



# Kishwauketoë Nature Conservancy

## 2019 Comprehensive Management Plan

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## **Kishwauketoe Board Members**

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## **Introduction**

Restoration seeks to return an ecosystem to a point where both ecological structure and function is increased to a level that existed prior to degradation. We generally think of structure in terms of native biodiversity and function in terms of natural processes that would occur such as nutrient cycling and flow of energy through an ecosystem. With any management plan, it is important to set goals to determine at what point restoration is complete and to prioritize projects. This management plan was written to create a roadmap of where the property is headed and to set goals on how to get there. This plan deals primarily with land management and restoration of structure and function with a strong emphasis on vegetative management. The plan encompasses other areas, such as wildlife and educational opportunities, and it recognizes the interconnectivity of both the biotic and abiotic world. We sought to foster a plan that would encourage good stewardship of the land and provide an outline for proper site management.

We must also acknowledge that restoration is a relatively new field and there is still much to learn. It is not possible to come up with a plan that is ridged and set in stone. Land management is not static, it's dynamic and we must take this into account as stewards of the land. For example, we do not know with certainty what an area that is overcome with invasive species will do when those species are removed. We do not know with certainty how that will affect the ecosystem or what plants will return in their place. Because of this we must realize that this is a roadmap to a destination, but it is not the only way to get there. Managing land is dynamic and we must treat it that way. We can have goals, but we must observe and continue to adapt as we gain knowledge of how the ecosystem acts and functions. Ultimately, those involved in the land management of this site have the responsibility to observe and make judgement calls based on the current site conditions and using the most up to date and accurate knowledge of proper techniques and understanding of environmental processes.

## **Overarching Management Goals**

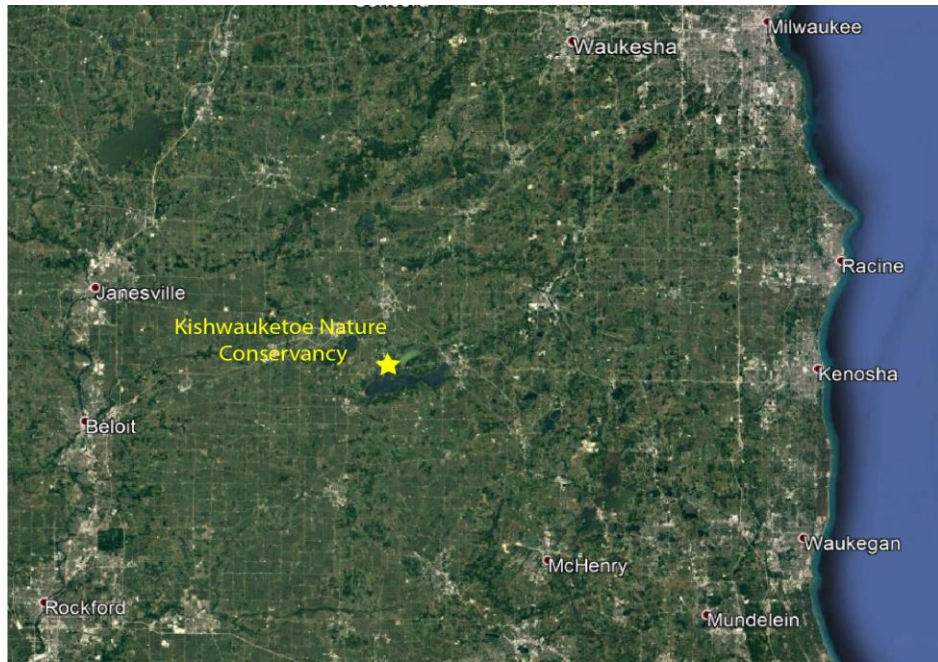
- Encourage good stewardship of the land and an appreciation of our natural environment
- Restore native plant communities to historic conditions
- Provide habitat suitable for sustainable wildlife populations
- Balance recreational opportunities with preservation of natural areas
- Nurture a curiosity and desire for furthering environmental education
- Foster a sense of place in the community and facilitate community involvement
- Promote restoration and awareness of our natural environment for future generations
- Create a compelling vision that will inspire the next generation that will care for this land

## **Site History and Description**

Kishwauketoe is a 231-acre property in Williams Bay, Wisconsin located in Walworth county. Historically the area was tall grass prairie intermixed with wetlands and oak savanna. Oak savannas are considered the most threatened ecosystem in the world. Currently oak savannas cover one percent of their original area. Restoring the land to its historical ecosystems would allow threatened ecosystems to expand

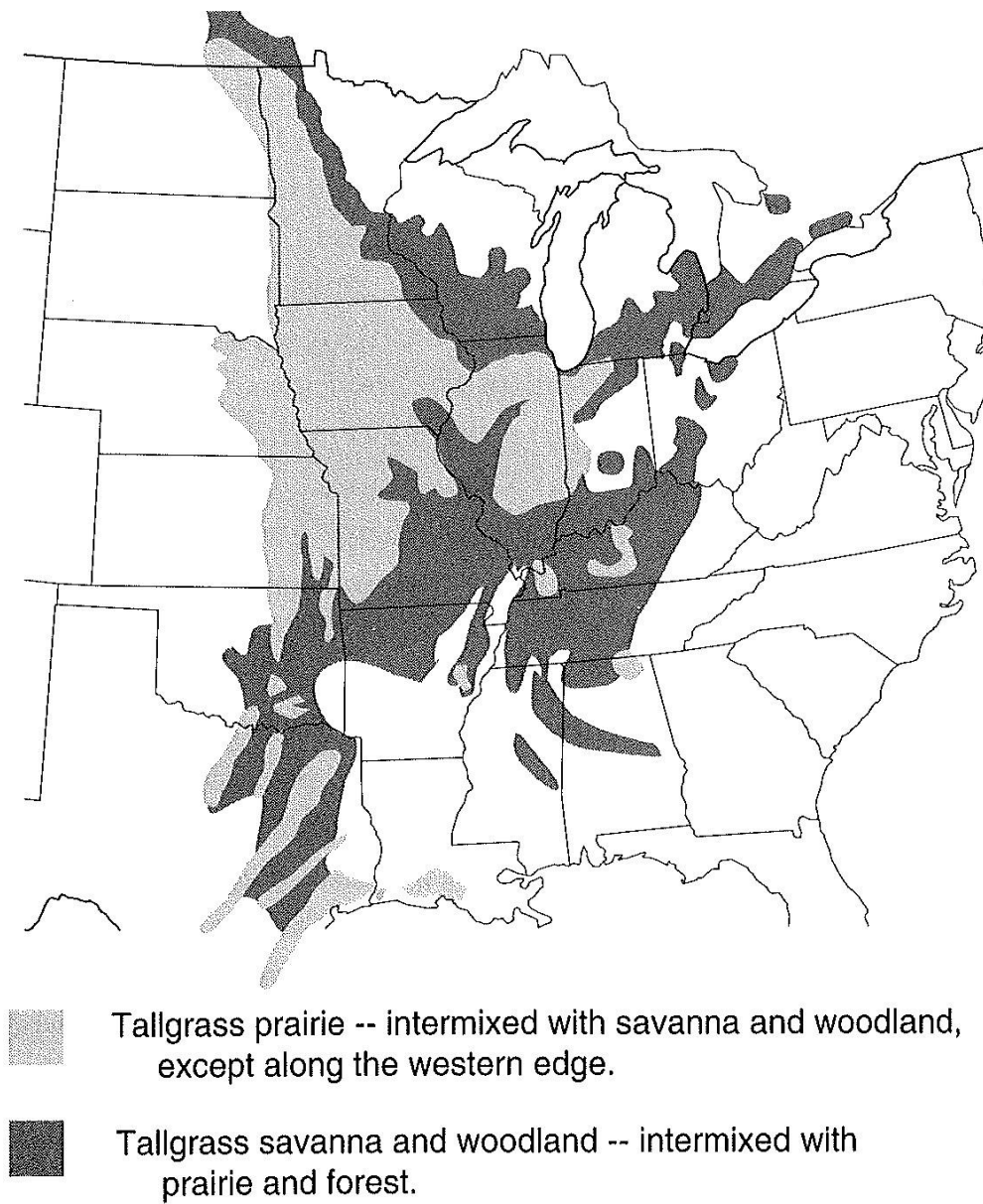
in geographic area and continue to exist. The southern portion of the property is composed of lowland sedge meadow and wet prairie that transitions into mesic prairie to the north. The property has over 65 acres of prairie under restoration. There is little change in elevation as you move further north on the property apart from the oak woodlands located on the north eastern section of the property. The soils on this site primarily are rich muck and silt loam soils. These soils also have higher organic matter content indicative of wetlands. This indicates the presence of wetter plant communities and ultimately guides what seed should be planted in different areas.

### **Locator and Property Boundary Maps**





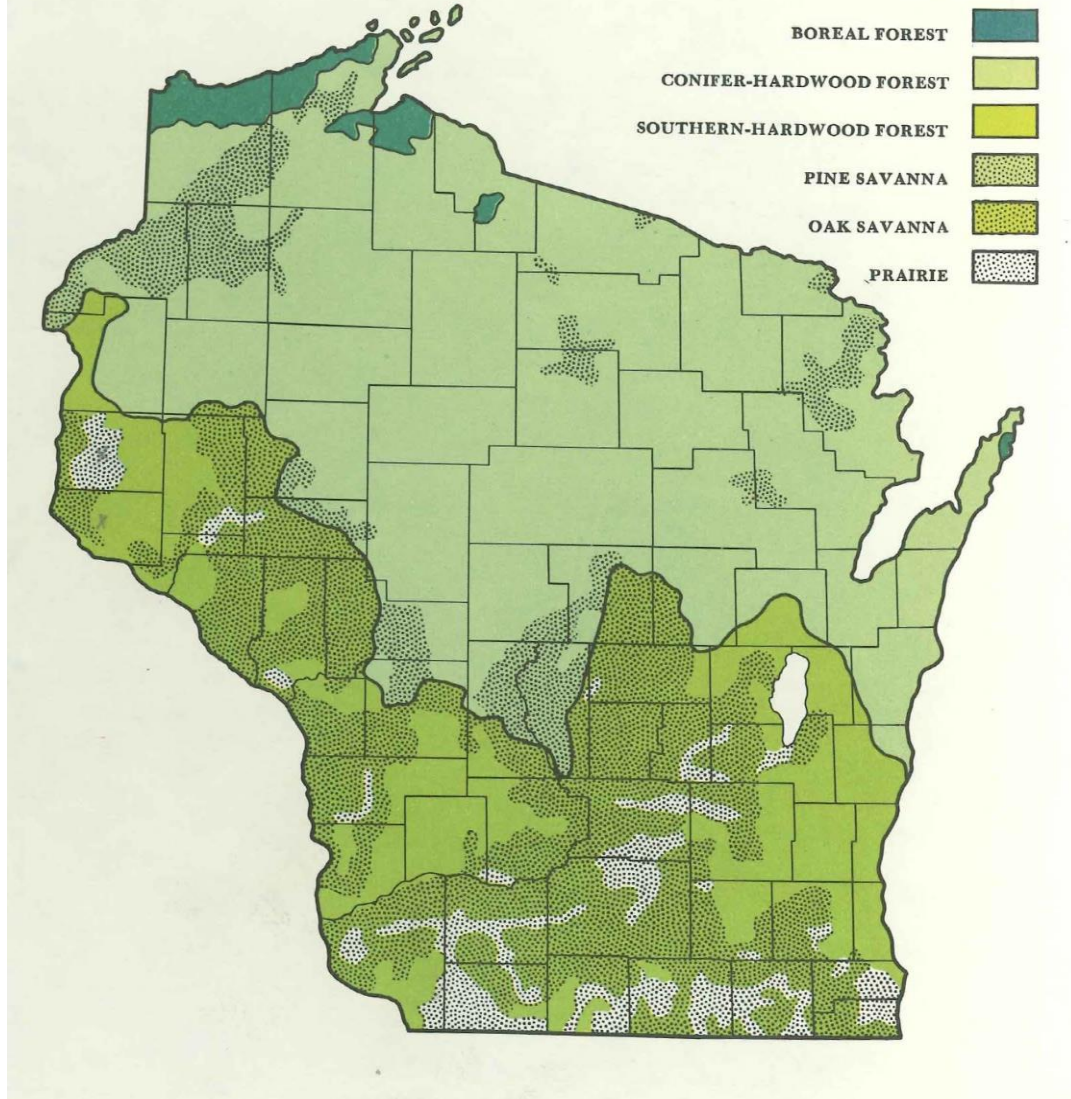
**Historical Extent of Tallgrass Prairie and Savanna**



### Historic Plant Communities



## Major Plant Communities of Wisconsin ca. 1840



Historic information is important when trying to restore a prairie. It gives you a better sense of what was there before ecosystem degradation began. It is extremely useful because it helps guide seeding and planting. Historical data points us toward the plants that are ideal for the conditions present. Based on historical records this area was primarily tallgrass prairie and oak savanna. This indicated that we should seek to restore these areas to these ecotypes and plant species that would be present in these ecosystems.

Soil Map

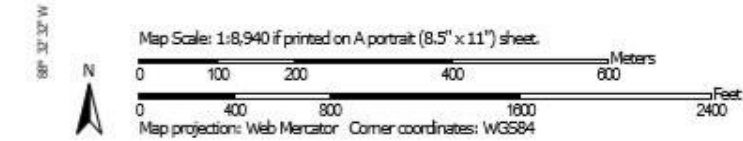
42° 35' 31" N

42° 35' 31" N



42° 34' 32" N

42° 34' 32" N



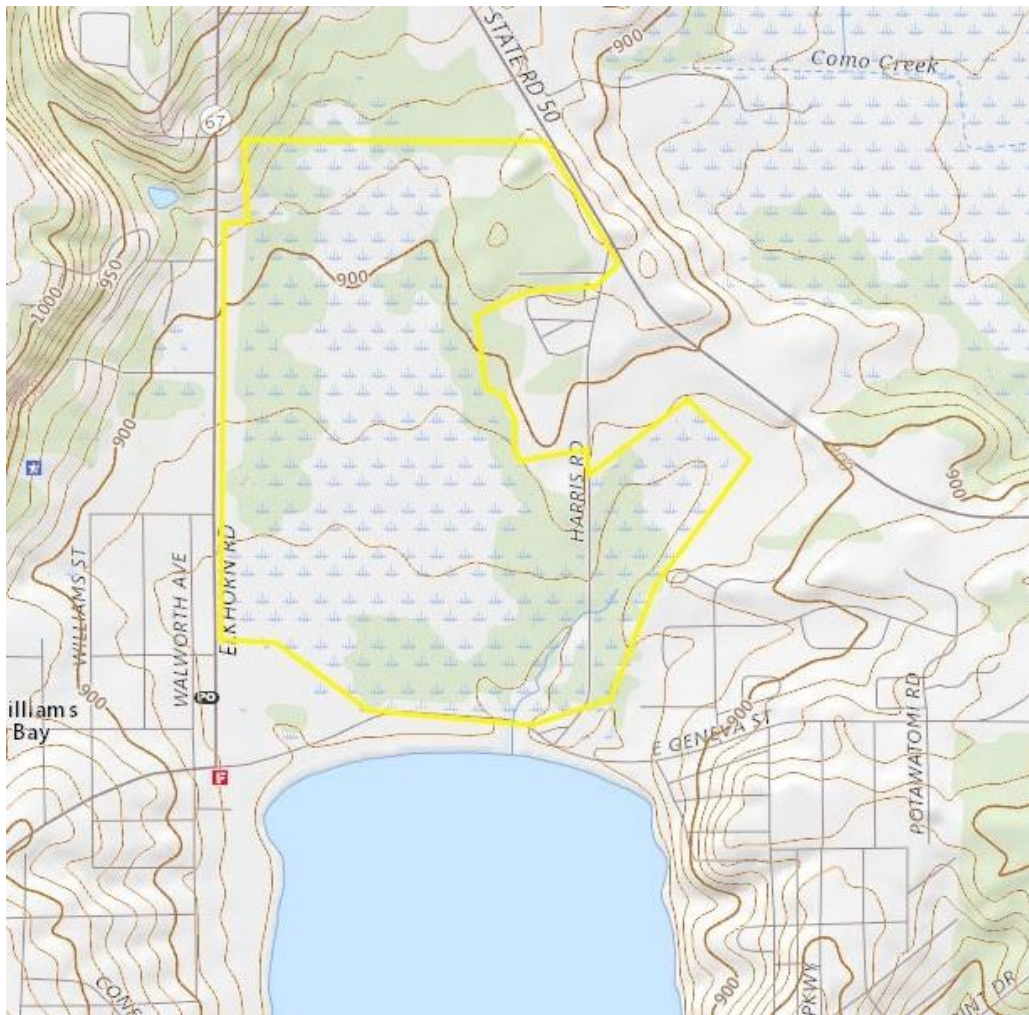


## Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Ac	Adrian muck, 0 to 2 percent slopes	3.3	0.8%
CyA	Conover silt loam, 1 to 3 percent slopes	10.9	2.7%
DdB	Dodge silt loam, 2 to 6 percent slopes	2.9	0.7%
GwA	Griswold silt loam, mottled subsoil variant, 0 to 3 percent slopes	26.6	6.7%
Ht	Houghton muck, 0 to 2 percent slopes	100.9	25.2%
KIA	Kendall silt loam, 1 to 3 percent slopes	30.7	7.7%
MwC2	Miami loam, 6 to 12 percent slopes, eroded	6.7	1.7%
MwD2	Miami loam, 12 to 20 percent slopes, eroded	11.9	3.0%
MxD2	Miami loam, sandy loam substratum, 12 to 20 percent slopes, eroded	15.9	4.0%
MxE2	Miami loam, sandy loam substratum, 20 to 35 percent slopes, eroded	2.3	0.6%
MyB	Miami silt loam, 2 to 6 percent slopes	45.9	11.5%
MyC	Miami silt loam, 6 to 12 percent slopes	16.5	4.1%
MyC2	Miami silt loam, 6 to 12 percent slopes, eroded	1.8	0.4%
Pa	Palms muck, 0 to 2 percent slopes	39.2	9.8%
Ph	Pella silt loam, 0 to 2 percent slopes	63.7	15.9%
PsB	Plano silt loam, till substratum, 2 to 6 percent slopes	2.9	0.7%
RaA	Radford silt loam, 0 to 3 percent slopes	6.1	1.5%
W	Water	10.8	2.7%
WhB	Warsaw silt loam, 2 to 6 percent slopes	0.9	0.2%
<b>Totals for Area of Interest</b>		<b>399.9</b>	<b>100.0%</b>

Soils are extremely important in restoration. Both soil type and moisture dictate the plant communities that are going to be present and thrive. Dry, sandy, nutrient poor soil lends well to short prairie ecosystems. Wetter, loamy soil tends to be indicative of wetter or mesic prairies. Rich, dark soils with high organic material tend to indicate wetland conditions. Much of this site is dominated by muck soils that are high in organic matter and are saturated the majority of the year. These will favor wetland plant communities such as fen, sedge meadow, or other wetland habitats and this should guide restoration goals. Much of the main areas are also dominated by silt loam indicating mesic prairie conditions. Plants are adapted to specific conditions and soil types are a huge driver of this. In restoration we need to create our restoration goals based on site factors such as soil type and use this information to inform our management decisions.

## Topographic Map



Topography also plays a large role in making informed decisions for restoration. Topography deals primarily with the slope and aspect of the terrain. Topography plays a large role in hydrology and impacts things like soil moisture. Slopes tend to be drier than lowland areas and this again has an affect on plant communities. The topography on this site is very flat with little elevation change except for in the northeastern part of the property.

## Integrated Pest Management (IPM)

Integrated pest management is a holistic approach to pest management that includes using various management techniques in conjunction to more effectively manage the pest. This approach combines biological, mechanical, chemical, and other control methods to achieve elimination of a pest. Kishwaukee takes this approach when dealing with invasive species. This approach requires fundamental, scientific knowledge such as plant biology and combines this with knowledge of the most



effective and up to date control methods. Integrated pest management is an effective and efficient method for eliminating invasive species and encourages good environmental stewardship.

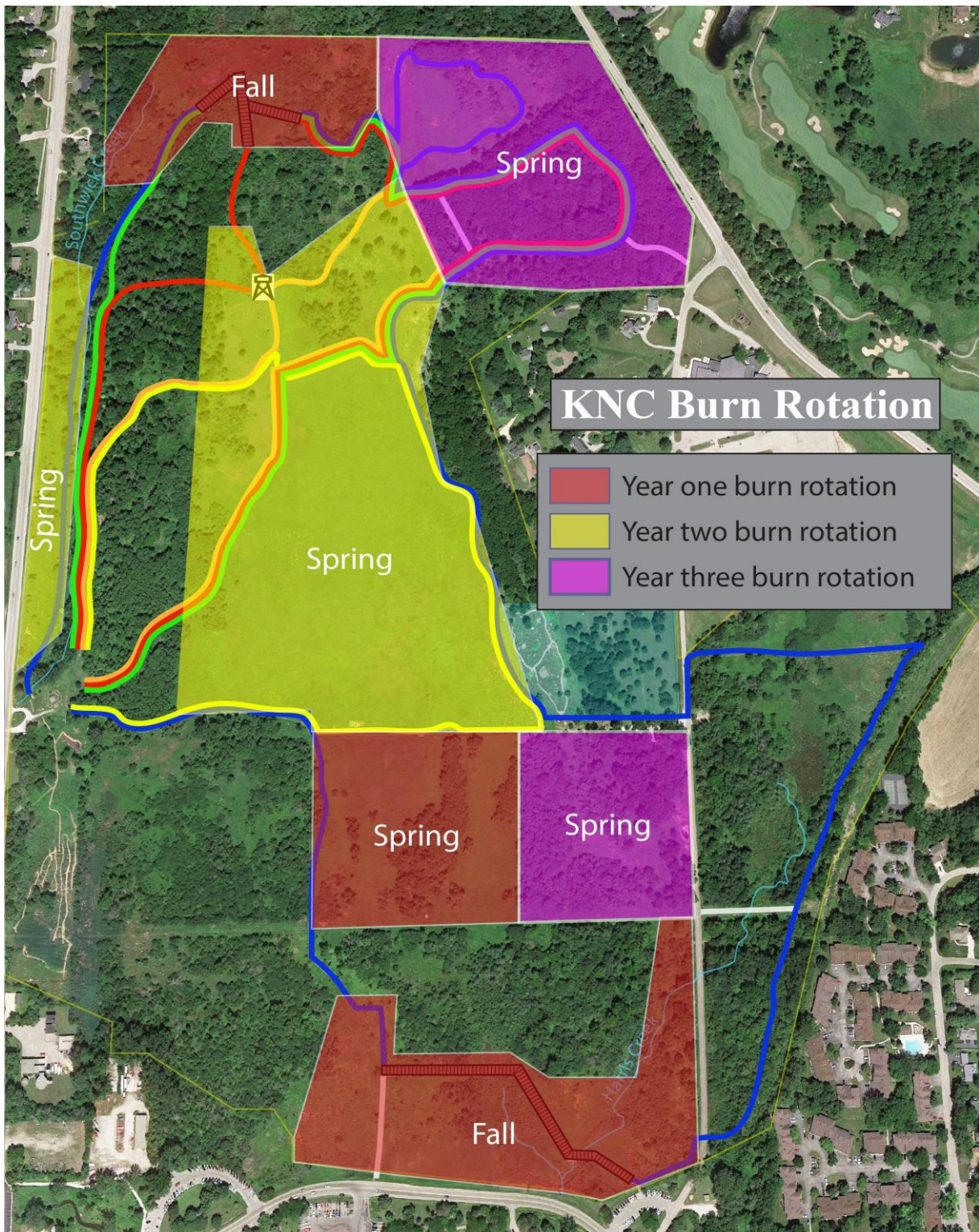
## **Early Detection and Prevention of Invasive Species**

Early detection of invasive species is vital in restoration and maintaining quality natural areas. When invasive species are found in low densities, they can be removed with fewer man-hours and less financial expenditure. As invasive species spread, it not only becomes more costly to remove them, but also habitat and biodiversity decline. Because of this, Kishwaukee is committed to monitoring invasive species. This is a joint effort between staff and those who are land users. Monitoring for invasive species will allow us to maintain our quality natural areas and continue restoration work.

Along with early detection, it is important to limit and prevent seed dispersal throughout the property. This is also the responsibility of both staff and land users. To prevent the spread of invasive species, vehicles should not be driven through areas with large amounts of invasive species. Seeds can be moved and introduced from mud on the vehicle or simply being carried on the equipment's surface. When it is necessary to drive in areas where seed may be picked up, a blower should be used to remove seed from the surface of equipment before entering other areas of the conservancy. If necessary, the equipment should also be washed. Staff and the public should also be careful to avoid spreading seed and should follow similar procedures to remove any potential seed from their boots and clothing.

## **Controlled Burning**

Fire plays a significant role in prairie and savanna health and provides many benefits to these ecotypes. Historically, periodic fire would have kept woody species in check and cycled nutrients into the soil. Prairie plants are adapted with deep roots, enabling them to continue growth after fire has removed above-ground biomass. Controlled burning is often used as a management tool for various reasons. It can be used to knock back woody species, create better soil contact for seeding, or aid in carrying out other management techniques. Fire is one of the most cost effective and efficient tools for prairie and savanna management. It can accomplish what would take many man-hours in only a few. Controlled burning is most often done in the spring, however it is also common in the fall. It is done when dead, dry material and adequate fuel loads are present in significant enough amounts to carry fire. Burning can affect animal populations, especially birds, insects, and reptiles. Because of this, areas of refuge should be left unburned for habitat. It is also not feasible to burn every area each year so a fire rotation is necessary, below is a map outlining which areas should be burned each year. This ensures that areas are continually being burned to maintain ecological health of the ecosystem. Areas may also be burned more frequently when it promotes achieving a management goal. An area may be burned if it is recently cleared, being prepared for seeding, or if it is observed that woody species are invading. All burns should be done with safety and environmental health being the greatest concern. Again, burn schedules are only a guide and an area should only be burned only once every three to five years. Changes in the burn rotation are to be expected, but that decision must be made as an informed, judgement call by the land manager.





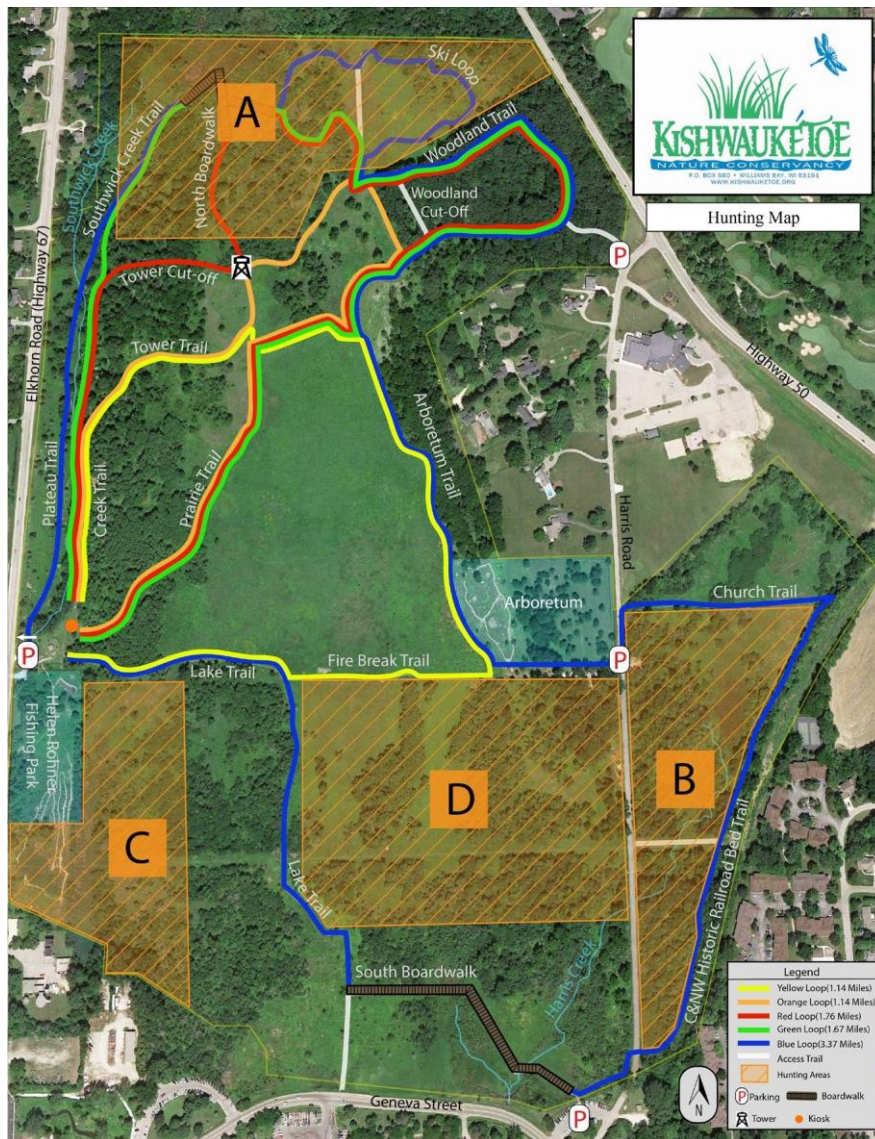
## Herbicide Use

Kishwauketoe is committed to being good stewards of the land and our environment. Part of this includes our use of herbicide. We believe that it is our responsibility to ensure that we minimize herbicide use and apply it safely and responsibly. While acknowledging that it is often necessary to use herbicides to manage and eliminate invasive species, we will use other removal methods as it is feasible. We are committed to using the techniques of integrated pest management to eliminate invasive species while reducing our herbicide use. Herbicides are often needed in the beginning stages of restoration, but as restoration continues, herbicide use should be negligible. The guidelines below are designed to ensure safe and responsible herbicide use.

1. Herbicide use should always be part of an integrated pest management plan and spraying should be used in conjunction with other management techniques (mowing, prescribed fire, mechanical removal, etc.) to reduce herbicide use.
2. Herbicide should only be used when it is deemed the best possible treatment method. When this has been concluded, applicators must adhere to the guidelines listed on this sheet and all state and federal pesticide regulations.
3. All persons applying herbicide must have a state pesticide applicator's certification.
4. All mixing and loading should be done away from any water sources.
5. The label of the product must be followed to determine safe herbicide usage for both yourself and the environment.
6. Always make sure to wear ALL personal protective equipment
7. The applicator is responsible for reducing overspray and drift, even if it is more time consuming and less efficient.
8. Spraying should not be conducted within one hour before or after a rainfall event.
9. Spraying should not be conducted if winds exceed 15 miles per hour
10. Spraying should not be conducted when the temperature exceeds 85 degrees Fahrenheit. Spraying conditions are ideal early in the morning and in the evening when temperatures are cooler and less wind is present
11. Plants that are flowering should not be sprayed to protect bees and other pollinating insects.
12. Spraying should not be done within 10 feet of any water body unless under extreme circumstances. If herbicide application is deemed necessary, applicator must have an aquatic license and an aquatic approved herbicide should be used.
13. Applicators should be mindful of plant biology in order to select the correct herbicide and formulation as well as time the spraying with when the least amounts of herbicide will be used and when herbicides will be most effective.
14. Avoid herbicides with residual toxicity or herbicides that take a long time to break down in soil.
15. Broadcast spraying should be avoided and only used in areas of major infestations/invasive monocultures. Spot treatment should be used as much as possible.
16. Ultimately the herbicide applicator is responsible for safe and responsible herbicide use to ensure personal, environmental, and public health.

## Hunting

Hunting is vital in maintaining a healthy ecosystem and preventing over browsing by deer. Historically, wolf populations would have kept deer in check, but because there are no wolves in the area anymore, hunting has become the main mechanism for controlling deer. If left unchecked, deer often over browse and this can have a negative effect on forbs and forest understories. They can completely alter the composition of a forest and prevent forest reproduction. Hunting also instills a better understanding and appreciation of nature that is invaluable for future conservation efforts. For these reasons, we believe that hunting is important to promote and allow. We do recognize, however, the multi-use recreation that occurs at Kishwaukee and do not want to cause conflict between hunters and hikers. Because of this we have designated hunting areas and allow only bow hunting of deer between November 1st and December 6<sup>th</sup> after registering with the Williams Bay Police Dept. Below is a map of the designated hunting areas.





## Volunteer Opportunities

Volunteers are very important to the continued success of restoration at Kishwauketoe. Most of the work done at Kishwauketoe is the result of donations and volunteers. There are many opportunities for volunteers to get involved with site management. During the winter months, volunteers assist in removing invasive species and thinning some black cherries in the oak woodlands. Volunteers are also very important in late fall for seed harvesting. Some great species for them to collect are purple prairie clover, big blue stem, bottlebrush, and several other species as needed. Local genotype seed always goes to good use. Volunteers are also helpful when manual removal of invasive species, such as garlic mustard, needs to be done. Volunteer activities must be promoted because their help is invaluable and it encourages public involvement in land management.

## Education and Public Involvement

Education and public involvement are both key pieces to restoration efforts and the continued success. Part of our goal at Kishwauketoe is to instill a love and passion for nature and foster a curiosity for how the natural world works. The future of restoration and our environment depends on this. Because of this, we are committed to public involvement and educational programs. We will continue to offer our kids programs and various other educational opportunities because education is critical to our legacy. We also will continue to engage with volunteers from all walks of life and age groups and hold public community events. All of these encourage people to grow in their knowledge and understanding of the natural world and our role in it. When people are connected with the land and the benefits it provides, people are more likely to care for the land well. Our mission and legacy is not bound just to the property boundaries of Kishwauketoe. Our hope is to create a greater sense of care for the land and a more complete land ethic.

## Management Calendar

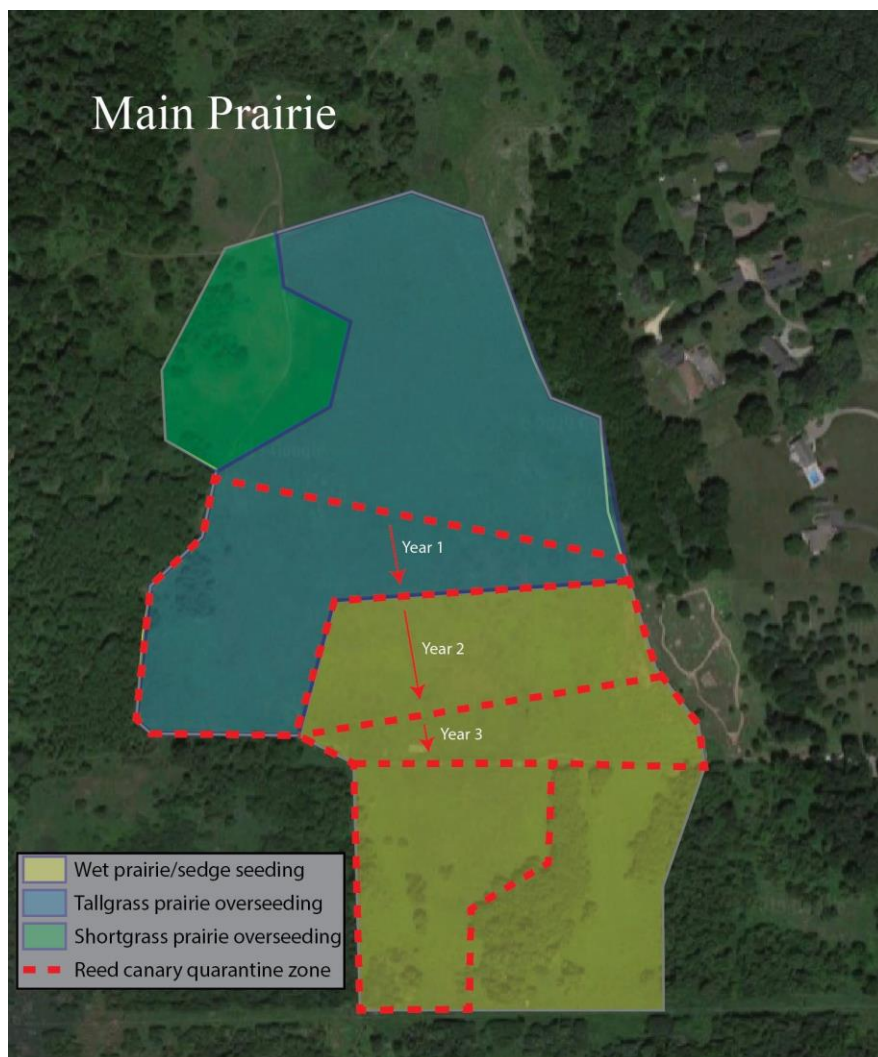
	Year 1	Year 2	Year 3
Fall	<ul style="list-style-type: none"><li>•Arboretum trail clearing</li><li>•Shrub planting on arboretum trail</li><li>•Burn fen and sedgemoor</li></ul>	<ul style="list-style-type: none"><li>•Ski loop restoration and clearing</li></ul>	<ul style="list-style-type: none"><li>•Tower savanna restoration</li><li>•Mixed forest tree management/plantings</li></ul>
Winter	<ul style="list-style-type: none"><li>•Lakefront clearing and</li></ul>	<ul style="list-style-type: none"><li>•Lakefront clearing and sedge meadow Restoration</li></ul>	<ul style="list-style-type: none"><li>•Lakefront clearing and sedge meadow Restoration</li><li>•Invasive buckhorn removal in fen area</li></ul>
Spring	<ul style="list-style-type: none"><li>•Burn Wet prairie</li><li>•Tree planting in Arboretum</li><li>•Shrub plantings in woodlands</li></ul>	<ul style="list-style-type: none"><li>•Burn main prairie unit and plateau</li><li>•Begin Seeding grasses in main prairie</li></ul>	<ul style="list-style-type: none"><li>•Burn ski loop, woodlands and wet prairie</li><li>•Seeding in main prairie</li><li>•Plateau oak hickory plantings</li></ul>
Summer	<ul style="list-style-type: none"><li>•Reed canary spraying in main prairie</li><li>•General weed/Invasive control</li></ul>	<ul style="list-style-type: none"><li>•Reed canary spraying in main prairie</li><li>•General weed/Invasive control</li></ul>	<ul style="list-style-type: none"><li>•Reed canary spraying in main prairie</li><li>•General weed/Invasive control</li></ul>

## Management Zones and Management Practices

### Main Prairie:

Management goals:

- Increase plant biodiversity
- Restore southern prairie to wet prairie and sedge meadow
- Maintain quality areas on northern end of prairie
- Manage reed canary grass
- Create burn schedule



The main prairie unit is predominantly tallgrass prairie with big blue stem (*Andropogon gerardii*) and few areas of little blue stem (*Schizachyrium scoparium*) and side oats grama (*Bouteloua curtipendula*). The southern section of the prairie is dominated by invasive reed canary grass (*Phalaris arundinacea*) that is becoming a monoculture. Throughout the prairie there are tallgrass prairie forbs such as cup plant



(*Silphium perfoliatum*), prairie doc (*Silphium terebinthinaceum*), rosin weed (*Silphium integrifolium*), compass plant (*Silphium laciniatum*), cream gentian (*Gentiana alba*), spiderwort (*Tradescantia occidentalis*), black eyed Susan (*Rudbeckia hirta*), tick-trefoil (*Desmodium canadense*), purple coneflower (*Echinacea purpurea*), purple prairie clover (*Dalea purpurea*), white prairie clover (*Dalea candida*), false sunflower (*Heliopsis helianthoides*), culvers root (*Veronicastrum virginicum*), white false indigo (*Baptisia alba*), yellow coneflower (*Ratibidia pinnata*) and other forb species.

Fire is essential to maintain prairie and savanna ecosystems. Prairie plants have coevolved with fire by sending out deep roots which makes prescribed fire a great management tool. Prescribed fire knocks back brushy, woody species, cycles nutrients back into the soil, and can knock back some nonnative invasive species. Burning should be done every 2-5 years in areas where prairies are established. Areas where brushy species are prevalent, or prairie is less established may justify more frequent burning. Prescribed burns can be done in both the spring or fall. However, burning is by far the most cost-effective tool for prairie and savanna restoration. Burn schedules are important because areas of refuge should be left for animals following burns, and not all areas are possible to burn every year due to time constraints and unfavorable conditions.

The biggest threat and highest priority for these areas is eliminating reed canary grass. Reed canary outcompetes other native species and over time will reduce plant biodiversity and have negative effects on wildlife such as pollinators, birds, insects and small mammals. Reed canary is a perennial grass that grows in thick patches and can spread via seed or through rhizome. These factors make it very hard to control and limit management options. Reed canary has not yet taken over in the northernmost area of the prairie, so containment and preventing further spread is of upmost priority. To accomplish this goal, a line will be mowed at the northernmost boundary of the reed canary grass monoculture creating a containment area. All reed canary outside of this area will be considered a higher priority because it has not yet become widespread and early detection and eradication will save countless man-hours, and greater investments should it continue to spread and take over. Any areas of reed canary grass outside of the quarantine area should be sprayed using Clethodim or glyphosate. Clethodim is a post emergence grass selective herbicide that is effective on grasses that are below six inches tall. This chemical is preferred because it will not have any effect on broadleaf species in the area. If reed canary is larger than 6 inches, glyphosate must be used to be effective. Glyphosate is a nonselective herbicide, so it should not be used in highly sensitive areas because of potential overspray. Timing is extremely important in reed canary management. Ideally, it is sprayed early spring following a spring burn or fall mowing because it will emerge faster than the other native grass species. Hitting it then will protect other native plants that begin to grow later in the season. This also encourages responsible herbicide use because less herbicide is used on smaller plants. Reed canary will take multiple years to eliminate, so it is practical and cost effective to start on the northern end and gradually push the northern end of the quarantine zone back year after year. Areas of thick reed canary grass will likely take two herbicide applications before visible progress is seen because reed canary grass will have significant amounts of seed left in the soil seed bank. It is also likely that supplemental seeding will be needed in these areas to restore native vegetation and prevent reed canary grass from reemerging. A recommended seed list of native seed for this area is included in this management plan. Seeding can be done manually but should ideally be done following a prescribed burn or mowing to create better soil contact when seeding.

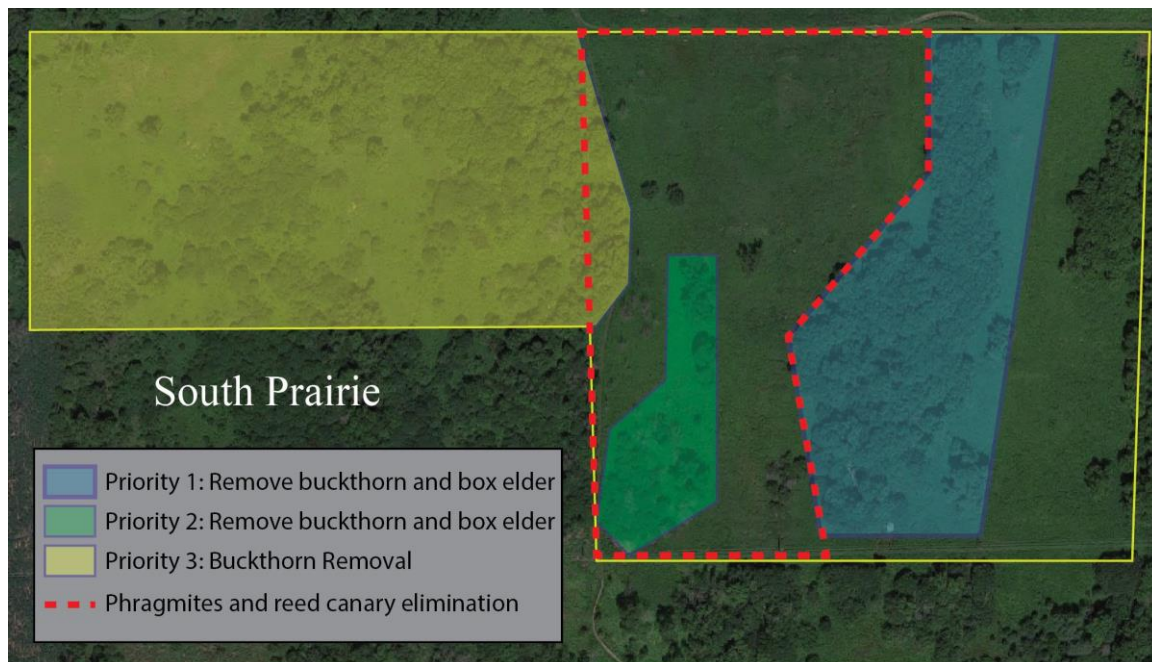
Areas that do not receive herbicide application should be mowed just prior to the grass seeding to eliminate further spread. Mowing should be done at around 6 inches to prevent killing native plant species. Mowing will also cause reed canary grass to resprout and continue growing and may provide opportunity for further spraying time permitting. Small isolated areas of reed canary that go to seed should have seed heads cut off and bagged to minimize seed dispersal.

Other invasive species that are minimally present include Canadian thistle (*Cirsium arvense*), giant ragweed (*Ambrosia trifida*), Queen Anne's lace (*Daucus carota*), and sweet clover (*Melilotus alba*, *M. officinalis*). Giant ragweed, Queen Anne's lace, and clover should be pulled manually where present in small quantities. If plants have flowered, seed should be bagged and removed from the property. It can also be spot treated using clopyrailid or aminopyralid which is a broadleaf selective herbicide that does not kill grasses. Herbicide, however, should only be used in areas where invasive species are widespread and manual removal is not practical. Canadian thistle is another highly aggressive perennial plant that cannot be effectively eradicated using other management options such as prescribed fire, or manual removal. This should be controlled using spot treatment of herbicide prior to flowering or seeding. Clopyrailid or aminopyralid should also be used when treating thistle species. The northern end of the prairie is also very dominated by Big Blue Stem and the primary forbs present are those in the silphium plant family. It would be beneficial to introduce more variety of forbs and grass species to this area to increase biodiversity and ecosystem resilience. Supplemental hand seeding should be done after burning and should not need to be repeated more than once or twice.

### Prairie South of Firebreak Trail

Management goals:

- Restore to wet prairie and sedge meadow
- Clear tree line
- Removal of invasive species



The south prairie has large areas of buckthorn and box elder and it also contains a large amount reed canary grass and some forbs. Removal of buckthorn and box elder followed by stump treatments is a major priority for this area. Follow up treatment for the next few years is necessary to continue knocking back invasive species in the area. Treating reed canary early in the year with a grass selective herbicide will reduce overspray and damage to native sedges. Cleared areas and areas of treated reed canary should be seeded with a sedge meadow seed mixture. Follow up treatments will be needed for limiting expansion



of invasive species, especially reed canary grass. Chemical foliar treatment will be needed for large phragmite patches. In smaller, isolated patches the “glove of death” or the swipe technique should be used to limit overspray and prevent killing native desirable species. Controlled burns are necessary every three to five years or as frequent as needed for more control over reed canary and woody re-sprouts. Willows are also prevalent in the western part of this prairie and burning will help slow their invasion into this area.

## **Plateau**

Management goals:

- Restore to oak hickory savanna
- Install low grass prairie seed mix
- Removal of invasive species



The plateau consists of oak species, Siberian elm, hickory, and box elder. There are sections of reed canary patches scattered throughout. Invasive species on the plateau include burdock, thistle, ragweed, reed canary and Queen Anne's lace. These need to be controlled in the coming years by implementing various management techniques from spraying to manual removal techniques. This area may also benefit from mowing to prevent annual invasives from reproducing. Following spraying and controlling reed canary, a low grass prairie seed mixture should be installed. Oak and hickory plantings need to be done to aid in restoring the plateau to oak-hickory savanna. Siberian elms and box elders need to be removed from the plateau along with reducing the density of walnuts. A few boxelders may be left here for biodiversity and habitat, but reproduction may need to be controlled. A burning regiment needs to be implemented and burns conducted every 2-3 years. This would also be a good area to plant native shrubs (see appendix for native shrub list) to improve plant biodiversity and provide more wildlife habitat. Birds will especially benefit from the nesting habitat and food sources that native shrubs provide along with benefits to small mammals, insects, and other species.

## Arboretum

Management goals:

- Facilitate environmental educational opportunities
- Removal of invasive species
- Plant trees and seed for desirable species



Long-term we plan to add signage for desirable species to reinforce educational opportunities at

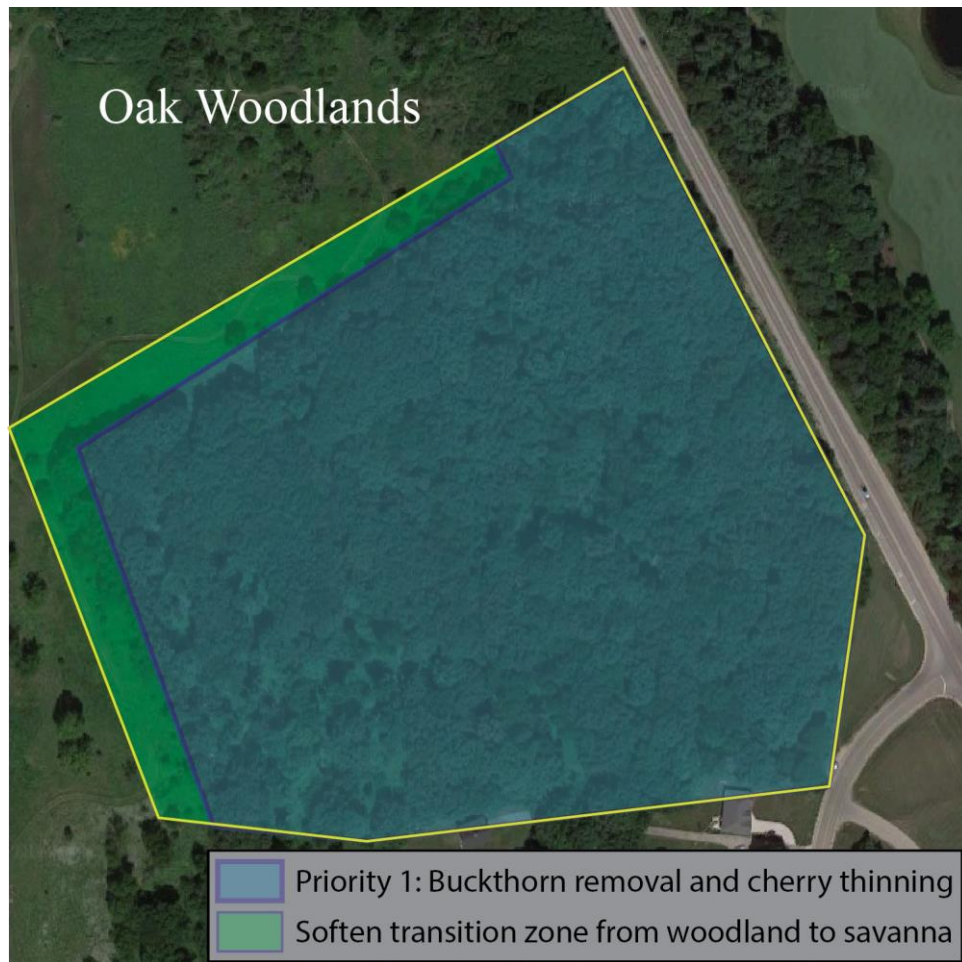


Kishwauketoe. In the upper arboretum (blue) we aim to plant trees and shrubs in openings where trees are less dense and remove any dead trees. In the lower arboretum, (green) removal of invasive species such as ragweed, reed canary, wild parsnip, and thistle is the top priority. After managing invasive species, we will wait to see what grows in their place and potentially seed for desirable plants if the seed bank does not provide desirable species. Outside of fence on west and south side similar species of invasive species should be removed and this area should be burned and planted with prairie seed for aesthetic reasons. This area will be designed to focus on education and education programs.

## Oak Woodlands

Management goals:

- Promote oak regeneration
- Plant native shrubs
- Improve understory and plant diversity
- Removal of invasive species
- Soften transition zone from woodland to savanna
- Improve wildlife habitat



This area is primarily dominated by mature oak and small black cherry with dispersed shagbark hickory, maples, walnut, and Ohio buckeye. The transition zones from woodland to savanna and prairie

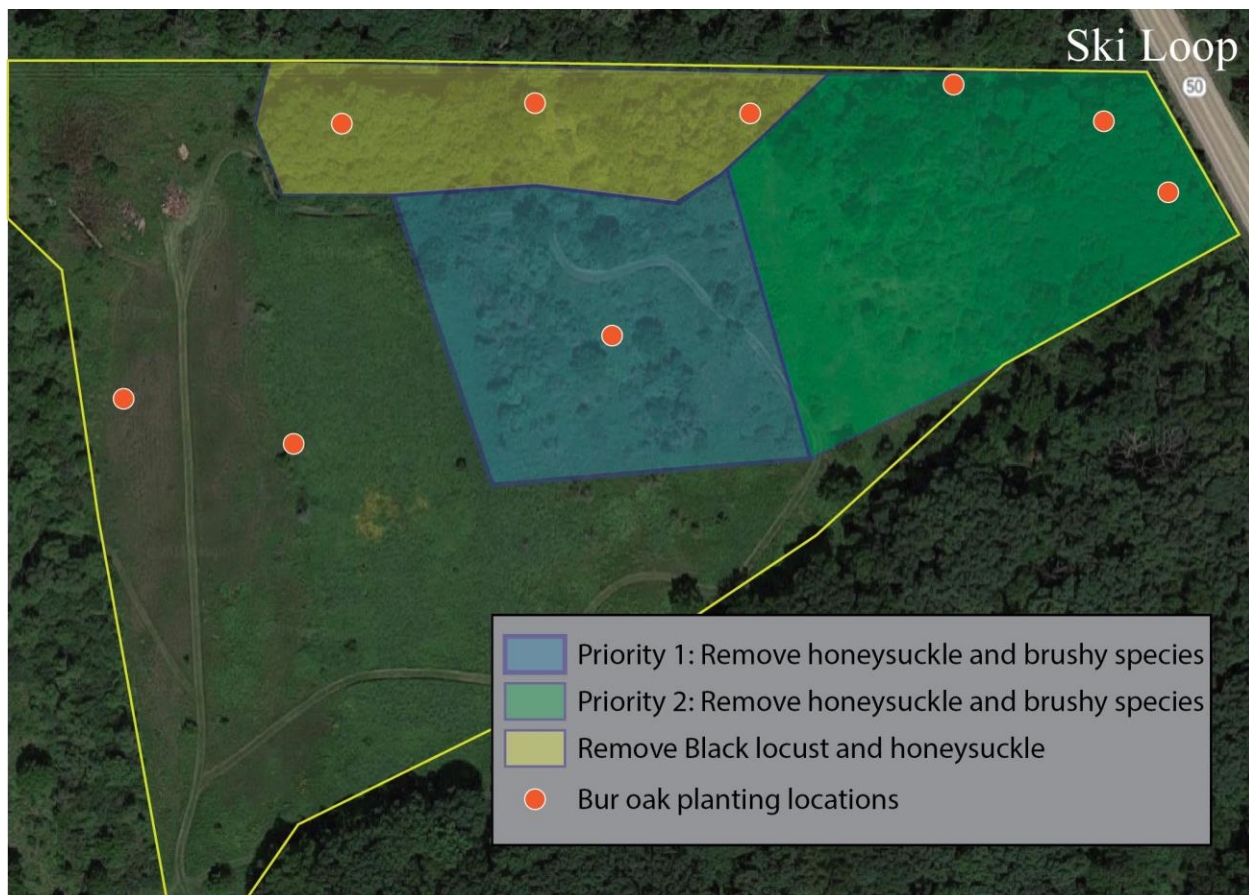
ecosystems on the north and west edge however is a very abrupt change in ecosystems. Creating soft transition zones allows for increased diversity and ecological niches within the unit as well as providing more habitat and cover for wildlife. Planting shrubs on this edge and reducing the density of trees such as black cherries and walnuts will help soften this transition zone. The woodlands also have little to no oak regeneration. To promote oak regeneration the black cherries under a DBH (diameter at breast height) of 6 in should be thinned out. Walnuts and other less-desirable tree species should be thinned at the land managers discretion. Native shrubs should be planted to promote wildlife habitat and food sources and to promote plant diversity. Invasive species such as buckthorn and burdock need to be removed from the woodlands. Controlled burns should be administered every 3-5 years to keep brushy invasive species at bay as well as to cycle nutrients within the environment. Garlic mustard is another common invasive species in woodlands that spring controlled burns can help control. Garlic mustard should be pulled manually, bagged, and removed in the spring before it goes to seed. Monitoring for garlic mustard and controlling it where necessary is important for continued high quality in this area. All standing dead trees that are not a safety risk should be left to provide habitat for detritivores and birds. Supplemental seeding in the woodlands should also be done if budget allows. The herbaceous understory has little diversity, probably due to deer overgrazing. Seeding should be done to promote plants such as woodland spring ephemerals and other woodland species.

### **Ski loop**

Management goals:

- Restore to oak savanna
- Soften edge/transition zone into oak woodlands
- Remove scrub brush from hillside





Oak Savannas are one of the most threatened ecotypes in the world and they are home to a wide variety of unique and even endangered plants and animal species. This area has elevated topography with dry, rocky soil that makes it conducive for prairie plants that are adapted with deep roots. There is currently prairie covering the majority of this unit, with honeysuckle and other brushy species that have overtaken the northeastern section of the unit. This prairie is dominated by big bluestem and contains forb species such as black-eyed Susan, whorled milkweed, butterfly weed, bee balm, purple coneflower, and other prairie species. Bur oaks have been planted along the boundaries of this unit in low densities.

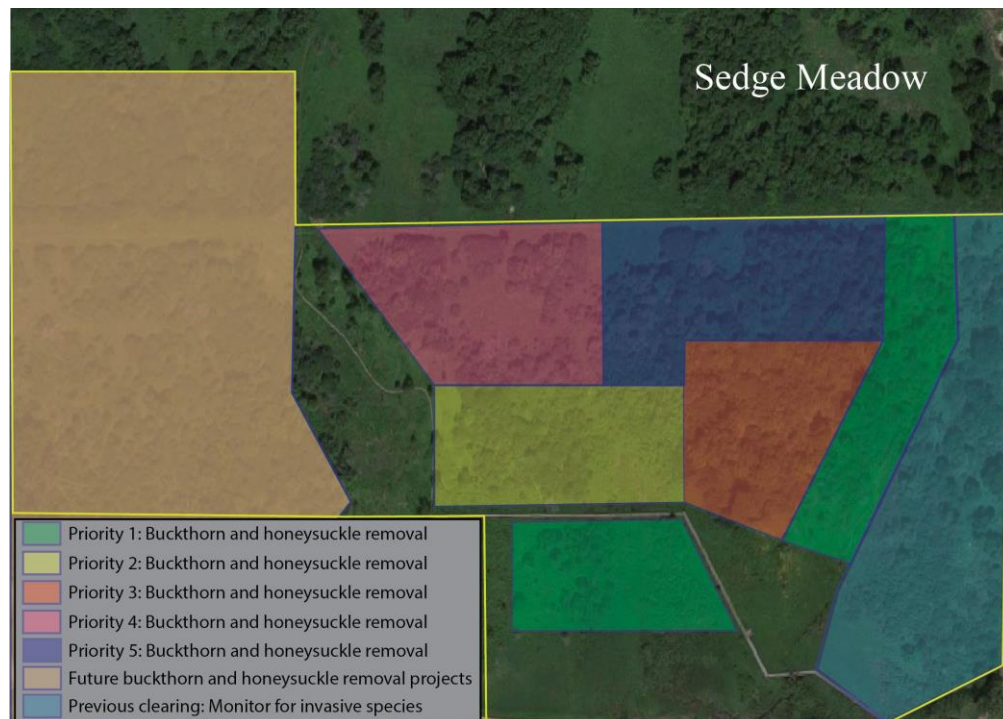
The first step in restoring this area to oak savanna is removing invasive honeysuckle present on the hillside. This will need to be done manually using chainsaws. Chemical stump treatment or foliar application of resprouts can be done to prevent the return of cut honeysuckle bushes. Stump treatment should be done using a 20% mixture of glyphosate mixed with water. Foliar application to resprouts can be done using metasulfuron methyl or glyphosate for honeysuckle. All woody species should be removed from this area except for oak species and some black walnut. There are also some crabapple trees. Some of these will be left as habitat and perching areas for birds and will also benefit other organisms that benefit from dead wood and decomposition. Cleared areas should be burned the following burn season after clearing and should then be seeded using prairie seed mixture. Burning will decrease the chance of brushy species and resprouts returning to recently cleared areas. This will also reduce the need for herbicide use. Several bur oaks should be planted within the prairie in selected sites but should not exceed a density of 20-50% canopy cover (see map above). They should also be planted mainly along the border of this unit. Planted trees should be fenced in to keep deer from damaging them. Trees should be planted either in the spring or fall and should be watered the first two summers. Continuing the removal of

honeysuckle from the northeastern part of the unit is a secondary priority of the Ski Loop unit. Black locust is also an invasive within this unit and needs to be removed along with the honeysuckle in the northern boundary of the unit. After clearing, follow up resprout spraying will be required in the spring and continual monitoring is needed.

## Sedge Meadow

Management goals:

- Removal of invasive species
- Diversity enhancement through seeding or plugs



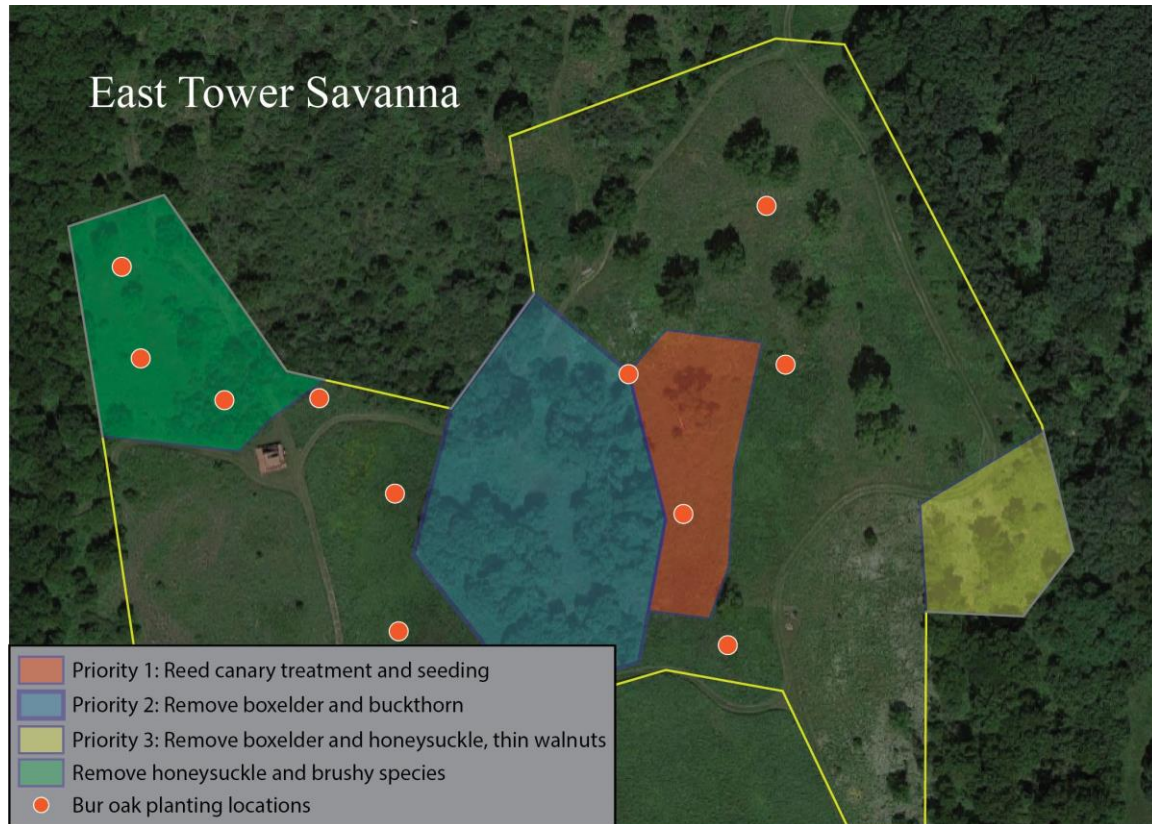
Previously cleared areas are dominated by sedges while uncleared areas have become dominated mainly by buckthorn and honeysuckle. Common Buckthorn, glossy buckthorn, honeysuckle, purple loosestrife, narrow leaf cattails, and phragmites need to be removed from the area. Buckthorn baggies will be utilized for larger buckthorn to reduce herbicide usage. These are plastic bags that remain over stumps for a year and prevent light from reaching the plant preventing resprouts. Smaller buckthorn and honeysuckle must have chemical stump treatment to eliminate resprouts. Burning will be done on site during the winter as buckthorn and honeysuckle are cut and treated. Purple loosestrife can be treated throughout the summer whereas narrow leaf cattails and phragmites should be treated in the late summer when they are taking nutrients into the roots for the winter. Burns should be conducted every 2-3 years. Recently cleared areas can be burned more frequently. Aspens need to be managed within the unit to prevent intrusion into the wetland areas. At the managers discretion aspen should be allowed to grow and mature as long as they don't spread to a large portion of the lakefront/sedge meadow unit.

## Tower Savanna



Management goals:

- Remove undesirable and invasive trees such as boxelder, black walnut, and buckthorn
- Implement supplemental seeding of low grass prairie and sedge mix
- Plant bur oaks in selected locations



This area consists of partially restored tall and short grass prairies as well as some wooded areas. The eastern part of the unit has grass remnants of pastureland, but also contains little bluestem, side oats grama, and various sedge species. The western end is tall grass prairie dominated by big blue stem. There are also large areas of reed canary grass within the lower areas of the unit. The middle of this unit contains a depression that has been invaded by woody species such as buckthorn and box elder. This area seasonally floods, making it a good area to plant sedges and other species that favor wet environments. The reed canary within the lower areas of the unit need to be treated with glyphosate or a grass selective herbicide. Treatment needs to occur in early spring and summer before seed heads form. Following treatment, a grass seed mixture should be installed in the area. The removal of box elder and buckthorn within the unit and treating the stumps with glyphosate and triclopyr respectively will eliminate resprouts when these species are removed. There is a large amount of burdock within the box elder and buckthorn section of the unit that needs to be manually removed during the spring/summer months. Following the completion of the box elder removal area there are two areas of the unit that contain both walnuts and honeysuckle that need to be removed as a secondary priority within the unit. One is located just north of the tower while the other is located on the east side of the unit. The cleared areas need a savanna seed mixture installed and Bur oaks need to be planted throughout the unit in selected locations (see map above). The Bur oak planting should not exceed 20-50% canopy cover.



## Mixed forest

Management goals:

- Plant native shrubs
- Removal of invasive species



Currently this unit is dominated by box elder and walnut. There are sugar maples and oaks scattered throughout. Walnut and box elder should be thinned throughout the unit. More desirable native trees should and shrubs should be planted within the unit. Planting native shrubs after invasive species are under control will allow for more plant diversity and food within the unit for wildlife. Mowing should be implemented to help control invasive species as most are annual invasive species in this area. Ragweed and burdock need to be controlled by using various techniques ranging from spraying to hand removal.

## Arboretum Trail

Management goals:

- Promote large, healthy walnut growth
- Removal of invasive species

- Enhance native shrub diversity

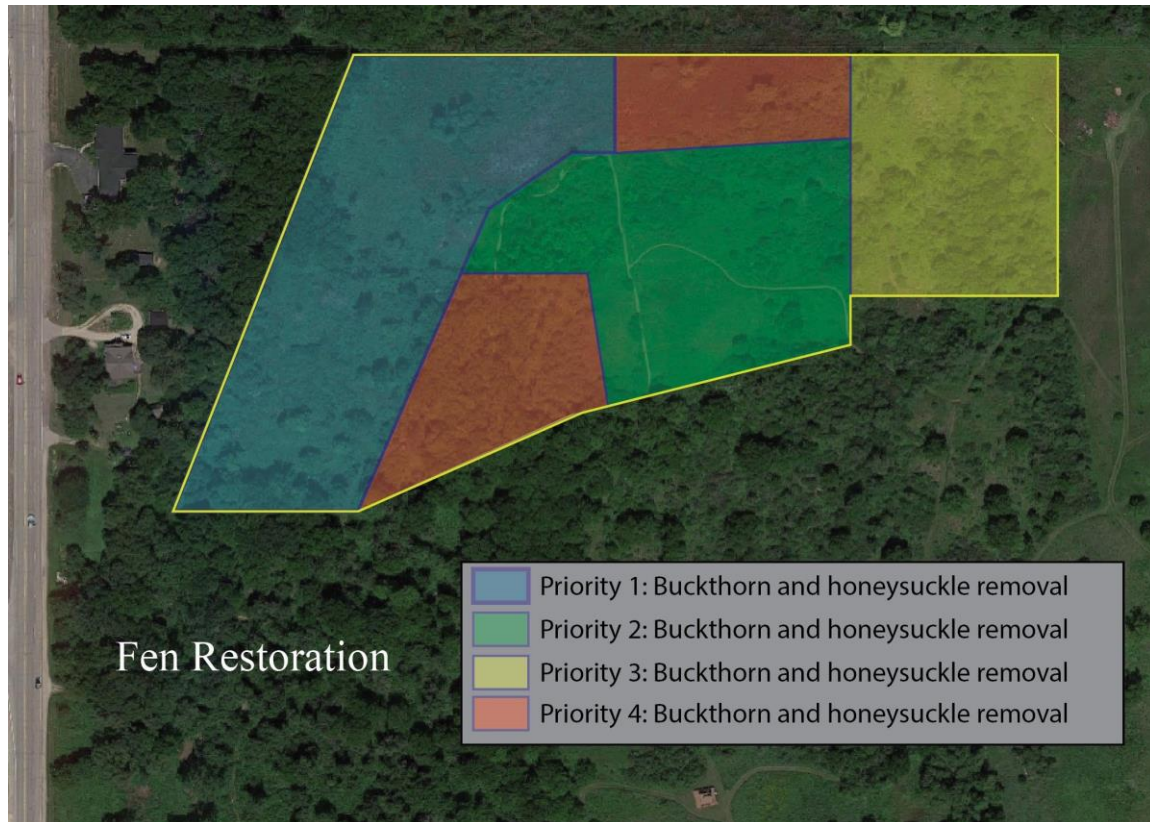


The unit is primarily dominated by walnuts and box elders with a few scattered understory trees. Ground cover is heavily dominated by honeysuckle. Trees under a DBH (diameter at breast height) of five inches will be removed to promote the growth of larger well-established walnuts. Selective thinning will also be utilized to help promote continued walnut growth where needed. Elderberries are already located within the unit, but more native shrubs should be planted in selected areas. Most box elders need to be removed within the unit as they are not a desirable species and can become invasive. Dead standing trees that do not present a safety concern, should be left to provide habitat for a variety of organisms, especially birds and woodpeckers. In order to maintain stand density, each year smaller trees need to be removed. This can be done by burning at the land managers discretion or by foliar chemical treatment. In initial years monitoring should be done for new honeysuckle growth and foliar chemical treatment should be done to prevent them from taking over the area again.

## Fen

Management goals:

- Removal of invasive species
- Supplemental plug planting and seeding



Fens are a unique wetland ecotype defined by their specific plant communities. They are fed by groundwater and the water table is often at or near the ground surface. They are home to many unique plants and wildlife species and play an important role in groundwater discharge. Kishwaukee's fen area has been degraded and is dominated by narrow leaf cattails and buckthorn. Invasive species should be controlled by removing buckthorn and honeysuckle and treating stumps. Use buckthorn baggies for larger buckthorn stumps. Foliar treatment should be done for phragmites and narrow leaf cattails within the unit. Burn every 2-3 years with a north wind. Recently cleared areas can be burned more frequently as needed.

## Appendices

### Appendix 1:Wet Prairie Plant/Seed Options



<i>Agalinis tenuifolia</i>	Slender False Foxglove	<i>Lathyrus palustris</i>	Marsh Vetching
<i>Allium canadense</i>	Wild Garlic	<i>Liatris spicata</i>	Dense Blazing Star
<i>Anemone canadensis</i>	Meadow Anemone	<i>Lilium michiganense</i>	Michigan Lily
<i>Apios americana</i>	Groundnut	<i>Lobelia cardinalis</i>	Cardinal Flower
<i>Asclepias incarnata</i>	Swamp Milkweed	<i>Lobelia spicata</i>	Pale Spiked Lobelia
<i>Asclepias sullivantii</i>	Prairie Milkweed	<i>Lycopus americanus</i>	Water Horehound
<i>Aster lanceolatus</i>	Panicked Aster	<i>Lysimachia quadriflora</i>	Prairie Loosestrife
<i>Aster lateriflorus</i>	Calico Aster	<i>Lythrum alatum</i>	winged Loosestrife
<i>Aster novae-angliae</i>	New England Aster	<i>Onoclea sensibilis</i>	Sensitive Fern
<i>Aster praeltus</i>	Willow Aster	<i>Oxypolis rigidior</i>	Cowbane
<i>Boltonia asteroides</i>	False Aster	<i>Panicum virgatum</i>	Switchgrass
<i>Cacalia plantaginea</i>	Prairie Indian Plantain	<i>Pedicularis lanceolata</i>	Swamp Lousewort
<i>Calamagrostis canadensis</i>	Blue Joint Grass	<i>Phlox glaberrima</i>	Smooth Phlox
<i>Carex annectans</i>	Yellow-fruited Sedge	<i>Physostegia virginiana</i>	Obedient Plant
<i>Carex buxbaumii</i>	Buxbaum's Sedge	<i>Pycnanthemum virginiana</i>	Common Mountain Mint
<i>Carex comosa</i>	Bristly Sedge	<i>Ribes americana</i>	American Black Currant
<i>Carex lacustris</i>	Lake Bank Sedge	<i>Rosa blanda</i>	Early Wild Rose
<i>Carex pellita</i>	Woolly Sedge	<i>Rudbeckia hirta</i>	Black-Eyed Susan
<i>Carex scoparia</i>	Pointed Broom Sedge	<i>Salix bebbii</i>	Bebb's Willow
<i>Carex stipata</i>	Sawbreak Sedge	<i>Salix discolor</i>	Pussy Willow
<i>Carex tetanica</i>	Rigid Sedge	<i>Salix petiolaris</i>	Meadow Willow
<i>Carex vulpinoidea</i>	Fox Sedge	<i>Saxifraga pensylvanica</i>	Swamp Saxifrage
<i>Cephalanthus occidentalis</i>	Buttonbush	<i>Scirpus cyperinus</i>	Wool Grass
<i>Cicuta maculata</i>	Water Hemlock	<i>Senecio pauperculus</i>	Balsam Ragwort
<i>Desmodium canadense</i>	Showy Tick-foil	<i>Silphium terebinthinaceum</i>	Prairie Dock
<i>Dryopteris thelypteris</i>	Marsh Fern	<i>Solidago gigantea</i>	Giant Goldenrod
<i>Elymus virginicus</i>	Virginia Wild Rye	<i>Solidago graminifolia</i>	Grass-leaved goldenrod
<i>Erigeron philadelphicus</i>	Philadelphia Fleabane	<i>Solidago riddellii</i>	Riddell's Goldenrod
<i>Eupatorium perfoliatum</i>	Common Boneset	<i>Spartina pectinata</i>	Prairie Cord Grass
<i>Galium boreale</i>	Northern Bedstraw	<i>Sphenopholis intermedia</i>	Slender Wedge Grass
<i>Gentiana andrewsii</i>	Closed Gentian	<i>Spiraea alba</i>	White Meadowsweet
<i>Gentiana crinata</i>	Fringed gentian	<i>Thalictrum dasycarpum</i>	Purple Meadow Rue
<i>Geum alleppicum</i>	Yellow Avens		Ear-leaved False
<i>Glyceria striata</i>	Fowl Manna Grass	<i>Tomanthera auriculata</i>	Foxglove
<i>Helenium autumnale</i>	Common Sneezeweed	<i>Valeriana ciliata</i>	Tobacco Root
<i>Helianthus grosseserratus</i>	Sawtooth Sunflower	<i>Verbena hastata</i>	Blue Vervain
<i>Hierochloe odorata</i>	Sweet Grass	<i>Vernonia fasciculata</i>	Common Ironweed
<i>Iris virginica</i>	Virginia Iris	<i>Veronicastrum virginicum</i>	Culvers Root
<i>Iris virginica shrevei</i>	Blue Flag Iris	<i>Zizea aurea</i>	Golden Alexanders

## Appendix 2: Mesic and Dry Prairie Plant/Seed Options

<i>Allium cernuum</i>	Nodding Wild Onion	<i>Heliopsis helianthoides</i>	False Sunflower
<i>Amorpha canescens</i>	Lead Plant	<i>Heuchera richardsonii</i>	Prairie Alum Root
<i>Andropogon gerardii</i>	Big Bluestem	<i>Hypericum ascyron</i>	Great St. John's Wort
<i>Andropogon scoparius</i>	Little Bluestem	<i>Koeleria cristata</i>	Prairie June Grass
<i>Anemone canadensis</i>	Meadow Anemone	<i>Kuhnia eupatorioides</i>	False Boneset
<i>Anemone cylindrica</i>	Thimbleweed	<i>Lespedeza capitata</i>	Round-headed Bush Clover
<i>Artemisia ludoviciana</i>	White Sage	<i>Liatris aspera</i>	Rough Blazing Star
<i>Asclepias tuberosa</i>	Butterfly Weed	<i>Liatris cylindracea</i>	Dwarf Blazing Star
<i>Asclepias viridiflora</i>	Green Milkweed	<i>Liatris pycnostachya</i>	Prairie Blazing Star
<i>Aster azureus</i>	Sky Blue Aster	<i>Liatris spicata</i>	Dense Blazing Star
<i>Aster ericoides</i>	Heath Aster	<i>Lilium philadelphicum</i>	Wood Lily
<i>Aster laevis</i>	Smooth Blue Aster	<i>Lithospermum canescens</i>	Hoary Puccoon
<i>Aster novae-angliae</i>	New England Aster	<i>Lithospermum incisum</i>	Narrow-leafed Stoneseed
<i>Aster ptarmicoides</i>	Upland White Aster	<i>Lobelia spicata</i>	Pale-spiked Lobelia
<i>Aster sericeus</i>	Silky Aster	<i>Monarda fistulosa</i>	Wild Bergamot
<i>Astragalus canadensis</i>	Canadian Milk Indigo	<i>Panicum leibergii</i>	Prairie Panic Grass
<i>Baptisia alba macrophylla</i>	White Wild Indigo	<i>Panicum oligosanthos</i>	Gould Scribner's Rosette Grass
<i>Baptisia bracteata</i>		<i>Panicum virgatum</i>	Switch Grass
<i>leucophaea</i>	Cream Wild Indigo	<i>Parthenium integrifolium</i>	Wild Quinine
<i>Blephilia ciliata</i>	Downy Wood Mint	<i>Pedicularis canadensis</i>	Wood Betony
<i>Bouteloua curtipendula</i>	Sideoats Grama	<i>Penstemon digitalis</i>	Foxglove Beard Tongue
<i>Bromus kalmii</i>	Prairie Brome	<i>Petalostemum candidum</i>	White Prairie Clover
<i>Carex bicknellii</i>	Bicknell's Sedge	<i>Petalostemum purpureum</i>	Purple Prairie Clover
<i>Carex meadii</i>	Mead's Sedge	<i>Phlox glaberrima</i>	Marsh Phlox
<i>Ceanothus americanus</i>	New Jersey Tea	<i>Phlox pilosa</i>	Sand Prairie Phlox
<i>Commandra umbellata</i>	Bastard Toadflax	<i>Polytaenia nuttallii</i>	Prairie Parsley
<i>Coreopsis palmata</i>	Prairie Coreopsis	<i>Potentilla arguta</i>	Prairie Cinquefoil
<i>Coreopsis tripteris</i>	Tall Coreopsis	<i>Prenanthes racemosa</i>	Glaucous White Lettuce
<i>Dalea candida</i>	White Prairie Clover	<i>Pycnanthemum tenuifolium</i>	Slender Mountain Mint
<i>Dalea purpurea</i>	Purple Prairie Clover	<i>Pycnanthemum</i>	
<i>Desmodium canadense</i>	Showy Trick Trefoil	<i>virginianum</i>	Common Mountain Mint
<i>Desmodium illinoense</i>	Illinois Tick-trefoil	<i>Ratibidia pinnata</i>	Grey-headed Coneflower
<i>Dodocatheon meadia</i>	Shooting Star	<i>Rosa arkansana</i>	Sunshine Rose
<i>Echinacea pallida</i>	Pale Purple Coneflower	<i>Rosa carolina</i>	Pasture Rose
<i>Elymus canadensis</i>	Canada Wild Rye	<i>Rudbeckia hirta</i>	Black-eyed Susan
<i>Eryngium yuccifolium</i>	Rattlesnake Master	<i>Rudbeckia triloba</i>	Brown-eyed Susan
<i>Euphorbia corollata</i>	Flowering Spurge	<i>Salix humilis</i>	Prairie Willow
<i>Euphorbia graminifolia</i>	Grass-leaved Goldenrod	<i>Schizachyrium scoparium</i>	Little Bluestem
<i>Galium boreale</i>	Northern Bedstraw	<i>Scutellaria parvula</i>	Small Skullcap
<i>Gentiana andrewsii</i>	Closed Gentian	<i>Senecio plattensis</i>	Prairie Ragwort
<i>Gentiana puberulenta</i>	Downy Gentian	<i>Senna hebecarpa</i>	Wild Senna
<i>Helianthus occidentalis</i>	Western Sunflower	<i>Senna marilandica</i>	Maryland Senna
<i>Helianthus rigidus</i>	Stiff Sunflower	<i>Silene regia</i>	Royal Catchfly

<i>Silphium integrifolium</i>	Rosinweed	<i>Sporobolus heterolepsis</i>	Prairie Dropseed
<i>Silphium laciniatum</i>	Compass Plant	<i>Stipa spartea</i>	Porcupine Grass
<i>Silphium perfoliatum</i>	Cup Plant	<i>Thalictrum dasycarpum</i>	Purple Meadow Rue
<i>Silphium terebinthinaceum</i>	Prairie Dock	<i>Tradescantia ohiensis</i>	Common Spiderwort
	Common Blue-eyed	<i>Vernonia missurica</i>	Missouri Ironweed
<i>Sisyrinchium albidum</i>	Grass	<i>Veronicastrum virginicum</i>	Culver's Root
<i>Solidago Juncea</i>	Early Goldenrod	<i>Vicia americana</i>	American Vetch
<i>Solidago nemoralis</i>	Gray Goldenrod	<i>Viola pedatifida</i>	Prairie Violet
<i>Solidago rigida</i>	Stiff Goldenrod	<i>Zizia aptera</i>	Heart-leaved Meadow Parsnip
<i>Solidago speciosa</i>	Showy Goldenrod	<i>Zizia aurea</i>	Golden Alexander
<i>Sorghastrum nutans</i>	Indian Grass		



### Appendix 3: Savannah Plant/Seed Options

<i>Agropyron trachycaulum</i>	Slender Wheatgrass	<i>Hystrix patula</i>	Bottlebrush Grass
<i>Allium canadense</i>	Wild Garlic	<i>Lathyrus venosus</i>	Veiny Pea
<i>Anemonella thalictroides</i>	Rue Anemone	<i>Liparis lilifolia</i>	Lily-leaved Twayblade
<i>Apocynum androsaemifolium</i>	Spreading Dogbane	<i>Lobelia inflata</i>	Indian Tobacco
<i>Aquilegia canadensis</i>	Columbine	<i>Luzula multiflora</i>	Common Wood Rush
<i>Arabis glabra</i>	Tower Mustard	<i>Panicum latifolium</i>	Broad-leaved Panic Grass
<i>Arenaria lateriflora</i>	Grove Sandwort	<i>Parthenium integrifolium</i>	Wild Quinine
<i>Asclepias exaltata</i>	Poke Milkweed	<i>Penstemon digitalis</i>	Foxglove Beardtongue
<i>Asclepias purpurascens</i>	Purple Milkweed	<i>Phytolacca americana</i>	American Pokeweed
<i>Aster saggitifolius</i>	Arrow-Leaved Aster	<i>Polemonium reptans</i>	Jacob's Ladder
<i>Aureolaria grandiflora</i>	Yellow False Foxglove	<i>Potentilla simplex</i>	Common Cinquefoil
<i>Blephilia ciliata</i>	Downy Wood Mint	<i>Prenanthes alba</i>	Lion's Foot
	Hairy Woodland	<i>Prunus americana</i>	American Plum
<i>Bromus pubescens</i>	Brome	<i>Pteridium aquilinum</i>	Bracken Fern
<i>Cacalia atriplicifolia</i>	Pale Indian Plantain	<i>Quercus alba</i>	White Oak
<i>Camassia scilloides</i>	Wild Hyacinth	<i>Quercus coccinea</i>	Scarlet Oak
<i>Carex cephalophora</i>	Oval Leaf Sedge	<i>Quercus macrocarpa</i>	Bur Oak
<i>Carex hirtifolia</i>	Hairy Sedge	<i>Quercus velutina</i>	Black Oak
<i>Carex pensylvanica</i>	Pennsylvania Sedge	<i>Ranunculus fascicularis</i>	Early Buttercup
<i>Carya ovata</i>	Shagbark Hickory	<i>Salix humilis</i>	Prairie Willow
<i>Cinna arundinacea</i>	Wood Reed Grass	<i>Scrophularia lanceolata</i>	Lanceleaf Figwort
<i>Corylus americana</i>	American Hazelnut	<i>Scrophularia marilandica</i>	Late Figwort
<i>Danthonia spicata</i>	Poverty Oatgrass	<i>Silene stellata</i>	Starry Campion
<i>Elymus villosus</i>	Silky Wild Rye	<i>Smilacina stellata</i>	Starry Solomon's Plume
<i>Erigeron pulchellus</i>	Robin's Plantain	<i>Solidago ulmifolia</i>	Elm-leaved Goldenrod
<i>Festuca obtusa</i>	Nodding Fescue	<i>Taenidia integerrima</i>	Yellow Pimpernel
<i>Galium concinnum</i>	Shining Bedstraw	<i>Thasipum trifoliatum</i>	Purple Meadow Parsnip
<i>Gentiana flavida</i>	Cream Gentian	<i>Triosteum aurantiacum</i>	Early Horse Gentian
<i>Gnaphalium obtusifolium</i>	Sweet Everlasting	<i>Triosteum perfoliatum</i>	Late Horse Gentian
<i>Helianthus decapetalus</i>	Thin-leaved Sunflower	<i>Verbena urticifolia</i>	White Vervain
<i>Helianthus divaricatus</i>	Woodland Sunflower	<i>Vicia americana</i>	American Vetch
<i>Helianthus hirsutus</i>	Hairy Sunflower	<i>Vicia caroliniana</i>	Carolina Vetch
<i>Helianthus strumosus</i>	Paleleaf Woodland Sunflower	<i>Wulfenia bulii</i>	Kittentails
<i>Hypericum punctatum</i>	Spotted St. John's Wort		

## Appendix 4: Sedge Meadow/Fen Plant/Seed Options

<i>Agalinis purpurea</i>	Purple False Foxglove	<i>Galium asprellum</i>	Rough Bedstraw
<i>Angelica atropurpurea</i>	Angelica	<i>Galium boreale</i>	Northern Bedstraw
<i>Apios americana</i>	Groundnut	<i>Gentiana procera</i>	Fringed Gentian
<i>Asclepias incarnata</i>	Swamp Milkweed	<i>Helenium autumnale</i>	Sneezeweed
<i>Aster lateriflorus</i>	Calico Aster	<i>Helianthus grosseserratus</i>	Sawtooth Sunflower
<i>Aster praeltus</i>	Willow Aster	<i>Impatiens capensis</i>	Jewel Weed
<i>Aster puniceus</i>	Purplestem Aster	<i>Iris virginica</i>	Blue Flag Iris
<i>Aster umbellatus</i>	Flat-topped Aster	<i>Juncus nodosus</i>	Knotted Rush
<i>Betula pumila</i>	Bog Birch	<i>Lathyrus palustris</i>	Wild Pea/Marsh Pea
<i>Bidens coronata</i>	Tall Swamp Marigold	<i>Lobelia kalmii</i>	Kalm's Lobelia
<i>Calamagrostis canadensis</i>	Bluejoint Grass	<i>Lobelia siphilitica</i>	Great Blue Lobelia
<i>Caltha palustris</i>	Yellow Marsh Marigold	<i>Lycopus americanus</i>	American Water Horehound
<i>Campanula aparinoides</i>	Marsh Bellflower	<i>Lycopus uniflorus</i>	Northern Bugleweed
<i>Cardamine bulbosa</i>	Bulbous Bittercress	<i>Lysimachia quadriflora</i>	Prairie Loosestrife
<i>Carex annectans</i>	Yellow-fruit Sedge	<i>Lythrum alatum</i>	Winged Loosestrife
<i>Carex aquatilis</i>	Water Sedge	<i>Mentha arvensis</i>	Wild Mint
<i>Carex atherodes</i>	Hairy Lake Sedge	<i>Muhlenbergia glomerata</i>	Marsh Muhly
<i>Carex bebbii</i>	Bebb's Sedge	<i>Onoclea sensibilis</i>	Sensitive Fern
<i>Carex buxbaumii</i>	Buxbaum's Sedge	<i>Oxypolis rigidior</i>	Cowbane
<i>Carex haydenii</i>	Hayden's Sedge	<i>Parnassia glauca</i>	Grass of Parnassus
<i>Carex interior</i>	Inland Sedge	<i>Pedicularis lanceolata</i>	Swamp Lousewort
<i>Carex lacustris</i>	Lake Sedge	<i>Physocarpus opulifolius</i>	Common Ninebark
<i>Carex prairiea</i>	Prairie Sedge	<i>Polygonum amphibium</i>	Water Knotweed
<i>Carex sartwellii</i>	Sartwell's Sedge	<i>Potentilla palustris</i>	Marsh Cinquefoil
<i>Carex sterlis</i>	Fen Star Sedge	<i>Pycnanthemum virginianum</i>	Mountain Mint
<i>Carex viridula</i>	Little Green Sedge	<i>Ranunculus hispidus</i>	Rough Buttercup
<i>Chelone glabra</i>	White Turtlehead	<i>Ranunculus pensylvanicus</i>	Bristly Crowfoot
<i>Cicuta bulbifera</i>	Bulblet-bearing Water Hemlock	<i>Rhynchospora capillacea</i>	Needle Beak Sedge
<i>Cicuta maculata</i>	Spotted Water-Hemlock	<i>Ribes americanum</i>	American Black Currant
<i>Cirsium muticum</i>	Swamp Thistle	<i>Rudbeckia hirta</i>	Black Eyed Susan
<i>Calystegia sepium</i>	Hedge Bindweed	<i>Rumex orbiculatus</i>	Great Water Dock
<i>Cornus stolonifera</i>	Red-osier Dogwood	<i>Rumex verticillatus</i>	Swamp Dock
<i>Cuscuta glomerata</i>	Rope Dodder	<i>Salix candida</i>	Sageleaf Willow
<i>Dasiphora fruticosa</i>	Shrubby Cinquefoil	<i>Salix eriocephala</i>	Missouri Willow
<i>Dryopteris cristata</i>	Crested Wood Fern	<i>Salix pedicellaris</i>	Bog Willow
<i>Dryopteris thelypteris</i>	Marsh Fern	<i>Salix petiolaris</i>	Meadow Willow
<i>Elymus virginicus</i>	Virginia Wild Eye	<i>Satureja arkansana</i>	Low Calamint
<i>Epilobium coloratum</i>	Willow Herb	<i>Saxifraga pensylvanica</i>	Swamp Saxifrage
<i>Epilobium leptophyllum</i>	Bog Willow-herb	<i>Scirpus acutus</i>	Hardstem Bulrush
<i>Eriophorum angustifolium</i>	Tall Cottongrass	<i>Scirpus cyperinus</i>	Woolgrass
<i>Eupatorium maculatum</i>	Cottongrass	<i>Scleria verticillata</i>	Low Nutrush
		<i>Scutellaria epilobiifolia</i>	Marsh Skullcap

*Eupatorium perfoliatum*      Common Boneset



## Appendix 5: Woodland Plant/Seed Options

<i>Actaea pachypoda</i>	White Baneberry	<i>Desmodium glutinosum</i>	Pointed-leaf Tick-trefoil
<i>Actaea rubra</i>	Red Baneberry	<i>Dicentra cucullaria</i>	Dutchman's Breeches
<i>Agrostis perennans</i>	Upland Bentgrass	<i>Dioscorea villosa</i>	Wild Yam
<i>Allium tricoccum</i>	Wild Leek	<i>Dodecatheon meadia</i>	Shooting Star
<i>Amelanchier arborea</i>	Serviceberry	<i>Dryopteris spinulosa</i>	Spinulose Wood Fern
<i>Amphicarpa bracteata</i>	Hog Peanut	<i>Elymus canadensis</i>	Canada Wild Rye
<i>Anemone quinquefolia</i>	Wood Anemone	<i>Elymus villosus</i>	Silky Wild Rye
<i>Anemone virginiana</i>	Thimbleweed	<i>Erythronium albidum</i>	White Trout Lily
<i>Anemonella</i>		<i>Eupatorium purpureum</i>	Purple Joe Pye Weed
<i>thalictroides</i>	Rue Anemone	<i>Festuca obtuse</i>	Nodding Fescue
<i>Aralia nudicaulis</i>	Wild Sarsaparilla	<i>Fragaria virginiana</i>	Wild Strawberry
<i>Arisaema triphyllum</i>	Jack in the Pulpit	<i>Geranium maculatum</i>	Wild Geranium
<i>Aster drummondii</i>	Drummond's Aster	<i>Helianthus divaricatus</i>	Woodland Sunflower
<i>Aster macrophyllus</i>	Big-Leaved Aster	<i>Helianthus strumosus</i>	Pale-leaved Sunflower
<i>Aster shortii</i>	Short's Aster	<i>Hepatica americana</i>	Round-lobed Hepatica
<i>Athyrium felix-femina</i>	Lady-fern	<i>Hydrophyllum</i>	
<i>Botrychium virginianum</i>	Rattlesnake Fern	<i>virginianum</i>	Virginia Waterleaf
<i>Brachyelytrum erectum</i>	Bearded Shorthusk	<i>Hystrix patula</i>	Bottlebrush Grass
<i>Bromus pubescens</i>	Hairy Woodland Brome	<i>Krigia biflora</i>	Two-Flower Cynthia
<i>Campanula americana</i>	Tall Bellflower	<i>Leersia virginica</i>	White Grass
<i>Carex blanda</i>	Common Wood Sedge	<i>Lonicera prolifera</i>	Grape Honeysuckle
	Short-headed Bracted	<i>Luzula multiflora</i>	Common Woodrush
<i>Carex cephalophora</i>	Sedge	<i>Menispermum</i>	
<i>Carex hirifolia</i>	Hairy Wood Sedge	<i>canadense</i>	Canada Moonseed
<i>Carex jamesii</i>	James' Sedge	<i>Monotropa uniflora</i>	Ghost Pipe
<i>Carex normalis</i>	Greater Straw Sedge	<i>Osmorhiza claytonii</i>	Clayton's Sweetroot
<i>Carex pensylvanica</i>	Common Oak Sedge	<i>Osmorhiza longistylis</i>	Ansiseroot
	Curly-Styled Wood	<i>Ostrya virginiana</i>	Ironwood
<i>Carex rosea</i>	Sedge	<i>Panicum implicatum</i>	Wooly Panic Grass
<i>Carex sprengellii</i>	Long-beaked Sedge	<i>Panicum latifolium</i>	Wide Leaved Panic Grass
	Narrow-leaved Oval	<i>Parthenocissus</i>	
<i>Carex tenera</i>	Sedge	<i>quinquefolia</i>	Virginia Creeper
<i>Carya cordiformis</i>	Bitternut Hickory	<i>Pedicularis canadensis</i>	Wood Betony
<i>Carya ovata</i>	Shagbark Hickory	<i>Penstemon digitalis</i>	Foxglove Beardtongue
<i>Caulophyllum</i>		<i>Phryma leptostachya</i>	American Lopseed
<i>thalictroides</i>	Blue Cohosh	<i>Podophyllum peltatum</i>	Mayapple
<i>Cinna arundinacea</i>	Sweet Woodreed	<i>Polygonatum</i>	
<i>Claytonia virginiana</i>	Spring Beauty	<i>canaliculatum</i>	Great Solomon's Seal
<i>Clematis virginiana</i>	Virgin's Bower	<i>Polygonatum</i>	
<i>Corylus americana</i>	American Hazelnut	<i>virginianum</i>	Woodland Knotweed
<i>Cypripedium pubescens</i>	Yellow Lady's Slipper	<i>Prenanthes alba</i>	White Lettuce
<i>Danthonia spicata</i>	Poverty Oat Grass	<i>Prenanthes altissima</i>	Tall White Lettuce
<i>Dentaria laciniata</i>	Cutleaf Toothwort	<i>Prunus virginiana</i>	Chokecherry

*Desmodium cuspidatum*    Large-Bract Tick-trefoil    *Quercus alba*    White Oak

<i>Quercus rubra</i>	Northern Red Oak	<i>Solidago flexicaulis</i>	Broad-Leaved Goldenrod
<i>Quercus velutina</i>	Black Oak	<i>Solidago ulmifolia</i>	Elm-Leaved Goldenrod
<i>Ribes missouriense</i>	Wild Gooseberry	<i>Taenidia integerrima</i>	Yellow Pimpernel
<i>Sanguinaria canadensis</i>	Bloodroot	<i>Thalictrum dioicum</i>	Early Meadow Rue
	Clustered Black	<i>Trillium grandiflora</i>	Great White Trillium
<i>Sanicula gregaria</i>	Snakeroot	<i>Trillium recurvatum</i>	Prairie Trillium
<i>Silene stellata</i>	Starry Campion	<i>Triosteum aurantiacum</i>	Horse Gentian
<i>Silene virginica</i>	Fire Pink	<i>Viburnum acerifolium</i>	Mapleleaf Viburnum
<i>Smilacina racemosa</i>	False Solomon's Seal	<i>Viburnum prunifolium</i>	Black Haw
<i>Smilax hispida</i>	Bristly Greenbrier	<i>Viburnum</i>	
<i>Solidago caesia</i>	Blue-Stemmed Goldenrod	<i>rafinesquianum</i>	Downy Arrowwood

## Appendix 6: Native Shrub List

<i>Cornus racemose</i>	Gray Dogwood
<i>Cornus sericea</i>	Red-osier Dogwood
<i>Sambucus canadensis</i>	Common Elderberry
<i>Corylus Americana</i>	American Hazelnut
<i>Viburnum trilobum</i>	American Highbush Cranberry
<i>Physocarpus opulifolius</i>	Ninebark
<i>Pyrus ioensis</i>	Prairie Crabapple
<i>Prunus Americana</i>	Wild Plum
<i>Amelanchier canadensis</i>	Eastern Serviceberry
<i>Amelanchier arborea</i>	Downy Serviceberry
<i>Amelanchier laevis</i>	Smooth Serviceberry
<i>Hamamelis virginiana</i>	Common Witch-hazel
<i>Carpinus caroliniana</i>	American hornbeam
<i>Crataegus Spp.</i>	Hawthorn
<i>Ostrya virginiana</i>	Ironwood



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