

MIAMI WOODS AND PRAIRIE ECOLOGICAL RESTORATION

**DURING 2010
&
2001 - 2010**



**NORTH BRANCH RESTORATION PROJECT
STEWARDS: Kent & Jerry Fuller 1/25/2011**

TABLE of CONTENTS

	Page
I. SUMMARY	1
Goal	1
Health of Miami Woods and Progress in Restoration	1
II. INTRODUCTION AND BACKGROUND	3
Location	3
Connections	3
History and Early Management	3
Heritage and Restoration Goals	4
Woodland Communities Versus “Unassociated Woody Growth”	5
Openings and Savannas	5
Hydrology and Physical Features	5
III. MANAGEMENT	6
Ecological Health, Habitat, and Five Key Factors	6
1. Seed	6
2. Invasive Species	6
3. Sunlight	6
4. Fire	6
5. Deer	7
Management Stages	7
Management Areas and Units	7
Management Practices	7
Deer Exclosure	7
Monitoring	8
IV. VOLUNTEER ACTIVITY	8
19,000 Hours of Stewardship	9
Workdays	9
Other Volunteer Work	9
Interns	10
FPDCC Staff and Contractors	10
V. EDUCATION	10
VI. CONDITIONS and ACTIVITY BY AREA	11
1. Cathedral Oaks Opening, Savanna, & Woodlands	11
2. Indigo Opening, Savanna, and Woodlands	12
3. Main Prairie and Savanna	12
4. River Woods and Savanna North	13
5. River Woods and Savanna South	14

Figure 1. Aerial Photo with Management Units iii

Figure 2. Management Areas iii

APPENDIXES

Appendix 1 Activities by date

Appendix 2 Activities by Group

Appendix 3 Activities by Year and Management Area

Appendix 4 Restoration Stages

Appendix 5 Status of Invasive Species

Appendix 6 Impacts of Deer

Appendix 7 Management Practices

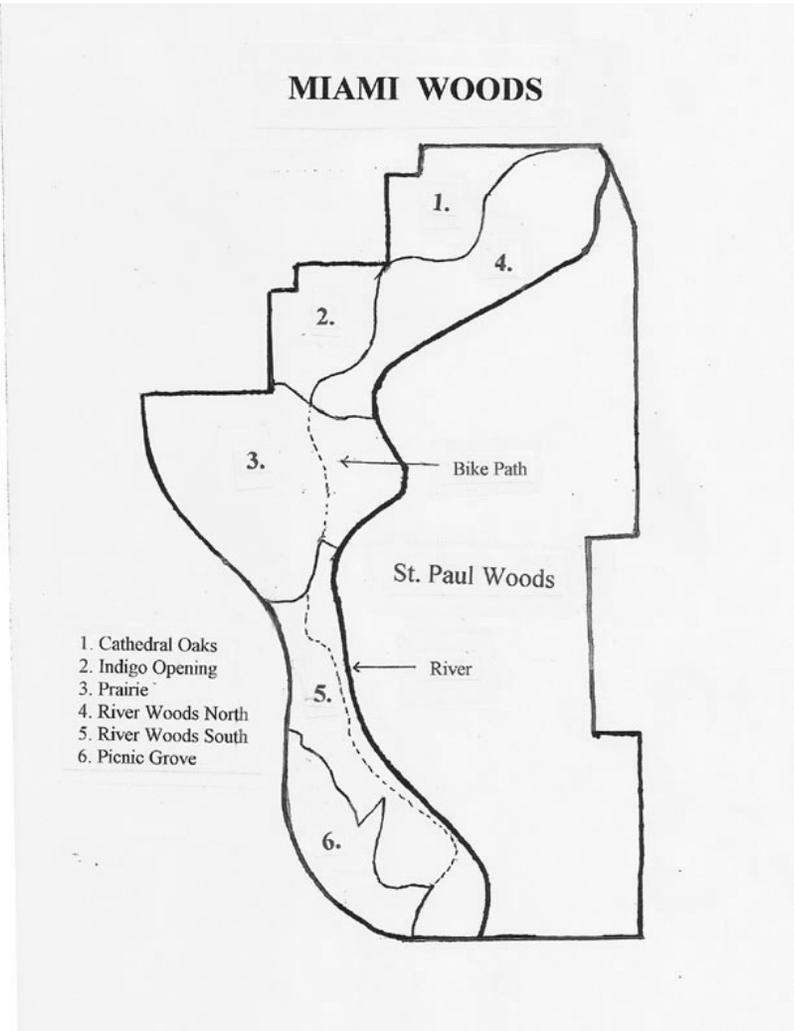
Appendix 8 Trees of Miami Woods

Appendix 9 Tree Diseases

Appendix 10 Shrubs & Vines of Miami Woods

Appendix 11 Herbaceous plants of Miami Woods

Appendix 12 Hydrology and Topography



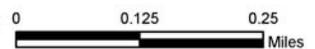
Miami Woods

Land Management Site #1206

Site Extent: 106 Acres Designated Management Units



Note: Volunteer work is focused primarily in areas including and north of Prairie 01 (PR01). It is the mission of the Forest Preserve District to manage all of its remnant natural areas county-wide, including areas outside of volunteer work units.



MIAMI WOODS FOREST PRESERVE ACTIVITIES & PROGRESS DURING 2010

I. SUMMARY

2010 was a busy year in Miami Woods with 42 work events that involved 879 volunteer visits and 2,625 hours of contributed work effort. Excellent progress was made in removing invasive brush and weeds and in thinning fire sensitive trees to allow sunlight to reach the ground. Woodland areas continue to respond, as areas that formerly had no grasses or wildflowers on the ground are now covered with vegetation. Unfortunately the new vegetation is limited to the species not eaten by deer. The excessive number of deer have devoured almost all new growth of plants that they prefer and have completely eliminated some species.

Goal

Our goal for the natural areas of Miami Woods and Prairie is to achieve restoration to the highest quality ecological condition possible using a minimum amount of management intervention. Our approach is to restore natural processes so native species can reproduce and ecological communities will become as diverse and self sustaining as possible.

The Health of Miami Woods and Progress in Restoration

The ecological health of Miami Woods consists of the vitality and diversity of its living things. Hundreds of kinds of native plants and animals live in dynamic balance by competing with and supporting each other. Many non-native species are also present. Most of them are not invasive and do not negatively affect the natural balance. However, a few weedy invasive species multiply disproportionately, destroying natural balances, and reducing diversity.

During the past 9 years the ecological health of Miami Woods has both improved and deteriorated. *The good news* is that as invasive brush and herbaceous species have been removed allowing more light to reach the ground, large areas that had almost no foliage on the woodland floor now have a lush growth of native plants. *The bad news is* that new growth is limited to a relatively few species that are not eaten by deer. The further bad news is that high quality, conservative native plants are losing ground in both the prairie and wooded areas and some have been lost entirely.

The health of Miami Woods depends on many factors, but five are dominant and support it like columns under a building. They are: 1. *availability and dispersal of seed*; 2. control of *invasive species*; 3. availability of *adequate sunlight*; 4. beneficial influence of periodic *natural fire*; and 5. control of *excessive animal populations*, specifically deer.

1. Seed is gathered from the woods and prairie by a team of volunteers that meets weekly

throughout summer and fall to gather seed from various high quality sites along the North Branch. Other volunteers also gather seed during larger fall weekend workdays devoted to seeds. Seed gathered from within Miami Woods is mixed with seed from other North Branch sites and distributed in the recovering portions of the preserves.

2. Control of invasive species is provided by volunteers who have made excellent progress by cutting buckthorn and other brush, pulling garlic mustard, and through selective use of herbicide. This activity absorbs much of the work effort provided by volunteers and is summarized in the table below. During 2010 removal of invasive brush was completed in two of the five management areas in Miami Woods.

3. The need for sunlight reaching the herbaceous layer “on the ground” varies in each ecological community ranging from 100% in the prairie to very little in closed forests. Because of the removal of natural fires, fire sensitive trees have become so abundant that they prevent reproduction of many savanna and woodland species including the reproduction of oaks and hickories. The answer to this is thinning of fire sensitive trees. This is done at the same time as removal of invasive brush or as a later step. During 2010 thinning of fire sensitive trees was completed in two of the five management areas.

4. Fire has been absent from Miami Woods for far too long. None of the wooded areas had been burned within the in past 15 years until management unit WO07 was burned during 2010. This was an important step, but a small fraction of what is needed. The Indigo Opening and a large part of the prairie were burned during 2008 for the first time in more than 10 years, but there was no controlled burning during 2009. Far more burning is needed to support control of invasive species and to stimulate native plants. Volunteers assist in controlled burns, but they are scheduled and led by Forest Preserve District staff.

5. The unmanaged and excessive deer herd is causing major damage to the health of Miami Woods and Prairie. Some species of plants have been completely eliminated by excessive browsing and the deer have eaten virtually all living woodland twigs within their reach except for invasive Tartarian honeysuckle and barberry. There are virtually no uneaten tree seedlings. Sampling of surviving saplings show that none are younger than 10 years and most are considerably older. Since few trees live more than 100 years, trees will be almost gone from Miami Woods by 2090 unless the deer herd is brought under control. Management of animal populations is the exclusive responsibility of Forest Preserve District staff.

During 2010 the focus of volunteer restoration remained on control of invasive species, thinning, and seed gathering and distribution. There were 42 workdays involving 879 volunteer visits, 2,203 hours of brush cutting, and 197 hours of weed pulling. Seed gathering involved 225 hours during workdays. Also the specialty seed gatherers spent 4 days in Miami Woods which included 38 person visits and 96 hours. There were also 488 hours of educational activity.

This year’s activity brought the total volunteer efforts since 2001 to: 247 work events, 6,917

work visits, 14,754 hours of brush cutting, and 2,631 hours of weed pulling. Seed gathering accounted for an additional 1,497 hours and educational activities for 4,228 hours. All in all, this adds up to almost 19,000 hours of donated stewardship volunteer work during organized events since management resumed 9 years ago. If the unrecorded work by stewards and others are added in, total volunteer hours add up to approximately 20,000 hours of hands-on work plus more than 4,000 hours of educational activity.

Workday Summary

Year	Work-days	Visits	Cut Brush	Pull Weeds	Gather Seeds	Education	Total Hours
2010	42	879	2,203	197	*225	488	3,113
2001-09	247	6,917	14,754	2,631	*1,497	4,226	23,110

*Plus many hours by seed team numbers

II INTRODUCTION AND BACKGROUND

Location

Miami Woods extends for one mile along the west side of the North Branch of the Chicago River in the Village of Morton Grove between Dempster and Oakton streets. On the west it is bounded by Caldwell Avenue except for an area of development at the intersection of Dempster and Waukegan Roads. It contains approximately 100 acres of natural area and is mirrored on the east side of the river by St Paul Woods.

Connections

Miami Woods is part of the green corridor of Forest Preserves along the North Branch of the Chicago River extending from its origin in Lake County into the City of Chicago. It is connected by the river and by a paved bike path which attracts many users. Ecologically it is connected with adjacent preserves by the river and physical proximity, but is divided from preserves to the north and south by busy four lane streets. The North Branch Bike Path is a portion of the approximately 20 mile paved path along the river from Devon Street in Chicago to the Chicago Botanic Garden in Glencoe. Within Miami Woods, it is heavily used, especially on weekends.

History & Early Management

For nearly all of the time since the last glacier retreated from our area 100 centuries ago, Miami Woods existed as part of a prairie that extended across much of northeastern Illinois. Other remnants of this prairie within the North Branch watershed include the Glenview Air Station Prairie, Glenbrook Nature Preserve, Somme Nature Preserve, Somme Prairie Grove, the Morton Grove Nature Preserve, Wayside Woods, and others. During the first hundred centuries, prairie plants created the deep black soil found throughout Miami Woods. For about one century the land was farmed and then for a bit less than one century it has been a Forest Preserve.

The Forest Preserve District has as its mandate to “acquire and hold lands containing natural forests, or lands connecting such forests for the purpose of protecting and preserving the flora, fauna, and scenic beauties, and restore, restock, and protect and preserve the natural forests and said lands, together with their flora and fauna, as nearly as may be, in their natural state and condition”. For many years it was assumed that the best way to manage the land was to leave it alone and that nature would “take its course” and restore natural conditions. In recent decades it has become obvious that this policy of benign neglect does not work in situations such as ours where the natural forces of nature are blocked by agriculture or urban development and where invasive species including deer are out of control. Where natural forces such as fire and seed dispersal can’t function or be simulated, natural ecological communities will not develop or be sustained.

Agricultural History

Miami Woods was a part of working farms until acquired by the Forest Preserve District, as can be seen on an aerial photograph from 1925. The main prairie was cultivated as was much of the remainder of the area. Portions not being cultivated appear to have been lightly wooded pasture. The wooded areas had widely spaced trees, many of which are still present and can be seen as large old trees with large lower branches or scars where such branches have been shade killed by later smaller trees. Most of the trees in Miami Woods have appeared since the 1920s, many since the 1950s. In the old photo the current bike path appears to be a narrow unpaved road.

Heritage and Restoration Goals

The preserve contains important remnants of the original prairie and woodlands that formed the natural heritage of the greater Chicago area. (See the Chicago Wilderness Atlas and Recovery Plan at www.chicagowilderness.org) As described in the Chicago Wilderness Biodiversity Recovery Plan, the natural heritage of the greater Chicago region consists of ecosystems which are formed from physical and biological components that provide diverse habitats for communities of plants (flora) and assemblages of animals (fauna).

Our goal for Miami Woods and Prairie (except for parking and picnic areas) is to achieve restoration to the highest quality ecological condition possible using a minimum amount of management intervention. Our approach is to restore natural processes so that native species can reproduce and ecological communities will become as self sustaining as possible. To the extent that natural processes such as prairie fires and seed dispersal can’t be restored, we use management practices including controlled burns and seed gathering to balance negative human impacts.

Our goal can be reached only through partnership with the FPDCC. Volunteers can deliver three of the five critical parts: controlling invasive species, managing sunlight, and dispersal of native seed. Authority for controlled burning and management of the deer herd belongs to the FPDCC and has not been delegated to volunteers although volunteers assist with burns.

Woodland Communities versus “Unassociated Woody Growth”

Because of the agricultural period in Miami Woods and its early history as prairie, together with the impact of deer and invasive plants, its woodland communities are quite weak, having relatively few woodland herbaceous species and almost no native shrubs. Restoring the herbaceous layer is an essential part of converting areas of “unassociated woody growth” into healthy woodlands. Trees are only a part of healthy woodlands and savannas.

Healthy wooded communities are complex interacting ecosystems consisting of many tree, shrub and herbaceous species such as grasses, sedges and broad leafed forbs also known as “wildflowers”. Old agricultural fields left to grow on their own typically develop into a mix of weedy plants usually dominated by invasive species. They are not recognizable as any naturally occurring ecological community, and within the Cook County Forest Preserves are known as “unassociated woody growth

The Openings and Savannas

Three open areas remain within the preserve and contain remnant populations of native prairie fauna and flora. The main prairie contains about 20 acres of open area in contrast to the smaller Cathedral Oaks and Indigo Opening with about 2 and 4 acres respectively. Savanna areas are less well delineated and consist of areas adjacent to the openings where trees have become established and shade covers 10 to 50% of the surface. Invasive species are being removed from those areas and fire sensitive trees are being thinned to encourage savanna shrubs and herbaceous plants.

Hydrology and Topography

The river and its flood plain are the main hydrological features in Miami Woods and form its eastern edge. The river falls only a few feet between Dempster and Oakton Streets and it’s nearly level flood plain varies in width from about 500 feet to zero in places where the river is cutting into upland areas. Much of the flood plain is bordered by relatively steep slopes rising about 5 or 10 feet to the upland. (See appendix 12.)

There are a series of 12 ephemeral streams which enter the river from within the preserve. Nine are fed entirely from within Miami Woods and three receive large amounts of storm water from outside of the preserve. All of them pass through culverts under the bike path. Storm water from outside the preserve comes from impervious pavement and buildings which produce “flashy” surges that are severely eroding the bottom and sides of the streams, especially downstream of the bike path culverts. The little watersheds that are entirely within the preserve provide good opportunities for restoration of wet prairie and sedge meadows.

The main prairie is drained by agricultural tiles, three of which emerge in the river bank areas in the form of 10 inch diameter vitrified clay pipes. Their location within the prairie is mostly unknown. They do not appear to drain areas beyond the preserve since they do not respond rapidly to rainfall events and produce only clear water. Two other large tiles are located further south and have similar flows.

In the past two years several large trees have fallen into the river and provided important aquatic habitat. Unfortunately they were removed, allegedly for flood control purposes. Removal was unnecessary because the flood plain easily accommodates the flow of flood water. The policy on tree removal needs to be reviewed and revised.

III MANAGEMENT

Ecological Health, Habitat, and Five Key Factors

Self sustaining natural communities and their populations are the highest measure of ecological health. All of these populations depend on natural habitats for survival. Habitats consist of physical, chemical and biological components which provide food/nutrients, and shelter.

The health of Miami Woods depends on many factors, but five are dominant and support it like legs of a table. They are: 1. *availability and dispersal of seed*; 2. *control of invasive species*; 3. *availability of adequate sunlight*; 4. *beneficial influence of periodic fire*; and 5. *control of excessive animal populations*, specifically deer. Other factors include hydrological changes, theft of vegetation, excessive predation by raccoons and house cats, but are of lesser impact.

1. *Seed* is gathered from the woods and prairie by volunteers during scheduled fall workdays and by a team that meets weekly throughout summer and fall to gather seed from various high quality sites along the North Branch. Seed gathered from within Miami Woods is mixed with seed from other sites and distributed in the recovering portions of the preserve.

2. *Invasive species* displace native species or prevent their reestablishment through competition for sunlight, moisture, or nutrients. In the case of buckthorn it also changes soil chemistry. Volunteers control invasive species by cutting buckthorn and other brush, pulling garlic mustard, and through selective use of herbicide. Progress is summarized in Section VI and the status of specific invasive species in Miami Woods and Prairie are summarized in Appendix 5.

3. Management of *sunlight* reaching the ground layer is accomplished by reviewing the situation after removal of invasive brush and then thinning fire sensitive trees as needed to reduce competition and provide the amount of sunlight typical of the appropriate ecological community. As the herbaceous community recovers, it helps provide fuel for controlled burns which are the preferred long term management practice. After initial thinning, more thinning may be needed to maintain appropriate sunlight conditions. Some thinning occurs naturally as a result of tree mortality, especially due to Dutch elm disease. Major thinning is about to take place in some management units due to the outbreak of emerald ash borers Appendix 9)

4. *Fire* has been absent from Miami Woods for far too long. All of the management units need to be burned on a two or three year return frequency. None of the wooded areas had been burned within the in past 15 years until management unit WO07 was burned this year. This was a welcome change, but far more burning is needed. In 2008 the portion of the prairie dominated by warm season grasses was burned, but the areas dominated by cool season grasses are in great

need of burning. There was no controlled burning during 2009. Far more burning is needed to support control of invasive species and to stimulate native plants. Volunteers assist in controlled burns, but they are scheduled and led by Forest Preserve District staff.

5. The unmanaged and excessive *deer* herd is causing major damage to the health of Miami Woods and Prairie (Appendix 6). Some species of plants have been completely eliminated by excessive browsing and the deer have eaten virtually all living woodland twigs and seedlings within their reach except for invasive Tartarian honeysuckle. Sampling of surviving saplings show that none are younger than 10 years and most are considerably older. Since few trees live more than 100 years, trees will be almost gone from Miami Woods by 2090 unless the deer herd is brought under control. Management of animal populations is the exclusive responsibility of Forest Preserve District staff.

Management Stages

The general stages of restoration in Miami Woods are: *Stage 1*. Initial control of invasive species; *Stage 2*. Attainment of needed sunlight conditions by thinning of fire sensitive species while continuing aggressive control of invasives and; *Stage 3*. Long term management using controlled burning. (For a further description of restoration stages see Appendix 7.)

Management Areas and Units

For management purposes the Preserve consists of 5 management *areas* which are subdivided into management *units*. The 6th area consists of picnic groves and parking lots and is not managed for ecological purposes. The management *areas* are shown in figure 2.

1. Cathedral Oaks opening, savanna, and woodland
2. Indigo opening, savanna and woodland
3. Main Prairie and Savanna
4. River Woods and Savanna North
5. River Woods and Savanna South

Management *units* are shown superimposed on an aerial photograph in figure 1.

Management Practices

Management practices are the methods used to restore ecological health. Those used in Miami Woods are briefly described in Appendix 7. They are further defined in guidelines developed by the Forest Preserve District.

Deer Enclosure

Deer enclosures are used as a management practice to preserve high value plants and to demonstrate the impact of deer browsing. The prairie enclosure is a 60 foot diameter fenced circle built in early spring of 2007 and the similar woodland enclosure in early 2009. They are intended to prevent extirpation of some species and to serve as an illustration of the problem. During the three growing seasons the prairie enclosure has been in place there have been two major results. The last of the wild indigo is surviving and the plants have gained strength each

year. In 2009 they blossomed and produced seed for the first time in almost 10 years. The second result is that lead plant within the enclosure is blooming and producing seed in contrast to similar plants outside where all new growth has been eaten and no blossoms or seed occur. No major change has appeared within the woodland enclosure during this first year except that wild geranium bloomed there and nowhere else in Miami Woods. A third long narrow enclosure was constructed at the end of 2010 to allow establishment of a visual buffer between the bike path and the parking lot of the Prairie View Shopping center. It will contain American plums and native shrubs that are otherwise being decimated by deer.

Monitoring

Monitoring of Miami Woods is carried out informally by the stewards who continuously observe conditions and on a formal basis by trained volunteers who monitor birds, butterflies, and plants of concern. Formal sampling of plants is also carried out by North Branch volunteers in the form of transect sampling and as part of larger scale woodland audits by the Audubon/Chicago Wilderness woodland audits.

IV. VOLUNTEER ACTIVITY

During this 9th year of renewed management, good progress continued to be toward completing stage one removal of invasive species, primarily buckthorn and related brush from all management units. (Removal was completed in all units within the Cathedral Oaks and Indigo management areas.) Similar progress was made in thinning fire sensitive trees where they are inhibiting herbaceous (ground layer) recovery. (Thinning was completed in all units of the Cathedral Oaks and Indigo Opening management areas.) Seed gathering and sowing continued. The prairie showed the benefits of the 2008 controlled burn, but no controlled burns were conducted during 2009. Woodland unit WO07 was burned during the fall of 2010. Hopefully more will be conducted during the coming year. Unfortunately the improvements resulting from management activities are being overshadowed by the unmanaged and excessive deer herd. The population is ten to twenty times as dense as pre-settlement times with the result that many species of native plants including shrubs are disappearing from the preserve.

During 2010 the focus of volunteer restoration remained on control of invasive species and seed gathering and distribution. There were 42 workdays involving 879 volunteer visits, 2,203 hours of brush cutting, and 197 hours of weed pulling. Seed gathering involved 225 hours during workdays and was supplemented by the specialty seed gatherers who spent 38 person visits and 96 hours gathering seed in Miami Woods. There were also 488 hours of educational activity. (Appendix 1 &2)

This year's activity brought the total volunteer efforts since 2001 to: 247 work events, 6,917 work visits, 14,754 hours of brush cutting, and 2,631 hours of weed pulling. Seed gathering accounted for an additional 1,497 hours and educational activities for 4,226 hours. All in all, this adds up to almost 19,000 hours of donated volunteer work activity during organized events since management resumed 9 years ago. If the unrecorded work by stewards is added in, total volunteer hours add up to substantially more than 20,000 hours. (Appendix 3)

Workday Summary

Year	Work-Days	Visits	Cut Brush	Pull Weeds	Gather Seeds	Education	Total Hours
2010	42	879	2,203	197	*225	488	3,113
2001-10	247	6,917	14,754	2,631	*1,497	4,226	23,110

*Plus many hours by seed team numbers

19,000 Hours of Volunteer Stewardship

The North Branch Restoration Project has been organizing volunteer restoration work in Miami Woods for more than 30 years. Early work focused on the prairie and nearby woods. Work stopped from 1996 through most of 2001 due to a moratorium on management activities, after which brush cutting resumed in December of 2001. From that time through 2010 more than 19,000 hours of volunteer stewardship work have been contributed during 247 work events, primarily to control invasive species and gathering and distributing seed. During 2010 there were 42 work days with 879 volunteer appearances which produced 2,625 hours of work. Additionally there have been 4,228 hours of educational activity, 488 during 2010. (Annex 1 & 2).

Workdays

All work days are organized by the North Branch site stewards. Regular weekend workdays are allocated among sites by consensus among stewards. Other special purpose days are scheduled by the site stewards during the week for the convenience of groups such as schools or corporations. In addition to larger weekend workdays, North Branch mini workdays are held during the week by the Wednesday Woodchoppers, a group of retirees who participated in 25 work events and contributed more than 500 hours clearing and burning large quantities of brush and fallen material during 2010.

The ability of the site stewards to organize and conduct workdays relies on the underlying organization of the North Branch Restoration Project and its leaders. It is also supported by Friends of Morton Grove Forest Preserves which sustains public support within Morton Grove and beyond. Important support is also received from the Cook County Forest Preserve District in the form of tools, herbicide, burn crews and contract tree removal.

Other Volunteer Work

In addition to the volunteer stewardship reported above, a great deal of other volunteer work goes into restoring Miami Woods such as:

Weekday gathering of seeds by the North Branch seed team

Processing seeds and preparation of seed mixes

Sowing of seeds by stewards

Stewards working at times other than scheduled events

Stewards preparing tools and herbicides

Application of herbicide to invasive species by stewards
Monitoring of birds, butterflies and plants of concern by volunteers
Volunteers dealing with organizational and outreach issues
Volunteers participating in training and gaining certification

Interns

Important work is done by Audubon interns funded by the Forest Preserve District. During 2010 this included 9 days by a trio of interns and one day with six. Activities included applying herbicide to buckthorn seedlings and to gray dogwood; pulling garlic mustard; and using chainsaws to thin saplings and cut buckthorn.

FPDCC Staff and Contractors

In addition to controlled burns in 2008 and 2010 described above, in 2006 Forest Preserve staff provided two days of support with the Zeppi brush cutter in the northwest corner of the prairie. A Forest Preserve contractor removed fire sensitive trees (unassociated woody growth) from four acres of the prairie In 2007.

V. EDUCATION & SCHOOL GROUPS

Schools have provided essential help in clearing brush and pulling garlic mustard in Miami Woods. Some groups have “adopted” a management area or a portion of it to focus their efforts and see the results. The Chicago City Day School has the most highly developed program which integrates restoration and river studies into their curriculum for the 4th, 6th, 7th, and 8th grades. Beginning in 2003 they adopted a large part of the River North area and have cleared brush from between the river and the bike path for about a quarter of a mile as well as working on the west side of the path and pulling garlic mustard from throughout the area.

Students from the Carl Shurz High School have cleared brush from a large portion of management unit WO04 along the bike path and the Baker Demonstration school has cleared buckthorn from much of the Cathedral Oaks opening and savanna. Several other schools have participated in one or more special workdays.

The largest single impact by a school has been by students from Wilbur Wright College. During 2006-2010 their 34 workdays have involved more than 1,000 student visits that produced more than 3,400 hours of work. This has resulted in removal of massive amounts of brush from north, west and south sides of the prairie. The effectiveness of these large school workdays has been made possible by the assistance of North Branch volunteers who have helped the stewards in directing student crews.

Education is an aspect of all workdays as stewards and experienced volunteers exchange information and provide information to new-comers or less experienced volunteers. Frequent topics of conversation are invasive species, fire, deer, and herbicides. Herbicide use, safety and practices are discussed as important tools with information often provided by volunteers who are certified by the State to apply herbicide. Invasive species are discussed with respect to both their

ecological impacts and management practices for their control. Controlled burns are discussed with respect to inhibiting invasive species and stimulating native plants. Deer are discussed with respect to their impact and the concept of ecological balance. The deer exclosures are discussed as demonstrations of their impact on the prairie and woodland.

Education of students on a more formal basis takes place as school groups split their time between hands-on restoration activity and educational activity that ranges from river sampling to nature contemplation writing. The Chicago City Day School has the most a highly developed program of the schools visiting Miami Woods which involves river study, botany, art, social science and literature.

VI. CONDITIONS and ACTIVITY BY AREA

During 2010 brush removal was concentrated in WO01 & 02 and in PR01. Thinning of fire sensitive trees was concentrated in WO01, 02 & 03 and in SA03, PR03, & WO12 & 13.

Herbicide application to invasive species continued throughout all units.

1. Cathedral Oaks Opening, Savanna and Woodlands

A 1925 aerial photo shows this area to have had scattered large trees and an open area where the high quality prairie plants are still found. Use at that time is uncertain, but probably as pasture and possibly cutting of hay from the opening. Many large oaks are still present surrounded by younger fire sensitive trees.

The open portion of the area is in stage 3 while the more recently cleared wooded portions are in *Stage 2*. Both are awaiting the return of controlled burning. The status quo is being maintained by pulling garlic mustard and using herbicides to control buckthorn seedlings and weeds. During 2010 work concentrated on removing the last remaining buckthorn and thinning fire sensitive trees from the entire area except where retained to provide a visual buffer along Dempster Street. Large quantities of fallen material was cut and burned in preparation for controlled burning. Work was concentrated in management units WO01 and WO02. Garlic mustard was pulled by the stewards with help from interns. Herbicide was applied to seedlings and re-sprouts by the stewards with help from interns.

In addition to other activities a long narrow deer exclosure was created along the edge of the shopping center parking lot at the western edge of unit WO01 with materials funded by the District. This will protect plantings of native plum and other species to create a visual buffer between the bike path and the parking lot. The existing buckthorn buffer had become ineffective because it had been stripped of twigs by deer browsing.

2010 stewardship: 23 workdays, 164 volunteer appearances 596 hours

2002-10 stewardship: 48.5 workdays 1,185 volunteer appearances 2,725 hours

Priority needs for 2011:

Burn entire management area

- Seed recently thinned eastern portions
- Apply herbicide to brush seedlings
- Pull garlic mustard
- Plant buffer trees

Longer term needs:

- Plant more buffer trees
- Repeat burning

2. *Indigo Opening, Savanna and Woodlands*

The 1925 aerial photograph shows almost no trees except for the southwest corner in the southern portion management unit WO06 and in WO08. The remainder was open, probably used for pasture and/or haying.

The open portions of the area are in *Stage 3* while the more recently cleared wooded portions are in *Stage 2*. The open portion benefitted from a controlled burn in 2008. The status quo is being maintained in the wooded areas by pulling garlic mustard and using herbicide to control re-sprouts and seedlings.

The major accomplishment during 2010 was the completion of thinning in the eastern side of unit SA02 which completed initial thinning throughout the management area. A further important accomplishment was the gathering of large quantities of seed from the high quality portions of the opening.

2010 Stewardship	3 workdays	108 volunteer appearances	249 hours
2002-10 Stewardship	52.5 workdays	1,081 volunteer appearances	2,726 hours

Priority needs for 2011:

- Gather seed

Longer term needs:

- Burn opening and woods in 2012
- Establish a native tree buffer along the southern edge of the shopping center parking lot
- Begin to establish a native tree buffer along western edge of the area.

3. *Main Prairie and Savanna*

The 1925 aerial shows virtually the entire prairie area being cultivated farm fields. Exceptions were: a small oval race track in the northwest corner near a farm house located on what is now a condo complex; a small grove of trees in management units WO10 and 11 at the northeast corner; trees and possibly a structure at the location of the old basement hole at the intersection of the Tunnel Access drive and the bike path; and something that may be a poultry yard with shelters nearby in unit PR03.

The presently open area is being managed as prairie while the wooded areas on the edges are being managed as savanna and open woods.

The major accomplishment in the prairie unit during 2010 was completion of buckthorn and brush removal from the southern portion of the prairie management area by students from Wright College. They also completed thinning of fire sensitive trees and removal of vast amounts of fallen material. *Stage 2* herbicide treatment of re-sprouts and seedlings continued in recently cleared areas. In the high stage 3 areas of the main opening, high quality conservative plants continue to be decimated by the excessive deer population. Inside the deer exclosure wild indigo (baptisia) continued to gather strength and the plants flowered and produced seed for the second year. The few remaining plants surviving outside the exclosure were eaten to the ground. This year the deer again ate tall goldenrod and the invasive multiflora rose.

Viewed generally from north to south, the northwest corner of the prairie and a narrow strip along its northern edge (UW02) includes about 1.5 acres that were cleared of buckthorn in 2007 & 08 which are in early *Stage 2*. Most of the northerly third of the prairie is in *Stage 3*; the central third is in late *Stage 2* with substantial gray dogwood problems; and the southern third is in early *Stage 2*, having been cleared of brush and trees in 2007. The savanna area south of the tunnel access road is in early *Stage 2*. A substantial buffer has been left adjacent to Caldwell Avenue south of the main opening.

During 2010 the recently cleared *Stage 2* areas were sown with seed.

2010 stewardship	8 workdays	317 volunteer appearances	953 hours
2002 –10 stewardship	59 workdays	1,854 volunteer appearances	5,837 hours

Priority needs for 2011:

- Burn the *Stage 2* portion (central and southern thirds) of the prairie
- Sow seed in the recently cleared *Stage 2* Areas.
- Herbicide gray dogwood in selected portions of the prairie.
- Herbicide brush seedlings and weeds in the southern 1/3 of the prairie.
- Herbicide weeds and brush seedlings in the northwest corner of the prairie.

Long term needs:

- Burn
- Continue stage two herbicide application
- Evaluate farm tiles and block or remove them
- Plant more bur oaks in northeast corner and along Caldwell.
- Plant native trees and shrubs along Caldwell Avenue and the new condo development.

4. River Woods and Savanna North

The 1925 aerial photograph shows the area to have been a mixture of woods, scattered trees and

a large open area in the flood plain directly south of the main opening in Cathedral Oaks. The open area may have been cultivated, but was probably a pasture or hay field by 1925.

Most of this unit is in *Stage 2* with the remainder nearing completion of both buckthorn removal and thinning.

The major accomplishment during 2010 was buckthorn removal and thinning of fire sensitive trees from most of unit WO03. Seed was sown in *Stage 2* areas.

2010 stewardship	5 days	211 volunteer appearances	576 hours
2002-10 stewardship	56 days	2,023 volunteer appearances	4,571 hours

Priority needs for 2011:

- Burn entire unit
- Stage 2* complete thinning in WO05
- Apply herbicide to brush seedlings

Long term needs

- Burn
- Complete stage 2 thinning in WO03 near Dempster & the river

5. River Woods and Savanna South

The 1925 aerial photo shows the area to be mostly open with a narrow band of large trees scattered along the river, and open woods with large trees at the south end in units WO16 and FO04 and FO05.

Most of this unit is in *Stage 2* except portions adjacent to Caldwell Avenue and the FPD parking areas where brush including buckthorn has been left to provide a visual buffer from the bike path. The river banks in sub units WO012, 13, & 14 contain the best spring ephemeral populations in the preserve, but they are being impacted by deer.

The major accomplishment in this area during 2010 was thinning of management unit WO13. Also garlic mustard was pulled.

Three major projects remain in this area: 1. completing stage one buckthorn removal and thinning in units WO13 and UW03; 2. thinning fire sensitive trees in units WO16 and FO04; and 3. resolving what to do with WO15 and SA04 with respect to buffering the bike path from the parking lot. Volunteers will complete #1. Contract help has been requested for #2. Number 3 is a longer term puzzle requiring study and discussion with the District with respect to solutions and resources to support implementation.

2010 stewardship	3 days	79 volunteer appearances	251 hours
2002-10 stewardship	23 days	594 volunteer appearances	2,351 hours

Priority need for 2011

Burn area east of the bike path

Complete buckthorn removal and thinning in units WO13 and SA04

Stage 2 thinning and oak rescue in WO16 and FO04

Long term needs

Burn west of the bike path

Thin portions of FO05

Design and create a buffer of native plants between the bike path and parking lot

Design and create a buffer of native plants near Caldwell Avenue in unit UW03

Multi-unit work activity

Some work days involve multiple management units. For 2010 the work effort has been allocated to the areas receiving the most work and not reported as fractions. Activities during those days are usually seed gathering or garlic mustard pulling. These multi unit work days included:

Total 2001-2010 7 days 180 volunteer appearances 594 hours

MIAMI WOODS AND PRAIRIE

ECOLOGICAL RESTORATION

DURING 2010

&

2001 - 2010

APPENDICES

**NORTH BRANCH RESTORATION PROJECT
STEWARDS: Kent & Jerry Fuller 1/25/2011**

APPENDIX 1
MIAMI WOODS 2010 WORKDAYS BY DATE

#	Day	Group	Activity	# Volunteers	Hours	Geographic Area				
						1	2	3	4	5
1	1/06	NB Mini	Brush & Thin	4	18	1				
2	1/17	NBRP	Brush & Thin	19	60	1				
3	1/20	NB Mini	Brush & Thin	7	23	1				
4	1/27	NB Mini	Brush & Thin	7	24	1				
5	2/03	NB Mini	Brush & Thin	5	18	1				
6	2/10	NB Mini	Brush & Thin	6	23	1				
7	2/20	Wright	Brush & Thin	27	90			3		
8	2/24	NB Mini	Brush & Thin	7	22	1				
9	3/03	NB Mini	Brush & Thin	7	23	1				
10	3/10	NB Mini	Brush & Thin	6	22				4	
11	3/20	Wright	Brush & Thin	25	92			3		
12	3/24	NB Mini	Brush & Thin	6	21	1				
13	3/28	NB+Wright	Brush & Thin	78	249			3		
14	3/31	NB Mini	Brush & Thin	7	24	1				
15	4/08	NB Mini	Brush & Thin	2	12	1				
16	4/14	NB Mini	Brush & Thin	5	19	1				
17	4/17	Wright	Brush & Thin	63	209			3		
18	4/28	NB Mini	Garlic M	5	18					5
19	5/05	Shurz HS	Thin	73	225				4	
20	5/06	Shurz HS	Thin	75	235				4	
21	5/12	NB Mini a	Brush & Thin	2	12			3		
		NB Mini b	Garlic M	4	12					5
22	5/23	NBRP	Garlic M	7	21				4	
23	5/25	CCDS 8 th	Garlic M	52	73		2			
24	5/27	CCDS 6&7	Garlic M	50	73				4	
25	9/29	NB Mini	Thin	2	12	1				
26	10/06	NB Mini	Brush & Thin	3	16	1				
27	10/11	Baker 4&5	Seed Gathering	51	105			3		
28	10/25	CCDS 7 & 8	Thin	40	125		2			
29	10/13	NB Mini	Brush & Thin	2	14	1				
30	10/16	Wright	Brush & Thin	38	127			3		
31	10/20	CCDS 6 th	Brush	32	98	1				
32	10/24	NBRP	Seed Gathering	16	51		2			
33	10/27	NB Mini	Brush	3	13	1				
34	11/02	CCDS 4 th	Seed Gathering	33	69			3		
35	11/10	NB Mini	Brush	3	12	1				
36	11/17	NB Mini	Brush	3	15	1				
37	11/24	NB Mini	Brush & Thin	6	20	1				
38	12/01	NB Mini	Deer Fence	6	20	1				
39	12/04	Wright	Brush & Thin	70	221					5
40	12/08	NB Mini	Brush & Thin	6	27		2			
41	12/15	NB Mini	Brush & Thin	9	34		2			
42	12/22	NB Mini	Brush & Thin	<u>7</u>	<u>28</u>		2			
Total				879	2,625					

**APPENDIX 2
WORKDAYS BY GROUP**

NBRP Weekend Workdays

#	Day	Group	Activity	# Volunteers	Hours	1	2	3	4	5
2	1/17	NBRP	Brush & Thin	19	60	1				
13a	3/28	NB+Wright	Brush & Thin	18	69				3	
22	5/23	NBRP	Garlic M	7	21					4
<u>32</u>	10/24	NBRP	Seed Gathering	<u>16</u>	<u>51</u>			2		
4				60	201					

NBRP Mini Wednesday Workdays

1	1/06	NB Mini	Brush & Thin	4	18	1				
3	1/20	NB Mini	Brush & Thin	7	23	1				
4	1/27	NB Mini	Brush & Thin	7	24	1				
5	2/03	NB Mini	Brush & Thin	5	18	1				
6	2/10	NB Mini	Brush & Thin	6	23	1				
8	2/24	NB Mini	Brush & Thin	7	22	1				
9	3/03	NB Mini	Brush & Thin	7	23	1				
10	3/10	NB Mini	Brush & Thin	6	22				4	
12	3/24	NB Mini	Brush & Thin	6	21	1				
14	3/31	NB Mini	Brush & Thin	7	24	1				
15	4/08	NB Mini	Brush & Thin	2	12	1				
16	4/14	NB Mini	Brush & Thin	5	19	1				
18	4/28	NB Mini	Garlic M	5	18					5
21	5/12	NB Mini a	Brush & Thin	2	12			3		
		NB Mini b	Garlic M	4	12					5
25	9/29	NB Mini	Thin	2	12	1				
26	10/06	NB Mini	Brush & Thin	3	16	1				
29	10/13	NB Mini	Brush & Thin	2	14	1				
33	10/27	NB Mini	Brush	3	13	1				
35	11/10	NB Mini	Brush	3	12	1				
36	11/17	NB Mini	Brush	3	15	1				
37	11/24	NB Mini	Brush & Thin	6	20	1				
38	12/01	NB Mini	Deer Fence	6	20	1				
40	12/08	NB Mini	Brush & Thin	6	27			2		
41	12/15	NB Mini	Brush & Thin	9	34			2		
<u>42</u>	12/22	NB Mini	Brush & Thin	<u>7</u>	<u>28</u>			2		
25				130	502					

Wright College

7	2/20	Wright	Brush & Thin	27	90		3
11	3/20	Wright	Brush & Thin	25	92		3
13b	3/28	NB+Wright	Brush & Thin	60	180		3
17	4/17	Wright	Brush & Thin	63	209		3
30	10/16	Wright	Brush & Thin	38	127		3
<u>39</u>	12/04	Wright	Brush & Thin	<u>70</u>	<u>221</u>		5
6				283	919		

Chicago City Day School

23	5/25	CCDS 8 th	Garlic M	52	73		2
24	5/27	CCDS 6&7	Garlic M	50	73		4
28	10/25	CCDS 7 & 8	Thin	40	125		2
31	10/20	CCDS 6 th	Brush	32	98	1	
<u>43</u>	11/02	CCDS 4 th	Seed Gathering	<u>33</u>	<u>69</u>		3
5				207	438		

Baker Demonstration School

<u>27</u>	10/11	Baker 4&5	Seed Gathering	<u>51</u>	<u>105</u>		3
1				51	105		

Carl Shurz High School

19	5/05	Shurz HS	Thin	73	225		4
<u>20</u>	5/06	Shurz HS	Thin	<u>75</u>	<u>235</u>		4
2				148	260		

SUMMARY

	<u>Days</u>	<u># Volunteers</u>	<u>Hours</u>
NBRP Regular	4	60	201
NBRP Mini	25	130	502
Wright College	6	283	919
Chicago City Day	5	207	438
Baker	1	51	105
Carl Shurz	<u>2</u>	<u>148</u>	<u>260</u>
	43*	879	2,425

APPENDIX 3
MIAMI WOODS WORK DAY STATISTICS

2001	Days	Volunteers	Cut Brush	Garlic Mustard	Seed	Stewardship	Education	Total
Cathedral Oaks	0	0	0	0	0	0	0	0
Indigo	0	0	0	0	0	0	0	0
Prairie	1	40	120	0	0	120	0	120
River North	0	0	0	0	0	0	0	0
River South	0	0	0	0	0	0	0	0
Multi Unit	0	0	0	0	0	0	0	0
Total	1	40	120	0	0	120	0	120

2002	Days	Volunteers	Cut Brush	Garlic Mustard	Seed	Stewardship	Education	Total
Cathedral Oaks	5	138	291	0	0	291	0	291
Indigo	7	101	242	8	0	250		250
Prairie	0	0	0	0	0	0	0	0
River North	1	44	132	0	0	132	0	132
River South	2	84	276	12	0	288		288
Multi Unit	1	6	0	15	0	15	0	15
Total	16	373	941	35	0	976		976

2003	Days	Volunteers	Cut Brush	Garlic Mustard	Seed	Stewardship	Education	Total
Cathedral Oaks	3	166	213	0	0	213	0	213
Indigo	4	62	170	0	0	170	36	206
Prairie	3	66	250	0	0	250	60	310
River North	5	151	195	43	0	238	323	561
River South	2	52	160	32	15	207	31	238
Multi Unit	0	0	0	0	0	0	0	0
Total	17	497	988	75	15	1078	450	1528

2004	Days	Volunteers	Cut Brush	Garlic Mustard	Seed	Stewardship	Education	Total
Cathedral Oaks	2	104	175	54	0	229	0	229
Indigo	4	102	132	30	0	162	174	336
Prairie	3	99	269	0	95	364	0	364
River North	6	214	372	37	0	409	386	795
River South	3	148	539	0	0	539	0	539
Multi Unit	4	69	0	190	34	224	0	224
Total	22	736	1487	311	129	1927	560	2487

2005	Days	Volunteers	Cut Brush	Garlic Mustard	Seed	Stewardship	Education	Total
Cathedral Oaks	4	191	335	30	0	365	0	365
Indigo	4	110	82	54	149	285	144	429
Prairie	1	34	0	0	88	88	0	88
River North	11	341	596	81	7	684	398	1082
River South	4	100	455	107	0	562	0	562
Multi Unit	0	0	0	0	0	0	0	0
Total	24	776	1468	272	244	1984	542	2526

2006	Days	Volunteers	Cut Brush	Garlic Mustard	Seed	Stewardship	Education	Total
Cathedral Oaks	4	186	174	263	0	437	61	498
Indigo	7	194	164	162	78	404	117	521
Prairie	8	192	550	0	72	622	0	622
River North	10	391	616	138	0	754	459	1213
River South	3	50	165	103	0	268	0	268
Multi Unit	0	0	0	0	78	78	0	78
Total	32	1013	1669	666	228	2563	637	3200

2007	Days	Volunteers	Cut Brush	Garlic Mustard	Seed	Stewardship	Education	Total
Cathedral Oaks	2	21	26	30	0	56	0	56
Indigo	3	61	97	140	0	237	123	360
Prairie	15	455	1244	78	59	1381	47	1428
River North	7	290	708	131	0	839	542	1381
River South	2	29	0	95	0	95	0	95
Multi Unit	2	53	0	28	167	195	0	195
Total	31	909	2075	502	226	2803	712	3515
2008	Days	Volunteers	Cut Brush	Garlic Mustard	Seed	Stewardship	Education	Total
Cathedral Oaks	3	113	209	56		265	0	265
Indigo	12	206	725	72		797	266	1063
Prairie	10	284	997	0		997	0	997
River North	4	163	323	122		445	169	614
River South	3	32	0	75		75	36	111
Multi Unit	1	52	0	0	160	160	0	160
Total	33	850	2254	325	160	2739	471	3210
2009	Days	Volunteers	Cut Brush	Garlic Mustard	Seed	Stewardship	Education	Total
Cathedral Oaks	2.5	102	212	61	0	273	125	398
Indigo	8.5	137	65	9	98	172	62	234
Prairie	10	367	861	36	165	1062	0	1062
River North	7	218	411	76	7	494	181	675
River South	1	20	0	66	0	66	0	66
Multi Unit	0	0	0	0	0	0	0	0
Total	29	844	1549	248	270	2067	368	2435
2010	Days	Volunteers	Cut Brush	Garlic Mustard	Seed	Stewardship	Education	Total
Cathedral Oaks	23	164	596	0	0	596	54	650
Indigo	3	108	125	73	51	249	135	384
Prairie	8	317	779	0	174	953	0	953
River North	5	211	482	94	0	576	299	875
River South	3	79	221	30	0	251	0	251
Multi Unit	0	0	0	0	0	0	0	0
Total	42	879	2203	197	225	2625	488	3113
2001-2010	Days	Volunteers	Cut Brush	Garlic Mustard	Seed	Stewardship	Education	Total
<i>Cathedral Oaks</i>	<i>48.5</i>	<i>1185</i>	<i>2231</i>	<i>494</i>	<i>0</i>	<i>2725</i>	<i>240</i>	<i>2965</i>
<i>Indigo</i>	<i>52.5</i>	<i>1081</i>	<i>1802</i>	<i>548</i>	<i>376</i>	<i>2726</i>	<i>1057</i>	<i>3783</i>
<i>Prairie</i>	<i>59</i>	<i>1854</i>	<i>5070</i>	<i>114</i>	<i>653</i>	<i>5837</i>	<i>107</i>	<i>5944</i>
<i>River North</i>	<i>56</i>	<i>2023</i>	<i>3835</i>	<i>722</i>	<i>14</i>	<i>4571</i>	<i>2757</i>	<i>7328</i>
<i>River South</i>	<i>23</i>	<i>594</i>	<i>1816</i>	<i>520</i>	<i>15</i>	<i>2351</i>	<i>67</i>	<i>2418</i>
<i>Multi Unit</i>	<i>8</i>	<i>180</i>	<i>0</i>	<i>233</i>	<i>439</i>	<i>672</i>	<i>0</i>	<i>672</i>
Total	247	6917	14754	2631	1497	18882	4228	23110

APPENDIX 4 RESTORATION STAGES

Restoration sites progress through three management stages which are general sequential, but may overlap.

0. Unmanaged:

Condition:

Recreational turf grass areas, structures, parking and driveways

Actions:

None

1. Initial control of invasive plants

Conditions:

Invasive species have suppressed or eliminated most native herbaceous species and oak and hickory tree seedlings.

Actions needed:

Brush removal w/ application of herbicide to stumps and seedlings (buckthorn, honeysuckle, barberry, etc.)

Application of herbicide to invasive herbaceous plants (phragmites, reed canary grass, thistles, parsnip, crown vetch, purple loosestrife, lesser celandine buttercup, etc.)

Pulling of plants: (white sweet clover, parsnip, garlic mustard, etc)

Controlled burning as soon as sufficient fuel is attained.

Limited seeding

Deer control

2. Restoration of sunlight

Conditions:

Substantial control of invasive exotic species, but excessive presence of fire sensitive native trees prevents availability of sunlight needed to support a healthy population of native shrubs and herbaceous species normally found in the community. Herbaceous fuel is typically not sufficient to support controlled burns.

Native species increasing in percent cover and diversity.

Actions Needed

Thinning of fire sensitive trees to allow adequate sunlight.

Continued aggressive control of invasive species (re-sprouts and seedlings) using herbicides together with fire and pulling.

Seeding to enrich diversity;

Removal of fallen logs that impede controlled burning and all large fallen buckthorn (which takes decades to decompose).

Deer control

3. Long term enrichment

Conditions:

Appropriate sunlight conditions are present and biodiversity continues to improve

Actions Needed:

Maintain appropriate sunlight conditions using fire and thinning as needed

Continuing control of invasive species through use of fire and spot application of herbicide; also pulling of garlic mustard in woodlands and pulling of white sweet clover in prairies as needed.

Continuing enrichment of diversity through seeding

Deer control

APPENDIX 5

STATUS OF INVASIVE PLANT SPECIES

Invasive species continue to pose a major threat to all natural areas including Miami Woods. Volunteers have focused the majority of our efforts to deal with the threat.

Buckthorn (*Rhamnus cathartica*)

Common buckthorn had overrun much of Miami Woods by the time volunteers began work. In some areas they are 40 or 50 years old and 15 to 20 feet tall. Elsewhere where invasion is recent, stems are only a foot high and almost as thick as grass. With the exception of areas where brush has been retained as a visual buffer, more than 90% has been cut and herbicide has been applied to the stumps and seedlings. Spot application of herbicide is needed in all of the cleared areas until a program of controlled burns can be established to provide long term management. Areas still needing clearing are the northeastern tip of management unit WO03 and portions of UW03 and WO13. Buckthorn removal is a major success story within Miami Woods.

Eurasian Honeysuckle (*Lonicera tatarica*)

The majority of Eurasian honeysuckle has been removed, remaining uncut only in the northeastern tip of WO03. As with buckthorn, the long term management can be controlled by burning if it is conducted regularly. The scattered honeysuckle that occurs on the banks of the river has been left to serve as bird habitat. It will be removed if and when native shrubs become established.

Barberry (*Berberis thunbergii*)

Barberry shrubs are scattered throughout the savanna and woodland areas. Spot application of herbicide is proving to be effective and will be necessary until an effective program of controlled burning is established.

Garlic Mustard (*Alliaria officinalis*)

GM is widespread in the savanna and woodland areas. Although abundance varies from year to year, good long term progress has been made by regular pulling. Continued vigilance and effort is needed, but prospects are good.

Japanese Hedge Parsley (*Torilis japonica*)

This plant is spreading steadily in spite of efforts to pull it. How severe its impacts will be are uncertain.

Reed Canary Grass (*Phalaris arundinacea*)

This grass is very resilient and difficult to eliminate. There are clumps present in several management units, especially in PR01 along the Tunnel Access drive. Spring and fall spraying is being done and must be continued. Progress is limited, but steady.

Thistles (*Cirsium vulgare*, *Cirsium arvense*, and *Cardus nutans*)

Canada thistles, bull thistles, and nodding thistles are a problem in recently cleared areas. Spot spraying is effective, but must be continued until strong competition is established. Canada thistles are the most difficult because they are perennial and have deep spreading roots. Progress is good, but limited by a continuing source of seeds blowing in from the on-going condo construction area adjacent to management units UW01 and WO06, 08 and 10.

Teasel (*Dipsacus laciniatus* & *sylvestris*)

Populations are present along Caldwell Avenue and the Tunnel Access drive. Progress is slow but steady and requires consistent application of herbicide.

Field Parsnip (*Pastinaca sativa*)

The population near Caldwell Avenue north of the Tunnel Access drive is small, but persistent and requires consistent application of herbicide.

Lesser Celandine Buttercup (*Ranunculus ficaria*)

This is a major threat to the Miami Woods floodplains. A small and very resilient population exists on the edge of the floodplain at the eastern tip of the prairie and in scattered locations to the south. But vast populations exist across the river in St Paul Woods. Herbicide has limited effect and the population persists. Continued application of herbicide is essential.

Creeping Charlie (*Glechoma hederacea*)

Vast populations exist in the four acres north of the Tunnel Access drive where unassociated woody growth was removed to expand the prairie opening. Full sunlight is favoring competing prairie plants which are expected to displace the invasive. Herbicide is not being applied.

Multiflora rose (*Rosa multiflora*)

Spot application of herbicide has greatly reduced the presence of multiflora rose and is providing effective control until a program of controlled burning becomes established.

Tall goldenrod (*Solidago altissima*)

This native species is very aggressive and persistent. It is a problem in management unit SA02 and elsewhere. It is being treated by hand mowing with a brush cutter as resources allow.

Gray Dogwood (*Cornus racemosa*)

This native species is invasive in the prairie (PR01) for poorly understood reasons. A regular program of controlled burning holds promise of long term management, but until that happens, mowing and/or herbicide application is being used to provide control.

APPENDIX 6

IMPACTS OF DEER

At present, the single greatest negative impact on the ecological health of Miami Woods is the excessive browsing by the unmanaged population of deer.

Many plant species have been severely reduced and some have been entirely eliminated. Most native shrubs have been destroyed and all seedlings of shrubs and trees have been eaten. By spring of 2010 no living twigs within the reach of deer were present in Miami Woods except for invasive Tartarian honeysuckle and barberry which deer will not eat. In the prairie gray dogwood shrubs were eaten back to their tough oldest parts.

High quality plants such as orchids, lilies, wild indigo, white prairie clover and others have been extirpated. Shrubs such as American hazel and sumac are gone. No tree seedlings of any species are present except for buckthorn. Buckthorn seedlings are repeatedly eaten back close to the ground, but are able to survive. The youngest surviving saplings are 10 years old and extend above the reach of deer.

The exact number of the present population is not known, but the stewards and others have observed as many as 20 or more deer while walking on the bike path from one end of the Preserve to the other. It is quite likely that the total number is more than 30.

The number has intensified during the past 10 years. In 2000 the brows line on trees and shrubs was not well defined and Caldwell Avenue was not visible from the bike path through the summer foliage. Since that time the deer have eaten all of the live twigs within reach up to about 5 feet and the street is clearly visible through the naked branches.

The impact is not limited to plants and foliage. Audubon Magazine in its November-December 2010 issue reported that, "For instance, at more than 20 wild white-tailed deer per square mile, there's complete loss of cerulean warblers, yellow-billed cuckoos, indigo buntings, eastern wood pewees, and least flycatchers. At 64 per square mile, you lose your eastern phoebes and even robins. But it's not only birds that nest close to the ground that are being wiped out by overabundant deer. Because deer also remove saplings, even mid canopy nesters like tanagers and grosbeaks are in serious trouble." Also, deer have been photographed eating the eggs and chicks of ground nesting birds.

20 deer per square mile is equal to one deer per 32 acres. Other studies have shown that pre-settlement densities were about one deer per 40 acres. Miami has about 100 acres of natural area, so using either rule of thumb it should have about 3 deer.

The management plan written by the Forest Preserve District in 2003 called for limiting the number of deer in Miami Woods to 8 animals.

The deer remain unmanaged.

DEER BROWSING PREFERENCE

Preferred / First to disappear

Prairie Lily*

Turks Cap Lily*

Prairie White fringed orchid*

Baptisia*

Spiderwort*

White Trillium*
Prairie Trillium*
Violet Cress*
Riddells Goldenrod*

Second Preference

Compass Plant*
White Prairie Clover*
Purple Prairie Clover
Illinois Tick Trefoil*
Lead Plant
Purple Milkweed*
Green Dragon*
Wild Geranium*
Indian Plantain*
New spring growth on some sedges
American Hazel*
New growth on all shrubs except Tartarian Honeysuckle & Barberry
All seedlings and saplings less than five feet tall

Intermediate Preference

Stiff Goldenrod
Gray Goldenrod
Buckthorn
Gray Dogwood
Hawthorn
Sullivant's Milkweed
Native Roses
Jack in the pulpit
Ironweed
Early season growth of some sedges

Next to Last Preference / Seldom Eaten

Common Milkweed
Multiflora Rose
Tall Goldenrod (increasing)
Great St Johns Wort
Balsam Ragwort
Blue Flag Iris

Never Eaten (and increasing)

Grasses
Bergamot
Rattlesnake Master
Mountain Mint
Tartarian Honeysuckle
Barberry

*Species lost from Miami Woods during last 10 years years

APPENDIX 7

MANAGEMENT PRACTICES

Management Practices are limited to those approved by the Forest Preserve District as described in their guidelines. The primary practices used in Miami Woods are described below.

Seed Gathering and Distribution

Seed gathering consumes less time than brush cutting, but is at least as important. A small group of volunteers meet on a weekly basis to gather seed from sites throughout the North Branch from late spring until November. The seed they gather is combined with seed gathered during regular workdays and processed into North Branch seed mixes. Mixes are prepared based primarily on the amount of sunlight and moisture needed by the plants. Mixed seed is distributed to site stewards who sow it in high priority areas.

Brush Cutting

Brush cutting to control invasives and get sunlight to the ground is the first step and consumes the majority of volunteer work hours. It also prepares the way for later management using controlled burns by allowing the growth of herbaceous fuel. Because buckthorn disrupts invertebrate populations and soil chemistry, its removal provides benefits beyond ordinary reduction in competition.

Herbicide Application

Herbicide is applied by volunteers who are licensed by the State of Illinois to control invasive species and re-sprouts from cut stumps. When management reaches stage three and fire becomes the primary management practice, the use of herbicide is reduced substantially.

Thinning

Thinning fire sensitive trees compensates for the lack of natural fires and returns needed sunlight to the ground layer. It reduces competition for light, moisture and nutrients; and the resulting herbaceous vegetation helps provide fuel for controlled burning.

Debris Removal

Cut materials are burned on site and consist of three categories: invasive brush, thinned trees, and fallen dead trees. Fallen trees are removed to facilitate controlled burning although the largest trunks are left as an important aspect of habitat. In much of Miami Woods, removal of fallen material has taken place as a separate management step because initial brush removal took place between 2001 and 2006 before burning of brush piles was allowed and it was not practical to haul and chip fallen material.

Controlled Burns

Controlled burning is the preferred management practice for control of invasive species, control of fire sensitive native tree species, and stimulation of native plants. Fire is an essential aspect of nature that has shaped the natural communities of northeastern Illinois for hundreds of centuries. Burning is needed throughout Miami Woods on a two or three year return cycle. Unfortunately current District policies and practices make woodland burns very time consuming. Less than 10 acres of woodland have been burned during the past 10 years.

Weed Pulling

Weeds such as garlic mustard, Japanese hedge parsley and white sweet clover are not easily controlled by herbicide and are pulled by hand.

Deer Exlosures

The prairie enclosure was built in early spring of 2007 and the woodland enclosure in early 2009. They are intended to prevent extirpation of some species and to serve as an illustration of the problem. During the three growing seasons the prairie enclosure has been in place there have been two major results. The last of the wild indigo is surviving and the plants have gained strength each year. In 2009 they blossomed and produced seed for the first time in almost 10 years. The second result is that lead plant within the enclosure is blooming and producing seed in contrast to similar plants outside where all new growth has been eaten and no blossoms or seed occur. No major change has appeared within the woodland enclosure during this first year except that wild geranium bloomed there and nowhere else in Miami Woods.

APPENDIX 8

MIAMI TREES

Background

Judging by the presence of prairie soils throughout Miami Woods, it was covered with prairie vegetation for most of its history since glaciation. At the time of European settlement it probably contained limited numbers of fire tolerant oaks and some fire intolerant tree species in the flood plain. The earliest aerial photo is from 1925 shows much of the area being actively farmed for row crops with the remainder probably being used as pasture. Few trees were present, primarily at the north and south ends and scattered along the low bluff at the edge of the river flood plain. Most of those trees were oaks which are still present today. The trees at the north and south may have been part of prairie groves from which the Village of Morton Grove is named.

Aerial photographs from 1961 show brush and tree cover across much of the Preserve except for the three openings: the main prairie and the Indigo and Cathedral Oaks openings. However, the brush and tree cover was relatively thin with open ground between the trees.

By 1990 trees had created a closed canopy except for about 15 acres in the main prairie opening, 3 in Indigo, and 2 in Cathedral oaks.

The post-agriculture trees are now at a stage where crowns have met and formed a closed canopy over much of the wooded portions of the Preserve. Competition is now killing off the shade intolerant hawthorns and weaker trees of all species leaving many trunks on the ground. In addition to normal successional mortality, there are a great many elm logs due to mortality from virtually Dutch elm disease. This makes use of controlled burns of the wooded areas difficult.

With the exception of an acre or so of young oaks in management units WO01 and WO04 at the eastern edge of the Cathedral Oaks opening, nearly all of the post 1925 trees are fire-sensitive species that have flourished due to the absence of natural fires. The most abundant of those species are green ash, elm, sugar maple, and basswood. There are also scattered box elder, hackberry, black ash, black walnut, and silver maple. There are many hawthorns, but they are relatively old and senescent. There is one large honey locust near the old farmhouse basement hole, several catalpas, and two butternuts.

The presence and reproduction of trees is the result of many factors. But the two primary factors in Miami Woods are the availability of sunlight and the impact of browsing by excessive numbers of white tailed deer. At the end of the agricultural period the availability of seed was important, but as brush and trees became established, the availability of sunlight became more important. As deer returned to the area and became more abundant, they became the dominant factor. Judging by the age of saplings, reproduction slowed greatly during the past 50 years, probably as a result of decreasing availability of sunlight and increasing deer density. Under current conditions, no tree species are able to reproduce. By the end of each winter there are no living twigs or seedlings within the reach of browsing deer. With the exception of buckthorn, there are no small trees less than 10 years old, and very few less than 20 years. Since few trees but oaks live more than 100 years, within the next century there will be no trees left in Miami Woods except for scattered oaks, unless the deer population is reduced.

In addition to the deer problem, the spread of fire-sensitive species has reduced the amount of sunlight around the old oaks to the extent that no oak or hickory seedlings can survive. Thinning of the fire-sensitive species by volunteers is reducing the excessive shade to the extent that oaks and hickories can probably reproduce if the deer problem is solved.

Conditions by species

Native Species

Oaks: Bur oaks (*Quercus macrocarpa*), swamp white oaks (*Q. bicolor*), white oaks (*Q. alba*), red oaks (*Q. rubra*) and scarlet oaks (*Q. coccinea*) are present in the locations noted above, but there are no oak seedlings because of deer and shade. The youngest oaks appear to be more than 20 years old, most are older than 30. A woodland deer enclosure has been created to determine whether exclusion of deer will allow reproduction to take place. A few dozen bur oaks have been planted and fenced at the northwest corner of the prairie.

Hickories: Shagbark hickory (*Carya ovata*) and bitternut hickory (*C. cordiformis*) are present with the oaks, but there are no seedlings and small trees appear to be more than 30 years old. Deer and shade are both inhibiting reproduction.

Ironwood: Ironwood/Hop Hornbeam (*Ostrya virginiana*) occurs in association with oaks at the north and south ends of the Preserve and with oaks on the low bluff along the floodplain. It is very tolerant of shade, but reproduction is prevented by deer browsing.

Walnuts: Black walnuts (*Juglans nigra*) are widely scattered in small numbers. There are only two white walnuts/butternuts (*J. cinerea*) present within in the Preserve and show no sign of reproducing. Deer and shade are both inhibiting reproduction of both species.

Ash: Green ash (*Fraxinus pensylvanicuca*) is the most abundant native tree species present, but is distributed unevenly. Some areas are almost 100% ash while others have a small percentage. Black ash (*F. nigra*) is present in small numbers. Both species are expected to be gone within a few years due to the emerald ash borer.

Elm: American elm (*Ulmus Americana*) was the second most abundant native tree species and is present throughout the preserve except for the prairie openings where it has been removed. Slippery elm (*Ulmus rubra*) is present in small numbers. All of the old elms have died of Dutch elm disease, pole sized trees are dying steadily, and only saplings are expected to be present in the future. In the long term, even saplings will be present only if the deer problem is solved.

Maple: Sugar maple (*Acer saccharum*) is probably now the second most abundant native tree species. It has heavily invaded the oak woodlands in the north and south portions of the preserve, and is scattered elsewhere. Silver maples (*S. saccherinum*) are present in small numbers in scattered locations. Seedling maples are very tolerant of shade, but reproduction of both species is being prevented by deer.

Basswood: Basswood/linden (*Tilia Americana*) occurs mostly as single trees in scattered locations, except for a major concentration in management unit WO02 where it forms a near monoculture. Reproduction is being prevented by deer.

Cherry: Black cherry (*Prunus pensylvanica*) trees are scattered throughout the Preserve in small numbers. Reproduction appears to be prevented by both deer and shade.

Box Elder: Box elder (*Acer negundo*) occurs as scattered individual trees mostly on woodland edges and in the floodplain. Reproduction appears to be prevented by both deer and shade.

Hackberry: Hackberry (*Celtis occidentalis*) occurs as scattered individual trees. Reproduction is being prevented by deer and perhaps shade as well.

Hawthorns: Hawthorns (*Crataegus* sp.) appear to have surged in abundance following the end of

agriculture covering large portions of the preserve. Many of them were overtaken by fire sensitive trees and by buckthorn. Many others are still living, but losing out to competition and nearing the end of their natural life spans.

Apples: Crab apples (*Pyrus*) of several species are present in small numbers as are a few domestic eating apple trees (*Pyrus malus*).

Plums: Wild plums (*Prunus Americana*) survive as domed clones in the prairie. Reproduction is prevented by deer who consume seedlings and rhizomatous suckers expanding from the clones. Plums are being planted in a linear enclosure to form a buffer along the Prairie View Shopping Center

Cottonwood: Cottonwood (*Populus deltoides*) occurs in small numbers as scattered trees near the margins of the main prairie opening, mostly near Caldwell Avenue.

Aspen: Aspen (*Populus grandidentata*) occurs only as a few remnant trees among the fire intolerant species. Without intense fire, they are losing out to the competition.

Mulberry: Red mulberry (*Morus rubra*) exists as a few very large old multiple stem trees of a foot or more in diameter near the old farm house basement pit at the intersection of the bike path and the tunnel access drive which aligns with Main to the east and west of the preserve.

Non-native Species

Catalpa: Catalpa (*Catalpa speciosa*) is native to southern Illinois, but was apparently introduced as a shade tree during the agricultural period. It occurs in WO03 & 04 near the Wayside stream. Reproduction is prevented by deer and shade.

Honey locust: Honey locust (*Gleditsia tricanthos*) is native to southern Illinois, but appears to have been planted near the old farm house. Reproduction is prevented by deer and shade.

Buckthorn: Although usually not considered a tree, common buckthorn (*Rhamnus cathartica*) in Miami Woods has grown to as large as a foot in diameter and to a height of 20 or so. It has been removed from most of the preserve except where retained to serve as a visual and sound buffer. Glossy buckthorn (*R. frangula*) occurs as scattered stems, but is not much of a problem.

APPENDIX 9

TREE DISEASES

Insect pests and a fungal diseases are having major impacts on trees within Miami Woods and elsewhere. Dutch Elm Disease (DED) has had a major impact by killing virtually all of the large old elms in the preserve since its arrival in the 1950s. Younger elms are steadily dying leaving few trees larger than 6 inches in diameter. Saplings are still present, but also decreasing in number. Seedlings are absent because of browsing by the excessive deer herd.

Emerald ash borers (EAB) are just beginning to have an impact. Judging by evidence of woodpecker activity on bark during December of 2010 there are more than 100 infected trees. It is likely that within only a few years all green ash and black ash will be dead.

Loss of elms (both American and slippery) over the past 50 years caused a somewhat gradual increase in sunlight reaching the ground. Loss of green ash will result in a far more rapid increase in sunlight on the ground. Black ash will also be lost, but is less abundant than green.

Based on historical aerial photographs, oral accounts, and surviving very old trees, most of the trees present in the early 1900s were oaks and hickories. Fire sensitive trees such as ash, elm, maple, and basswood were probably present in small numbers, especially in the flood plain. During the agricultural period while natural fires were suppressed, fire sensitive species spread throughout Miami Woods except in the main prairie opening and the treeless portions of the Cathedral Oaks and Indigo Openings savannas. There are decaying remains of large elms throughout the existing savanna and wooded areas. There are also a few large living ash and maple trees that were probably present in 1925. There are virtually no seedlings of any species because of excessive deer browsing during recent years.

The likely effect of DED and EAB will be the thinning of all wooded portions of Miami Woods with the exception of those dominated by maple and basswood. This will bring increasing amounts of sunlight to the ground and stimulate growth of herbaceous species. This will benefit old oak woodlands at the north and south ends of Miami Woods and will cause some wooded areas to shift toward becoming savannas. The impact on flood plains is uncertain, but based on old aerial photos they were far more open in the past and are likely to return to that condition.

Currently substantial amounts of volunteer time and effort is being expended to remove fallen elms which impede controlled burns. This management activity will probably need to increase as massive quantities of ash trees are added to the elms that fall annually. Considering that there are approximately 75 acres of wooded area within Miami Woods and that tree density probably ranges from 100 to 200 trees per acre and perhaps 10% to 15% of those trees are ash, there will probably more than 1,000 additional dead trees in Miami Woods within a few years.

Distribution of seed into affected areas will need to be adjusted as shade is reduced.

The fifth tree species heavily impacted by disease is Butternut. It probably was present only in small numbers, but canker disease appears to be slowly killing them throughout northeastern Illinois. Of the two remaining in Miami Woods, only one is healthy.

APPENDIX 10

MIAMI SHRUBS AND VINES

Miami Woods and its prairie contain only a few species shrubs and vines.

Native Shrubs

Nannyberry (*Viburnum lentago*): A few clones survive in the prairie, but are not expanding or shrinking as the result of deer browsing.

Black Haw (*Viburnum prunifolium*): A small population exists in the southern edge of the cathedral oaks opening along the bike path, but is not expanding as new growth is consumed by deer.

American hazel (*Corylus Americana*): The last of the American hazel was consumed by deer several years ago.

Sumac (*Rhus glabra*?): A few live shoots survive in the northwestern corner of the prairie, but are annually diminishing in number. Dead wood from large sumach stems are found from time to time as buckthorn brush is removed.

Roses: Three native species are present in the prairie and other openings: pasture rose (*Rosa Carolina*), early-flowering rose (*R. blanda*) and Illinois rose (*R. setigera*). All are present in small and diminishing numbers apparently due to deer browsing.

Lead plant (*Amorpha canescens*): this small shrub is still present in the prairie in large numbers, but new growth is totally consumed annually by deer which has eliminated flowering or production of seed except for plants within the prairie deer enclosure.

Indigo bush (*Amorpha fruticosa*): planted in the northwest corner of the prairie in 200?

Bladernut (*Staphylea trifolia*): Planted in the northwest corner of the prairie in 200-

Shrubby St John's Wort (*Hypericum prolificum*): Planted in the northwest corner of the prairie in 200?

Dogwood: Red-osier dogwood (*Cornus stolonifera*) is present in small numbers, but is being suppressed and eliminated by deer. Gray dogwood (*Cornus racemosa*) is native, but invasive. Whatever natural forces previously kept it in balance are no longer effective. The lack of fire is a factor, but even in other locations which are burned often, it presents a difficult problem. Changes in drainage, increased airborne nutrients, and the absence of elk and bison may all be factors. Deer annually eat most of the new growth, but it spreads by rhizomous roots. It remains a major problem in the main prairie. Herbicide is being used to control it.

Raspberry: Black raspberry (*Rubus occidentalis*) is present in small numbers, but numbers are diminishing due to browsing by deer.

Elderberry (*Sambucus Canadensis*): has been absent from the Preserve, but is being reintroduced within the parking buffer lot deer enclosure.

Non-Native Shrubs

Honeysuckle (*Lonicera tatarica*): Invasive Tartarian honeysuckle is by far the most abundant and formerly occupied large areas, especially in the southern third of the prairie opening and areas south of

the prairie toward the parking lot. Most of it has been cut and treated with herbicide. It is one of the few shrubs which deer will not eat. Amur honeysuckle is present in small numbers and is less aggressive. Neither species is eaten by deer and continues to reproduce.

Buckthorn (*Rhamnus cathartica*): Common buckthorn existed in both shrub and tree form throughout the Preserve for many years forming dense thickets with the largest reaching 12 inches in diameter and a height of about 20 feet. Most of it has been removed, but seedlings form almost continuous mats in some areas. These are held down to a height of 6 to 12 inches by browsing deer. Herbicide is being used to control the seedlings. Reproduction continues from the seed bank and as birds bring seed in from nearby areas.

Multiflora rose (*Rosa multiflora*): This invasive species occurs in the openings, savannas and woodlands. Much of it has been cut and treated with herbicide. During the last two years most new growth on the remaining plants has been consumed by deer. It continues to reproduce.

Barberry (*Berberis thunbergii*): This thorny invasive species is one of the few shrubs not eaten by deer. It occurs as scattered plants, most of which have been cut and treated with herbicide.

High-Bush Cranberry (*Viburnum opulus*) the non-native form of this plant occurs as scattered individuals, but is not invasive. It does not appear to be reproducing.

Native Vines

Poison Ivy (*Rhus radicans*): Poison ivy is abundant in the wooded portions of the Preserve where, at the extreme, it attains a diameter of nearly two inches and covers the top of some dead trees. Ecologically it is not a problem, but large vines are being cut, and because it is quite sensitive to fire, it will become less common when fire becomes a regular management tool.

Grape (*Vitis riparia*): Wild grape vines occur throughout wooded portions of the Preserve. They are a useful woodland species. Existing vines are healthy, but deer browsing prevents reproduction.

Virginia creeper (*Parthenocissus quinquefolia*): Virginia creeper is scattered in woodland areas in small numbers, but is not able to reproduce due to deer browsing.

Yellow honeysuckle (*Lonicera prolifera*): This native vine occurs along the river bluff. It was locally abundant in management unit WO13, but has nearly disappeared, probably due to browsing.

Bittersweet (*Celastrus scandens*) : Two vines of native bittersweet exist on the western edge of the prairie. Seed from those plants are being reintroduced into the parking lot buffer deer enclosure.

Non-native Vines

Nitshade (*Solanum dulcamara*): This weedy vine occurs in disturbed areas, but gives way when competition develops. It is not a problem within the preserve.

APPENDIX 11

MIAMI HERBACEOUS VEGETATION

Herbaceous vegetation in the Miami Woods preserve reflects its history of relatively intense agriculture. The entire preserve appears to have been used for row crops and pasture. But fortunately farming ended before herbicides were used intensively. Some native plants survived the agricultural period and during the past 30 years seeds of many native species have been reintroduced by the North Branch Restoration Project. However, the greatly increased density of deer, especially during the past 10 years, has reduced and even eliminated the presence of some species, especially forbs.

In general, deer do not eat grasses or sedges although they browse sedges for a brief period in the spring during their early growth, after which they switch to other plants as they begin to grow. As a result, grasses and sedges are doing well.

Species that have disappeared include: Turk's cap lilies (*Lilium michiganense*), white prairie clover (*Petalostemum candidum*), purple milkweed (*Asclepias purpurascens*), prairie white fringed orchid (*Habenaria leucophaea*) and spiderwort (*Tradescantia ohioensis*).

Herbaceous species that deer don't eat include: white snake root (*Eupatorium rugosum*), stick-seed (*Hackelia virginiana*), bergamot (*Monarda fistulosa*), and mountain mint (*Pycnanthemum virginianum*),

For a further discussion, see annex 6 on impacts of deer.

APPENDIX 12

HYDROLOGY AND TOPOGRAPHY

Topographically Miami Woods consists of three zones: upland that varies in elevation by only about 5 feet and slopes gently toward the river; transitional slopes that drops 5 to 10 feet over a relatively brief distance (10 to 200 feet) to the floodplain. The floodplain is relatively flat and varies in width from a few feet to more than a hundred yards. The river falls only a foot or two between Dempster and Oakton Streets and its channel is slightly below 610 feet in elevation

The river and floodplain are the main hydrological features in Miami Woods and form its eastern edge. Three small streams emerge from storm drains at the edge of the preserve. They appear to have been ephemeral before development, but now carry small base flows and transport very large flash flows from upstream impervious areas during and after storm events. These flows are causing severe bank erosion. There are also nine upland drainage areas from within the preserve that form wet swales of varying size that produce seasonal flow and have outlets passing through culverts under the bike path.

The land slopes generally from the west toward the river and from north to south. Elevations range from about 635 feet at the northwestern edge of the prairie to a bit less than 610 feet along the river's edge. The river descends only a few feet from north to south as it runs from Dempster past Oakton Street. The 610 foot contour line runs along the river channel through the entire preserve. At the north end it has been straightened for a distance of about 1,300 feet and apparently deepened since there is a dry oxbow which appears on the map as management unit WO05. At the south end near Caldwell Avenue the channel has also been moved, leaving a dry oxbow on the St Paul side of the river. Both changes were made before the earliest aerial photo taken in 1925. It is not known whether lowering of the stream bed occurred at the time of the straightening as the result of erosion.

The frequently inundated portion of the floodplain lies between 610 and 615 in elevation. The less frequently inundated portion lies between 615 and 620. Most of the transition from floodplain to upland is narrow and lies between the 620 and 625 contour lines which run close together. The upland varies only slightly in elevation.

Existing management units reflect topography to some extent, but appear to have been drawn primarily based on the vegetative cover that existed in about 1980.