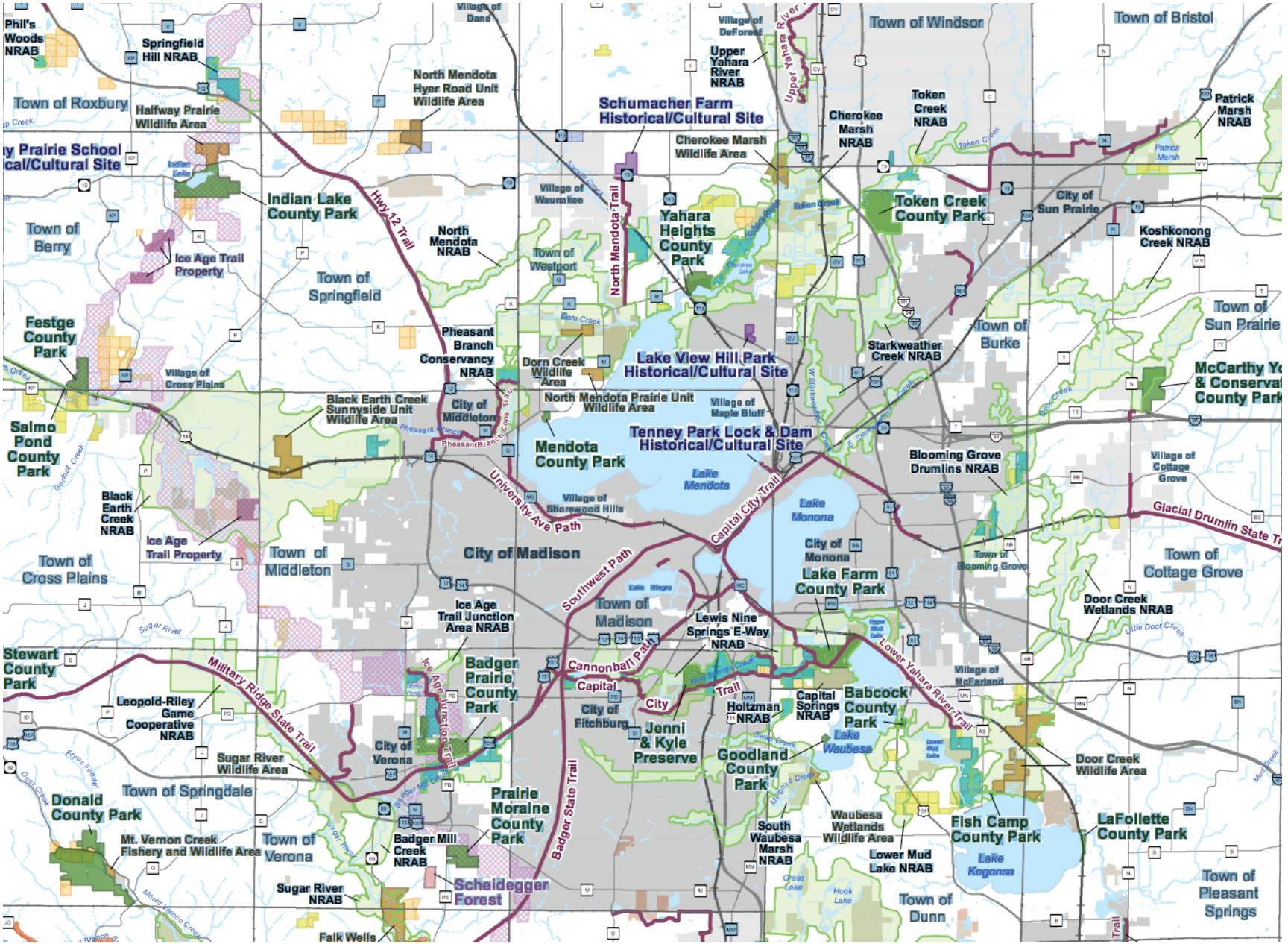

Figure 7-2. Dane County Parks park system and Natural Resource Areas map. Source: Dane County Parks

LAND MANAGEMENT

This Plan is meant as a framework for managing Middleton's conservancy lands system, however, is not a substitute for management plans for specific conservancy areas. The recommendations provided in this plan are general guidelines for management and are not intended to be conclusive or static.

Land Stewardship Strategies

Successful land stewardship requires routine monitoring and evaluation. Monitoring and assessment of past management activities thus informs changes in management tactics in response to results of previous management. This process of adaptive management also allows for adjustments in management practices based on new available information and research.

Land stewardship additionally requires flexibility due to the nature of ecological systems – natural fluctuations (e.g. populations dynamics, hydrology), random events (e.g. weather), unpredictable results of prior management activities, and other factors beyond human control.

General land management strategies should:

- Use a scientific, data-driven approach to management
- Focus on vegetation: the appropriate plant community assemblage provides habitat for insects, wildlife and birds
- Manage for endemic natural communities and native vegetation
- Provide habitat for species of special concern
- Reduce extent and spread of invasive species
- Restore natural processes to a landscape (e.g. fire regime, hydrology)

STORM WATER MANAGEMENT

Many of Middleton's conservancy areas additionally serve as storm water management facilities. Management of urban storm water is important because runoff increases sedimentation, conductivity and temperature of surface water, which degrades downstream water and habitat quality. Storm water runoff influences urban streams and wetlands by increasing the amount and flow of water in a system. Impervious surfaces associated with urban environments (e.g. impervious roads, parking lots, buildings and rooftops) exacerbate storm water runoff.

Management of storm water is guided by the City's storm water management plan, which includes a 2010 Water Quality Master Plan and associated studies. Storm water management goals include reducing sediment and suspended solids loads, in compliance with State regulations, and mitigating erosion. The Department of Public Works (DPW) and associated committees (WRMC, Storm Water Utility Board) are responsible for storm water management projects, study projects, and facility maintenance. Storm water features such as detention ponds and retention ponds aim to promote water infiltration.

Consequently, multiple City departments and committees are involved with land management decisions and oversight on conservancy lands functioning on some level as storm water management facilities. This has led to both gaps and overlap in responsibility, particularly for vegetation management. Examples of mismanagement include unnecessary or arbitrary mowing of natural areas (e.g. John C Bock Community Forest native plantings), or neglect due to lack of designated responsibility (e.g. Hidden Oaks Conservancy).

Opportunities

While managing conservancy lands for storm water provides challenges, using natural systems to manage storm water has many advantages (Table 7-3).

For over 20 years, the City has restored and managed native plant communities in its conservancy lands and storm water features. Native plants are adapted to our climate and offer greater value per acre compared to non-native vegetation by providing superior storm water infiltration capability, wildlife habitat, and resilience to drought (Table 7-3). The superior ability of native plants compared to introduced grass species to promote water infiltration, prevent erosion and withstand periods of draught is attributable to their deep root systems (Figure 7-3)[33]. Many prairie species contain about 2/3 of their biomass below ground in roots.

Given the level of expertise required in determining proper timing and application of vegetation management practices, we recommend that one entity should ultimately be responsible for vegetation management on land with native plantings. Costs of vegetation management may be shared across departments. For example, PLRF could conduct prescribed burns or maintenance mowing of a storm water detention basin, however expenses could be billed to DPW.

33 Minnesota Department of Natural Resources. 2018. Native Grasses - Soil Stabilization. Accessed April 1, 2018. https://www.dnr.state.mn.us/roadsidesforwildlife/nativegrasses.html

Improvement projects related to storm water management should be the responsibility of the Public Works Department. Proposed capital projects include: Tiedeman Pond pump replacement and feasibility study/stormwater abatement plan; Stricker and Tiedeman Pond Stormwater Detention Pond, Tiedeman Pond dredging around the sewer grate, and Tiedeman Pond forebay dredging.

Updating the City's GIS system and establishing an in-house GIS database could improve coordination between City departments. Benefits would include: shared access to maps and relevant data between multiple City departments, up-to-date public lands map are maintained in a central location, public lands maps delineate management responsibilities and desired management practices specific to area. Enhanced GIS capacity would provide a mechanism for documenting and evaluating land stewardship activities qualitatively and quantitatively.

Acquisition of additional lands could provide opportunities for enhanced storm water management, conservation and recreation. Coordinate with the WRMC regarding runoff control measures and acquisition of lands for enhanced mitigation of runoff. For example, the WRMC is currently investigating land aquisition around the North Fork of the Pheasant Branch Creek for corridor buffers and storm water detention basins. These areas could additionally provide benefits for wildlife habitat and recreational use.

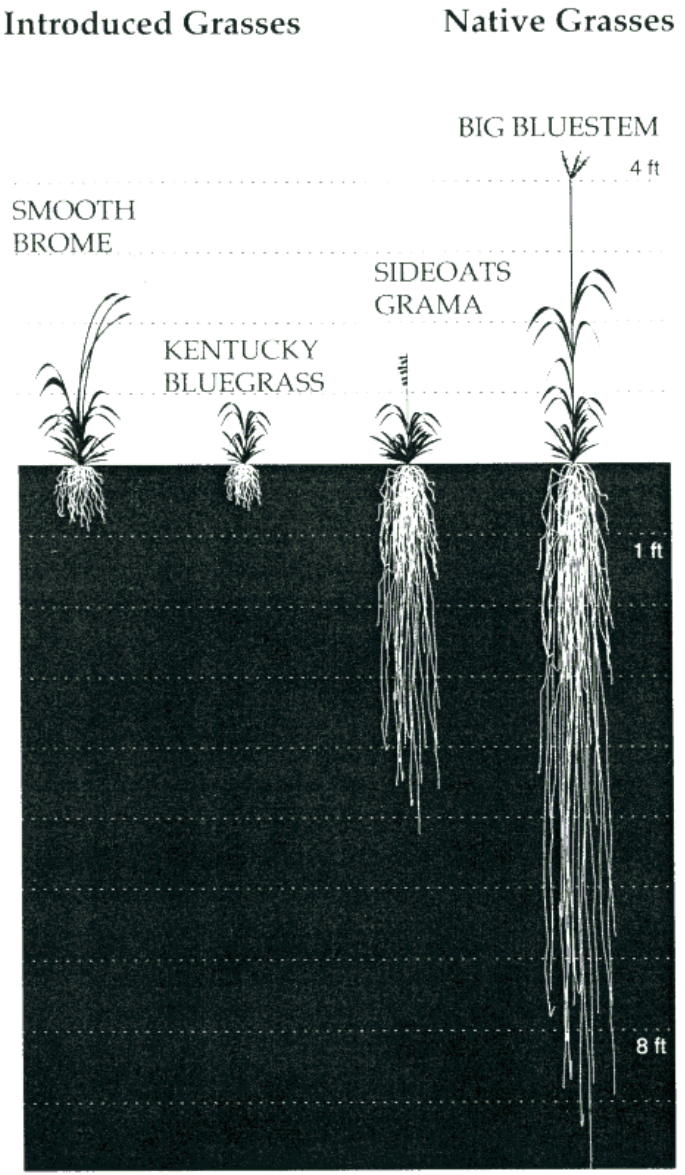

Figure 7-3. Root depth of native grasses compared to introduced turf grasses, prepared by the Minnesota Department of Natural Resources, 2018. Prairie grasses and forbs grow extensive roots up to 20 feet deep.

Table 7-3. Opportunities and Constraints of Detention Basin Native Plantings

OPPORTUNITIES	CONSTRAINTS
Provides pollinator habitat	Requires weed management by personnel knowledgeable in native plant identification
Deep roots of prairie plants allow increased storm water infiltration and attenuation of runoff compared to shallow-rooted non-native vegetation	Requires properly timed maintenance mowing or burning
Aesthetics	Seed cost
If in a weed management program, limits influx of invasive species into downstream areas	
Provides wildlife habitat	
Native plants host more nutrient and pollutant-reducing microorganisms compared to non-native	
High below-ground biomass leads to increased carbon sequestration	
May be eligible for grant funding	

INVASIVE PLANT SPECIES

Invasive species warrant special attention because of the reduction in habitat diversity and quality that they are likely to cause. The best approach is to prevent a small number of plants from becoming a major infestation through regular monitoring and prompt control.

Invasive species are classified in Wisconsin by the Wisconsin NR 40 listing (Wis. Adm. Code ch. NR 40)[34].

Prohibited species are those not currently found in Wisconsin, with the exception of small pioneer stands of terrestrial plants, but which, if introduced to the state, are likely to survive and spread, potentially causing significant environmental or economic harm or harm to human health. It illegal to possess, transport, transfer, or introduce Prohibited invasive species in Wisconsin without a permit.

Restricted species are those that are already established in the state and cause or have the potential to cause significant environmental or economic harm or harm to human health. Restricted species are subject to a ban on transport, transfer and introduction, but possession of terrestrial species is allowed.

Caution species are those that may be placed in other categories such as prohibited, restricted, or non-restricted because they are not currently found in the state, appear to be invasive only regionally, or their potential for invasiveness in Wisconsin is unknown.

Non-regulated species are those that may have some beneficial uses as well as negative impacts on the environment but are already integrated into Wisconsin's ecosystems so that control or eradication is not practical or feasible.

The Wisconsin NR 40 Invasive Species list provides some measure of severity of invasive species threats. However, the list does not convey severity of Non-regulated invasive species that are considered widespread and "not practical or feasible" to eradicate. Some listed Non-regulated species, (e.g. Birdsfoot trefoil), are pernicious in native plant communities and should be removed from remnant and restored native plant communities.

34 Wisconsin Department of Natural Resources. 2013. Invasives Rule – NR 40 Terminology, Invasive Species. Accessed March 20, 2018 https://dnr.wi.gov/topic/invasives

Management of Prohibited Species in Middleton

Wisconsin Prohibited species identified in Middleton since 2011 are listed in Table 7-4.

Water Hyacinth and Water Lettuce, Orchid Heights Conservancy/ Pheasant Branch Conservancy

The City received a WDNR Aquatic Invasive Species (AIS) Grant in 2010 for removal of a large infestation of water lettuce and hyacinth from the North and South detention ponds in Orchid Heights Park/Orchid Heights Conservancy, and some areas in the Pheasant Branch Conservancy where water hyacinth and water lettuce plants had been transported downstream into the Pheasant Branch marsh, which ultimately drains into Lake Mendota. This project was an "emergency response" to a rapidly growing invasion that threatened the habitat quality of the Pheasant Branch Conservancy. The source of infestation is unknown. All plant material was removed in 2010, and the area was monitored 2011-2013. No water hyacinth and water lettuce plants were identified following removal in 2010.

Southern Cattail, multiple locations

Southern cattail (*Typha domingensis*) was first identified in 2011 in multiple locations within a ¼ mile area in storm water swales, culvert areas, and wetland areas. Areas include the North Fork of the Pheasant Branch Creek stream corridor and confluence pond, South Fork of the Pheasant Branch Creek stream corridor adjacent to Costco parking lot, and Esser Pond. The City received a WDNR Early Detection AIS Grant for Southern cattail removal 2012-2013, and a second five-year AIS Grant for 2014-2018. Grant funds from the 2014-2018 AIS Grant additionally cover removal of two Wisconsin Restricted species: Phragmites (*Phragmites australis*) and purple loosestrife (*Lythrum salicaria*). Project is ongoing.

Policeman's Helmet, Orchid Heights Park/Orchid Heights Conservancy

Policeman's helmet (*Impatiens grandulifera*) was identified in storm water swales in Orchid Heights Park in 2015. The area was monitored and plants were removed as found 2015-2018. Monitoring is ongoing.

Table 7-4. Wisconsin NR 40 Prohibited Species Identified in Middleton 2011-2017

SPECIES NAME	STATUS
Water hyacinth (*Eichhornia crassipes*)	eradicated
Water lettuce (*Pistia stratoites*)	eradicated
Southern Cattail (*Typha domingensis*)	ongoing monitoring and removal
Policeman's helmet (*Impatiens grandulifera*)	ongoing monitoring and removal

RESTORATION CAPITAL PROJECTS

Adequate funding is necessary to preserve and enhance the quality of Middleton's natural areas. According to the Conservancy Lands Plan Update Survey, 22% of verified Middleton residents listed habitat restoration and management of native vegetation as the highest priority for allocation of funds with respect to conservancy lands. When identifying management priorities, 81% of residents cited invasive species management as very important (4) or extremely important (5) on a 1-5 Likert scale. Additionally, 65% of residents cited restoring areas to native vegetation communities as very important (4) or extremely important (5).

Biodiversity that is supported through well-functioning ecosystems is of primary importance to me - Survey respondent, 2018

When initiating a native plant establishment project, we recommend a 10-year establishment period prior to shifting the project from capital to maintenance budgets. This allows the planting to establish and become resilient to degradation from invasive species, flooding, or other outside influences.

Proposed restoration capital projects for the next five years are listed in Table 5-7.

MANAGEMENT PRACTICES

Common land management activities are described in the 2011-2016 Conservancy Lands Plan[35].

35 Schreiber Anderson Associates. 2010. p 2-1

Table 7-5. Estimated Per Acre Costs of Restoration for General Natural Community Types

PLANT COMMUNITY	INITIAL YEAR OF RESTORATION *PER ACRE*	MATURE RESTORATION (>10 YEARS) *PER ACRE*	10-YEAR COST *PER ACRE*
Prairie communities	$1,500	$300	$11,000
Wetland communities	$1,500	$300	$11,000
Oak savanna/oak woodland communities	$5,000	$300-600	$27,000

WILDLIFE MANAGEMENT

Middleton's conservancy lands are home to a diversity of wildlife that occupies the variety of habitat types within the conservancy lands system - wetlands, prairie, savanna and woodlands. For different species of wildlife, these areas serve as travel corridors, resting areas, breeding grounds, or year-round habitat.

During the public outreach process for this plan, dozens of comments were received from conservancy users about how they appreciate their interaction with birds and wildlife when visiting Middleton's public lands. According to Cornell University's "e-Bird," a citizen-science database, over 235 species of birds have been identified in Pheasant Branch Conservancy. Other e-bird hotspots include Stricker Pond, Tiedeman Pond, and Graber Pond.

> *I love to be outside and experience the natural environment. Spotting a special animal like a mink, hawk, turtle, or deer is wonderful. I am so grateful for our conservancy lands and want to see them preserved and cared for - Survey respondent, 2018*

Sometimes wildlife can have a negative impact on conservancies and the community. An example of this includes nutrient inputs to kettle ponds from non-migratory Canada geese, which can lead to algal blooms and a decline in water quality. Another example of negative wildlife impacts are losses in biodiversity due to grazing pressure from white-tailed deer. Deer abundance increased dramatically in the last several decades and deer populations greatly exceed historic levels in southern Wisconsin. Selective browsing by deer influences alters the vegetative composition of natural communities[36]. Over-browsing and selective browsing reduce biodiversity of our landscapes, increase susceptibility to invasive species, and indirectly reduce habitat for Wisconsin native fauna. Middleton has engaged in a deer damage abatement program since 2002.

Past management activities

Blanding's turtles

City staff, contractors and volunteers have played an active role monitoring for Blanding's turtles (*Emydoidea blandingii*) and enhancing habitat. These turtles are protected under Wisconsin law and are found in several conservancy areas within the City, including Pheasant Branch Conservancy, Graber Pond Conservancy and Middleton Hills Conservancy wetland area. Volunteers and contractors surveyed Middleton's natural areas for turtles (2009-2014) and monitored movement of these turtles using radio telemetry. This project was supported by WDNR Citizen-Based Monitoring Partnership Program funds, received in 2011.

A tile break and wetland restoration on the west side of Pheasant Branch Conservancy is near the overwintering habitat of the turtles, and surrogate nesting media (sand piles) were placed on the east side of the conservancy.

The three Blanding's turtles fitted with radio telemetry devices were monitored weekly to see where they were utilizing the marsh (2012-2013). The data indicated that the turtles hibernate each winter near this restored wetland area. This monitoring project also provided insight into the seasonal patterns of snapping turtles and painted turtles, which following similar patterns of migration. Nesting sites were also documented. Eggs from non-suitable, dangerous nesting sites (i.e. lawn) were collected and reared by a DNR turtle expert. These "head-started" turtles grow faster than their outdoor counterparts, and have a greater chance of survival due to their size. In 2012, 9 head-started turtles were released in the Pheasant Branch Conservancy; in 2013, 16 head-started turtles were released.

Over the course of the 5-year project, the consultant (Thompson & Associates Wetland Services) presented numerous talks and demonstrations, and facilitated over 1000 hours of volunteer work.

36 Côté SD, Rooney TP, Tremblay JP, Dussault C, Waller DM. Annual Review of Ecology, Evolution, and Systematics 2004 35:1, 113-147

Deer Management

Middleton has participated in deer management in the Pheasant Branch Conservancy since 2002 with the assistance of WDNR Urban Wildlife Damage Abatement and Control grants. The grant program helps offset expenses related to monitoring and estimating deer populations, culling deer with sharpshooters, performing health and tissue sampling (for Chronic Wasting Disease), modifying habitat to reduce suitability to deer, and other abatement methods.

The project is aimed at reducing the density of deer given the absence of natural predators in urban Middleton. An unnaturally large population of deer creates a nuisance in yards and parks, contributes to car accidents on local roads, and negatively impacts native vegetation in Middleton's conservancies. The WDNR recommends an acceptable threshold of 10 deer per square mile (about 1 deer per 64 acres) in the Madison Metropolitan area. Since 2002 the program has been successful in reducing the number of deer in the conservancy. Project activities also include grant renewal, education and outreach materials (Figure 7-4).

Major deer damage abatement activities included:

Aerial surveying	2014, 2015
Habitat modifications: removing invasive brush	2014, 2015
Sharpshooter culling	2002-2014

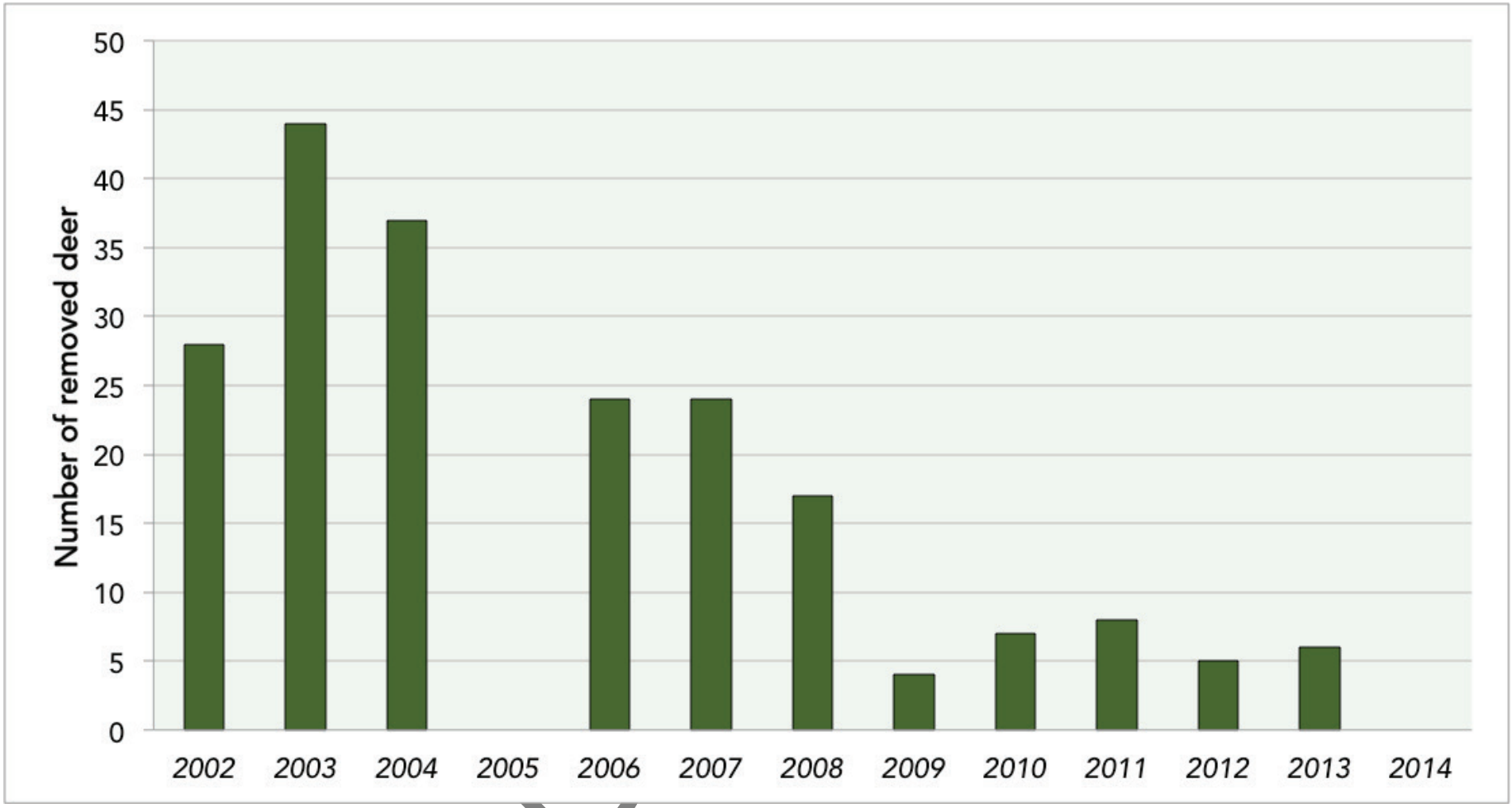

Figure 7-4. Deer Damage Abatement Deer Removal in Middleton 2002-2014

"Bird City"

In 2011 the City was awarded "Bird City" status by the Bird City Wisconsin project, recognizing the City's commitment to maintaining and enhancing bird habitat. In order to become a "Bird City," a community needs to demonstrate that they have met at least seven of 22 criteria within these four categories:

Category 1	Creation and Protection of Habitat
Category 2	Participation in Programs Promoting Effective Community Forest Management
Category 3	Limiting or Removing Hazards to Birds
Category 4	Public Education

This status has been renewed annually.

ENDANGERED, THREATENED AND SPECIAL CONCERN SPECIES

Threatened and Endangered Species are plants and animals designated by state and federal agencies to receive legal protection due to their rarity. At the state level, Wisconsin State Statute 29.604 and Administrative Rule Chapter NR 27 provide guidance on this protection.

As part of this protection, the Wisconsin DNR's Bureau of Endangered Resources maintains the Wisconsin Natural Heritage Inventory (NHI) program. The WNHI Working List contains 1) native species known or suspected to be rare and/or declining in the state, 2) natural communities recognized by WNHI, and 3) certain other natural features that occur in Wisconsin. The Working List includes species legally designated as "Endangered" or "Threatened" by either the State of Wisconsin (State Statute 29.604 and Administrative Rule NR 27) or the federal government (federal Endangered Species Act). It also contains species the department has designated "Special Concern," as well as the USFWS's formal "Candidate" species[37].

NHI data is publicly available at a township level. Since the City of Middleton boundary extends across 3 townships, we listed the NHI for all 3 townships, current as of July 2017 (Table 7-6). Township lists exclude bald eagles and particularly sensitive species for the purpose of protecting the locations of these elements. Thus, the data presented at the Township level should not be used for reviewing a proposed land development or land management project for potential impacts to endangered resources.

Sensitive Species are generalized to the County level. Dane County sensitive species elements are listed in Table 7-7[38].

Protected wild animals

In addition to legal protection for threatened and endangered species, Wisconsin rule NR 10.02 extends legal protection to specifically named animals regardless of rarity (Table 7-8).

37 Wisconsin Natural Heritage Program, Bureau of Natural Heritage Conservation, Wisconsin DNR. 2016. Wisconsin Natural Heritage Working List. Madison, WI Accessed March 1, 2018 https://dnr.wi.gov/topic/nhi/wlist.html.
38 Wisconsin Department of Natural Resources. 2017. Sensitive Species List: Elements to be Generalized to County Level. PDF file last updated October 2017

Incidental Take

The WDNR has the authority to allow incidental take of endangered and threatened species under certain circumstances, and has developed protocols to minimize negative impacts to protected native species while conducting land management and landscape altering activities[39].

An *Incidental Take Permit/Authorization* is issued on a project-by-project basis, and the individual or agency responsible for incidental mortality must submit an application prior to performing land management activities.

Broad Incidental Permit/Authorizations were created for common land management activities such that neither an application nor a permit fee is required. An individual or organization covered by this permit or authorization is therefore automatically covered.

Land management activities in Middleton's conservancy lands are covered under the Grassland and Savanna Broad Incidental Take Permit/Authorization. Incidental take (mortality) of endangered and threatened species may occur during grassland and savanna management activities, however, these activities are necessary for maintaining habitat for these species.

According to the Grassland and Savanna Broad Incidental Take Permit/Authorization:

The term "grassland" broadly includes prairie communities, sedge meadow, shrub-wetland, fen, brush prairie, sand barrens, bracken grassland, and sphagnum bog. Pastures and fields dominated by non-native grasses and forbs with or without shrubby invasion, and plantings of native grasses and forbs are also considered "grassland".

The term "savanna" refers to oak and pine barrens, glades, oak openings (oak savanna), open oak woodland and all phases in between. Degraded lands, agricultural lands, and other forested lands that are targeted for grassland or savanna restoration also are included under this authorization.

Prior to completing land management activities, the land manager must compile a list of species likely to be present on site. If the WDNR is funding or approving the management activity, a DNR staff will conduct an assessment using the NHI database. If the WDNR is not conducting, funding, or approving the project, an Endangered Resources Review can be requested.

Activities Covered

This permit/authorization is not a blanket approval for all activities that may occur in a grassland and savanna habitat. Only the following management activities are covered when appropriate species protocols are followed: prescribed burning, mowing/haying, selective tree or brush cutting, herbicide application, and grazing. Other activities (tree planting, flooding, harvesting seed from Threatened and Endangered Species) require special instructions and/or special permissions from the WDNR Bureau of Endangered Resources.

The WDNR also prepares incidental take protocols outlining management protocols for individual species. Listed plants are grouped under a single protocol.

39 Wisconsin Department of Natural Resources. January 20, 2017. Broad Incidental Take Permit/Authorization for Grassland and Savanna Management. Accessed April 1, 2018 https://dnr.wi.gov/topic/erreview/itgrasslands.html

Rusty-Patched Bumble Bee

The rusty-patched bumble bee (*Bombus affinis*) is a federally endangered species under the Endangered Species Act (ESA) effective as of March 21, 2017. Middleton is located in a High Potential Zone, as identified by the USFWS, meaning that rusty-patched bumble bees are likely present in the area. The USFWS recommends assuming that rusty-patched bumble bees are present where suitable habitat is present (i.e. prairie communities) although population levels are low even in High Potential Zones. Known populations exist in several locations in the greater Madison metropolitan area, including at the UW-Madison Arboretum.

Federally funded projects in High Potential Zones may require a federal permit for incidental take. Non-federally funded projects do not require a permit outside of compliance with the ESA. The USFWS provides conservation management guidelines, or recommendations for land management practices in areas of potential rusty-patched bumble bee habitat[40]. Local USFWS ecologists are available for consultation regarding management of the rusty-patched bumble bee.

To make a prairie it takes a clover and one bee, -

One clover and a bee,

and revery.

The revery alone will do

If bees are few.

- Emily Dickinson

40 US Fish and Wildlife Service. 2018. Conservation Management Guidelines for the Rusty Patched Bumble Bee (Bombus affinis). US Fish and Wildlife Service, US Department of the Interior. PDF file

Table 7-6. Middleton Threatened and Endangered Species Recorded at the Township Level, 2017

SCIENTIFIC NAME	COMMON NAME	WI STATUS	FEDERAL STATUS	GROUP	TOWNSHIP	TOWNSHIP NAME
Bombus affinis	Rusty-patched Bumble Bee	SC/N	Listed Endangered	Bee	T7N R8E	Middleton
Lespedeza leptostachya	Prairie Bush Clover	END	Listed Threatened	Plant	T8N R9E	Westport
Ammodramus henslowii	Henslow's Sparrow	THR	Species of Concern	Bird	T8N R9E	Westport
Cirsium hillii	Hill's Thistle	THR	Species of Concern	Plant	T8N R9E	Westport
Emydoidea blandingii	Blanding's Turtle	SC/P	Species of Concern	Turtle	T8N R9E	Westport
Acris blanchardi	Blanchard's Cricket Frog	END		Frog	T8N R9E	Westport
Aflexia rubranura	Red-tailed Prairie Leafhopper	END		Leafhopper	T8N R9E	Westport
Asclepias purpurascens	Purple Milkweed	END		Plant	T7N R8E	Middleton
Papaipema silphii	Silphium Borer Moth	END		Moth	T7N R8E	Middleton
Ruellia humilis	Hairy Wild Petunia	END		Plant	T7N R8E	Middleton
Terrapene ornata	Ornate Box Turtle	END		Turtle	T7N R8E	Middleton
Progne subis	Purple Martin	SC/M		Bird	T8N R9E	Westport
Agalinis gattingeri	Roundstem Foxglove	THR		Plant	T7N R8E	Middleton
Notropis anogenus	Pugnose Shiner	THR		Fish	T8N R9E	Westport
Polytaenia nuttallii	Prairie Parsley	THR		Plant	T8N R9E	Westport
Vireo bellii	Bell's Vireo	THR		Bird	T8N R9E	Westport
Cuscuta glomerata	Rope Dodder	SC		Plant	T8N R9E	Westport
Cuscuta polygonorum	Knotweed Dodder	SC		Plant	T8N R9E	Westport
Houstonia caerulea	Azure Bluets	SC		Plant	T7N R8E	Middleton
Nothocalais cuspidata	Prairie False-dandelion	SC		Plant	T8N R9E	Westport
Acipenser fulvescens	Lake Sturgeon	SC/H		Fish	T8N R9E	Westport
Thamnophis radix	Plains Gartersnake	SC/H		Snake	T8N R9E	Westport

Source: WDNR. Data current as of 2017.

END = endangered; THR = threatened; SC = special concern: SC/FL = federally protected as endangered or threatened, but not so designated by DNR; SC/H = take regulated by establishment of open closed seasons; SC/M = fully protected by federal and state laws under the Migratory Bird Act; SC/N = no laws regulating use, possession, or harvesting; SC/P = fully protected

Table 7-6. Middleton Threatened and Endangered Species Recorded at the Township Level, 2017

SCIENTIFIC NAME	COMMON NAME	WI STATUS	FEDERAL STATUS	GROUP	TOWNSHIP	TOWNSHIP NAME
Anguilla rostrata	American Eel	SC/N		Fish	T8N R9E	Westport
Epiaeschna heros	Swamp Darner	SC/N		Dragonfly	T7N R8E	Middleton
Microtus ochrogaster	Prairie Vole	SC/N		Mammal	T7N R8E	Middleton
Microtus pinetorum	Woodland Vole	SC/N		Mammal	T8N R9E	Westport
Myndus ovatus	A Planthopper	SC/N		True Bug	T8N R9E	Westport
Prairiana cinerea	A Leafhopper	SC/N		Leafhopper	T8N R9E	Westport
Calcareous fen	Calcareous Fen	NA		Community	T8N R9E	Westport
Dry prairie	Dry Prairie	NA		Community	T8N R8E	Springfield
Dry-mesic prairie	Dry-mesic Prairie	NA		Community	T8N R9E	Westport
Emergent marsh	Emergent Marsh	NA		Community	T8N R9E	Westport
Northern wet forest	Northern Wet Forest	NA		Community	T8N R9E	Westport
Shrub-carr	Shrub-carr	NA		Community	T8N R9E	Westport
Southern sedge meadow	Southern Sedge Meadow	NA		Community	T8N R9E	Westport
Springs and spring runs, hard	Springs and Spring Runs, Hard	NA		Community	T7N R8E	Middleton
Stream--fast, hard, warm	Stream--Fast, Hard, Warm	NA		Community	T7N R8E	Middleton

Source: WDNR. Data current as of 2017.

END = endangered; THR = threatened; SC = special concern: SC/FL = federally protected as endangered or threatened, but not so designated by DNR; SC/H = take regulated by establishment of open closed seasons; SC/M = fully protected by federal and state laws under the Migratory Bird Act; SC/N = no laws regulating use, possession, or harvesting; SC/P = fully protected

Table 7-7. Sensitive Species in Dane County Not Otherwise Listed as Threatened and Endangered Species in Middleton-area Townships, 2017

COMMON NAME (SCIENTIFIC NAME)
Animal Aggregate Sites
Bat Hibernaculum
Herptile Hibernaculum
Mammals
Big Brown Bat (*Eptsicus fuscus*)
Little Brown Bat (*Myotis lucifugus*)
Northern Long-eared Bat (*Myotis septentrionalis*)
Eastern Pipistrelle (*Perimyotis subflavus*)
Reptiles
Timber Rattlesnake (*Crotalus horridus*)
Easter Massasuage Rattlesnake (*Sistrurus catenatus catenatus*)
Ornate Box Turtle (*Terrapene ornata*)

Source: WDNR. Data current as of 2017.

Table 7-8. Wisconsin Rule NR 10.02 Protected Wild Animals, 2017

(1)	Cougar, Canada lynx, badger, moose, gray wolf, wolverine and flying squirrel, except as provided in Section 1b, NR 10.02 .
(2)	Endangered or threatened species listed in ch. NR 27.
(3)	Albino and white deer.
(4)	Woodchuck except as provided in s. 29.337, Stats.
(5)	Prairie chicken, Canada spruce grouse (spruce hen), swans, cranes, bitterns, plovers, kingfishers, cormorants, herons, sandpipers and grebes.
(6)	Eagles, hawks, falcons, and owls except as provided in ch. NR 18.
(7)	Hen pheasants except as expressly provided in this chapter, or in ch. 29 or 169, Stats.
(8)	Any other wild bird not specified in Chapter NR 10.
(9)	Timber rattlesnake (*Crotalus horridus*), except that a timber rattlesnake may be killed in emergency situations involving an immediate threat to human life or domestic animals.
(10)	Gophersnakes (*Pituophis catenifer*), gray ratsnakes (*Pantherophis spiloides*), and the North American racers (*Coluber constrictor*).
(11)	Blanding's turtles (*Emydoidea blandingii*).

Source: Wis. Adm. Code ch. NR 10.02

RECOMMENDATIONS

LAND STEWARDSHIP RECOMMENDATIONS

Develop and maintain a variety of native plant communities. Existing native plant communities are protected and enhanced, and additional communities are established to the extent possible given the limitations of size, surrounding land use, and available resources. Native plant communities provide habitat for insects, wildlife and birds.

Management of conservancy lands should be guided by management plans. Each conservancy area should have a dedicated Management Plan/Master Plan. A Master Plan should have a minimum lifespan of 10 years but no longer than 25 years.

Establish an in-house GIS database (geodatabase) as a land management tool

1) *Document and evaluate land stewardship and restoration activities in a central location*
2) *Map management units and delineate management responsibility among City departments*
3) *Map areas of special protection such as remnant and restored areas and known locations of rare and threatened species*
3) *Document grants and grant activities*
4) *Record interpretive and educational programming, and volunteer activities (time, location, activity, outcome)*
5) *Include conservancy lands facilities (trails, bridges, overlooks, signage, other structures). Note condition, maintain an annual replacement and maintenance budget, record installation data, and document maintenance activities and expenses*

All conservancy areas should be subject to growing season vegetation surveys. Monitoring and assessment of past management activities should inform changes in management tactics in response to results of previous management. Consider using UAV aerial imagery as an assessment tool.

Prevent introduction and spread of invasive species. Perform active and regular monitoring of invasive species. Eradicate new invasions of non-native species while they are limited in extent and easier to remove. Prevent invasive seed production. Consider using mapping tools to track the locations and extent of invasive species. Mapping tools can be used to monitor new infestations and to evaluate past and ongoing management efforts.

Management of conservancy lands should involve restoring natural processes to a landscape. The City actively restores fire regime to many conservancy areas through prescribed burning. Human-caused modifications in hydrology also impact the health of natural communities. Restoration of natural hydrology should also be a priority. Past restoration includes the removal of drain tiles in the western portion of the Pheasant Branch Conservancy.

Prescribed fire is a critical land management tool necessary for maintaining the prairie, savanna, and wetlands in Middleton. When planning prescribed burns, consider ecological goals and smoke management. Conduct prescribed burns only when air quality conditions are moderate or better, and smoke dispersal conditions are fair, good, or excellent.

RECOMMENDATIONS ON MANAGING ACROSS MUNICIPAL BOUNDARIES

Establish a memorandum of understanding (MOU) with partners to allow cross-boundary collaboration on land stewardship of the Pheasant Branch Conservancy and Stricker Pond Conservancy.

1) *Managing the Pheasant Branch Conservancy as a whole rather than separate units may lead to lower per-acre costs, since equipment and personnel would be mobilized once rather than multiple times when conducting the same land management activity (e.g. prescribed burning, invasive plant spraying, etc). An MOU should contain language allowing cross-boundary land management activities between City of Middleton, Dane County Parks, the WDNR, and the Friends of Pheasant Branch. At a minimum it should allow prescribed fire, herbicide application, and invasive plant removal, within guidelines agreed to by the land managers for each entity. The MOU should note that each entity shares the common goal of managing and maintaining prairie, oak woodland, oak savanna and wetland communities.*

RECOMMENDATIONS ON MANAGING RARE AND THREATENED NATURAL COMMUNITIES AND WILDLIFE

Identify and protect areas with unique natural resources, such as remnant and restored areas, and known locations of rare and threatened species. Consider protection of these areas such as reducing or eliminating human and pet impact. Comply with federal and state regulations regarding protection of threatened and endangered species.

1) *Follow management guidelines in the WDNR's Broad Incidental Take Protocol for Grasslands and Savannas*
2) *Review the USFWS's Conservation Management Guidelines for the Rusty-Patched Bumble Bee (Bombus affinis). Consult with local USFWS ecologists.*

Create a system for monitoring wildlife and use collected data to inform management. Establish a framework for submitting observations that can be used by City staff as well as citizens and volunteers. Identify and monitor threatened and endangered species.

1) *Consider hosting an iNaturalist bioblitz in a defined conservancy area.*
2) *Link with established local projects such as the WDNR's Snapshot Wisconsin project and the UW-Madison's Urban Canid project. Snapshot Wisconsin is a volunteer-based partnership to monitor wildlife across the state. Participants submit trail camera footage that is classified (species identified) using crowdsourcing methods*

Continue urban deer damage management. Use the WDNR standard for the Madison Metropolitan area of 10 deer/square mile as a target for deer herd size. Assess herd size every 5 years using aerial flyovers or UAV flyover.

Trails and trail use policy should consider impacts to wildlife. With respect to dog exercise in conservancy lands:

1) *Evaluate compliance with current rules, feasible methods of enforcing rules and repercussions for not following rules*
2) *Consider further surveying of conservancy user attitudes towards dogs in conservancies and policy options*
3) *Consider pilot studies restricting dogs from sensitive areas or sensitive times of year (i.e. breeding bird season)*

RECOMMENDATIONS RELATED TO STORM WATER MANAGEMENT

Identify a single entity to be responsible for vegetation management on land with native plantings, including storm water detention ponds. Costs of vegetation management may be shared across departments.

Improvement projects related to storm water management should be the responsibility of the Public Works Department. Capital projects include: Tiedeman Pond pump replacement and feasibility study/stormwater abatement plan; Stricker and Tiedeman Pond Stormwater Detention Pond; Tiedeman Pond dredging near sewer grate; Tiedeman Pond forebay dredging.

Establish an in-house GIS database (geodatabase) as a land management tool (see above).

Review recommendations of the UW-Madison Water Resource Management (WRM) Practium report: Making Stricker's Pond a Better Resource for Middleton and Madison Residents (2016).

Coordinate with the WRMC regarding runoff control measures and acquisition of lands for enhanced mitigation of runoff. For example, the WRMC is currently investigating land aquisition around the North Fork of the Pheasant Branch Creek for corridor buffers and storm water detention basins. These areas could additionally provide benefits for wildlife habitat and recreational use.

RECOMMENDATIONS ON PREVENTING ENCROACHMENT

Mark and maintain property boundaries. The boundary of public lands should be clearly marked to help orient visitors and staff, ensure land management activities occur within the property, and to discourage encroachment by neighbors.

Develop an explicit future desired state for each conservancy area or subunits within a conservancy. Engage with developers and conservancy neighbors to plant conservancy-compatible vegetation along lot lines. For example, if an area contains prairie and prescribed burning is an intended management tool, encourage adjacent developments against planting heat-sensitive plans such as Arborvitae.

Restore areas where social trails have formed to natural vegetation. Establish clear policy against social trails.

RECOMMENDATIONS ON FUNDING RESTORATION AND MANAGEMENT

Seek public and private funds for development, restoration and management. Maintain partnerships with organizations and individuals.

Secure necessary funding to maintain ecological restorations through at least the first 10 years of post-planting maintenance. The initial phases of restoration, site preparation and post-planting maintenance require timely and intensive effort by land managers. As the restoration matures and desirable vegetation establishes, maintenance needs and costs decrease. When initiating a native plant establishment project, we recommend a 10-year establishment period prior to shifting the project from capital to maintenance budgets.

Maintain a database of grants:

1) Document grants applied for and grants received (funding amount, City match, project description, length of project/funds)

2) Create a grant calendar of available grants, grant deadlines and other funding opportunities. Update at least annually.

RECOMMENDATION ON ACQUISITION

Acquisition of conservancy land should be a priority when the opportunity arises, particularly areas of high quality habitat and areas in conservation and greenway corridors.