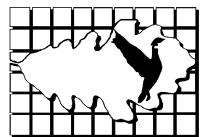

HILLOWAY PARK
RESTORATION PLAN
MINNETONKA, MINNESOTA



**A P P L I E D
E C O L O G I C A L
S E R V I C E S**



I N C.

**Hiloway Park
Restoration Plan
Minnetonka, Minnesota**

Prepared by:

Kim Alan Chapman, Ph.D.
Steven I. Apfelbaum, M.S.

Applied Ecological Services, Inc.
4018 West 65th Street, Suite 16
Edina, Minnesota 55435

Submitted to:

Mark Simenson
Public Works Department
City of Minnetonka
11522 Minnetonka Boulevard
Minnetonka, Minnesota 55305

&

Perry Vetter
Recreation Services
14600 Minnetonka Boulevard
Minnetonka, Minnesota 55345

June 2003

INTRODUCTION

The City of Minnetonka, working with Applied Ecological Services, Inc., has developed technical reports, restoration and management planning documents, and detailed construction specifications for carrying out restoration and management of City open space, especially parks. Testing and demonstrations of these approaches over a period of four years identified the most effective restoration and management techniques and established baselines for an ecological monitoring program. These templates, designed to simplify and make cost-effective the restoration and management work undertaken by the City, have been applied to open space and parks in priority order based on the judgment of staff and the results of this program's investigations. Refinements to the standard specifications were anticipated and considered likely as new data, new technologies, financial constraints, and opportunities changed. Some conditions, such as the pine forests at Hilloway Park, were anticipated but not encountered in the park study sites examined.

This restoration plan was developed using and referring to existing templates and protocols, which can readily be applied to all situations found at Hilloway Park, with the exception of the pine plantations. It is not appropriate to restore a boreal or northern hardwoods forest at Hilloway Park given the soil and climatic conditions, which are problematic for species with a typical distribution in the coniferous-deciduous biome north of the Twin Cities metropolitan area. Instead, this brief report recommends a simple and cost-effective approach to restoring additional ecological functions and diversity to the pine plantation in the context of the City of Minnetonka park restoration and management planning and implementation process.

The chief goals of this interim restoration plan are to:

- 1) Provide guidance to Minnetonka public works and park staff on how to proceed in the management of Hilloway Park consistent with existing plans and procedures;
- 2) Recommend refinements to the existing stewardship program necessary for management of the pine plantation at Hilloway Park;
- 3) Identify any broader needs for restoration and management at Hilloway Park.

HISTORICAL CONDITIONS AT HILLOWAY PARK

The original vegetation of the park—oak savanna (also called “oak openings”)—grew on its circumneutral loam and silt loam soils. Frequent wildfires sweeping over the hilly landscape prevented the vegetation from succeeding to a closed forest. White oak (*Quercus alba*), northern pin oak (*Q. ellipsoidalis*), and bur oak (*Q. macrocarpa*) formed an open canopy and a brushy understory as re-sprouting stems, along with American hazelnut (*Corylus americana*), big-tooth aspen (*Populus grandidentata*), trembling aspen (*P. tremuloides*), sumac (*Rhus spp.*), blackberry (*Rubus spp.*), dogwood (*Cornus spp.*) and many other plant species typically found in oak savanna on both moist and drier sites. Open dry prairie areas with scattered bur oak would likely have developed on small areas of sandy loam or soils with sandy/gravelly subsoils in and around the park. Prior to the 1850’s, wetlands and open water sheltered some upland areas from the frequent fires, allowing the development of woodlands dominated by oaks and aspens (mostly bigtooth) with an understory of shrubs typical of oak savanna, but also including prickly ash (*Zanthoxylum americanum*), red-berried elder (*Sambucus pubens*), and nannyberry (*Viburnum lentago*), among others.

Land clearing, farming, and grazing reduced the abundance of native species and eliminated the most sensitive native species from the park. At the same time, the development of the surrounding lands reduced the likelihood that native species would recolonize disturbed areas once farming was halted. Instead, the non-native invasive common and glossy buckthorns (chiefly *Rhamnus cathartica*, but also *R. frangula*) and other species adapted to farming and development (e.g., Tartarian honeysuckle, *Lonicera tatarica*; garlic mustard, *Alliaria petiolaris*; black locust, *Robinia pseudoacacia*) arrived in the region to colonize the abandoned pastures and cropland once farming stopped. Also, in order to stabilize small areas of eroding, sandier soils in the park, pines were planted 40-50 years ago. Of these pines, only white pine (*Pinus strobus*) is native in the northern Twin Cities metropolitan area on similar soils and is capable of reproducing itself. Jack pine (*P. banksiana*) is a short-lived species that will experience deterioration of its vascular system, death of limbs, and death of portions of the crown in the next few decades, while white pine and red pine (*P. resinosa*) are longer-lived.

CURRENT CONDITIONS AT HILLOWAY PARK

As did the frequent fires prior to 1850, farming and grazing in the park maintained sparsely wooded conditions until about 1960 when these practices were halted. With few disturbances since then, the park has undergone succession to more wooded conditions. In addition to the planted pines, several tree species have formed complete or partial canopies over much of the eastern portion of the park. These trees include green ash (*Fraxinus pensylvanica*), boxelder (*Acer negundo*), black cherry (*Prunus serotina*), hackberry (*Celtis occidentalis*), and American elm (*Ulmus americana*). In the western portion of the park, shrubs now dominate large areas. These native shrubs include gray dogwood (*Cornus racemosa*), smooth sumac (*Rhus glabra*), nannyberry, and prickly ash. Non-native invasive shrubs (common buckthorn, Tartarian honeysuckle) are developing beneath the densest areas of trees and shrubs.

Native groundlayer species were probably sparse in the park when farming stopped. Originating at scattered locations in and around the park, native groundlayer species have colonized and spread in the abandoned pastures, fields, and pine plantation.

In wooded areas groundlayer succession has involved the limited colonization and spread of jack-in-the-pulpit (*Arisaema triphyllum*), starry false-solomon's seal (*Smilacina stellata*), bedstraw (*Galium spp.*), meadow-rue (*Thalictrum sp.*), cat-brier (*Smilax sp.*), agrimony (*Agrimonia gryposepala*), arrow-leaved aster (*Aster sagittifolius*), downy yellow violet (*Viola pubescens*), buttercup (*Ranunculus abortivus*), wood fern (*Dryopteris carthusiana*), sensitive fern (*Onoclea sensibilis*), Pennsylvania sedge (*Carex pensylvanica*), Sprengel's sedge (*C. sprengellii*), sweet cicely (*Osmorhiza sp.*), riverbank grape (*Vitis riparia*), and Virginia creeper (*Parthenocissus sp.*), among others. These areas are sufficiently wooded and large enough to support Eastern Wood-pewees and Great-crested Flycatchers.

The process of native groundlayer succession in the pine plantation has been slowed by the 1.5-2 cm deep needle layer and by dense shading from common buckthorn. Buckthorn poses a problem throughout the park because it prevents natural succession from taking place in the groundlayer. The lack of oak seed trees throughout the park also contributes to the failure of

oaks to re-establish themselves, which they would naturally do in the succession process. Historically in this region, the groundlayer plants would have colonized and spread beneath an oak canopy, not a pine canopy. Without a dense groundcover of native species to compete against them, buckthorn, Tartarian honeysuckle, garlic mustard, and other species are able to establish seedlings and grow abundantly. Numerous trails are also helping to move seeds of non-native invasive species, particularly garlic mustard, around the park.

In more open areas the groundlayer colonizers have included goldenrods (*Solidago canadensis*, *S. rigida*), asters (*A. sagittifolius*), bergamot (*Monarda fistulosa*), blue-eyed grass (*Sisyrinchium sp.*), sedge (*Carex spp.*), and the non-native Kentucky bluegrass (*Poa pratensis*), which covers much of small remaining openings together with the non-native invasive plant, reed canary grass (*Phalaris arundinacea*). Much of this area is dominated by a shrubby growth of green ash, boxelder, gray dogwood, smooth sumac, nannyberry, with some common buckthorn where shade becomes denser. The presence of Indigo Buntings and Gray Catbirds here are indicators of semi-open savanna conditions. Savanna is an area of scattered to dense patches of woody plants. At Hilloway the existing savannas are composed largely of shrubs and young trees.

Only two small grassy openings are sizeable enough to be distinct in the brushy savanna portion of the park. They are very small and cannot support expected grassland birds typical of this setting, such as Savanna Sparrow and Clay-colored Sparrow. These small openings are best considered and managed as part of the larger savanna.

Except for the pine plantation, the situations found at Hilloway Park have been described in greater detail in the City's Natural Resources Stewardship Program documents.

RESTORATION & MANAGEMENT AT HILLOWAY PARK

The overarching concept in restoration and management is to establish ecological conditions that will allow the plant communities to change over time in a way that is consistent with natural tendencies of succession. In addition, restoration and management are best planned taking account of the local climate, soils, vegetation, disturbance regime, and surrounding landscape. Working with the patterns and tendencies of nature reduces management costs and increases the chances for creating diverse, long-lasting plant communities.

To provide an overall conceptual framework and justification for Hilloway Park, three units are recommended: forest, savanna, and emergent wetland. (See Hilloway Park Current Conditions and Management Units map.) These units are justified on several grounds:

- 1) **Forest** – The process of forest succession is progressing but has been slowed by three factors: the dense pine needle layer; the abundance of common buckthorn; and a lack of oak seed trees. The goal of management will be to increase the diversity of the forest canopy and the diversity and coverage by groundlayer vegetation. The strategy used will be to accelerate the rate of succession. The end result will be an oak-pine forest in the current pine plantation with a diverse groundlayer and shrub layer, relatively free of non-native invasive species such as common buckthorn and garlic mustard. Deciduous forest will develop outside the pine plantation.

The dense planting of pines is causing the death and injury of many. The tops of many trees are constrained by their neighbor's crowns. When the pine crown is hemmed in or damaged from competition, the roots are not supplied with food from the photosynthesizing needles. In this weakened state, pines can become more susceptible to disease, such as blister rust. Thinning the pine canopy and planting white, bur, and northern pin oak in light gaps, will increase diversity of the canopy and reduce competition. Oak-white pine forest is a common plant community type in the Upper Midwest and appropriate for the future forest at Hilloway Park.

- 2) **Savanna** – Where woody plants have developed a nearly continuous canopy, it is reasonable and cost-effective to work with the successional process, but manage the

process in order to retain existing native species and invite colonization by additional native species. Succession is not as advanced in this management unit as in the forest unit. In addition, groundlayer succession is being slowed by buckthorn colonization under the developing woody canopy. The goal of management is to direct succession towards a diverse, relatively open habitat able to support Indigo Buntings, Gray Catbirds, and other wildlife commonly found in savannas. The strategy is to use fire as a tool to regulate the growth of woody vegetation while maintaining relatively open understory vegetation so that native plants can colonize the groundlayer. Light surface fires can remove litter and kill small-stemmed woody plants (especially buckthorn) and maintain open understory conditions. The eventual result will be an oak savanna with a wide variety of native shrub species and a groundlayer of native wildflowers and sedges.

It is not recommended that the jack pine stands be managed towards pine forest as jack pine forms an open canopy easily invaded by other species, and is short-lived.

It is expected that this unit will be safely and cheaply managed with prescribed fire. More than half the boundary is paved trail or road, providing a secure fire break. Additional details for savanna management is provided in the City's Natural Resources Stewardship Program documents.

- 3) **Emergent Wetland** – The approach for restoring and managing emergent wetland habitat at Hilloway Park is detailed in the City's Natural Resources Stewardship Program documents.

Further discussion of restoration and management philosophy and the adaptive management approach applied in Minnetonka City open space and parks is available in the City's stewardship program documents.

RESTORATION & MANAGEMENT TASKS AT HILLOWAY PARK

The tasks outlined below are recommended to meet the following goals: 1) increase the diversity of the forest canopy and the diversity and coverage by native groundlayer vegetation; 2) direct succession in the savanna area towards a diverse, relatively open habitat largely free of non-native invasive plants; and 3) manage the emergent wetland appropriately.

Recommended restoration tasks are outlined for each management unit. Acreage is estimated. Phasing is assumed to begin in Year 1 and continue sequentially by year. Some years are skipped when no work is scheduled for that year.

Forest (ca. 15.0 acres)

1. Conduct non-native invasive shrub and herbaceous species removal according to the standard specifications already prepared for the City. Invasive non-native shrub removal procedures are documented in the City management and stewardship planning documents. Controlling the spread of garlic mustard can be aided by reducing the number of trails in the park. This plant is carried from colonies to new infection locations by walkers along trails. The seedbank remains viable for 4-5 years. Since it is a biennial, all the flowers in a single year are from the same colonization event. If flowering is occurring in every year, then there were two or more colonization events. Controlling flowering for 4-5 years is key to garlic mustard control. A biological control is being developed and may be available in Minnesota in 2005-2006. Until then it is urgent that the spread be checked by closing infected trails and eliminating the plant along trails left open for visitor use.

2. Rather than attempt to plant a native shrub understory and herbaceous ground cover vegetation, we propose a minimalist strategy for increasing native woody plants, groundlayer diversity and cover, and canopy diversity. By accelerating succession and increasing competition from native species, management will also reduce the likelihood of re-invasion by non-native species. This can be accomplished in the following ways:

- a. White pine is already seeding into the most open areas at the fringes of the white pine stand and beneath the red pines. These seedlings can be protecting for several years using

inexpensive paper bud caps while the leader grows above the deer browsing height. Bud capping can easily be accomplished each fall by volunteers.

b. To accelerate canopy succession, thin the pine canopy to favor the best individuals in dense pine areas. Plant white, bur, and northern pin oak saplings in light gaps and at the edges of the pine forest.

c. To increase native groundcover and native woody understory plants in areas where native species are sparse or few to none, rake away the pine needle litter in patches down to the mineral soil. The patches can be placed and oriented for aesthetic impact and visual buffering. Plant seeds of white pine (*Pinus strobus*), red-berried elder (*Sambucus pubens*), and native wildflowers and sedges in the patches. Seed can be collected on site, or raking can be timed to coincide with a good white pine seed year. Where a coppice growth of dense woody stems develops, it may be necessary to thin to encourage maximum growth of white pine seedlings, planted oaks, and other desirable future canopy trees. The process of seed germination, seedling growth, and shrub and sapling establishment will require 3-5 years. White pine may also be planted as bare root stock at reasonable cost.

While white pine is moderately shade tolerant at early stages of growth, it becomes less shade tolerant with age. Release of saplings by overhead thinning of the pine canopy may be necessary at 7-15 years. Care should be taken to not open the canopy in the vicinity of pine saplings beyond 80% as this invites colonization by buckthorn. Monitoring the success of seedling establishment and the exclusion of non-native invasive shrubs should be undertaken to validate and demonstrate the effectiveness of this approach.

We would strongly encourage not removing native shrubs, including prickly ash, as these are helping to exclude non-native invasive shrub species from portions of the pine plantation and its edges. If the prickly ash is preventing other native species from growing, it may be appropriate to remove it.

3. We would discourage planting purchased seeds or live plants, and would especially discourage the use of boreal and northern hardwood forest groundlayer species. There are sound ecological reasons for this published in several papers and conference proceedings using Applied Ecological Services, Inc. studies in the Boundary Waters Canoe Area Wilderness (BWCAW) of

northern Minnesota and elsewhere. The needle layer of northern pine forests is broken down by fungi during the winter or removed periodically (20-40 years typically) by surface fires. The podzolic soils and cool temperatures favor the development of fungi. Even with this rate of needle removal, the native herbaceous vegetation in northern settings typically begins to be suppressed when the pines reach an age of approximately 25-30 years. When the trees reach 50-70 years, herbaceous plant cover is virtually restricted to locations where trees have fallen, along lakeshores, and in moose or deer trails. In pine plantations, the needle rain is even heavier than natural forests and the needle removal rate even slower. At Hilloway and elsewhere in the metro region, the soils are not podzolic and the fungal flora did not historically decompose needles, but rather deciduous leaves. In addition, the bacterial decomposition taking place in the summer at Hilloway and elsewhere in the region is likewise better suited to deciduous leaves rather than needles. Thus needle accumulation is heavy in pine plantations of the metro region.

The main cause of groundlayer cover loss is the rapid drying of the humus layer which causes shallow-rooted herbs and sedges to suffer reduced biomass and even death. At the southern range edge of these groundlayer plants, July-August moisture stress is likely to pose a problem to long-term survival in a pine stand. We recommend instead that conditions be established that exclude non-native invasive shrubs and promote the natural colonization of the pine plantations by locally-adapted plants. If after 4-5 years such colonization is not taking place, it may be reasonable to plant typical oak/hardwood woodland species at the margins of the plantations, from where they will colonize the interior of the stands as opportunities arise (e.g., light gaps).

Phasing

- Year 1. Remove and treat all non-native woody vegetation (e.g. buckthorn, honeysuckle) using existing stewardship specifications. Begin protecting white pine seedlings with bud caps. Where feasible, control invasive non-native herbs.
- Year 2. Treat non-native woody vegetation regrowth. In areas that lack non-native invasive species, rake and seed white pine, red-berried elder, and other species using locally gathered seed. If local pines are intended to be the seed source, time the raking to coincide with August-October seed release from cones in a good seed year (which occurs every 3-5 years).

- Year 3. Continue to seed new areas that lack non-native invasive species. Monitor success of seeding and survival of white pine seedlings. Rake and seed again if required.
- Year 4. Monitor success of seeding and survival of white pine seedlings. Selectively prune around white pine seedlings and other preferred future canopy trees as needed. Apply bud caps as needed.
- Year 5-9. Selective pruning, bud capping, and release from overstory competition by thinning. Also thin dense clumps of pines. Plant bare-root white, bur, northern pin oak in light gaps created by thinning and at the edges of the pine forest.

Savanna (ca. 10.3 acres)

Specifications for restoring this type of system are detailed in the City's stewardship program documents. Treatment at Hilloway Park could include the following:

1. Reduce non-native invasive species and subsequent invasions.
2. Conduct prescribed burning.
3. Monitor the seed bank response prior to any seed or plant introduction.
4. If (and where) after 3-4 years the seed bank has not provided a significant response, introduce native savanna plants by seeding.
5. Use the seeding lists and strategies in the standard specifications; these are appropriate for this site and desired future conditions.
6. Use the standard cover cropping specifications; these are appropriate for interim soil stabilization in high risk erosion locations.

Phasing

- Years 2-3. Remove and treat non-native plant species using standard specifications. Conduct brief inventory of groundlayer species in selected areas.

- Years 3-4. Conduct prescribed burning using standard specifications.
- Years 5-6. Conduct brief inventory of groundlayer species in selected areas and evaluate need for seeding and plug installation. Planting specifications for this type of setting is detailed in the City's stewardship program documents.

Emergent Wetland (ca. 2.9 acres)

Follow existing specifications for control of invasive non-native species in emergent wetland systems.

Phasing

- To be developed as necessary.

Hiloway Park

Current Conditions & Management Units

