

John C. Bock Community Forest Ecological Assessment and Management Plan

Prepared for the City Middleton

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March 2009



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TABLE OF CONTENTS

Executive Summary	1
Introduction and Methods	3
Introduction	3
Property Location.....	3
A Brief History of the John C. Bock Community Forest.....	4
Methods	5
A Plant Ecology Primer	7
Introduction	7
The Plant Community.....	7
Plant Community Structure	7
Savanna, Woodland or Forest?.....	9
Description and Analysis of Current Conditions: An Overview	12
Introduction	12
Cultural Features.....	12
Soils	13
Topography	15
Aerial Photographs	16
Diseases	19
Hazard Trees	20
Adjacent Land Use	20
Vegetation.....	20
Description and Analysis of Current Conditions: Individual Survey Units	32
Introduction	32
Old Field Unit.....	32
Oak Woodland Unit	36
Brushland Unit	39
Hay Field Unit	42
Management Overview and Objectives	45
Introduction	45
Management Plan Limitations	46
Implications of the Community Forest Designation	47
Desired Future Condition Statement.....	47
Objectives and Recommendations	48
Management Recommendations.....	50
Objective 1: Develop and Maintain a Variety of Native Plant Communities.....	51
Objective 2: Practice Sustainable Forestry	71
Objective 3: Provide Multiple Opportunities for Education and Recreation	76
Objective 4: Minimize Impacts to Adjoining Neighborhoods.....	80
Objective 5: Utilize External Funding and Partnerships	81
Implementation Schedule.....	83
Estimated Costs	85

Summary	87
References	88
Appendix I: Annotated List of Observed Species.	
Appendix II: Species Recommended for Planting.	
Appendix III: John C. Bock Community Forest Stewardship Plan (Holaday 2008).	
Appendix IV: Scommunity Gardens Communications.	

List of Figures

Fig. 1. Bock Forest Location.	3
Fig. 2. Sampling Units.	5
Fig. 3. Changes in Forest Structure with Changes in Soil Texture.	8
Fig. 4. Savanna, Woodland, and Forest Canopy and Midstory Variation.	9
Fig. 5. Open Grown Oak Tree (l) and Woodland Grown Oak Trees (r).	10
Fig. 6. Cultural Features.	12
Fig. 7. Kiosk (u) and Memorial Rock (l).	13
Fig. 8. Bock Forest Soil Types.	14
Fig. 9. Bock Forest Topography (DCiMap 2003).	16
Fig. 10. Bock Forest Aerial Photographs From 1937 to 2008.	17
Fig. 11. Dead Elm Trees Along the South Edge of the Oak Woodland.	20
Fig. 12. 1834 Public Land Survey Plat.	21
Fig. 13. Number Of Native and Non-native Species By Life-form In All Survey Units.	23
Fig. 14. Number Of Native and Non-native Species Per Survey Unit.	24
Fig. 15. Number of Invasive Species By Life-Form Per Sampling Unit.	27
Fig. 16. Bock Forest Invasive Species.	28
Fig. 17. Old Field Unit Location.	32
Fig. 18. Cottonwood Along East Side.	34
Fig. 19. Scattered Trees.	34
Fig. 20. Bare Soil Beneath Dense Honeysuckle.	34
Fig. 21. Oak Woodland Unit Location.	36
Fig. 22. Oak Woodland.	37
Fig. 23. Oak Branches Growing Towards Open Field.	37
Fig. 24. Brushy Oak Woodland Edge.	37
Fig. 25. Brushland Unit Location.	39

Fig. 26. Dense Honeysuckle and Buckthorn Typical of the Brushland Unit.	40
Fig. 27. Large Buckthorn.	41
Fig. 28. Buckthorn Seedling Groundlayer.	41
Fig. 29. Hayfield Unit Location.	42
Fig. 30. Hay Field, West Subunit After Mowing.	42
Fig. 31. Future Vegetation Types and Cultural Features.	50
Fig. 32. Forestry Mower.	52
Fig. 33. Typical Woody Debris Left After Forestry Mowing.	52
Fig. 34. No-till Seed Drill.	55
Fig. 35. Tree Shelter.	57
Fig. 36. Cottonwood Groves.	72
Fig. 37. Feller Buncher.	73
Fig. 38. Alternative Wood Uses.	74
Fig. 39. Suggested Garden Location.	77

List of Tables

Table 1. Bock Forest Soil Types.	15
Table 2. Summary Characteristics of the Major Plant Communities at Bock Forest.	22
Table 3. Number And Proportion Of Native And Non-native Species By Life-form In All Survey Units.	23
Table 4. Number And Proportion Of Native And Non-native Species Per Survey Unit.	24
Table 5. Location and Abundance of the Observed Invasive Species.	26
Table 6. Number and Proportion of Native and Non-native Species in the Old Field Unit.	33
Table 7. Number and Proportion of Native and Non-native Species in the Oak Woodland Unit.	36
Table 8. Number and Proportion of Native and Non-native Species in the Brushland Unit.	40
Table 9. Number and Proportion of Native and Non-native Species in the Hay Field Unit.	43
Table 10. Non-native Species Management Concern Level.	69
Table 11. Funding Opportunities.	81
Table 12. Implementation Schedule.	84
Table 13. Estimated Cost.	86

EXECUTIVE SUMMARY

Introduction

This report provides the results of the ecological assessment of the John C. Bock Community Forest (hereafter BF) and recommendations for: developing and maintaining a variety of native plant communities; practicing and showcasing sustainable forestry; and providing opportunities for environmental education and outdoor recreation. BF is a City of Middleton Conservancy property. It is 19.27 acres and is located along the north side of Highland Way.

This report is based on information gathered during seven site visits made between June and November 2008, coupled with secondary sources of information, such as aerial photographs, the Dane County Geographical Information System database, and the 2008 Community Forest Stewardship Plan prepared by Dane County DNR Forester Steve Holaday. In addition, public comments were received during a June 24, 2008 site tour, a November 5, 2008 preliminary results presentation at the Middleton library, a March 4, 2009 Conservancy Lands Committee meeting, and directly at various times.

Summary of Existing Conditions

Land survey records from the 1830s indicate BF was oak savanna when the first white settlers arrived, as was most of southern Wisconsin. It is currently a mixture of old field (former agricultural fields dominated by cool season grasses with a variety of native and non-native forbs, shrubs, and trees), active hay field, and oak savanna that has converted to southern dry-mesic forest comprised of large, mature white and bur oak mixed with smaller and younger box elder, hackberry, black cherry, elm, basswood, and a variety of native and non-native shrubs. Aerial photographs reveal the entire site was cropped since 1937, but likely since much earlier, until the 1970s, except for the forested area.

One hundred and sixty-two species were identified during the survey (see Table). Fifty-nine percent of the 162 are native, a relatively low proportion, although not surprising given the site's agricultural history, relatively small size, and the absence of management for the last 30 years. Although the proportion of native species is higher than non-native species, the cover and abundance of the non-

Number of Species Observed.

Life form	Number of Species		
	Native	Non-native	Total
Trees	19	5	24
Shrubs	15	7	22
Vines	4	37	7
Graminoids	8	10	18
Forbs (flowers)	47	42	89
Ferns	2	0	2
Total	95	67	162

native species greatly exceeds native species throughout the entire site, except in the forest where oak and other native trees are dominant. In many areas, the cover is 100 percent non-native, mostly because of dense buckthorn, honeysuckle, and non-native grasses.

No Wisconsin or Federally Endangered, Threatened, or Special Concern plants or animals were observed.

Threats

Benign neglect and invasive species are the greatest threats to BF's long-term ecological integrity. Fifteen invasive species were observed: Canada thistle, crown vetch, leafy spurge, white and yellow sweet clover, wild parsnip, garlic mustard, dame's rocket, reed canary grass, bird's-foot trefoil, autumn olive, buckthorn, honeysuckle, multiflora rose, and Siberian elm. Honeysuckle and buckthorn are of greatest concern because they are abundant and are eliminating other species.

Opportunities

When white settlers began arriving in Wisconsin there were an estimated 5.5 million acres of oak savanna and 2.1 million acres of prairie. Almost immediately the prairies and savannas were plowed for agriculture, used (or over-used) for pasture, and invaded by brush and trees following fire suppression, causing their rapid demise. Today, less than 500 acres of oak savanna and less than 2,000 acres of prairie remain. BF offers a wonderful opportunity to restore this lost biological heritage for public education and enjoyment and to benefit prairie and savanna dependant flora and fauna.

BF offers the unique opportunity practice and showcase sustainable forestry in an urban location, including tree harvesting, tree planting, and on-site wood product use. BF also offers opportunities to educate and engage the public in BF's restoration and reforestation, and to provide community gardens with a portion of each garden dedicated to growing plants for BF's restoration.

Realizing these goals for Bock Forest will require a substantial and sustained effort. A significant amount of brush must first be cleared, invasive species eliminated, seeds sown, trees planted and tended, and public awareness raised and involvement gained. Conversion of former cropland covered with buckthorn and honeysuckle to oak savanna, prairie, and oak woodland will not happen overnight, but it is achievable.

INTRODUCTION AND METHODS

Introduction

This report provides the results of an ecological assessment of the John C. Bock Community Forest (hereafter BF) and a series of restoration and management recommendations for the Forest. More specifically, this report provides:

1. An annotated list of all observed plant species.
2. A determination of current habitat types.
3. The status of rare, threatened, and endangered species.
4. The status of invasive species.
5. Information on abiotic factors, such as topography and soil type.
6. Information on unique natural and cultural features.
7. Management and restoration recommendations.
8. Ecological information to help interpret and understand the assessment and management recommendations.

Property Location

BF is located in Dane County, Wisconsin within the City of Middleton, along the north side of Highland Way (Fig. 1). More specifically, it is located in the west half of Section 6, Township 7 North, Range 9 East. BF is 19.27 acres.



Fig. 1. Bock Forest Location (black star).

A Brief History of the John C. Bock Community Forest

From Jim O'Brien, president of Friends of Pheasant Branch:

On January 31, 2006 the Friends of Pheasant Branch transferred title for 19.27 acres of open land along Highland Way to the City of Middleton. Purchased by the Middleton-Cross Plains School District in the 1970s, the land had been set aside for building a school that would serve the northeast section of the city. It was left alone for several decades, providing the neighborhood with an enjoyable natural landscape and access to the Pheasant Branch Conservancy.

After the turn of the century the school board decided to sell the land and build a school elsewhere. With its proximity to the conservancy, the Highland Way property seemed to environmentalists an area that ought to be preserved rather than developed. The conservancy could thereby expand to the southeast, with measures put in place that would infiltrate storm water rather than allow it to run off toward the Pheasant Branch Creek and toward Lake Mendota. The opportunity to restore the land as a prairie with an oak savanna and woods seemed too good to pass up.

The Friends of Pheasant Branch, formed in the mid-nineties, accepted the challenge of raising funds for the purchase. A parcel of buildable land in a rapidly developing community, the land along Highland Way was assessed at three million dollars—a sum which the school board would need to realize to meet its fiduciary responsibility.

It took the better part of three years to raise the funds. When approached, local foundations proved willing to respond. The John C. Bock Foundation allocated \$200,000, the first major donation of the fund-raising drive; and the Madison Community Foundation came through with a \$100,000 grant at the very end of the campaign. Other foundations, among them MG&E, Evjue, and an anonymous foundation, contributed heavily. Governments too proved generous: the Dane County Conservation Fund donated \$865,000, the State Stewardship Fund \$774,000, and the City of Middleton \$300,000. With Dan Erdman setting an example, businesses and individual donors also contributed mightily to the cause. A donor board soon to be erected on the land lists eight individuals or couples and three foundations other than the aforementioned ones as contributing \$10,000 or more; fifteen couples or individuals as contributing \$5,000 or more; fourteen at \$2,500 or above, and a total of sixty-four at \$1,000 or more.

When the Friends came up \$180,000 short as the option to purchase was due to expire, ten couples or individuals committed at various levels to guaranteeing a bridge loan to cover the shortfall. The terms of the loan allowed for two years to raise the money. Owing to the continued generosity of the Friends' supporters, the loan, along with the interest accruing to it, was paid off months before the deadline.

As mentioned above, the Friends transferred title for the land to the City of Middleton. An application to have the land designated a "community forest" proved successful. In recognition of the earliest major contribution to the campaign, the Highland Way parcel was officially named the John C. Bock Community Forest.

Methods

Survey Unit Delineation

BF was divided into four survey units based on vegetation and location (Fig. 2):

1. Oak Woodland (1.0 acres).
2. Hay Field (1.4 acres in the west subunit and 0.6 acres in the east subunit).
3. Old Field (10.25 acres).
4. Brushland (5.6 acres).

Sampling units were selected based on homogeneity of vegetation within the unit and a significant difference from the adjacent vegetation. A gravel pedestrian path occupies an additional 0.4 acres.

Vegetation Survey

Survey units were systematically walked during site visits made June 9, 18, and 24, August 3, September 12 and 18, and November 29, 2008. A record was kept of all observed species (species presence) in each survey unit during each visit. Species that are difficult to field identify were vouchered and keyed out in the office.

In addition to species presence, information was recorded for:

1. Relative abundance (rare, uncommon, common, abundant, dominant).
2. Distribution within the survey unit.
3. Canopy and subcanopy tree species and their relative abundance.
4. Invasive species location and abundance.

Abiotic Factors

Abiotic information was recorded during each visit and additional information was obtained from secondary sources, such as the Dane County Soil Survey, the Dane County Geographical Information System database, the 2008 Community Forest Stewardship Plan prepared by Dane County DNR Forester Steve Holaday (see Appendix III), the Pheasant Branch Conservancy Management Plan prepared by a University of Wisconsin Forest Ecology and Management class (Budyak *et. al* 2006), Middleton Park and Open Space Plan (2005-2009),



Fig. 2. Sampling Units. BF outlined in black, sampling units in yellow.

Geology, Cultural History and Ecology of the Pheasant Branch Conservancy and Watershed in Middleton, Wisconsin (Friends of Pheasant Branch 2005), and the Northern Lake Mendota Regional Plan (Schreiber/Anderson Associates 1999).

Abiotic information includes:

1. Topography, including slope and aspect.
2. Soil type.
3. Natural and cultural features.
4. Prior disturbance and the resulting effect.
5. Special management needs, opportunities, and concerns.

Aerial Photograph Analysis

Analysis of aerial photographs often provides important historical information and insights into changes in land cover and land use practices not observable in the field. In order to assess these types of changes a chronosequence of aerial photos from 1937 to 2008 was visually assessed for:

1. Changes in the extent and location of vegetation types.
2. Changes in infrastructure (roads, buildings) and other cultural features.



A PLANT ECOLOGY PRIMER

Introduction

Plant ecology is the scientific study of how plants interact and affect each other and their environment. This section is designed to help the reader understand this report by providing:

1. An explanation of the term “plant community” and their classification.
2. An explanation of plant community structure.
3. A discussion of the characteristics of oak savanna, oak woodland, and oak forest.

The Plant Community

Most people recognize that certain plants commonly grow together, while other plants rarely, if ever, grow side by side. Broadly speaking, groups of plants that commonly grow together are called a **plant 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* (Curtis 1959).

Plant Community Structure

Most plant communities are composed of distinct layers of vegetation that define their **structure**. In forested communities the **canopy** is the uppermost layer. It is composed of the **dominant** (most abundant based on the amount of biomass or the species that has the strongest influence on the other plant community members) and the associate (codominant), tree species.

The canopy has a strong influence on all of the other (lower) vegetation layers because of its strong effect on light levels. Alterations in the amount of canopy closure often cause a cascading effect as lower layers of vegetation adjust to the change. This is an important relationship for land managers and restorationists to understand since their activities often alter the canopy. Shifts in the composition of the canopy species are often associated with successional changes. **Succession** refers to the replacement of one species with another due to differing competitive ability, changes in the environment, and random events or disturbances, such as tornadoes, fire, or disease.

Altering canopy closure causes cascading effects as lower layers of vegetation adjust to the change, an important relationship to understand.

The **midstory** is the layer below the canopy and, like the canopy above it, has a strong effect

on lower layers because of its influence on the amount of light they receive. It is often subdivided into a subcanopy layer and a shrub and seedling layer. The **subcanopy** is composed primarily of two classes of trees based on their ability to become part of the canopy, which is determined by their growth patterns. Some species grow quickly through the midstory and become part of the canopy. The amount of time they spend in the subcanopy before joining the canopy is related to their growth rate, shade tolerance, and the presence or absence of canopy gaps. Others species stay relatively short and remain in the midstory their entire life. The subcanopy is very important in determining the future composition of a forest or woodland because today's subcanopy is often tomorrow's canopy.

The **shrub and seedling layer**, the other component of the midstory, consists of various woody plants (shrubs), such as gooseberry, brambles, and dogwood, and the young offspring (seedlings) of the canopy and midstory trees. The composition and density of the shrub layer is most closely related to canopy and soil moisture conditions, although this relationship can be altered by external factors, such as grazing and fire. Typically, there is an inverse relationship between canopy closure and shrub density such that closed canopy sites have relatively few shrubs, although shade tolerant invasive shrubs, such as buckthorn, often skew this relationship (Fig. 3).

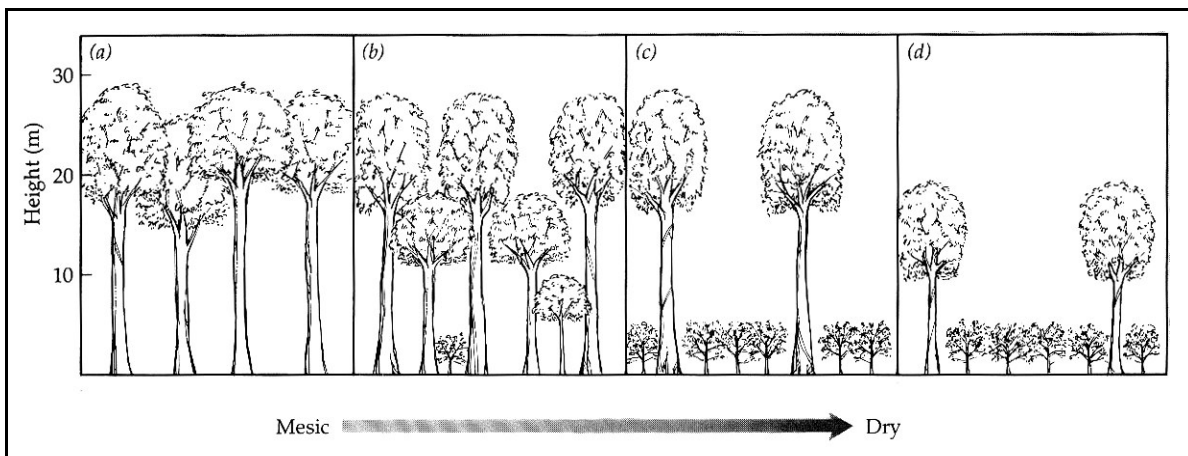


Fig. 3. Changes in Forest Structure with Changes in Soil Texture.

(a) Fine-textured soils have closed upper canopies and little understory. As soils become progressively drier, canopy structure grades from (b) evenly distributed to (c) open upper canopy with significant shrub layer to (d) open upper canopy of reduced height, with significant shrub layer. (Adapted from Aber and Melillo 1991.)

The lowest layer is the **groundlayer**. The groundlayer is composed of wildflowers, ferns, grasses, sedges, and mosses. The groundlayer is typically the most diverse layer in undisturbed native plant communities. As might be expected, the composition of the groundlayer is strongly influenced by the layers above it, as well as soil moisture and fertility.

Not all plant communities have all of these layers. Prairies, for example, do not have a canopy or subcanopy in the classic sense because they lack trees, although tall grasses shade shorter plants.

Savanna, Woodland or Forest?

Understanding the differences between oak savanna, oak woodland, and oak forest is helpful for understanding Bock Forest's historic and current vegetation. It's *crucial* for understanding its restoration and management.

Although precise definitions are difficult and aren't universally accepted, it's safe to say the primary difference between these three plant communities is the density of the oak trees, which are the most abundant tree species, and the resulting differences in canopy closure (Fig. 4).

Oak savannas are generally considered to have at least one tree per acre, but less than fifty percent canopy cover. Oak woodland canopies are more closed, typically 40 to 70 percent, but can range from 30 to 90 percent. Oak forest canopies are typically 70 to 100 percent closed, although there are often gaps caused by disease, wind, and tree mortality.

Due to the differing amount of sunlight the trees receive in each of the three plant communities, especially while they are young, there are significant differences in their appearance (Fig. 4, Fig. 5). Oak savanna trees typically have a characteristic growth form referred to as **open grown** in which there are wide-spreading, horizontal branches, often originating very low on a trunk that is relatively short and thick. The open grown form is a response to the abundant sunlight—why grow up to reach the sunlight when it's already there?

Conversely, trees that develop in the shade of a forest have a growth form referred to as **forest grown** in which there are few, if any, lower branches because there isn't enough light to support their growth. Because young trees grow upward towards the sun, their trunks are typically relatively tall and slender (Fig. 4).

Oak woodland trees have some characteristics of both savanna and forest trees, but are easily distinguished by a trained eye. Because the woodland canopy is somewhat open, some of the trees have an open grown form, although the form is usually less pronounced than in a savanna tree because there isn't enough sunlight to support fully developed lower branches. More common is a tall, moderately slender tree, perhaps with a few smaller diameter horizontally growing branches low on the trunk, but with the majority of the branches in the upper half of

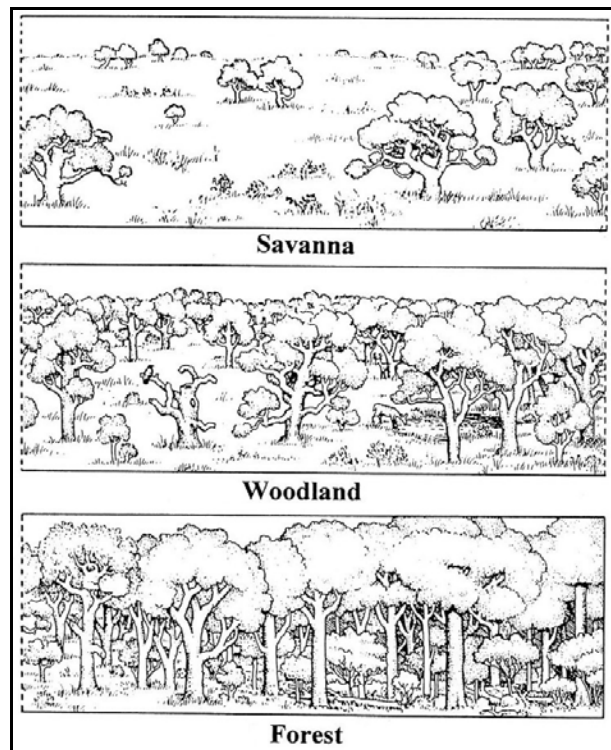


Fig. 4. Savanna, Woodland, and Forest Canopy and Midstory Variation. Adapted from The Tallgrass Restoration Handbook, Packard and Mutel, 1997.



Fig. 5. Open Grown Oak Tree (l) and Woodland Grown Oak Trees (r).

the tree where they receive more sunlight. These branches frequently take on a contorted, twisted, open, spreading appearance (Fig. 5).

The differences in tree form and canopy closure between oak savanna, oak woodland, and oak forest create significant differences in the amount of light reaching the midstory and groundlayer, producing noticeable differences in their structure and composition.

Grasses are dominant in oak savanna, while trees, especially oak, are dominant in oak woodland and, especially, oak forests. Shrubs are common in all three communities, but in oak savanna and oak woodland frequent fires prevent them (or historically prevented them) from becoming dense and tall. In oak forest the shrubs are typically tall and dense because fire is less frequent due to the shady and moist environment. In early settler accounts, oak woodland and oak savanna are both frequently described as “park-like,” a term not extended to oak forests.

The conversion of oak savanna to forest, often with an intermediate oak woodland stage, is a common occurrence in southern Wisconsin and an interesting story that mixes ecology and human interaction with the landscape. Prior to the arrival of the earliest white settlers, oak savannas were kept free of invading trees and brush by frequent fires. However, the settlers suppressed fire to protect their crops, livestock, dwellings, and even their own lives. This had the inadvertent effect of allowing more trees and shrubs to become established.

Cochrane and Iltis (2000) write “Unfarmed savannas, except very dry or very wet ones, were changed into closed-canopy forests within two to three decades [following fire suppression]....” They attributed this to “the successional replacement of ...the dominant oaks by other shade tolerant/fire intolerant¹ trees and shrubs,” such as maple, basswood, elm, and ash. These

¹ Shade tolerant refers to a plant’s ability to successfully to grow in continual shade. Fire intolerant species are

species are relatively fast growing and shade tolerant compared to oak, but are easily fire-killed.

Sometimes the oak savanna converted to oak woodland or oak forest when fire stopped, rather than a forest of sugar maple, basswood, elm, and ash. The explanation for this transformation is due to the presence of *oak grubs*. Oak grubs are short, multi-stem oak trees a few feet tall that look more like a shrub than a tree. They're created when an oak sapling or seedling has its top (aboveground portion) repeatedly killed by fire, or sometimes grazing, while the roots survive. When fire or grazing stops, the grubs grow rapidly into trees from their already strong root system.

When European settlers began arriving in Wisconsin there was an estimated 5.5 million acres of oak savanna. The acreage of oak woodland is largely unknown because early ecologists and land surveyors failed to recognize it as a distinct plant community instead including it with oak savanna (when the canopy was relatively open) or oak forest (when the canopy was relatively closed). However, it's very likely it was nearly as widespread as oak savanna (WDNR 2005, Pruksa and Faber-Langendoen 1997).

Currently, less than 500 of the original 5.5 million acres of oak savanna remain, making it "extraordinarily rare" (WDNR 2005, WDNR 1995). Bock Forest offers a wonderful opportunity to help restore this lost part of Wisconsin's biological heritage.



Oak Species in Bock Forest: White, Red, Bur, and Black (l to r).

those unable to survive a fire, usually because they have thin bark or can't resprout.

DESCRIPTION AND ANALYSIS OF CURRENT CONDITIONS: AN OVERVIEW

Introduction

This section presents and interprets the collected information that pertains to BF as a whole and relates this information to management needs and opportunities. Individual survey units are described and discussed in the next section (Descriptions of Individual Survey Units). Common plant names are used to improve readability. Appendix I lists all observed plant species and provides both scientific and common names.

Cultural Features

See Fig. 6 for the location of the features discussed below.

The most obvious cultural feature is a gravel multi-use trail approximately 15 feet wide that bisects BF from north to south. The trail is located along a 66-foot wide underground utility easement.

Besides providing access to BF, the trail also provides access to the Orchid Heights neighborhood, Pheasant Branch Conservancy, and public land north of Pheasant Branch Conservancy, as well as access for the farmer who is renting the hay fields. The trail is heavily used. Two fire hydrants are located along the east side of the trail.

Several well-worn dirt and grass “desire trails²” connect the gravel trail to the various apartment complexes east of BF.

A high quality, three-sided kiosk is located along the west side of the trail, a short distance north of the Highland Way entrance (Fig. 7). The kiosk has a

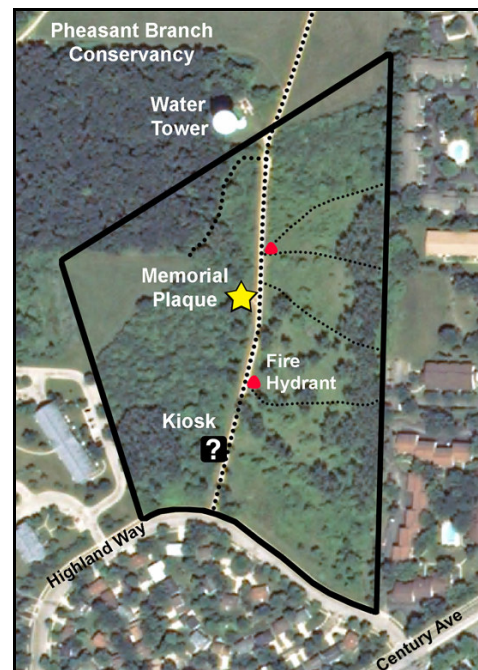


Fig. 6. Cultural Features.

Black large dotted lines are official trails, black small dotted lines are desire trails, other features as labeled.

² A desire trail is an informal trail pedestrians prefer to take to get from one location to another rather using a sidewalk or other official route.

roof and three lockable, Plexiglas-covered display panels.

A semicircle of small boulders is located midway along the trail. A larger boulder in the center of the semicircle has an inscribed bronze plaque honoring John C. Bock, the site's namesake (Fig. 7). The inscription reads:

These sylvan, old growth trees were preserved for the future through the foresight of John C. Bock, a true environmentalist who believed in the lakes, trees and land of Wisconsin. This small refuge, representative of the magnificent forests that once covered this State, was acquired in part by a grant from the John C. Bock Foundation.

A City of Middleton water tower is located next to the gravel trail, just north of BF. A chain link fence surrounds the tower's base.

Bock Forest doesn't have a designated parking area. Rather, vehicles typically park along Highland Way, which is wide enough for vehicles to safely park on both sides. Madison Metro buses service Century Avenue, one block away from Bock Forest, seven days a week. There isn't a bike rack, although there currently may not be a need since bikes were not observed locked to any tree, the entrance gate, or other object.



Fig. 7. Kiosk (u) and Memorial Rock (l).

Soils

According to the Dane County Soil Survey (Glocker and Patzer 1978), Dane County Interactive Mapping Application (DCiMap 2003), and the United States Department of Agricultural Web Soil Survey (<http://soils.usda.gov/survey>) there are four mapping units representing three soil series at BF (Fig. 8, Table 1).

Only one, McHenry silt loam, 12 to 20 % slopes (Mdd2), is considered highly erodible (Glocker and Patzer 1978, DCiMap 2003) although no appreciable erosion was observed. The low erosion risk is important because it indicates soil disturbing activities, such as tree planting and soil preparation for seeding native species, aren't likely to cause erosion, thereby opening the door to a wide choice of management methods. It also indicates that trail construction shouldn't be a problem, except possibly for the steepest areas of Mdd2.

The low erosion risk is important because it allows more site preparation options.

All mapping units are very suitable for tree growth (Glocker and Patzer 1978). Saint Charles has the highest site index³ for red oak (71), followed by 67 for both Dodge and McHenry. Seedling mortality is expected to be low in all mapping units.

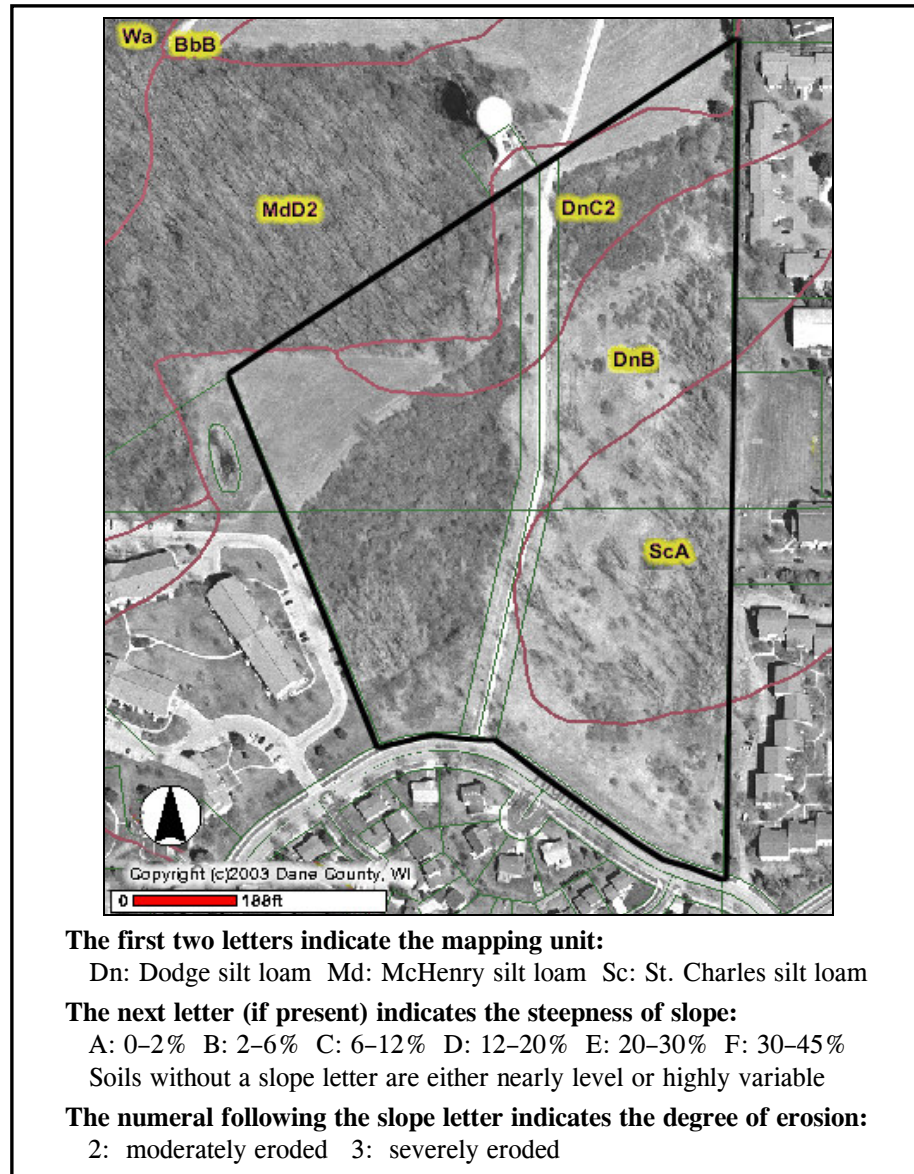


Fig. 8. Bock Forest Soil Types (DCiMap 2003). Black line is Bock Forest boundary. Yellow-highlighted letters and numbers are soil mapping unit symbol. Dark red lines are soil mapping unit boundaries.

³ Average height in feet of the dominant and codominant trees in a stand at 50 years of age.

Table 1. Bock Forest Soil Types.

Map Unit Symbol	Soil Series	Acreage (% of total) ¹	Description
DnB	Dodge silt loam, 2 to 6% slopes	10.1 (52%)	Deep, well drained, high available water capacity, moderately permeable, high natural fertility, moderate erosion hazard.
DnC2	Dodge silt loam, 6 to 12% slopes, eroded	2.9 (15%)	Deep (but less than DnB due to erosion), well drained, high available water capacity, moderately permeable, high natural fertility, severe erosion hazard.
MdD2	McHenry silt loam, 12 to 20% slopes, eroded	1.7 (9%)	Deep, well-drained, medium available water capacity, moderately permeable, medium natural fertility, severe erosion hazard.
ScA	St. Charles silt loam, 0 to 2% slopes	4.6 (24%)	Deep, well drained to moderately well drained, very high available water capacity, high natural fertility, low erosion risk, prime farmland.

¹ Acreage calculated using tools at <http://websoilsurvey.nrcs.usda.gov/app/>.

Topography

Bock Forest's high point, approximately 936 feet above sea level, is at the south end of the property (Fig. 9). The lowest point, approximately 904 feet above sea level, is at the north end of the property. Thus, there is approximately 32 feet of relief on the property.

The majority of the site has a slope of less than two percent (Fig. 9). The exceptions are most of the Oak Woodland, where the slope is greater than 12 percent according to DCiMap (2003), although personal observations suggest this may be an exaggeration except at the eastern end, and the south end of the property where a short but steep bank drops down to join the sidewalk in an area that was likely reshaped during sidewalk construction. The bank is not indicated in the topography map (Fig. 9) but is important to note because it hinders easy pedestrian access, although this could be easily mitigated by reshaping a part of the bank.

The site's gentle slope is important because it facilitates public access and trail construction, because it reduces the risk of erosion during restoration and management activities, and because it facilitates access of the equipment that will be needed for management and for sustainable forestry operations.

Aspect⁴ is predominantly north to northwest, which is towards Pheasant Branch Conservancy (Fig. 9). This indicates surface runoff from the site flows towards Pheasant Branch, although the gentle slope and deep silty soil promotes infiltration so that surface runoff is likely minimal most of the year. While a south aspect typically favors prairie and savanna more than a north aspect because it's hotter and drier, in this case the north aspect is so slight it's inconsequential and shouldn't impact any of the planned restoration activities.

⁴ Aspect refers to the direction the surface of the ground faces, e.g., a hillside with a west aspect faces to the west.

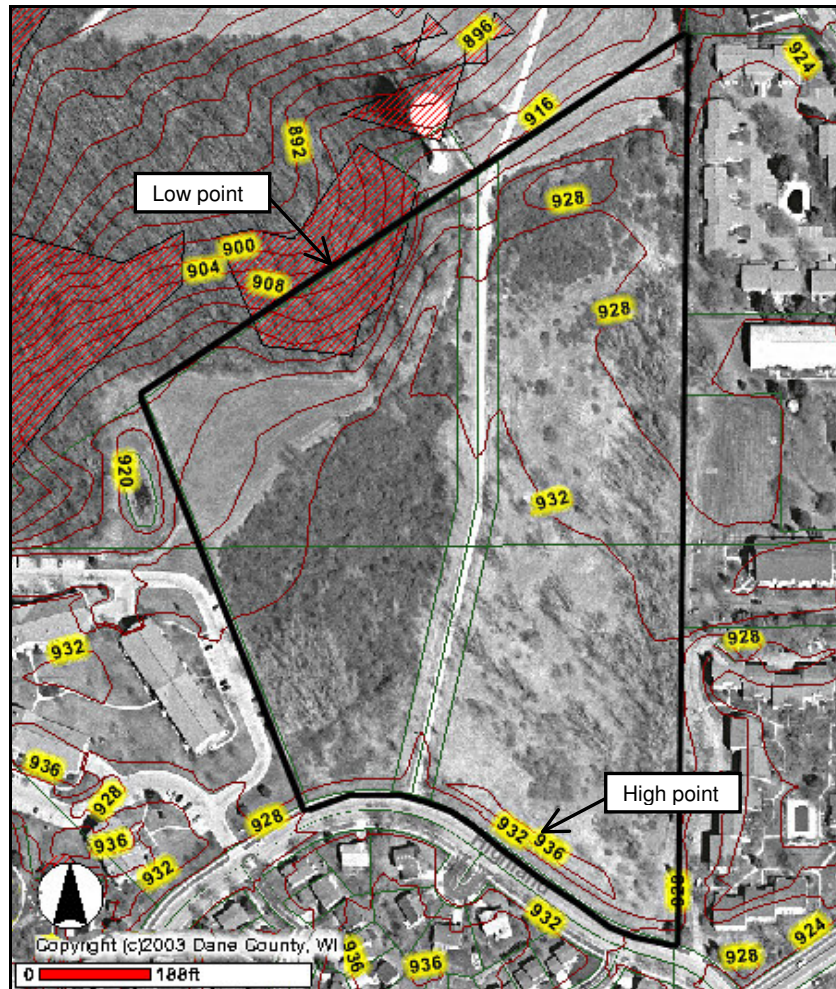
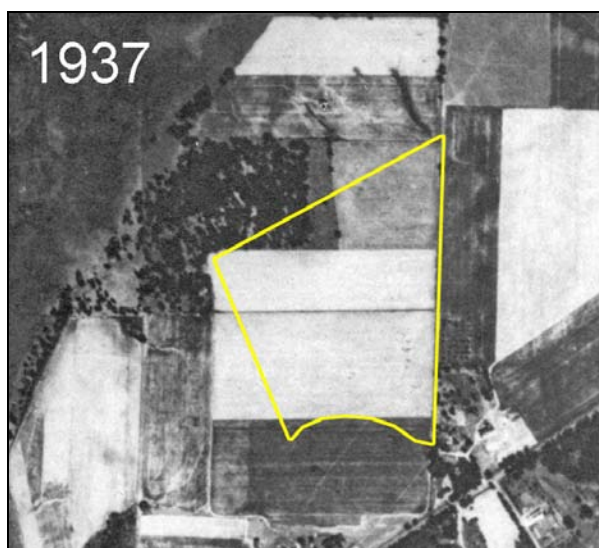


Fig. 9. Bock Forest Topography (DCiMap 2003). Black line is property boundary. Solid red lines are 4-foot contour lines. Yellow highlighted numbers are elevation (feet). Red cross-hatching indicates slope $\geq$ 12 percent.

Aerial Photographs

Analysis of a chronosequence of aerial photographs from 1937 (the earliest available year for this part of Wisconsin) to 2008 reveals numerous changes to BF and the surrounding landscape (Fig. 10).

The photos clearly show that the entire site has been farmed since 1937 except for the Oak Woodland. Farming most likely started much earlier than 1937, however. Individual farm fields separated by fence lines are visible in the earlier photos. Some of the fence lines have trees and shrubs growing along them. Starting with the 1962 air photo and continuing thereafter the interior fence lines are gone and the area is farmed as one field.



July 1937



September 1950



September 1962

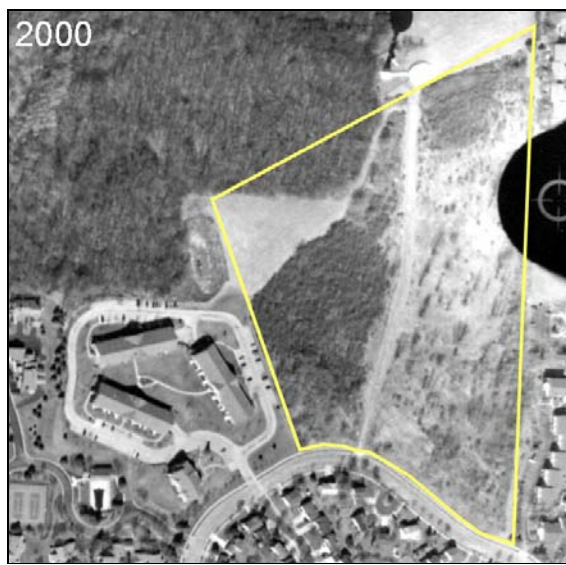


May 1980

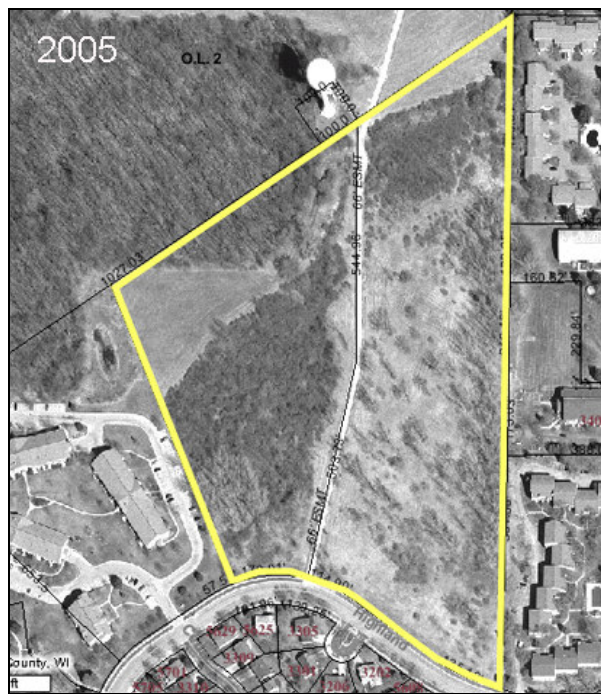
Fig. 10. Bock Forest Aerial Photographs From 1937 to 2008 (continued on following page).
Property line in yellow. North at top for all photos.



April 1990



March 2000



2005



2008

Fig. 10, cont. Bock Forest Aerial Photographs From 1937 to 2008. Property line in yellow. North at top for all photos.

Trees and brush are nonexistent after the fence lines and their associated trees and shrubs have been removed, except for a few trees along the east property line and the Oak Woodland. Trees and brush first begin to reappear about 1980. By 1990 trees and shrubs are visible throughout the site, except for the Hayfield, which is being cropped. Once the brush gains a toehold it spreads rapidly, nearly covering the west half of the property by 2000. Growth is slower in the east half and there appear to be more trees and fewer shrubs. This part of the property may have been mowed.

The return of trees and shrubs is likely related to the end of agricultural use after the property was purchased by the Middleton – Cross Plains School District. This indicates that all of the trees currently growing on site are less than 30 years old and most are less than 20 years old. The exceptions are the trees in the Oak Woodland and a few trees along the east property line.

All of the trees are less than 30 years old, other than the trees in the Oak Woodland.

Although the Oak Woodland has remained tree-covered since well before 1937 it has undergone significant change nonetheless. Note how individual trees are visible in the 1937, 1950, and 1962 air photos. Presumably, these trees are the large oak trees still present today. However, by 2000 the gaps between the trees have filled in making it difficult to distinguish individual trees. This is due to the arrival and growth of additional trees, such as box elder, elm, and black cherry, as well as shrubs, such as buckthorn.

Two factors likely contributed most to the increased tree and shrub cover in the Oak Woodland – the cessation of grazing when the site was purchased by the school district and the fast growth rate of some tree species, such as box elder and black cherry. Livestock often eat tree and shrub seedlings as fast as they appear, thereby preventing the establishment of new trees and shrubs, without directly affecting the established trees. Once the livestock are removed the tree and shrub seedlings survive, grow rapidly, and fill the canopy gaps.

Another significant and easily noticed change is the suburbanization of the surrounding land that began in earnest during the late 1980s.

Diseases

Dutch Elm Disease

Although not verified by laboratory testing, it's very likely Dutch Elm Disease (DED) is present based on the presence of dead elm trees in the Oak Woodland (Fig. 11). There are about ten dead trees.

DED is a vascular disease caused by either of two closely related species of fungi: *Ophiostoma ulmi* (Buism.) Nannf. and *Ophiostoma novo-ulmi* Brasier (Haugen 1998). Once the fungus infects a tree its vascular system becomes clogged, the leaves wilt, and the tree dies, although an infected tree may survive. Disease progression may occur rapidly, killing the tree in one growing season, or it may progress gradually over several years. Trees

infected via root grafts tend to die faster because the fungus is carried throughout the tree by the vascular system.

DED spreads from tree to tree by two mechanisms: root grafts between nearby trees and over longer distances by two species of beetles, the native elm bark beetle and the smaller European elm bark beetle. In Wisconsin, the native elm bark beetle is more likely than the European bark beetle to spread DED because it is better able to survive winter temperatures. Root graft spread of DED is a very significant cause of tree death in urban forests where elms are closely spaced.



Fig. 11. Dead Elm Trees Along the South Edge of the Oak Woodland.

Hazard Trees

While a detailed hazard tree survey is beyond the scope of this report, no dead trees or trees with large dead branches were observed near a trail. The dead elm trees along the south edge of the Oak Woodland could pose a safety hazard as they disintegrate, but they are not near an established trail.

Adjacent Land Use

It is important to consider adjacent land uses and the impacts, both positive and negative, they may have on Bock Forest because diseases, invasive species, and other factors don't respect property lines.

The west and east sides of BF abut several large apartment complexes, and single family homes are located along Highland Way at BF's southern end. The north end of BF is contiguous with Pheasant Branch Conservancy, which is also owned and managed by the City of Middleton as conservancy land. The vegetation type in BF matches the vegetation in the adjacent area of Pheasant Branch Conservancy, i.e., hay field in the eastern half and oak woodland in the western half. This is important, especially for the oak woodland, because large areas of similar habitat have higher ecological value than small areas and it because provides the opportunity to create and manage large areas of a single habitat type.

Vegetation

Historic Plant Communities and Vegetation

Based on the 1834 Wisconsin public land survey records, it appears BF and most of the surrounding area was predominantly oak savanna with several areas of prairie large enough to warrant mapping (Fig. 12) (<http://digicoll.library.wisc.edu/SurveyNotes>). In fact, oak

savanna and prairie were the dominant plant communities in central and western Dane County prior to the arrival of the early white settlers (Ellarson 1949, Curtis 1959).

In T8N R8E (the adjacent township located to the northwest from BF) the surveyor recorded a “marsh” 528 feet wide along the south side of section 35, a stream 3.3 feet wide flowing south, and a spring 1.3 feet wide flowing south along the south side of section 36 (Fig. 12). Presumably the spring and stream relate to current day Pheasant Branch.

Except for the nearby marsh and Lake Mendota, the surveyor described BF and the surrounding landscape as “rolling and second rate, timber[ed] [with] bur, white, and black oak [with an] undergrowth [of] grass.” Bur and white oak are the classic trees of oak savanna. “Second rate” refers to the suitability of the land for agriculture. The land was probably considered second rate because of its rolling topography.

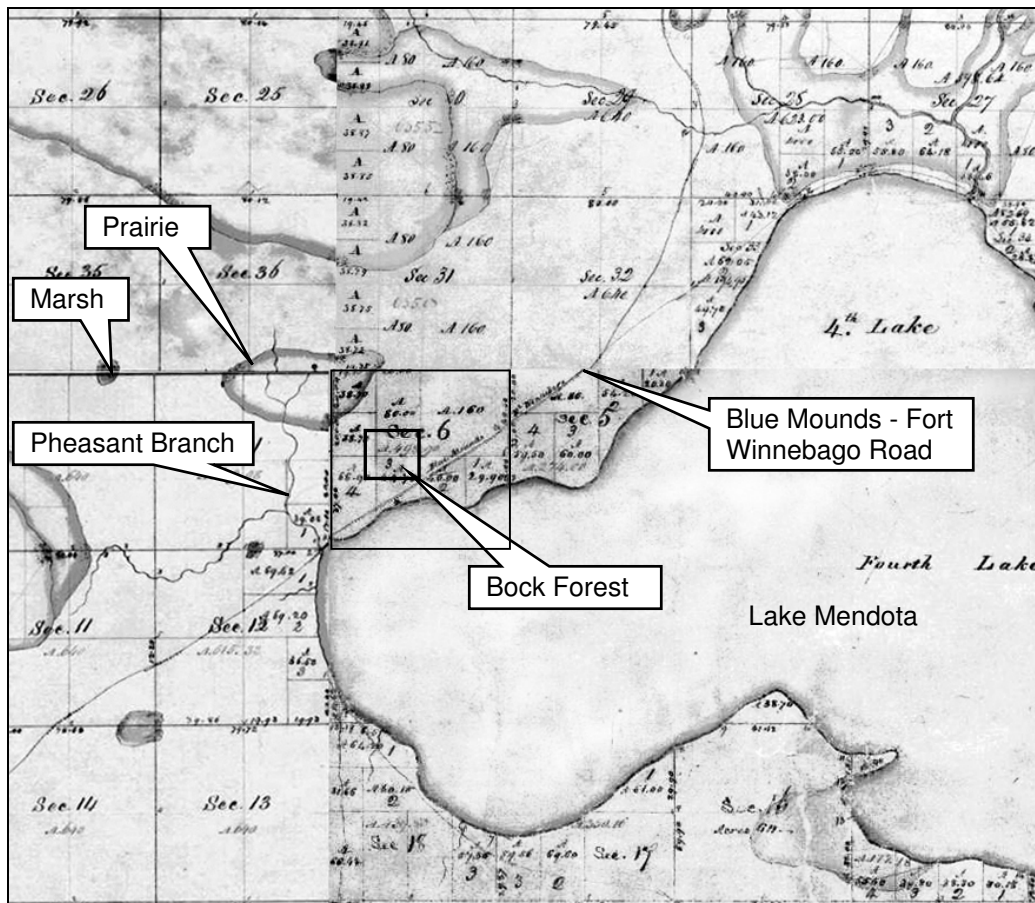


Fig. 12. 1834 Public Land Survey Plat. Composite image showing parts of four townships: Clockwise from upper left: T8N R8E; T8N R9E; T7N R9E; and T7N R8E. Bock Forest (heavy black line) is in section 6 (light black line) of T7N R9E. Shaded areas are prairie except for the area labeled marsh and the area labeled “4th Lake,” which is Lake Mendota.

Current Plant Communities and Vegetation

Today, the Old Field and Brushland units are most accurately classified as *old field* (Table 2). The Hay Field unit is best classified as *grass-legume hay*. The Oak Woodland unit has converted (succeeded) from oak savanna to *southern dry-mesic forest* because it has been heavily invaded by a variety of trees not normally associated with oak savanna, including box elder, slippery and American elm, black cherry, apple, and ash, and because oak tree density has increased due to fire suppression.

Table 2. Summary Characteristics of the Major Plant Communities at Bock Forest
(Adapted from Curtis 1959 and Sample and Mossman 1997).

Community Type	Distinguishing Characteristics	Community Stability and Successional Trend	Location at Bock Forest
Southern Mesic Forest	Dominated by sugar maple with lesser amounts of basswood, red oak, and ironwood. Closed canopy produces deep shade throughout the summer. Flowering groundlayer plants are predominantly spring blooming in order to utilize the sunlight available before the canopy closes. Shrub density is typically low, but may include gooseberry, bladdernut, and witch hazel.	Very stable. Not prone to fire because of the shady, moist conditions and because maple leaves decompose quickly.	None at current time, however, in the absence of disturbance and/or management most of the Oak Woodland Unit could succeed to this type.
Southern Dry-mesic Forest	An intergrade between dry forests and mesic forests with some characteristics of each. Red and white oak are the most important tree species, but sugar maple, basswood, elm, black walnut, and white ash may also be common. The canopy is more open than in a mesic forest and typically has numerous gaps. Fewer spring blooming plants than a mesic forest in favor of summer and fall bloomers. Shrub density and diversity is typically very high and thickets are common.	Usually succeeded by mesic forest in the absence of major disturbance such as fire, severe drought, or windstorm.	Oak Woodland Unit.
Oak Woodland	An intergrade between forest and savanna with characteristics of each. White oak is usually the most important tree species, but bur, black, and red may also be present, depending on soil. Canopy is more closed than a savanna, but more open than a forest, allowing enough light at mid- and ground level to support light-demanding plants. Fire suppression allows box elder, elm, cherry, walnut and other tree species to become established, starting the conversion to forest. Shrub density is medium to low if burned, otherwise may become high.	Stable with periodic fire. Usually succeeded by forest in the absence of major disturbance such as fire, severe drought, or windstorm. Can convert to oak savanna following major disturbance.	The Oak Woodland Unit has some oak woodland characteristics.
Oak Savanna	A fire adapted, mostly open community with widely spaced bur, white, or black oak trees. Tree spacing is such that there is more sun than shade at ground level. Grasses dominate the groundlayer, but forb ¹ diversity is typically very high. Peak blooming period is during the summer, but the blooming period begins during spring and continues through fall.	Very stable in the presence of periodic fire otherwise may convert to dry-mesic or mesic forest.	None at current time, but historically the entire property.
Grass-legume Hay	Conventionally farmed hayfields with >25% cover of grasses and legumes and forbs other than alfalfa. Often dominated by grasses such as smooth brome, Timothy, and orchardgrass.	Stable with continued agricultural use. Otherwise, typically converts to old field.	Hay Field Unit.
Old Field	Former agricultural field typically dominated by non-native grasses, such as Kentucky bluegrass, brome, and quack, but also containing native and non-native forbs. Trees and shrubs may be abundant. Usually wildlife plantings, conservation reserve plantings (CRP), retired hayfields, or retired pastures.	Converts to brush and then forest in the absence of grazing, mowing, fire, or other management to control woody plants.	Brushland Unit, Old Field Unit.

¹ A forb is a herbaceous nongrassy annual, biennial, or perennial plant. Often loosely used to indicate a wild flower.

Number of Species Observed

One hundred and sixty-two species were identified property-wide (Table 3, Fig. 13, and Appendix I for the full species list). Although this is a moderately high number given the site's small size, long agricultural history, and the small number of plant community types present, the proportion of native species is low (Table 3). Small sites tend to have less environmental variation and therefore fewer species. Agricultural use, including grazing, generally decreases the number of native species and increases the number of non-native species.

Table 3. Number And Proportion Of Native And Non-native Species By Life-form In All Survey Units.

Life-form	Native		Non-native		Total Number
	Number	%	Number	%	
Trees	19	79	5	21	24
Shrubs	15	68	7	32	22
Vines	4	57	3	43	7
Graminoids ¹	8	42	10	58	18
Forbs (flowers)	47	53	42	47	89
Ferns	2	100	0	0	2
Total	95	59	67	41	162

¹ Grasses, sedges, and rushes.

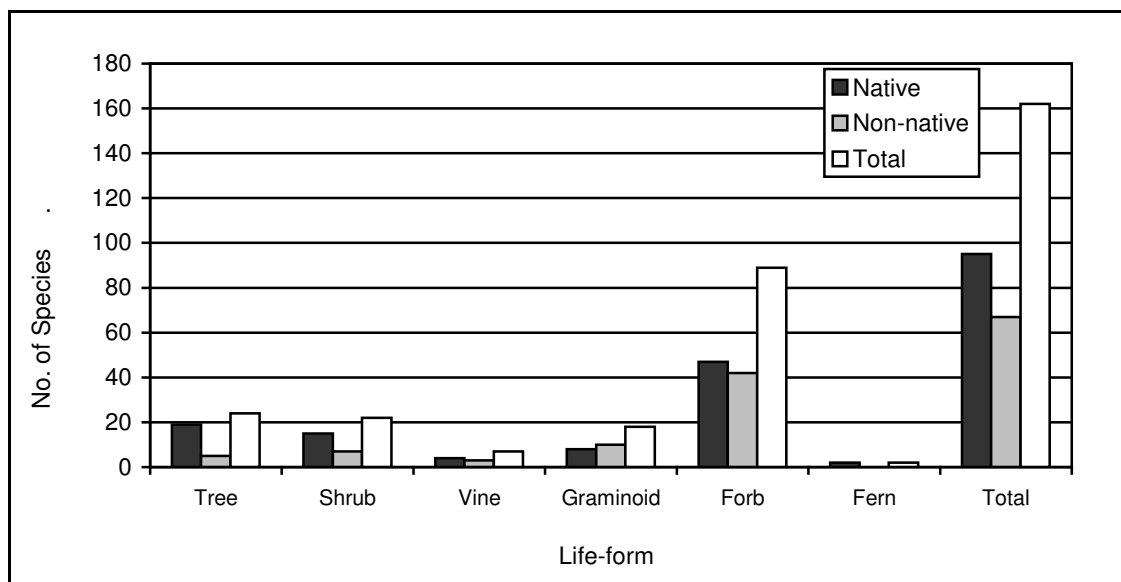


Fig. 13. Number Of Native and Non-native Species By Life-form In All Survey Units.

Not surprisingly, there are significant differences between survey units. The Old Field has the highest number of species (120) followed by the Brushland (75), the Oak Woodland (56), and the Hay Field (19) (Table 4, Fig. 14).

However, simply having a higher species count doesn't necessarily indicate an area is ecologically better than another area with fewer species. Rather, the relative abundance of native and non-native species must also be considered. A higher abundance and proportion of native species is typically equated with higher ecological value, other things being equal.

Proportions of Non-native and Native Species

The Oak Woodland has the highest proportion of native species (Table 4). The Old Field and Brushland follow with 51 and 50 percent, respectively. The Hay Field has only 11 percent native species, as might be expected for an active agricultural field. The high proportion of native species in the Oak Woodland is due partly to the high number of native tree species (12 of the 19 native trees found on the property occur here). Also, although it was grazed, it wasn't plowed or heavily logged, allowing some native herbaceous and shrub species to survive.

Table 4. Number And Proportion Of Native And Non-native Species Per Survey Unit.

Survey Unit	Native		Non-native		Total Number
	Number	%	Number	%	
Oak Woodland	45	79	12	21	57
Hay Field	2	11	17	89	19
Old Field	61	51	59	49	120
Brushland	38	50	37	50	75

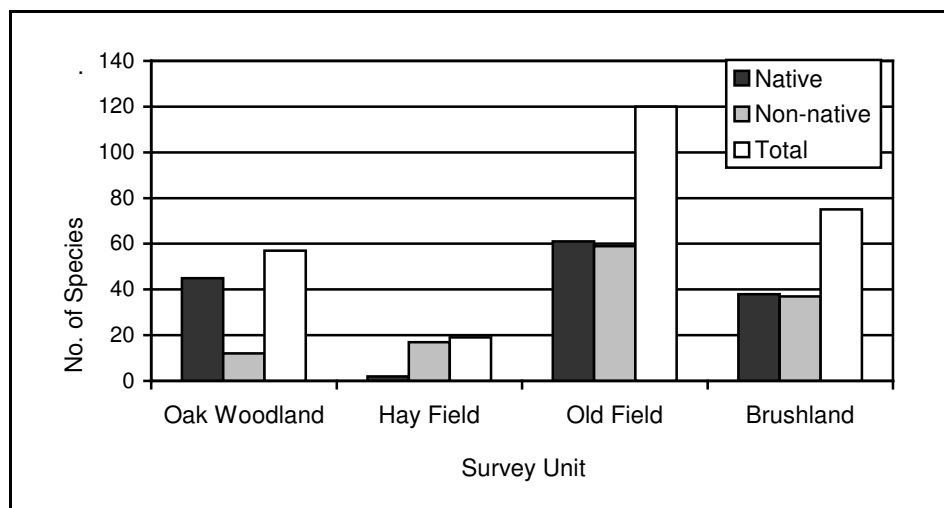


Fig. 14. Number Of Native and Non-native Species Per Survey Unit.

Property-wide, 95 of the 162 observed species (59%) are native, a relatively low proportion. When only herbaceous species (graminoids, forbs, and ferns) are considered the number of native species drops to 57 out of 109 (52%), reflecting the influence the 11 native tree species and 8 native shrubs species have on the overall native species count.

It's important to note that neither the number of species or the percentage of native / non-native species fully indicates the diversity or health of an area. Rather, it's also important to consider native and non-native *density* (number of individual plants) and *cover*⁵. This is because it is typically better to have a high number of non-native species with low density and low cover than it is to have a low number of non-native species with high density and cover. High non-native species density and cover typically causes the loss of native species, such as when a patch of reed canary grass eliminates all other vegetation.

Although not directly measured, visual observations suggest non-native species density and cover *greatly* exceeds the native species throughout the Hay Field, Old Field, and Brushland Units. In the Oak Woodland, native species cover and density is higher than non-native species, although exceptions occur, such as where buckthorn and honeysuckle are abundant.

It is also important to consider the *type* of non-native species that are present. This is important because some non-native species are relatively benign and rarely displace more desirable native species, while others quickly become so abundant that they cause a significant loss of native species and disrupt normal ecological processes. The latter is called an **invasive species**.

Invasive Species

Invasive species nearly always warrant special management attention because they cause severe ecological damage. The best approach is to prevent a small number of plants from becoming a major infestation through periodic monitoring and rapid treatment.

A species can be invasive in one plant community but not in another.

It is important to note that a species can be invasive in one plant community but not in another. For example, wild parsnip is invasive in sunny habitats but is rarely a significant concern in shady habitats. It is equally important to note that native species can be invasive, e.g., ragweed, Canada goldenrod, and box elder.

Fifteen invasive species were observed. Nine are forbs, four are shrubs, one is a tree, and one is a grass. Their location and abundance are discussed in Table 5. ***This list is specific to Bock Forest and is based on species behavior, current abundance, and the site's current and projected environmental conditions. It should not be used to assess other sites.***

While only two of the 15 (buckthorn and honeysuckle) are abundant enough to have caused the widespread loss of desirable species, they all have this potential. In fact, small

⁵ Cover is the vertical aerial projection on the ground of the above ground portion of a species or, more simply, the amount of horizontal space a plant occupies when viewed from directly above.

Table 5. Location and Abundance of the Observed Invasive Species.

Common Name	Scientific Name	Location ¹	Abundance
Forbs			
Garlic Mustard	<i>Alliaria petiolata</i>	OW: Eastern third. OF: NE corner. More plants could be hidden in the impenetrable thickets of BL.	Low in both areas, only a few plants.
Canada Thistle	<i>Cirsium arvense</i>	OF: Scattered throughout. BL: Sunny edges, especially at N end near gravel trail.	Low in both areas overall, but patches are forming
Crown Vetch	<i>Coronilla varia</i>	HF: West subunit: west end near neighbor's detention pond where it was planted and along south side. OF: Scattered throughout, especially the east side and the near Highland Way entrance. BL: Mostly south and east sides and other sunny areas.	HF: Medium, spreading outward from pond. OF: Medium, has formed patches. BL: Low, southern patches are the largest.
Leafy Spurge	<i>Euphorbia esula</i>	HF: West subunit. OF: Scattered throughout, most abundant at south end. BL: Mostly along south and east sides, especially along gravel trail where there is more sunlight.	HF: Low, cropping may have stopped seed production. OF: Low overall, but forming patches mingled with other species. BL: Low overall.
Dame's Rocket	<i>Hesperis matronalis</i>	OW: Mostly at east end. OF: Scattered locations, mostly along east edge. BL: Scattered locations, most abundant at north end.	Low in all areas.
Bird's-foot Trefoil	<i>Lotus corniculata</i>	HF: Scattered throughout, probably part of seed mix.	Low.
White and Yellow Sweet Clover	<i>Melilotus alba</i> , <i>Melilotus officinalis</i>	OF: Scattered throughout. BL: Sunny edges, mostly along gravel trail.	OF: Medium overall, but high in some areas. BL: Low.
Wild Parsnip	<i>Pastinaca sativa</i>	OF: Scattered throughout. BL: Sunny edges, mostly along gravel trail.	OF: Medium. BL: Low.
Shrubs			
Autumn Olive	<i>Elaeagnus umbellata</i>	OF: Few scattered throughout.	Low.
Honeysuckle	<i>Lonicera spp.</i>	OW: Throughout but most abundant along south edge. OF: Throughout as individuals and dense patches, dense patches at north end. BL: Throughout.	OW: Low overall. OF: Medium to high. BL: Extremely high.
Common Buckthorn	<i>Rhamnus cathartica</i>	OW: Throughout but most abundant along south edge. OF: Throughout but most abundant along east side near cottonwood trees. BL: Throughout, dominant in some areas.	OW: Low overall, but very high along south edge. OF: Medium to high. BL: Extremely high, many to 25 feet tall and 10 inches diameter.
Multiflora Rose	<i>Rosa multiflora</i>	OF: Few scattered individuals.	Low, small size.
Trees			
Siberian Elm	<i>Ulmus pumila</i>	OF: Few scattered individuals.	Low but seedlings are present.
Grasses			
Reed Canary Grass	<i>Phalaris arundinacea</i>	OF: Scattered patches. BL: Along gravel path in sunny areas. Also by the detention pond on the property west of Hay Field and the private property east of Bock Forest.	OF, BL: Low, mostly discrete patches.

¹ OF is Old Field, BL is Brushland; HF is Hay Field, and OW is the Woodland.

monotypic patches of crown vetch and larger patches of leafy spurge indicate this process is underway. Fourteen of the 15 invasive species occur in the Old Field unit, giving it the dubious distinction of having the highest invasive species diversity (Fig. 15).

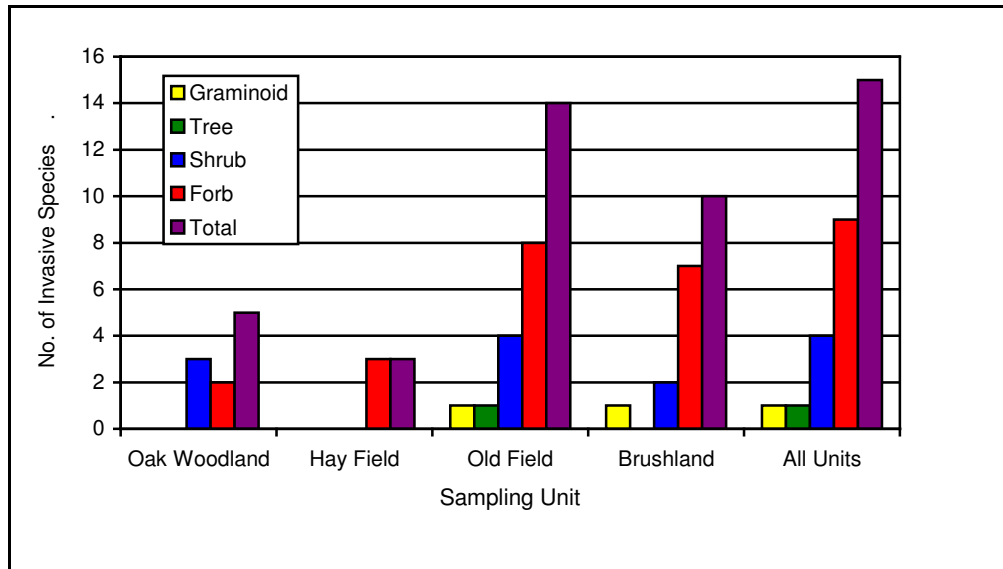


Fig. 15. Number of Invasive Species By Life-Form Per Sampling Unit.

BF's invasive species are individually discussed below and illustrated in Fig. 16.

Garlic Mustard

Garlic mustard is a shade-loving, biennial, herbaceous plant. At maturity it ranges from 12 to 48 inches in height. Crushed leaves and stems emit a garlic odor, facilitating the identification of non-flowering plants. It was introduced from Europe as a culinary herb and has since spread throughout northeastern and midwestern United States. Once it's established it forms a tall, dense stand that excludes all other species. Bare soil is common beneath established patches. Seed production is prolific – often hundreds of seeds per plant. Seed viability in the soil is approximately seven years.

Canada Thistle

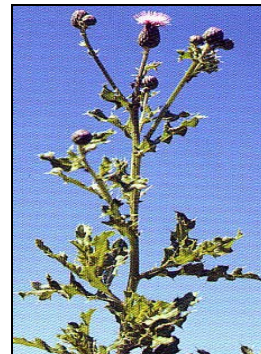
Canada thistle is a spiny, branching, perennial forb that grows to five feet tall. Despite its name, it is native to Europe, not Canada. It grows in clonal patches of either female or male plants; only female plants produce seeds. It spreads by wind-borne seed and by lateral root growth. It prefers sunny areas and typically requires soil disturbance to become established.



Garlic Mustard in Flower (l) and an Infestation (r) (UWEX 2000)



Dame's Rocket



Canada Thistle (Doll 2001)



Leafy Spurge



Wild Parsnip



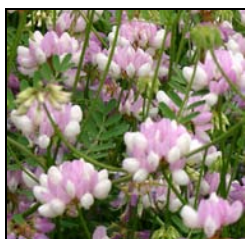
Honeysuckle With Fruit



White (l) and Yellow (r) Sweet Clover



Multiflora Rose (Doll 2001)



Crown Vetch



Common Buckthorn With Fruit (UWEX 2001)



Reed Canary Grass



Siberian Elm (MN DNR)



Bird's-foot Trefoil Infestation (l) (WDNR), Flower Detail (r).



Autumn Olive Fruit (l), Leaf Underside With Silver Scales (r)

Fig. 16. Bock Forest Invasive Species.

Crown Vetch

Crown vetch is an herbaceous, long-lived perennial and member of the legume family. It forms dense, monotypic stands that can engulf acres of land, climbing fences, trees, and shrubs as it spreads. It is native to Europe, southeast Asia, and north Africa. It was brought to the United States for agricultural and for erosion control. It self-seeds readily and also spreads by creeping roots. Seeds may persist for 100 or more years in the soil, making it difficult to eradicate once a seed bank has formed.

Leafy Spurge

Leafy spurge is a deep-rooted, herbaceous perennial. It is native to Eurasia, but has been in the United States for nearly 200 years. It is a noxious weed in Wisconsin. The small, green, inconspicuous flower is surrounded by two large yellow-green bracts that are often mistaken for the flower. It's invasive because it starts growing early in the spring, has an extensive and deep root system laden with dormant buds, rapidly spreads vegetatively and by seeds, which are explosively dispersed up to 15 feet, and because it is allelopathic⁶. It prefers sunny areas and will grow in all soil types, except where wet.

Dame's Rocket

Dame's rocket is a showy, short-lived perennial with large, loose clusters of fragrant, white, pink, or purple flowers that bloom from May to August. It's a Eurasian native that was introduced as an ornamental landscape plant, from which it quickly escaped because of its prolific seed set. Many people mistakenly identify it as phlox, but the phlox flower has five petals in contrast to dame's rocket's four petals. Also, phlox has opposite leaves while dame's rocket has alternate leaves. It sometimes is included in "meadow in a can" seed mixes.

Bird's-foot Trefoil

Bird's-foot trefoil is an herbaceous perennial and member of the legume family. Native to Europe, it has been widely planted in the United States for erosion control, agricultural, and as a groundcover for landscaping. Like crown vetch, it forms dense, creeping mats that eliminate other vegetation. It spreads by both seeds and vegetatively. Seeds are long-lived in the soil.

Wild Parsnip

Wild parsnip is a short-lived perennial that grows four to seven feet in height. It typically spends one or more years as a basal rosette. Then, when conditions are favorable, it grows upward, flowers, produces seeds, and dies. It spreads primarily by seeds. Preventing seed production by mowing or pulling eliminates it. Wild parsnip causes phytophotodermatitis: when the sap of the plant contacts skin in the presence of sunlight a chemical reaction takes place causing a rash or blister.

⁶ Release of toxic substances by one plant species to suppress the growth of other plant species.

White and Yellow Sweet Clover

White and yellow sweet clover are very similar in appearance, the primary difference being flower color (i.e., white verses yellow), although yellow sweet clover is shorter and blooms earlier than the white. Both are biennial legumes. Growing to five feet tall during the second year, sweet clover often forms large, dense stands that eliminate other species via shading and possibly allelopathy. Once established, it persists via seeds. One plant can produce 250,000 seeds and the seeds may remain viable for thirty or more years.

Autumn Olive

Autumn olive is a deciduous shrub, typically six to 20 feet tall. It is sometimes considered a short tree. It is native to Asia. It fixes nitrogen, although it is not a member of the legume family. It was imported to the United States in the 1830s and has since been used for wildlife plantings, urban landscaping, and to control soil erosion. It spreads primarily via birds and other wildlife that eat the pink- to red-colored fruit. Its leaves have a silvery cast on their underside. The fruit may also have silvery spots. A mature plant may produce 30 pounds of fruit, about 60,000 seeds.

Honeysuckle

Honeysuckle is a dense, upright growing shrub that usually has numerous stems. It can grow to 10 feet in height in either shade or sun. Fragrant pink, white, or yellow flowers appear in spring and are followed by red, yellow, or orange berries. Birds and other animals eat the fruit and disperse the seeds. Honeysuckle is one of the first shrubs to leaf-out in the spring and one of the last to lose its leaves in the fall. This gives it a strong competitive edge which it exploits at the expense of native flora. Left uncontrolled honeysuckle frequently forms dense thickets with bare soil underneath. Honeysuckle is native to Asia and Europe and was introduced to the United States as an ornamental landscape plant.

Honeysuckle and buckthorn are Bock Forest's most abundant invasive species.

Common Buckthorn

Common buckthorn is a shade-loving shrub. It grows as tall as 30 feet with a stem diameter of 10 inches. Female buckthorn produce prolific quantities of green-black fruit during the fall. Male buckthorn produce only pollen. Like honeysuckle, birds eat the fruit and disperse the seeds. Also like honeysuckle, buckthorn is one of the first shrubs to leaf-out in the spring and one of the last to lose its leaves in the fall, making it a very strong competitor. It forms dense thickets with bare soil underneath.

Multiflora Rose

Multiflora rose is a dense spreading shrub with arching canes armed with stout recurved thorns. Mature plants may reach eight feet tall. It is typically found in sunny

One multiflora rose can produce up to 500,000 seeds per year.

environments. It was introduced into the United States from Japan in 1886 for use as a rootstock for cultivated roses and was soon thereafter widely promoted for wildlife food, for preventing soil erosion, and as a “living fence.” It is now naturalized throughout most of the Midwest. One plant can produce up to 500,000 seeds per year and the seeds may remain viable for as long as 20 years. Birds often eat the rose hips (the fruit containing the seeds), and then disperse the seeds long distances.

Siberian Elm

Siberian elm is a fast-growing deciduous tree related to American and slippery (red) elm. It can grow to 50 to 70 feet tall. It is tolerant of dry and infertile soil and, as its name suggests, cold temperatures. It is a prolific seed producer that can create thickets of saplings given the right conditions. A native of eastern Asia, Siberian elm was introduced to the U.S. in the 1860s for its hardiness, fast growth, and ability to grow in various moisture conditions.

Reed Canary Grass

Reed canary grass is a sod forming perennial that can grow to nine feet in height. It is found most often in sunny wetlands, but also grows in sunny upland areas. Reed canary grass spreads rapidly, both by seeds and creeping rhizomes. Because of its tall height, dense growth, and rapid spread it nearly always extirpates other species as it spreads, resulting in a dense monoculture with little or no value to wildlife. It is native to Europe and Asia and was brought to the United States during the 1800s for agriculture and erosion control.

Endangered, Threatened, and Special Concern Species

No endangered, threatened, or species concern plants or animals were observed⁷.



⁷ Based on the Wisconsin Department of Natural Resources, Natural Heritage Working List (WDNR 2007).

DESCRIPTION AND ANALYSIS OF CURRENT CONDITIONS: INDIVIDUAL SURVEY UNITS

Introduction

The purpose of this section is to present and interpret the data collected that is specific to each of the four survey units and to provide a detailed description of each unit. Management needs and opportunities are also discussed.

Old Field Unit

At 10.1 acres this is Bock Forest's largest sampling unit (Fig. 17). Air photos indicate it was in continuous agricultural use from 1937, but certainly since much earlier, until the 1970s when the parcel was purchased by the Middleton-Cross Plains School District and the Ziegler farm stopped operating. It appears there was a grass cover, probably pasture grasses or grass hay, when agricultural use stopped. The grass has been invaded by a variety of native and non-native plants during the 25 years it's been fallow.

One hundred and twenty species were detected (Table 6 and Appendix I for the full species list). This is 74 percent of the species found property-wide. Overall the vegetation is best described as cool season non-native grasses⁸ mixed with a variety of native and non-native forbs, trees, and shrubs. Shrubs have formed thickets in some areas and the trees have formed a canopy in some areas. In other words, a typical southern Wisconsin old field in the early stages of converting to brush and then forest.

The best-developed tree canopy is an approximately 1.5 acre area along the east edge where cottonwood is abundant (Fig. 17 and Fig. 18). As noted in the Holaday report (2008) the cottonwood are mostly 5 to 15 inches DBH⁹, a maximum of about 30 to 35 years old, and generally 30 to 50 feet high. The canopy is dense enough to shade to ground throughout the



Fig. 17. Old Field Unit Location.

⁸ Cool season grasses are grasses that grow most actively in the spring and fall when air and soil temperatures are relatively cool. Conversely, most prairie grasses are warm season grasses and grow most actively during the summer.

⁹ Diameter at breast height, typically 4.5 feet above the ground on the uphill side.

day during the growing season, although the dense buckthorn and honeysuckle shrub layer (discussed below) may contribute more to the shade than the trees.

Table 6. Number and Proportion of Native and Non-native Species in the Old Field Unit.

Life-form	Native		Non-native		Total Number
	Number	%	Number	%	
Trees	11	69	5	31	16
Shrubs	10	67	5	33	15
Vines	2	50	2	50	4
Graminoids	7	50	7	50	14
Forbs (flowers)	31	44	40	56	71
Ferns	0		0		0
Total	61	51	59	49	120

Other trees growing with the cottonwood include box elder, black cherry, aspen, and Amur maple. They are generally shorter, younger, have a smaller DBH, and are less abundant than the cottonwood. Amur maple is an ornamental tree that can be invasive: Only one small tree was observed along the east property line near the north end, but it was full of seeds.

Although trees are scattered throughout the rest of the unit, they generally don't form a closed canopy. Rather, they occur individually and in small groups (Fig. 19). They are a mixture of native species, such as white and green ash, box elder, black walnut, cottonwood, silver maple, American and slippery elm, and non-native species such as flowering crabapple, apple, and Siberian elm. The absence of oak is noteworthy. There is a large, multi-stem Siberian elm, an invasive species, approximately 40 feet tall.

Shrub diversity is high: Fifteen of the 22 species occurring property wide are found in this unit. Five of the 15 are non-native, including all four of the site's invasive shrubs: autumn olive, honeysuckle, common buckthorn, and multiflora rose. White mulberry, the other non-native species, is sometimes considered invasive.

Buckthorn and honeysuckle are the most abundant non-native shrub species by a wide margin. In fact, the abundance of each is greater than the combined abundance of all the native shrubs. Buckthorn is generally restricted to beneath the cottonwood canopy, although it's spreading outward from the cottonwood and occurs in scattered locations throughout the unit (Fig. 18). Buckthorn seedlings are abundant beneath the cottonwood, indicating the presence of a seed bank.

Honeysuckle has formed large, dense and impenetrable thickets at the north end (Fig. 20). The soil is mostly bare beneath the thickets because of the dense shade and allelopathy. It also occurs throughout the unit as individual plants and in small groupings that will likely develop

into dense thickets within five to 10 years. Like buckthorn, it has formed a seed bank where abundant.

Native shrubs of note include red osier dogwood, hawthorn, wild plum, sumac, red raspberry, sandbar willow, elderberry, nannyberry viburnum, and downy arrowwood. While native shrub species outnumber non-native species ten to five, their abundance is very low compared to buckthorn and honeysuckle. Nevertheless, nearly all provide fruit, pollen, and nectar for songbirds, butterflies and other wildlife, making their presence welcome. An effort should be made to preserve them during the restoration of this area.

Other than red osier dogwood and sandbar willow, which are more typically associated with wetland, the rest are prairie or savanna species. Sumac and raspberry can be invasive because they spread by suckers (rhizomes).

There are eighty-nine groundlayer species (when vines are included). Forty are native (45%) and 49 are non-native (55%). In addition to a higher species count, non-native species abundance and cover *greatly* exceeds the native. Although cover was not quantitatively measured, visual observations suggest non-native species account for at least 90 percent of the herbaceous cover.

Nine of the ten herbaceous invasive species occurring property-wide are present, including garlic mustard, Canada thistle, crown vetch, leafy spurge, dame's rocket, white and yellow sweet clover, wild parsnip, and reed canary grass. Only bird's-foot trefoil is lacking.

Sweet clover and wild parsnip are the most abundant herbaceous invasive species. Both are distributed throughout most of the unit, except for the shadiest areas. Wild parsnip is a health risk for visitors because its sap chemically burns skin when exposed to sunlight. Canada thistle and leafy spurge are moderately abundant, but are well on their way to becoming very widespread. Garlic mustard is restricted to the very northeast corner and only a few plants were found. Crown vetch has started to form moderately large monotypic patches, mostly



Fig. 18. Cottonwood Along East Side.
Undergrowth is primarily buckthorn.



Fig. 19. Scattered Trees.



Fig. 20. Bare Soil Beneath Dense Honeysuckle (clipboard for scale).

near the west edge of the cottonwood, but also occurs in smaller patches in many other places.

Interestingly, several of the non-native species are either garden plants or cooking herbs. This includes chives, oregano, lily of the valley, orange daylily, iris, and yucca. Most likely they were planted, possibly on the Ziegler farmstead, although this isn't known for sure. None are very abundant, other than the oregano, which has a creeping growth form and has formed a groundcover in several areas.

There are several species of garden plants and cooking herbs, such as yucca and oregano.

Non-native cool season graminoids include smooth brome, quack, Kentucky bluegrass, orchard, timothy, meadow fescue, reed canary, and yellow foxtail. All except quack and yellow foxtail are common agricultural species and may be a remnant of the site's agricultural history. Quack and yellow foxtail are common agricultural weeds and may also remain from when the site was in agriculture. Most occur throughout the unit, especially Kentucky bluegrass. Reed canary grass, an invasive species, is generally restricted to a few patches, especially along the eastern border, although it is spreading and will continue to do so.

Although seven native graminoids are present, their combined abundance is surpassed by reed canary grass abundance alone. Nevertheless, their presence is welcome. The list includes big bluestem, wood sedge, oval-headed sedge, sand sedge, eastern star sedge, path rush, and switch grass. Big bluestem and switch grass are native prairie grasses. They may have been planted by someone in the neighborhood or may have been moved (as a seed) by wildlife from one of the prairies in Pheasant Branch Conservancy.

Non-native species abundance and density exceeds the native species, possibly by as much as ten to one.

There are 31 native forbs compared to 40 non-native forbs, a nearly equal percentage (Table 6 and Appendix I). Overall, however, the abundance and density of the non-native species greatly exceeds that of the native species, possibly by as much as ten to one. Most of the native forbs are typically associated with sunny habitats, including prairie, but there are also species more commonly associated with savanna and disturbed, sunny habitats. The eclectic species mix is due to the variety of light conditions that occur throughout the site. It may also represent, in the case of some of the prairie species, an introduction of seed from an outside source.

Examples of the prairie (sun-loving) species include yarrow, Indian hemp, common milkweed, heath aster, pilose aster, field thistle, robin plantain, bee balm, common evening primrose, yellow coneflower, pilose aster, Culver's root, wild lettuce, ragwort, early goldenrod, and black-eyed Susan. None are very abundant, however, and in some cases there is only one plant.

Savanna species include white snakeroot, woodland sunflower, and white vervain. None are abundant. The species most often associated with disturbed, sunny habitats include giant ragweed, horseweed, and daisy fleabane. All are annual and none are abundant.

Yard waste, Christmas trees, and other trash have been dumped in the bushes along the along the east property line.

Oak Woodland Unit

This unit is approximately 1.1 acres (Fig. 21). However, its functional size is much larger because it is contiguous with approximately 16 acres of similar habitat in Pheasant Branch Conservancy. This connection creates significant opportunities and has important management implications. The Oak Woodland is BF's highest quality natural area.

The Oak Woodland Unit is classified as a dry-mesic forest. Previously, it was oak savanna that converted to oak woodland because of fire suppression, which then converted to dry-mesic forest because of continued fire suppression and an influx of tree species other than oak that closed the canopy.

There are 13 tree species of which 12 are native (Table 7 and Appendix I). The oaks are clearly the oldest and largest and are indicative of the oak savanna and oak woodland history (Fig. 22). The individual trees visible in the 1937 aerial photo are probably the oaks that currently comprise the majority of the canopy.

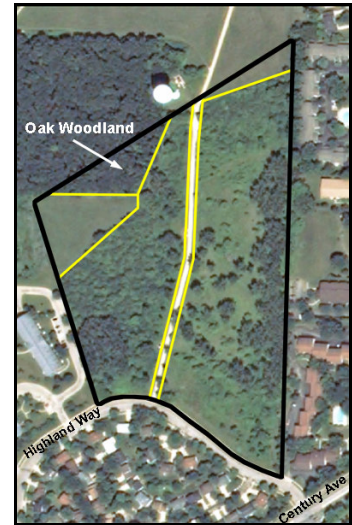


Fig. 21. Oak Woodland Unit Location.

Table 7. Number and Proportion of Native and Non-native Species in the Oak Woodland Unit.

Life-form	Native		Non-native		Total Number
	Number	%	Number	%	
Trees	12	92	1	8	13
Shrubs	8	62	5	38	13
Vines	3	75	1	25	4
Graminoids	5	100	0	0	5
Forbs (flowers)	15	75	5	25	20
Ferns	2	100	0	0	2
Total	45	79	12	21	57

In addition to being the most abundant tree species and the canopy dominant, oak also has the largest average DBH of all the tree species. A red oak (or possibly a red oak – black oak hybrid) approximately 34 inches DBH was observed, although the unit average is probably closer to 18 to 20 inches. Although, red, white, bur, and black oak are present, white oak is the most abundant.

Other common canopy species include black cherry, black walnut, slippery and American elm,

and box elder. Black cherry 6 to 12 inches DBH is the canopy dominant at the east end of the unit, probably because this area was once open field. Box elder and elm are most abundant along the sunny south edge, although Dutch elm disease is reducing elm abundance. Less common canopy species include hackberry, basswood, shagbark hickory, and bitternut (yellowbud) hickory.

Despite the oak savanna history, the oak trees lack the open grown form that typifies savanna trees, although some along the south edge have an open grown form on the side that's adjacent to the open field (Fig. 23). However this is due to the branches growing horizontally towards the open field where there is more sunlight. As Fig. 22 shows, overall most of the trees have a woodland- or forest-grown form, suggesting this area has been tree-covered for some time, probably for the last 150 or more years.

There is evidence of oak regeneration with oaks of various size classes throughout most of the Woodland, although seedlings are more abundant than saplings. Oak seedlings and saplings are especially abundant near the sunnier edges (oak seedlings and saplings require abundant sunlight to survive). This is important because it indicates that oak should continue to be a part of the Woodland.

There are numerous dead trees on the ground in various stages of decomposition. Some have been there long enough so that only the trunk remains, while others have recently fallen and still have their small branches. Dead wood is an important and beneficial addition to the Oak Woodland and should not be "cleaned-up."

There are 13 shrub species. Eight are native, five are non-native, and three of the non-native are invasive: buckthorn, honeysuckle, and multiflora rose.

Of the three invasive shrubs, buckthorn and honeysuckle are of greatest concern. Both occur throughout the Woodland, often at a high enough



Fig. 22. Oak Woodland.

Note the variety of tree diameters, dead wood on the forest floor, and the lack of a shrub layer.



Fig. 23. Oak Branches Growing Towards Open Field. Note the lack of branches on the side of the tree away from the field.



Fig. 24. Brushy Oak Woodland Edge. Most is buckthorn, but honeysuckle, box elder, and chokecherry are also present.

abundance to have caused the partial or complete loss of the herbaceous groundlayer and to have stopped tree regeneration. Buckthorn is the most abundant non-native shrub. It is especially abundant along the south edge where it sometimes forms a dense and impenetrable thicket (Fig. 24). Most of the buckthorn is less than three or so inches in diameter at the base and will be easy to remove. Multiflora rose is relatively uncommon probably because it prefers sunny habitats.

The other non-native shrubs are white mulberry and garden current. Garden current is a horticultural plant grown for its fruit, known as a current or gooseberry. It can be invasive.

The Woodland has a compliment of native shrubs, including nannyberry viburnum, chokecherry, prickly gooseberry, poison ivy, common elderberry, downy arrowwood, and red and black raspberry. All provide valuable food for wildlife and are a valuable component of the Woodland's flora. However, other than the chokecherry, which is suckering and forming patches, their abundance is low compared to the invasive shrubs.

Buckthorn and honeysuckle are a significant management concern.

Red and black raspberry and chokecherry have the potential to become invasive in the areas where tree or invasive shrub clearing occurs during management activities. Monitor for this and take action if needed.

There are four vine species, three are native and one is non-native. The native vines are hog peanut, Virginia creeper, and riverbank grape. All are relatively common species in southern Wisconsin and all provide wildlife food. The latter two often climb trees, suppressing their growth and sometimes breaking branching or toppling the tree. For this reason they should not be allowed to climb oak or hickory. Hog peanut is typically low growing, sometimes forming large patches. The lone non-native vine is deadly nightshade. It is not a significant concern given its current low abundance and because it typically is not aggressive.

There are 22 native herbaceous groundlayer species, a relatively small number compared to an intact oak woodland or oak savanna. The low number may be an aftereffect of grazing and fire suppression coupled with the harmful effects of invasive species. Fifteen are forbs, two are ferns, and five are graminoids. They are a mixture of forest/woodland (shade) and savanna species (mixed sun and shade). Some, such as northern bedstraw, yellow wood sorrel, and stinging nettle, grow in multiple light regimes.

The groundlayer is a mixture of forest and savanna species.

Examples of the forest species include Jack-in-the-pulpit, enchanter's nightshade, white avens, American figwort, cleavers, clearweed, wooly blue violet, lady fern, and sensitive fern. This is the only unit with ferns.

Savanna species include wild geranium, calico aster, May apple, germander, and false Solomon's seal. These species may owe their presence to the grazing that kept the canopy partially open. Unfortunately, none are very abundant and the list is very short compared to an undisturbed savanna.

No native grasses are present, but there are four sedge species (wood sedge, oval-headed sedge, eastern star sedge, and an unidentified sedge) and one native rush (path rush). None are very abundant, perhaps due to historic grazing. No non-native graminoids were found. In comparison, there could be 20 to 60 native graminoids in an undisturbed oak woodland or oak savanna.

There are five non-native forb species. Two are invasive: garlic mustard and dame's rocket. Fortunately, neither of the invasive species is abundant. In fact, less than a dozen plants of the two species were found. (All were pulled, bagged and removed.) Even though current abundance is low, this can change very quickly, indicating the need for regular monitoring.

The other non-native forbs are burdock, bull thistle, and heal all. They are common species (in southern Wisconsin) that prefer full sunlight and thrive on disturbance. Burdock and bull thistle are agricultural weeds that can sometimes be invasive in sunny habitats. Heal all occurs in a wide variety of sunny and shady habitats, especially where the soil is compacted. These non-native species are of lesser concern than the invasive species (but not of no concern) because shade reduces their vigor and limits their spread, and because their abundance is low. Nevertheless, prompt attention is warranted.

Brushland Unit

Air photos indicate this area was in continuous agricultural use since at least 1937, but probably since much earlier, until the 1970s when the parcel was purchased by the Middleton-Cross Plains School District and the Ziegler farm ceased operating. It appears there was a grass cover, probably pasture grasses or grass hay, when agricultural use stopped. The grass has been invaded by a variety of native and non-native plants during the 25 years it's been fallow. Unit size is approximately 5.6 acres, making it the second largest unit after the Old Field Unit.

Seventy-five species were observed, of which 38 (51%) are native and 37 (49%) are non-native (Table 8 and Appendix I). However, as discussed in more detail below, non-native species cover and abundance greatly exceeds native cover and abundance, probably by twenty to one.

The majority of this unit has a dense, nearly impenetrable cover of buckthorn and honeysuckle (Fig. 26). The only areas lacking the dense cover are the edge of the gravel trail, an area of mowed turf grass at the south end, and the northeast corner. The interior of the unit also has a few areas without the dense brush, but the only way they can be reached is by crawling beneath the surrounding buckthorn and honeysuckle.



Fig. 25. Brushland Unit Location.

Table 8. Number and Proportion of Native and Non-native Species in the Brushland Unit.

Life-form	Native		Non-native		Total Number
	Number	%	Number	%	
Trees	7	78	2	22	9
Shrubs	6	67	3	33	9
Vines	3	60	2	40	5
Graminoids	3	23	10	77	13
Forbs (flowers)	19	49	20	51	39
Ferns	0		0	0	0
Total	38	51	37	49	75

The dense shrub layer started to form in the early 1980s, expanded slowly for about ten or so years and then exploded, covering almost the entire site within the next eight or so years (see aerial photographs and discussion on page 16). Buckthorn generally dominates the south half of the unit while honeysuckle dominates the north half, although they intermix everywhere. Many of the buckthorn are eight or more inches in diameter, quite large for buckthorn (Fig. 27). Numerous individual honeysuckle cover a 12' by 12' area, making them quite large, as well.

Seedlings and small-sized individuals of honeysuckle and buckthorn are very abundant (Fig. 28). In fact, buckthorn and honeysuckle seedlings are about all that grows in the areas with the densest shrub layer. Seedling abundance and the seed bank will need to be considered during restoration.

European highbush cranberry is the other non-native shrub that's present. It can be invasive, although it isn't in BF.



Fig. 26. Dense Honeysuckle and Buckthorn Typical of the Brushland Unit. View from the west side (Highland Ridge parking lot) (l) and south side (Highland Way) (r).

Although there are nine tree species – seven native and two non-native – the southwest corner is the only part of the unit with a well-formed tree canopy (Fig. 25). As the 2008 Holaday report indicates, this area is a small grove of cottonwood trees. Most are five to 18 inches DBH and about 15 to 40 feet tall. There are a few box elder, as well. The grove occupies approximately 0.6 acres, a relatively small portion of the 5.6-acre unit.

In addition to cottonwood and box elder, other native trees within the unit include shagbark hickory, red cedar, black cherry, red oak, and black oak. None are very abundant, occurring as scattered individuals or in small groupings. In some ways, this distribution mimics that of an oak savanna because it creates a mix of sun and shade, although oak and hickory are the typical oak savanna trees. Nevertheless, these trees may be useful as surrogate oak trees during oak savanna restoration.

The two non-native tree species are flowering crabapple and apple. Neither is abundant or invasive. Both provide nectar, pollen, and food (fruit, buds, sap) for wildlife.

There are 57 groundlayer species (when vines are included). Twenty-five are native and 32 are non-native. In addition to their higher species count, the non-native groundlayer species also have a significantly higher abundance and cover than the native species.

Eight of the 10 herbaceous invasive species occurring property-wide are present, including Canada thistle, crown vetch, leafy spurge, dame's rocket, white and yellow sweet clover, wild parsnip, and reed canary grass. Only bird's-foot trefoil and garlic mustard are lacking. Given the difficulty of accessing the interior of the unit, it's possible either or both are present, although garlic mustard is more likely because it is more shade tolerant than bird's-foot trefoil.

Most of the herbaceous invasive species occur in the sunniest areas of the unit, especially the south and east edges and a large area in the northeast corner. As previously mentioned, these are the areas of the unit where the dense brush layer is reduced or absent. Leafy spurge and Canada thistle have already formed patches that will keep expanding. Dame's rocket is more abundant in this unit than any other. As previously discussed, wild parsnip, which is growing near the trail, is a health risk for visitors because its sap chemically burns skin when exposed to sunlight.

A large patch (15' by 25') of oregano is located at the south end of the unit. Otherwise, this unit lacks the variety of horticultural species present in the adjacent Old Field Unit.



Fig. 27. Large Buckthorn.



Fig. 28. Buckthorn Seedling Groundlayer.

Eight of the ten herbaceous invasive species occurring property-wide grow here.

This unit has the highest number of non-native graminoids (10) of all the sampling units. (The Old Field Unit has the next highest with seven.) Species include redtop, smooth brome, orchard, quack, red fescue, meadow fescue, reed canary, timothy, Kentucky bluegrass, and yellow foxtail. All except quack, yellow foxtail, and reed canary grass are commonly planted for agricultural use and may be a remnant of the site's agricultural use. Quack and yellow foxtail are common agricultural weeds and may also remain from when the site was in agricultural use. Reed canary grass, an invasive species, is generally restricted to a few scattered patches in the sunnier areas, most frequently in the northeast corner, although it will spread.

No native grasses are present, although there are three native sedges: eastern star sedge, oval-headed sedge, and a sedge that couldn't be identified to species because it did not have a flower or fruit. Only a few individuals of each species were seen, however.

Hay Field Unit

This unit is comprised of a 0.6 acre East Subunit and a 1.4 acre West Subunit (Fig. 29). As its name suggests, this unit is an active agricultural field whose vegetation is periodically cut, raked, baled, and hauled away to feed livestock (Fig. 30). Differences between the subunits are minor and relate primarily to the presence - absence of various species, as discussed below.

Both subunits are leased by the City of Middleton to a nearby farmer (Penni Klein, pers. com.). The lease is annual and includes an additional nine or so acres of hay within Pheasant Branch Conservancy that's located north of the eastern subunit.

This unit has the lowest species count of all the sampling units (Table 9). This is not surprising given its current and longstanding agricultural use.



Fig. 29. Hayfield Unit Location.



Fig. 30. Hay Field, West Subunit (foreground) After Mowing.

Table 9. Number and Proportion of Native and Non-native Species in the Hay Field Unit.

Life-form	Native		Non-native		Total Number
	Number	%	Number	%	
Trees	0		0		0
Shrubs	0	0	1	100	1
Vines	0		0		0
Graminoids	0	0	4	100	4
Forbs (flowers)	2	14	12	86	14
Ferns	0		0		0
Total	2	11	17	89	19

As might be expected, non-native cool season grasses account for the majority of the herbaceous vegetation. Smooth brome, orchard, meadow fescue, and Kentucky bluegrass are most abundant. It's possible additional cool season grasses are present, but mowing, which seemed to occur shortly before site visits, made grass identification challenging. This is the only survey unit with zero native graminoids.

Forb diversity is also very low; only 14 species. Only two are native: common milkweed and Canada goldenrod, both occurring only in the western subunit. Both spread vegetatively and are very hardy, possibly explaining their presence in a regularly mowed hay field. Both can be somewhat invasive in sunny habitats, although this isn't the case in this unit, probably because of the mowing.

The 12 non-native forbs are a mix of agricultural species, such as alfalfa and red clover, and common agricultural weeds, such as yellow rocket, common plantain, dandelion, and curly dock. There are three invasive species: crown vetch, bird's-foot trefoil, and leafy spurge. The crown vetch is spreading into the hay field from the detention pond on the property adjacent to the west side of the field (Highland Ridge apartments). It's most abundant near the pond, but there are numerous satellite populations in the field, especially along the south edge. Expect the existing populations to expand and for new ones to appear in the absence of management.

Crown vetch is spreading into the Hay Field from the Highland Ridge detention pond.

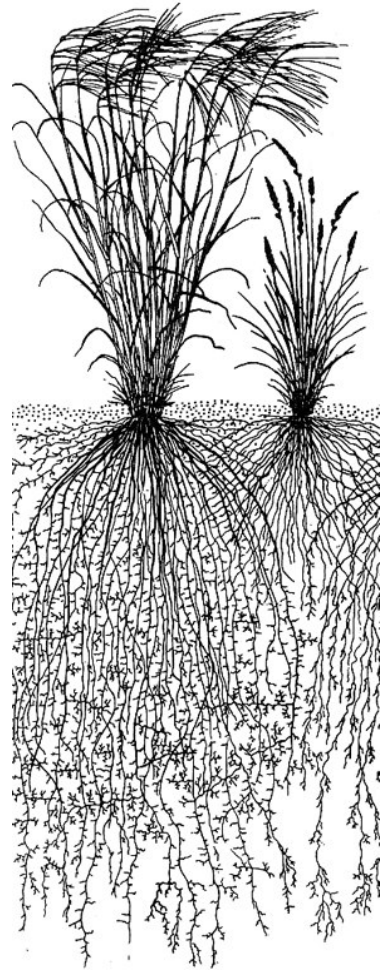
Bird's foot trefoil is scattered throughout both subunits. It was probably planted with the agricultural grasses for its nitrogen-fixing ability. Leafy spurge is scattered throughout the western subunit, but is less abundant than bird's-foot trefoil.

Reed canary grass surrounds most of the Highland Ridge detention pond. While it hasn't spread into the hay field, it quite likely will.

One white mulberry shrub less than 12 inches tall was found growing along the south side. No trees, vines, or ferns were found, not surprising for a hay field.

If regular mowing stopped, it's very likely this unit would quickly be invaded and covered by honeysuckle, box elder, buckthorn, crown vetch, bird's-foot trefoil and other native and non-native species migrating from adjacent areas. Its appearance would initially be similar to the Old Field Unit and then progress to something similar to the Brushland Unit.

It's possible grassland birds nest in both subunits, although the eastern subunit is probably more appealing and functional because it's connected to another nine or so acres of hay field, as well as additional acres of non-forested land within Pheasant Branch Conservancy. However, the nests are probably destroyed when the hay is cut. This could be avoided by requiring the first cutting to be delayed until after the end of the first week of July, although hay quality will be reduced.



MANAGEMENT OVERVIEW AND OBJECTIVES

Introduction

Sound land management is based on an understanding of current conditions, a set of objectives describing desired future conditions, and numerous ecological principles. The current condition of Bock Forest has been discussed and the objectives for the future condition are outlined later in this section. The ecological principles used to formulate the management recommendations are discussed below.

1. It is best not to think of the property as the “Old Field Unit,” the “Oak Woodland Unit,” and so on. Rather, it is far better to remember that the site functions as a whole and to consider the influence one area has on the other areas and how individual areas can be managed in concert to achieve larger, property-wide goals that could not be achieved by managing on a unit basis.
2. Management for one species or habitat type is nearly always management against other species or habitat types. For instance, one plot of land cannot be managed simultaneously for grassland birds and forest birds. Therefore, effective management attempts to produce as diverse a spectrum of habitat types as possible in order to attract as many species as possible *within the constraints imposed by the site*. It is sometimes necessary to select and manage for one habitat type.
3. A large tract of a given habitat type is better than a smaller tract. This is because many species require large areas of relatively homogenous habitat, especially wildlife. Also, one large tract is better than two smaller tracts even if the total acreage is the same because smaller tracts have a higher proportion of *edge* relative to *interior*. Tracts with a high proportion of edge are more susceptible to invasion by weeds and therefore harder to maintain.
4. Historically, natural ecological processes maintained the landscape and promoted ecological health without human intervention. For instance, fire used to sweep across the landscape for hundreds of miles killing brush, rejuvenating plant communities, and regenerating oak. Currently, many natural ecological processes are unable to maintain the landscape and promote ecosystem health because the landscape is too fragmented. Consequently, human intervention in the form of directed management is required. Benign neglect generally creates more problems than it solves and results in the loss of species and their habitats.

**Benign neglect
usually creates
more problems
than it solves.**

Management Plan Limitations

Natural resource management plans must be flexible because the resources they manage constantly change, because new information is often acquired, new technologies are developed, new insights are reached, and because budgets fluctuate. Consequently neither this nor any other management plan should be viewed as conclusive or absolute. Instead, it should be viewed for what it is: a blueprint that provides information, guidance, and a starting point for the ongoing process of ecologically based, thoughtful land stewardship.

Successful management requires monitoring to provide feedback on the effectiveness of the activities and to discover new information. Careful and diligent monitoring and evaluation allows appropriate and necessary changes to be made to the management plan, a process known as *adaptive management*. Changes should be made in consultation with all interested parties and a qualified ecologist.

While this report references invasive species control, providing specific how-to information for all of Bock Forest's invasive species is beyond the scope of this report. Instead, the reader is referred to the following websites that provide a wealth of detailed information on this topic:

1. **The Wisconsin Department of Natural Resources.** Identification and control recommendations for many Wisconsin invasive species, and a discussion of management techniques, <<http://dnr.wi.gov/invasives/>>.
2. **The Global Invasive Species Initiative.** Hosted by The Nature Conservancy, this site provides identification and control information for a large number of invasive species, plus information on techniques, including selecting and safely using herbicides, and an extensive link section, <<http://tncinvasives.ucdavis.edu>>.
3. **EXTOXNET (EXTension TOXicology NETwork).** "Objective, science-based information about pesticides – written for the non-expert," <<http://extoxnet.orst.edu/>>.
4. **Invasive Plant Association of Wisconsin (IPAW).** IPAW's mission is to "promote better stewardship of Wisconsin's natural resources by advancing the understanding of invasive plants and encouraging the control of their spread," <<http://www.ipaw.org>>. A good source for control recommendations and techniques.

The recently published book *Invasive Plants of the Upper Midwest: An Illustrated Guide to Their Identification and Control* (Czarapata 2005) is highly recommended as an up to date and comprehensive reference.



Implications of the Community Forest Designation

A special situation exists because Bock Forest is a designated Community Forest. This designation bestows benefits, but also sets a range of acceptable management and land use options. These options are specified in the John C. Bock Community Forest Stewardship Plan written by Dane County WDNR Forester Steve Holaday (Holaday 2008) (Appendix III). This plan, crafted with input from the City of Middleton Forester, the City of Middleton Public Land Manager, and representatives from the Friends of Pheasant Branch, forms the backbone of the restoration and management recommendations provided in this report. Objectives of the Community Forest listed in the Holaday plan are:

Education Studies: Use the community forest to teach about our natural environment and to promote environmental stewardship through education on proper sustainable forest and ecosystem management with an emphasis on oak savanna and other native WI communities found in the community forest.

Forest Management: Harvest trees when recommended to promote forest health, maintain and restore native plant communities, and provide wood products.

Wildlife: Maintain a diversity of trees, shrubs, forbs and grasses to provide habitat for a variety of wildlife. Deer numbers may be controlled to prevent over-browsing of vegetation.

Aesthetics: Maintain the health of the native ecosystem for aesthetic enjoyment.

Recreation: Maintain hiking trails throughout the woods and oak savanna. Maintain a diverse ecosystem that will encourage passive recreational activities such as bird watching and photography.

Watershed/Water Quality: Follow Wisconsin's Forestry Best Management Practices for Water Quality. Minimize exposure of bare soil to minimize soil erosion.

Control Invasive Species: Use Best Management Practices (BMPs) for controlling invasive species; prevent new infestations from occurring through continued education and monitoring efforts.

Desired Future Condition Statement

A *desired future condition* statement is a broad statement that expresses a vision of a site's future character.

Desired future condition statement for Bock Forest: Bock Forest hosts a variety of native plant communities, such as forest, oak savanna, and prairie, to the extent possible within the limitations associated with its size, surrounding land use, and the available resources. Sustainable forestry is practiced and showcased. Non-native species abundance is minimized to protect and encourage native flora and fauna. Visitors have safe, educational and recreational opportunities that enhance their understanding and appreciation of Bock Forest's cultural and natural history.

Objectives and Recommendations

Objectives are concise, but general statements that describe a specific component of a site's desired future condition. They are the basis for developing recommendations.

Recommendations are specific actions undertaken to achieve a given objective.

Recommendations can be short- or long-term and can be either ongoing or occur once.

Objectives and recommendations for Bock Forest are first presented in outline form to provide an overview. Recommendations are then discussed in detail in the following section.

Recommendations are consecutively numbered to facilitate cross-referencing.

Objective 1: 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. Non-native species abundance is minimized to protect native flora and fauna.

Recommendation 1. Restore the Brushland Unit and the Hay Field West Sub-unit to oak savanna.

Recommendation 2. Restore the Old Field Unit to prairie.

Recommendation 3. Enhance Ecological Conditions in the Oak Woodland Unit.

Objective 2: Practice Sustainable Forestry

Tree harvest to promote regeneration occurs as needed using traditional and non-traditional methods. Harvested wood products are used or recycled on site whenever possible and waste is minimized.

Recommendation 4. Harvest cottonwood trees from the Old Field and Brushland Units.

Recommendation 5. Utilize the trees removed during restoration and management activities.

Recommendation 6. Follow best management practices for water quality and invasive species.

Recommendation 7. Retain dead trees when they're not a safety hazard.

Objective 3: Provide Multiple Opportunities for Education and Recreation

Visitors are offered hands-on and passive educational opportunities. Volunteers are actively recruited to assist with restoration and management. Community access and recreational use compatible with natural resource protection is encouraged. Public safety is protected.

Recommendation 8. Develop community gardens totaling one acre or less.

Recommendation 9. Complete a hazard tree survey.

Recommendation 10. Use interpretive signs and the kiosk to tell Bock Forest's cultural and natural history.

Recommendation 11. Improve the trail system.

Recommendation 12. Plan for an educational facility.

Objective 4: Minimize Impacts to Adjoining Neighborhoods

The City strives to be a good neighbor by minimizing the impacts of Bock Forest development and public use on the adjoining neighborhoods.

Recommendation 13. Provide replacement screening as trees and shrubs are removed from property lines.

Recommendation 14. Mark property lines.

Objective 5: Utilize External Funding and Partnerships

Public and private funds are obtained for development, restoration, and management. Partnerships are developed with organizations and individuals.

Recommendation 15. Obtain external funding.

Recommendation 16. Link with other organizations.



MANAGEMENT RECOMMENDATIONS

Figure 31 provides a vision for Bock Forest following full implementation of the management recommendations. It includes adjacent areas of Pheasant Branch Conservancy to show the importance of connecting similar vegetation types. New trails are not shown because their location and number is to be determined.

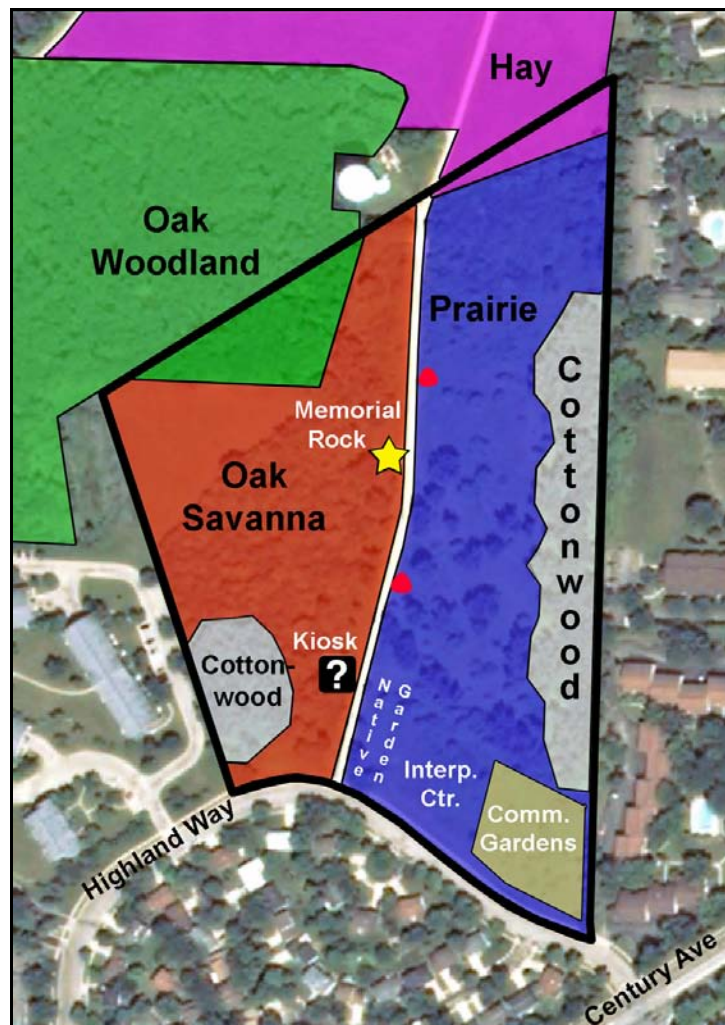


Fig. 31. Future Vegetation Types (black text) and Cultural Features (white text).

Objective 1: 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. Non-native species abundance is minimized to protect native flora and fauna.

Recommendation 1: Restore the Brushland Unit and the Hay Field West Sub-unit to Oak Savanna

Converting the Brushland Unit and the West Subunit of the Hay Field Unit to oak savanna will create a large area of similar habitat by connecting these seven acres with approximately 16 acres of similar vegetation in the adjacent Pheasant Branch Conservancy (Fig. 31). Converting the Brushland will require significant effort because the extensive shrub layer must be removed. Converting the Hay Field to oak savanna will require much less effort because brush is absent and weeds, other than non-native grasses, are relatively infrequent.

The cottonwood stand located in this unit will be managed as a sustainable forestry demonstration area as prescribed in the Holaday Stewardship plan (see Recommendation 4).

Conversion to oak savanna requires three steps:

1. Site preparation to eliminate unwanted vegetation, create appropriate light conditions, and prepare a suitable seedbed.
2. Planting oak and hickory seedlings and saplings, and sowing native grass, sedge, forb, and shrub seeds.
3. Post-planting management.

Step 1: Site Preparation. The Brushland and Old Field Units will be individually discussed because they have different requirements.

Brushland Unit: Start by removing the trees and shrubs, except for the cottonwood trees in the southwest corner. Their removal creates the full sun conditions the oak seedlings and herbaceous groundlayer species require and facilitates subsequent weed eradication.

Tree and brush removal can be done by hand or by forestry mower (Fig. 32) but the forestry mower is the best option because the buckthorn and honeysuckle are so dense that hand clearing would be a slow and daunting task. However, expect that hand clearing will be required for trees larger than the capacity of the mower. This may include many large buckthorn. The exact cutoff point depends on the capacity of the mower. A high-powered, large capacity mower is recommended to reduce the amount of handwork that'll be needed and to speed the restoration process. Contractors should be willing to provide specifications for their equipment. A larger unit will be more expensive to hire, but should pay for itself

by clearing larger trees and being more productive. If the budget allows, consider mowing all areas of the property at the same time to make the clearing more cost effective and to speed the restoration process.

Preserve all oak and hickory trees while clearing. While neither is abundant, the few that are present will speed the conversion to oak savanna and produce some, albeit limited, age diversity. Flag the trees to be retained in advance and consider prohibiting the mower from working within the drip line of the retained trees to reduce the risk of damage and soil compaction. This is especially important if the mowing occurs between April and October when the risk of oak wilt infection is highest.

A few trees other than oak and hickory could be retained to serve as *surrogate savanna trees* while the oak and hickory trees that will be planted mature. Retaining these trees will also keep the site from looking barren while the savanna develops. Select trees with side branches (open grown form), if possible. Do not retain any cottonwood, except those in the cottonwood grove, and do not retain any female box elder or you will battle their seedlings for years.

Note the opportunity to benefit wildlife by creating snag trees during site preparation. See Recommendation 7 (Retain Dead Trees) for details.

Expect to see the ground covered with shredded, partly shredded, and sometimes mostly intact trees and shrubs after forestry mowing (Fig. 33). This material may mulch the soil surface several inches deep. Deep debris will take years to decompose, especially if it's coarse. Consequently, it will need to be burned or piled and burned to expose the bare soil needed for planting seeds and to stimulate weed seed germination during the site preparation process.

Follow the forestry mowing by hand cutting the remaining trees and shrubs. Cut them as close to the ground as possible in order to facilitate safe operation of the equipment needed during the remainder of restoration process. You may also wish to cut lower the stumps left by the mower. Treat the hand cut tree and shrub stumps with herbicide to prevent regrowth. (Mowed trees and shrubs typically can't be treated because the remaining stem is too mangled to absorb herbicide.)

The trunks and large branches of the cleared trees could be saved for making sign or fence posts, dimensional lumber, display cases, and other uses (see Recommendation 5). Material not deemed worth saving, e.g., short pieces, deformed trunks, etc., could be chipped for



Fig. 32. Forestry Mower. Rotating drum has large teeth that cut and shred woody material (www.raycomfr.com).



Fig. 33. Typical Woody Debris Left After Forestry Mowing.

mulch and used in the community gardens or on trails, or sold or given to the public as a sustainable forestry demonstration. Seed bearing buckthorn, honeysuckle, multiflora rose, or other invasive species that are chipped should not be used for mulch because this will spread their seeds. This material should be burned, landfilled, or composted at high temperature.

Hand cutting isn't normally done during spring sap flow (April and May) because herbicide effectiveness is reduced (the flowing sap washes off the herbicide) or when the ground is at risk for disturbance. However, on this site the cutting (and forestry mowing) can be done anytime because the foliar herbicide applications planned to control the herbaceous weeds will also control the woody resprouts and weeds resulting from the soil disturbance.

Tree and brush cutting and mowing can be done any time of year.

Retain desirable native shrubs, such as hawthorn and elderberry. Flag them in advance and make workers are aware of the need to save them. Don't worry about trying to save gray dogwood or sumac; they'll likely survive the site preparation process since they are clonal and can sprout from their roots. However, a patch or two could be saved if desired, just don't select one that's mixed with crown vetch or other invasive species.

The next step after tree and shrub clearing is to conduct a controlled burn. A burn will remove woody debris and thatch, kill weed seeds, expose soil, and trigger weed seed germination. The burn will likely be very spotty with large areas unable to carry fire because of insufficient fuel. Nevertheless, it's worth burning whatever will burn. Ideally, the burn will occur in mid- to late April, when the weeds have grown a few inches tall, but before the site becomes too green to burn. Burning after green-up weakens the weeds by forcing them to use additional root reserves to regrow, making them more vulnerable to herbicide and killing some outright. If the site is too green to burn by the time the trees and brush have been cleared, or won't burn because there is too much "mulch" from the mowing, then begin herbicide application as outlined below and instead conduct the prescribed burn after the vegetation has died and dried following the first herbiciding. This delay should allow the mulch to dry enough to burn.

After the site has greened-up with weeds following the burn, it should be sprayed with a nonselective herbicide, such as glyphosate (e.g., RoundUp), to begin the process of eliminating herbaceous weeds and the weed seed bank. Depending on the species of weeds present and their abundance, inclusion of an herbicide specific to broadleaf weeds or woody plants, such as Garlon 3A (active ingredient triclopyr), may be advised. Site inspection and consultation with a licensed herbicide applicator will reveal the best choice.

Subsequent weed growth should be killed by another herbicide application. Maximize the time between applications to reduce cost and chemical use but do not allow any weeds to produce seeds. Mowing can be used to prevent weed seed production and to further reduce chemical use, but it won't eradicate perennial species.

Repeat the process of allowing the site to green up and then spraying until the weeds are judged sufficiently under control to allow planting. Depending on the weather, expect to

spray three to five times during the growing season, more often during spring and early summer. Expect to treat for a full growing season, and quite likely two, before planting. Be willing to delay planting until the weeds are under control. Eliminating the weeds *before* planting is crucial for success: Once weeds and native seedlings are growing together weed control options are greatly reduced.

**Delay planting
until the weeds
are under control.**

The advantage of using herbicide to control the weeds is that the soil isn't disturbed. Consequently, the plant roots hold the soil in place while they decay and erosion is minimized. Soil tillage (plowing, disking, rototilling) is an herbicide-free weed control option that can be alternated with herbicide application. The downside is that it increases the risk of soil erosion and therefore isn't recommended because the site drains towards Pheasant Branch, although the actual risk is probably low.

If soil erosion becomes a concern during site preparation you can sow a cover crop of annual rye grass. Use about four to five pounds per acre for a growing season seeding and five to seven pounds per acre for a dormant seeding. With favorable weather, the grass will germinate and grow several inches tall in about two weeks. The roots will remain and stabilize the soil after it's sprayed during the next herbicide application. Try not to plant the grass shortly before an herbicide application so that it has time to grow and form roots before being sprayed. The rye grass will also provide fuel for a burn and can be planted for this purpose. Mow or spray the rye grass when it begins to head-out so that it won't produce seeds. Silt fencing is another erosion control option, although it blocks small mammal and herptile movement, requires maintenance, is an obstacle during burns, and is unsightly.

There is a long, linear soil mound in the northeast portion of this unit. If the budget allows, this mound should be either bulldozed level or excavated and removed to make planting, management, and trail construction easier. If the soil is transported off site, note that it contains invasive species and handle accordingly.

Hay Field: This area will require significantly less effort to convert to oak savanna because tree and shrub clearing isn't needed. Rather, site preparation requires a controlled burn followed by herbicide applications as outlined above. Grass is a strong competitor and must be eliminated before the native species can be planted.

The burn will be most effective if the non-native grasses have grown about three or four inches prior to the burn, for the reasons described above. Burning may stimulate dormant crown vetch, bird's-foot trefoil, and sweet clover seeds to germinate, but this is okay because they will be killed by the herbicide. Burning will be most economical if done in conjunction with other units.

Step 2: Planting. Both woody (oak, hickory, and shrubs) and herbaceous species (forbs, sedges, grasses, rushes, and others) need to be planted. Each is discussed individually below.

Herbaceous Species. Herbaceous species are the species that will be planted as seeds, even though shrubs, such as lead plant or New Jersey tea, are included. Appendix II provides a list of recommended species. The list emphasizes species that are:

1. Appropriate for the expected light conditions.
2. Appropriate for the soil types.
3. Commercially available.
4. Grow readily from seed.
5. Known to have grown historically in the Middleton area.

Most of the species that will be planted initially are prairie species rather than true oak savanna species. This is because the site will be sunny, like a prairie, rather than the mixture of shade and sun associated with savanna. This will change as the oak and hickory trees mature and create shade, causing some of the prairie species to disappear and opening the door for the introduction of savanna species. This may take 15 to 20 or more years.

Savanna species can be planted near the retained trees, including the cottonwood grove, where there will be a mixture of sun and shade. The light preference for each of the recommended species is indicated.

The selected species can be introduced either as seeds or live plants. Seeds have the advantage of being relatively inexpensive to purchase and quick to plant. Also, nurseries have a larger selection of seeds than plants. Their disadvantage is that they take several years to become a noticeable plant, at least to the untrained eye, and some may not bloom for four or more years after planting.

Live plants produce quicker results, often blooming the first year. However, they are much more expensive than seeds and require much more time and effort to plant. (The typical recommendation is to plant one plant per square foot, which is 43,560 plants per acre, a prohibitive cost for most projects.) They also require watering until they are established and may require protection from deer and rabbits.

It isn't necessary to plant all of the listed species. Nor is it necessary to plant a given species over the entire site. For example, expensive species, such as shooting star, and short stature species, such as Jacob's ladder, can be spot sown near a trail where they will be seen and enjoyed.



Fig. 34. No-till Seed Drill.

Two methods are applicable for seed planting: A no-till seed drill (Fig. 34) and hand broadcasting. Because of the relatively large planting area and because the soil surface will probably be crusted at the end of the site preparation process, which hinders the incorporation of the seeds into the soil, a no-till seed drill will probably be the best option for most of the site. Hand planting will be useful for spot sowing select species alongside

trails, beneath retained trees, into drifts for visual impact, and for microsite¹⁰ seeding.

Seeds can be sown during either spring or fall, although fall is usually preferred because the forb seeds receive the cold period they require to break dormancy during the winter and are then ready to grow the following spring. Fall seeding is usually done after the soil has cooled sufficiently so that none of the seeds will germinate that fall, but before the ground freezes or is snow covered. Most fall plantings in southern Wisconsin are done during late October and November.

Seeds can be sown during either the fall or the spring, although fall is usually preferred.

Spring seeding is usually done between mid-May and mid-June, although May is preferred because cooler temperatures and frequent rains produce a moist soil that enhances germination and seedling survival. Spring plantings have the advantage of allowing one more round of weed control before planting because the weeds will be growing before it's time to plant.

Woody Species. Bur oak, white oak, and shagbark hickory are the classic trees of oak savanna in southern Wisconsin. Their reintroduction is the next step of the oak savanna restoration process. Because the site will need periodic mowing the first growing season after planting the herbaceous species, it's best to delay tree planting until this mowing has ended. This will make mowing easier and prevent small, hard to see seedlings from being accidentally mowed. Saplings tall enough to be visible during mowing could be planted sooner.

Plant the largest bare root seedlings available, 3/8 inch diameter at the base of the stem is a minimum standard, 1/2 inch is better. Stem diameter is a better indicator of quality than height. Age is also important because older stock is typically more developed than younger. If funds allow, plant as many saplings as possible, such as 1.5 to 2 inch caliper (diameter) saplings that will be about five to seven feet tall. Although they're much more expensive than seedlings, you'll need fewer, they have a higher survival rate than seedlings (if properly planted and cared for), and they'll provide a measure of "instant success," showing visitors the site is being cared for.

About 60 percent of the oak being planted should be bur and the remainder white. Plant about ten to twenty shagbark hickory, depending on their size; more if they're small, fewer if they're large. Plant randomly, rather than in rows that appear unnatural. Plant a few groupings of more closely spaced trees that will eventually form a grove. It's also okay to leave several areas of about one-half acre or so unplanted that will remain prairie.

Plant about 50 to 100 trees per acre, a total of 350 to 700 for the seven-acre site. This is about one tree per 870 per square feet or 435 square feet, respectively. If you're planting only seedlings, plant towards the high end of the range to account for their higher mortality. Plant towards the low end of the range if you're planting a mix of saplings and seedlings. You may be able to plant as few as 10 to 20 trees per acre if they are saplings that are well cared

¹⁰ A microsite is an area with different environmental conditions than the surrounding area; wet or dry, sunny or shady, for example. Planting microsites with species adapted to the different conditions increases site diversity.

for. If it won't be possible to protect or care for the seedlings or saplings after planting (watering, weed control, etc.), then plant at a higher rate because mortality will be higher.

Predation by mice, voles, deer, rabbits, and other wildlife will likely be high, as will mortality due to weather and other causes. This is the reason for the high planting rate; at maturity only five to 15 trees per acre are needed, on average, an overall survival to maturity rate of ten to fifteen percent. Methods for reducing wildlife damage include tree shelters (tubes), hardware cloth "cages," and spray on repellants.

Tree shelters are probably the best choice because they can be installed when the tree is planted and they're low maintenance, especially compared to repellants that need to be repeatedly applied (Fig. 35). Tree shelters are tubes or triangles about three to four inches in diameter and two to six feet high that are placed around a seedling or sapling and staked into place. They have been shown to increase seedling survival and to increase seedling growth rate by creating a warmer microclimate, like a miniature greenhouse. They also provide protection during mowing and herbicide spraying. It's best to bury the bottom of the shelter to prevent rodents from using the shelter as a nest site. At a minimum, the shelter bottom should firmly contact the ground.



Fig. 35. Tree Shelter.

Cost is typically one to four dollars apiece depending on size, style, and the quantity purchased. Price includes a stake and netting to cover the top opening so birds won't enter and be trapped. Biodegradable versions are available. Use ventilated shelters for oak. Tall sizes are recommended because deep snow reduces a shelter's effective height.

**Plant only native
species obtained
locally.**

For detailed information on planting and caring for oak see <<http://www.for.msu.edu/extension/ExtDocs/NCR605.pdf>>. See <http://www.nwtf.org/conservation/bulletins/bulletin_10.pdf> for tree shelter information.

Bock Forest is eligible to receive free seedlings from the Wisconsin DNR. White oak, bur oak, and shagbark hickory are available, but only as one, two or three year seedlings. They also offer suitable shrub seedlings, including prairie crab, American hazelnut, prairie ninebark, and wild plum. Orders must be made in single species lots of either 100 or 1,000. For details and an order form see <<http://dnr.wi.gov/forestry/Nursery/Order/SeedlingApplication2009.pdf>> or contact the county forester.

Sound ecological management dictates that only *native* species from a *local* source (local ecotype) should be used for all planting materials. A nursery specializing in native plants is preferred. This ensures the species planted are adapted to the local growing conditions and protects locally occurring populations of the same species from genetic contamination. This is especially important for rare, threatened, and endangered species.

Step 2: Post-planting Management. Post-planting management encourages the species you planted and discourages weeds. Examples include mowing, burning, weed control, and adding additional species. Post-planting management is extremely important and should be planned and budgeted for before the first seed touches the soil.

The developmental stages that occur in the planting as it becomes established and information on the specific management activities needed during this time are provided below. Long term development patterns and management needs are also discussed.

Year One

Year one refers to the planting's first growing season. It cannot be overemphasized that it is highly likely that none of the wild flowers or grasses that were planted will bloom. In fact, most will be only a few inches tall at the end their first growing season and won't be revealed by casual observation. Most of the noticeable green growth during the first year will be weeds and a few of the faster growing native species, such as black-eyed Susan.

► *This is normal and is not an indication of failure* ◄

The reason that very few native species are visible during the first growing season is that they limit their upward growth in favor of growing a large root system. A large root system is important because many species live 50 years or longer. Only after they have staked out their underground territory will they shoot upward. Also, some seeds may lie dormant for several years until conditions are just right for germination.

Weed Control

Mowing

► *The primary year one management need is to prevent weeds from setting seeds and to reduce their height to prevent shading of native seedlings* ◄

Both of these goals are accomplished by periodic mowing. The planting is typically mowed whenever the growth is 8 to 12 inches tall or when the growth is dense enough to cause shading at the soil surface, *whichever occurs first*. The goal is to remove the overstory of weeds while maintaining the understory of native plants.

For the first mowing, cut the growth down to a height of about 3 inches. Subsequent mowing should be to a height of about 4 to 6 inches, but this height may need to be increased to avoid mowing the faster growing prairie plants; field inspection is the only way to determination the proper height.

Expect to mow approximately every 3 to 5 weeks, on average. The actual frequency depends on soil moisture, air temperature, and weed density and height. Do not mow the prairie as if it were a turf grass lawn. Mowing too often and too low encourages short stature weeds, such as dandelion and white clover, and puts the planting at risk.

Discontinue mowing at the end of the growing season when there is no longer a danger

of weed seed production. The remaining stubble mulches the soil during the winter, protecting the seedlings from frost damage and desiccation.

- *Mowing is critical to a successful restoration; do not fail to meet this need* ◀

Hand Cutting or Pulling

In addition to mowing, careful, selective cutting or pulling may be acceptable as long as soil disturbance is minimized and the disturbed soil is firmed afterward. Soil disturbance stimulates weed seeds to germinate and damages native seedlings. Because of the large planting area, hand pulling will be most suitable for the “hot spots” where weed density is high enough to exclude the native species.

Weeds that are difficult to pull or that will cause a large amount of soil disturbance when pulled, such as burdock and mullein, can be killed or retarded by slicing the plant off just below the soil surface with a shovel or by clipping the plant as close to the ground as possible with a pruning shear, brush saw, or string trimmer. Remove and properly dispose of all cut or pulled weeds that contain seeds or are large enough to smother native seedlings if left on the ground.

- *Accurately identify plants prior to clipping or pulling; it is often very difficult to distinguish between the seedlings of weeds and native species* ◀

Herbicides

Herbicides are typically not useful for weed control in prairie plantings except for careful spot treatments of individual plants. This is because herbicides do not distinguish between native and non-native plants. Use a narrow spectrum herbicide that targets the weed of concern (e.g., Milestone, Vantage) rather than a broad-spectrum herbicide (e.g., Roundup) to minimize impacts to nontarget species.

- *Indiscriminate herbicide use will cause the loss of native species* ◀

Fertilizing

Fertilizing is not recommended at any time because it tends to cause rapid, lush weed growth at the expense of the nutrient frugal native species. The exception is that the tree and shrub seedlings and saplings would benefit from a light application of a slow release fertilizer each year for the first two or three years.

Controlled Burning

There won't be enough fuel for a burn at the beginning of the first growing season and burning is typically not recommended at the end of the first growing season because the dead vegetation provides a protective mulch for the seedlings during the winter.

Other

Replace or repair damaged tree shelters as needed.

Tree and shrub seedling and sapling survival and growth will be increased if you maintain a vegetation (weed) free zone two to three feet wide around each seedling and sapling (if any were planted this year). This can be accomplished by spraying a pre-emergent herbicide over the top of the dormant seedlings or around the saplings during early spring, or by carefully spraying a nonselective herbicide during the growing season, or by mulching.

When mowing the turf grass adjacent to the gravel trail discharge the clippings away from the planting area to avoid spreading weeds and smothering seedlings.

Mulching the planting with clean, weed-free straw after seeding will boost germination and seedling survival. The straw can be hand spread or professionally blown. You should still be able to see about 30 percent of the ground after mulching—do not over-mulch, some native seeds require light to germinate.

Year Two

Many of the faster-growing species, such as Canada wild rye, black-eyed Susan, bee balm, and gray-headed coneflower may start blooming this year. Slower-growing species, such as prairie dock, compass plant, and big bluestem will be noticeable by their foliage, but are not likely to flower. Oak and hickory seedlings and saplings will be planted this year.

Weed Control

Weed density will be lower than last year if the first year weed control program was adhered to. Remaining weeds should still be controlled because they compete with the native plants for light, water, nutrients, and space.

Mowing

During early spring of the second year the planting should be mowed to a height of about two inches before growth begins. Mowing lower than this may damage seedlings. In southern Wisconsin, this is typically done during late March or early April. The cut material should be chopped as fine as possible so it won't mulch the soil or smother seedlings. In many ways, this mowing mimics the effects of fire by allowing the soil to warm faster, promoting the growth of the heat-adapted native species, and letting more light reach the seedlings.

Regular mowing (as was done during the first growing season) is typically not necessary unless weeds are still abundant. If weeds are abundant, mowing should be done before the weeds set seeds and at a height that is above the height of the native species. Spot mowing hot spots with a string trimmer allows maximum selectivity and minimizes disturbance to the areas that don't need mowing.

Hand Pulling and Cutting

The planting will benefit from hand or mechanical weeding that reduces weed abundance, but this is most suitable for hot spots where weed density is high enough to be excluding native species. Follow the criteria provided for year one.

Herbicides

Continue the careful spot treatment of individual weeds using the criteria provided for year one. Fewer weeds means more native plants.

Controlled Burning

There won't be enough fuel for a burn at the beginning of the second growing season and burning is typically not recommended at the end of the growing season because the dead vegetation provides a protective mulch for the seedlings during the winter.

Watering

Regularly water the saplings that were planted. If possible, water the seedlings as well, although this may be a daunting and unrealistic task because of their abundance. Fertilize tree and shrub seedlings and saplings during late spring, as outlined in year one.

Other

Replace or repair damaged tree shelters as needed.

Maintain the vegetation (weed) free zone around seedlings and saplings as described for year one.

Year Three and Successive Years

This is when the planting develops its character. By the end of the third year the majority of the species planted will have germinated and established themselves unless weather conditions have been extreme in the preceding years. Although not all species will bloom this year, it is likely there will be flowers blooming throughout the growing season. Weed density should be reduced due to greater competition from the native species and prior control efforts. This is the first year there may be enough fuel for a burn.

Weed Control

From this year forward perennial and biennial species are likely to be more problematic than annuals. Annual weeds are less common because there is insufficient bare soil for them to become established and because they have been prevented from setting seeds during the two prior years. Nevertheless, weed control is always important. Use whichever method is most appropriate.

Mowing

Mowing is not necessary unless there is insufficient fuel for a burn. In this case, mow the planting during early spring following the protocol outlined for year two.

Watering

Although the saplings should be established, reducing their need to be watered, water if the weather is dry. Losing a tree that's two or three years old is a setback.

Controlled Burning

The third year is the first year there is likely to be sufficient fuel to support a fire. For the first few years of burning, a spring burn is preferred over a fall burn so that the dead vegetation will mulch the planting during the winter. After several spring burns, it is best to mix spring and fall burns.

Burning annually for five to six years starting as soon as there is sufficient fuel to carry a fire will greatly speed the establishment of the planting and control some weeds. After this initial "burn-in" the frequency can be reduced, if desired. Protect the oak saplings from fire by cutting and raking away the vegetation and then wetting the area. Protect as many of the seedlings as possible, although it's probably not feasible to protect them all. Fire will only top-kill the oak seedlings and they will resprout. However, they will have lost several years growth and resprouting creates a multi-stem plant that looks more like a bush than a tree.

Overseeding

Native plant density and diversity may be lower than expected because of weather conditions, seed predation or mortality, or weed competition. If this problem occurs it can be corrected by *overseeding* or *spot planting* additional species. It is usually only necessary to treat problem areas, rather than the entire site.

Overseeding is accomplished by hand sowing seeds mixed with moist sawdust. Germination will be increased if the soil surface is loosened with a hoe or garden rake prior to seeding and the seeds are raked into the soil and the soil is firmed afterward, although care should be taken to avoid disturbing established native plants. Raking may not be practical for large areas. Early spring (until early June) and late October or November are the best times for overseeding; immediately following a burn is an excellent time because there will be bare soil.

Spot planting is accomplished by planting transplants of the desired species. Allow about one foot between plants. Mulch around the base of each plant and water as necessary until they are established. Early spring and late fall are the best times for spot planting because the transplants are dormant or semi-dormant and air temperatures are cooler. Spot planting is relatively expensive and is therefore most suitable for small, highly visible areas, such as near the memorial stone, kiosk, or trail edges. Note the opportunity to grow transplants in the community garden (see Recommendation 8).

Recommendation 2: Restore the Old Field Unit to Prairie.

The Old Field Unit is amenable to prairie restoration (Fig. 31 on page 50). Compared to the existing weed-dominated vegetation, prairie will attract a greater variety of wildlife, be more aesthetically pleasing, increase property-wide diversity, and offer unique options for environmental interpretation and education.

The cottonwood stand along the eastern edge will be managed as a sustainable forestry demonstration area according to the Holaday plan (see Recommendation 4). The east subunit of the Hay Field can either remain in hay or be converted to prairie, although leaving it in hay is suggested. This is because it's a small area (0.6 acres), the renting farmer may appreciate being able to continue renting it and not having to crop around a new, diagonal boundary, and because the City may eventually convert the entire hay field to prairie or other habitat anyway.

Note the similarity to the oak savanna restoration process.

Prairie restoration requires three steps:

1. Site preparation to eliminate unwanted vegetation and prepare a suitable seedbed.
2. Sowing seeds of the prairie species.
3. Post-planting management.

Note the similarity to the oak savanna restoration process outlined in Recommendation 1 (page 51). The most significant difference is that oak and shagbark hickory won't be planted, although a few could be strategically placed as either a specimen tree, to block the view of the water tower or neighboring buildings, or to soften the hard edge of the gravel trail. Planting too many, however, will eventually create shade that will eliminate many of the sun-loving prairie plants.

Step 1: Site Preparation. Start by removing all of the trees and non-native shrubs, except for the cottonwood along the east side, which are part of the sustainable forestry operation. Removing the trees and brush creates the full sun conditions the prairie species require and facilitates subsequent herbaceous weed eradication.

See the oak savanna restoration section (page 51) for a discussion of tree and shrub clearing techniques, timing, and other information. A forestry mower could easily clear the site in a day, not including trees larger than about four to six inches in diameter, depending on the mower's capacity. The amount of "mulch" left by the forestry mower will be less than in the Brushland Unit, although you can expect that some areas will be covered several inches deep; the honeysuckle thicket area at the north end, for instance. Linking forestry mower work in this area with work in the other areas will be the most cost effective route.

Trees too large for the forestry mower will need to be removed by hand or with tree harvesting equipment. You'll also need to hand clear trees and shrubs from beneath the

cottonwood since the mower won't be able to access this area. Note the opportunity to create snag trees during tree clearing and the suggestions for utilizing the cleared material (see the sustainable forestry discussion on page 71 for details).

Desirable native shrubs, such as wild plum, elderberry, nannyberry, and downy arrowwood should be retained. Flag them prior to starting work and make sure all workers know they should be saved.

**Retain native shrubs,
such as wild plum,
elderberry, nannyberry,
and downy arrowwood.**

After the site has been cleared, conduct a controlled burn to remove the thatch, kill weed seeds, expose bare soil, and trigger weed seed germination. The burn should carry relatively well, or at least better than the Brushland Unit because there is more herbaceous fuel. Nevertheless, don't expect the entire site to burn. Ideally, the burn will occur in mid- to late April, when the weeds have grown a few inches tall, but before the site becomes too green to burn. If the site is too green to burn by the time the trees and brush have been removed, then begin herbicide application as outlined below and instead conduct the prescribed burn after the vegetation has died and dried following the first herbiciding. See the oak savanna restoration discussion (page 51) for additional details.

After the site has greened-up with weeds following the burn, it should be sprayed with a nonselective herbicide, such as glyphosate (e.g., RoundUp), to begin the process of eliminating herbaceous weeds and the weed seed bank. Follow the schedule outlined for the oak savanna. Depending on the species of weeds present and their abundance, inclusion of an herbicide specific to broadleaf weeds or woody plants, such as Garlon 3A (active ingredient triclopyr), may be advised. Site inspection will reveal the best choice.

Given the site's long agricultural history, the abundance of weeds, including invasive species, and the fact that they've built up a seed bank during the last 30 years, it is unrealistic to expect that all weeds will be eliminated. Rather, the goal is to eliminate as many as possible before planting. Expect to need to treat for a full growing season, possibly two, before planting and be willing to delay planting until the weeds are under control. Eliminating as many weeds as possible *before* planting is crucial for a successful prairie.

If soil erosion becomes a concern during site preparation you can sow a cover crop of annual rye grass. See page 54 for the full discussion.

There is a long, linear soil mound with a shallow, wide depression along its south side located at the north end of this unit. Both may have been created during either water tower construction or underground utility installation, although their origin isn't known. If the budget allows, the mound should be bulldozed southward into the adjacent depression and leveled to make planting, management, and trail construction easier.

Step 2: Planting. Planting with a no-till seed drill is recommended for the same reasons the drill was recommended for the oak savanna area. Planting the two areas at the same time

will provide some cost savings, assuming they are ready to plant at the same time. Hand planting will be useful for spot sowing select species along trail edges, into drifts for visual impact, and for microsite seeding. See the oak savanna planting discussion beginning on page 55 for details.

Appendix II has a list of suggested species. Selection criterion follows that listed for the oak savanna species (see page 55).

Step 3: Post-planting management. Post-planting management for the prairie is identical to the oak savanna. See the multi-year oak savanna management discussion beginning on page 58 for details. As a reminder, post-planting management is extremely important and should be planned and budgeted for.

Recommendation 3: Enhance Ecological Conditions in the Oak Woodland Unit

Although the Oak Woodland is Bock Forest's highest quality natural area, it still needs management to maintain and enhance its ecological health and to ensure the long-term presence of oak. This is especially important because it is attached to another 16 or so acres of oak woodland in Pheasant Branch Conservancy, plus the seven acres of oak savanna being developed in the Brushland and Old Field Units. Improvements in one area improve the entire area.

The primary management needs are invasive species control, especially honeysuckle and buckthorn, removing trees that are competing with the mature oak trees, adding missing species, especially groundlayer species, and facilitating oak regeneration.

The approach outlined below differs slightly from the approach outlined in the Holaday Stewardship Plan (2008) (Appendix III). While the Holaday plan recommends reducing the basal area by about 30 to 45 percent (from 115 down to between 60 and 80) by removing cull trees (deformed, over-mature, diseased, and at risk trees) *and oak trees* if necessary to achieve the target basal area, the recommendations outlined below suggest removing the cull trees, but not any oak. Another difference is that the Holaday plan suggests planting "white oak, bur oak, red oak, black walnut, basswood, and sugar maple" while this plan suggests planting only oak and shagbark hickory because they are oak woodland species and because they are fire tolerate.

The rational for the alternate recommendation is that maintaining this area in oak woodland keeps it more "ecologically connected" to the adjacent 16 acres of oak woodland in Pheasant Branch Conservancy because the two areas will have the same habitat type. This commonality and connection reduces habitat fragmentation. Also, the disturbance associated

with removing the mature oaks could introduce invasive species into the surrounding oak woodland.

Enhancement requires five steps:

1. Structural restoration: removing unwanted trees and shrubs to create appropriate light conditions.
2. Non-native species control.
3. Groundlayer enrichment: stimulating the growth and spread of existing native species and adding missing species.
4. Securing the long-term presence of oak.
5. On-going management.

Each step is discussed in detail below.

Step 1: Remove Select Trees and Shrubs to Create Appropriate Light Conditions. As previously discussed, the Woodland has been heavily invaded by trees such as box elder, black cherry, and elm that aren't normally a significant component of an oak woodland, and also by invasive shrubs such as honeysuckle, buckthorn, and multiflora rose. The net result is shade so dense that it has eliminated much of the native herbaceous groundlayer and is slowing oak regeneration. Removing the invading trees and shrubs will reestablish appropriate oak woodland structure and, as a result, the appropriate light conditions.

Appropriate light conditions will stimulate the native plants that have been suppressed by dense shade, may trigger latent native seed germination, and will facilitate the survival of the existing oak saplings and seedlings. It will also invigorate the mature oak trees by reducing the competition they face for light, nutrients, water, and space. This makes them more resistant to disease and insect attack, preserves what's left of their open and woodland growth form, and increases their life span.

Restoring appropriate light conditions will invigorate herbaceous plants and protect the mature oak trees.

Done with an eye towards sustainable forestry, the goal should be to eventually remove the majority of trees and saplings that aren't oak or shagbark hickory and all of the invasive shrubs. Leaving widely scattered trees other than oak and hickory to increase diversity and provide additional wildlife food is recommended, as long as they don't impinge upon an oak or hickory. Remove all of the box elder, however.

Young black cherry trees dominate the east end of the unit. In this area, timber stand improvement is appropriate with an emphasis on removing cull trees to stimulate the remaining cherry. Black cherry is commercially valuable once it's large enough in diameter to be useful for lumber, i.e., a saw log¹¹.

¹¹ A log or tree that is large enough to be milled into lumber, typically at least 10 to 12 inches in diameter and at least eight feet long, although this varies with the species and milling equipment.

Although hand cutting, with brush saw and chain saw, is the recommended clearing method, there are alternate methods that offer advantages in certain situations. One alternate method is chemical girdling via basal bark application of an appropriate herbicide, such as Garlon 4 (triclopyr) in basal bark oil. With basal bark applications, the herbicide is applied in a band around the trunk near the base of the tree. The chemical is absorbed through the bark and translocates to the roots, killing the tree. The advantage of this method is that it is faster and more economical than cutting, and there's no slash to dispose of. Also, the treated tree dies slowly and slowly opening the canopy is often advantageous because it reduces the risk of a vigorous weed response.

Basal bark treatment is often the best option when a large, undesirable tree is interwoven with a tree that will be retained, making it difficult to fell the undesirable tree without damaging the desirable tree. The disadvantage of the basal bark girdle method is that the dead trees remain standing until they eventually fall, sometimes creating aesthetic and safety concerns.

An alternate girdling method is to make two parallel chainsaw cuts about 3 inches apart around the trunk a foot or two above the ground. The cuts only need to be about one-half inch deep on small trees and one to one and one-half inches deep on larger trees, although this varies with bark thickness. Both cuts are then treated with an appropriate herbicide, causing the tree to die. This method is slower than basal barking because of the time needed to make the cuts, but requires significantly less herbicide.

Fire is an alternate method for thinning the canopy. It will be slower than mechanical methods, but more cost effective.

Fire is another method for thinning the canopy. Fire is more cost effective than manual cutting, but it's slower because it typically requires several burns done over several years. However, as noted above, opening the canopy slowly has advantages. Disadvantages of fire include the hazard associated with standing dead trees and the possibility that some species will resprout, such as box elder, honeysuckle, and buckthorn. Additionally, fire won't kill some trees either because they are too large, their bark is too thick, or because there isn't enough fuel to create a sufficiently hot fire.

A forestry mower isn't recommended for this unit because of the steep slope at the east end and because it will be difficult to maneuver around the oak trees without damaging them. Mowing might be an option, however, along the open south edge where the honeysuckle and buckthorn are most abundant.

Do not remove any oak or shagbark hickory trees, saplings, or seedlings while thinning the canopy. Oak and shagbark hickory are the primary trees of oak woodland and the woodland's future requires their presence. Avoid damaging oak, including breaking branches or nicking the bark, while removing unwanted trees since damage invites insects, oak wilt, and other diseases. For this reason, no tree clearing should be done from April 1 until October 1 when the risk of oak wilt infection is highest. Small shrub clearing could be done during this time, as long as care is taken to avoid the oak.

Wintertime removal of trees when the ground is frozen or snow covered is typically preferred because there is less risk of disturbing and compacting the soil, which invites weeds and damages tree roots, because there is less risk of oak wilt if an oak is accidentally damaged, and because there is less risk of equipment and personnel spreading weeds. Also, work is easier and faster because leaves are absent so there is less volume and weight of material. Herbicides, which are required to prevent resprouting, are still effective when properly chosen and applied.

Note the need to retain dead and snag trees for wildlife while clearing. In fact, clearing presents an opportunity to create snag trees (see discussion on page 75).

Step 2: Control Invasive and Non-native Species. Invasive and non-native species must be controlled or they will spread, native species will continue to be extirpated, and it will be extremely difficult for the introduced flowers and grasses to survive because of the stiff competition they'll face. Also, the dense growth of buckthorn and honeysuckle prevents oak tree regeneration.

Eradicating invasive and non-native species is a challenge requiring several years of unbroken effort. Expect this and do not be discouraged by it. Fortunately, eradication isn't always necessary. A more realistic goal is to reduce non-native species abundance to a level where the natives can successfully compete against them, and then maintain their abundance at or below this level.

Non-native species must be controlled or native species will continue to be lost and it will be extremely difficult for the introduced flowers and grasses to survive.

Table 10 lists the management concern level for each of the Woodland's non-native species. Of the 12 non-native species present, the five invasive species are of greatest concern. Honeysuckle and especially buckthorn will present the biggest challenge because of their abundance. Garlic mustard, dame's rocket, and multiflora rose, the other invasive species, are less abundant, but are still a concern.

Although invasive species pose the greatest and most immediate threat, don't ignore the other non-native species. Prompt control while their abundance is low prevents the loss of additional native species and may negate the need for an intensive effort later on.

Weed control in the Woodland requires selectivity to eliminate the weeds without harming the native species. Selective control methods include spot herbicide application, mowing/cutting, properly timed burning, and pulling.

Step 3: Encourage Existing Native Groundlayer Species and Add Missing Species.

Variations in the density of the tree canopy as enhancement proceeds will create a range of light conditions that will likely include woodland, savanna, and possibly prairie along the southern edge where light enters from the Hayfield Unit. Areas with different light conditions can be planted with different species, boosting overall diversity and more closely mimicking nature.

Table 10. Non-native Species Management Concern Level.

Scientific Name	Common Name	Management Concern Level ¹			Comments
		Low	Med.	High	
Forbs					
<i>Alliaria petiolata</i>	Garlic mustard			X	Invasive species, biennial.
<i>Arctium minus</i>	Burdock		X		Biennial, agricultural weed.
<i>Cirsium vulgare</i>	Bull thistle		X		Biennial, most vigorous in sun.
<i>Hesperis matronalis</i>	Dame's rocket			X	Invasive species, biennial.
<i>Prunella vulgaris</i>	Heal all	X			Perennial.
Grasses					
None present					
Vines					
<i>Solanum dulcamara</i>	Nightshade	X			Perennial.
Trees					
<i>Pyrus malus</i>	Apple	X			Has high wildlife value, could be left.
Shrubs					
<i>Lonicera sp.</i>	Honeysuckle			X	Invasive species.
<i>Morus alba</i>	White mulberry		X		Potentially invasive species.
<i>Rhamnus cathartica</i>	Common buckthorn			X	Invasive species.
<i>Ribes rubrum</i>	Garden current	X			Has wildlife value.
<i>Rosa multiflora</i>	Multiflora rose			X	Invasive species.

¹Based on current abundance, ability to spread and cause ecological harm given the environmental conditions, and the difficulty of control. This list is specific to the Oak Woodland Unit of BF and should not be used to assess other sites.

The existing native oak woodland and savanna species will benefit from the removal of trees, invasive shrubs, and weeds and begin to flower and start spreading. There is also the possibility that new species will appear from the seed bank or from suppressed live plants. However, because very few woodland and savanna forbs and no grasses were detected and because of historic grazing it is unrealistic to expect the herbaceous groundlayer will recover on its own. Consequently, it will be necessary to add the missing species in order to regain a full compliment of species.

It is unrealistic to expect the herbaceous groundlayer to recover on its own.

However, it is recommended that you finish removing trees and shrubs as outlined above and that you diligently control the herbaceous weeds and the tree/shrub resprouts for a full growing season, at a minimum, before adding species. Areas that remain overly weedy after one growing season of weed control should be prepared for a second growing season before they're planted. This will create the conditions necessary for the survival of the species you'll be adding. Seeding into dense weeds or improper light conditions is a waste of resources. Inspection will allow you to determine when the herbaceous species can be planted, not any specific timetable.

It is also recommended that you do at least one controlled burn prior to planting as part of your weed control and site preparation activities, if burning is possible. Fire removes the

leaf litter, which increases the likelihood the seeds you're sowing will contact the soil and reduces the risk that the seedlings will be smothered. Fire also stimulates dormant native seeds to germinate, although it can also stimulate dormant weed seeds. Fire provides some control of tree and shrub resprouts and seedlings, possibly reducing chemical use. And, fire will remove some of the slash and debris left from the tree and shrub removal, making it easier to control herbaceous weeds and introduce seeds.

Appendix II provides a list of the forb, grass, sedge, and shrub species appropriate for reintroduction. The selected species will have to be hand planted since machines won't be able to access the interior of the site. See the oak savanna planting discussion for details on spot planting, the pros and cons of seeds verses plants, spring verses fall planting, overseeding after the initial planting, and the importance of using local ecotype seeds (page 55).

It is important to preserve the existing oak seedlings and saplings and to encourage new ones, so there will be a "next generation" to replace the existing oak trees when they die.

Step 4: Protect the Existing Oak Trees and Encourage Regeneration. Oak is a disappearing resource throughout southern Wisconsin. The culprit? Shade. Oak is unable to reproduce in its own shade because seedlings and saplings require abundant sunlight. Conversely, the seedlings of sugar maple, basswood, and many other species thrive in shade. Consequently, oak is being slowly replaced throughout the southern Wisconsin landscape by more shade-tolerant species.

This process is already in motion in the Oak Woodland as evidenced by the relatively low abundance of oak saplings in the shady interior of the unit. Fortunately, saplings and seedlings are fairly common near the sunny south edge, and there are some in the interior, as well.

It is important to preserve the oak seedlings and saplings and to encourage new ones so that there will be a "next generation" to replace the existing oak trees when they die. The same is true for shagbark hickory.

Removing the unwanted trees and shrubs as outlined in Step 1 will create light conditions favorable for the growth and survival of existing and future oak seedlings and saplings. The next step is to ensure there will be oak seedlings and saplings *throughout* the woodland.

Acorns can be collected and either planted directly in suitable locations (the simplest method) or grown in a container for a year or two and then transplanted. Growing oak seedlings could be part of the proposed community garden (see page 76). Bur and white oak are preferred since they are the typical species of oak woodland and are more resistant to oak wilt than red and black oak. Bur oak is especially suitable for areas with drier soil. Select planting locations that are as sunny as possible to maximize survival. See the oak tree selection, planting, and protection discussion in the oak savanna restoration section for additional details (page 56). Remember, as a Community Forest you are eligible to receive free oak and hickory seedlings from the WDNR nursery.

Step 5: Maintain the Desired Conditions Once They're Achieved. Management does not stop once the desired conditions have been achieved. Weeds will arrive via wind, water, and wildlife, weed seeds in the soil will grow, and leaf litter will accumulate, suppressing low-growing native plants, such as shooting star.

Oak woodland is a fire-dependant community. Thus, fire will be an important management tool. It will be beneficial to conduct an annual or every other year spring or fall burn for three or four years after seeding the herbaceous species. The burns will speed establishment of the native species, help control weeds and brush, remove the leaf litter that can inhibit seed germination and hamper native seedling survival, and stimulate native seed production.

After three or four burns, a typical recommendation is to divide the woodland into two or three burn units and burn them on a rotating basis, typically three to four times per ten years on a random basis. This pattern can be altered to achieve specific management objectives. For instance, a unit may be burned several years in a row to control buckthorn or garlic mustard seedlings.

You should expect that on-going control of weeds will be needed. This can be done by burning, cutting, pulling, or spot spraying.

Rotational burning minimizes the loss of beneficial insects, damage to ground nesting animals, and limits the loss of fire sensitive species because they can move between burned and unburned areas. Linking burning in this unit with burning in the surrounding Pheasant Branch Conservancy oak woodland is strongly recommended, especially because it will allow larger, more practical burn units.

You should expect that on-going spot control (mowing, pulling, spraying) of buckthorn, honeysuckle, dame's rocket, garlic mustard, and other weeds will be needed. Even if these species were eradicated before planting, a highly unlikely scenario, it's very likely they will eventually reappear because they are present in the surrounding area and in the seed bank. Periodic inspection will allow you to detect problems while they are small and easily correctable. Linking weed control in the Oak Woodland Unit with weed control in the surrounding Pheasant Branch Conservancy oak woodland is strongly recommended.

Objective 2: Practice Sustainable Forestry

Tree harvest to promote regeneration occurs as needed using traditional and non-traditional methods. Harvested wood products are used or recycled on site whenever possible and waste is minimized.

In addition to the specific recommendations provided below, sustainable forestry practices are woven throughout the Management Recommendations section.

Recommendation 4: Harvest Cottonwood Trees From the Old Field and Brushland Units.

This recommendation references the two areas comprised of primarily cottonwood that total about two acres (Fig. 36). Management goals are two fold: demonstrate sustainable forest management of cottonwood and use the cottonwood for visual screening between the adjacent apartments and BF.

The recommendations follow the Holaday Stewardship Plan (2008), with a few additions. See Appendix III for the full Holaday plan.

From the Holaday Stewardship Plan:

Priority Practices

- Remove hazard limbs or trees, if any.
- Control invasive species.

Secondary Practices

- Clearcut 50% of the stand in 2010 and clearcut the other 50% of the stand in 2015. Then clearcut 25% of the stand every 10 years thereafter. These harvests must use the following guidelines:
 1. Harvest any time from October 1 - March 1 to maximize the vigor of resprouting.
 2. Follow "Wisconsin's Forestry Best Management Practices for Water Quality", such as harvest only when the ground is firm (dry) or frozen to minimize rutting by wheeled or tracked vehicles.
 3. When cutting trees, care must be taken to avoid damaging the residual trees – the trees that are not harvested.
 4. Design the harvest to maintain maximum screening by residual trees.
- Control cottonwood just outside the perimeter of the stand. Harvesting will trigger cottonwood to resprout within the stand as well as outside. To contain the cottonwood to the original stand, annual herbicide control of resprouts outside the stand will be necessary, especially the summer following a harvest.



Fig. 36. Cottonwood Groves (striped areas).

Make tree harvesting an educational event. (Not just the cottonwood but also the trees that will need to be cleared for prairie and oak savanna restoration.) Demonstrate the different techniques available for felling, moving, and utilizing trees. This could include hand felling using chain saws or more industrial logging equipment, such as feller bunchers, tree shears, and cut to length tree harvesters (Fig. 37), although it may be difficult to attract large equipment operators for such a small harvest. Downed logs could be transported by traditional methods, such as forwarders, or by less traditional methods, such as horses.

It would be best to remove the invasive shrubs growing with the cottonwood prior to harvesting the cottonwood to reduce the risk of spreading and stimulating them. It will also

make harvesting easier and safer. Some can be cleared by forestry mower when clearing is done in other areas of the property, but the mower won't be able to access the interior of the stand.

Cottonwood is dioecious, meaning there are male trees that produce only pollen and female trees that produce only seeds. The fluffy "cotton" often seen floating through the air contains the seed. Because a mature female cottonwood can produce a million or more seeds, it's recommended the first harvest include as many female trees as possible to reduce the number of seeds falling into the prairie and oak savanna areas of the property. Sex can be determined during spring when the trees are flowering and seeding.

Completely removing all of the cottonwood has been suggested as an alternative to their rotational harvest (Friends of Pheasant Branch, pers. com.). This is a viable option that offers the benefits of eliminating cottonwood seed rain and the need to regularly treat the cottonwood suckers that will appear in the prairie and oak savanna. It will also double the volume of wood harvested, which might make a commercial sale viable. The downside is the loss of screening, although this may not be a significant concern because the neighboring properties have mature landscaping and because replacement screening can be provided, and the loss of Bock Forest's best opportunity to demonstrate sustainable forestry practices, especially those related to harvesting.



Fig. 37. Feller Buncher (u), Harvester That Also Cuts to Length (caterpillar.com) (m), and Forwarder To Transport Logs (thetreeharvester.com) (l).

Recommendation 5: Utilize the trees removed during restoration and management activities.

A variety of tree species in a variety of sizes will be cleared from BF, but most will be too small to be a saw log, which is typically the most valuable use for timber, and will therefore have relatively little commercial value. (The cottonwood is large enough for saw logs, but isn't a particularly valuable saw log species.) While small trees are used for pulp (to make paper), it typically takes a much larger volume of trees than BF will be able to produce to attract a commercial buyer, especially in southern Wisconsin where the pulp market is limited to begin with.

Typical methods for disposing of non-commercially valuable woody material include piling and burning, piling and leaving to decompose, chipping, and landfilling. For Bock Forest, however, this material provides an opportunity to showcase sustainable forestry practices by utilizing this “waste” material.

Consequently, you will need to explore more creative outlets for the wood. Suggestions include:

1. Using larger branches and smaller trunks for fencing, signposts, birdhouse posts, or raised bed frames for the community gardens. Wattle fences utilize branches to create functional fencing (Fig. 38).
2. Chipping branches and trunks to create mulch for trails, the community garden, or for sale or free distribution to the public. Do not include buckthorn, honeysuckle, or other seed-bearing invasive species or they will spread to new areas. Box elder, which has limited use as dimensional lumber and firewood, is suitable for chipping.
3. Making dimensional lumber (planks, 2x4s, etc.) on site using a portable saw mill. Custom operators may be willing to purchase otherwise unmarketable material. However, given the currently depressed wood market, it may be difficult to attract a cash buyer. Instead woodworkers, artisans, and hobbyists may be willing to cut and/or mill logs in exchange for a portion of the lumber, or to do the harvesting and/or milling as a public demonstration in exchange for the lumber.

Cottonwood will provide the largest volume of wood (approximately 4,700 board feet if it’s all harvested at once, according to the Holaday plan). However, as the Holaday plan notes, its uses are limited:

Cottonwood can be used for boards and paneling, but never for studs or beams. It is very unstable when drying so it needs lots of restraint. Also, it is not very rot resistant. It is most commonly used for pallets; it is sawn and quickly nailed into pallets before it starts to twist. It’s considered too soft to use for flooring, although it could be used for subflooring. Nice rustic tongue and groove paneling can be made if boards are dried flat with restraint; thicker boards will allow for taking out the defects in the molding process.



Fig. 38. Alternative Wood Uses. Wattle fence made with branches (u) (Marcin Zamorski), rustic park shelter using whole logs (c), and log bench (l) (middlezonemusings.com).

4. Hire a portable saw mill and operator to saw dimensional lumber for sale to the public, for use in City building projects, or for constructing a Bock Forest educational center. The cost will likely be less than purchasing the lumber outright and some operators may be willing to mill in exchange for a portion of the lumber.
5. Whole logs could be used vertically after bark removal in the construction of a rustic, simple, open-sided shelter (Fig. 38) or the educational center.
6. Firewood. Logs not suitable for milling could be cut to length, split, and sold for firewood as a “restoration fundraiser” involving high school students or other volunteer groups.
7. Burls (a large rounded outgrowth on the trunk or branch of a tree) are prized by wood turners. Burls are especially common on cherry, but can occur on any species.
8. Four to six foot long sections of trunk could be placed along trails as a rustic bench (Fig. 38). The cottonwood would be best for this because of their large diameter.
9. Leave logs or parts of logs on the ground for wildlife after removing the branches. Note, however, these may be a hazard while mowing the young prairie and oak savanna plantings, so either mark them or place them conspicuously.
10. Investigate using cut material, especially small diameter brush, for biomass. This will likely require chipping to reduce volume and trucking to a facility. A biomass test project utilizing primarily buckthorn is underway at Kelleher Park in Burnsville, Minnesota (<http://www.forestrycenter.org/headlines.cfm?RefID=105066>).

Recommendation 6: Follow Best Management Practices for Water Quality and Invasive Species.

Best Management Practices (BMPs) for water quality are “voluntary guidelines to help landowners, loggers, and natural resource managers minimize nonpoint pollution from forest management activities” (<http://www.dnr.state.wi.us/forestry/Usesof/bmp>). The manual is available on-line or can be ordered by phone at (608) 267-7494.

Invasive species BMPs are “voluntary practices to integrate with normal forest management that otherwise could be a vector for the spread of invasive species.” The BMPs were finalized February 2009 and a manual will be available soon. Check the Wisconsin Council on Forestry’s website for the manual: <http://council.wisconsinforestry.org>.

Recommendation 7: Retain dead trees when they’re not a safety hazard.

Some of the standing dead trees, also known as snag trees, in the Oak Woodland Unit should be left to provide habitat and food for wildlife unless they are a safety hazard. Snag trees were not

observed in any other unit. Forty-six species of birds, 25 species of mammals, and numerous species of reptiles and amphibians in Wisconsin are dependent on snags (WDNR n.d.).

There are two types of snag trees—hard and soft. Hard snags have rotten centers, a solid exterior, and usually have some limbs still attached. Hard snags make excellent den trees. Soft snags have soft, decayed wood and have usually lost their branches. Soft snags are excellent foraging sites for insect eating birds and make excellent nest sites for cavity nesting birds such as woodpeckers and black-capped chickadees.

Snag trees can be created by girdling or basal bark herbiciding an appropriate tree. Try to select as large a tree as possible since a large tree benefits a greater number and variety of species than a small tree. Trees that are deformed, diseased, or are crowding an oak tree are the best candidates. Select trees a safe distance away from trails. The safety of created snag trees can be improved by topping them off 10 to 20 feet above the ground to produce a branchless stub.

Forty-six species of birds, 25 species of mammals, and numerous species of reptiles and amphibians in Wisconsin are dependent on snags.

Allowing fallen trees to decompose in situ facilitates nutrient recycling and provides important food and shelter for a wide variety of wildlife. For example, downed rotting logs provide excellent shelter for salamanders, moles, shrews, millipedes, and other wildlife of all sizes. Hollow logs are often used as dens. Fallen trees in the Oak Woodland should be left. Consider leaving some of the trees that will be cut during prairie and oak savanna restoration, after removing their branches.

Objective 3: Provide Multiple Opportunities for Education and Recreation

Visitors are offered hands-on and passive educational opportunities. Volunteers are actively recruited to assist with restoration and management. Community access and recreational use compatible with natural resource protection is encouraged. Public safety is protected.

Recommendation 8: Develop community gardens totaling one acre or less.

The residential areas surrounding Bock Community Forest are one of Middleton's lowest income areas (Penni Klein, pers. com.). Devoting one acre or less of BF to low cost or free community gardens offers families the opportunity to grow some of their own food, become involved in the community, and, as outlined below, become part of Bock Forest's restoration and management. Nearness to a public bus route facilitates garden access. Community gardens as outlined below are compatible with the Community Forest concept and the Bock Forest Stewardship Plan (Steve Holaday, Dane County DNR Forester, pers. com.).

Garden plots would be issued with the stipulation that the recipient is required to use a portion of their garden space to grow native plants for Bock Forest. They could grow trees, shrubs, grasses, forbs, or other plants. They could be grown for seeds, transplanting, or both. Since some native species take several years to start producing seed or to grow large enough to transplant, it's probably best to permanently dedicate a section of each plot for growing the native plants so that the plants remain if plot ownership changes. The plots should be slightly oversized to compensate for the portion used for growing the native plants.

Garden plots would be issued with the stipulation that the recipient is required to use a portion of their garden space to grow native plants for planting into Bock Forest.

Fig. 39 shows a suggested location with about 0.8 acres (34,848 square feet) for garden plots with an additional 0.2 acres for composting, tool storage, mulch storage, etc. This location was selected because: it is level and receives day long sunlight; because its corner location reduces habitat fragmentation; and because a dedicated access point away from BF's main access could be easily developed. The one acre of garden space is about five percent of BF's 19.27 acres.

Consider including a native plant demonstration garden as part of the community garden, although in a more visible location, such as near the Highland Way entrance. Labeled plants growing in a mulched bed will help visitors identify the plants they see as they meander the prairie, savanna, and woodland. A native plant garden also provides a wealth of interpretive opportunities, especially if the bed is framed with "waste" wood originating on site, mulched with chips made from wood harvested on site, and the signs utilize waste wood for posts or frames. A native plant demonstration garden also provides additional volunteer opportunities.



Fig. 39. Suggested Garden Location (yellow highlight).

Community Action Coalition of South Central Wisconsin, located in Madison, is a helpful local resource for community garden planning and development assistance. For more information see: <http://www.cacscw.org/index.htm>. For a wealth of information on community garden design, planning, and other issues see: http://www.canh.asn.au/community_gardening/sa-cgkit-Garden.html and http://www.foodshare.net/toolbox_month_design.htm.

See Appendix IV for: a letter from Ms. Stefanie Brouwer, nonprofit grant manager for the WNDNR written in response to a letter from the Friends of Pheasant Branch expressing concern about community gardens in Bock Forest; a respond letter to Penni Klein, City of Middleton public lands manager, written by BioLogic Environmental Consulting; and emails from Steve Holaday, Dane County WDNR forester, discussing the appropriateness of community gardens at Bock Forest.

Recommendation 9: Complete a hazard tree survey.

A certified arborist should complete a hazard tree survey, although you may wish to delay the survey until at least some of the tree clearing has been completed.

As previously noted, snag trees located away from trails may be left for their wildlife value.

Recommendation 10: Use interpretive signs and the kiosk to tell Bock Forest's cultural and natural history.

Enhancing visitors' understanding of the Forest's cultural history, natural features, and management will enrich their visit. Interpretive signs are one way to accomplish this. Interpretive signs may also allay concerns about tree and shrub removal by explaining why it's being done and the benefits that will result.

High quality interpretive signs are available from Badger State Industries in Waupun, Wisconsin. Contact the Madison sales office at 608.240.5207 or visit their website at <http://www.buybsi.com> for more information.

Interpretive signs may allay public concerns about tree and shrub removal.

Signs purchased from Badger State Industries need to be enclosed in a frame and the frame mounted on a post. Best-Ex, Inc. in Baraboo, Wisconsin (800-356-4882 or www.best-exfab.com) makes powder coated aluminum frames to fit any size sign. The frames have tamper proof screws and a solid back. Make sure there is a good seal between the Plexiglas and the frame or water will seep through and damage the sign.

The frames are available with a variety of sleeves to fit onto different types of mounting posts, e.g., a wooden 4" X 4" post or a metal post. The sleeves hold the sign at a 45-degree angle for easy viewing. While a metal post might ordinarily be the best choice for the areas where you will be burning, you may instead want to use wood posts made from on site materials as another demonstration of sustainable forestry practices. Similarly, sign frames could be made from on site materials.

Consider taking "before" photographs from various locations throughout the property. In addition to providing a permanent record that future land managers will find useful, the photos can also be used on interpretive signs. A before photo on an interpretive sign placed at the same location the photo was taken provides the reader with the *before* image, while the view beyond the sign provides the *after* image.

Recommendation 11: Improve the trail system.

The only official trail through Bock Forest is the wide, straight gravel trail that follows an underground utility corridor. While trail aesthetics could be greatly improved by adding

meandering curves to reduce the straight-ahead-view of the water tower, and to narrow the trail to make it more intimate and interesting, preliminary inquiries with City staff seem to suggest these changes are not feasible because of the need to maintain the utility corridor.

Nevertheless, it may be possible to soften the appearance and feel of the trail by reducing the width of the area that's mowed along the sides of the trail. Strategically placed shrubs or groups of shrubs will soften the hard edge and make the water tower less visible. Similarly, specimen oak trees that would eventually send branches over the trail, creating a roof and hiding the water tower, will also soften the trail's hard edge. Make sure anything planted in or near the utility right of way is safe or expendable in case underground utility repairs are needed.

Development of pedestrian footpaths through the restored prairie and oak savanna is highly recommended. These trails could branch away from the main trail near the south end, meander through the prairie and oak savanna and then return to the main trail near the north end of the property.

Delay new trail construction until the area's restoration work has been completed through at least the planting phase. This will protect visitor safety during tree clearing and herbicide application.

The City will need to decide what it wants to do with the existing desire trails (see Fig. 6 on page 12 for their location). Probably the best option is to close them since off-trail travel is not allowed in Conservancy properties and because they lead visitors onto private property. Because the trails are heavily used and long established (they're visible in the 1980 aerial photo), public acceptance of their closure may be difficult and quite possibly lead to new trails forming in different locations.

Benches are highly recommended, especially if made from on site materials. A strategically placed bench along a trail invites lingering and provides an opportunity to rest.

Recommendation 12: Plan for an educational facility.

Contract terms of the WDNR Stewardship grant allow "construction of an educational facility on an area of the Stewardship Property [Bock Forest] that is adjacent to Highland Way that is approximately one-half acre in size for the purpose of providing education to the public concerning the conservation and natural resource aspects of the Stewardship Property, the Pheasant Branch Conservancy, and the surrounding area. The specific location, size, and use of the facility shall be approved by the City, the Friends, the DNR and Dane County."

Given the time and expense associated with prairie and oak savanna restoration, it would be best if the stakeholders would select a location for the educational facility in advance of initiating restoration efforts. The selected area could be cleared of invasive species, but instead of being planted with relatively expensive native species, it could be seeded with

either a less expensive native species mix or non-native species that aren't invasive, such as "no-mow" grass. Advance planning will also allow greater use of trees harvested on site.

Consider starting with a simple, open sided shelter that can be converted to year-round use as funds allow and need dictates.

Objective 4: Minimize Impacts to Adjoining Neighborhoods

The City strives to be a good neighbor by minimizing the impacts of Bock Forest development and use on the adjoining neighborhoods.

Recommendation 13: Provide replacement screening as trees and shrubs are removed from property lines.

Experience shows that neighbors often object to the loss of screening even when it's invasive species being removed. Experience also shows that the same neighbors almost invariably soon appreciate the improved view, better air circulation, fewer mosquitoes, and increased sunlight.

Replacement screening might not be needed because neighboring properties have mature landscaping.

In the case of Bock Forest, the loss of screening may be less of an issue because the adjacent properties have their own mature landscaping and because many of the buildings to the east don't have windows facing Bock Forest.

Nevertheless, you may wish to replace some of the lost screening by planting appropriate native shrubs, which will benefit wildlife as well. See Appendix II for a list of suitable species.

It won't be necessary to provide replacement screening when the cottonwood are cut. This is because they will be rotationally cut, so some screening will always remain, and because the cut trees will vigorously resprout from the roots and quickly grow tall enough to provide screening.

Recommendation 14. Mark property lines.

Posting "Private Lands Beyond" signs along BF's perimeter will discourage visitors from straying beyond its boundaries. In essence, they are a no trespassing sign placed for the benefit of adjoining landowners. Locating signs near the desire trails is an obvious choice.

Objective 5: Utilize External Funding and Partnerships

Public and private funds are obtained for development, restoration, and management. Partnerships are developed with organizations and individuals.

Recommendation 15. Obtain external funding.

Table 11 provides a short list of funding sources for trail maintenance, hazard tree assessment, vegetation management, educational events, and other activities. See the Learning, Experiences, and Activities in Forestry (LEAF) website for an extensive listing of state and national grants: <<http://www.uwsp.edu/cnr/leaf/Resources/grants.aspx>>.

Table 11. Funding Opportunities.

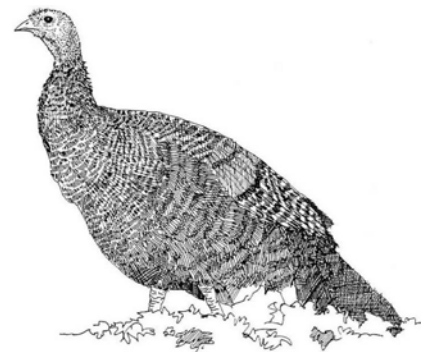
Grant (Source)	Intent	Available Funds.	Match Req.	Due Date	Contact Information
Aids For Acquiring and Developing Local Parks (WDNR)	Helps buy land or easements and develop or renovate local park and rec facilities for nature-based outdoor recreation purposes.	Varies	No	May 1	http://www.dnr.state.wi.us/org/caer/cfa/LR/Stewardship/localparks.html
Recreation Trails Program (WDNR)	Development and maintenance of recreational trails and trail-related facilities for both motorized and non-motorized recreational trail uses.	Varies	Up to 50%	May 1	http://dnr.wi.gov/org/caer/cfa/LR/SECTION/recreails.html
Community Impact (Madison Comm. Found.)	Preserve and restore natural resources. Involve citizens in the stewardship of natural resources.	Varies	No	Jan. 16, July 15	http://www.madisoncommunityfoundation.org/
C.D. Besadny Conservation Grant (Nat. Res. Foundation of WI)	Natural resource projects and programs at a small-scale, local level (<\$10K).	\$100 to \$1.5K	50:50	Jan 15	http://www.wisconservation.org/index.php?page=About_the_Program
Urban Forestry Grant (WDNR)	Projects that improve a community's capacity to manage its trees, e.g. management plans, inventories, training, tree planting, hazard tree assessment, maintenance, and removal.	\$1K to \$25K*	50:50	June (letter of intent)	http://www.dnr.state.wi.us/forestry/uf/grants/ *funding on hold-check website
Plant Dane! (Graham-Martin Fdn., Dane Co.)	Provide native seeds and plants at reduced cost for rain gardens and restoration projects.			Jan. 31	http://www.myfairlakes.com/plantDane.aspx
N. Am. Assoc. for Enviro. Ed.	Environmental education grant clearing house.				http://eelink.net/grants-eespecificresources.html

Recommendation 16. Link with other organizations.

Create cooperative arrangements with conservation organizations, schools, civic groups, and other to use Bock Forest for field trips, projects, and other educational activities. In exchange, they may be able to supply seeds, plants, or other materials, or labor. Examples include:

1. Dane County Parks (<http://www.countyofdane.com/lwrp/parks/>).
2. Local schools, especially the Middleton-Cross Plains School District.
3. Boy-, Girl-, and Eagle Scouts.
4. Madison Chapter of the Wild Ones, a not-for-profit educational organization promoting “environmentally sound landscaping practices to encourage biodiversity.” Wild Ones information available at www.for-wild.org.
5. Nearby neighborhood associations.
6. Friends of Pheasant Branch. The restoration and management of BF is a major undertaking that will require a significant and sustained effort to make it successful. The assistance and efforts of the organization that spearheaded the drive to create the political entity known as Bock Forest are needed to create the ecological entity.
7. Learning, Experiences, and Activities in Forestry (LEAF) is a state funded partnership between the WDNR-Forestry and the Wisconsin Center for Environmental Education at UW Stevens Point. Its mission is to “advance excellence in K-12 forestry education through partnerships that develop, disseminate, implement, and evaluate relevant resources and services.” Its mission is in perfect alignment with Bock Forest’s Community Forest designation. See their website for a wealth of information: < <http://www.uwsp.edu/cnr/leaf/index.aspx> > .

The assistance of the organization that created the Bock Forest political entity will be needed to create the Bock Forest ecological entity.



IMPLEMENTATION SCHEDULE

Table 12 provides a suggested implementation schedule for the previously outlined activities. The schedule spreads out labor and material costs and allows resources to be focused, increasing the likelihood of success. It also provides the opportunity to “learn as you go.” Nevertheless, the schedule is only a suggestion based on the assumptions listed below. You should adapt it to meet your needs and the available resources.

Assumptions used to develop the implementation schedule include:

1. Staggered implementation schedule to spread out effort and cost. If funding allows this could be compressed to speed BF’s restoration and to reduce some costs.
2. Cost per unit area decreases as the size of the area increases. Thus, other things being equal, it is most cost effective to treat as large an area as resources allow.
3. Oak savanna restoration will start before prairie restoration because it requires more time to complete because of the need to have mature oak and hickory trees.
4. It’s best to delay planting until the weeds are under control.
5. It’s best to begin interpretive shelter planning as soon as possible, even if construction is years away.

If the 2009 budget allows, the most cost effective approach will be to initiate restoration of the Brushland, Old Field, and Hay Field Units during 2009. This would include clearing all of the trees and brush, other than the cottonwood, followed by herbicide treatment of these areas to control regrowth and resprouts, and then planting when the weeds have been subdued, possibly during fall 2009 but more likely during 2010.

Even if funding does not allow the entire site to be cleared, sprayed, and planted, consider clearing the brush and trees from the entire site anyway. Then, spray and plant as much as the budget allows, and mow the balance several times a year to keep the weeds in check until additional funds are available. This approach will jump-start the restoration process and prevent many of the weeds from becoming more deeply entrenched.

Table 12. Implementation Schedule.

Objective and Recommendation	Year ¹						Comments
	2009	2010	2011	2012	2013	2014-2018	
Objective 1: Develop and Maintain a Variety of Native Plant Communities							
R 1: Restore the Brushland Unit and the Hay Field West Subunit to Oak Savanna.	brush, prep	prep, plant	mgmt	mgmt	mgmt	mgmt	Start with tree and brush removal, continue with herbaceous weed and brush resprout control, fall planting preferred, delay planting until weeds are under control.
R 2: Restore the Old Field Unit to Prairie.	brush	prep	prep, plant	mgmt	mgmt	mgmt	Clear brush at same time as Brushland for cost savings. If budget and resources allow, could prepare and plant on same schedule as Brushland Unit.
R 3: Enhance Ecological Conditions in the Oak Woodland.	brush, weeds	burn, weeds	plant, weeds	mgmt	mgmt	mgmt	Clear brush from south edge at same time as other units for cost savings, but no tree and brush work between 4/1 and 10/1 to minimize oak wilt risk, except for hazard trees.
Objective 2: Practice Sustainable Forestry							
R 4: Harvest cottonwood trees from the Old Field and Brushland Units.		cut 1 st 50%				cut 2 nd 50%	Cut 50% of stand in 2010, the other 50% in 2015. Then cut 25% of stand every 10 years. See App. II for details. For alternate option of eliminating all cottonwood, clear as part of prairie and savanna site preparation, or clear all at once to possibly attract a wood buyer.
R 5: Utilize the trees removed during restoration and management activities.	All years						Volume of material will be highest during initial phases of restoration and after rotational cottonwood harvests.
R 6: Follow BMPs for water quality and invasive species.	All years						Especially while harvesting trees.
R 7: Retain dead trees when they're not a safety hazard.	All years						Create dead (snag) trees for wildlife during site preparation activities.
Objective 3: Provide Multiple Opportunities for Education and Recreation							
R 8: Develop community gardens totaling one acre or less.	plan, prep	imple ment					Plan in 2009, begin site preparation in 2009 for spring 2010 use. Include native plant demonstration garden.
R9: Complete a hazard tree survey.	X	X					Consider delaying until after tree and brush clearing is done.
R 10: Use interpretive signs and the kiosk to tell Bock Forest's cultural and natural history.	X	X	X	X	maint	maint	Take before photos in 2009. Signs explaining tree and shrub removal may allay public concerns and should be placed before work starts.
R 11: Improve the trail system.	soften close		expand	expand	expand	expand	Soften gravel trail edges and block water tower view, close desire trails. Expand system into new areas once they're planted.
R 12: Plan for an interpretive center.	X	X					Select location and clear invasive species but plant less expensive cover. Stockpile harvested materials for facility construction.
Objective 4: Minimize Impacts to Adjoining Neighborhoods							
R 13: Provide replacement screening.	Only if needed						Omit if not a concern.
R 14: Mark property lines.	Anytime as needed						Omit if not a concern.
Objective 5: Utilize External Funding and Partnerships							
R 15: Obtain external funding.	All years, all areas						
R 16: Link with other organizations.	As soon as possible						

¹ Year when the indicated activity should be initiated.

ESTIMATED COSTS

Assumptions and Caveats

Table 13 provides a cost estimate for the materials and activities that are expected to be required during the next five years, assuming the Table 12 implementation schedule is followed. Costs beyond five years aren't included because they are difficult to estimate since they depend on what has and hasn't been done in the preceding years and the success of those activities.

The Table is based on 2009 prices from a variety of local contractors and vendors, which are subject to change without notice. Moderate price increases are assumed for subsequent years. **The Table assumes all of the work will be done by contractors.** Using City personnel, volunteers, and Department of Corrections workers will significantly reduce labor costs.

Income that might be generated from the sale or trade of harvested wood products is not included, nor is the value of plant materials grown in the community gardens. You may be able to realize significant savings by taking advantage of economies of scale. For example, the estimated cost to forestry mow the Old Field and Brushland Units at the same time is about \$11,000, but increases to at least \$12,250 if spread over two years.

Seed cost is difficult to estimate because production, and therefore cost, fluctuates annually. Cost also varies with the specifications of the seed mix. Mix specifications that influence cost include:

1. Proportion of grasses and forbs (the grass to forb ratio). Grasses are relatively inexpensive (\$5 to \$30 per pound) while forbs are relatively expensive (\$10 to \$200 per ounce).
2. Seeding rate. The higher the seeding rate (seeds per square foot), the higher the cost, but the better the chances the planting will be successful. Higher seeding rates are recommended for weedy sites.
3. Size of planting area. Most seeds are sold on a tiered pricing system – the more you buy, the less expensive they are per unit weight.
4. The species selected. Species that are easily grown and that produce lots of seed are inexpensive. Others, such as many of the woodland and savanna species, are more difficult to grow and are more expensive.

One way to reduce seed mix cost is to plant a forb-rich mix in the most visible areas and a less showy, less expensive mix in less visible areas.

As previously noted, you are eligible for free tree and shrubs seedlings from the WDNR nursery. However, saplings are not available from the nursery and shrub selection is limited. Consequently, you will need to purchase some woody plant materials from other sources.

Table 13. Estimated Cost.

Labor	Year					Comments
	2009	2010	2011	2012	2013	
Oak Savanna (6.4 ac.)						
Forestry mow and clear trees, Rx burn	6,400					Lower cost if done with other areas, may not burn.
Spray resprouts and weeds (site prep)	1,600	1,700				ATV sprayer, 4x/yr.
Plant site with seed drill and by hand		560				Link with other areas, if possible. Fall planting.
Mow and weed control (post-planting)			3,138	4,224	4,416	Tractor mow 3-4x in 2011. Backpack sprayer or brush saw for 2011-2013 (2x/yr).
Plant oak seedlings and saplings			8,000			65 1.5" caliper saplings (10/ac) and 385 seedlings (60/ac).
Prairie (8.7 ac.)						
Forestry mow and clear trees, Rx burn		7,543				Lower cost if done with other areas, may not burn.
Spray resprouts and weeds (site prep)		1,920	2,160			ATV sprayer, 4x/yr.
Plant site with seed drill and by hand			765			Link with other areas, if possible. Fall planting.
Mow and weed control (post-planting)				3,491	5,244	Tractor mow 3-4x in 2012. Backpack sprayer or brush saw for 2012-2013 (2x/yr).
Oak Woodland (1.0 ac.)						
Clear trees and brush by hand	1,500					May be able to forestry mow south edge at lower cost.
Herbaceous weed control	640	500	450	400	400	Backpack sprayer or brush saw.
Burn		850				Do in conjunction with PB Conservancy.
Seed by hand and plant oak saplings			750			Five 1.5" caliper saplings.
Harvest Cottonwood Trees (2.0 ac.)		6,000				First 50% cut in 2010. Assumes no income from harvest. ~\$11K - \$12K to remove all.
Community Gardens (1.0 ac or less.)	900	1,000				Planning and set up.
Shrub Screening						Only if requested by neighbors.
Labor Total	11,040	20,073	15,263	8,115	10,060	
Materials	2009	2010	2011	2012	2013	
Herbicide, water conditioner, dye, etc.	400	800	600	200	150	
Oak saplings for savanna & woodland			9,800			70 1.5" caliper trees @ \$140 per tree, delivered.
Oak and hickory seedlings			free			From WDNR nursery.
Oak savanna seed mix		5,440				~70 species, ~\$850/ac.
Prairie seed mix			7,395			~70 species, ~\$850/ac.
Oak Woodland seed mix			900			~50 species, ~\$900/ac.
Interpretive signs and frames			660			6 signs, frames, and posts at \$110.
Community garden development	1,500	500	250	250	250	Plots, fencing, signage, native garden, etc.
Materials Total	1,900	6,740	19,605	450	400	
YEAR TOTAL	\$ 12,940	\$ 26,813	\$ 34,868	\$ 8,565	\$ 10,460	

SUMMARY

Land survey records from the 1830s indicate BF was oak savanna when the first white settlers arrived, as was most of southern Wisconsin. It is currently a mixture of old field (former agricultural fields dominated by cool season grasses with a variety of native and non-native forbs, shrubs, and trees), active hay field, and oak savanna that has converted to southern dry-mesic forest comprised of large, mature white and bur oak mixed with smaller and younger box elder, hackberry, black cherry, elm, basswood, and a variety of native and non-native shrubs. Aerial photographs reveal the entire site was cropped since 1937, but likely since much earlier, until the 1970s, except for the forested area.

One hundred and sixty-two species were identified during the survey. Fifty-nine percent of the 162 are native, a relatively low proportion, although not surprising given the site's agricultural history, relatively small size, and the absence of management for the last 30 years. Although the proportion of native species is higher than non-native species, the cover and abundance of the non-native species greatly exceeds native species throughout the entire site, except in the forest where oak and other native trees are dominant. In many areas, the cover is 100 percent non-native, mostly because of dense buckthorn, honeysuckle, and non-native grasses.

Opportunities

When white settlers began arriving in Wisconsin there were an estimated 5.5 million acres of oak savanna and 2.1 million acres of prairie. Almost immediately the prairies and savannas were plowed for agriculture, used (or over-used) for pasture, and invaded by brush and trees following fire suppression, causing their rapid demise. Today, less than 500 acres of oak savanna and less than 2,000 acres of prairie remain. BF offers a wonderful opportunity to restore this lost biological heritage for public education and enjoyment and to benefit prairie and savanna dependant flora and fauna.

BF offers the unique opportunity practice and showcase sustainable forestry in an urban location, including tree harvesting, tree planting, and on-site wood product use. BF also offers opportunities to educate and engage the public in BF's restoration and reforestation, and to provide community gardens with a portion of each garden dedicated to growing plants for BF's restoration.

Realizing these goals for Bock Forest will require a substantial and sustained effort. A significant amount of brush must first be cleared, invasive species eliminated, seeds sown, trees planted and tended, and public awareness raised and involvement gained. Conversion of former cropland covered with buckthorn and honeysuckle to oak savanna, prairie, and oak woodland will not happen overnight, but it is achievable.

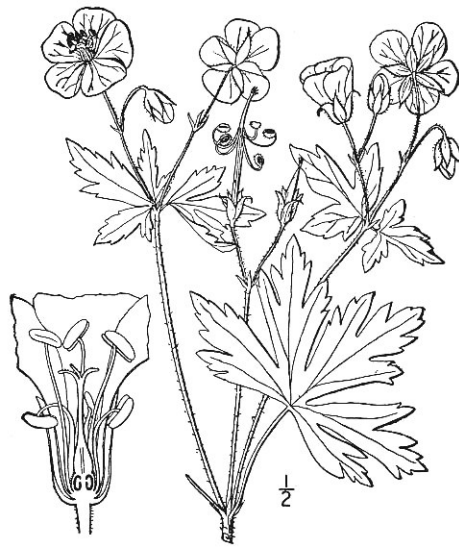
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APPENDIX I

ANNOTATED LIST OF OBSERVED SPECIES



Wild Geranium (*Geranium maculatum*)

Scientific Name	Common Name	Native or Exotic	Invasive Species	Oak	Woodland	Hay Field	Old Field	Brushland	Comments
Forbs									
<i>Acalypha virginica</i>	Three-seeded Mercury	N						X	Prefers shade
<i>Achillea millefolium</i>	Yarrow	N					X		
<i>Agrimonia gryposepala</i>	Agrimony	N					X		
<i>Alliaria petiolata</i>	Garlic mustard	E	X	X			X		Removed during survey
<i>Allium schoenoprasum</i>	Chives	E					X		Horticultural species
<i>Ambrosia artemisiifolia</i>	Common ragweed	N						X	Causes allergies; potentially invasive
<i>Ambrosia trifida</i>	Giant ragweed	N					X		Causes allergies; potentially invasive
<i>Apocynum cannabinum</i>	Indian hemp	N					X		Butterfly plant
<i>Arctium minus</i>	Burdock	E	X	X			X	X	Potentially invasive; agricultural weed
<i>Arisaema triphyllum</i>	Jack-in-the-pulpit	N		X					Prefers shade
<i>Asclepias syriaca</i>	Common milkweed	N				X	X	X	Butterfly plant
<i>Aster ericoides</i>	Heath aster	N					X		Prefers dry soil
<i>Aster lanceolatus</i>	Panicled aster	N					X		More common in sunny wetlands
<i>Aster lateriflorus</i>	Calico aster	N		X					Savanna species
<i>Aster pilosus</i>	Pilose aster	N					X		Can be weedy
<i>Barbarea vulgaris</i>	Yellow rocket	E				X	X		Biennial; agricultural weed
<i>Carduus nutans</i>	Nodding thistle	E	X				X	X	Potentially invasive; biennial
<i>Chenopodium album</i>	Lamb's quarter	E					X	X	Annual; can be weedy
<i>Circaea lutetiana</i>	Enchanter's nightshade	N		X				X	Prefers shade
<i>Cirsium arvense</i>	Canada thistle	E	X				X	X	Perennial; most abundant in Old Field Unit
<i>Cirsium discolor</i>	Field thistle	N					X		Native grassland thistle; desirable
<i>Cirsium vulgare</i>	Bull thistle	E	X	X			X	X	Potentially invasive; biennial
<i>Convallaria majalis</i>	Lily of the valley	E					X		Horticultural species
<i>Conyza canadensis</i>	Horseweed	N					X		Annual; common in disturbed areas
<i>Coronilla varia</i>	Crown vetch	E	X			X	X	X	Highly invasive
<i>Daucus carota</i>	Queen Ann's lace	E	X			X	X	X	Potentially invasive; biennial
<i>Echinacea purpurea</i>	Purple coneflower	E					X		Not native to WI; horticultural species
<i>Erigeron annuus</i>	Daisy fleabane	N					X	X	Annual; common in disturbed areas
<i>Erigeron pulchellus</i>	Robin plantain	N					X		Prairie and savanna species
<i>Eupatorium rugosum</i>	White snake root	N					X	X	Annual; can be weedy

Scientific Name	Common Name	Native or Exotic	Invasive Species	Oak	Woodland	Hay Field	Old Field	Brushland	Comments
Forbs, continued									
<i>Euphorbia esula</i>	Leafy spurge	E	X			X	X	X	Highly invasive
<i>Galium aparine</i>	Cleavers	N			X			X	Annual; prefers shade
<i>Galium boreale</i>	Northern bedstraw	N			X				
<i>Geranium maculatum</i>	Wild geranium	N			X				Woodland edge or savanna species
<i>Geum canadense</i>	White avens	N			X		X	X	Can be weedy
<i>Glechoma hederacea</i>	Creeping Charlie	E				X	X	X	Common lawn weed
<i>Helianthus divaricatus</i>	Woodland sunflower	N					X		
<i>Hemerocallis fulva</i>	Orange daylily	E					X		Horticultural species
<i>Hesperis matronalis</i>	Dame's rocket	E	X	X			X	X	Invasive species
<i>Hieracium caespitosum</i>	Yellow king devil	E					X		
<i>Hypericum perforatum</i>	Common St. John's-wort	E					X		Can be weedy
<i>Hypericum prolificum</i>	Shrubby St. John's-wort	N					X		
<i>Iris sp.</i>	Iris	E					X		Horticultural species
<i>Lactuca canadensis</i>	Wild lettuce	N					X		
<i>Leonurus cardiaca</i>	Motherwort	E					X	X	Perennial; can be weedy
<i>Leucanthemum vulgare</i>	Daisy	E	X				X		Potentially invasive
<i>Linaria vulgaris</i>	Butter and eggs	E					X		Can be weedy
<i>Lotus corniculata</i>	Bird's-foot trefoil	E	X			X			Invasive
<i>Medicago lupulina</i>	Black medic	E					X		
<i>Medicago sativa</i>	Alfalfa	E				X			Agricultural species; perennial
<i>Melilotus alba</i>	White sweet clover	E	X				X	X	Invasive; agricultural species
<i>Melilotus officinalis</i>	Yellow sweet clover	E	X				X	X	Invasive; agricultural species
<i>Monarda fistulosa</i>	Bee balm	N					X	X	Prairie species; butterfly plant
<i>Nepeta cataria</i>	Catnip	E					X		
<i>Oenothera biennis</i>	Common evening primrose	N					X		Prairie species; butterfly plant
<i>Origanum vulgare</i>	Oregano	E					X	X	Horticultural species; patches in some areas
<i>Oxalis stricta</i>	Yellow wood sorrel	N			X			X	
<i>Pastinaca sativa</i>	Wild parsnip	E	X				X	X	Sap causes chemical burn to exposed skin
<i>Physalis heterophylla</i>	Ground cherry	N					X	X	
<i>Physalis virginiana</i>	Virginia ground cherry	N					X		

Scientific Name	Common Name	Native or Exotic	Invasive Species	Oak	Woodland	Hay Field	Old Field	Brushland	Comments
Forbs, continued									
<i>Pilea pumila</i>	Clearweed	N		X					Stem is translucent
<i>Plantago lanceolata</i>	English plantain	E					X		Lawn weed
<i>Plantago major</i>	Common plantain	E				X	X		Lawn weed
<i>Podophyllum peltatum</i>	May apple	N		X					Fruit is a walnut-sized 'apple'
<i>Polygonum pensylvanica</i>	Smartweed	N						X	
<i>Potentilla simplex</i>	Common cinquefoil	N					X		
<i>Prunella vulgaris</i>	Heal all	E		X			X	X	
<i>Ratibida pinnata</i>	Yellow coneflower	N					X	X	Prairie species; butterfly plant
<i>Rudbeckia hirta</i>	Black-eyed Susan	N					X		Prairie species; butterfly plant
<i>Rumex crispus</i>	Curly dock	E				X	X	X	Potentially invasive; perennial
<i>Scrophularia lanceolata</i>	American figwort	N		X					Savanna and forest species
<i>Senecio pauperculus</i>	Ragwort	N					X		Prairie species; butterfly plant
<i>Silene vulgaris</i>	Bladder campion	E					X	X	
<i>Smilacina racemosa</i>	False Solomon's seal	N		X				X	
<i>Solidago canadensis</i>	Canada goldenrod	N				X	X	X	Can be invasive
<i>Solidago juncea</i>	Early goldenrod	N					X		Prairie species
<i>Stellaria media</i>	Common chickweed	E					X		
<i>Taraxacum officinale</i>	Dandelion	E				X	X	X	Lawn weed
<i>Teucrium canadense</i>	Germander	N		X				X	Savanna species
<i>Tragopogon dubius</i>	Goat's beard	E				X	X	X	
<i>Trifolium pratense</i>	Red clover	E				X	X		Agricultural species
<i>Trifolium repens</i>	White clover	E					X		Agricultural species
<i>Urtica dioica</i>	Stinging nettle	N		X			X	X	Has stinging hairs
<i>Verbascum thapsus</i>	Common mullein	E	X				X		Potentially invasive
<i>Verbena urticifolia</i>	White vervain	N					X		Savanna species
<i>Veronicastrum virginicum</i>	Culver's root	N					X		Prairie species
<i>Viola pensylvanica</i>	Smooth yellow violet	N					X	X	Forest and woodland species
<i>Viola sororia</i>	Woolly blue violet	N		X				X	Forest and woodland species
<i>Yucca flaccida</i>	Yucca	E					X		Horticultural species

Scientific Name	Common Name	Native or Exotic	Invasive Species	Oak	Woodland	Hay Field	Old Field	Brushland	Comments
Vines									
<i>Amphicarpaea bracteata</i>	Hog peanut	N		X					Annual
<i>Convolvulus arvensis</i>	Field bindweed	E					X	X	Can be invasive
<i>Echinocystis lobata</i>	Wild cucumber	N						X	Annual; extravagant flower display
<i>Ipomoea species</i>	Morning glory	E					X		Horticultural species
<i>Parthenocissus quinquefolia</i>	Virginia creeper	N		X			X	X	Climbs trees; produces fruit
<i>Solanum dulcamara</i>	Nightshade	E		X				X	
<i>Vitis riparia</i>	Riverbank grape	N		X			X	X	Climbs trees; produces fruit
Graminoids									
<i>Agrostis gigantea</i>	Redtop	E						X	Agricultural species
<i>Andropogon gerardii</i>	Big bluestem	N					X		Prairie grass; to 8 feet tall
<i>Bromus inermis</i>	Smooth brome grass	E				X	X	X	Agricultural species
<i>Carex blanda</i>	Wood sedge	N		X			X		Somewhat weedy in habit
<i>Carex cephalophora</i>	Oval-headed sedge	N		X			X	X	
<i>Carex muhlenbergii</i>	Sand sedge	N					X		Grows on dry soils
<i>Carex radiata</i>	Eastern star sedge	N		X			X	X	Most often in shady habitats
<i>Carex sp.</i>	Sedge	N		X				X	Sterile
<i>Dactylis glomerata</i>	Orchard grass	E				X	X	X	Agricultural species; short-lived perennial
<i>Elytrigia repens</i>	Quack grass	E					X	X	Agricultural species/weed; can be invasive
<i>Festuca rubra</i>	Red fescue	E						X	Agricultural species
<i>Festuca pratensis</i>	Meadow fescue	E				X	X	X	Agricultural species
<i>Juncus tenuis</i>	Path rush	N		X			X		Tolerates compacted soil
<i>Panicum virgatum</i>	Switch grass	N					X		Prairie grass
<i>Phalaris arundinaceae</i>	Reed canary grass	E	X				X	X	Agricultural species; invasive
<i>Phleum pratense</i>	Timothy	E					X	X	Agricultural species; short-lived perennial
<i>Poa pratensis</i>	Kentucky bluegrass	E				X	X	X	Agricultural and horticultural species
<i>Setaria glauca</i>	Yellow foxtail	E						X	Agricultural weed

Scientific Name	Common Name	Native or Exotic	Invasive Species	Oak	Woodland	Hay Field	Old Field	Brushland	Comments
Trees									
<i>Acer glabrum</i>	Amur maple	E					X		Potentially invasive
<i>Acer negundo</i>	Box elder	N	X	X			X	X	Potentially invasive; fast-growing; short-lived
<i>Acer saccharinum</i>	Silver maple	N					X		Fast-growing; short-lived
<i>Carya cordiformis</i>	Bitternut hickory	N			X				Less wildlife food value than shagbark hickory
<i>Carya ovata</i>	Shagbark hickory	N			X			X	Wildlife food source
<i>Celtis occidentalis</i>	Hackberry	N			X				Wildlife food source
<i>Fraxinus americana</i>	White ash	N					X		Emerald ash borer susceptible
<i>Fraxinus pennsylvanica</i>	Green ash	N					X		Emerald ash borer susceptible
<i>Gleditsia species</i>	Honey locust cultivar	E					X		Horticultural species; only seedlings observed
<i>Juglans nigra</i>	Black walnut	N					X		
<i>Juniperus virginiana</i>	Red cedar	N					X	X	Evergreen
<i>Malus species</i>	Flowering crabapple	E					X	X	Horticultural small tree / large shrub
<i>Populus deltoides</i>	Cottonwood	N					X	X	Fast-growing; short-lived
<i>Populus tremuloides</i>	Quaking aspen	N					X		Fast-growing; short-lived
<i>Prunus serotina</i>	Black cherry	N			X		X	X	Wildlife food source
<i>Pyrus malus</i>	Apple	E			X		X	X	Wildlife food source
<i>Quercus alba</i>	White oak	N			X				Wildlife food source
<i>Quercus macrocarpa</i>	Bur oak	N			X				Wildlife food source
<i>Quercus rubra</i>	Red oak	N			X			X	Wildlife food source
<i>Quercus velutina</i>	Black oak	N			X			X	Wildlife food source
<i>Tilia americana</i>	Basswood	N			X				Fast-growing
<i>Ulmus americana</i>	American elm	N			X		X		Dutch elm disease susceptible
<i>Ulmus pumila</i>	Siberian elm	E	X				X		Invasive species
<i>Ulmus rubra</i>	Red or slippery elm	N			X		X		Dutch elm disease susceptible
Shrubs									
<i>Cornus racemosa</i>	Gray dogwood	N						X	Can be invasive (clonal)
<i>Cornus stolonifera</i>	Red osier dogwood	N					X	X	Can be invasive (clonal)
<i>Crataegus sp.</i>	Hawthorn	N					X	X	Wildlife food source
<i>Elaeagnus umbellata</i>	Autumn olive	E	X				X		Invasive

Scientific Name	Common Name	Native or Exotic	Invasive Species	Oak	Woodland	Hay Field	Old Field	Brushland	Comments
Shrubs, continued									
<i>Lonicera</i> sp.	Honeysuckle	E	X	X		X	X		Invasive
<i>Morus alba</i>	White mulberry	E	X	X		X	X		Potentially invasive
<i>Prunus americana</i>	Wild plum	N					X		Wildlife food source; clonal
<i>Prunus virginiana</i>	Choke cherry	N		X					Can be invasive (clonal)
<i>Rhamnus cathartica</i>	Common buckthorn	E	X	X			X	X	Invasive
<i>Rhus glabra</i>	Smooth sumac	N					X	X	Can be invasive (clonal)
<i>Rhus hirta</i>	Staghorn sumac	N					X	X	Can be invasive (clonal)
<i>Ribes cynosbati</i>	Prickly gooseberry	N		X					
<i>Ribes rubrum</i>	Garden current	E		X					Horticultural species
<i>Rosa multiflora</i>	Multiflora rose	E	X	X			X		Invasive
<i>Rubus idaeus</i>	Red raspberry	N		X			X		Potentially invasive in sunny habitats
<i>Rubus occidentalis</i>	Black raspberry	N		X					Potentially invasive in sunny habitats
<i>Salix exigua</i>	Sandbar willow	N					X		More common in wet soil
<i>Sambucus canadensis</i>	Elderberry	N		X			X	X	Wildlife food source
<i>Toxicodendron rydbergii</i>	Poison ivy	N		X					
<i>Viburnum lentago</i>	Nannyberry	N		X			X		Wildlife food source
<i>Viburnum opulus</i>	European highbush cranberry	E	X					X	Potentially invasive; native type preferred
<i>Viburnum rafinesquianum</i>	Downy arrowwood	N		X			X		Wildlife food source
Ferns and Fern Allies									
<i>Athyrium filix-femina</i>	Lady fern	N		X					
<i>Onoclea sensibilis</i>	Sensitive fern	N		X					

APPENDIX II

SPECIES RECOMMENDED FOR PLANTING

All of the species listed in the following table don't need to be planted into each planting area. Rather, select appropriate species based on the available funds, current site conditions, especially the amount of sun / shade, the availability from local nurseries, and other factors.



Special Planting Instructions	Light ¹			Scientific Name	Common Name	Flower Color	Flower Period	Height	Comments
	SH	PS	FS						
				Graminoids			A M J J A S O		
Use light seeding rate			X	<i>Andropogon gerardii</i>	Big Bluestem			3-8'	Tall; purple tinged foliage; sod former
			X	<i>Bouteloua curtipendula</i>	Side-oats Grama			2-3'	Short stature; orange "flower"
Especially recommended	X	X		<i>Brachyelytrum erectum</i>	Long-awned Wood Grass			2-3'	Fine texture; not aggressive; does best in light shade
		X	X	<i>Bromus kalmii</i>	Prairie Brome			1-3'	Fine texture
Especially recommended		X		<i>Bromus pubescens (purgans)</i>	Hairy Wood Chess			2-5'	Slightly fuzzy seed heads
Spot plant-expensive		X		<i>Carex bicknellii</i>	Copper-shouldered Oval Sedge			1-3'	Oval shaped flowers at tips of stems
Spot plant-expensive	X	X	X	<i>Carex blanda</i>	Common Wood Sedge			3-6"	Broad leaves; grows readily
Spot plant-expensive		X	X	<i>Carex cephalophora</i>	Oval-headed Sedge			6-16"	Greenish-yellow seedhead
Spot plant-expensive	X	X		<i>Carex gracillima</i>	Graceful Sedge			1-2'	Arching form; dangling seedheads
Spot plant-expensive		X	X	<i>Carex muhlenbergii</i>	Sand Sedge			2'	Seedhead at tip of stem
Spot plant-expensive	X	X	X	<i>Carex pensylvanica</i>	Common Oak Sedge			6-12"	Fine texture; will spread; foliage usually yellow-green
Spot plant-expensive	X	X		<i>Carex radiata</i>	Eastern Star Sedge			6-8"	Very fine texture; grows in clumps
Spot plant-expensive	X	X		<i>Carex sprengelii</i>	Long-beaked Sedge			1-2'	Seed heads dangle from ends of stems
Use light seeding rate		X	X	<i>Elymus canadensis</i>	Canada Wild Rye			3-6'	Short lived; cool season; curly seed head
Especially recommended	X	X		<i>Elymus hystrix</i>	Bottlebrush Grass			3'	Seed head looks like a bottlebrush
Especially recommended	X	X		<i>Elymus villosus</i>	Silky Wild Rye			1-3'	Cool season; clump forming
Especially recommended	X	X	X	<i>Elymus virginicus</i>	Virginia Wild Rye			2-4'	Cool season; clump forming
Use light seeding rate		X	X	<i>Juncus tenuis</i>	Path Rush			6"	Tolerates soil compaction and foot traffic
Especially recommended	X	X	X	<i>Muhlenbergia racemosa</i>	Upland Wild Timothy			2-3'	Fine texture foliage
Use light seeding rate		X	X	<i>Panicum virgatum</i>	Switch Grass			3-6'	Tall, but fine textured
		X	X	<i>Schizachyrium scoparium</i>	Little Bluestem			2-3'	Fine texture; white feathery seed head
Use light seeding rate		X	X	<i>Sorghastrum nutans</i>	Indian Grass			3-6'	Rich golden brown feather-like seed head
Spot plant-expensive		X	X	<i>Sporobolus heterolepis</i>	Prairie Dropseed			2-4'	Forms arching mounds; elegant; fragrant
				Forbs					
Especially recommended	X	X		<i>Actaea rubra</i>	Red Baneberry	Wht	J	1-2'	Gum drop shaped flower; bright red berries; attractive foliage
Especially recommended		X		<i>Agastache nepetoides</i>	Yellow Giant Hyssop	Yel	J J A S	5-6'	Wisconsin Threatened; easily from seed
Especially recommended		X		<i>Agastache scrophulariaefolia</i>	Purple Giant Hyssop	Purp	J A S O	4-6'	Tall plant with lots of thimble shaped flowers
	X	X	X	<i>Allium canadense</i>	Wild Garlic	Pink	M J J	6-20"	Can divide the edible bulb; butterfly plant
		X	X	<i>Allium cernuum</i>	Nodding Onion	Lav	J A	6-12"	Edible bulb
Especially moist areas		X	X	<i>Anemone canadensis</i>	Canada Anemone	Wht	M J	6-18"	Will slowly spread; low-growing
		X	X	<i>Anemone cylindrica</i>	Thimbleweed	Wht	J J	2-3'	Silky petals; thimble shaped seed head
Spot plant	X	X		<i>Anemone quinquefolia</i>	Wood Anemone	Wht	A M	3"	Early spring bloomer; forms patches
		X	X	<i>Anemone virginiana</i>	Thimbleweed	Wht	J J	2-4'	Thimble shaped seed head
Especially recommended	X	X	X	<i>Aquilegia canadensis</i>	Wild Columbine	Red & yel	A M J	1-3'	Butterfly plant; self sows

Special Planting Instructions	Light ¹			Scientific Name	Common Name	Flower Color	Flower Period	Height	Comments
	SH	PS	FS						
				Forbs, continued			A M J J A S O		
Spot plant	X	X		<i>Arisaema triphyllum</i>	Jack-in-the-pulpit	Grn	A M J J	1-2'	Unique flower shape; red berry cluster in fall
Spot plant		X		<i>Asclepias exaltata</i>	Poke Milkweed	Wht	J A	2-4'	Savanna specialist
Especially recommended		X	X	<i>Asclepias purpurascens</i>	Purple Milkweed	Purp	J J	2-4'	Wisconsin Threatened; savanna specialist; butterfly plant
		X	X	<i>Asclepias syriaca</i>	Common Milkweed	Crm-pink	J A S	2-3'	Butterfly plant; very showy; monarch larvae food source
Especially recommended		X	X	<i>Asclepias tuberosa</i>	Butterfly Weed	Org	J J A	2-3'	Butterfly plant; very showy; monarch larvae food source
		X	X	<i>Aster azureus</i>	Sky Blue Aster	Blue	S O	1-4'	Sky blue color; butterfly plant
Especially recommended		X	X	<i>Aster cordifolius</i>	Heart-leaved Aster	Blue	A S O	2-4'	Leaves are heart-shaped
		X	X	<i>Aster laevis</i>	Smooth Aster	Blue	A S O	3-5'	Butterfly plant; foliage is smooth; butterfly plant
Near edges	X	X		<i>Aster lateriflorus</i>	Calico Aster	Wht-blue	A S O	1-3'	Arching form; lots of small flowers
		X	X	<i>Aster novae-angliae</i>	New England Aster	Purp-blue	A S O	2-5'	Butterfly plant; very showy; late season color
Use light seeding rate		X	X	<i>Aster pilosus</i>	Frost Aster	Wht	S O	2-5'	Butterfly plant; abundant, small flowers; can be weedy
Especially recommended	X	X		<i>Aster sagittifolius</i>	Arrow-leaved Aster	Blue	A S O	2-4'	Leaves are arrow-shaped; fall color
	X	X		<i>Aster shortii</i>	Short's Aster	Blue	A S O	2-3'	Small flowers, but showy
		X	X	<i>Astragalus canadensis</i>	Canada Milk Vetch	Crm-yel	J J A	1-4'	Pea-like flowers held above foliage; legume
		X	X	<i>Baptisia leucantha</i>	White Wild Indigo	Wht	J J	3-4'	Legume; flowers held above foliage on tall stem
		X	X	<i>Baptisia leucophaea</i>	Cream Wild Indigo	Cream	M J	1-3'	Legume; drooping foliage and flower stalks
Especially recommended		X	X	<i>Cacalia atriplicifolia</i>	Pale Indian Plantain	Wht	J A S	3-6'	Leaves white underneath; red stem; distinctive foliage
	X	X		<i>Cacalia muhlenbergii</i>	Great Indian Plantain	Wht	J A S	5-7'	Wisconsin special concern
Especially recommended	X	X	X	<i>Campanula americana</i>	Tall Bellflower	Blue	J A S	3-5'	Biennial; butterfly plant; flowers star-like
		X	X	<i>Cirsium discolor</i>	Prairie Thistle	Pink	J A	3-7'	Native thistle; butterfly and insect plant; leaves white below
		X		<i>Coreopsis palmata</i>	Stiff Coreopsis	Yel	J J A	12-30"	Butterfly plant; spreads
Use light seeding rate		X	X	<i>Desmodium canadense</i>	Canada Tick-trefoil	Purp	J A	3-5'	Nitrogen fixer; aggressive
Spot plant-expensive		X	X	<i>Dodecatheon meadia</i>	Shooting Star	Lav-wht	A M J	4-6"	Flower looks like a shooting star; spreads slowly
Especially recommended		X	X	<i>Echinacea pallida</i>	Pale Purple Coneflower	Lav	J J	2-4'	Butterfly plant; threatened in WI
		X		<i>Eryngium yuccifolium</i>	Rattlesnake Master	Wht	J A S	3-5'	Attracts many insects; butterfly plant
Especially recommended		X		<i>Eupatorium purpureum</i>	Sweet Joe Pye Weed	Pink	J A S	3-8'	Aromatic; flowers in open domes; butterfly plant
Use light seeding rate		X	X	<i>Eupatorium rugosum</i>	White Snakeroot	Wht	J A	2-4'	Can be weedy; annual
Spot plant-expensive		X	X	<i>Euphorbia corollata</i>	Flowering Spurge	Wht	J J A	2-4'	Seed head explodes to disperse seeds
	X	X	X	<i>Fragaria virginiana</i>	Wild Strawberry	Wht	M J J	3-8"	Wildlife food; will spread; produces edible fruit
Spot plant-expensive		X		<i>Geranium maculatum</i>	Wild Geranium	Lav-purp	A M J J	1-2'	Very showy; will spread; shade tolerant
		X	X	<i>Gaura biennis</i>	Biennial Gaura	Pink	J A S	5-6'	Tall, rangy plant; biennial
Especially recommended		X		<i>Helianthus divaricatus</i>	Woodland Sunflower	Yel	J A S	3-5'	Flowers like small sunflowers; birds eat the seeds
		X	X	<i>Helianthus occidentalis</i>	Western Sunflower	Yel	J A S	1'	Leaves at ground level; flowers on tall stem
Especially recommended		X		<i>Helianthus strumosus</i>	Pale-leaved Sunflower	Yel	J A S	3-5'	Flowers like small sunflowers; birds eat the seeds
Use light seeding rate		X	X	<i>Heliopsis helianthoides</i>	Ox Eye Sunflower	Yel	J J A S	2-5'	Forms clumps; butterfly plant
	X	X		<i>Hydrophyllum virginianum</i>	Virginia Waterleaf	Purp	M J	1'	Forms patches; spring color

Special Planting Instructions	Light ¹			Scientific Name	Common Name	Flower Color	Flower Period	Height	Comments
	SH	PS	FS						
				Forbs, continued			A M J J A S O		
		X	X	<i>Kuhnia eupatorioides</i>	False Boneset	Crm-Wht	A S	2-4'	Erect stem with flat flower cluster; gray-green foliage
		X	X	<i>Lactuca canadensis</i>	Wild Lettuce	Yel	J A	3-6'	Flowers turn purple with age; dark green foliage
		X	X	<i>Lespedeza capitata</i>	Roundhead Bush Clover	Crm-Grm	A S O	3-4'	Interesting winter texture; nitrogen fixer
Especially recommended			X	<i>Liatris aspera</i>	Blazing Star	Purp	J A S	2-3'	Very showy; butterfly plant
		X	X	<i>Lobelia spicata</i>	Pale Spiked Lobelia	Lav	M J J	1-2'	Fine texture; early bloomer
		X	X	<i>Monarda fistulosa</i>	Bergamot	Lav	J A S	2-4'	Butterfly and humming bird plant; aromatic
Use light seeding rate		X	X	<i>Oenothera biennis</i>	Common Evening Primrose	Yel	J J A S	2-6'	Biennial; interesting wintertime texture
	X	X		<i>Osmorhiza claytonii</i>	Sweet Cicely	Wht	M J	1-3'	Fern-like foliage; flowers are very small; long, black seeds
		X	X	<i>Parthenium integrifolium</i>	Wild Quinine	Wht	J J A S	2-3'	Flat topped flower clusters somewhat like a cauliflower head
		X	X	<i>Petalostemum candidum</i>	White Prairie Clover	Wht	J J A	1-3'	Butterfly plant; legume; fine texture
Near trail edges		X	X	<i>Petalostemum purpurea</i>	Purple Prairie Clover	Purp	J J A	12-18"	Butterfly plant; legume; fine texture
Especially recommended	X	X		<i>Phlox divaricata</i>	Woodland Phlox	Blue	A M	1-2'	Spreads by rhizomes to form dramatic patches
Especially recommended	X	X		<i>Podophyllum peltatum</i>	May Apple	Wht	A M	1-2'	Apple-like fruit; unique, very large, umbrella-like leaf
Near trail edges	X	X	X	<i>Polemonium reptans</i>	Jacobs Ladder	Lav-blue	A M J	8-12"	Bell shaped flowers; divided foliage
		X	X	<i>Polygonatum biflorum</i>	Solomon's Seal	Yel	J J	2-5'	Arching form with hanging flowers; blue-black berries
		X	X	<i>Polygonatum canaliculatum</i>	Great Solomon's Seal	Yel	M J J	2-4'	Arching form with hanging flowers; blue-black berries
		X	X	<i>Potentilla arguta</i>	Prairie Cinquefoil	Yel	J A S	12-40"	Lower leaves feather-divided
		X	X	<i>Pycnanthemum virginianum</i>	Mountain Mint	Wht	J A S	20-36"	Aggressive; aromatic; butterfly plant
		X	X	<i>Ratibida pinnata</i>	Yellow Coneflower	Yel	J A S	3-5'	Short-lived colonizer; butterfly plant; aromatic seed head
Use light seeding rate		X	X	<i>Rudbeckia hirta</i>	Black-eyed Susan	Yel	J J A S O	2-3'	Biennial; pioneer; butterfly plant
		X	X	<i>Rudbeckia subtomentosa</i>	Sweet Black Eyed Susan	Yel	A S O	3-6'	Large, downy flower heads; butterfly plant
Use light seeding rate		X	X	<i>Rudbeckia triloba</i>	Branched Coneflower	Yel	J A S O	2-4'	Short-lived; butterfly plant; very showy
		X	X	<i>Silphium integrifolium</i>	Rosin Weed	Yel	J A S	4-8'	Tall; unbranched; birds eat seeds
Use light seeding rate		X	X	<i>Silphium laciniatum</i>	Compass Plant	Yel	J J A S	5-9'	Prairie giant; butterfly and bird plant
Use light seeding rate		X	X	<i>Silphium perfoliatum</i>	Cup Plant	Yel	J A S	5-9'	Birds drink from leaf "cups"; butterfly plant
Use light seeding rate		X	X	<i>Silphium terebinthinaceum</i>	Prairie Dock	Yel	J A S	5-8'	Taproots reach 9-12' deep; butterfly and bird plant
		X	X	<i>Smilacina racemosa</i>	False Solomon's Seal	Wht	J J	2-3'	Arching form; flower cluster at tip; red berries
Especially recommended	X	X		<i>Solidago flexicaulis</i>	Zig Zag Goldenrod	Yel	A S O	2-3'	Stem zig-zags; fall color; will spread
		X	X	<i>Solidago nemoralis</i>	Old Field Goldenrod	Yel	A S O	1-2'	Arching form; butterfly and insect plant
Use light seeding rate		X	X	<i>Solidago rigida</i>	Stiff Goldenrod	Yel	A S O	1-5'	Butterfly plant; roots penetrate to 15'
		X	X	<i>Solidago speciosa</i>	Showy Goldenrod	Yel	A S O	1-4'	Butterfly plant; one of the showiest
Especially recommended	X	X		<i>Solidago ulmifolia</i>	Elm-leaved Goldenrod	Yel	A S O	2-3'	Leaves shaped like elm leaves; will spread
Especially recommended	X	X		<i>Taenidia integerrima</i>	Yellow Pimpernel	Yel	M J	2-3'	Savanna specialist; flowers in umbels; uncommon
Especially recommended		X		<i>Teucrium canadense</i>	Germander	Pink	J A	18-30"	Aromatic; will spread
		X	X	<i>Thalictrum dioicum</i>	Early Meadowrue	Yel-grn	A M	8-20"	Light green, delicate foliage
Especially recommended		X	X	<i>Tradescantia ohiensis</i>	Spiderwort	Blue	M J	2-4'	Butterfly plant; forms arching clumps

Special Planting Instructions	Light ¹			Scientific Name	Common Name	Flower Color	Flower Period	Height	Comments
	SH	PS	FS						
				Forbs, continued			A M J J A S O		
Especially recommended	X	X		<i>Triosteum aurantiacum</i>	Horse Gentian	Yel-grn	M J J	2-3'	Leaves clasp stem; bright orange berry-like seed pod
Use light seeding rate		X	X	<i>Verbena stricta</i>	Hoary Vervain	Blue	J A S	3-6'	Butterfly plant
		X		<i>Verbena urticifolia</i>	White Vervain	Wht	J A	3-5'	Flower in a terminal spike
		X	X	<i>Vernonia fasciculata</i>	Ironweed	Purp	J A S	4-6'	Butterfly plant; very showy; rich color
Especially recommended		X	X	<i>Veronicastrum virginicum</i>	Culver's Root	Wht	J J A	3-6'	Long flower spike; butterfly plant
Especially recommended			X	<i>Zizia aurea</i>	Golden Alexanders	Yel	A M J	1-3'	Butterfly plant
				Shrubs and Vines					
Especially recommended		X	X	<i>Amorpha canescens</i>	Lead Plant	Purp & gold	J J A	30-40"	Shrub; butterfly plant; gray-green foliage
		X	X	<i>Ceanothus americanus</i>	New Jersey Tea	Wht	J J A	18-36"	Shrub; butterfly plant; large clusters of flowers
Especially recommended		X	X	<i>Celastrus scandens</i>	American Bittersweet	Wht	M J	to 25'	Vine; bright orange fruit
		X	X	<i>Clematis virginiana</i>	Wild Clematis	Wht	J J A	to 15'	Vine; seeds have long fuzzy appendage
	X			<i>Cornus alternifolia</i>	Pagoda Dogwood	Wht	M J	to 25'	Shrub; purple-black fruit
Will spread		X	X	<i>Corylus americana</i>	American Hazelnut	Yel	J J	4-10'	Shrub; forms thickets; produces nuts
Especially recommended		X	X	<i>Diervilla lonicera</i>	Bush Honeysuckle	Yel	J J	6-20"	Shrub; a native honeysuckle; not aggressive
		X	X	<i>Physocarpus opulifolius</i>	Ninebark	Wht	J J	3-10'	Shrub; ball-like flowers; flaky bark
Will spread		X	X	<i>Prunus americana</i>	Wild Plum	Wht	M J	6-10'	Shrub; forms thickets; produces plums eaten by wildlife
		X	X	<i>Rosa blanda</i>	Early Prairie Rose	Pink	J J	3-5'	Shrub; butterfly plant; red rose hips in fall
		X	X	<i>Rosa caroliniana</i>	Pasture Rose	Pink	J J A	2-4'	Shrub; butterfly plant; red rose hips in fall
	X	X	X	<i>Sambucus canadensis</i>	Elderberry	Wht	J A	5-10'	Shrub; edible purple-black fruit; wildlife food
	X	X	X	<i>Viburnum lentago</i>	Nannyberry	Wht	M J	8-15'	Shrub; large flower clusters; blue-black fruit; fall color
Especially recommended	X	X		<i>Viburnum rafinesquianum</i>	Arrowwood Viburnum	Wht	M J	8-15'	Shrub; large flower clusters; blue-black fruit
	X	X		<i>Viburnum trilobum</i>	American Highbush Cranberry	Wht	M J	to 12'	Shrub; attractive flowers; red fruit; wildlife food

1: SH is daylong shade (forest light conditions); PS is a mixture of sun and shade (savanna light conditions); FS is full or nearly full sun (prairie light conditions).

APPENDIX III

JOHN C. BOCK COMMUNITY FOREST

STEWARDSHIP PLAN (WDNR 2008)

The following pages contain the 2008 John C. Bock Community Forest Stewardship Plan written by Steve Holaday, the Wisconsin Department of Natural Resources Forester for Dane County, Wisconsin.

JOHN C. BOCK COMMUNITY FOREST STEWARDSHIP PLAN

Name(s) and Address of Landowner(s):

City of Middleton
7426 Hubbard Avenue
Middleton, WI 53562-3118

County: Dane

Town: 7N; Range 9E; Section 6

Total Plan Acreage: 19.27 acres

This forest stewardship plan provides guidance for woodland and oak savanna management on the John C. Bock Community Forest. This guidance may be amended with approval by the DNR forester and a representative of the City of Middleton. A summary of the Wisconsin School and Community Forest Program and its benefits can be found at <http://www.uwsp.edu/cnr/leaf/schoolforest/registration.shtml>

This is a 10-year forestry plan, to be implemented from 2008 to 2017. The objectives of the John C. Bock Community Forest are as follows:

Education Studies: Use the community forest to teach about our natural environment and to promote environmental stewardship through education on proper sustainable forest and ecosystem management with an emphasis on oak savanna and other native WI communities found in the community forest.

Forest Management: Harvest trees when recommended to promote forest health, maintain and restore native plant communities, and provide wood products.

Wildlife: Maintain a diversity of trees, shrubs, forbs and grasses to provide habitat for a variety of wildlife. Deer numbers may be controlled to prevent over-browsing of vegetation.

Aesthetics: Maintain the health of the native ecosystem for aesthetic enjoyment.

Recreation: Maintain hiking trails throughout the woods and oak savanna. Maintain a diverse ecosystem that will encourage passive recreational activities such as bird watching and photography.

Watershed/Water Quality: Follow Wisconsin's Forestry Best Management Practices for

Water Quality. Minimize exposure of bare soil to minimize soil erosion.

Control Invasive Species: Use Best Management Practices (BMPs) for controlling invasive species; prevent new infestations from occurring through continued education and monitoring efforts.

General Forestry Information

Oaks: Oak trees, which are valuable wildlife species, are becoming less common in the forests of southern Wisconsin. Historically, oaks have been part of oak savannas or oak woodlands. Now there is a gradual conversion to more shade tolerant species, such as black cherry, hickory, elm, boxelder, and in some areas, maple and basswood. This conversion is a result of a lack of fire due to European settlement and modern fire prevention, high deer population, invasive species, and lack of proper woodland management. In the past when fires were common, oak trees survived fires and grew well. Now, oaks tend to get shaded out by brush and more shade tolerant trees. However, landowners can follow practices in this plan to restore an oak savanna and keep oaks in their woodlands along with a variety of other desirable tree and shrub species.

Oak wilt: No harvesting should occur in stands containing oak from April 1 to October 1 because of the possibility of infection with the oak wilt disease. It is during that time that the insect that carries the fungus (which is a close cousin to the fungus responsible for Dutch elm disease) is active and may be attracted to fresh wounds on oak trees. For the same reason, no pruning or thinning should take place with oak during that time frame.

Best Management Practices: Follow "Wisconsin's Forestry Best Management Practices for Water Quality" (DNR publication: PUB-FR-093 2003). The field manual lists practices landowners, loggers and land managers should use to protect water quality during forest management activities. Practices addressed include maintaining harvesting equipment to prevent spills and controlling soil erosion on logging or recreation trails. Exposed soil must be seeded to establish vegetation cover. To prevent impacts to mammals and plants, forest management activities, such as harvesting that includes the use of wheeled or tracked vehicles, should operate only during the dormant season (November 1 – March 1) and when the ground is firm (dry) or frozen.

Gypsy Moth: The gypsy moth, an invasive species and present in southern Wisconsin, is an insect that severely defoliates (eats the leaves of) "preferred" trees, such as oaks, aspens, basswoods, white birches, tamaracks and willows. Pines and spruces can be defoliated if in proximity to preferred hardwoods. Heavy defoliation from gypsy moth outbreaks will occur about every 10 years. Defoliation can result in tree death, but with proper forest management, it does not have to. First of all, mortality is typically the result of multiple stresses occurring together. Defoliation, drought, windstorm, other insects, diseases and over-crowding of trees are all tree stressors. Managing your forest to keep trees healthy is your best defense in reducing losses from gypsy moth outbreaks. Completing the thinnings and harvests that are scheduled will promote vigorous growth and tree health. While

beneficial, thinning and harvesting can cause short-term stress, so avoid these practices within a growing season of heavy defoliation or drought. Secondly, maintain a diversity of tree species increasing the proportion of species that are not preferred or avoided by the Gypsy Moth. “Non-preferred” species include maple, hickory, black cherry, black walnut, pines and spruces. Tree species “avoided” by the gypsy moth include ash and white cedar. The Gypsy Moth usually has little impact on conifers in pure conifer stands.

Prior to establishing a harvest or thinning, conduct a survey of gypsy moth egg masses. If sampling indicated a density of gypsy moth egg masses greater than 1,000/acre, delay harvesting or thinning until the outbreak is past and the trees have recovered. Aerial spraying to suppress an outbreak may be an option for protecting regeneration or high value timber. Information on the gypsy moth, how to predict outbreaks and the DNR suppression spray program is available from your local DNR forester.

Property Lines: Property lines should be regularly maintained for general forest management and to help prevent misunderstandings when harvesting or conducting woodland maintenance along a property boundary. Where there are no fences, steel posts at intervals of 100 feet along the line serve as good semi-permanent markers. Painting the tops with bright orange or red paint will make them easier to find later. For property lines adjacent to residential lots, strategically plant native shrubs to provide screening between public and private property.

Wood Utilization: No firewood or other trees may be removed from the community forest area without the prior consent of the City of Middleton. Trees that are cut for forest management purposes that create firewood of any commercial value can be sold to the public to fund restoration or education projects on the community forest. Trees selected for harvest may be sold or used by the city.

Terminology: Forestry related terms that may be used in this plan are defined below.

Forester – an individual trained in the science of forestry with a thorough understanding of the forest ecosystems in which they practice. Such an individual will typically have college education in the forest sciences.

Logger – an individual with an understanding of the practice of felling designated trees efficiently and carefully removing them from the forest.

Harvest – the cutting of standing trees that have merchantable value because they can produce logs, pulp, or other forest products.

Stand – an area with similar timber conditions that is useful to describe and manage the area.

Basal area – a measure of how crowded the trees are in a stand. It is the total cross sectional area of all trees in an acre, expressed in square feet per acre. For example, a 14-inch tree's cross sectional area is approximately one square foot. Basal area for hardwoods commonly range between 60 and 120 square feet per acre.

Thinning – a cutting where some of the trees in a stand are cut to reduce the basal area and encourage better growth of the remaining, or residual trees. If the trees that are thinned out are large enough to have commercial value, this may be termed a “harvest”.

Pruning – the removal of lateral (side) branches from the stem of a tree to encourage growth of clear (knot-free) wood of higher economic value. Typically, the first 17 feet of a tree are pruned to produce a clear 16' log.

Mature, overmature – when applied to trees, mature refers to the point in life when growth has become extremely minimal due to age. An overmature tree has passed the point of maturity and may begin to decline, with such indicators as decay and increasing numbers of dead branches in the crown of the tree.

General Property Description

The John C. Bock Community Forest is located adjacent to and part of the Pheasant Branch Conservancy. The land is adjacent to residential housing to the south and east, and the Pheasant Branch Conservancy to the north and west. A municipal water tower is located along the northern border. The non-wooded land was used for farming until fairly recently, as shown in the soils area photo taken in about 1970. Currently the land cover is approximately 3 acres of woodland and 15 acres of brush and grass with scattered trees. A well maintained gravel trail runs north-south down the middle of the land. The diversity of land cover types provide an exceptional opportunity for students and the community to study a diversity of environments, natural community types, and wildlife habitats, learn about sustainable forest and ecosystem management, and maintain the woodland, plant trees and restore an oak savanna. The community forest is an upland forest. Surface soils are primarily loam and silt loam with slopes ranging from 0-20%; see the attached Soils Resource Map and Descriptions for details.

Natural Heritage Inventory

During a search of Wisconsin's Natural Heritage Inventory (NHI) database, 7 plant species were found on the list. These species are or were observed either on the property or adjacent to it in undisturbed habitat. The plants were listed with a state status as either threatened, endangered or of special concern. To prevent impacts to mammals and plants, forest management activities such as harvesting that include the use of wheeled or tracked vehicles, should operate only during the dormant season (about November 1- April 1) and when the ground is firm (dry) or frozen.

Stands - Management Areas

Four stands were identified during a vegetation inventory of the school forest. A "stand" is an area with similar vegetation conditions that is useful to describe and manage that area. Details of the management recommendations are found under each stand description.

Practices for All Stands

Priority Practices

- Remove hazard limbs or trees. Along any trail system in a wooded area, there may be occasional hazard trees or limbs that should be removed. These can be entire trees or portions of a tree that are dead and could break off and fall on a passerby at any time. Some trees could just be trimmed while others may need to be cut down. An assessment of hazard trees should be made once each year and after large wind or ice storms. The DNR forester can assist with identifying hazard trees. Where dead trees occur away from trails, they may be left standing as they are beneficial to wildlife.
- Control invasive species. Invasive species are trees, shrubs, vines or forbs that spread rapidly and “crowd out” more desirable native trees, shrubs and forbs, thus adversely affecting the natural ecosystem. Invasive species found on this community forest are boxelder, buckthorn, honeysuckle, grapevine and reed canary grass. Also, keep an eye out for garlic mustard and treat it immediately when identified.

Stand 1: 1 acre, O 15+³ / CH 5-11¹

Oak large sawtimber over central hardwood poletimber

Stand Description

This upland oak stand, established in about 1890, is located along the northern border of the community forest. It is adjacent to and part of a larger woodland in the Pheasant Branch Conservancy. The stand slopes to the northwest at about 12%. The soil is McHenry silt loam of medium fertility, described in detail in the “Soils Resources Map and Descriptions”, attached. The stand is dominated by a good stocking of oak large sawtimber (15+ inches in diameter). The volume of large and small sawtimber is 6,600 board feet per acre. The stand has a basal area of 107 square feet per acre.

- Small and large sawtimber species are black oak, red oak, white oak, hickory, black cherry and boxelder.
- The secondary timber type is central hardwoods poletimber (5-11 inches in diameter). The volume of poletimber is 6 cords per acre. Poletimber species are black cherry, black walnut, white oak, black oak, bur oak, elm and boxelder.
- Seedling and sapling species (0-5 inches in diameter) are black cherry, hickory, elm and boxelder.
- Invasive species include buckthorn honeysuckle and boxelder.

Stand Analysis

- Regeneration: Young trees will become the future forest when the existing large trees are gone. The young trees in this stand consist of desirable and undesirable species. The most undesirable tree species are boxelder that should be removed since they are invasive and can crowd out species more desirable for wildlife and timber value. The most desirable existing young tree species for wildlife and timber value are the oaks and black cherry. These most desirable tree species should be “released” by cutting less desirable trees around them that are touching their branches and competing for space and sunlight.
- Basal area and harvesting: The average basal area in this stand is 107 square feet per acre. (Basal area is a measure of how crowded the trees are.) An oak stand with a

basal area of 115 or higher is considered too crowded for optimum growth. In the year 2010 this stand will have a basal area of about 115 and will be ready for a selective harvest to maintain the health and productivity of the woodland. It is unlikely that this harvest will attract a typical logger, but “creative” community members can facilitate selling and using the wood.

Management Objective

Maintain this as primarily an uneven-age oak stand but include a diversity of other tree species through selective thinning, invasive species control and tree planting.

Priority Practices

- Remove hazard limbs or trees, if any. For details, see the previous section “Practices for All Stands”.
 - Control invasive species. For details, see the previous section “Practices for All Stands”.
- Page 5 of 8

Secondary Practices

- Plant tree seedlings. In open areas created by removing invasive species or timber harvesting, plant tree seedlings of desirable species if there is not already adequate regeneration. Plant white oak, bur oak, red oak, black walnut, basswood and sugar maple. Plant larger bare-root stock, such as 2-3 feet tall and 20 feet apart. Protect the trees from deer browse using: bitter tasting sprays on the terminal shoot, dryer cloth or heavy-weight paper folded vertically and stapled around the terminal shoot, or fencing 4-feet tall and 3-feet in diameter around each tree.
- Promote wildlife habitat.
 - Squirrels, large birds and other wildlife will be abundant as long as there are nut-bearing trees like oaks, hickories and walnuts.
 - Leave two to four standing dead trees, or “snags”, per acre to provide shelter for cavity nesting wildlife as well as a food source for insect-feeding songbirds.
 - Use waste logs, branches, and brush from improvement cuttings to form brush piles. Brush piles provide shelter for rodents, rabbits and other small mammals and songbirds. Leave and encourage large rotting logs lying on the ground for more diverse habitat. Plant wildlife shrubs for additional food and habitat.
- Conduct a selection harvest by 2010. The trees in this stand can be selectively harvested at any time following the guidelines below. However, thinning should begin by 2010. A commercial harvest is unlikely but hopefully an “educational” thinning can be organized. This harvest will give small and large trees of good quality more room to grow by removing poorer quality, over-mature, diseased and other at-risk trees. Openings will provide sunlight for natural regeneration or planting of desirable trees. This harvest must use the following guidelines:
 1. Do not harvest from April 1 to October 1 to minimize the spread of oak wilt.
 2. Follow “Wisconsin’s Forestry Best Management Practices for Water Quality”, which includes practices to control soil erosion.
 3. Maintain an average basal area of 60-80 sq. ft. per acre.
 4. Harvesting order of removal:
 - Remove poorly formed trees (crooked, leaning); trees injured by insects, disease or bad weather; and over-mature trees (trees that are beginning to decay or will likely die within 10 years).

- Remove better-formed trees if necessary to reach the target basal area. If possible, focus on areas where oak and other desirable seedlings, saplings and poletimber exist to create small random reforestation openings for young trees to grow in sunlight.
5. When cutting trees, care must be taken to avoid damaging the residual trees – the trees that are not harvested.

Stand 2: 2 acres, CW 11-15² / CW 5-11¹
Eastern cottonwood small sawtimber over eastern cottonwood poletimber

Stand Description

This stand is comprised of 2 areas, one portion along the eastern border and the other portion along the western border. This area is fairly level. Soils are silt loam with high fertility. The trees were established in about 1975. The basal area is 70 square feet per acre.

- This is a nearly pure stand of eastern cottonwood small sawtimber (11-15 inches in diameter). The volume of sawtimber is 2,350 board feet per acre.
- The secondary timber type is eastern cottonwood poletimber (5-11 inches in diameter). The volume of poletimber is 7 cords per acre.

Stand Analysis

Because cottonwood resprouts like aspen when it is clearcut, this stand of cottonwood provides an opportunity to demonstrate sustainable forest management of cottonwood and aspen. Also, the location of the cottonwood trees provide a natural screen between the adjacent apartments and stand 4, where an oak savanna will be established. It is unlikely that these harvests will attract a typical logger, but “creative” community members can facilitate selling and/or using the wood.

Management Objective

Demonstrate sustainable forest management of cottonwood and aspen and provide a visual screen between the adjacent apartments and stand 4, where an oak savanna will be established. Page 6 of 8

Priority Practices

- Remove hazard limbs or trees, if any. For details, see the previous section “Practices for All Stands”.
- Control invasive species. For details, see the previous section “Practices for All Stands”.

Secondary Practices

- Clearcut 50% of the stand in 2010 and clearcut the other 50% of the stand in 2015. Then clearcut 25% of the stand every 10 years thereafter. These harvests must use the following guidelines:
 - 5. Harvest any time from October 1 - March 1 to maximize the vigor of resprouting.
 - 6. Follow “Wisconsin’s Forestry Best Management Practices for Water Quality”, such as harvest only when the ground is firm (dry) or frozen to minimize rutting by wheeled or tracked vehicles.
 - 7. When cutting trees, care must be taken to avoid damaging the residual trees – the

trees that are not harvested.

8. Design the harvest to maintain maximum screening by residual trees.

- Control cottonwood just outside the perimeter of stand 2. Harvesting will trigger cottonwood to resprout within stand 2 as well as outside stand 2. To contain the cottonwood to stand 2, annual herbicide control of resprouts outside stand 2 will be necessary, especially the summer following a harvest.

Stand 3: 1 acre, Grass

Stand Description

This stand consists of fairly level grassland with silt loam soils with high fertility. The grass is currently harvested for hay.

Stand Analysis

This stand is a transition area between stand 1 (oak woodland) and stand 4 (establishing an oak savanna). This transition area provides a good opportunity to plant trees to establish a future forest and educate students and the community about tree planting.

Management Objective

Plant a diversity of trees to establish a tree plantation. Manage it to eventually become a woodland to expand the adjacent woods, identified as stand 1.

Priority Practices

- Establish a tree plantation.
 - Maintain the grass in this stand until preparation for planting.
 - In the late summer before spring tree planting, spray a 2-foot wide strip of glyphosate in the rows where the trees will be planted. Spray rows 9 feet apart or adjust this width depending on the equipment that will be used to mow the grass between the rows the first 3 summers after planting.
 - In the fall before planting, order a diversity of tree seedling species. Order 500 conifers and 500 hardwoods.
 - In the following spring, plant alternating rows of conifers and hardwoods. Contact the DNR forester to schedule the use of a tree planting machine that is pulled behind a tractor of approximately 45 hp.
 - Immediately after planting, spray a pre-emergent herbicide over the top of the dormant tree seedlings.
 - Mow between the rows of trees 4-5 times each summer, including after the first frost in the fall. This will keep the trees from being shaded out and will remove habitat for mice, moles and voles which can chew the bark of trees during the winter months and kill them.
 - Each fall or spring thereafter for 3 years, spray a pre-emergent herbicide over the top of the dormant seedlings.
 - When trees reach approximately 10-feet tall, begin lateral and corrective pruning.
 - Depending on tree survival, the trees will eventually need to be thinned out, depending on tree health and shape, or tree species. Thinning can occur every 10 years or so, first as non-commercial thinning then eventually as commercial thinning.

Secondary Practices

- Control invasive species. For details, see the previous section “Practices for All Stands”.

Stand 4: 15.27 acres, Shrubs over grass

Stand Description

This area is mostly flat with some areas reaching slopes up to 10%. Soils are silt loam with high fertility. Vegetation cover is mostly shrubs and grass with scattered trees. About ½ acre in the far northeast corner includes the adjacent mowed field. Species include black and bur oak, eastern cottonwood, boxelder, elm, red osier dogwood, buckthorn, honeysuckle and reed canary grass. The most desirable tree species for this site is an occasional bur oak sapling. A well-constructed and maintained wide gravel path runs down the middle of this stand.

Stand Analysis

This stand was likely a prairie or oak savanna before European settlement. Oak savannas and prairie once covered a large portion of southern Wisconsin. They provide a unique habitat of plants and associated animals; often these are rare species. Oak savannas (or oak openings) have a maximum 50% tree canopy, intermittent oaks spaced singularly or in clumps (1-15 per acre), occasional shagbark hickory and hackberry trees, and an undergrowth of prairie plants. It is recommended to restore this stand to an oak savanna because:

1. Having an oak savanna would be a unique ecosystem to compare with the ecosystem of a more common oak and central hardwood stands; and
2. The Middleton community supports establishing an oak savanna.

Management Objective

Establish an oak savanna.

Priority Practices

- Establish the oak savanna
 - Flag any existing oak trees that should be preserved for the oak savanna.
 - Remove the large cottonwood trees. Kill the cottonwood trees with herbicide before cutting to prevent resprouting.
 - Remove all remaining trees and shrubs. Either cut and treat the cut stem with herbicide or use a forestry mower to chip the vegetation, then spray herbicide on the resprouts.
 - Kill the existing cool season grasses, including reed canary grass.
 - Plant prairie grasses and forbs.
 - Plant oaks (potted or balled and burlaped). If deer browse is a problem, a fence may need to be placed around each tree.
 - Conduct prescribed burns on a regular basis to encourage native prairie and woodland plants and reduce invasive species. Wet or mow the area around the young oak trees prior to burning to prevent the young oaks from being top-killed by fire.

Utilization of Cottonwood

Cottonwood can be used for boards and paneling, but never for studs or beams. It is very unstable when drying so it needs lots of restraint. Also, it is not very rot resistant. It is most commonly used for pallets; it is sawn and quickly nailed into pallets before it starts to twist. It's considered too soft to use for flooring, although it could be used for subflooring. Nice rustic tongue and groove paneling can be made if boards are dried flat with restraint; thicker boards will allow for taking out the defects in the molding process.

SUGGESTED 10 - YEAR FORESTRY PLAN PRACTICE SUMMARY

This table may be used as a work reminder, referring to the plan for details.

<i>Phase</i>	<i>Stand #</i>	<i>Practice</i>
1	1, 2, 4	Remove hazardous trees or limbs, if any.
1	1, 2	Remove invasive species.
2	4	<u>Establish and maintain oak savanna</u> : Harvest all cottonwood. Remove brush. Kill cool season grasses. Plant prairie grasses and forbs. Plant oaks. Conduct prescribed burns.
3	3	<u>Establish tree plantation</u> : Site preparation for tree planting. Order trees. Plant trees. Apply herbicide annually for 3 years. Mow grass between the rows of trees several times each summer for 3 summers. Prune branches when trees reach 10 feet tall. Thin trees as needed.
4	2	Clearcut 50% of the stand area in 2010. Clearcut the remaining 50% in 2015. Then clearcut 25% of the stand every 10 years thereafter.
4	1	Selection harvest.
5	1	Plant tree seedlings following harvest.

Provide the name, address, and telephone number of the preparer of this plan:

Steve Holaday, Forester
Wisconsin DNR
3911 Fish Hatchery Road
Fitchburg, WI 53711

FOREST STEWARDSHIP PLAN MAP

John C. Boeck Community Forest

Owner's Name <i>City of Middleton</i>	Town or Village Name	County <i>Dane</i>
Street or Route <i>7426 Hubbard Ave.</i>	Township No. <i>7 N</i>	Range <i>9</i>
City, State, Zip Code <i>Middleton, WI 53562-3118</i>	Acres <i>19.27</i>	☒ E ☐ W Section <i>6</i>

Section Diagram
8" = 1 Mile

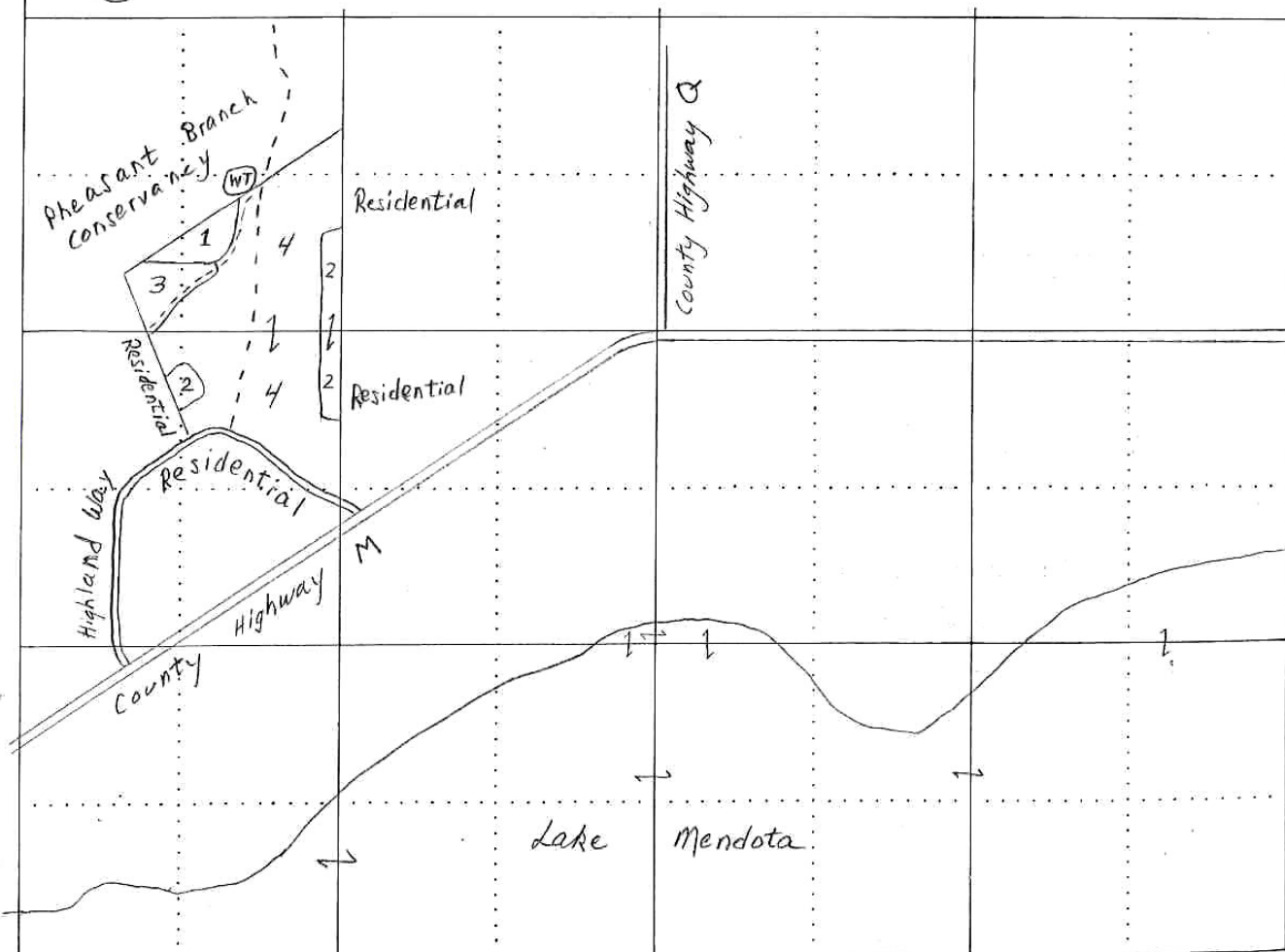


Prepared By *Steve Holaday*
Date *11-12-07*

Legend

- 1 = Stand 1 = 1 acre, Oak large sawtimber over central hardwood poletimber, O 15+³ / CH 5-11¹
- 2 = Stand 2 = 2 acres, Cottonwood small sawtimber and poletimber, CW 11-15² / CW 5-11¹
- 3 = Stand 3 = 1 acre, Grass
- 4 = Stand 4 = 15.27 acres, Upland brush

(WT) = Water Tower



Soils Resources Map and Descriptions

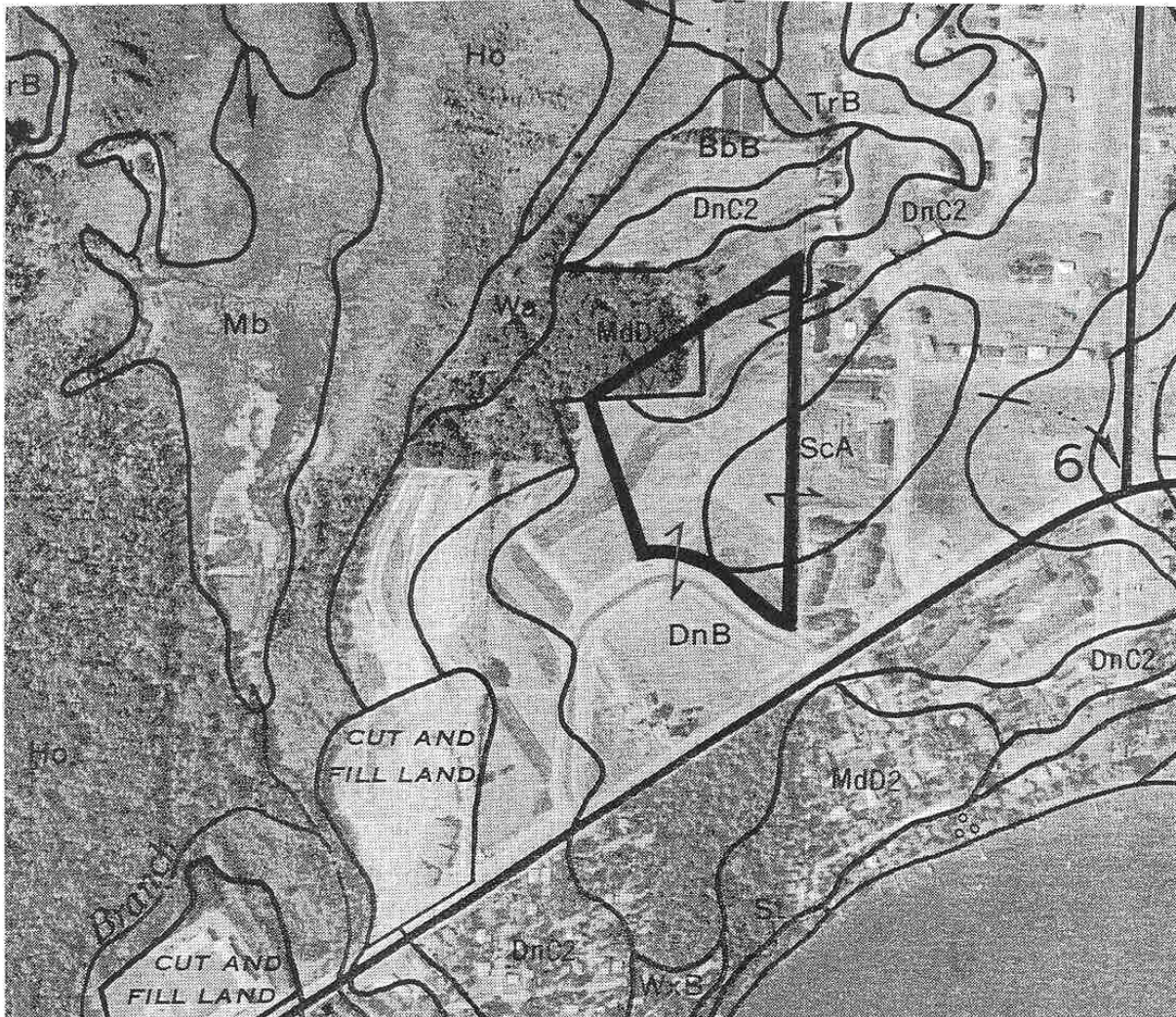
John C. Bock Community Forest, City of Middleton
Township 7N, Range 9E, Section 6

This soils map aerial photo was taken in about 1970.

DnB & DnC2 - Dodge silt loam, 2-6% slopes & 6-12% slopes, eroded. The Dodge soils are deep, well drained soils on glaciated uplands. The soils are 26-36 inches of silt loam loess over calcareous sandy loam glacial till. Soil fertility is high.

MdD2 - McHenry silt loam. 12-20% slopes, eroded. The McHenry soils are deep and well-drained glacial uplands. The surface layer is about 7 inches of silt loam. The subsurface layer is about 26 inches of silty clay loam to sandy clay loam. The depth to calcareous glacial till begins at 24 to 40 inches. Soil fertility is medium.

ScA - St. Charles silt loam, 0-3% slopes. St. Charles soils consist of deep, well drained to moderately well drained soils on glaciated uplands. These soils formed in deep loess and loamy glacial till under mixed hardwoods. The silt loam surface layer is about 9 inches thick. The subsoil is about 41 inches thick of loam, silt loam, and silty clay loam. The underlying material is calcareous sandy loam till. Soil fertility is high.



APPENDIX IV

COMMUNITY GARDEN COMMUNICATIONS

The following pages contain communications regarding the development of community gardens at Bock Forest.



State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Jim Doyle, Governor
Matthew J. Frank, Secretary
Lloyd L. Eagan, Regional Director

South Central Region Headquarters
3911 Fish Hatchery Road
Fitchburg, Wisconsin 53711-5397
Telephone 608-275-3266
FAX 608-275-3338
TTY Access via relay - 711

February 18, 2009

Jim O'Brien, President
Friends of Pheasant Branch
2533 Branch St.
Middleton WI 53562

Subject: Community Garden Issue at the Highland Way property, Pheasant Branch Conservancy

Dear Mr. O'Brien:

Recently you contacted me about the possibility of the City of Middleton using 3 acres of the Highland Way property for community gardens. The property was purchased by the Friends of Pheasant Branch in 2006 with a grant from the Stewardship program and was subsequently assigned to the City of Middleton. The goals of the project (and factors on which it was ranked) were the protection, restoration and enhancement of the natural resource values of the site as an integral part of the Conservancy and lake Mendota Priority Watershed: water quality, wetlands, forest cover (including old growth forests), wildlife habitat, and air quality. Other goals included nature-based outdoor recreation and forestry education. These goals were outlined in the Land Management Section (page 7, # II) of the grant contract (S-ADLP2-902), with the requirement that the completed plan be approved by the DNR, Dane County, the city and the friends. The plan has not yet been completed or submitted for review.

In an earlier discussion with Sally Kefer last year, I indicated that the statutes do not prohibit the use of Stewardship ADLP funds for community gardens and that such a use, depending on size, may be appropriate for the site. However, upon further consideration and consultation with regional resource managers, we cannot support this use for several reasons. First, the Highland Way acquisition was one of the largest investments of public dollars per acre in any one project in the state. Creating community gardens would be a significant change to the original purpose of the grant, affecting 15% of the acreage assisted with the grant. We do not feel that creating community gardens is compatible with the natural resource protection goals for which the project was originally funded. We are concerned about the potential for problems with erosion and runoff; introduction of invasive and nuisance species; chemical use; fragmentation of habitat restoration; and overall management of an intensive public use.

In summary, given these concerns and the lack of a completed Land Management Plan, we cannot support such a use.

Sincerely,

Stefanie Brouwer,
South-Central Region NCO Grant Manager

Cc: Laura Guyer, Conservation Fund Manager, Dane County Land and Water Resources
Kimberlee Wright, Statewide Stewardship NCO Grant Manager, DNR Lands and Facilities

dnr.wi.gov
wisconsin.gov



March 16, 2009

Ms. Penni Klein
City of Middleton
7426 Hubbard Ave
Middleton, WI 53562

Re: Ms. Stefanie Brouwer's letter to Mr. Jim O'Brien dated February 18, 2009 regarding the community gardens proposed for Bock Community Forest

Dear Ms. Klein,

I have reviewed Ms. Brouwer's February 18, 2009 letter to Mr. O'Brien, President of Friends of Pheasant Branch, regarding the placement of community gardens at Bock Forest. Below are my comments on the concerns that have been raised.

Size: The letter indicates a community garden of three (3) acres that would occupy fifteen (15) percent of Bock Forest. In fact, the management plan being developed suggests a maximum size of one (1) acre, which is no more than five (5) percent of Bock Forest's 19.27 acres. I don't know where the three-acre figure originated; it's never been part of the management plan.

Sustainable forestry component: The management plan recommends that each garden plot be *"issued with the stipulation that the recipient is required to use a portion of their garden space to grow native plants for Bock Forest. They could grow trees, shrubs, grasses, forbs, or other plants. They could be grown for seeds, transplanting, or both."* The native plant portion of each garden plot will be permanently dedicated so that the plants remain if plot ownership changes.

This requirement will involve and educate a segment of the public that otherwise might not be involved in natural area restoration and management. It will also provide low cost plant materials for Bock Forest, stretching thin budget dollars.

As a further demonstration of sustainable forestry practices, the management plan specifies that trees cleared during restoration of the property will be used in the gardens for fencing, raised bed frames, sign posts, and other uses. In addition, wood mulch, produced on site from harvested trees, will be used in the gardens.

Fragmentation: The suggested garden location is at the very southeast corner of the property. This location was specifically chosen to avoid habitat fragmentation, allow easy gardener access



Where Science & Stewardship Meet

2505 Richardson Street Fitchburg Wisconsin 53711-5474 Ph. & Fax (608) 277-9960

through a dedicated access point, and to place it away from the main access point to Bock Forest (the gravel trail). If a community garden located at a property corner is a habitat fragmentation concern, then isn't the educational facility being planned also a fragmentation concern?

Erosion: Erosion and runoff are not expected to be a concern. The site is level and essentially flat, making it ideal for gardening. Soil type is Dodge silt loam, which is a deep, well-drained, moderately permeable soil, according to the Dane County soil survey. Garden plots and walkways between plots will be mulched which will increase infiltration and reduce runoff.

Pests: Weed control is typically addressed in the written agreement gardeners sign in order to receive a plot. The gardens are not expected to be a vector for forest diseases such oak wilt and Dutch elm disease, or insects such as gypsy moth, emerald ash borer, and others.

Finally, note that in a series of emails I had with Steve Holaday, WDNR Dane County Forester, in early February 2009, he thought the idea of a community garden was "fantastic" as long as the garden was one (1) acre or less and that it included the requirement to grow native plants for restoring Bock Forest (see enclosed).

Sincerely,

A handwritten signature in black ink that reads "MIKE ANDERSON". The letters are in all caps and have a casual, slightly slanted style.

Michael P. Anderson

enc. Steve Holaday email dated February 12, 2009

BioLogic

From: "Holaday, Steven - DNR" <Steven.Holaday@Wisconsin.gov>
To: "Michael Anderson" <biologic@chorus.net>
Sent: Thursday, February 12, 2009 9:57 AM
Subject: RE: Bock Community Forest

That's certainly not a problem. I'd say if the vegetable garden portion of it were limited to an acre (435 plots) there would not be any issues. I think the tree and prairie nursery side of it is fantastic.

Steve Holaday
Forester

Wisconsin Department of Natural Resources
3911 Fish Hatchery Road
Fitchburg, WI 53711
Phone: 608-275-3234
FAX: 608-275-3338
Email: steven.holaday@wisconsin.gov

From: Michael Anderson [mailto:biologic@chorus.net]
Sent: Thursday, February 12, 2009 7:48 AM
To: Holaday, Steven - DNR
Cc: Penni Klein
Subject: Re: Bock Community Forest

Hi Steve,

Discussion/planning of the community garden is just starting, but 10' X 10' plots have been mentioned. If there were 43 plots of this size (just throwing out a number, here) that would be one tenth of an acre, which would be 0.005% of Bock's total area.

Mike

----- Original Message -----

From: Holaday, Steven - DNR
To: Michael Anderson
Sent: Wednesday, February 11, 2009 3:25 PM
Subject: RE: Bock Community Forest

My management plan contains appropriate management practices in those stands that the John C. Bock Management Plan group from the City of Middleton agreed upon. As far as I am concerned anything can be changed as long as the group agrees on it and, since it is in the School and Community Forest program, I need to approve it as responsible forest and land management.

Regarding the community garden:

- How many acres?
- How many acres for the various uses (trees, prairie plants, vegetables, other)?

3/16/2009

I just want to make sure the non-forestland/wildlife habitat is a fairly small percentage of the entire community forest.

Steve Holaday

Forester

Wisconsin Department of Natural Resources

3911 Fish Hatchery Road

Fitchburg, WI 53711

Phone: 608-275-3234

FAX: 608-275-3338

Email: steven.holaday@wisconsin.gov

From: Michael Anderson [<mailto:biologic@chorus.net>]

Sent: Wednesday, February 11, 2009 2:17 PM

To: Holaday, Steven - DNR

Subject: Re: Bock Community Forest

Hi Steve,

Thanks for the info.

Another question: Does the Stewardship Plan you wrote have the final say on the allowable site uses and mgmt prescriptions? The reason I ask is that I have copies of other documents, some of them only in draft form, that also make mgmt recs, provide a vision for the site, etc. The various plans align closely, but not 100% and I want to make sure whatever I recommend is appropriate.

Mike

----- Original Message -----

From: Holaday, Steven - DNR

To: Michael Anderson

Sent: Wednesday, February 11, 2009 1:59 PM

Subject: RE: Bock Community Forest

With the integration of beds to grow trees, prairie plants for seeds, etc. that sounds appropriate. If at least half of the garden area was for those purposes and the other half or less area was for vegetables for human consumption, that would be appropriate. If this was MFL land there could be no vegetables for human consumption allowed, but the school and community forest program is not so strict.

Steve Holaday

Forester

Wisconsin Department of Natural Resources

3911 Fish Hatchery Road

Fitchburg, WI 53711

Phone: 608-275-3234

FAX: 608-275-3338

Email: steven.holaday@wisconsin.gov

3/16/2009

From: Michael Anderson [mailto:biologic@chorus.net]
Sent: Wednesday, February 11, 2009 12:18 PM
To: Holaday, Steven - DNR
Subject: Bock Community Forest

Hi Steve,

I'm working on the Bock Forest assessment and mgmt plan. There has been some interest in having community gardens on site. Is there any restriction on this type of use at Bock?

One thought would be to include space within the garden that's devoted to raising forbs, grasses, shrubs and tree seedlings for out-planting into the forest, which would provide public education and involvement, and reduce restoration cost. Boles from small trees cleared during the restoration process could be used in the gardens for fence posts, trellis, etc, thereby showcasing sustainable use of forest materials.

Sound reasonable and allowable within the context of a community forest?

Thanks,
Mike

Michael P. Anderson
BioLogic Environmental Consulting, LLC
2505 Richardson Street
Fitchburg, WI 53711-5474
Phone/fax: 608.277.9960
Web: www.gobiologic.com
Email: biologic@chorus.net
Restoring and managing native plant communities since 1996.

3/16/2009