



Steps and woodland path at Iroquois Park, c. early 20th century. (University of Louisville, Photographic Archives)

Chapter 7 The Living Landscape

Prepared by Andropogon Associates, Philadelphia PA

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Introduction

The genius of the Louisville Olmsted Parks System is rooted in the distinctive and diverse landscapes that characterize each park. Olmsted's design sought to bring order and more drama to each site by clarifying and heightening its predominant character. And it is that special character that still dominates current perceptions of these parks – the wild forest of Iroquois, the rolling pastoral terrain of Cherokee and the expansive river front of Shawnee. But the landscapes of the parks today, both natural and designed, are very changed from those that inspired Olmsted.

The purpose of these guidelines is to provide a framework for restoring these landscapes to their former grandeur while addressing the more complex social and environmental issues that characterize the modern urban park.

The vision of the Louisville Olmsted parks that is contained in this Master Plan represents a level of care and management of landscapes that has never been achieved by any park system. Much of the country is faced with crisis conditions in the community infrastructure. Maintenance has been undervalued and deferred, based on rote practices, and routine to marginal tasks like trash pick-up and lawn mowing. Neither management nor labor have the expertise and staff necessary to accomplish a comprehensive renewal of these landscapes and Louisville is not alone. Every major city administration is facing similar problems. Moreover there are no well established techniques for sustainable landscape management. This is a field that is in its infancy.

It is only recently that land managers have recognized the need to develop approaches that better sustain both natural as well as more intensely designed landscapes, that are more cost effective and that reduce environmental impacts and energy consumption. The current lack of staff, equipment and expertise at Metro Parks is in some ways a mixed blessing. It is sometimes easier to build a new structure than it is to change an entrenched one.

These guidelines in this manual are founded on the premise that landscape management and restoration is a heuristic process – that is, one in which the participants learn by doing while being guided by a set of principles. The objective is to provide a framework for developing an ongoing Landscape Management Program that is rooted in the idea that those who use and care for a landscape should be responsible for sustaining its value over time. Implicit in this concept is the process of ongoing assessment of what is happening on a site and continuous adaptation of the management program as information about the site is documented and trends are observed.

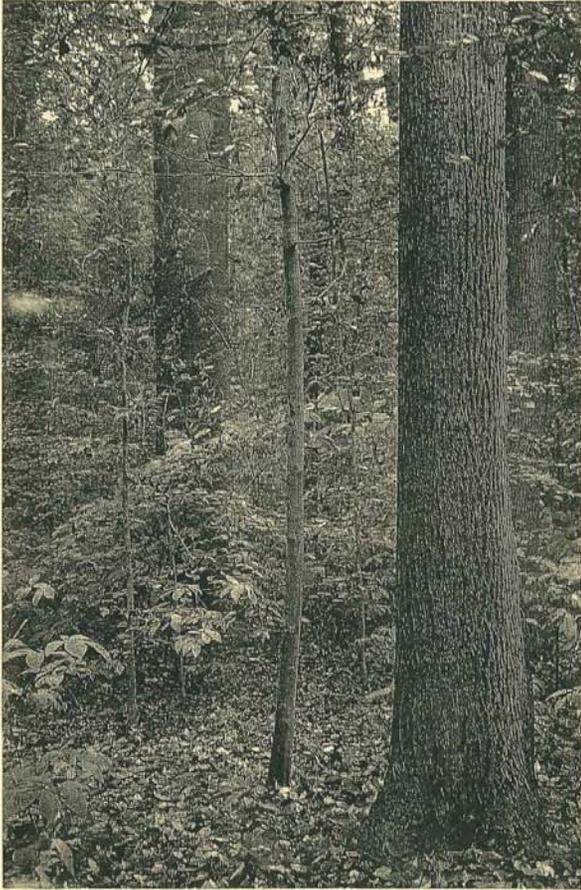
Lastly, it is important to acknowledge that we cannot know enough at any one point about a site to accurately predict the future or to fully specify what actions are appropriate to take. This entire program is, to some extent, a grand experiment that we have no choice but to embark upon. It is a program that will evolve over time. The crucial steps include training workshops yoked to key demonstration projects that will provide on-the-ground trials and real feedback.

This manual is organized in four major sections:

- *Proposed, Current and Historic Landscape Management Practices*
- *Landscape Management Strategies*
- *Procedures & Techniques*
- *Management Log for Barringer Hill, Cherokee Park*



Bridge over Beargrass Creek, Cherokee Park, c. 1929 (University of Louisville, Photographic Archives, Caulfield & Shook Collection)



Mature beech and tulip poplar forest, Iroquois Park. (Eco-Tech, Inc. Photo by John MacGregor, 1992)



Historic woodlands, Cherokee Park, c. 1923. (University of Louisville, Photographic Archives, Caulfield & Shook Collection)

Proposed Landscape Management Practices

Management Areas and Cover Types

The first step in determining the management program was to delineate each of the major management areas in each park, because sustainable landscape management is primarily centered on whole places, such as Barringer Hill, rather than on isolated tasks such as litter removal or lawn mowing. This is an important distinction. The objective is for the participants to understand the whole landscape not just the parts.

The management areas for each park are simply those places with the highest degree of local identity. Typically they embrace a major physiographic area such as a stream valley or a hill. This may be modified by the dominant landscape character such as the extent of forest or a large maintained field. These places typically have names, often several historically, and are easily identified by people living in the area. Indeed, the closer the designation of management areas conforms to the community's general experience of the place, the easier it will be for a wide group of people to participate in and contribute to the overall process of becoming good stewards. Within larger management areas there may also be smaller sub-areas that are similarly distinguished by their special character that may be the focus of a special management goal, such as a wet seep on steep slopes of Burnt Knob.

Each management area will be treated as a whole to keep touch with the larger picture which is the context for decision making. A management log will be kept for each management area that records change over time and serves a primary record of the impacts of management and use. A case study of a management log is included at the end of this section that addresses Barringer Hill and the vista restoration project that was initiated in the spring of 1994.

Within each of these management areas a mosaic of cover types is proposed that describes the management objectives in terms of the structure and type of the vegetation. These cover types reflect both the original Olmsted design intention as well as the environmental conditions that pertain today and are intended to serve as a bridge between the historic character and the ecological functions of natural landscape systems.

The cover types have been grouped in two major kinds: those that are comprised primarily of woody plants, such as trees and shrubs, and those that are comprised primarily of herbaceous plants, such as grasses, wildflowers and ferns. The wooded cover types are characterized by a structure that may be comprised of many layers of plants, from canopy and understory trees to shrubs and a groundlayer. The soil is covered by

a layer of litter and is very intolerant of trampling. The prime management focus is to ensure that the indigenous plants are continuously replacing themselves to sustain the native communities. The herbaceous landscapes, on the other hand are typically much smaller in scale, ranging from short turf underfoot to knee-high, or even shoulder high grasses and wildflowers in wet meadows. The ground is not visible when effectively stabilized. These landscapes generally have to be managed by mowing or other methods to prevent the eventual growth of forest cover.

Wooded Landscapes

Forest

The forest cover type refers to those areas where a multi-layered, multi-aged, and multi-specied landscape structure is desired. This cover type is very consistent with the intent of the original Olmsted designs which retain virtually all the natural forest that occurred in the three parks—from the extensive forests of the slopes of Iroquois to the smaller remnants at Cherokee and Shawnee parks. Several special management options will also be developed and refined including forest edge and light forest.

Woodland

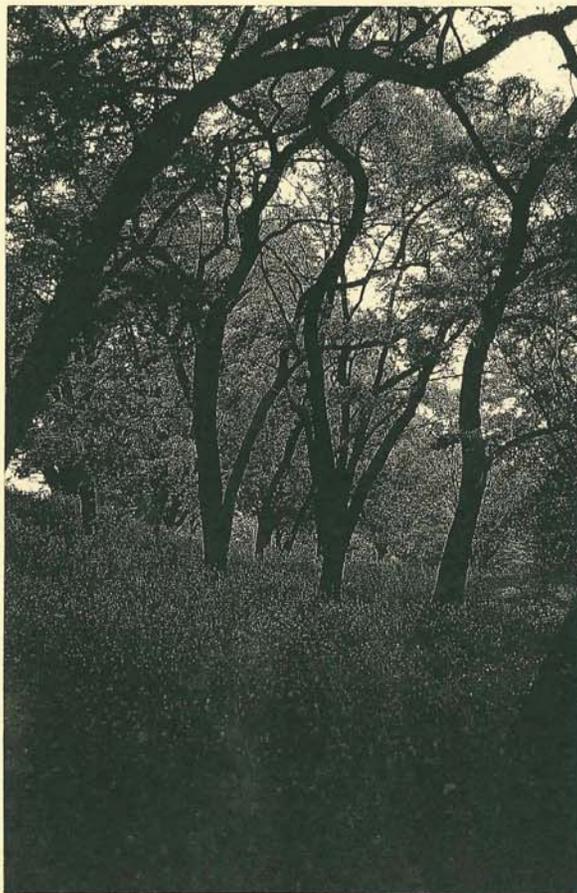
Woodland areas are proposed for use along edges and pathways where use is more intensive and where selective management of the landscape is desirable in order to create more open views through the landscape. Many of the tornado-damaged areas, where canopy trees were lost, creating an open character, also should be managed as woodland.

Forest Glade

Forest Glade is a special management option where more open forest conditions are desired to draw the eye and hence the walker to a path juncture or to create a place of pause or gathering. Management consists of a careful editing of selected plants in the forest layers to enhance a sense of an opening within an enclosure. All forest glades are small in area, typically less than a single canopy's width.

Grassland and Meadow Landscapes

The sweeping open landscapes of Cherokee Park, for example, epitomize many peoples' perception of an Olmsted Park. The broad areas of mown grass invite walking, sitting and other casual recreation and provide expansive views that reveal and dramatize the natural terrain. But at the same time, a century of close mowing and use have led to serious erosion and sedimentation throughout the park system and have severely damaged the specimen trees as well as the adjacent woodlands.



Open locust glade in Wissahickon Park, Philadelphia PA. (Andropogon Associates, 1992)

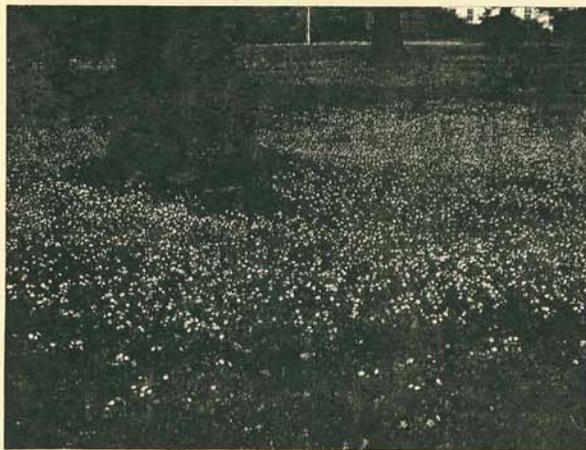
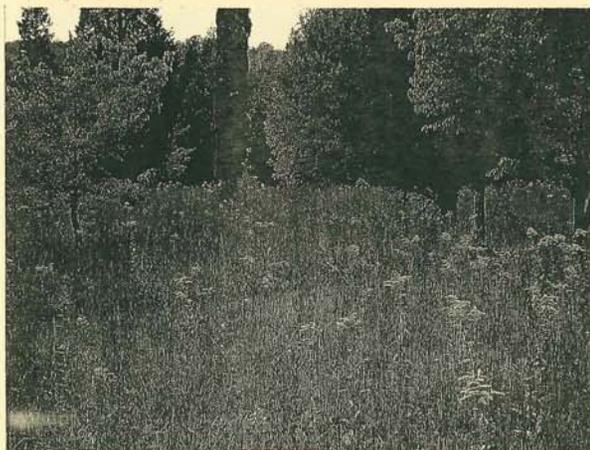


(Top) Meadow on Summit Field, near Panthers Point, Iroquois Park. (Andropogon Associates, 1993)



(Bottom) Meadow edge to woodlands, Central Park. (Central Park Conservancy. Photo by Sarah Cedar Miller, 1992)

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(Top) Meadow margin along woodland edge, New Jersey. (Andropogon Associates, 1992)

(Bottom) Grass path through savannah, New Jersey. (Andropogon Associates, 1992)

(Top) Test plots demonstrating savannah, greensward and turf, Pennsylvania. (Andropogon Associates, 1992)

(Bottom) Greensward in open beech woodland, Pennsylvania. (Andropogon Associates, 1992)

(Top) Historic view of greensward, Cherokee Park, July 15, 1930 (University of Louisville, Photographic Archives, MSD Collection)

(Bottom) Southern Parkway, c. 1920/30. (University of Louisville, Photographic Archives, R.G. Potter Collection)

The objective is to retain this important design character while reducing associated impacts by developing a variety of open landscape management options.

Savannah

Informal groves of canopy trees as well as thickets of smaller trees and shrubs set in meadow or prairie represent a more habitat-focused variation on the Parkland cover type. This cover type may be especially useful to reestablish the character of the original shrub beds and border plantings by creating a floriferous screen that can be adequately maintained.

Meadow & Prairie

A taller herbaceous cover is recommended for use as filter strips to buffer natural areas from adjacent turf or greensward areas as well as in larger habitat areas where a lawn is not required for walking and sitting upon. Broad greensward trails can be used for access. Both meadow and prairie are comprised of forbs and mixed grasses; however, in prairie areas a greater emphasis will be given to warm-season grasses and historic, indigenous plant communities. This taller grassland was not characteristic of the Olmsted landscape; however, the historic photographs do reveal informal margins where the greensward appears to be at least a foot or more tall.

Greensward

A less closely mown cover of mixed grasses and forbs that is more similar to the historic greensward will be used for all other lawn areas.

Parkland

Informal groves of trees set in greensward rather than turf will reduce the direct impacts to the individual trees in the groves from mower damage and compaction, as well as to adjacent natural habitats from stormwater damage.

Turf

Closely mown cool-season grass will be restricted to the most intensively used and intensely maintained athletic sites. Maintenance will seek to minimize pesticides and increase use of organic fertilizers.

Parkway and Street Trees

Tall high branching canopy trees planted in rows along roadways are central to the Parkway and street tree experience. Native canopy trees should be favored in replacement plantings, or with in-kind replacements, in accordance with the recommended parkway and street tree list in Chapter 3, The Parkways.

Current Landscape Management Practices

The successful renewal of the Olmsted Parks Parkways will require a commensurate level of renewal in the care of these landscapes. Current maintenance is very limited and has been inadequate to sustain designed landscape features. This has contributed to the decline of natural areas which comprise the major settings of all the Olmsted parks. There needs to be a maintenance plan by park areas; written performance standards to gauge effectiveness; oversight review to amend or refine operations to achieve desired goals; and training, and time, to tackle the major issues involved in landscape management and restoration such as removal of invasive exotic vegetation, gully and trail repairs, bank stabilization, etc. There is also a need for coherent design standards that relate to the historic design intent of the parks.

Given that protecting and managing the natural resources of the parks and parkways is a priority goal, it should be pointed out that this is not possible to achieve within the present structuring of Metro Parks maintenance operations. Without expansion and restructuring there is no room for natural resource management. Present operations include the following:

SPRING/SUMMER

60%-70% mowing lawns
25%-30% trash collection
15%-20% special summer events
moving bleachers and picnic tables

FALL/WINTER

60%-70% leaf litter and snow removal from park roads and city streets; equipment and facilities repair (about half the picnic tables are stolen or vandalized yearly)
30% trash collection

Wooded Landscapes

The forest and woodland areas range in character from some of the best examples of historic natural landscapes left in the region, such as those at Iroquois Park, to severely disturbed patches of remnant canopy trees and extensive invasive exotics, such as those found in places in Shawnee and Cherokee parks. No management distinction is made between forest and woodland areas at present and all the woody landscapes are largely unmaintained. The exception is when the understory vegetation is removed to increase visibility, such as for vistas and along roadsides. In places, resulting erosion has been severe and threatens to undermine infrastructure. Elsewhere rampant growth of invasive exotics has been encouraged by the clearing activities while native plants have been reduced in extent. In Cherokee Park, the forest also was severely impacted by the tornado of 1974 that destroyed over two thousand mature canopy trees. This area today is largely dominated by invasive exotic shrubs that have invaded freely under the tornado-opened canopy.

Two primary forest management needs are clear. The first is to restore and sustain the forested areas of the Olmsted Parks using largely native plant communities similar to those that served as the inspiration of each park at its inception. The second is to develop appropriate management practices for achieving selected design effects, especially related to increasing visibility. The success of these efforts will depend on the control of widespread misuse and overuse of the natural areas and damage due to trampling and off-trail use. Stormwater management is equally important and will require a comprehensive approach and program.

Grassland and Meadow Landscapes

The open landscapes of the Olmsted Parks are nearly all mown turf, comprised largely of mixed cool season grasses. With the exception of the golf course and some athletic fields, the turf areas are given only limited maintenance, which is generally adequate to maintain vegetative cover except where there is compaction, erosion and/or sedimentation due to uncontrolled use or excess stormwater. There are also areas of Parkland, where large trees, in groves or as specimens, occur in turf, although many are in poor condition, due to soil compaction, mower damage to the trees, or species unsuitable to site conditions.

The general problems with turf management are primarily related to associated environmental impacts, including excessive energy consumption and pollution; excessive runoff, erosion and sedimentation; and excessive reliance on herbicides, pesticides, inorganic fertilizer, and lime in those areas that are highly maintained, such as golf courses.

Three major management directions are recommended that will be evaluated over time to ensure there is no compromise in the original character of the design. Indeed, they are intended to better foster the landscape effects that Olmsted intended.

- Limited reduction in the extent of turf by expanding the area of more diverse, managed natural habitats, such as meadow, prairie and savannah.
- Modifications to current turf management to reduce the level and impacts of maintenance by emulating historic management practices.
- Reduction of the impact of runoff from mown grass onto adjacent woodlands by maintaining a margin of meadow as a filter strip to reduce runoff velocity, trap sediment and absorb nutrients.

These proposed revisions are remarkably consistent with the goal to renew the landscape character of the Olmsted era for these parks. Many of the management recommendations are more like those of the turn of the century than current conventions which rely on newly hybridized grasses and modern mowing machinery and high impact maintenance.



Historic greensward along Beargrass Creek, Cherokee Park, c. 1933. (University of Louisville, Photographic Archives, Caulfield & Shook Collection)

Historic Landscape Management Practices

The historical documentation of the Louisville Olmsted Parks and Parkways reveals a level of experience and care in the landscape that is difficult to imagine today. Lists of recommended species include dozens of plants, both native and exotic, that are now unavailable and required expert local propagation skills and capacity. The sheer magnitude, diversity and complexity of the historic plantings is very impressive. It is little wonder that these parks were as popular and renowned as they were. Many traditional management practices were more appropriate environmentally and merit being rediscovered and adapted to today's context.

The foremost landscape distinctions, then and now, are between closed and open landscapes, both perceptually and ecologically. Closed landscapes are characterized by a continuous tree canopy and include forests and woodland areas. Visibility is usually restricted. Multiple layers of woody plants and their roots provide stability both above and below ground. Open landscapes, on the other hand, are characterized by only a few shrubs and/or occasional trees, and there is typically unrestricted or partially restricted visibility. Site stabilization is provided by a dense herbaceous cover, such as grasses and wildflowers, and stability is dependent on maintaining continuous cover at ground level.

Wooded Landscapes

Not only did Olmsted's primary inspiration come from the park's natural landscapes and features, his design focus sought to heighten and dramatize the most characteristic patterns of each landscape. Perhaps most importantly, he preserved the natural features and made them integral to the vision of each park. He was renowned for his ability to 'edit' and enhance the landscape – adding and removing plants selectively to reveal the general landscape character that he found already in place. But these effects, which contributed so greatly to the original design, did not persist as the environmental quality of these habitats declined over time. Woodlands that initially featured masses of spring ephemeral wildflowers were gradually overwhelmed by invasive exotic vines and shrubs, some of which escaped from planting elsewhere in the parks and in the city. Although these design effects collapsed with the degradation of the environment, many can, with management, be restored.

Two of Olmsted's woody planting types were not successful. The Mixed Border Plantings, for example, never developed as Olmsted had planned. Nor are there any remnants left today except for a legacy of some invasive exotic plants. Olmsted described his intention to remove plants from this dense intermix of species as they matured to create specific aesthetic effects, but the idea was flawed from the outset. It did not

address critical ecological relationships and the odd mixture of species never behaved like a native plant community. A second and similar situation occurs in areas that are designated as Shrub Beds on the historic plans. No remnants survive except some exotic invasive species and there is no evidence they were stable, especially on steep slopes. Therefore, no effort will be made to replicate either the planting patterns or species composition of these elements.

Grassland and Meadow Landscapes

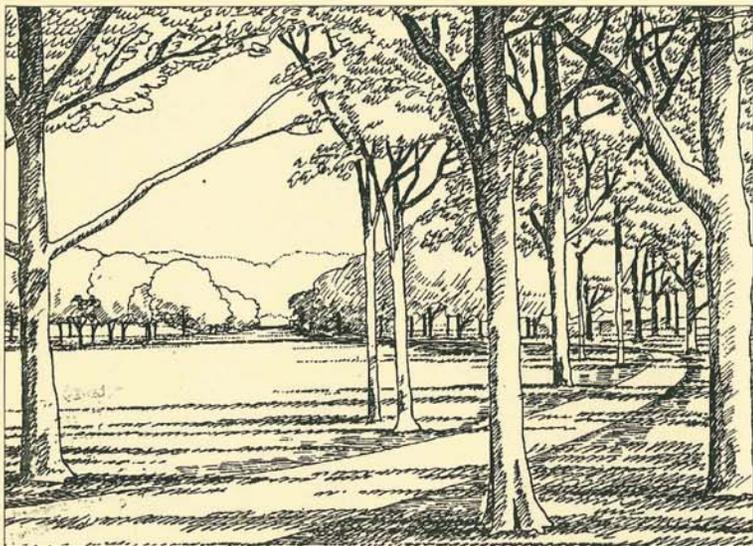
Olmsted is generally credited with having popularized the extensive use of lawn in the modern landscape. But it is important to remember that the lawn of today is very different from that of Olmsted's day. Ever since turf was distinguished from pasture as a purely aesthetic and recreational landscape type, the trend has been toward an increasingly uniform carpet of cool-season grass. But not until after World War II, with the development of rotary mowers, new hybrid grasses and the increasing reliance on inorganic fertilizers and pesticides, did the very short and often monospecific turf of today appear. The historic photographs, many of which are included in this report, consistently show many areas of longer turf as well as tall grass and wildflowers that were not distinguished from turf on the design plans. The "greensward" management proposed in this manual is intended to come closer to that of Olmsted's day than current management practises.

The greensward of Olmsted's era was also more 'green' with regard to maintenance. The use of organic fertilizers prevailed and pesticides were largely unused, resulting in a more diverse soil flora supporting dense, lush growth. The greensward was relatively diverse and often included numerous broad-leaved herbs, such as veronicas and chickweeds, in addition to mixed grasses. And perhaps most importantly, the grass was cut long, that is cut to a length of about 4-5 inches instead of 2-3 inches, and often regrew to 6-7 inches before being cut again. From a maintenance perspective, this practice reduced drought stress while conserving energy and labor. Environmentally, it increased infiltration of water and produced less rapid runoff than today's turf.



Historic woodland path, Cherokee Park, November 1, 1930. (University of Louisville, Photographic Archives, MSD Collection)

7. The Living Landscape



Drawing illustrates a woodland creating a soft edge for an open greensward lawn. (Andropogon Associates, 1990)

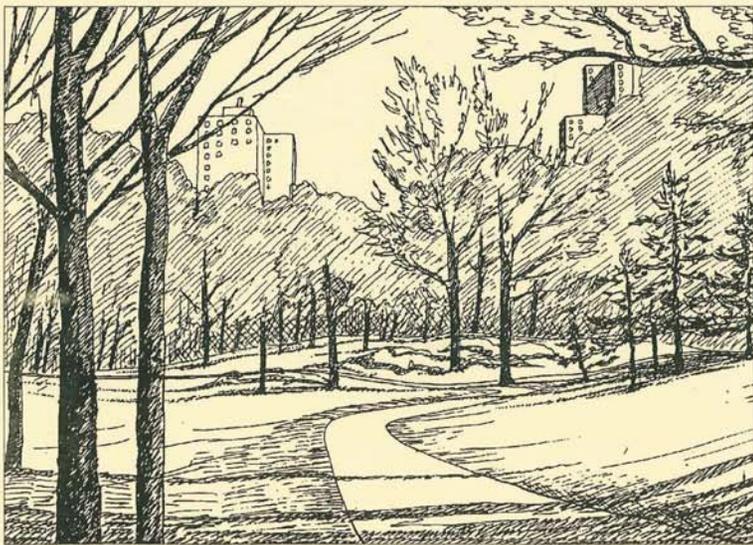


Illustration of path winding into forest is an example of where savannah management could be used to stabilize ground and create a less manicured transition to forest. (Andropogon Associates, 1990)



Part of the illustrative plan for Cherokee Park shows how the four cover types occur at the base of Barringer Hill. (Andropogon Associates, 1994)



Historic vista across Beargrass Creek shown restored after management. (Andropogon Associates, 1994)

Landscape Management Strategies and Procedures & Techniques

This section has two major components. The first, Landscape Management Strategies, is comprised of a sequence of illustrations showing the incremental restoration of each of the four major cover types, including reestablishing the natural layering of a forest, managing woodlands, creating prairies and savannahs, and reducing mowing to favor 'greensward'. The objective is to focus management activities on the highest priorities, based on the current condition of the landscape. For example, in a degraded landscape, controlling erosion and exotics will be more important than planting wildflowers. A restabilized landscape, however, may be the ideal opportunity to reintroduce a species that once occurred in that place.

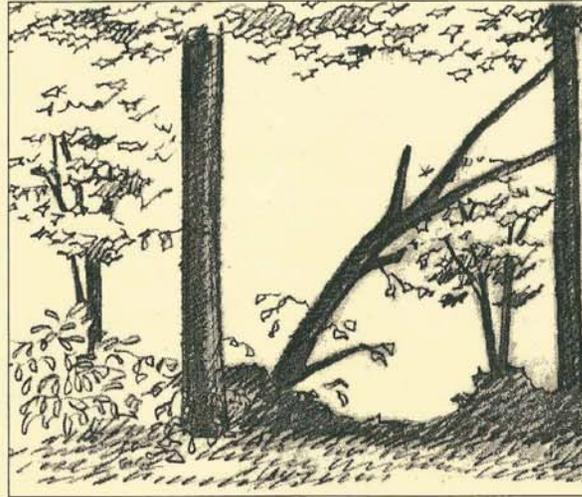
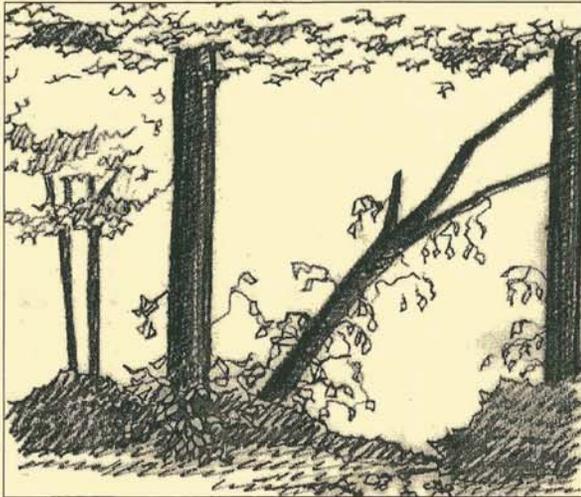
The second, Procedures and Techniques, is intended to provide overall guidelines for initiating the activities proposed for carrying out the recommended landscape management strategies. It is important, however, to remember that good management will take a lot more than following a manual. Staff training, monitoring, demonstration projects and ongoing brainstorming and innovation are integral to the overall effort.

The procedures & techniques include:

- *Ground Stabilization*
 - *Repair of Eroded or Compacted Soils*
 - *Procedure for Repairing & Stabilizing Ground Layer*
 - *Gully Stabilization*
- *Exotic Species*
 - *Identification*
 - *Removing Woody Exotics*
- *Planting*
 - *Woody Plants, Balled & Burlapped*
 - *Woody Plants, Bareroot*
 - *Container Grown Plants and Plugs*
- *Savannah Management*
 - *Conversion of Turf to Meadow*
 - *Prairie Restoration*
 - *Savannah Restoration*
- *Wetland and Streambank Habitats*
 - *Wetland Restoration*
 - *Streambank Enhancement*
- *Vista Management*
- *Trail Monitoring*
- *Trail Maintenance Guidelines*

The management log, itself a technique for management, comprises the next section. The sample log is one that was developed for vista management at Barringer Hill in Cherokee Park during the spring of 1994.

Planting specifications for planting woody plant materials completes this chapter.



Landscape Management Strategies for Forest Cover Type

Disturbance Condition

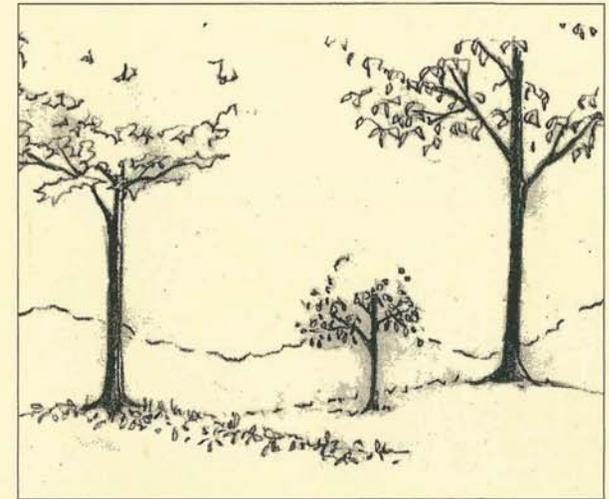
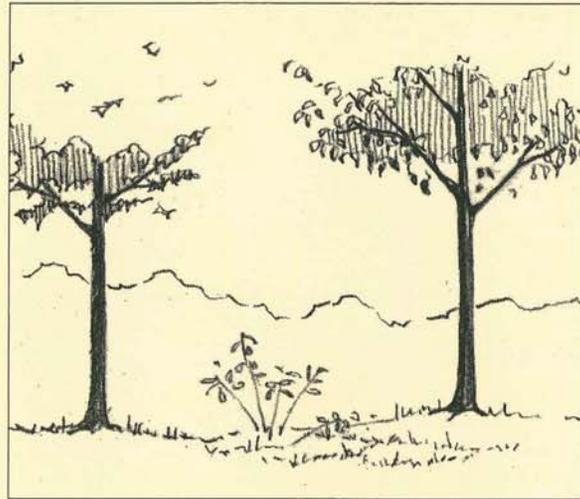
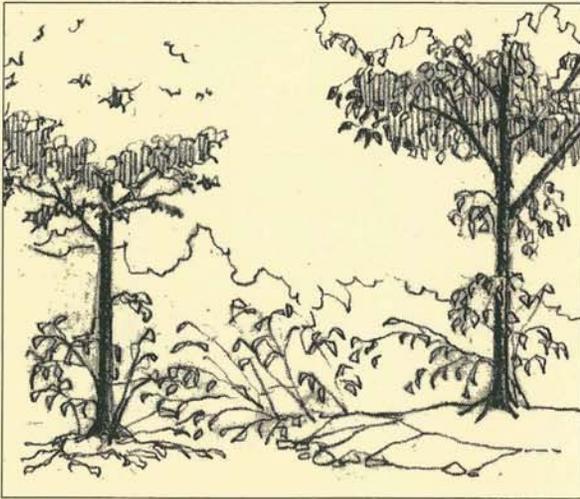
1. Diseased or damaged canopy trees with few replacements present in lower layers.
2. Poor recruitment of native species in the understory and canopy layers as well as ground layer.
3. Reproduction of invasive exotics in the ground, shrub and understory layers. Diverse herbaceous ground layer being replaced by more uniform and/or exotic forb cover.
4. Presence of vines at edges and canopy gaps.
5. Erosion and compaction as a result of trampling and outlaw trails.

Repair Strategy

1. Repair of disturbed forest takes place incrementally over time and must be prioritized. Initiate management in those areas where native plant communities are the most stable in order to preserve them.
2. Close outlaw trails especially in steep or sensitive areas.
3. Restabilize eroded ground.
4. Initiate control of invasive species beginning with most threatening.
5. Remove tree limbs and dead branches only as necessary where hazardous conditions prevail. Save snags for wildlife cover.
6. Begin replanting in those areas where no native plants are present or erosion is a possible hazard.

Enhancement Strategy

1. Forest enhancement is concerned with reestablishing the structure of the forest, including four distinct forest layers: herb (ground); shrub; understory; and canopy.
2. Native plants are the only species recommended for planting. Select plants from the appropriate plant community type list. Favor those species that are under-represented or that are not reproducing well despite management.
3. Initiate evaluation of possible wildlife reintroductions and enhancements, including hibernacula and nesting boxes.



Landscape Management Strategies for Woodland Cover Type

Disturbance Condition

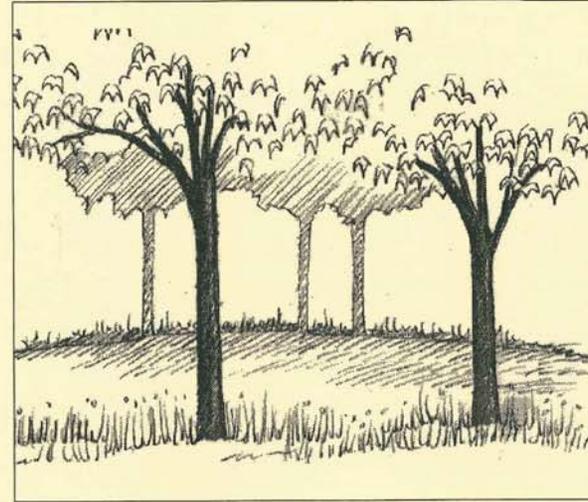
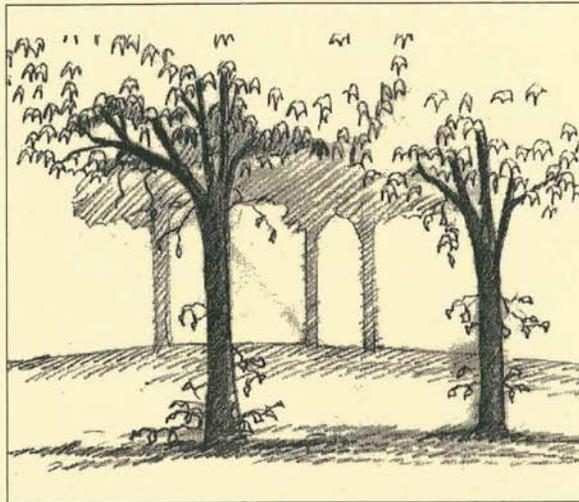
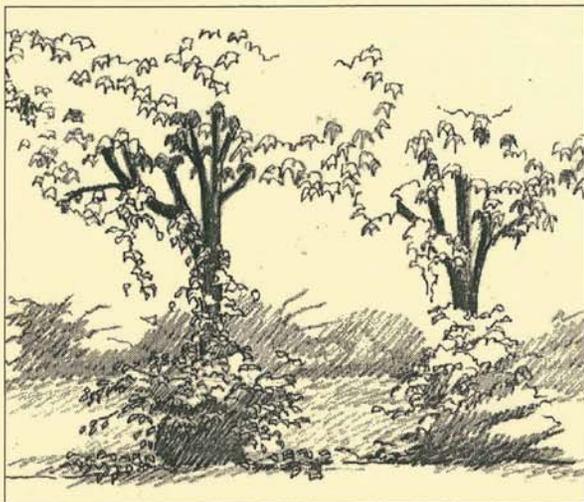
1. Frequent canopy gaps caused by loss of canopy trees due to disease or damage.
2. Seed sources for native species may be limited by distance from and lack of continuity with more mature forests of that habitat type. Natural recruitment may be very limited.
3. Open woodland canopy fosters the proliferation of invasive exotics.
4. Presence of vines at edges and in canopy gaps, displacing woodland ephemeral wildflowers and other native reproduction.
5. Eroded or compacted ground.

Repair Strategy

1. Evaluate management options. Some open woodlands are more appropriately managed as forest and others as savannah, especially where a significantly more open landscape would result from exotics removal.
2. Initial stages of management are the same as for forest—site stabilization, exotics control and canopy replacement.
3. Ground layer vegetation is often more important for site stabilization than in the forested landscapes where there is more vegetation in the other layers to hold soil.
4. Replanting efforts should be coordinated with exotics removal to ensure greater success of new plantings and adequate restabilization after exotics removal.

Enhancement Strategy

1. Enhancement of open woodlands is concentrated on replacing the multilayered structure and establishing herbaceous ground layer species while the canopy is still more open.
2. Many of these woodlands will naturally succeed to forest over time. Where desired, the open character of woodlands, rather than the more closed quality of a mature forest, can be retained by selectively restricting shrub and understory layers while enhancing herbaceous vegetation.
3. Select plants from the appropriate plant community type. Favor those species that are under-represented in the park or that are not yet reproducing well naturally.



Landscape Management Strategies for Savannah/Meadow Cover Type

Disturbance Condition

Savannah/Meadow is presently limited in occurrence in the Olmsted Parks, typically confined to recently disturbed areas or where maintenance has been temporarily deferred. The most diverse and attractive example is at the Knob at Iroquois Park. Increased use of savannah/meadow/prairie cover types would have many benefits of local and regional importance. There are two major obstacles. Meadows are unfamiliar to the public who may perceive them as unmaintained and techniques for establishment and maintenance need further refinement. Meadows are recommended for the following:

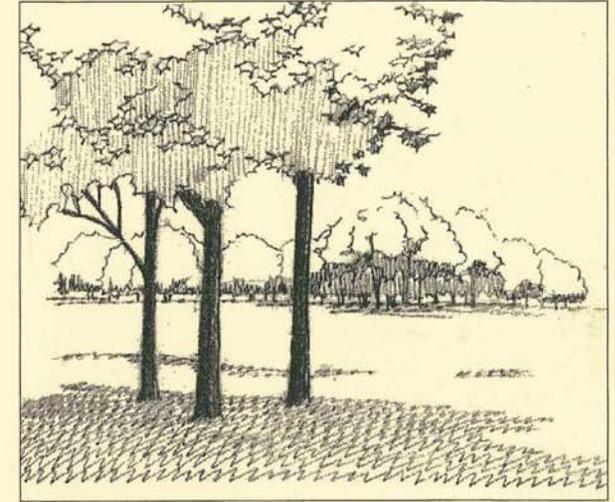
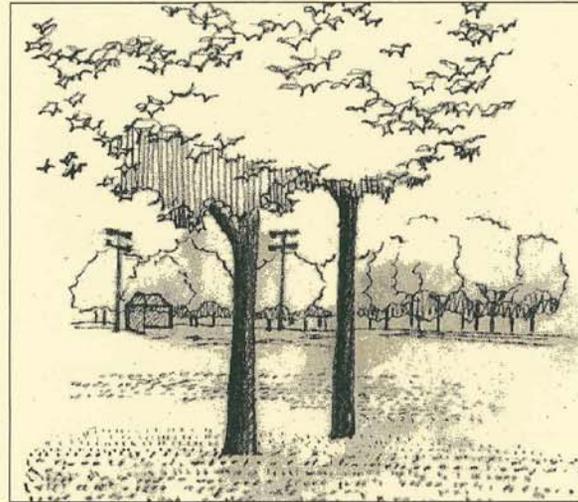
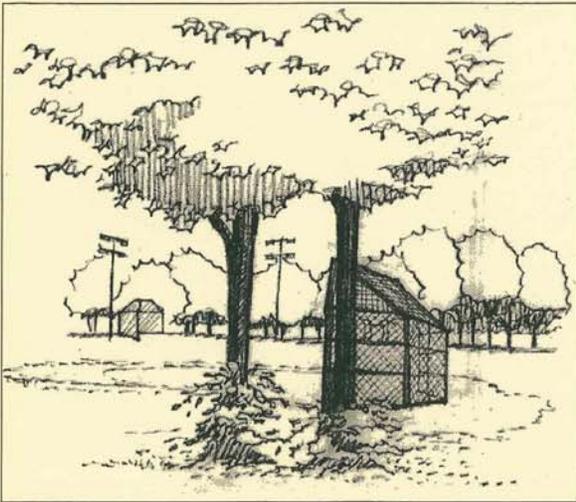
1. Forest margins that have been severely impacted by vegetation clearance, the remaining canopy trees, vines and other exotics can be managed to favor savannah.
2. Open woodlands that are so severely disturbed that the native understory is gone can be managed as savannah.
3. Parkland and turf areas that cannot be reasonably maintained as turf or where better stormwater control is required can be managed as savannah.

Repair Strategy

1. Initial management phase concentrates on removal of non-native woody plants.
2. Exotics may need to be removed incrementally if seriously entrenched.
3. Restabilization of the ground layer may be necessary where few natives are present or erosion is likely.
4. Savannah cover type will succeed to open woodland, then forest unless ground layer is mown and managed for meadow.

Enhancement Strategy

1. Continuous overseeding is necessary especially if initial meadow diversity is low. Native seed should be collected locally.
2. Mowing schedule of 1-3 times per year should be coordinated with wildflower and grass reproduction. Meadow mowing should not be done during ground bird nesting season.
3. Select new canopy plantings from appropriate plant community type. Use Olmsted's species list and planting plan where appropriate to the local site conditions, excluding invasive species. Where substitutions are made, seek species of similar appearance and character. Favor canopy species that are under represented in the park, including those not readily available commercially. Plant from Olmsted's species list where it is a match to the plant community types.
4. String-cut under tree canopies to reduce compaction and mower damage to trees.



Landscape Management Strategies for Greensward Cover Type

Disturbance Condition

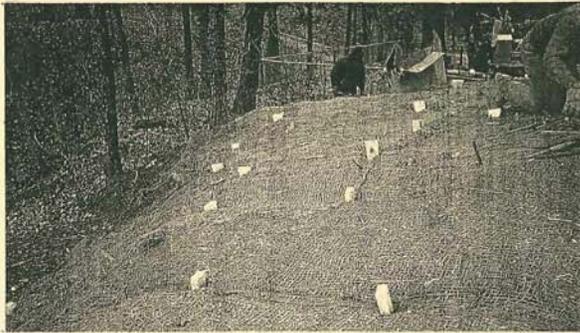
1. Inappropriate mix of park uses.
2. Athletic facilities intrude on historic greensward areas.
3. Excessive runoff from closely mown turf.
4. Turf stressed by limited maintenance and trampling.
5. Large trees in informal groves killed or damaged over time.

Repair Strategy

1. Relocate athletic facilities.
2. Restrict turf to athletic fields.
3. All other areas should be managed as greensward.
4. Stabilize and re-seed bare soil areas.
5. Amend pH regularly in small increments.
6. Cut turf 3" long or greater.
7. Implement greensward management guidelines to extent feasible.
8. Margins and left-over space between play fields and at road edges and woodland margins should be managed as greensward or savannah to reduce stormwater impacts.
9. Revise mowing and maintenance regimen to reflect proposed layout of turf, greensward and savannah.

Enhancement Strategy

1. Use diverse seed mix with mixed grasses and forbs, including nitrogen-fixing legumes. The lawn mixes of Victorian era and pre-World War II, used before hybrid grasses were developed, are good models and reflect Olmstedian era practices.
2. Keep taller—ideally 5" to 7" but not less than 3"—and no higher than 7". This shades soil, delays dormancy and reduces water stress and the need for irrigation (which may induce fungus diseases). Less frequent mowing also reduces soil compaction, energy consumption and pollution.
3. Use no herbicides or pesticides. Wait, wait, wait—It will take time for the Greensward to toughen up and become more diverse and hardy. Observe carefully and with patience.
4. Select new canopy plantings from appropriate plant community type. Use Olmsted's species list and planting plan where it is appropriate to the plant community type. Favor canopy species that are under represented in the park, including those not readily available commercially. String cut under tree canopies to reduce damage to trees.



(Top) Long straw is spread over amended soil before covering soil with stabilization blanket.

(Middle) Jute stabilization blanket is tacked in place to hold soil.

(Bottom) Container shrubs are planted through rips cut into the jute netting.



(Top) Compacted soil has been broken up around heavily eroded tree roots as preparation for soil improvement and stabilization measures.

(Bottom) Workers add leaf matter to improve nutrient quality of woodland soil.

Photographs on this page are from an on-site workshop with the staff of the National Park Service at Richmond National Battlefield Park, Richmond, Virginia, conducted by Robbin Sotir, President of Robbin B. Sotir & Associates, Marietta, Georgia, and Andropogon Associates on landscape management techniques for the Revolutionary and Civil War Battlefields Parks, 1990. The new landscape management practices recommended managing stable native plant communities, which are more appropriate ecologically and more cost effective than more familiar, horticultural maintenance. (National Park Service, 1990)

Procedures & Techniques

Ground Stabilization

Repair of Eroded and/or Compacted Soils

Soil compaction can be a very insidious problem, largely because its effects are often underestimated. Any time there is visible soil compaction, there has also been damage to vegetation. Even trees not directly damaged above ground may have sustained damage in the root zone (which typically extends well beyond the reach of the branches). Existing roots can be crushed and the soil may now be too tight for new roots to grow. In general, an ideal soil would be around 50% void space and of that space 50% would be air and 50% water. A compact soil typically has too little of both, lacking water and oxygen in the root zone for adequate respiration and growth. Where erosion and compaction has occurred, it is important to repair the site as quickly as possible by stabilizing and rehabilitating the soil before undertaking new planting. The compacted zone must be broken up and soil lost to erosion must be replaced.

Procedure for Repairing & Stabilizing Ground Layer

The addition of organic matter is nearly always important and may be as simple as adding leaves from nearby. Where the surface has been compacted it is mandatory to break up the compacted layer completely. This can be done using hand rakes, taking care to avoid damaging tree roots that are living above and below the zone of compaction. At this point, organic matter and/or other soil amendments can be added.

Additional protection for the soil surface in the form of an erosion-control blanket is usually beneficial. A three-inch layer of long straw (that is, uncut rather than shredded) covered with jute matting tacked with wooden stakes is a completely organic treatment which provides erosion control as well as a measure of protection from damage should some trampling occur. Jute matting alone is not adequate.

If the mat is then covered with leaves and light brush, all traces of both soil and the repair work can be disguised. When the soil surface is treated in this fashion, uncomposted leaves may be used as organic amendment without worrying that they will induce slippage of the new soil. Both the leaves and the matting with soil will decompose in place, providing additional nutrients.

Gully Stabilization: Stabilizing With Check Dams

Where gullies have formed, low wooden check dams can be used to reduce the velocity of runoff and encourage the deposition of sediment within the gully. These can be built from tree trunks and large branches found on the site. These dams should be small and located at frequent intervals. The reduced velocity of stormwater in turn reduces its capacity to erode. At the same time, they encourage deposition of sediment in the runoff, all along the length of the gully rather than at the bottom of the slope. Complete gully restoration cannot take place, however, until the quantity of stormwater received has been significantly reduced.

These check dams must be small enough to permit a flow of water over the dam or new channels will be cut at the sides. These dams must also be located so that the top elevation of the downstream dam is no lower than the bottom of the upstream dam or scour will occur. Check dams made from wood found on the site typically do not last more than three or four years, by which time the site should be stabilized if runoff has been adequately controlled. If not, stormwater management should be reassessed for the site.

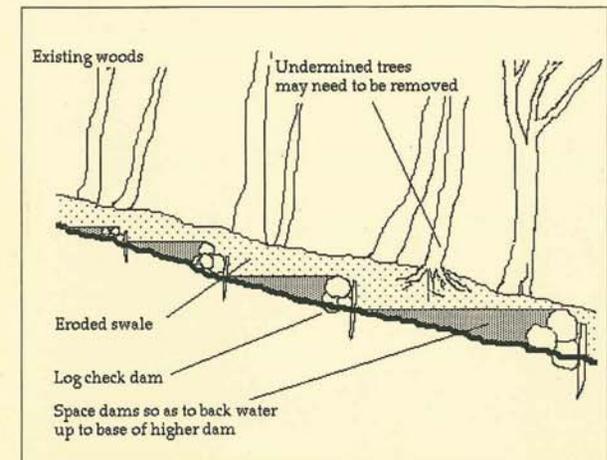
Gully Stabilization: Stabilizing With Rock

Large boulders are extremely valuable and should never be simply disposed of. They can be used as aesthetically pleasing rip-rap and to create artificial 'bedrock' surfaces as part of single-file adventure trails and along stream channels, and to provide access to special features such as the water's edge.

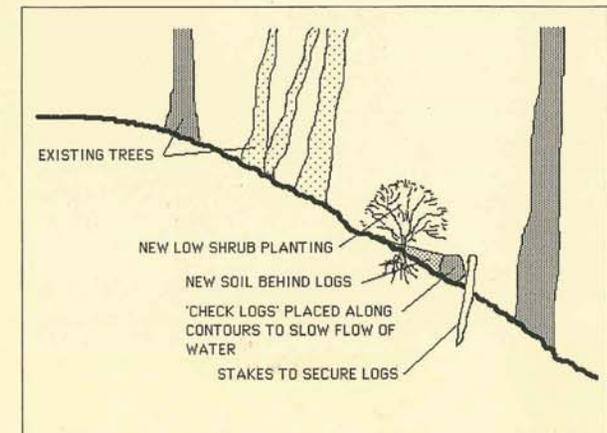
Gully Stabilization: Replanting

Plants improve soil by adding organic matter and by loosening compacted layers. Without vegetative cover, no organic matter is added and rainsplash action alone, without further trampling, will increase compaction. Steep eroded areas must be stabilized with woody material; herbaceous plants alone are insufficient to establish cover.

Exotics control should be carried out concurrently and incrementally — a kind of continuous attack policy. Any area cleared should be replanted immediately, with a straw and jute matting, wherever existing native cover is inadequate to close the gap in a single growing season. The rate at which ground should be opened and replanted should be determined by what can be adequately maintained in subsequent years.



Long section through wooded slope showing check dams placed in gully (Andropogon Associates, 1989)



Long section through wooded slope showing shrub planting behind check dams. (Andropogon Associates, 1989)

7. The Living Landscape



(Top) Shrub honeysuckle (*Lonicera* spp.) is pervasive throughout the Louisville Olmsted Parks. (Eco-Tech, Inc., Photo by John MacGregor, 1993)

(Bottom) Euonymus vines are blanketing the ground and climbing into the trees in Cherokee Park. (Eco-Tech, Inc., Photo by John MacGregor, 1993)

(Top) Volunteers removing exotic invasive trees, Wissahickon Park, Philadelphia, Pennsylvania. (Andropogon Associates, 1993)

(Bottom) Winged euonymus (*Euonymus alatus*) is replacing native understory shrubs in Cherokee Park. (Eco-Tech, Inc., Photo by John MacGregor, 1993)

(Top) Training session on selective herbicides for invasive controls, Wissahickon Park, Philadelphia, Pennsylvania. (Andropogon Associates, 1993)

(Bottom) Volunteers removing exotic invasive vines in woodlands, Wissahickon Park, Philadelphia, Pennsylvania. (Andropogon Associates, 1993)

Exotic Species

Identification

A number of invasive exotic species are highly prevalent in the Louisville Parks. These plants, which can spread and overwhelm an area in a single season, compete so successfully with native communities that the native vegetation of the parks is greatly reduced, year after year. Uncontrolled spread of invasive exotic vegetation replaces native plants and destroys wildlife habitat, eventually reducing biodiversity in the landscape. The Olmsted Parks, particularly Iroquois, contain excellent stands of native vegetation which are threatened by invasive exotics.

These four species are especially prevalent throughout all three Olmsted Parks:

Japanese honeysuckle (*Lonicera japonicum*)
Common privet (*Ligustrum spp.*)
Shrub honeysuckle (*Lonicera spp.*)
Oriental bittersweet (*Celastrus orbiculata*)

The following species are prevalent in each of the three parks as indicated:

Shawnee Park

White mulberry (*Morus alba*)
Biennial wormwood (*Artemisia vulgaris*)

Cherokee Park

Winged euonymus (*Euonymus alatus*)
Periwinkle (*Vinca minor*)
English ivy (*Hedera helix*)
Five-leaf akebia (*Akebia quinata*)
Garlic mustard (*Alliaria officinalis*)

Iroquois Park

Miscanthus (*Miscanthus sinensis*)
Tree-of-heaven (*Ailanthus altissima*)
Multiflora rose (*Rosa multiflora*)

Removing Woody Exotics

The following methods are recommended for the control of invasive woody vegetation. Removal of these plants, however, is only the beginning. Many invasive species persist despite almost total eradication. Regular monitoring is a crucial part of any invasive control program. Continuous experimentation and evaluation are mandatory.

Management of other exotic species may be more required in the open landscapes. Evaluate conditions carefully. Do not remove a larger area than can be appropriately managed subsequently.

Hand Pulling

Hand pulling is effective where plant stem diameter is less than one-half inch.

Where invasives such as Japanese honeysuckle are mixed with desirable native species, repeated weeding of the honeysuckle will gradually give a competitive edge to the other plants. However, real diligence is required. These plants must be pulled up gently by the roots when the soil is moist and all runners that have rooted pulled up as well. Although this approach is tedious at the outset, it will provide excellent control over time.

Similarly, honeysuckle growing in trees can be tackled by severing the stem connections to the ground. Again, a blade weed-whipper or a ratchet lopper is useful. The vines can be left to rot in the trees if appearance is not a problem. Several successive cuttings can be extremely effective in exhausting the rootstocks.

This is a recommended schedule of activity for hand removal of hard-to-get-rid-of invasive exotics:

May: Complete hand cutting and removal of plant
June: Complete hand cutting and removal of plant
October or November: Follow-up monitoring and removal if necessary

Weed Wrenching

Weed wrenching is effective where plant stem diameter is between one-half and three inches.

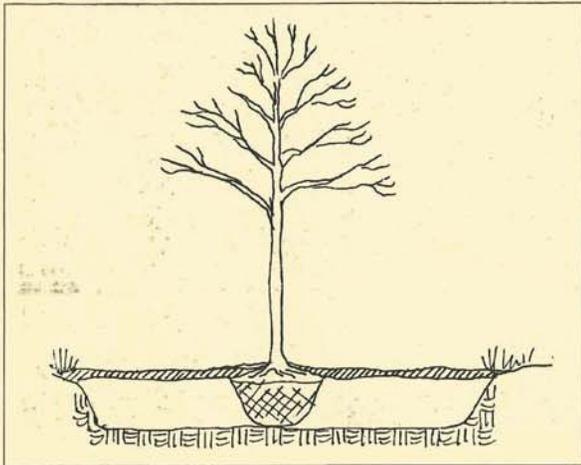
The Weed Wrench is a tool specifically developed for removal of trees and shrubs less than 3" in diameter. It is a long lever with a fulcrum plate and jaws at one end and a handle at the other. It works by gripping the base of the plant with the jaws with the fulcrum placed flat on the ground, as shown in the illustration. By pulling on the long handle of the tool, the operator simply leverages the entire tree, including root system, out of the ground, as shown. Tough plants sometimes require several pumps of the handle before the tap root breaks.

When removing multistemmed trees and shrubs, it is a good idea to prune out stems at the base of the plant so that the weed wrench jaws can reach around the main stem. Weed wrenches are effective for removing species such as shrub honeysuckle, privet, oriental bittersweet, winged euonymus and tree-of-heaven.

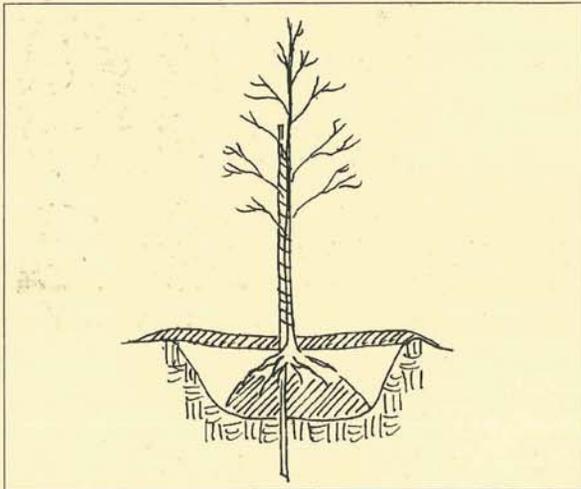
Weed Wrenches are simple to use and come with a set of instructions and safety cautions. They come in four sizes and are available from: New Tribe, 5517 Riverbanks Road, Grants Pass, OR 97527; telephone: 503-476-9492.



A team of volunteers uses a weed wrench to remove the lower stem and root of a Norway maple during a woodland restoration project in the Wissahickon Park, Philadelphia, Pennsylvania. Note the small amount of soil and disturbance involved in removal of the root mass. (Andropogon Associates, 1992)



Drawing shows balled and burlapped tree planted into wide tree pit that will accommodate root growth. Top of root ball should be set level with existing grade as shown. Use support staking only if necessary where prevailing winds are severe. (Andropogon Associates)



Drawing shows bare-root tree set into tree pit with roots spread over mound of soil. Tree should be set at same level where it grows naturally. Staking is not necessary in woodland restoration. (Andropogon Associates)

Sequential Removal

Large woody invasives can be killed over a period of time by sequential cutting. About one-third of the tree branches are removed the first year after the growing season is finished. The second year an additional third of the branches can be removed. This gradually reduces the amount of woody material in the tree. The tree can be taken down entirely in the third year, or left as a standing dead tree for wildlife habitat. Seedlings and saplings of native replacement species can be established in the developing gaps.

This technique is recommended for removing white mulberry and other undesirable trees.

Black Plastic Mulch

Where vines, such as Japanese honeysuckle, have completely overwhelmed a site and no native species are present, a black plastic mulch can be used to kill the plants. Although this plastic is unsightly, it is later removed and involves no herbicides. First, cut and remove the heaping portions of the vines. A blade weed-whipper can be especially useful for cutting the stems. The black polyethylene should be held tightly in place, using staples or stakes. Where appearance is an issue, an open mesh fiber can be used to secure a leaf mulch over the slippery plastic. It may take at least 18 months to adequately control the honeysuckle. When the plastic is removed, complete restabilization of the site is necessary. Jute matting and additional replanting are usually required.

Herbicide Management

A key management objective is to reduce the adverse environmental impacts of landscape maintenance, especially reliance on pesticides. It is important to note, however, that Herbicide Management may be advisable where well-established invasives species show extreme resistance to non-chemical control means. At this time, only mechanical methods are generally recommended until there is some feedback on their effectiveness locally. Selected species in selected locations may be evaluated further for herbicide management using the principles of Integrated Pest Management (IPM) that uses herbicides in combination with mechanical and other methods.

Planting

Woody Plants, Balled & Burlapped

Balled and burlapped trees are transplanted with a ball of soil, wrapped in burlap, around their roots. B&B is the most common technique for transplanting trees and large shrubs from nurseries. The primary drawback is the weight of the root ball. If vehicular access to the planting site is undesirable or not available, B&B planting may be too difficult and bare-root planting should be considered.

Preparing for Planting

Digging a planting hole slightly larger than the root ball is the usual B&B planting method but wherever a wider area can be incorporated, it will foster better root growth. A deeper hole does not benefit the tree and may jeopardize the planting if it should result in settlement.

Where no adjacent vegetation would be damaged, mark out a planting area that is five times the diameter of the planting ball. Use a rototiller or shovels to loosen and mix the soil in this entire area to a depth of about 12 inches. Organic matter can be added to the loosened soil as long as the new material is uniformly mixed throughout the area.

In more wooded areas, the idea is to give the new plant as much of the top layer of soil for new growth as can be accommodated without unduly damaging other plants. This will require careful hand digging to avoid cutting existing roots.

Planting and Mulching

In the center of the prepared area, dig a shallow hole to set the tree and root ball in. The hole should allow the root ball to sit on solid ground rather than on loose soil. Once the ball is set in the hole, its upper surface should be level with the existing soil.

After the tree is properly situated, cut and remove the rope or wires holding the burlap in place and securing any part of the tree. Fold back or cut away 1/3 of burlap and remove any bunched burlap. Position the tree so that it is perpendicular to the ground and the main stem is growing straight up.

Backfill around the root area and gently pack the soil to prevent major air pockets. Do not pack the soil too hard. Water can be used instead of your foot to help the soil settle and prevent overpacking. Rake the soil level over the entire area, and cover it with four inches of mulch. Some mulches decompose quickly and will have to be replenished once or twice a year. Maintaining the mulch layer carefully will improve tree growth substantially.

The Right Way to Plant

A common mistake is to plant the tree too deep. The top of the root ball should be at the same elevation as it was when the plant was growing in the nursery. The pit bottom should be exactly the same depth as the ball so that no settling occurs later. The root ball should be planted complete with its biodegradable burlap wrap and supporting biodegradable twine. Once in the pit, the burlap and twine should be pulled away from around the trunk to prevent the bark from rotting underneath. Excess burlap should be cut away because large air pockets can form around the material. Tamp the soil firmly to prevent settling and to remove any large air pockets; do not over compact. Water the plant with a hose at a slow dribble. Prune up to 1/3 of the foliage if necessary, or as otherwise directed, to reduce water stress once the plant begins to grow. Branches should be pruned where the branch meets the branch 'collar' to promote rapid healing.

Berms or watering basins are not recommended—mulch should hold the water adequately. Do not mound mulch up around the trunk of the tree. It will damage the bark and encourage disease.

It is best not to stake the tree. The movement is necessary for building the trunk's strength.

Do not wrap the trunk with "protective" tape. It will slow the tree's ability to adapt to the site and provide a cozy home for insects. The tape is often held in place with thin thread at top and bottom, which will strangle a tree just as wire will. Tree bark needs air and sunlight in order to build a healthy protective sheath.

Woody Plants, Bareroot

Bareroot plants are generally obtained from nurseries and dug when dormant and stored without soil cover in a cold moist environment. Bareroot trees are the most easily transplanted, with minimal equipment necessary, but they must be planted when the weather is cool and moist in early spring. Not all species can be transplanted bareroot so not all will be available for use.

Ideally, bareroot trees should be planted as soon as the ground can be worked—late February or early March in the Southeastern U.S., to take advantage of cooler temperatures and damper soils. Bareroot material should not be planted after the weather turns hot and dry—this condition can occur as early as April in the Southeast.

Preparing for Planting

Upon arrival on the site, bareroot trees should be stored in the shade and their roots covered with wetted mulch, straw or compost. As the weather warms, these protective measures become increasingly impor-



(Top) Volunteers planting shrubs to stabilize woodland slope, Pennsylvania. (Andropogon Associates, 1992)



(Bottom) Volunteers planting bareroot trees, Pennsylvania. (Andropogon Associates, 1992)



(Top) Bareroot trees are customarily dipped into a wetting agent before planting to ensure sufficient initial moisture during the critical planting stage, Pennsylvania. (Andropogon Associates, 1992)



(Bottom) Even children can manage the transportation of bareroot trees, Pennsylvania. (Andropogon Associates, 1992)

7. The Living Landscape



(Top) Meadow and oldfield at Nettleloth Sanctuary, Cherokee Park. (Andropogon Associates, 1993)

(Bottom) Controlled burning of oldfields and prairies is frequently used for wildlife habitat enhancement, maintenance and weed control. This is a controlled burn at the Gateway National Recreation Area, Brooklyn, New York, in a joint program with the New York City Audubon Society. (National Park Service, Jamaica Bay Wildlife Refuge, Photo by Don Riepe, c. 1980s)

tant. Mix a wetting solution such as "Liqua-Gel" with water to form a paste thick enough to cling to the roots. The wetting agent retains many times its own weight of water. Before planting, clip any broken or damaged roots and dip the entire root system in this solution to rehydrate the root system and to maintain an even moisture balance in the soil after planting.

Planting

To plant, dig a hole 6 inches larger than the size of the spread root system and about 18 inches deep. Make a small, well compacted, mound of earth in the center of the hole and spread roots over this mound. Position the tree so that its main stem is growing straight up. Backfill soil around the roots. Add compost or other organic matter. After planting, tamp the soil firmly to prevent air pockets but do not pound the soil hard.

Mulching & Watering

Mulch with rotted leaves where available. If rainfall is insufficient—less than one inch of rain a week, water newly planted trees at the rate of five gallons of water per tree every two weeks during the drought.

Staking

Trees planted on open ground should be staked as shown in the drawing above. Woodland trees are usually not staked or wrapped. Stake only where very windy or where vandalism is a problem.

Container Grown Plants and Plugs

Many smaller plants, both herbaceous and woody, can be purchased in containers ranging from plugs to several gallons in size. This technique is especially useful for species that are unavailable and must be propagated as well as species that have taproots and are difficult to transport. Container growing of native reforestation plants can be easily undertaken by volunteers who have only small spaces such as a balcony. The very small sizes should be planted only in the springtime; they are too vulnerable to frost-heaving in the fall.

The most effective method for establishing native grasses on bare soil is by plugs which have been propagated from local stock. Although costly at the outset because it is so labor intensive, this method requires the least maintenance in following years because nearly complete cover is achieved in the first season. This approach is at present still fairly limited and the plugs are available commercially on a very limited basis. For large area plantings, it is advisable to contract directly with a propagator to obtain adequate supplies at a reasonable price. Arrangements should be made to contract grow this plant material in the fall prior to spring installation.

Planting

Container grown plants can be set in a hole no deeper than, and only slightly wider than, the container, leaving adequate room to backfill properly. Plugs can be planted with a tree planting bar, usually at one-foot centers.

The plant should be carefully removed by gently upending the container or cutting it away from the soil which should be held as a mass by the dense roots of the plant. If the soil is not held by roots it is likely that the plant has not yet developed adequately.

Examine the sides of the root mass for roots that are circling the pot and that could develop into girdling roots over time. These roots should be severed before planting.

Upon planting, the plant should be watered in, mulched, and watered as needed during the first growing season.

Savannah Management

Conversion of Turf to Meadow

As a general rule, wherever there is presently stable cover, a meadow should be accomplished incrementally through revisions in management, rather than by killing and replacing the existing vegetation.

Mowing

Reduce mowing schedule to once or twice annually to reflect revised layout of turf, greensward, meadow etc. The purpose of mowing is to control volunteer woody growth to maintain an open landscape character. Where there is extensive woody development, especially exotic vines and shrubs such as honeysuckle, Japanese knotweed, privet, etc. — mow 2-3 times annually rather than only 1-2 times, for approximately two years or until woody growth is adequately controlled.

The height of the blade should be set between 8-12" and no lower than 6". The tall grasses should be still tall enough to be easily distinguishable from turf. It is not necessary to remove cuttings. If woody growth is negligible, annual mowing may be skipped or the saplings can be cut with lopping shears. If honeysuckle or other exotics are present, repeated mowing of the infested areas will help control and reduce its extent. The annual mowing may be completed any time during the dormant season or early spring except when ground nesting birds are active. A second mowing in summer to reduce the height of the meadow may also be desirable.

Overseeding

The primary purpose of overseeding is to bring greater diversity to the meadow more rapidly than would occur naturally and to compensate for reduced seed sources due to fragmentation. Locally propagated and/or collected seed is preferable, from analogous habitats with similar environmental conditions. Overseeding can be undertaken at almost anytime of year as there is minimal soil preparation or aftercare. Typically, however, seed will be available in the fall after it has ripened and can be field sown immediately, not unlike natural conditions. Seeding can be undertaken by broadcast manually or mechanically. Vegetative plugs can be used to hasten the establishment of selected species that are not as easily or rapidly established by seed.

Prairie Restoration

Prairie restoration is a good possibility on top of the knob at Iroquois Park. A small area of old field that retains some native grasses and forbs was identified in the Inventory of Plant Communities and Disturbances. This small area should be used as a starting point for prairie or grassland restoration in Iroquois Park.

Prairie restoration in a fescue-dominated habitat should be expected to be labor intensive and time consuming. Some basic guidelines are suggested in the following:

1. Shallow disking can initially remove some of the non-native weed species in the prairie. However, this will often uncover other weedy seeds, and hand weeding, herbicide or disking will probably have to be undertaken every few months to control weedy species. Deep plowing should not be done.
2. On this small area, drill seeding and interplanting may be done in lieu of disking. Hand control of weed species will most likely still be necessary.
3. Seed and plant material should consist of fifty to eighty per cent native grasses from the list provided. Little bluestem and big bluestem are especially recommended. Forbs can be interplanted with seeds or seedlings.
4. Spring seeding and planting has been most successful in our area. However, fall seeding is possible for some plant material.
5. Control burning is a necessity for maintenance and weed control in prairies. This should be done after the third year of establishment. In Kentucky where winters are relatively mild and rainfall is ample for tree growth, prairies were probably created and maintained by fire. Fires were often set by Indians to provide forage for the large grazing animals that sustained their cultures.

6. Early spring mowing is sometimes effective on both weeds and woody species. However, hand weeding will be essential for at least the first few years after establishment.

Savannah Restoration

Savannahs are open woodlands where trees grow in park-like stands. They are plant communities midway between forests and prairies, where large trees and tall grasses are the dominant features. Much of the central part of Kentucky, the Inner Bluegrass, was a savannah woodland probably maintained by Indian-set fires. The Knobs of the Outer Bluegrass, which includes Jefferson County, probably also supported ridgetop savannahs in pre-settlement times.

Savannah woodlands are recommended for establishment at Iroquois and Shawnee Parks.

1. As with prairies, removing and controlling the dominant exotic grasses (usually fescue) and forb cover is the most challenging aspect of the restoration.
2. All other guidelines mentioned for prairies also apply to savannahs, except that establishment of some desirable trees is necessary. Species selected should include some oaks and hickories from the selected park. These species are mentioned in the Inventory of Plant Communities and Disturbances for each park. A tree stocking rate of twenty to forty stems per acre is recommended.

Wetland and Streambank Habitats

Wetland Restoration

Ponds

Wetland restoration or creation is proposed for Cherokee Park at the upstream inflow to Willow Pond. Here, a ditch supplies water to the pond. Shallow excavations and checking the ditch can be used to create a small wetland at this location. This wetland will have the benefit of providing habitat diversity while filtering the nutrients and pollutants that wash into the pond from the adjacent golf course.

A shallow wetland pond is also suggested in the hydric soil near the riding stables at Iroquois Park to replace lost habitat. This small wetland will be driven by both surface runoff and groundwater. Wetlands have been previously filled in the area by grading woody and earthen debris into the lowlands near the beech forest. This material could be removed and, by paying close attention to topsoil and hydrology, these wetlands could be restored.



(Top & bottom) Drainage channel and small wetland retention area restored by volunteers, Wissahickon Park, Philadelphia, Pennsylvania (Andropogon Associates, 1992)

7. The Living Landscape

Detention Swales

At Iroquois Park wetland creation is feasible on the top of Burnt Knob to slow the runoff that causes erosion on the shaley slopes. Such detention-basin wetlands can thus serve more than one purpose. Outflow elevations should be constructed one to two feet higher than the wetland's lowest elevation to retain some water in the wetland. Varying bottom elevations throughout the wetland will prevent the establishment of a monoculture of cattails or soft rush.

Hydrology

If the hydrology is right, the wetland will be right. Evaluate the hydrologic conditions for a site, such as water level elevations, velocity, hydroperiod, nutrient and chemical levels, and sedimentation rates.

- Source of water can be surface flooding from streams, groundwater, or rainwater.
- Watershed/wetland size ratio should be considered. Usually the larger, the better. Smaller ratios are possible to restore with more poorly drained soils.
- Periodicity of inundation or saturation determines the type of community restored or created.
- Restoration of hydrology may require the checking of human-made ditches and the renovation of flood regimes.
- Creation of shallow ponds for habitat diversity will increase the number and kinds of plants and animals. Use clay subsoil from ponds for ditch plugs or berms.
- The use of water control structures, where possible, will provide some ability to manipulate water levels, which is especially important during the early periods of plant establishment.

Soils

Store and replace topsoil during the construction phase. Be concerned with erosion possibilities. Slopes should be very gentle and stable even without vegetation cover.

Vegetation

When possible, select potential restoration locations adjacent to existing wetlands to allow natural regeneration. Container-grown stock is often the most successful for the price. Adjacent wetlands can be used as a seed source. Herbaceous wetland plants can be installed in small wetlands, or in those wetlands where quick establishment is essential. In some cases, seeds of wetland plants are used in a temporary matrix of grass like red-top or annual rye (non-natives that will die out in standing water), or switchgrass. Fescue should be avoided except in the most difficult to establish areas. Select species carefully according to targeted depth of water.

Sources

Plant material for restorations should be obtained from local sources if possible. Both plants and seeds should be used to establish wetlands and prairies. Woodland and streambank restorations will generally require plant material rather than seeds. If some desired material is not available, contract growing of plants and seed is a viable option. Shooting Star Nursery of Frankfort, Kentucky, carries a large supply of plants and seed of forests, prairies and wetlands. They have an especially good selection of prairie grasses and forbs. Jane's Native Seeds of Owenton, Kentucky also carries a wide selection of native plants and specializes in wetland species. However, with any supplier the source of the material should be questioned and a local seed source should be requested.

Species List for Restoration

Trees

Pin Oak	Quercus palustris
Swamp chestnut oak	Q. michauxii
Overcup oak	Q. lyrata
Swamp white oak	Q. bicolor
Cherrybark oak	Q. pagodifolia
Green ash	Fraxinus pennsylvanicus
Red maple	Acer rubrum
Shellbark hickory	Carya laciniata

Shrubs

Buttonbush	Cephalanthus occidentalis
Silky dogwood	Cornus amomum
Alder	Alnus serrulata
Elderberry	Sambucus canadensis
Arrowwood	Viburnum dentatum
Swamp holly	Ilex decidua
Virginia willow	Itea virginica
Swamp rose	Rosa palustris
Chokeberry	Aronia melanocarpa
Steeplebush	Spiraea tomentosa

Herbaceous

Sweet flag	Acorus calamus
Water plantain	Alisma subcordatum
Swamp milkweed	Asclepias incarnata
Marsh marigold	Bidens spp.
Drooping sedge	Carex crinita
Sedge	Carex frankii
Sedge	Carex grayii
Turtlehead	Chelone glabra

Umbrella sedge
Manna grass
Mistflower
Boneset
Goldenrod
Sneezeweed
Hibiscus
Blue flag
Cardinal flower
Rattlebox
Bugleweed
Monkeyflower
Ditch stonecrop
Smartweed
Smartweed
Lizard's tail
Arrowhead
Bulrush
Goldenrod
American bur-reed

Cyperus strigosus
Glyceria striata
Eupatorium coelestinum
Eupatorium perfoliatum
Euthamia graminifolia
Helenium autumnale
Hibiscus moschuetus militaris
Iris virginica
Lobelia cardinalis
Ludwigia alternifolia
Lycopus virginica, americanus
Mimulus ringens, alatus
Penthorum sedoides
Polygonum pennsylvanicum
Polygonum coccineum
Saururus cernuus
Sagittaria latifolia
Scirpus atrovirens
Solidago rugosa
Sparganium americanum

Seed matrix material

Redtop	Agrostis alba, gigantea
Switchgrass	Panicum virgatum
Annual rye	Lolium annua

Streambank Enhancement

Beargrass Creek (which flows through Cherokee Park), like many urban streams, suffers from a homogenization of instream habitat and loss of a viable riparian community. The increase in impervious surfaces upstream of the park has resulted in increased flows that have washed out riffles, logs, woody debris and steepened banks. The following methods are recommended for the re-establishment of in-stream habitat and the streambank community.

1. Riffles should be recreated along Beargrass Creek by placing Class II and III channel lining (rocks) across the stream. Riffles should occur approximately every six times the width of the stream.
2. Boulders two to three feet in diameter should be placed in the stream to provide current diversity and fish cover.
3. Pools can be created by using check dams which create plunge pools or by simply excavating the stream bottom.
4. In some location the vertical streambank may be appropriate to stabilize the banks where erosion is severe. This is also true along the Ohio River at Shawnee Park where commercial traffic is causing beach erosion.

Species List for Restoration: Streambanks

Trees

Pin oak	<i>Quercus palustris</i>
Swamp chestnut oak	<i>Q. michauxii</i>
Shumard oak	<i>Q. shumardii</i>
Cottonwood	<i>Populus deltoides</i>
Red mulberry	<i>Morus alba</i>
Green ash	<i>Fraxinus pennsylvanicus</i>
Silver maple	<i>Acer saccharinum</i>
Box elder	<i>Acer negundo</i>
Wild giant cane	<i>Arundaria gigantea</i>
Black walnut	<i>Juglans nigra</i>

Shrubs

Buttonbush	<i>Cephalanthus occidentalis</i>
Silky dogwood	<i>Cornus amomum</i>
Alder	<i>Alnus serrulata</i>
Elderberry	<i>Sambucus canadensis</i>
Arrowwood	<i>Viburnum dentatum</i>
Pawpaw	<i>Asimina triloba</i>
Spicebush	<i>Lindera benzoin</i>
Carolina willow	<i>Salix caroliniana</i>
Sandbar willow	<i>Salix exigua</i>
Indigobush	<i>Amorpha fruticosa</i>
Hazelnut	<i>Corylus americana</i>

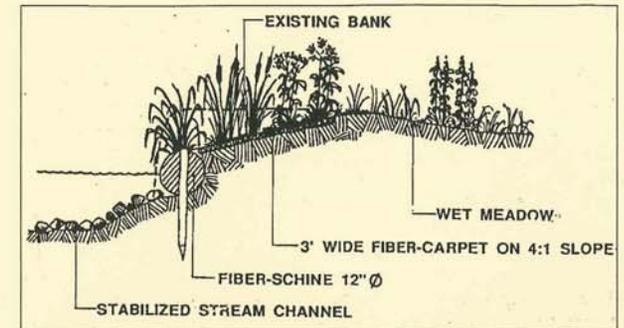
Herbaceous

Swamp milkweed	<i>Asclepias incarnata</i>
Marsh marigold	<i>Bidens</i> spp.
Joe-pye weed	<i>Eupatorium fistulosum</i>
Hibiscus	<i>Hibiscus moscheutos militaris</i>
Jewelweed	<i>Impatiens capensis</i>
Jewelweed	<i>Impatiens pallida</i>
Blue flag	<i>Iris virginica</i>
Cardinal flower	<i>Lobelia cardinalis</i>
Blue lobelia	<i>Lobelia siphylitica</i>
Monkeyflower	<i>Mimulus ringens, alatus</i>
Late phlox	<i>Phlox paniculata</i>
Smartweed	<i>Polygonum pennsylvanicum</i>
Smartweed	<i>Polygonum coccinum</i>
Smartweed	<i>Polygonum lapathifolium</i>
Goldenglow	<i>Rudbeckia laciniata</i>
Bulrush	<i>Scirpus atrovirens</i>
Spanglegrass	<i>Uniola latifolium</i>
Wild rye	<i>Elymus virginicus</i>



(Top) A degraded streambank showing continuous erosion from increased flow due to upstream development, Allentown, Pennsylvania. (Andropogon Associates, 1992)

(Bottom) Streambank is being restored with rolls of staked coconut fiber. The bank is graded back to more natural contours and planted with wetland vegetation, Allentown, Pennsylvania. (Andropogon Associates, 1992)



(Top) Section of streambank restoration, Allentown, Pennsylvania. (Andropogon Associates, 1992)

(Bottom) Completed restoration with finished grading and wetland plantings, Allentown, Pennsylvania. (Andropogon Associates, 1992)



(Top) Historic view of Panther Point, Iroquois Park, c. 1928. (University of Louisville, Photographic Archives, Caulfield & Shook Collection)

(Bottom) Overgrown vista at Krupp's Point. (Anáropogon Associates, 1993)

Vista Management

The wide expansive views of the past are simply not sustainable and have been responsible for severe impacts to the forest and have jeopardized the slopes as well as park infrastructure. The views must be more intermittent—more like a lace curtain—in order to permit adequate site stabilization. Sightline clearing is proposed as an alternative to drastic clearing of vistas. This approach is selective and is to be used to create specific views rather than to open up an entire site.

Proposed solution: An open woodland, comprised of very few canopy trees that frame the view, with a mixed understory of largely shrubs.

Object: To replace damaged trees with healthy but smaller trees and shrubs, and a few framing trees. Retain multi-layered structure to extent feasible.

Stabilize, Plant and Manage Existing Vistas at Southern and Northern Overlooks

The sheared vistas will take some time to regrow and recover from past management practices. It will be an incremental process and there are no simple answers. Some trials may be needed before larger scale approaches are applied. The general approach should be as follows:

1. Develop and implement a stormwater management plan for the vista area.
2. Restabilize and replant eroded slopes.
3. Wait until trees develop before applying Sightline Clearing Guidelines as indicated in the following section.

Manage and Open Up New Wooded Vistas at Krupp's and Panther Points

Overall Sightline Management

It may be better in some cases to remove a tree, rather than cut the limbs. Fast growing species like ash that will grow back rapidly can be removed entirely. Young smaller trees and shrubs that will stay low and not interfere with the vista will be released by removing fast growing competition species. Reshape the crown of lower growing species to reduce height.

Take care to retain the natural shape of trees. Do not make them look 'butchered' regardless of from where they will be viewed. Position the cut to make the pruning less noticeable.

The view of vegetation below and along the sides of the vista is especially important. The sides should not be branchless trunks. Retain the visual softening provided by branches. The vista when complete should look like it was always there.

Selective Sightline Clearing

1. Mark probable center line vista. Inventory trees – note invasive species, historic or particularly large trees. Work in winter to maximize visibility.
2. Cut a window for sighting along which sightlines and viewsheds can be studied. Powerful binoculars may be useful as well as a two-way radio with headsets. One person should be stationed at the location of the visitor to determine what specific plants or branches should be removed.
3. These limbs or plants should be marked for removal with spray paint or red plastic tape by a second person stationed on the earthworks. Shake each plant or limb to verify with 'sighter'.
4. The proposed work should be reviewed before cutting by the crew to be sure sightline will be effective and no unnecessary cutting is done. Do not prune in the spring when the sap is rising.

Pruning Guidelines

The ideal time to prune trees is the late dormant season or very early spring before the new leaves form.

Locate the branch bark ridge, that is, the folded area of bark where the branch leaves the tree stem. Stub cut the branch about twelve inches above the branch bark ridge so that the weight of the branch does not rip the final cut. Locate a point (A on the diagram) at the crotch of the branch but outside the branch bark ridge. Locate a second point (B on the diagram) above the swelling where the branch meets the branch collar. Make the final cut at line AB as shown.

Never leave stubs partway up the branch. Never prune behind the branch bark ridge; this practice wounds the tree. Never top trees by completely severing the leader midway up the tree.

Ground support is crucial to keep climbers supplied, and for clean-up and chipping branches. Chainsaw safety procedures should be followed and protective clothing worn throughout the work.

List of Equipment and Materials

Pick-up Truck
 Equipment Trailer
 Chainsaws
 Loppers
 Clippers
 Pruning Saws
 Horticultural Knives
 Spray Paint (bright red or pink)
 Plastic Surveyor's Tape (bright red or pink)

"It is particularly important that the new Superintendent of Iroquois Park should be instructed not to head in the trees in the nursery or in the border plantations. The intention is to have all these trees, when planted out, grow in as natural a manner as possible, so as to eventually resemble closely the existing natural woods. To head the trees in would be certain to produce an artificial and monotonous aspect, quite out of keeping with the natural woods.

It may strike you as rather odd, but it has been our experience that a florist when placed in charge of a park has to unlearn a good deal that he has been accustomed to practice. In fact it has frequently occurred that we have obtained better results from a man like a farmer, ignorant of horticulture and arboriculture, than from a gardener who has definite ideas which, if carried out in a park, produce a very artificial and unsuitable result. This is particularly the case in such a wild bit of scenery as characterizes Iroquois Park. You should be on your guard on every occasion to apply the fundamental principle of natural and wild effect in everything the Superintendent suggests."—Excerpts from Frederick Law Olmsted, Jr. & John C. Olmsted to R. C. Kinkead, October 4, 1897

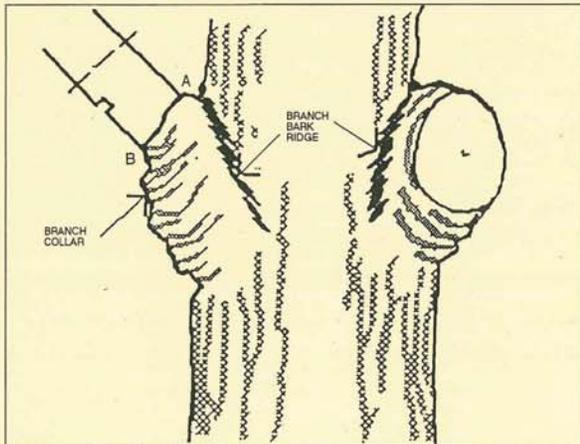


Diagram shows sequential procedure for pruning. (Adapted by Andropogon Associates from Shigo & Trees, Associates)

Trail Monitoring

Trail monitoring, along with the landscape management log discussed next, is an integral component of any demonstration area or capital project. A consistent methodology known as trail transects can be used to describe existing conditions as well as change over time. A system of trail transects could accurately portray changes in the ground surface of the trail at selected intervals, using both photography and measured trail cross-sections.

Procedure

Identify trampling sites

The objective is to sample sites that reflect a range of different trail conditions. A typical number of transects in a two-mile distance is 35.

Starting at a trail head or specified point, place a numbered aluminum tag on a single tree with lagscrew at a height of between 2-4 1/2 feet and record in log book. Next run a cyclometer (a measuring wheel) along the centerline of the trail to the next specified point (an average distance is 300 feet). Repeat.

Establish transect

At each point, place a second numbered aluminum tag on a tree on the other side of the trail, preferably a short distance from the trail edge. The line between the trees should be level and should cross the trail roughly perpendicularly. Extend a string across the trail, attaching each end to the tag nails of each tree. In the log book, record the information for the second tree.

Measure transect

The measurement is made with the use of two fiberglass tape measures. One is extended between the two trees for horizontal measurement across the trail. The second tape, equipped with a Plumb Bob, is suspended for vertical measurement. After measuring the width to establish both trail tread edges, vertical measurements can be taken and changes in soil loss calculated.

Photograph and document site conditions

Using a tripod mounted camera set at a fixed reference point along the transect, take record photographs and log description of existing conditions.

Materials required

(2) sets of numbered aluminum tags (per transect)
 (2) nails or lagbolts (per transect)
 (1) cyclometer,
 (1) notebook
 (1) chart for measurement (per transect)
 (1) hand altimeter
 (1) roll of string,
 (2) fiberglass measuring tapes
 (1) Plumb Bob
 (1) hammer
 (1) level
 (1) camera
 (1) stereo board
 (1) tripod
 (2) stakes per transect
 (2) surveying pins
 (1) roll of string
 (3) target cards
 (1) stereo instrument or (1) digitized plotter
 Charting paper, marking pen, film.

(This procedure is from *Trail Package: Synopsis of Historical, Environmental, and Sociological Considerations Related to Mountain Bicycle Use in Park Trail Settings*, The International Mountain Bicycling Association, Los Angeles CA, May 1986.)



The Management Log—Learn by Doing: Supervision, Training and Monitoring

All landscape management is purposeful and reflects specific goals such as the restoration of an historic plant community or the control of stormwater to reduce erosion. Our objective is to provide guidelines for a monitoring program that is developed incrementally by those who are managing the landscape. A key concept of these guidelines is the Management Log which serves as a site database that continuously records and informs our actions.

The establishment of a site database is one of the most crucial components of the effort to develop a sustainable landscape management program. We are already restricted by a lack of understanding about how landscape systems function. Without monitoring we are simply making policy decisions and implementing management based on guesses.

The management log will include, in addition to the baseline information gathered for the Master Plan, a record of all management activities that are implemented on site, as well as their effectiveness. All management will be monitored and assessed with regard to the goals established at the outset and the program will be revised along the way to reflect the most current understanding that flows from the monitoring.

An important function of this database is to overcome the hurdle of time and help reveal long term trends and the consequences of our actions. If we are to restore the character to these landscapes that gave rise to the original designs, then we must understand and work with the natural regenerative processes and inherent landscape patterns of each place. Our purpose is to understand these parks as living systems of terrain and water, plants, animals, and people as well as works of art. This is an incremental process. Pay close attention and learn from the site; it will surprise and inform you.

The Management Log is comprised of two major sections: the general monitoring log that addresses all sites in the landscape and is undertaken regularly and the project management log that addresses special management efforts.

General Monitoring

General monitoring includes baseline monitoring of site conditions and recording and assessing maintenance activities. The process of expanding and updating the general archive is a continuous one. The Natural Resources Inventory phase of this Master Plan identified specific baseline monitoring gaps that should be addressed immediately, especially with regard to endangered species and critical habitats in Iroquois and Cherokee Parks. These include:

- The archival material gathered in the past as well as for this Master Plan.
- Baseline monitoring undertaken in this phase as well as in the future.
- Annual review of each park with a one-year plan and revisions to five-year plan. Some of these plans will of necessity be very brief and may note only what the general conditions are and postpone any active intervention until other higher priority areas are dealt with. A photographic log should be included with each review.
- Record of maintenance activities, including trash pick-up, weeding, watering, fence repair, tree maintenance and removal of blowdowns.

Special Management

Special management efforts could be undertaken in areas where, for instance, recapturing the historic landscape scene, such as an important view, is particularly revealing of park character. Historical photographs and/or drawings will form part of the database upon which management efforts are based. These special management efforts are refined as closely as possible and might include:

- A summary of the purpose of the special management effort and how it relates to the master plan.
- Written and photographic descriptions of expected vegetative responses to compare with later assessments of actual management.
- A description of management activities undertaken, time spent, and location recorded on a site map.
- Before- and after- management photographs.
- First-year follow-up with assessment and recommendations for further action and monitoring.

The following case study Management Log was developed for the initiation of the Barringer Hill vista restoration project and is intended to be a model for other management areas.

Metro Parks worker uses a large weed wrench to remove a box elder from the vista area at Barringer Hill, Cherokee Park. (Andropogon Associates, 1994)

The Landscape Management Log

This is an in-progress draft management log for use by Metro Parks staff while doing the initial landscape management at Barringer Hill Vista. The log will be updated and revised as needed based on suggestions from the field work taking place during March 1994.

Landscape Management Review Summary

All proposed landscape management by Metro Parks should meet a review criteria to be developed in conjunction with the Conservancy and the Advisory Review Board. Landscape management activities should pass through the same review criteria as stated in the Master Plan for projects.

Additionally, all management activities should be recorded on log sheets along with the management objective, which should be written as a description of the vegetation cover type. Monitoring records should continue and the expected management results can then be compared with actual changes in landscape and vegetation.

Management Log Contents

1. Management Zone
2. Original Conditions
3. Historic Design Intent
4. Changes Over Time
5. Current Conditions
6. Proposed Renewal
7. Proposed Management & Activity Schedule
8. Photography Log: Key Map
9. Photography Log: Existing Conditions
10. Photography Log: During Management
11. Photography Log: Additional Photographs
12. Photography Log: After Management
13. Activity Log

Technical Information

- Invasive Plant Identification Sheets

We need your help to

PROTECT THE WOODLANDS!

*How? Here are five things you
can do to make a difference.*

1. Respect the fences protecting the hundreds of native ferns, bulbs, vines and perennials recently planted by Central Park's Woodland Restoration Crew and community volunteers. PARK RULES: ARTICLE III SECTION 7.

2. Let the woodland plants grow and bloom for all Park visitors to enjoy. Remember: It is against the law to remove plants or their branches and flowers from the Park. PARK RULES: ARTICLE III SECTION 7.

3. Use asphalt paths and the new stone and gravel "Adventure Trails" to get to the stream and cascades and to travel through the woods. Off-path trampling -- foot and bike -- causes soil compaction and erosion. It kills woodland plants. PARK RULES: ARTICLE III SECTION 5.

4. Take your garbage out of the woodlands to the nearest trash basket. One piece of garbage can spoil the beauty of this special Park landscape. Don't let it be yours. PARK RULES: ARTICLE III SECTION 8.

5. Keep pets on leash. Birds and woodland animals already live in a very stressful environment. PARK RULES: ARTICLE III SECTION 12 & 14.



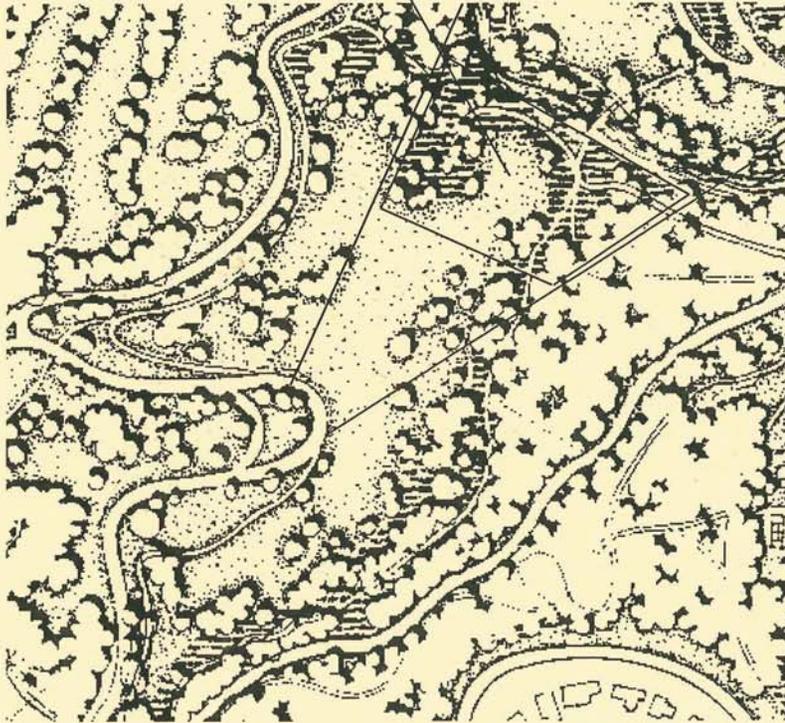
Central Park Conservancy

Thank you for your consideration.

Sign posted in woodlands educates the public about park renewal efforts and appropriate use and protection of park resources. (Central Park Conservancy)

Management Zone
Barringer Hill Vista

Vista Management
Work Area



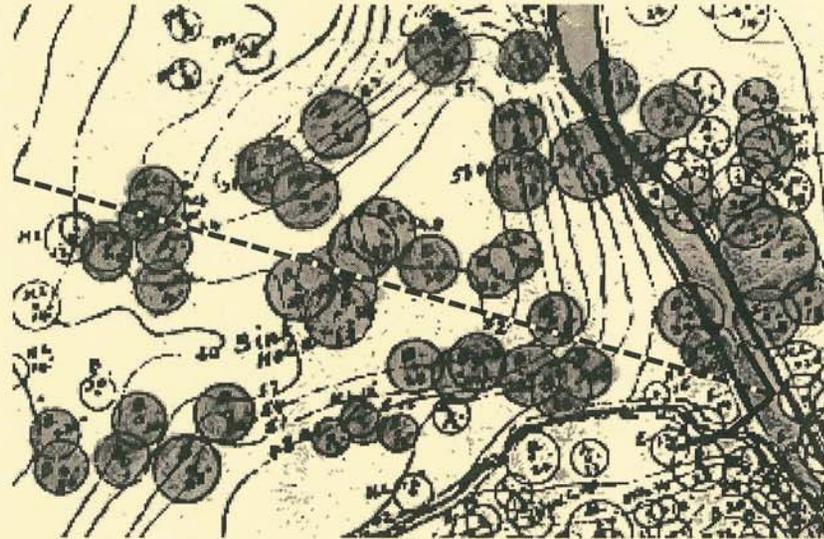
Original Conditions
Barringer Hill Vista

Purpose:

Review the original conditions of the site to understand its original features, including the larger context of vegetation, hydrology, topography, etc.

Graphic Title:

1891 Existing Conditions Survey, Cherokee Park



Description:

This early drawing shows part of the vista area and the wooded slope leading to Beargrass Creek, shown on the right side of the plan. At the turn of the century, this sloped forest was a mature beech woods with a largely open understory.

Historic Design Intent

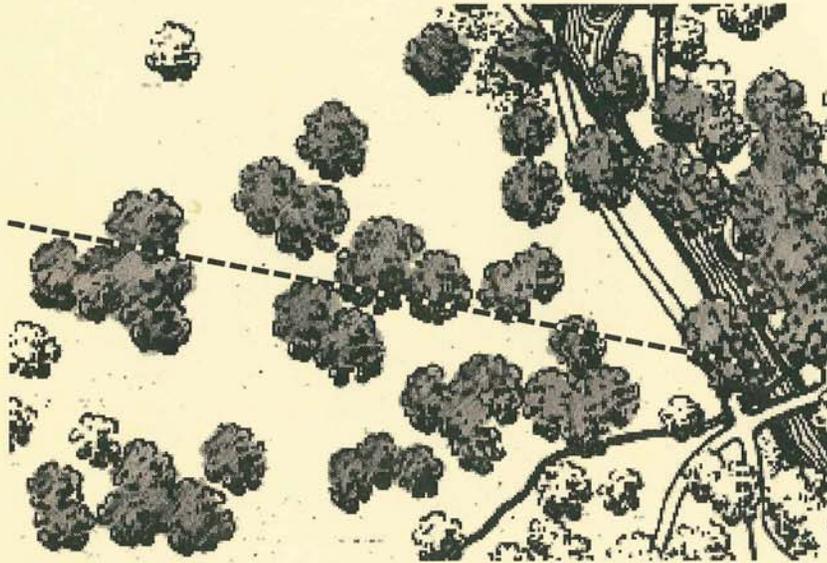
Barringer Hill Vista

Purpose:

Review any historic designs to understand how the present management goals relate to the historic landscape.

Graphic Title:

1897 General Plan, F. L. Olmsted



Description:

The Olmsted drawing shows the design intention to keep the view through the woods from the overlook to the creek valley, as indicated by the arrow on the plan. The view is not entirely open - groves of trees overlap the edges of the vista and in some cases the view is through the trees rather than over top of the tree canopies.

Changes Over Time

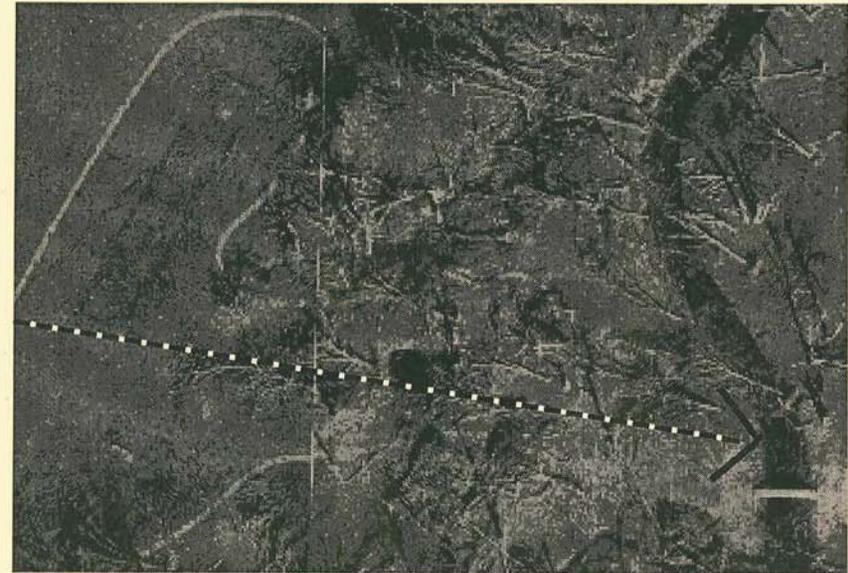
Barringer Hill Vista

Purpose:

Review major events that have impacted the site, such as storm damage, new construction, changes in management, etc.

Graphic Title:

1974 Aerial Photograph, Cherokee Park



Description:

The 1974 tornado felled over two thousand trees in Cherokee Park. Barringer Hill in particular was devastated - the tornado cleared a swath to Beargrass Creek on both sides of the creek. Many of the mature trees were completely uprooted. The sudden loss of canopy reduced forest cover substantially and fostered the spread of invasive, non-native species.

Current Conditions

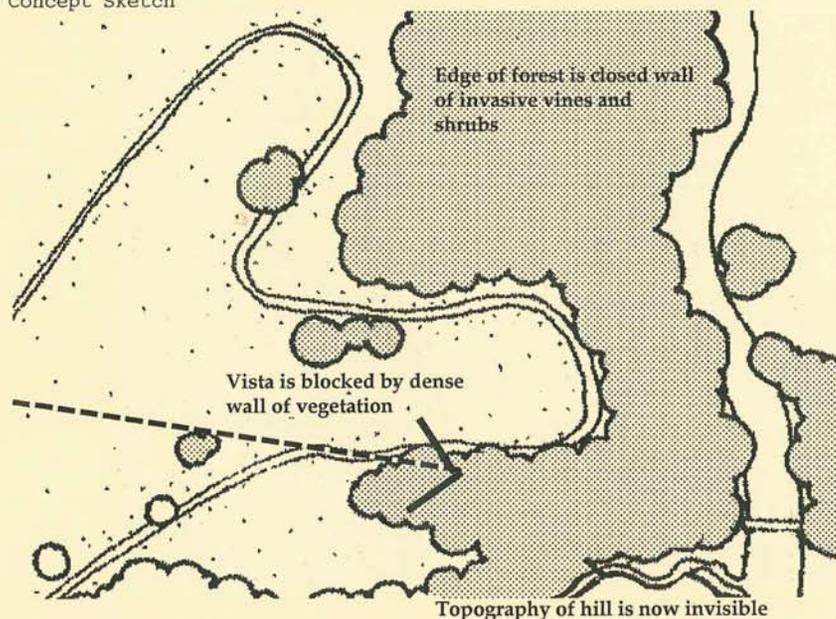
Barringer Hill Vista

Purpose:

Review the current conditions to see how the landscape has changed from the historic landscape.

Graphic Title:

Barringer Hill "Before" Condition, Andropogon Associates, 1992
Concept Sketch



Description:

Replanting following the tornado and twenty years of unmanaged understory growth have resulted in a dense thicket of vegetation that blocks the vista from the hill above. The mature trees have been replaced by stands of younger, relatively even-aged trees. The understory is clogged with invasive shrubs and vines, although a native herbaceous layer persists in many areas.

Proposed Renewal

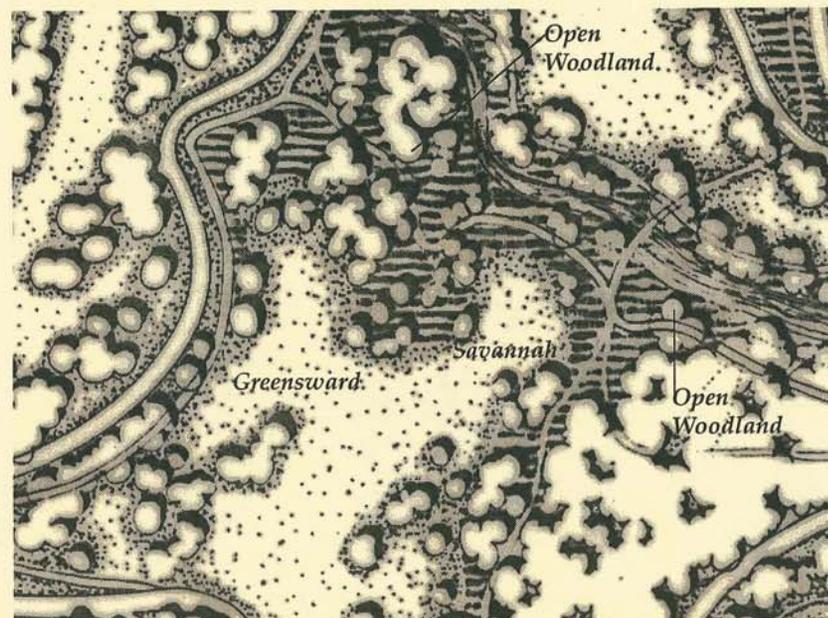
Barringer Hill Vista

Purpose:

Develop a plan of proposed cover type management that restores the native plant structure to the landscape.

Graphic Title:

Master Plan for Cherokee Park, Andropogon Associates, 1993



Description:

The diagram shows the proposed scenario of landscape cover types that is the overall goal of management at Barringer Hill. An open woodland cover type is proposed for the present dense woodland thicket; a savannah of long grasses and tree groves is proposed for the central vista, and a greensward of mixed forbs and grasses is proposed for the mowed hillside.

Proposed Management & Activity Schedule

Barringer Hill Vista

Purpose (Management target):

Move toward open woodland with healthy ground layer, limited shrubs, without infestation of exotic vines and shrubs.

Expected Vegetation Result:

Removal of sprouting vines and shrubs expected to be required once in March, once in June, and once in late August. Monitoring late in the year expected to show 90% drop in areas infested with targeted exotics. Appearance of native groundlayer expected by early April, and, if management efforts are successful, native plants should be measurably increased and show more species diversity one year later.

Tasks & Techniques:

1. Tag invasive species to be removed with colored ribbons.
2. Cut vines with loppers. Remove at wood edges; leave hanging in trees in deep woods.
3. Pull saplings up with weed wrenches.
4. Cut shrubs back to 8". Leave rootstock and stump in place to retain soil. Stockpile brush in accessible areas to avoid trampling woodlands.
5. Cut trees so as to minimize disturbance to adjacent plants. Fell trees in section and leave stumps in place.
6. Spread leaf litter over bare spots.

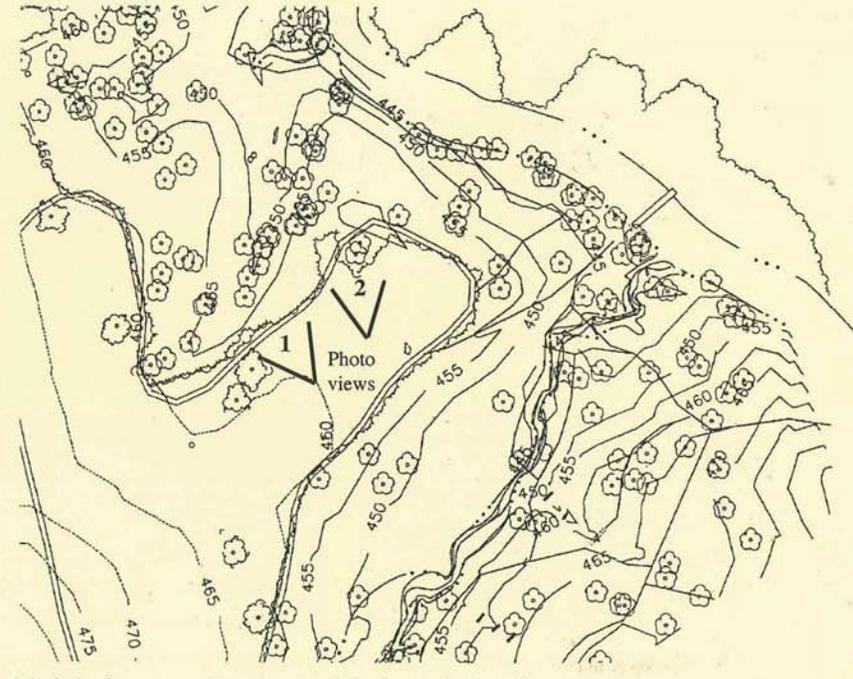
Tools:

- Chain saw - 1
- Brush cutter (gas powered) - 1
- Brush cutters (hand) - 2
- Gas cans - 2
- Weed wrenches (small, med, lg) - 3
- Metal rakes - 2
- Pruning shears - 9
- Loping shears - 7
- Long handled tree saw - 2
- Bow saws - 4
- Tagging tape rolls - 10
- Hard hats - 9
- Ear protectors - 4
- Leg protectors - 4
- Work gloves - 10

JANUARY	FEBRUARY	MARCH Removals completed
APRIL	MAY	JUNE Follow-up
JULY	AUGUST Follow-up	SEPTEMBER
OCTOBER	NOVEMBER	DECEMBER

Photography Log—Key Map

Barringer Hill Vista



Photography Log: Existing Conditions
Barringer Hill Vista

Description/Location/Date



VIEW #1
3/14/94 9:30 A.M.



VIEW #2
3/14/94 9:30 A.M.

Photography Log: During Management
Barringer Hill Vista

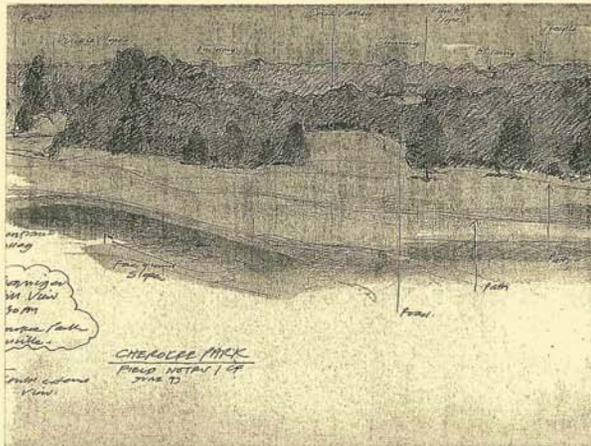
Description/Location/Date



#2
3/14/94 3:30 P.M.

Polaroid photos taken from locations #1 and #2 show vine-infested woodland edge. (Andropogon Associates, 1994)

Polaroid photo taken from location #2 during vista management. (Andropogon Associates, 1994)



Field sketch of Barringer Hill before management. (Andropogon Associates, 1994)

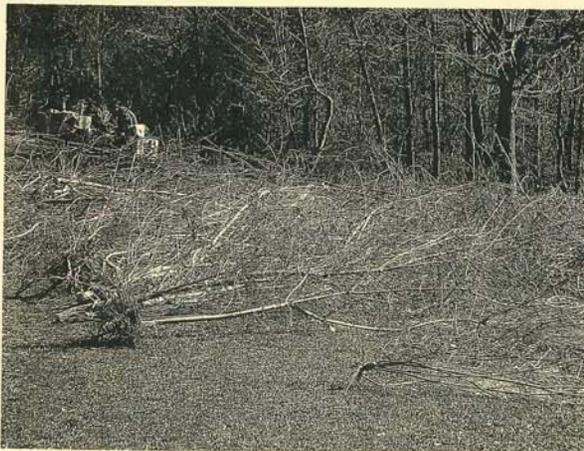


Brush chipping operations taken from overlook to vista and from vista back to overlook. (Andropogon Associates, 1994)



*Photography Log: Additional Photographs
Barringer Hill Vista*

Description/Location/Date



(Top) Selective clearing at woodland edge. (Andropogon Associates, 1994)

*(Bottom) Trees tagged for removal have been weed wrenched out by the roots.
(Andropogon Associates, 1994)*

*Photography Log: After Management
Barringer Hill Vista*

Description/Location/Date



#1
2/14/94 3:30 P.M.

*Polaroid photo taken from location #1 shows selectively cleared
woodland edge. (Andropogon Associates, 1994)*



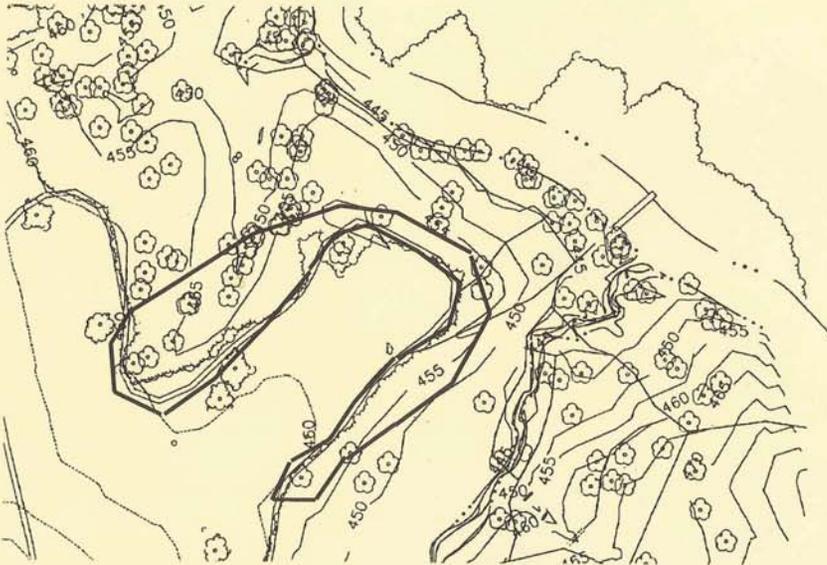
Woodland following vegetation management. (Andropogon Associates, 1994)

Activity Log

Barringer Hill Vista

Purpose (Immediate Management Target):

Remove targeted invasive exotic species including grapevine, honeysuckle and blackberries by the roots. Clear only the area that will not lead to increased erosion. Evaluate other groundcover.



Invasive Plant Identification Sheet

Shrub Honeysuckle (*Lonicera tatarica*; *L. maackii*)

Tartarian Honeysuckle, Amur Honeysuckle

LEAVES: Opposite, simple, roughly oval shaped, some are pointed. 1 to 3" long.

FRUIT: Bright red, 1/4" in diameter, grows opposite like leaves.

FLOWERS: White, in June. Sweet-smelling.

PLANT: Multi-stemmed shrub that can reach 10-15' in height. Very dense and leggy.

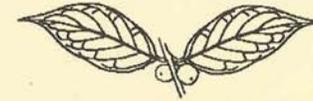
Drawings from Michael A. Dirr, *Manual of Woody Landscape Plants* (Champaign, IL: Stipes Publishing Company, 1977).
Photographs of leaves & stems from George W. D. Symonds, *The Shrub Identification Book* (New York: M. Barrows and Company, 1963).



Amur shrub leaf



Tartarian shrub leaf



Paired opposite leaves



Berries



Shrub honeysuckle. (Photo by John MacGregor, 1993)

WORKER / ACTIVITY / TIME

Cutting vines	9 persons	3.5 hrs
Removing shrubs trees & vines	9 persons	7.0 hrs

Invasive Plant Identification Sheet

Vine Honeysuckle (*Lonicera japonica*)

Japanese Honeysuckle

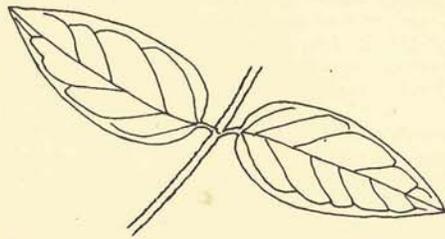
LEAVES: Opposite, simple, oval shaped. 1 to 3" long. Semi-evergreen

FRUIT: Bright red, 1/4" in diameter, visible in fall.

FLOWERS: White, in June. Sweet-smelling.

PLANT: Weedy, twining vine that can reach 15-30' in height.

Drawings from Michael A. Dirr, *Manual of Woody Landscape Plants* (Champaign, IL: Stipes Publishing Company, 1977).
Photographs of leaves & stems from George W. D. Symonds, *The Shrub Identification Book* (New York: M. Barrows and Company, 1963).



Paired opposite leaves



Stem and leaf variation



Japanese honeysuckle in the Louisville Parks. (Photo by Andropogon Associates, 1993)

Invasive Plant Identification Sheet

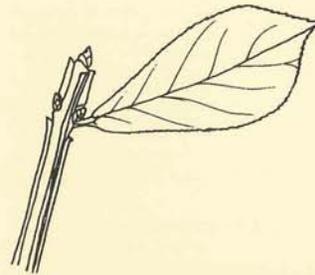
Winged Euonymus (*Euonymus alatus*)

LEAVES: Opposite, simple, shaped like long ovals, pointed. 1 to 2" long.

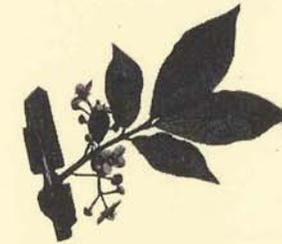
STEM: Green to brown with 2 to 4 corky wings.

PLANT: Multi-stemmed shrub that can reach 15-20' height, noted for red color in fall.

Drawings from Michael A. Dirr, *Manual of Woody Landscape Plants* (Champaign, IL: Stipes Publishing Company, 1977).
Photographs of leaves & stems from George W. D. Symonds, *The Shrub Identification Book* (New York: M. Barrows and Company, 1963).



Single leaf and stem



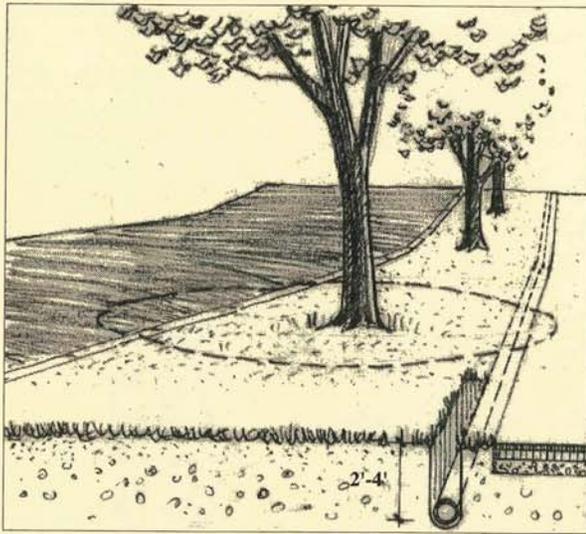
Stem with flowers



Stem



Winged euonymus. (Photo by JohnMacGregor, 1993)



The illustration shows tunneling for a utility line under the drip line of a street tree. Tunneling is the preferred method of placing utility lines under existing street trees, since utility trenching near a tree can kill as much as 50% of its roots, which will likely cause decline or death of the tree. A depth of at least 2 feet, and preferably greater, is recommended.

Specifications

Prepared by *Andropogon Associates, Philadelphia PA*

Specifications should include several key items:

- Qualifications of the bidding contractors, including references and photographs of previous work.
- Attendance at a pre-bid conference is mandatory for bidding. This conference should include a site review and demonstration of any techniques which may be unfamiliar to the bidders.
- A clear description of construction review procedures, plant selection, and reviews by the landscape architect during the course of the work.
- A clear description of close-out procedures for completion of the work and any maintenance and guarantee follow-up procedures by the contractor.

The following is a specification for the planting of balled-and-burlapped trees for the Olmsted Parkways.

Landscape Planting Specifications

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included:

1. Planting of balled and burlapped trees.

1.2 SUBMITTALS

- A. Plant Sources: Submit list of plant sources for planting for approval of Landscape Architect before ordering material.
- B. Planting Schedule: Submit proposed planting schedule, indicating dates for plant tagging, digging of woody material, transportation (and transit methods) and installation of each type of landscape work during normal seasons for such work in area of site. Correlate with specified maintenance periods to provide maintenance from date of substantial completion. Once accepted, revise dates only as approved in writing, after documentation of reasons for delays.
- C. Submit mulch sample for Landscape Architect approval.

1.3 WARRANTY

- A. Remove and replace trees found to be dead or in unhealthy condition during a one-year warranty period. Make replacements during growth season following end of warranty period. Replace trees which are in doubtful condition as determined by Landscape Architect at end of warranty period.
- B. Contractor shall provide all specified maintenance work for plant materials for a period of twelve (12) months after the completion and acceptance of the landscape plantings.
 1. Begin maintenance work immediately after planting. Maintenance work shall include watering, pruning, spraying, removal and replacement of dead material, resetting settled plants to proper grade or upright position, reguying and restaking, and other necessary operations as may be required to keep the plants in a live and healthy growing condition.
 2. All replacements shall be plants of the same kind, size, and quality as originally specified in the "Plant List" and they shall be furnished and planted at no additional cost to the Owner, with the exception of plants damaged by vandalism. Should vandalism occur, the Contractor shall notify the Landscape Architect in writing describing the quantity of plant materials affected and related damages.

Proceed with replacement operations only after written acceptance per the above.

C. Final Inspection and Acceptance of Plant Materials

1. As part of this item, the Contractor shall remove all guy wires, tree protectors, and stakes at the end of the plant establishment period. Not less than thirty (30) days prior to the end of the plant establishment period, the Contractor shall notify the Landscape Architect requesting inspection of the work to determine its degree of completion to establish the end of the establishment period.
2. After inspection, the Contractor will be notified of final acceptance of the work, or any deficiencies which must be corrected to the satisfaction of the Landscape Architect before final acceptance.

1.4 QUALITY ASSURANCE

- A. Experience: Contract landscape work to a single firm specializing in landscape work. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this section.

B. Source Quality Control: Provide trees of quantity, size, genus, species and variety shown and scheduled for landscape work and complying with recommendations and requirements of ANSI Z60.1, "American Standard for Nursery Stock," published by the American Association of Nurserymen, Inc.

C. Plant Selection: Contractor must identify nursery source or collection site for all plant materials and submit list to the Landscape Architect for approval before ordering material.

1. All woody plant material shall be obtained from nurseries with soils similar to the soils on the planting site and grown under climatic conditions similar to the City of Louisville for at least two years.

D. Plant Inspection: No plant material shall be planted by the Contractor until inspected and approved by the Landscape Architect at the site of the work. The Landscape Architect shall be the sole judge of the quality and acceptability of the plant materials. All rejected material shall be immediately removed from the site and replaced with acceptable material at no additional cost to the Owner.

1. In the event of a discrepancy between plant schedule and planting plans, rely on the planting plan and notify Landscape Architect immediately for confirmation.

1.5 JOB CONDITIONS

A. Proceed with planting work as rapidly as portions of the site become available, working within seasonal limitations for each kind of planting required.

B. Utilities: Determine locations of underground utilities and perform work in a manner which will avoid possible damage. Hand excavate, as required. Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.

1. Protection of Existing Utilities: Locate existing underground utilities in area of work. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations.
2. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult with Landscape Architect immediately for directions. Cooperate with Landscape Architect and utility companies in keeping respective services and facilities in operation.
3. Repair damaged utilities to satisfaction of utility owner and the Owner at no extra cost to the Owner.

4. It is the Contractor's responsibility to contact any and all affected utilities, jurisdictions and agencies to secure any required approvals, inspections, etc. Costs of all required permits (if any) shall be borne by the Contractor.

5. It is the Contractor's responsibility to contact the Department of Public Works and arrange for any required traffic controls and safety devices.

C. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions or obstructions, notify Landscape Architect before planting.

1.6 EXTRA STOCK

A. Provide adequate extra stock of materials required to perform remedial work, reseeding, and replanting as specified in 1.3 Warranty.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil:

1. Fertile, friable, natural loam reasonably free of subsoil clay lumps, slag, and any stone larger than 2" in any dimension; free of roots, stumps, sticks, weeds and other litter; and fall within soil pH level of 5.0-7.0.
2. Obtain topsoil from a local source, from naturally well-drained sites where topsoil occurs in a depth of not less than four inches.

B. Balled and Burlapped Trees:

1. All balled and burlapped trees and shrubs are to be tagged by the Landscape Architect prior to digging at the nurseries. These plants must be of specimen quality and have as natural a shape as possible, characteristic of the species in the native condition. Trees shall not be pruned as a street tree standard. All plants shall be grown on their own roots. No grafted plants are acceptable unless otherwise specified.
2. Balled and burlapped trees and shrubs shall be freshly dug. No healed-in plants or plants from cold storage will be accepted. They shall be sound, healthy and vigorous, well branched and densely foliated when in leaf. They shall be free of disease, insect pests, eggs or larvae, and shall have healthy, well developed root systems grown in recognized nurseries in accordance with good horticultural practice. All plants shall conform to the recommen-

dations and requirements of ANSI Z60.1, "American Standard for Nursery Stock," published by the American Association of Nurserymen, Inc.

C. Miscellaneous Landscape Materials:

1. Protective road-boarding: wood planking, as specified in 3.1.C.

D. Water:

1. Hoses and other watering equipment required to transport water from a source on the site to the planting work shall be included as part of the work of this Section.

PART 3 - EXECUTION

3.1 INSPECTION

- A. All operations shall be performed only when proper soil and weather conditions are present to permit satisfactory completion of work without destroying soil tilth and structure.
- B. Examine the areas and conditions under which planting work is to be performed and notify the Landscape Architect in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected in an acceptable manner.
- C. Provide protective road-boarding within planting areas and off paved surfaces to protect all adjacent areas and improvements from damage due to vehicular activity, etc. Correct all damages prior to establishment of maintenance period as directed by Landscape Architect.

3.2 TIME OF PLANTING

- A. Start the work of planting when other divisions of the work have progressed sufficiently to permit the work of planting. Thereafter, conduct planting operations under favorable weather conditions during the next season or seasons which are normal for such work as determined by accepted practice in the locality of the project. Do not plant when the ground is frozen. Contractor shall notify and obtain approval of the Landscape Architect prior to commencing planting operations. In general, plant during the following season unless otherwise approved:

Balled and Burlapped Trees

Fall or spring:

April 1 through June 1 and September 15 through November 1

7. The Living Landscape

3.3 DIGGING AND HAULING

- A. All stock shall be delivered promptly when dug and the roots shall be carefully protected in transit against drying out.
- B. All precautions customary in good trade practice shall be taken in preparing plants for transplanting, and workmanship that fails to meet the highest standards will be rejected. Balled and burlapped plants shall have firm natural balls of earth and shall conform to horticultural standard specifications of the American Association of Nurserymen. No plant required to be balled and burlapped shall be planted if the ball is cracked or broken either before or during the process of planting. Loose, broken or manufactured balls will be rejected.

3.4 LAYOUT

- A. The Contractor shall stake out all plant locations on the site for review and adjustments, as required, by the Landscape Architect. Receive acceptance by the Landscape Architect prior to commencement of planting.

3.5 PLANTING SCHEDULE

- A. The Contractor shall give advance notification to the Landscape Architect of installation dates and schedule. The Landscape Architect shall review with the Contractor the placing and orientation of plants upon installation.

3.6 PLANTING AREA PREPARATION

- A. Verify that soil materials and compaction meets requirements for planting, and that grades conform substantially to those shown on the Drawings.
- B. Tree pits shall not be dug until their locations have been approved by the Landscape Architect. The landscape contractor shall provide advance notification of installation dates and schedule to the Landscape Architect.
- C. After confirming location of tree planting, mark out a planting area that is five times the diameter of the planting ball, or a minimum area of 6' in diameter. Use a rototiller or shovels to loosen and mix the soil in this entire area to a depth of 12 inches. Organic matter can be added to loosened the soil as long as the new material is mixed uniformly throughout the area.
- D. Where soils are clayey, glazing of planting hole sides should be avoided. After tree holes are dug scarify sides of the hole where the edges are glazed.

- E. Free existing topsoil of stones larger than 1-1/2 inches in size and remove trash, debris, twigs, root mat, and other matter. If surface of soil is compacted, scarify to facilitate incorporation of additional planting topsoil.

3.7 BALLED AND BURLAPPED TREE PLANTING

- A. In the center of the prepared planting area, dig a shallow hole to set the tree, root ball and all. The hole should allow the root ball to sit on solid ground rather than on loose soil. Once the ball is set in the hole, its upper surface should be level with the existing soil.
- B. Moisten prepared planting areas before planting if soil is dry. Water thoroughly and allow surface moisture to dry before planting. Do not create a muddy soil condition.
- C. Install balled and burlapped trees plumb and in center of pit, as shown on Drawings, with top of ball at the same elevation as the surrounding finished grades.
- D. Do not pull burlap out from under root balls unless directed by the Landscape Architect. When set and partially backfilled and compacted, cut bindings from around stems and trunk. Remove the burlap from the sides and tops of the balls and cut or adjust burlap to prevent the formation of air pockets.
- E. Place backfill mixture carefully to avoid damaging roots and to fill all voids. Tamp backfill firm in 8-inch layers to prevent settlement. Water each plant and entire area of plant beds thoroughly. If backfill settles after watering, add more backfill to bring to required grade. Under no condition shall the crown of the plant be below finish grades.

3.8 MULCHING

- A. Mulch for woody plant materials shall be double-shredded hardwood fiber mulch, free from deleterious materials and suitable for long-lasting top dressing. Submit mulch sample for Landscape Architect approval. Mulch shall be distributed around each plant to a depth of four inches, with no excessive accumulation around the trunk.

3.9 PRUNING

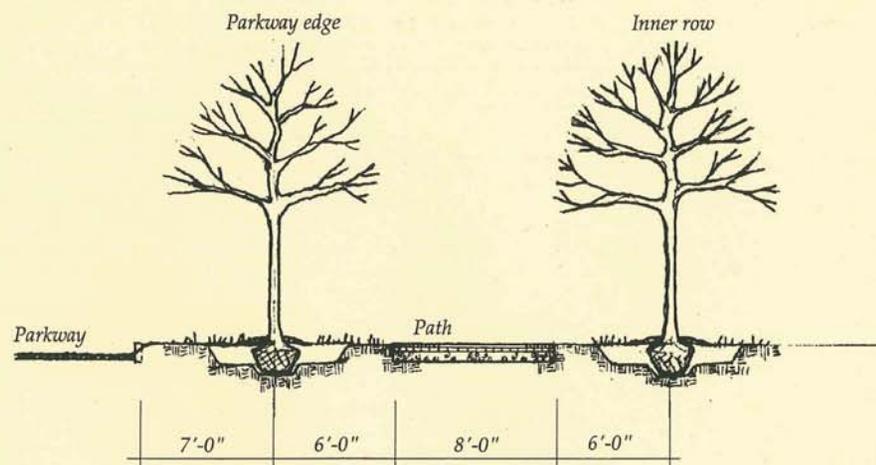
- A. Remove crossing, dead, or injured branches with a clean cut.
- B. Prune trees in the presence of Landscape Architect and in accordance with standard horticultural practices to preserve the natural character of the plants.

3.10 WATERING

- A. All woody plant material shall be thoroughly watered to a saturated depth of 6" minimum the same day as they are planted. Watering shall continue as needed to keep plants healthy and unwillted.

3.11 PROTECTION AND CLEAN-UP

- A. Protect landscape work and materials from damage due to landscape operations and operations by other contractors and trades. Treat, repair or replace damaged landscape work as directed.
- B. Immediately after planting, protect landscape areas from all traffic until established. The Contractor shall be responsible for correction of all damage done by unauthorized traffic at no additional cost.
- C. Remove and/or replace mulch that has been displaced. Keep all paved surfaces and storm sewers free of mulch material.
- D. Maintain "broom-clean" operations and premises at all times.
- E. Perform maintenance work as specified under 1.3, Warranty.



Scarlet oak
Quercus coccinea



Willow oak
Quercus phellos



Pin oak
Quercus palustris

Trees for parkway edge (above) and trees for inner row (below)

Photos by Stephen V. Chelminski, *The Tree Identification Book*, George W.D. Symonds, (William Morrow & Co., Inc., NY: 1958).

Typical planting section through Southwestern Parkway



Sugar maple
Acer saccharum

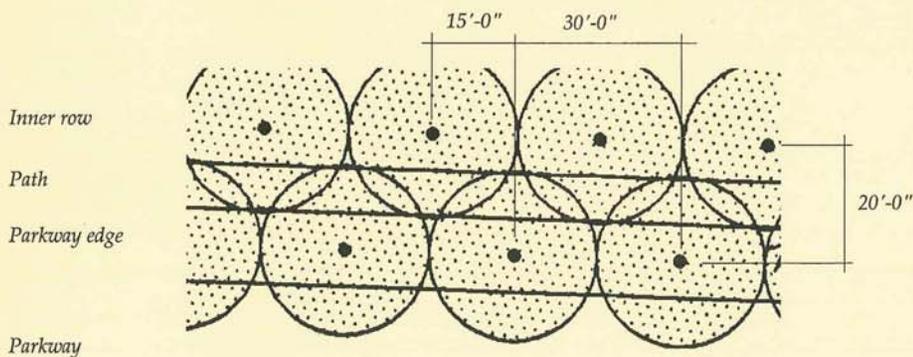


White ash
Fraxinus americana



Basswood
Tilia americana

Trees for Southwestern Parkway at River Glen



Typical planting plan at Southwestern Parkway