

2361 Dewes Street
Glenview, IL 60025
January 12, 2014

Larry Suffredin, Commissioner
Forest Preserve District of Cook County
Suite 192
820 Davis Street
Evanston, IL 60201

Dear Larry,

The Miami Woods report for 2014 is enclosed for your information. We again offer it as an example of the many sites being restored by volunteers within the County's Forest Preserves.

This year there are three parts:

- 1) A brief summary of management (input) activity primarily in terms of workdays, volunteers, and hours of donated work;
- 2) A seven page report on ecological results (outputs); and
- 3) A brief report on St Paul Woods, which in ecological terms functions as the eastern half of Miami Woods.

The report on ecological results addresses ecological health in terms of populations and the six major habitat factors that affect them: seed, invasive species, ground-layer sunlight, fire, hydrology, and animal imbalance.

We hope that the separation of input activities in part 1 from output results in part 2 will be of interest to you. Our experience is that while inputs are important, the real story is in the ecological results we are trying to accomplish.

And speaking of results, please note that again this year, it is the unmanaged deer herd that is the factor that is preventing recovery of ecological health in Miami Woods. The thousands of hours of work by volunteers have resulted in control of invasive species, adequate ground-layer sunlight, and adequate seed availability. It is only the excess population of deer that is preventing full recovery. Anything that you can do to help move the District in the direction of controlling deer in the North Branch Watershed would be much appreciated.

Sincerely,



Kent and Jerry Fuller
Volunteer Stewards
North Branch Restoration Project

MIAMI WOODS & PRAIRE 2014 UPDATE

Including:

MIAMI WOODS MANANAGEMENT ACTIVITIES 2014

MIAMI WOODS ECOLOGICAL CONDITIONS 2014

ST PAUL WOODS MANAGEMENT ACTIVITIES 2014



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MIAMI WOODS MANAGEMENT ACTIVITIES 2014

This is a brief summary of ecological restoration activities in Miami Woods during 2014. An in depth report on conditions is provided in "*2014 Miami Woods Review of Ecological Health*".

Miami Woods contains 106 acres in designated management units. In addition, the 5 acres of woods between the Caldwell avenue parking lot and the street are being restored. All 111 acres are being managed to control invasive woody and herbaceous species. But about 10 acres of brush remain in visual buffers along streets. Except for those buffers, invasive woody species have been removed from all of Miami Woods.

During 2014, the native plant communities within Miami Woods continued to recover from decades of invasion by brush and other invasive species. However, recovery has been limited to species not eaten by deer. This has resulted in continuing recovery of grass and sedges, but not most broad-leafed species.

Work in the Miami Prairie by the North Branch Restoration Project began in 1977. Large scale removal of brush from woodland areas began late in 2001. Since 2001 there have been 390 workdays involving 8,669 volunteer visits. Volunteers have contributed 23,841 hours of stewardship work. 76% of the effort has been in cutting brush, 15% pulling garlic mustard, and 9% gathering seed. There has also been 4,784 hours of organized educational activity during the period, primarily devoted to river studies.

During 2014 there were 25 workdays where 330 volunteer visits resulted in contribution of a total of 924 hours of work. Brush cutting accounted for 74% of the hours, garlic mustard removal for 12%, and seed gathering for 12%

Groups working in Miami Woods during 2014 included: the Chicago City Day School on 4 days, Wright College on 4 days, and single days by Curie Metropolitan High School, the Veridian Energy Group, the North Shore Choral Society, WBEZ radio, and the Sigma Chi fraternity from Northwestern University. The remaining days were North Branch Restoration Project events which included North Branch volunteers and students from a variety of schools.

Workdays during 2014 were devoted to pulling garlic mustard, gathering seed and removing brush to narrow some of the brushy buffer areas along streets. Most of the brush removal was concentrated in the badly degraded area between the parking lot and Caldwell Avenue and in the buffer area along Caldwell Avenue north to the prairie. Elsewhere thinning of fire-sensitive trees is being continued to maintain the amount of sunlight reaching the herbaceous layer. Herbaceous invasive species and seedlings of woody invasives are being controlled using herbicide applied by the site stewards. One exception is garlic mustard which is pulled by hand. The invasive celandine buttercup, *ranunculus ficaria*, is emerging as a major threat to the riparian wetland, and is not fully controlled.

Controlled burning was conducted in the spring by a Forest Preserve contractor which resulted in burning several woodland units for the first time in more than 10 years, an important milestone. Fire was reintroduced to the open areas beginning in 2008 after a hiatus of more than 10 years. The main prairie has been burned six times since 2008, most recently in November of 2014. The extent and intensity of prairie burns has varied greatly depending on weather conditions. Conditions this year were marginal with the result that areas dominated by the big prairie grasses burned, but others did not.

The removal of invasive brush and the near absence of native shrubs in Miami Woods, in part due to browsing by deer, has resulted in very limited nesting habitat for shrub-land birds. In response, Audubon Chicago Region has obtained a grant to reintroduce native shrubs to provide nesting habitat and for use by migratory birds. The growing of local origin shrubs began during 2014 with planting scheduled during 2015.

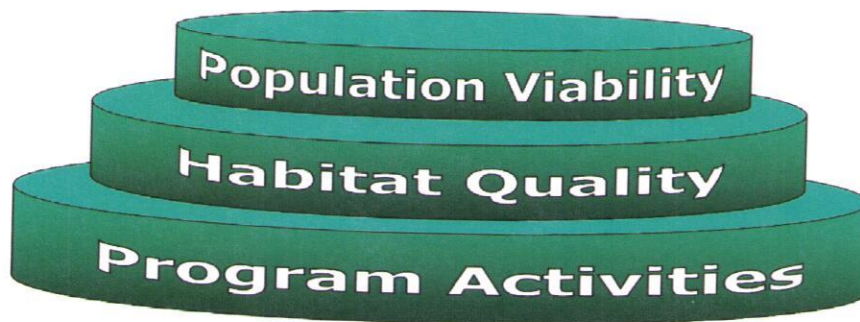
MIAMI WOODS ECOLOGICAL HEALTH 2014

The land that was to become Miami Woods was formed by glaciers and 100 centuries of prairie vegetation, together with groves of trees that probably came and went under the influence of drought and fire. (A thorough discussion of the geology and soils of Miami Woods can be found in Susanne Masi's 1991 master of science thesis.) It was farmed for about a century and then acquired to be a forest preserve and left unmanaged for decades in the belief that it would recover. In the absence of natural processes such as fire, and impacted by the new force of invasive species, the scattered old oaks became surrounded by young fire-sensitive trees, together with thickets of buckthorn and Tartarian honeysuckle. During the past 30 years volunteers have invested more than 20,000 hours of stewardship work controlling the invasive species, thinning fire sensitive trees, and reintroducing native seed. Also, the Forest Preserve District is in the process of returning the natural force of fire to the land.

I INTRODUCTION

Ecological communities: As described in the *Chicago Wilderness Atlas of Biodiversity* and the *Chicago Wilderness Biodiversity Recovery Plan*, plants, animals and other living organisms naturally self-assemble into identifiable kinds of ecological communities based on where conditions are best suited for their growth and reproduction. Communities are identified based on their habitat and populations. Individual species may occur in more than one type of community, but they are most abundant where they are most competitive. In general, ecological communities within Miami Woods consist of woodland, savanna, and prairie, ranging from mesic (moderately moist) to wet, including wetland. The aquatic community consists primarily of the river together with its bed and benthic organisms.

A framework: The ecology of natural areas and their state of health can be viewed as a three layered system. The top layer consists of populations of plants and animals including invertebrates, reptiles, amphibians, birds, and mammals. The sustainability of those populations is the ultimate measure of ecological health. The middle layer consists of physical, chemical and biological habitats that provide food, shelter, and conditions needed for reproduction. The bottom layer consists of human activity which includes both activities that harm habitat and activities that protect and restore it. Each layer rests on the one below.



Ecological health / Ecological Quality of natural areas includes both populations and habitat, but it is the state of the top layer that is the ultimate measure. The ecological quality of habitats depends on many factors, but there are six that are key to restoration: seed, invasive species, sunlight, fire, animal management, and hydrology. These six major factors can be envisioned as the sides of a storage bin (section V). Deficiencies in any factor can be seen as lowering one of the six sides, spilling out biodiversity and reducing ecological health. Restoring each of these factors is essential to restoring ecological quality. (For a discussion of ecological health and its six factors in Miami Woods see section V.)

II CURRENT STATUS OF ECOLOGICAL COMMUNITIES

The best available map for discussing ecological conditions is the FPCC map of management units superimposed on an aerial photograph (Attached). The management unit boundaries were drawn without regard for topography and before restoration began, apparently based largely upon degree of canopy closure including buckthorn and fire sensitive trees. As the boundaries of the woodland and savanna communities become clearer it will probably be useful to modify and perhaps combine some units. The emerging ecological communities within Miami Woods cover portions or all, of multiple management units. In this review, the communities are discussed primarily in terms of existing management units.

Prairie: In terms used in the *Biodiversity Recovery Plan*, Miami Prairie is a fine-textured-soil prairie that ranges from mesic to wet-mesic. The prairie community covers the northern 80% of PR01 and all of PR02 & 03. Its condition varies depending on the length of time since invasive species have been controlled. The oldest areas are in the northern one third of PR01 and western 60% of PR02 and PR03

Savanna: In terms used in the *Biodiversity Recovery Plan* it is a fine-textured-soil savanna that ranges from mesic to wet mesic and is found in management units SA01 and SA02. The area between the two units is a woodland that is rapidly thinning due to the death of ash trees to the extent that the two savannas will soon become connected by a very open woodland or savanna. Management units SA03 and SA04 have extensive tree cover and lack savanna species; and thus appear to be better identified as woodlands.

Wooded Communities: Historically there was very little woodland in Miami Woods except near the river. Public land survey records from 1840 are discussed in the Masi thesis and show that trees on the west side of the river were predominantly scattered oaks. Most of the soil in the preserve is deep black prairie "corn-belt" soil suggesting that throughout most of its history the area was covered with prairie vegetation. Oaks and hickories probably moved back and forth in response to wet and dry periods and to the impact of fire. Fire sensitive trees may have been present, but would have been limited to wetter areas. An aerial photograph from 1925 shows very limited presence of trees with most of the land being farmed. There were scattered trees along the edge of the river, and while there were some wooded areas, they appear to be lightly wooded pastures with treetops that did not meet. The only area with woods that had a closed canopy at that time was in portions of WO03 and WO04. The remaining old oaks show that they grew to large size with wide spread lateral branches which have since been shade- pruned as the fire sensitive species moved in. At present it is the younger fire sensitive species that make the

Preserve appear to be so densely wooded. Reproduction of trees and shrubs has not been successful for more than 10 years due to excessive deer browsing.

At present all of the floodplain and much of the uplands are covered with wooded communities ranging from very open to small areas with closed forest formed by reproduction probably dating from the 1920s or '30s. The upland woods are mesic to wet-mesic and support a mixture of very large oaks more than 100 years old (fallen branches have shown more than 120 growth rings) and fire sensitive species that are less than 60 years old. Woodland flora is present to some extent throughout the present woodlands, but it is more diverse in areas that supported trees in 1925.

Very few native shrubs were present in the Preserve even before the deer population erupted, probably as the result of cultivation and grazing. The contrast between the diversity of native shrubs in nearby Harms Woods versus Miami Woods suggests that grazing was more intense in Miami.

Closed forest was rare, if present at all, within Miami Woods in earlier times. Herbaceous species associated with closed forests are not found at present. The closed canopy that appears in the northeast corner in the 1925 aerial photo was apparently an oak woodland where the crowns of widely spaced trees had reached each other, but forest flora had not become established. The management units shown on the map were apparently designated based on tree cover in the 1970s regardless of whether crown closure was the result of recent invasion by fire sensitive species or was associated with older communities. Since the goal of restoring Miami Woods to its earlier communities, it does not seem appropriate to encourage development of closed forest conditions.

Floodplain, River and Wetlands: The floodplain can be easily seen in the topo map as the area below the 620 contour line. It extends along the west side of the river from the north/south midpoint of the preserve in management unit FO03 northward almost to its northern border. It includes the eastern portions of management units FO03, SA03, PR02, WO11, WO09, WO07; all of FO02, FO01 and WO05; and the southeastern portion of WO03. There is also an area of floodplain at the southern end of the Preserve covering most of FO05. Canopy cover varies greatly throughout the floodplain, ranging from approximately 50 to 90%. Herbaceous cover varies greatly from place to place depending in elevation, in part due to drainage, but probably even more on the length of time vegetation is submerged following storm events. Duration of inundation varies greatly from year to year, and in wet years substantial areas support little or no herbaceous vegetation for extended periods. Invasive species have been virtually eliminated except for persistent small patches of reed canary grass which are spot sprayed; and celandine buttercup which is increasing in spite of regular spot spraying.

The floodplain has changed substantially during the past 200 years. There are no systematic records, but at the time of the public land survey the river was smaller and flows may have dried out during some seasons. Certainly a higher percentage of rainfall was absorbed throughout its undeveloped watershed, and Lake Michigan water was not being used and discarded into it. The aerial photograph from 1925 shows that there were few trees in the floodplain at that time and portions of it were being cultivated.

In the upland areas there are nine small ephemeral streams that are fed entirely from within the Preserve. They are recovering from the impact of invasive species and excess shade, and have good potential as sedge meadows. There are also wet pockets that are recovering and have potential for supporting wetland vegetation and forming ephemeral ponds during wet years.

The river channel and its flows support an aquatic community that is beyond the scope of this review.

Mini Sites: Mini sites can range from a few acres to as small as a few hundred square feet. They are places where certain species have a competitive advantage and where mini communities can become established. They may be obvious at the beginning of restoration, or they may not be identifiable until recovery is well under way.

North Branch Restoration Project Strategy: The early stages of restoration are like a rescue mission. The central idea is to protect and salvage the existing living resources that survive in remnant patches. To do this, the main focus is on the remnants: gathering seed, controlling invasive species, and restoring the availability of sunlight by removing brush and thinning fire sensitive trees.

During early stages of restoration the North Branch approach is to broadly distribute seed mixes into cleared areas. These mixes contain a variety of species based on the amount of sunlight and moisture that they need. Individual species may be included in more than one mix if they can grow under a variety of conditions. This approach gives a variety of species the opportunity to self-select into places where they are best able to compete. Seed is introduced during multiple years because weather conditions vary from year to year and site conditions evolve as vegetation recovers. The purpose is to allow mini communities of plants to develop naturally in mini sites throughout each larger restoration site.

As restoration of a site progresses, mini sites develop as the result of many factors, but the result is diversification of the larger area. Stewards can help this process along by identifying and tracking likely mini sites and ensuring that they receive needed care, but for the most part they emerge spontaneously.

One set of likely mini sites within Miami Woods are the nine small watersheds that exist entirely within the preserve and are drained by small seasonal streams that flow to the river through culverts under the bike path.

III POPULATIONS

Plant Populations: The aerial photograph from 1925 shows that there were relatively few trees in Miami "woods". Most of the area appeared to be in use as farm fields or pasture. At the time, trees were spread out with space between the crowns. Many of those old trees are still present. Most are oaks and hickories that are now crowded by younger fire-sensitive species. Much of the formerly treeless area is now covered with fire-sensitive trees. Herbaceous vegetation in the currently wooded areas is characteristic of savanna and open woodland conditions, and little or no forest vegetation is present. The main prairie and two smaller savanna openings currently support a diverse mix of prairie and savanna species which survived agricultural activity and have been strengthened by seed from local remnant natural areas.

Plant populations are unevenly distributed not just because of varied habitats, but because various places are at different stages of recovery following control of invasive species and application of various management practices. 162 species of prairie and savanna plants were found on site by North Branch volunteers when they began restoration in 1977. Since then more native prairie and savanna species have been reintroduced from nearby remnants. As work expanded into woodland areas, more native species were found and more woodland species were reintroduced. Unfortunately, since restoration began, the deer population erupted from less than one per 40 acres to more than ten per 40 acres. This has resulted in the loss of 35 plant species and 23 more have been greatly reduced in abundance and appear to be headed toward disappearance.

Animal populations: Reptiles and amphibians are basically absent from Miami Woods with the exception of two snake species, a few American toads; and turtles in the river. Bird species are monitored and show that shrub nesting species have declined. This has stimulated a project to restore native shrubs. Ground-nesting birds are absent, probably due to the large raccoon population together with pressure from other native predators and household cats. Native predators include great horned owls, hawks, coyotes and even deer. Invertebrate populations are mostly unknown although butterflies have been monitored in some years.

IV Habitats

The preserve contains 5 community types: Black Soil Prairie, Savanna, Woods, Wooded flood plain, and the river itself. It also has the potential for creating several small ephemeral ponds and/or sedge meadows. These communities exist because of complex interactions between species and the existence of physical, biological and chemical habitats. Restoration of the health and quality of those communities depend on six major habitat factors discussed in section V

Physical habitat in Miami Woods is largely determined by topography and human facilities. Topography divides the site into three zones: a gently sloping upland, nearly flat floodplains and relatively narrow transition slopes between upland and flood plain. There are three small eroding streams that carry water from off-site to the river. The storm flow in these streams is vastly greater than before development of the surrounding area and is resulting in severe stream bank erosion. Small sub-watersheds within the Preserve support small seasonal streams that flow to the river through culverts under the bike path. These are discussed in the hydrology section below. Soils are predominantly deep black (corn-belt) silt loams that were created by prairie plants. There are small areas on the transitional slopes with thinner lighter soils that may reflect a woodland history. The original soil within the floodplain appears to be overlain by substantial quantities of black prairie soil eroded and deposited during the agricultural period.

There is a major physical legacy from historical agricultural use which existed for about 100 years until about 1925, and left continuing impacts due to cultivation and pasturing of livestock. Details of agricultural use are unknown, but it appears to have been intense judging from the reduced herbaceous vegetation and near absence of native shrubs. The main prairie is drained by agricultural tiles as discussed below in the hydrology section. The main existing cultural feature is the picnic grove with its lawns, shelter, and parking lot. The other major cultural feature is the segment of the North Branch bike path which runs near the river between Oakton and Dempster Streets. In the 1925 aerial photograph most of the bike path appears as a narrow

gravel road. There is evidence of old farm roadways, and the presence of concrete bollards and anecdotes indicate that there was a FPDC access drive along the northern edge of the prairie to the depth of the existing condo development. The remains of an old farm house basement exist at the intersection of the bike path and the Main Street right-of-way.

Utility easements are another cultural feature. They exist along Caldwell Avenue and across the prairie from Caldwell Avenue to the bike path at the north-south midpoint of the preserve. The easement covers the land that would have been Main Street in Morton Grove if it had crossed the river. It provides access to the deep tunnel drop shaft near the bike path. The MWRD deep tunnel provides combined sewer overflow protection and runs from north to south deep underground through the preserve. It has no known impact on surface or groundwater within the preserve. Two water mains exist within that easement and extend to the east from Caldwell under the river and through St Paul Woods providing Morton Grove with major access to water supplied from the City of Chicago. During 2014 both mains were replaced using open cut construction from Caldwell to the bike path and tunneling under the river. The North Branch Restoration Project agreed to re-vegetate the disturbed area to ensure use of local origin seed.

Further south the Village of Niles has an easement from the intersection of Caldwell and Cleveland Street to the river north of the parking lot. A 72 inch storm sewer is planned for construction in that right of way during 2015 also using open cut construction.

Physical access to the preserve is primarily by way of the bike path, the picnic grove, and the unofficial "hole-in-the-fence" at the southeastern corner of the parking lot for the Prairie View Shopping Center at the north end.

Biological habitat is recovering as invasive species are being brought under control, sunlight is being returned to the ground layer, and seed is being reintroduced from other nearby natural areas. But recovery has been held back by excessive deer populations as discussed below. The impacts of excessive raccoon populations are unquantified, but probably contribute to the absence of reptiles, amphibians, and ground-nesting birds. Plant diseases have killed most of the elms (*Ulmus* sp.) and are rapidly killing all ash trees (*Fraxinus* sp.). Disease has also killed all but one of the less abundant butternut trees (*Juglans cineria*). With the exception of gray dogwood in the prairie, native shrubs are few in number, probably due to use as pasture and more recently due to deer browsing. Currently browsing prevents reproduction of all trees and shrubs and is eroding the few remaining shrub clumps. The impact of excessive browsing by deer is clearly evident in three deer exclosures located in the main prairie, woodland unit WO04, and adjacent to the Prairie View Shopping Center parking lot. A project is underway, sponsored by Audubon, to reintroduce native shrubs to provide improved bird habitat. Planting is expected to begin in 2015.

Chemical habitat and impacts within it are relatively unknown. Airborne deposition of nutrients and contaminants is similar to surrounding areas and is unquantified. Chemical concentrations in the river and loadings from upstream are unknown, but include effluent from a very large sewage treatment plant in Lake County and large quantities of urban non-point runoff. Warmth from wastewater and salt from streets limits ice formation on the river. Limited sampling data from the river is available from the Chicago City Day School whose students regularly sample the river. Within Miami Woods three small tributary streams bring flood water and chemical loading

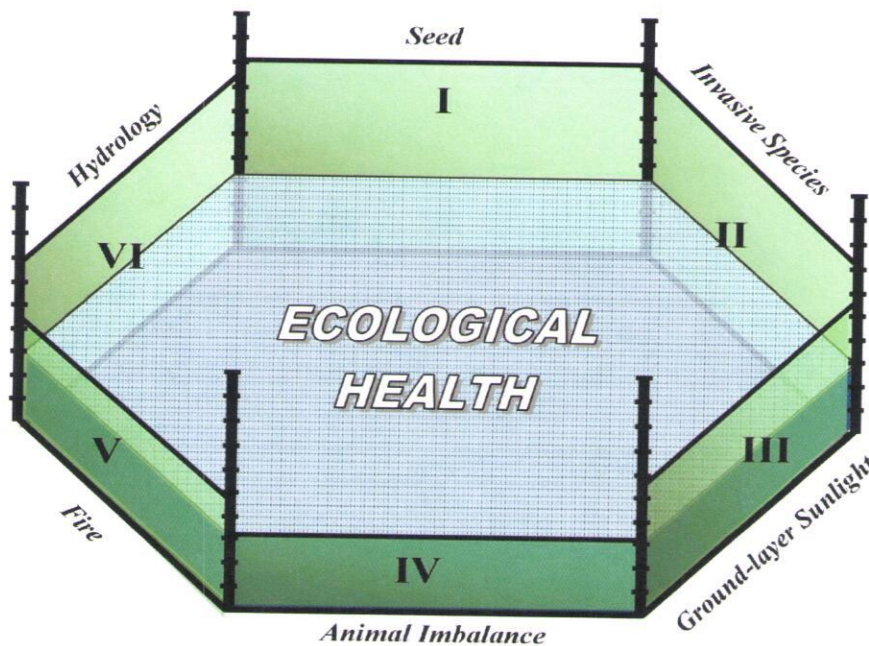
from off site as discussed in the hydrology section below. There have been problems with sanitary sewage entering the streams in the past, but none is known to exist at present.

Human Activity:

Historic human impact is present primarily in the form of past agricultural use which is discussed below in the hydrology section. Recreational use associated with the Bike path and picnic grove continues to have some impact. Maintenance of water and sewer mains under the Main Street and Caldwell Avenue rights of way also continue to have negative impacts, primarily in the form of excavation related to replacement and augmentation. Positive human activity is found in restoration activities discussed below.

V State of Restoration in Miami Woods Habitats & Six Major Factors

Habitat Factors: There are many habitat factors needed to support healthy ecological communities and they can be described and measured in many ways. But there are six major factors that determine the success of restoration which can be envisioned as the sides of a six sided reservoir that stores ecological quality as illustrated below. The most deficient (limiting) factor determines the level of quality that can be supported.



Ecological Quality Container & Limiting Habitat Factors
(The most deficient factor limits the level of ecological quality)

Seed collection and Dispersal: The reintroduction of native seed from local sources began at the start of restoration and has continued to the present. Seed is gathered by volunteers throughout

the North Branch watershed during the growing season, then processed and combined into mixes according to the amount of sunlight and moisture needed by the plants. Some species that are difficult to gather from natural areas are grown by gardeners using wild seed from local areas. Seed from those plants are also added to the mixes. The mixes are then allocated among the restoration sites including Miami Woods. Seeding has been successful in Miami Woods, but deer have suppressed or prevented recovery of many forbs (broad-leafed species).

Invasive species: The control of invasive plant species has been a major component of the restoration project from its start in Miami prairie in 1977. The most time-consuming activity has been the removal of brush, primarily common buckthorn (*Rhamnus cathartica*) and Tartarian honeysuckle (*Lonicera tatarica*). Seedlings of these species continue to require control. Other woody species that were a problem, but are under control are multiflora rose (*Rosa multiflora*), privett (*Ligustrum vulgare*), and barberry (*Berberis thunbergii*). Since restoration resumed in 2001, 390 workdays and more than 23,000 hours of stewardship work have been devoted to control of invasive species, primarily to brush control. At present brush removal has been completed throughout Miami Woods except where it has been left to provide perimeter buffers for sight and sound. The long term strategy is to replace all invasive brush with native shrubs.

Herbaceous invasives continue to pose challenges, but are held in check by spot application of herbicide. The two most persistent challenges are reed canary grass (*Phalaris arundinacea*) and Canada thistle (*Cirsium arvense*). Others requiring treatment are common reed (*Phragmites australis*), teasel (*Dipsacus laciniatus*), and field parsnip (*Pastinaca sativa*). By far the most threatening is celandine buttercup (*Ranunculus ficaria*) which is rapidly invading floodplains and is increasing with in Miami Woods in spite of aggressive spraying. Spot application of herbicide is conducted throughout the Preserve several times annually.

Sunlight: The availability of adequate sunlight determines the presence and abundance of many species. As described in the *Biodiversity Recovery Plan*, prairies can tolerate up to 10% tree cover, savannas from 10-50%, woodlands 50-80%, and forests 80-100%. Due to the absence of the natural force of fire, Miami Woods is far shadier than it would be in a natural condition. Removal of invasive brush helps to restore needed levels, but thinning of fire-sensitive tree species is also essential. Initial thinning of fire-sensitive trees has been conducted throughout the Preserve during the past 14 years and the rapid die-off of ash trees in some areas is greatly increasing the amount of sunlight reaching the ground. However, some areas still have too much shade, and continuous growth and closure of the tree canopy means that continued thinning is needed.

Fire: The natural force of fire has been absent from Miami Woods for most of the past 200 years. It is needed as a management tool to help control invasive species and to stimulate native species. During the past 10 years, the main prairie has been burned several times and the other two openings twice, but most of the woodland management areas have been burned only once. Burning on a two year cycle is needed for ecological reasons and would reduce the use of herbicide needed to control invasives.

Animal Imbalance: The absence of large predators and changes in habitat have greatly altered animal populations within the Preserve. The largest impact on the ecosystem is from the dense deer population. Records of observations by volunteers report the first sighting of a deer in 1978. The next year there were two. The eruption began from there. Videos made in 1995

showed continuous vegetation from the ground into the trees along edges of open areas. In recent years a hard browse line has been present with twigs and leaves present only above the reach of browsing deer. With the exception of Japanese honeysuckle, barberry, older canes of multiflora rose, and older stems of gray dogwood, all other twigs and leaves are consumed. Impacts on forbs (broad leafed plants) are almost as severe. Many species have been suppressed or completely eliminated as noted in section III. As a result, populations of the few forbs that are not eaten have become very abundant. Most grasses and sedges have not been noticeably impacted although sedges are grazed aggressively during the early spring until other plants become available.

Another animal species that appears to have exploded is raccoons. The impacts are unknown, but probably contribute to the absence of amphibians and reptiles as well as the absence of ground-nesting birds.

Hydrology and Wetlands: As briefly described above in the section on physical habitat, the topography of Miami Woods consists of relatively flat uplands, transitional slopes, and wetlands. Some of the transitional slopes are quite steep in areas where the river has been cutting into the uplands in relatively recent times, and less so elsewhere.

Surface hydrology consists of the river itself, the river floodplain, small tributaries, and small seasonal ponds and wetlands scattered in the prairie openings.

Sometime before 1925 the river channel was dredged and partially straightened, especially at the north and south ends near Dempster and Oakton Streets where portions of the old channel can be seen as oxbows. No restoration has taken place within the river itself. Unfortunately heavy woody materials are periodically removed by the Metropolitan Water Reclamation District. This reduces the flood retention function of the floodplain and destroys natural stream habitat.

The floodplain is heavily impacted by flooding that is more frequent and longer lasting than historic patterns because of upstream development. The 1925 aerial photograph shows that there were few trees in the floodplain and that portions were cultivated. Currently it is covered with fire-sensitive trees. Within the floodplain, invasive species are being controlled and some seeding is being done, but major restoration is unlikely due to flooding stresses. Lesser celandine buttercup is a major threat to surviving plants, especially spring ephemerals.

There are twelve small tributary streams of varying size that feed the river within Miami Woods. Three receive large surges of storm runoff from beyond the Preserve and are eroding unsightly gullies. They have small base flows, probably from footing drains and air conditioning condensate. They provide useful habitat, but, without control of the off-site flows, little can be done to control the erosion. One exception is a 2014 Eagle Scout project that resulted in two log dams in the lower portion of the Wayside Woods stream that drains portions of Dempster Street. The temporary impoundments behind the dams will reduce the erosive force of storm flows. The other nine streams are ephemeral and receive water only from within the Preserve. They have good potential including the possibility of creating ephemeral ponds by controlling their flow where they run through culverts under the bike path.

Small wetland pockets occur in the prairie and woodlands and provide important habitat for wetland plants and animals.

Groundwater has not been mapped, but portions of the prairie are seasonally quite wet. There are three large drain tile outlets that appear to drain the prairie. They are 12 inch vitrified clay which is unusual for farm tiles, but they are dry except during spring or prolonged wet periods and show little or no response to individual rainfall events. Mapping and blocking the tiles could lead to restoring additional wetland areas or even ephemeral ponds.

VI MONITORING

Monitoring the condition of plant communities in Miami ranges from anecdotal observation by long term observers including stewards, to intense carefully quantified surveys. The occurrence and abundance of many species vary somewhat from year to year, but trends eventually emerge. As mentioned in the section on populations, monitoring began in the prairie in 1977 and showed an increasing number of species to be present in response to restoration efforts. Since the eruption of the deer population the number of broad-leafed species has declined. However, the number of sedges and grasses has increased.

The number and abundance of native species is one somewhat crude indication of ecological quality. The quality of those species based on their sensitivity to disturbance is an additional factor. The Floristic Quality Assessment system described in *Plants of the Chicago Region* by Swink and Wilhelm provides a robust methodology for evaluating quality based on values assigned to each native species occurring within the Chicago Region. Using that system it has been found that between 1981 and 2011 the weighted mean C value has progressed from 2.9 to 3.8 and the weighted native FQI from 9.5 to 14.1. This shows that floristic quality has improved even though numerous high quality native species have been lost to excessive deer browsing. Apparently the improvement in grasses and sedges has been enough to outweigh the loss in plants that deer prefer. The surveys have also shown that invasive species have declined since restoration began.

An earlier major review of conditions in Miami Prairie was conducted by Susanne Masi as a master of science thesis in 1991. A major conclusion of the thesis was that, "The hypothesis of the study has been supported, namely, that significant improvement of the prairie's natural quality has resulted from the interaction of management practices and natural succession. This improvement is measured in the quadrats and on the Prairie as a whole by (1) the increase of the number of native species and (2) the increase in abundance and quality of native species, and (3) the decrease in the abundance of alien and weedy native species. Chapter 4 showed that the Natural Area Rating Index (NARI) increased significantly from 1981 to 1990 for the transect and for the prairie as a whole."

Overall Miami Woods and Prairie remains a work in progress. Five of the six major habitat factors have improved significantly: invasive brush has been removed and invasive weeds are under control; fire sensitive trees have been thinned returning needed sunlight; periodic fire is being returned to the landscape; seed has been distributed; and hydrology is not posing major problems. Although the sixth factor continues to destroy ecological health and quality, there has been some improvement in floristic quality and the stage is set for major recovery when the deer herd is brought under control.

