

Village of Shorewood Hills Parks and Open Space Plan

Appendix 2: Comparison of Oak Woodland, Mesic Forest, and Oak Savanna Restorations and Recommendations

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This appendix is designed to address several aspects of park restoration. First there is a comparison of oak woodland, mesic forest, and oak savanna restorations so that an appropriate restoration model can be selected for each park. The remainder of the document presents methods to carry out an oak woodland or mesic forest restoration including the removal of invasive species.

Existing Vegetation

The vegetation of Shorewood Hills today is of varying ages and species. The older areas of woodland have numerous white oak and red oak trees over 24 inches in diameter. Hackberry, bur oak, ash, and shagbark hickory trees also grow in these older forested areas. Photographic evidence of past oak savanna is not apparent, but photographs from 1937 show that much of Shorewood Hills was quite open, probably due to clearing and logging by early settlers. Over the last 60 years Shorewood Hills has become more wooded and today much of the area is a woodland dominated by oaks. In some areas the mid-story is dominated by the exotic species. Buckthorn and honeysuckle occur in varying densities throughout the village.

Choosing a Restoration Model (Goal 1C.1)

In order to choose a restoration model, the current vegetation, site characteristics, usage and nature of the park should be considered. Since several of the Shorewood Hills parks are quite small and surrounded by houses, it may be impossible to do a full-scale restoration to an oak savanna. In smaller parks some residents will express objections to burning. Due to the small size of the natural areas in most of the parks, it may be necessary to treat the restoration like a garden, weeding and possibly watering if necessary, rather than as a natural area that can maintain itself. This appendix will discuss the oak woodland, mesic forest, and oak savanna restoration options.

Option 1: Oak Woodland

Most of the Village of Shorewood Hills is woodland. While undesirable species including Norway maple, box elder, buckthorn, honeysuckle, and garlic mustard grow throughout the Village, the majority of the canopy layer throughout much of Shorewood Hills consists of desirable woodland species including red oak, white oak, bur oak, hackberry, and shagbark hickory. By discouraging and controlling the spread of the undesired species and encouraging the growth of a native mid-story and under-story, the biodiversity of the woods will increase. By replacing honeysuckle with shrubs such as viburnum, buckthorn with musclemwood, and garlic mustard by wild geranium and other native forbs, the Village will restore native flora, keep the structural integrity of the woods and enhance the habitat for wildlife. This gradual restoration will enable existing woodland wildlife to continue to live in the parks.

The ease of implementation of this option is a strong justification. Multiple mature canopy trees, some native mid-story shrubs, and native ground layer species consistent with an oak woodland community are present in parts of the Shorewood Hills parks. If these areas are restored to oak woodland, the majority of the work will be invasive plant removal, which can be done by use of volunteer help, keeping costs down. Existing native shrubs and ground layer species can also provide seeds to replant other, more disturbed areas, further lowering the costs of this option. The woodland structure can also be enhanced by planting appropriate young trees, which will diversify the age structure and increase the number of tree species in the forest community. Planting shrub and ground layer species will enhance biodiversity in the parks.

Goals of an Oak Woodland Restoration

- Create an example of a Southern Wisconsin oak woodland ecosystem with appropriate native species at canopy, mid, and ground layers, as described by John Curtis in *The Vegetation of Wisconsin*.
- Support native wildlife with a wide selection of native woodland plants.
- Use the oak woodland restoration to educate people about and involve them in the restoration of this community.

Advantages of an Oak Woodland Restoration

- Large woodland trees are already present in a majority of the parks.
- An oak woodland restoration requires little cutting of established canopy trees. As a result, a woodland restoration causes less disruption to parks.
- Local seeds and plants are available to use in restorations.
- This restoration increases the biodiversity of the parks by replacing non-native invasive species with a wide variety of native species.
- Since Shorewood Hills adjoins Eagle Heights Woods, a larger oak woodland, restoring the Shorewood Hills parks to this habitat increases the area of oak woodland and enables birds and other animals that require larger forest areas to live here, thereby increasing animal diversity. If each Shorewood Hills park is restored to a different community, there is the danger that these small restorations become habitat islands that cannot support animals requiring larger habitat areas.

Disadvantages of an Oak Woodland Restoration

- A large amount of oak woodland is already present nearby in the Campus Natural Areas.
- Many invasive species are already established. People object to removing invasive species because they think it looks like a clear cut.
- Restoration may disturb wildlife and destroy habitat.
- Restorations are a lot of work. Invasive species are hard to remove. New plants require water and care. Animals may damage or kill new plantings.
- Oak trees will not regenerate in a closed canopy forest, so continuous disturbance including cutting, burning, and creating canopy breaks are required to try to allow oak regeneration and maintain oak forest.

Option 2: Mesic Forest

Most of the Village of Shorewood Hills is currently oak forest. Oak forests are not stable, but over time with natural succession become mesic forest because oaks will not grow in shade. As a result, few young oak seedlings survive in a forest. Instead, other shade tolerant trees like basswood and sugar maple grow under the oaks. Oaks will only grow in sunny holes in the forest caused by tree falls or cutting. Cutting and fire are required to kill fire-sensitive trees like maple and basswood in order to keep the woods open and increase the odds that oak seedlings will get enough sun to grow.

Without intensive management, over time the oak forest will gradually become mesic forest. This more diverse forest community is less susceptible to diseases like oak wilt. As with oak woodland, the current plant species in the parks are consistent with this option. The initial and most labor intensive step, as with oak woodland, will be invasive plant removal, which can be done by use of volunteer help, keeping costs down. Existing native shrubs and ground layer species can also provide seeds to replant other, more disturbed areas, further lowering the costs of this option. The woodland structure can also be enhanced by planting appropriate young trees, which will diversify the age structure and increase the number of tree species in the forest community. Planting shrub and ground layer species will enhance biodiversity in the parks.

Goals of a Mesic Forest

- Create an example of a Southern mesic forest ecosystem with appropriate native species at the canopy, mid and ground layers, as described by John Curtis in *The Vegetation of Wisconsin*.
- Support native wildlife with a wide selection of native woodland plants.
- Use the mesic forest restoration to educate people about and involve them in the restoration of this community.

Advantages of a Mesic Forest Restoration

- Large woodland trees are already present in a majority of the parks.
- Mesic forest restoration requires little cutting of established canopy trees. As a result, a woodland restoration causes less disruption to parks.
- This type of restoration costs less and takes less effort since it allows natural succession rather than preventing it. Maintaining oak woodland by keeping the shade tolerant maples, basswoods, and elms out requires frequent cutting and/or burning.
- By having multiple tree species rather than a few species, the park trees are less vulnerable to being destroyed by a single tree disease, such as oak wilt.
- Local seeds and plants are available to use in restorations.
- Mesic forest restoration increases the biodiversity of the parks by replacing non-native invasive species with a wide variety of native species.
- Since Shorewood Hills adjoins Eagle Heights Woods, a larger woodland, restoring the Shorewood Hills parks to this habitat increases the area of woodland and enables birds and other animals that require larger forest areas to live here, thereby increasing animal diversity. If each Shorewood Hills park is restored to a different community, there is the danger that these small restorations become habitat islands that cannot support animals requiring larger habitat areas.

Disadvantages of a Mesic Forest Restoration

- A large amount of woodland is already present nearby in the Campus Natural Areas.
- Many invasive species are already established. Neighbors object to removing invasive species because they think it looks like a clear cut.
- Restoration may disturb wildlife and destroy habitat.
- Restorations are a lot of work. Invasive species are hard to remove. New plants require water and care. Animals may damage or kill new plantings.
- The presence of too many maples and other smaller trees will further stress the oaks and ultimately kill them, accelerating succession.
- A maple/basswood forest has denser shade and supports fewer ground layer plants.
- Oaks provide better wildlife food than maples and basswoods.

Option 3: Oak Savanna

Another option would be to restore the woods to their pre-settlement condition, an oak savanna. The oak savanna community was maintained by fires set by Native Americans. The oak savanna had large, open grown, fire resistant trees such as bur oaks and had between 10% and 50% tree canopy. The ground layer required sun and had a mixture of prairie and wood edge plants. As fire ceased with settlement, initially other disturbances like grazing and agriculture kept the land open. However, once agriculture and grazing ceased, much of Shorewood Hills became forest and savanna plants were replaced by woodland plants that tolerated shade. Exotic species have also invaded the woodlands.

Restoring savanna would provide Shorewood Hills residents with exposure to this rare community. Since oak savanna is the rarest plant community in Southern Wisconsin, this restoration can teach Village residents about oak savannas and their restoration. Restoring some areas of Shorewood Hills to savanna would be beneficial for surviving open grown oaks that are crowded by other trees in the forest or by invasive seedlings and non-native shrub layers.

The Shorewood Hills woods have numerous red oak, white oak, bur oak, shagbark hickory, and hackberry. All are species that lived in oak savannas. Much of the Shorewood Hills area was agricultural and succeeded into woods in the last sixty plus years.

At a nearby savanna restoration, the Wingra Oak Savanna at Ho Ne Um in the UW Arboretum, one of the major problems has been establishing savanna ground layer species. At the Arboretum their attempt to seed and plant the area after clear cutting failed because opportunistic species, such as bitter dock, dames' rocket, and tall goldenrod, moved into the area before the desired species became established. In Shorewood Hills a major concern would be that garlic mustard would spread when new canopy openings let in more light. An alternative method would be burning and gradual clearing of understory vegetation, followed by seeding.

An oak savanna restoration will cause drastic changes in park appearances and may arouse public opposition, but public involvement and education could decrease this opposition.

Goals of an Oak Savanna Restoration

- Create an example of an oak savanna community with appropriate native species, as described by John Curtis in *The Vegetation of Wisconsin*. This will increase the diversity in the Village parks.
- Support native wildlife with a wide selection of native savanna plants.
- Use this restoration to educate people about and involve them in the savanna restoration.

Advantages of an Oak Savanna Restoration

- An oak savanna restoration will reintroduce a rare plant community into the Village. Much of southern Wisconsin was formerly oak savanna, but today it is the rarest community.
- This restoration increases the biodiversity of the parks by introducing plants not currently present in the Shorewood Hills parks.
- If the area is large enough, it will provide habitat to different wildlife than the oak woodland.

Disadvantages of an Oak Savanna Restoration

- Many invasive species are already established and are difficult to remove.
- Many trees would have to be cut, not simply honeysuckle and buckthorn, in order to get less than 50% canopy cover. This would be expensive and cause a negative public reaction because it would look like a clear cut to some residents.
- Disturbance may lead to erosion and the invasion of non-native aggressive species.
- Replanting a savanna will probably cost more money because native plants and seeds will have to be acquired from outside the Village.
- Restoration of parks to savanna may disturb wildlife and destroy habitat.
- Savanna restorations require even more effort than woodland restorations. Oak savanna restoration causes more disturbance and the resulting sunlight encourages invasive species that have to be removed. New plants require water and care. Animals may damage or kill new plantings. In order to maintain the area as savanna, regular fire or cutting will be required.

Conclusion: At this time, generally the oak woodland/mesic forest option is preferable to the oak savanna option for the Shorewood Hills parks.

Justification for the Oak Woodland/Mesic Forest Option

- Many of the Village parks are currently predominantly oak woodland.
- Village residents like the wooded, secluded character of the Shorewood Hills.
- Removing exotics and replanting disturbed areas with native species can be done gradually. This should cause less controversy and provide wildlife habitat during the entire process.
- Establishing and managing an oak woodland or mesic forest takes significantly less labor and less money than establishing an oak savanna.
- A mesic forest or oak woodland restoration can diversify tree age, structure and species within the Village forest, making the trees less susceptible to disease and avoiding the simultaneous death of a large group of trees within a park. Clearing undesirable species around open grown oaks will prevent their lower limbs from being shaded out, improving tree health and longevity.
- In areas with oak wilt, oaks cannot be planted and other tree species will have to be added to keep the park wooded.
- In other areas, repeated disturbance like cutting and fire will be undesirable and inevitably succession to mesic forest will occur.
- Since Shorewood Hills adjoins Eagle Heights Woods, a larger woodland, restoring the Shorewood Hills parks to this habitat increases the area of woodland and enables birds and other animals that require larger forest areas to live in this area, thereby increasing animal diversity.

Oak Woodland/Mesic Forest Objectives

- Maintain a forest (more than 50% tree cover) with the canopy dominated by oaks - red, white, bur, black as long as this is feasible (oak wilt and other oak diseases may make this impossible).
- Keep the remaining canopy composed of native trees (hickory, hackberry, ash, cherry, and basswood).
- Limit exotic species to no more than 5% cover in the ground layer, mid-story, and canopy layers.
- Establish an understory consisting of a minimum of 40 native forbs (out of a list exceeding 90 applicable species).
- Monitor and control invasive and exotic species encroachment on site.
- Identify historically significant trees in the parks.

Oak Woodland Implementation Plan

Oak Woodland Site Preparation Overview

At the beginning of the restoration, invasive, non-native plant species will be removed. This is a labor-intensive project because there are many invasive species in some areas. The species that are the most detrimental to the woods will be removed first. The removal of the most prevalent exotic species, buckthorn, honeysuckle, Norway maple, black locust and garlic mustard, will disturb the mid and ground layers. Garlic mustard has been removed from the parks every year for more than five years and will continue to be removed.

Initially the Norway maples should be removed. Currently this species occurs in only a few places in the parks, but because this maple becomes very tall and creates dense shade, it can shade the canopy trees and damage them. In addition, Norway maples produce many young that quickly dominate the lower levels of a forest and shade out the ground layer. As a result, all the Norway maple seedlings throughout the proposed restorations also need to be removed.

Subsequently, buckthorn and honeysuckle removal should proceed. This work could be done by volunteers, students in classes, or possibly hired out (work-release program, independent contractors). An emphasis should be placed on public involvement from the beginning to help ensure public support. Volunteer work should be closely supervised to ensure that the correct species are being removed and that stumps are treated.

If possible, a burn of these areas should be attempted before planting native seeds. The resulting removal of the leaf litter will help ensure better seed/soil interaction. Where burning does not occur a raking of the soil for increased friability will be necessary. Burning will also eliminate Norway maple seedlings and other non-native species. Care must be taken when native shrubs are present because many native woodland shrub species may be killed or will die back when burned.

Oak Woodland Site Implementation

In order to restore the park, native diversity will be promoted by planting seeds, seedlings, plants, shrubs, and trees.

Desired tree species (oak, hickory) seedlings (from seed and small bare root plants to diversify tree age in the woods) can be planted by volunteers, students, or paid employees. The actual number of trees to be planted will need to be assessed once all removals are done and an accurate tree inventory and survey is completed. To discourage animal browsing, trees should be protected using methods such as a chicken wire frame around a newly planted tree.

In some parks the mid-story is dominated by non-native species. When all the undesirable species are removed, there will be few trees or shrubs in this mid-level, so native shrub seeds and seedlings will need to be planted.

Woodland forbs and grasses should be seeded after the soil has been made friable. The need for planting will depend on the existing plants in the park and the plants that come up from seed. However, some seeding should be done immediately after removal to keep opportunistic weed species from becoming established. Seeds should be planted at the optimum season.

In addition, inter-seeding (seeding in small areas where existing forbs are already present) will continue to be necessary to fill gaps in the oak woodland restoration. Herbaceous species should be continually harvested and collected and dispersed in appropriate locations throughout the park.

Removal Recommendations for Specific Invasive Species on All Sites

Buckthorn and Honeysuckle removal

Begin by cutting all fruiting buckthorn and honeysuckle and treating cut stumps with either RoundUp or Garlon 4. Follow the concentration and application time instructions of the Control Recommendation of Ecologically Invasive Species by the Bureau of Endangered Resources, Wisconsin Department of Natural Resources (DNR). Buckthorn can be cut at any time of the year, but the concentration of the active ingredient changes with the seasons. Brush from cutting should be chipped. Chipping should prevent seeds from being dispersed.

The removal of non-native species causes disturbance and brings light to the ground layer, creating an opportunity for garlic mustard and other invasive species to spread. Monitoring and control may be necessary.

Garlic Mustard

During all phases of the restoration garlic mustard must be controlled. Garlic mustard is a biennial. Its tiny seeds are brought in by storm water, on shoes and animals, and with contaminated soil or mulch. In the first year it remains short and has only a few leaves. In the second year it blooms at the end of May and produces thousands of seeds that remain viable up to 7 years.

In areas where there is a lot of garlic mustard and few native wildflowers, Glyphosphate (RoundUp) can be sprayed late in the fall after other plants die down (for first year plants) or early in the spring before the garlic mustard plants bloom and before the other woodland plants are actively growing. Once garlic mustard begins to bloom it is too late for the herbicide to work and hand pulling needs to be done for the rest of the season. In areas where garlic mustard is scattered or where desirable species are already present, hand pulling is necessary. Volunteers should be used if possible. Most areas need to be checked several times annually beginning before May 1 or a week after spraying if the area is sprayed. In areas with good ground cover, the garlic mustard is visible early but may almost disappear under other plants by May 15. Pulling should be completed by mid-July. All second year plants should be bagged and sent to a waste dump, rather than composted.

Norway Maple Removal

Large Norway maples, over 12 inches in diameter, can be killed by girdling. Trees should be completely removed in high-risk areas such as by bike and walking paths and roadways. Trees that do not pose a risk can be girdled and left standing in place for wildlife habitat or can be cut and left on the ground.

Smaller Norway maples can be cut and the stumps treated with RoundUp or Garlon 4 to prevent resprouting. Remaining brush from cutting should be chipped when possible.

Norway maple seedlings can be removed by hand. Older Norway maples must be removed before seedlings to prevent reseeding. Disturbance should be minimized to avoid invasion by non-native species. Burning will help kill maple sprouts.

Village of Shorewood Hills Parks and Open Space Plan

Appendix 3: Campus Natural Areas Bird Checklist

The birds of Shorewood Hills are similar to those of the Campus Natural Areas. The University of Wisconsin-Madison Campus Natural Areas adjoin the Village of Shorewood Hills on the east. Eagle Heights Woods is an oak forest in the Campus Natural Areas that continues into Shorewood Hills as Koval Woods. In addition to sharing woodland habitat, the Campus Natural Areas and Shorewood Hills share the Lake Mendota shoreline.

The Campus Natural Areas Bird Checklist, produced by the Friends of the Campus Natural Areas, has 253 species of birds that have occurred in the Campus Natural Areas in the last 25 years. Over 220 were seen between 1999 and 2002. The checklist shows the seasonal abundance of birds occurring in the CNA and the species that nest in the Campus Natural Areas. More than 72%, or 182 species, of the birds in the Campus Natural Areas can be expected at least occasionally in Shorewood Hills. Approximately 70%, or 58 species, of the 81 species that probably nest in the CNA attempt to breed in Shorewood Hills at least in some years. See the attached Campus Natural Areas Bird Checklist for the seasonal abundance of specific species.