



*Pilot Knob Hill Phase II
Natural Resource Management Plan
November, 2007*

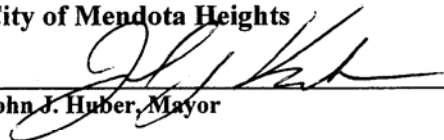


REVIEW AND APPROVAL

We, the undersigned, have reviewed and understand this Natural Resource Management Plan for Pilot Knob Hill and agree to follow its recommendations and guidelines for the land being protected through funding from the Trust for Public Land, DNR Remediation Grant, DNR Metro Greenways Grant, DNR Natural and Scenic Grant, and Dakota County Farmland and Natural Areas Program.

We further recognize that there may be a need to revise this plan at some future date to adapt to new site conditions as a result of new information, storms, disease, climate change, etc. Prior to any material changes to revise and/or implement the plan that would affect more than two acres of the site, or an expenditure of at least \$10,000, the undersigned parties and their appropriate representatives will be contacted and must jointly agree to any material changes prior to implementation.

City of Mendota Heights



John J. Huber, Mayor

11/26/2007
Date

Dakota County

Alan Singer, Farmland and Natural Area Program Manager

Date

Minnesota Department of Natural Resources

Date

Pilot Knob Hill Phase II Natural Resource Management Plan

Compiled by:

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Tony Randazzo
Daniel Tix**

**Great River Greening
November 2007**



Pilot Knob Hill Natural Resource Management Plan

Great River Greening, a nonprofit organization, helps communities coordinate cost-effective and sustained efforts to manage ecosystems of the Mississippi, Minnesota and St. Croix River valleys in the Twin Cities metropolitan area. We are primarily an implementing organization, providing on-the-ground ecological restoration and management of both public and private land. We engage thousands of volunteers in the planting of native vegetation, removal of exotic weeds, native seed collection and stewardship—work which results in an informed and involved citizenry. GRG also acts as a catalyst, creating effective partnerships among agencies, municipalities, and private landowners responsible for managing river valleys and their natural resources. Restoration ecologists and other scientists provide technical expertise. For more information, see our website at www.greatrivergreening.org.

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Executive Summary

The potential acquisition and restoration of a 15 acre addition to the 8 acres of existing public natural area on Pilot Knob Hill represents a historic opportunity to protect a significant piece of Minnesota's history and restore some of the native prairie and savanna that has all but disappeared from the landscape. Known as Oheyawahi ("a hill much visited"), this prominent hill is a burial ground and sacred space to the Dakota people. It was a landmark for river navigation recognized by early European-American settlers. In 1851, a major treaty signed between the Dakota and whites ceded to the U.S. 35 million acres of land in Minnesota (Woolworth and White 2004). Today, the site is adjacent to Fort Snelling State Park, within a major bird migration route; it is both surrounded by dense urban development, while also an integral part of the wildlife rich Minnesota River corridor.

The main purpose of this report is to identify the most appropriate targets for restoring and managing the Pilot Knob Hill Phase II site and then determine an effective strategy for achieving those targets. These targets and recommendations, and much of the background information, is based on information gathered for the Phase I management plan (Great River Greening, 2005). In addition, we identify several additional options to enhance the project, such as including volunteers and increasing the diversity of wildflowers. The overall goal is to make this site an inviting place where people can enjoy its views, experience the natural setting, and learn about and honor its storied past. The site could also become a gateway to Mendota Heights for thousands of daily motorists.

Restoration Targets:

Pilot Knob Hill should be restored to native prairie and savanna, habitats that were present in the mid-1800s before the land was settled by Europeans, and of utmost ecological value (MN DNR.2006) and cultural value today. When restored, the site will give visitors a sense of the diverse and beautiful prairie landscape that is rare today.

Restoration Process:

The restoration of native habitats in the 15 acre Pilot Knob Hill Phase II project area will be a long term process. Little native vegetation is left due to fairly typical disturbance of agriculture use and homesite development. These disturbances have allowed a number of threatening invasive species to get a foothold, though they are still at manageable levels.

Unlike Phase I, this site can be restored in distinct steps and distinct areas. Fortunately, the area with the greatest ecological connectivity to Phase I will also be the easiest area to restore. With the suite of invasive species on the site, however, the restoration needs to proceed systematically and with care.

Volunteer Opportunities:

Nearly every part of this restoration project can involve volunteers, either through large, well-publicized events or as small, self-sufficient groups requiring minimal supervision. The large events allow local people to come together for meaningful work, become personally involved, and learn more about the restoration and the site. Potential volunteer activities run the gamut from invasive species removal to planting and seeding.

Pilot Knob Hill Natural Resource Management Plan

Trails and Overlook:

A simple, low-maintenance trail system with overlooks that connects to the Phase I trails will give visitors the opportunity to contemplate the site's expansive views of natural and human-built landscapes.

Costs:

Estimated cash requirements for native prairie and savanna restoration are:

- Whole Site Treatments (exotics etc.) \$ 32,000
- Area 1 Prairie \$ 35,000
- Area 2 Prairie and Savanna \$ 54,000
- Areas 3 Savanna and Prairie \$ 30,400
(10yrs of 30yr plan)
- Wildlife Hibernaculum/Nest Boxes \$ 6,300
- Trail/Overlook/Parking constr \$ 38,800
- Interpretive displays \$ 30,000

Acquisition Requirements:

This management plan is designed to fulfill the requirements of the acquisition partner organizations and grant programs. Use of the site will be determined in the final grant agreements, but sound management and appropriate public access are principles that are fully anticipated. The acquisition partners include Trust for Public Land, Dakota County Farmland and Natural Areas Program, DNR Metro Greenways, DNR Remediation Fund, and the DNR Natural and Scenic Area Grants Program.

Funding:

The Pilot Knob Hill Phase II natural resource restoration project has many components that are compelling for funders:

- it is highly visible,
- it has a nationally significant role in the history of the Dakota people and European settlement of the region,
- it connects to existing natural areas and is in a key township in the state's Comprehensive Wildlife Conservation Strategy,
- prairie and savanna communities are high priority habitats for restoration due to their rarity,
- the work provides meaningful opportunities for volunteers.

While there are no guarantees for fundraising, the City of Mendota Heights can anticipate that substantial funding for the restoration project can be generated through grants. If selected to coordinate the restoration work, Great River Greening can work with the City to secure grant funds for the project.

A Vision:

An artistic vision of a restored Pilot Knob Hill gives a sense of how this natural area could look. The waving prairie grasses, flushes of colorful wildflowers throughout the season, and scattered, twisting-limbed bur oaks in a restored Pilot Knob Hill would be a striking sight to thousands of drivers crossing the bridge into Mendota Heights. It would be a great setting for bringing together community members to commemorate such a significant place.

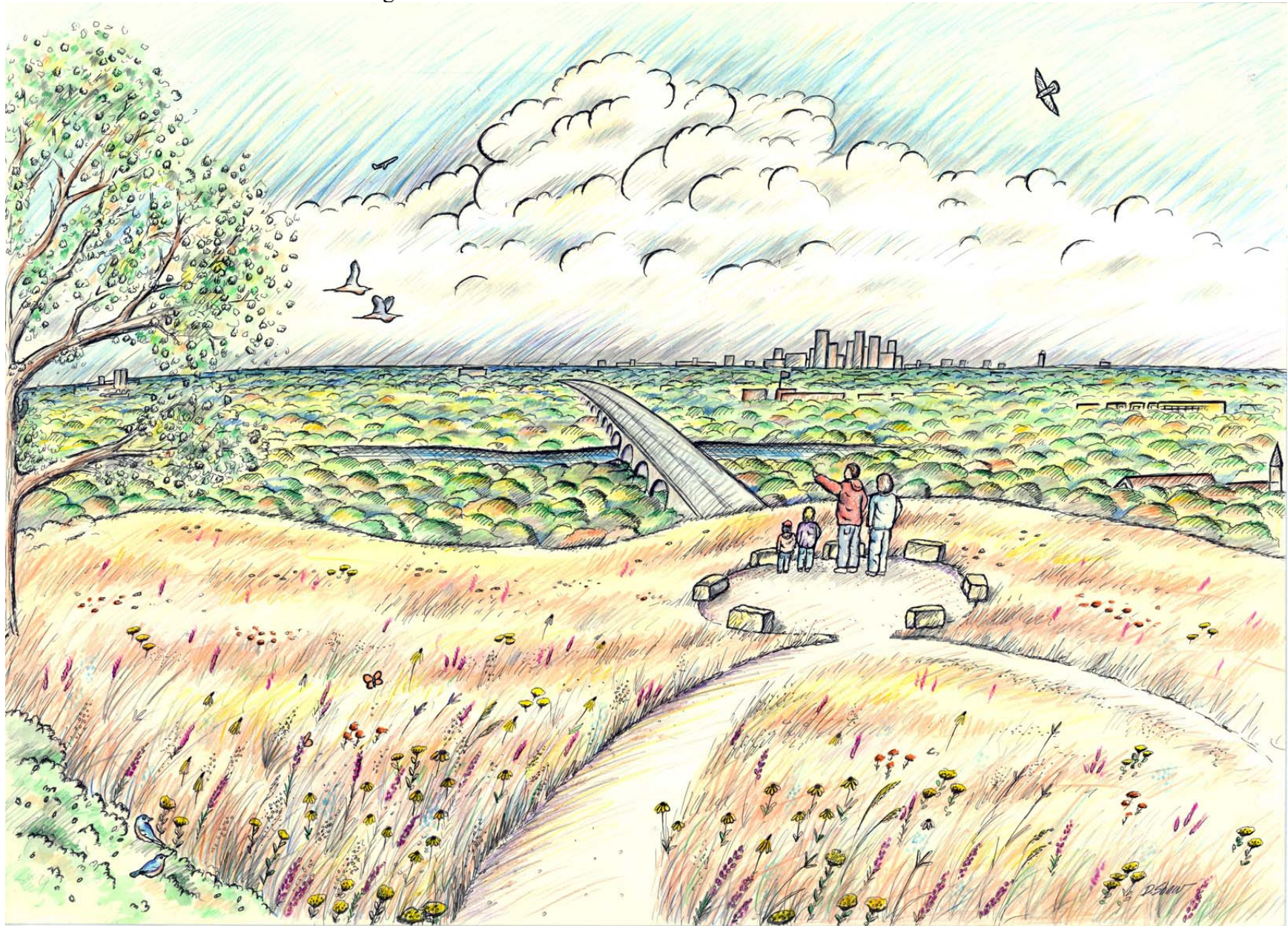


illustration by Dan Shaw

Acknowledgements

This plan was written under the guidance of Guy Kullander, James Danielson, and Sue McDermott and of the City of Mendota Heights; Alan Singer of the Dakota County Farmland and Natural Areas Program; and Robert McGillivray of The Trust for Public Land. Ryan Ruzek assisted with shape files; Mary Hagerman at Dakota County GIS Services supplied high resolution aerial photos and assistance with re-projecting. Cathy Undem at Dakota Co. Farmland and Natural Areas Program supplied historic aerial photos.

Many volunteers from several organizations have contributed on drafts of this report include Gail Lewellan, Sister Jan Dalsin, and Jeanne Hollingsworth of the Pilot Knob Preservation Association; Larry Grainger of PKPA and the JRB Minnesota River History Center; Jim Anderson, Cultural Liaison of the Mendota Mdwakenton Dakota Community; Rudy, long-time resident at the north homesite; and Dale Bachmeier, Acacia Park Cemetery for allowing access during the acquisition period.

Peter Wielke, USDA-NRCS, and Liz Harper, Non-game Specialist at MN DNR, provided expert review and data on select portions of the plan. Chet Meyers, Chairperson of the Red-Headed Woodpecker Recovery, Audubon - Minneapolis provided valuable resources on the habitat needs of red-headed woodpeckers.

Cordelia Pierson of The Trust for Public Land compiled the Phase I version of the funding sources listed in Appendix C. Susan Overson of the Mississippi National River and Recreation Area assisted with estimates of the costs of creating and installing interpretive signs.

This plan was presented to the Mendota Heights Parks and Recreation Commission on November 13, 2007, and the City Council on November 20, 2007.

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Pilot Knob Hill Project Area Location

Pilot Knob Hill Phase I and II project areas are in the southern corners of section 27 and 28, range 23, township 28 in Mendota Heights, Dakota Co. Pilot Knob Hill is located in the 2000 block of Pilot Knob Road at its northern terminus.

The Pilot Knob Hill Phase II project area consists of over 16 acres of potential habitat, consisting of three parcels currently owned by the City, and the bulk of the acreage from a Trust for Public Land acquisition from Acacia Park Cemetery. Phase I and Phase II straddle both sides of the Pilot Knob Road, which reaches a dead-end at the site, and will no longer be necessary. This adds a small amount of acreage to the project location; its removal is important for connectivity.

This land is adjacent to the eight acres in Phase I combining for a total of approximately 24 acres. The project site is bordered

by highways to the east and paved road on the south, Acacia Park cemetery to the west. The two sites together then are bordered on the north by Highways 55 and 110 just east of the Mendota Bridge, and to the west by the Big Rivers Regional Bike Trail (maintained by Dakota County) and Sibley Memorial Highway (Figure 1). Fort Snelling State Park sits within the Minnesota River Valley just west of the project area. The Minnesota Valley National Wildlife Refuge adjoins the state park just upstream from the project area. The south edge of Mississippi National River and Recreation Area is just north of the project area.

The views from the hill span native forests and wetlands in the Minnesota Valley, as well as a broad panorama of the urban landscape including the Minneapolis skyline, Fort Snelling State Park and History Center, and the MSP International Airport.

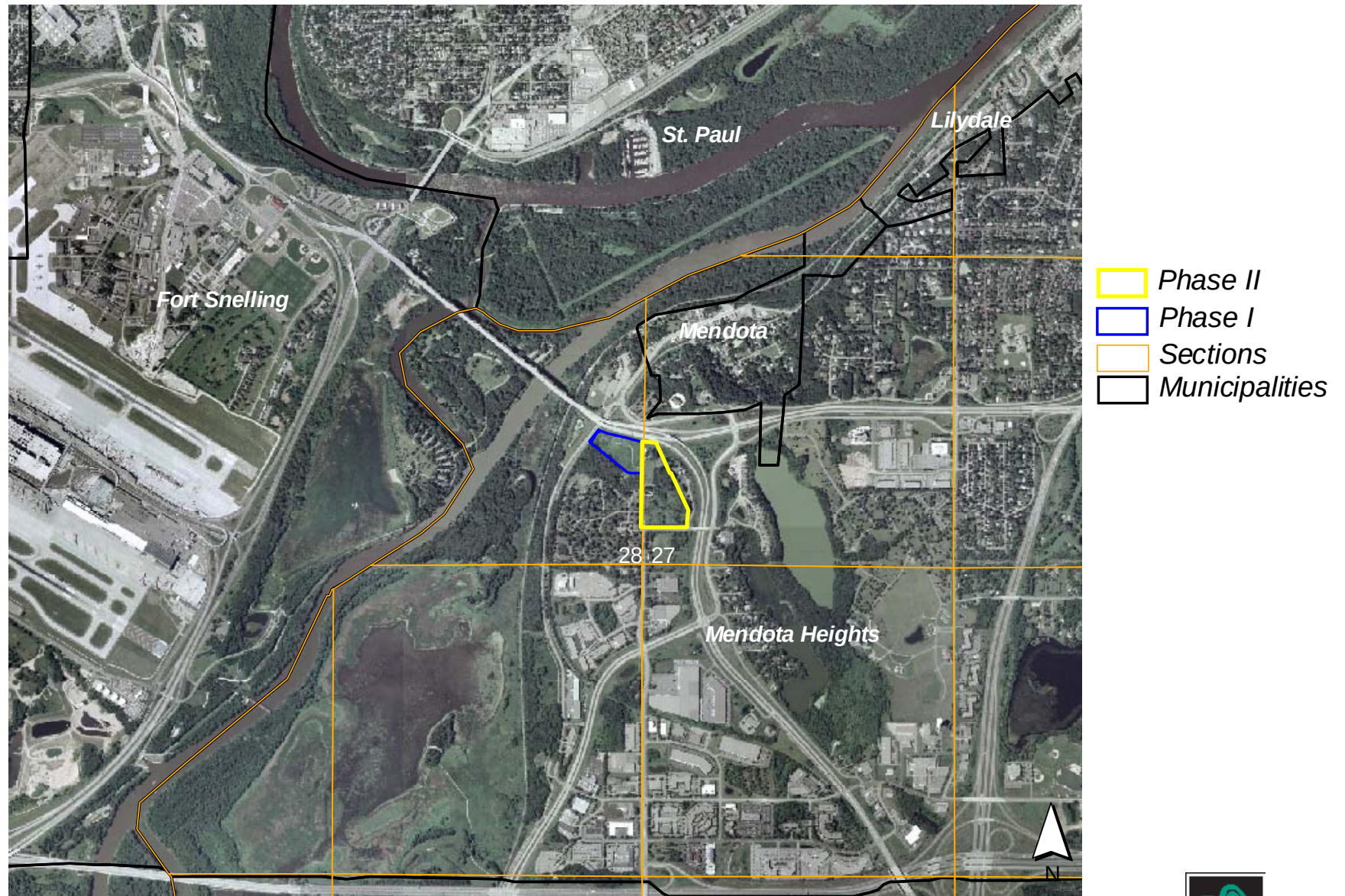
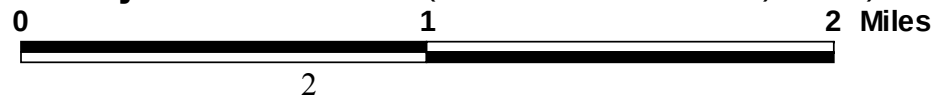


Figure 1: Pilot Knob Hill Project Location (2003 FSA Color Aerial) Photo)



Geology and Soils

During the Paleozoic Era 450-523 million years ago, the Pilot Knob Hill region was covered by warm, tropical seas. Sediments deposited in these seas later formed a series of limestone, sandstone, dolomite and shale layers throughout southeastern Minnesota. The uppermost strata of this sedimentary rock series occurs near the surface on the sides of Pilot Knob Hill. Rocks exposed within the Phase I project area include the Decorah shale, a gray-green shale, and Platteville limestone. These layers are known for having highly abundant fossils, including brachiopods, cephalopods, gastropods, crinoids, and trilobites (Ojakangas and Matsch 1982).

Much later in time, the Paleozoic bedrocks were covered by glacial deposits. Approximately 13,000 years ago, Pilot Knob Hill was covered by the eastern edge of the Des Moines lobe of the Wisconsin glacialiation, which was the latest glacialiation in Minnesota. When the glacial lobe melted from its edge and retreated, approximately 12,000 years ago, outwash streams flowed over the Pilot Knob area northward into the Mississippi River. These meltwater streams left beds of sandy and gravelly outwash (Hobbs et al. 1990). The braided meltwater stream bed was later followed by Glacial River Warren, a huge glacial river that originated from the southern tip of Glacial Lake Agassiz in western Minnesota and formed the broad and wide valley now occupied by the Minnesota River (Wright 1972). The glacial outwash deposits sit underneath the upper slopes of Pilot Knob, including most of the project area. Lower slopes

of Pilot Knob were carved by Glacial River Warren, which removed layers of outwash and underlying glacial till, and cut into the underlying sedimentary bedrock layers.

According to the Dakota County Soil Survey (NRCS 1983), three soil types occur in the Pilot Knob Hill phase II project area (Figure 2). Brief descriptions of these soil types given below are excerpted from this soil survey. Interpretations of conditions for soil formation are from Brady (1974) and Weikle (pers. comm.). Additional recommendations on suitable plant communities for the different soil types are interpretations of the authors of this report.

Soil survey polygon attributes and boundaries were created before 1983, which predates the latest road construction improvements for highway 55. The steep slopes along highway 55 at the northeast corner of the project area occur further south today than they did when the soil survey was created.

The three soil types in the Pilot Knob Hill phase II project area are all mesic loams or silt loams most suitable for mesic plant communities such as mesic prairie or savanna.

The Waukegan soil is by far the most prevalent soil, with only minor corners of the project areas Lester and Kanaranzi (likely disrupted from Hwy 55 construction) Waukegan soils in the site are classified as mollisols, meaning that they contain dark, upper horizons formed under prairie.

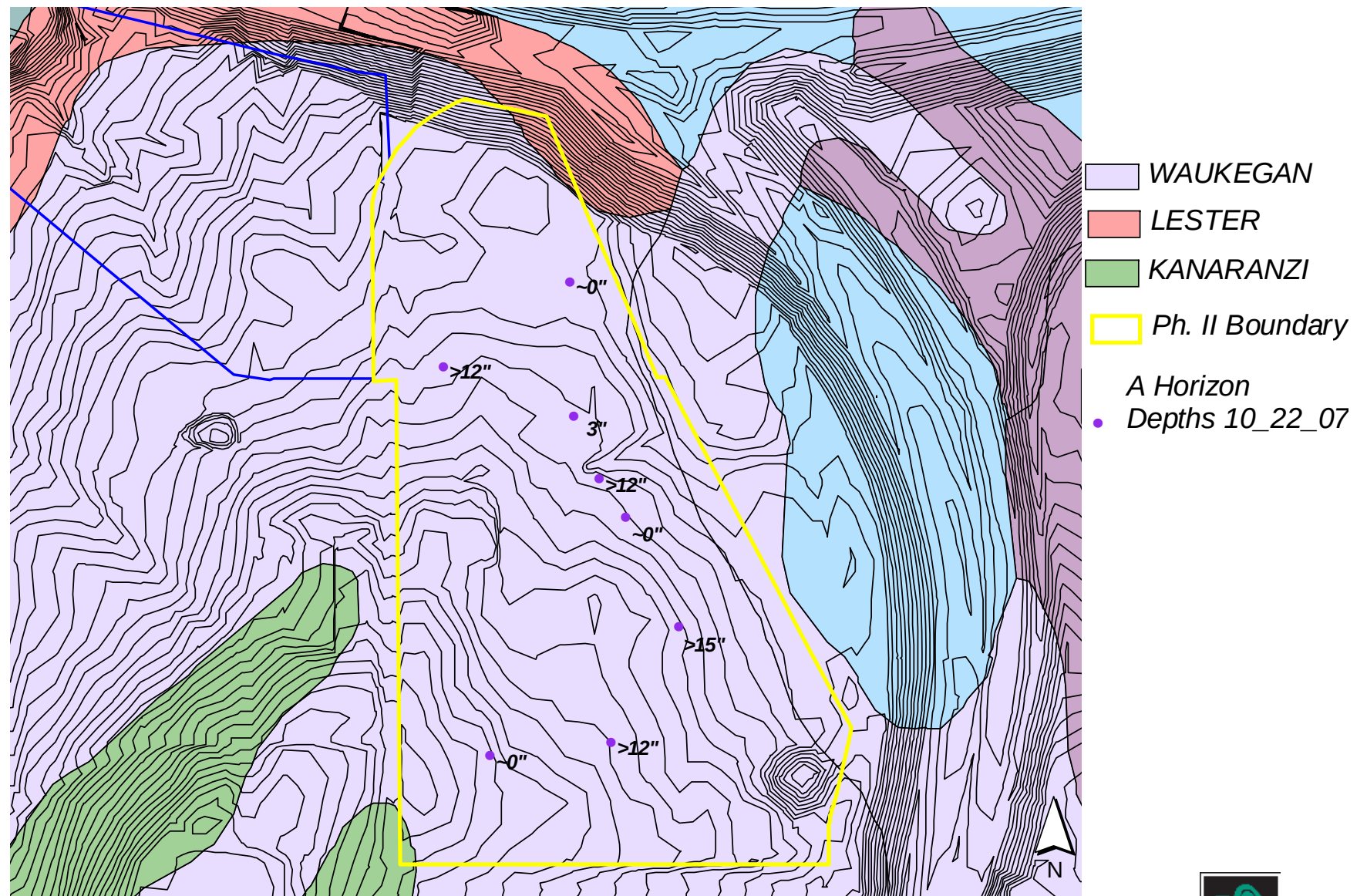


Figure 2: Soils of Pilot Knob Hill Project Area(Source: USDA, 1983)

0 400 800 Feet



Soil borings were taken as part of this planning process (see Figure 2). Topsoil depths were found to vary greatly, being very deep in many spots but essentially absent in others. This lack of topsoil in some spots is likely due to erosion from agriculture, and scraping for road building or other purposes.

These soil borings also revealed the presence of invasive exotic earthworms, specifically nightcrawlers (*Lumbricus terrestris*). This infestation is common but the deleterious effect of earthworms on forest and woodland understory plants is well documented.

Waukegan Silt Loam – This is a gently sloping, well-drained soil formed in a deep, silty mantle over sandy and gravelly outwash deposits. In a typical profile, silt loam extends to a

depth of 32 inches, underlain by gravelly coarse sand of glacial outwash deposits.

Lester Loam – This soil is a deep, well-drained loam formed in glacial till deposits. A typical pedon consists of loam to 11 inches over clay loam. The underlying clay loam is likely to have formed in shale and limestone colluvial deposits. In phase II this soil was likely disrupted during Hwy 55 construction.

Kanaranzi Silt Loam – This is a gently sloping, well-drained soil of fine silt loam. In a typical profile, silt loam extends to a depth of 0-7 inches. Native vegetation is classified as tall grass prairie.

Vegetation of Pilot Knob Before European Settlement

The upper slopes of Pilot Knob were dominated by native prairie vegetation in the early 1800s, as clearly illustrated by Seth Eastman's drawing from 1847. Between open prairies were bands of woody vegetation concentrated along drainages. Given the mesic (moist) soils on these upper slopes, the prairie vegetation would have been predominantly mesic tallgrass prairie.



Eastman's drawing of Pilot Knob

Minnesota Historical Society

Frederick J. Marschner's map of "The Original Vegetation of Minnesota" shows the Pilot Knob region as "Oak Openings and Barrens" (Figure 3; Marschner 1974). This map was based on the notes of surveyors of the Public Land Survey, who marked off the grid of section lines across the state and surveyed most of Dakota County from 1847 to 1855. Oak Openings and Barrens were principally "scattered trees and groves of Oaks (mostly bur oaks) of scrubby form with some brush and thickets, in a matrix of tall-grass prairie, and occasionally with Pines" (Heinselman 1974).

These Oak Openings and Barrens would be described today as Southern Dry Savanna or Southern Mesic Savanna (MNDNR 2005, in preparation). Mesic prairies and oak savannas are fire-maintained plant communities that burned every 5-10 years, which prevented them from being overtaken by brush and trees. Before European settlement, wildfires set by lightning or Native Americans frequently swept across the landscape (Grimm 1984).

Today, mesic prairies and savannas are among the rarest native plant communities in Minnesota. Most prairies and savannas in the region were cleared for agriculture or urban development. Nearly all that remained transformed into woodlands and forests due to the suppression of wildfires.

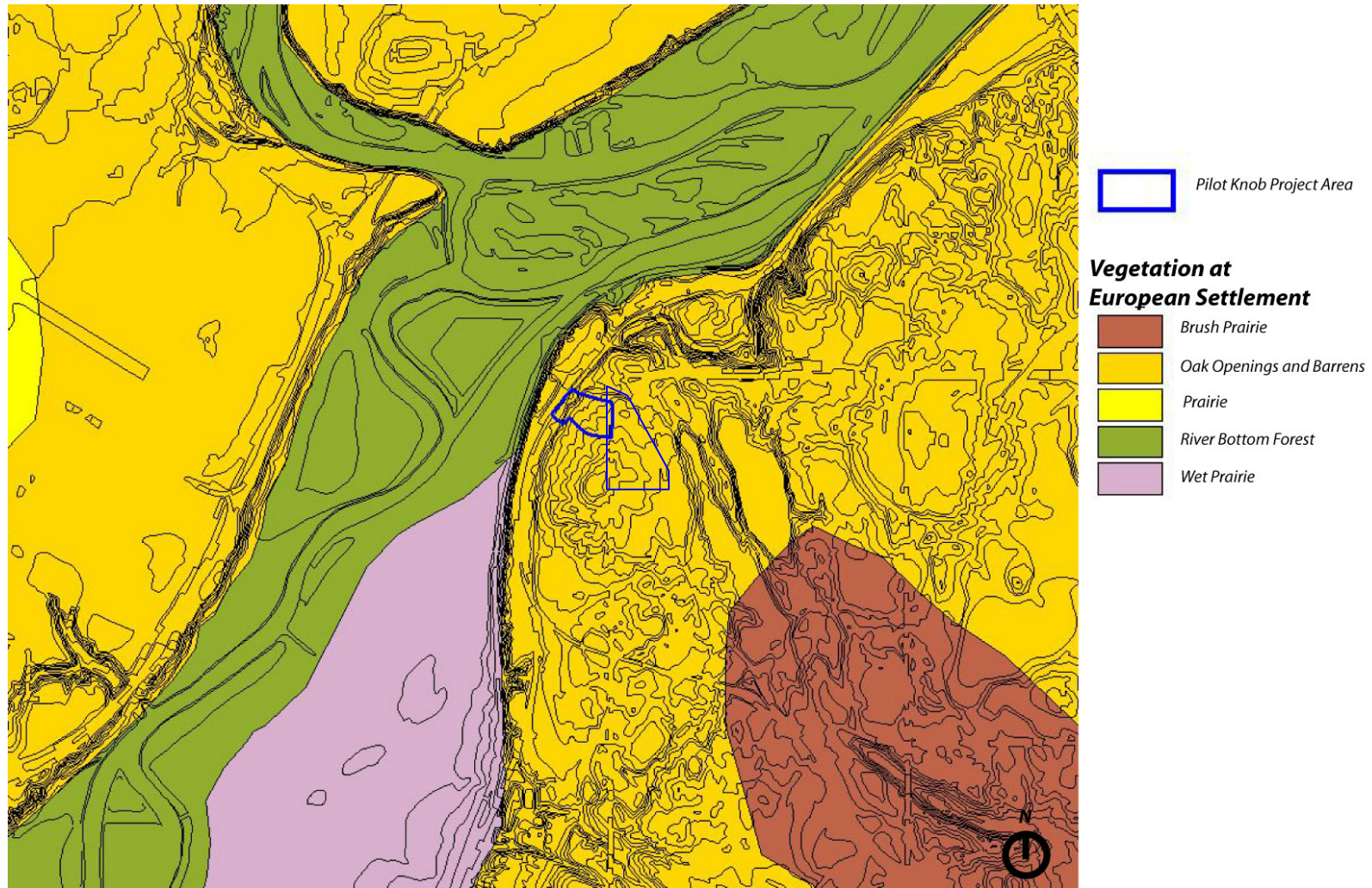


Figure 3: Vegetation at the Time of European Settlement at Pilot Knob
(Redrawn from Marschner, 1974)

0 1 2 Miles



Vegetation of the Pilot Knob Project Area in the 1900s

Figures 4, 5 and 6 are historic aerial photos of the area in 1945, 1970 and 1985 respectively. The project area was primarily a farm and other houses in the early 1900s. Large fields were cultivated on the south end and north end. The east-central portion appears to have been an intense livestock area; in 1970, trees and shrubs appear to have volunteered in this former east-central livestock areas, presumably due to the removal of the livestock. The old field on the south end currently supports a large number of young green ash and other trees.

By 1985, Pilot Knob Road's connection to Hwy 55 was re-routed and has been a dead end cul-de-sac ever since. Several homesites existed on the site, with a cluster of small lots in the southeast. MN DOT constructed a detention basin in the southeast corner, but it does not appear to collect much runoff at this point. Most recently, Acacia Park Cemetery has changed the use of the grounds around the central homesite. The back lot is now used extensively for equipment and vehicle storage.

Up until the 1990s, the large turf area between the two remaining homesites was cut for sod by Acacia Park Cemetery (Bachmeir, pers. comm.)

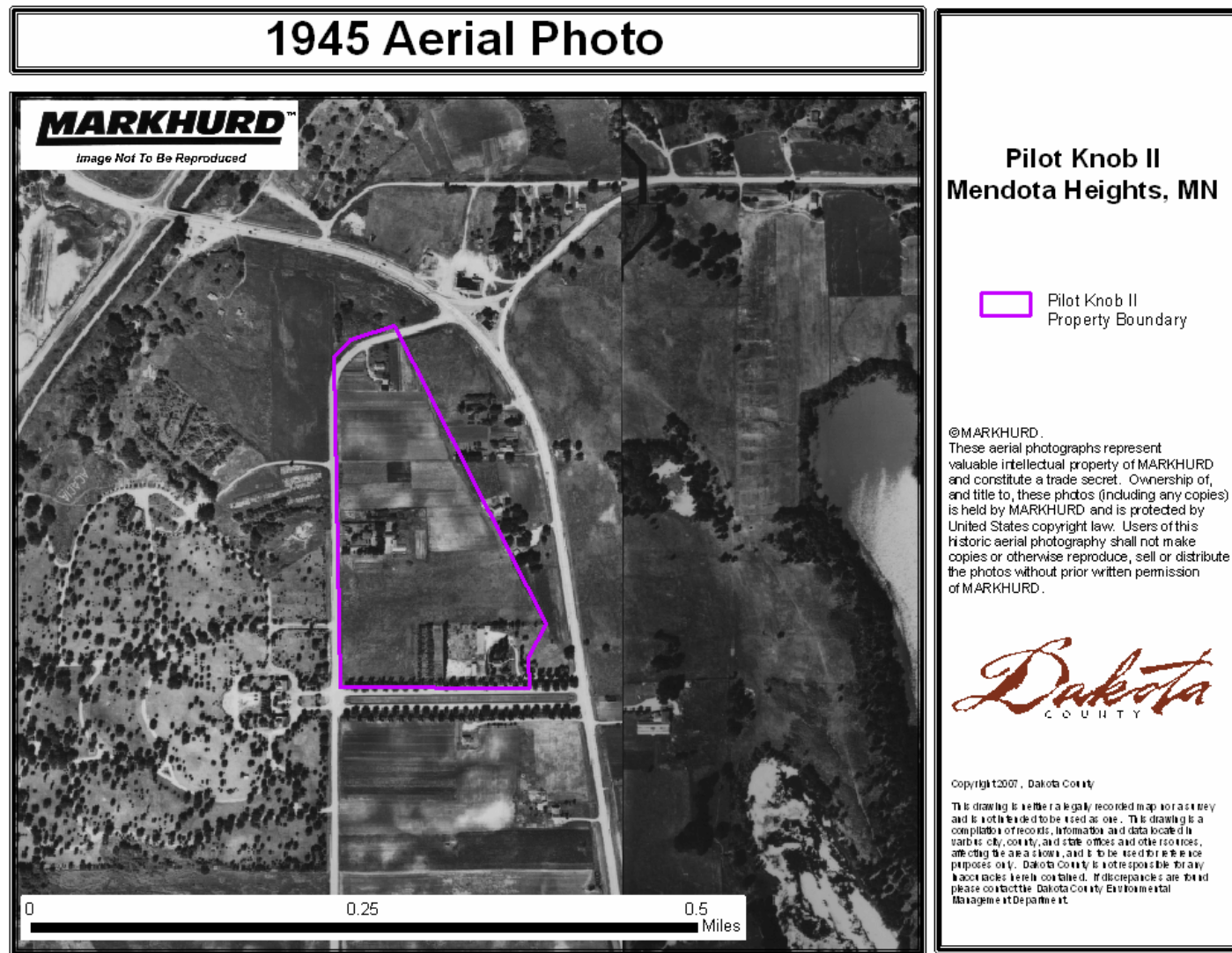


Figure 4: 1945 Aerial Photo of Pilot Knob Hill
(Photo and layout courtesy of Dakota Co. Farmland and Natural Areas Program)

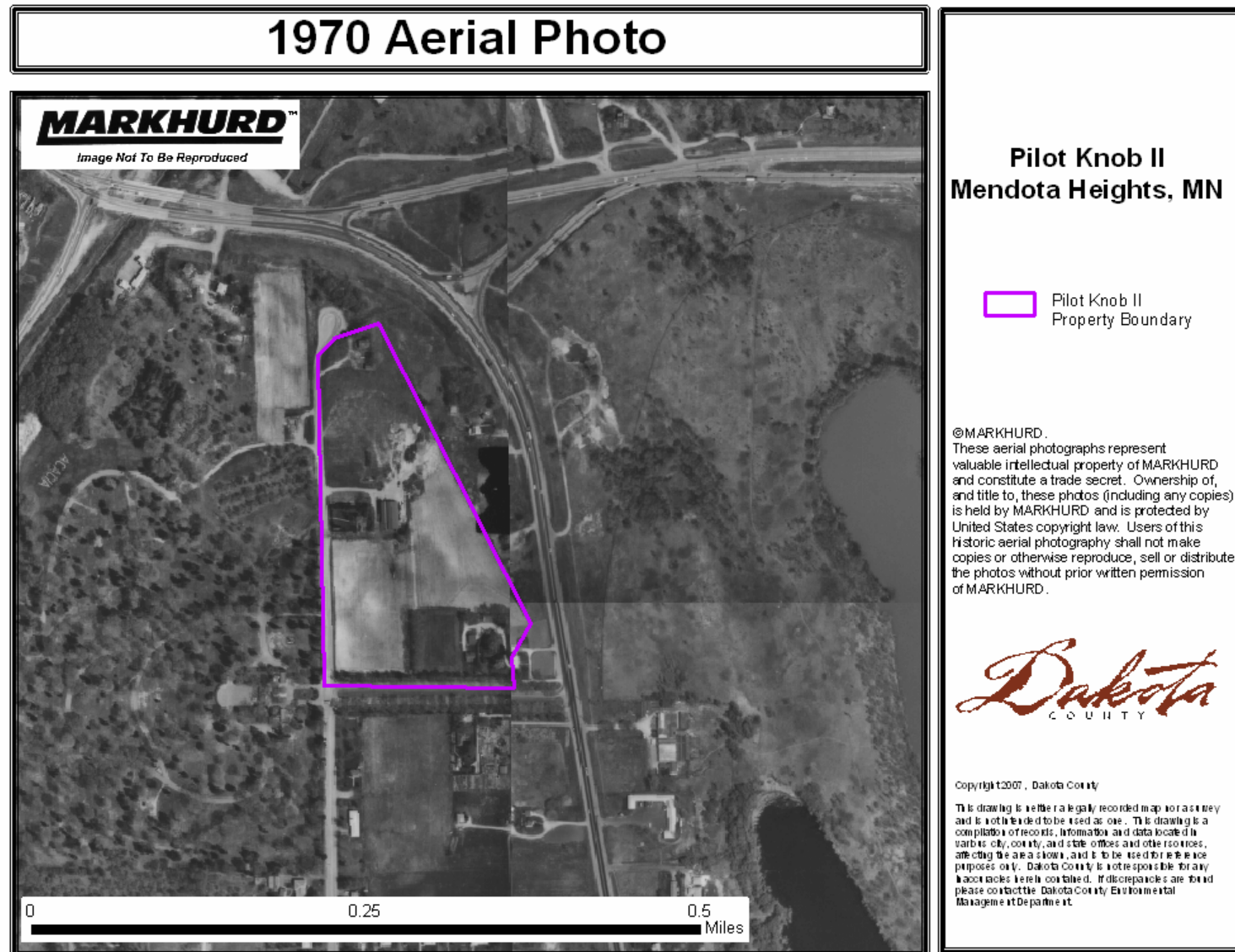


Figure 5: 1970 Aerial Photo of Pilot Knob Hill
(Photo and layout courtesy of Dakota Co. Farmland and Natural Areas Program)

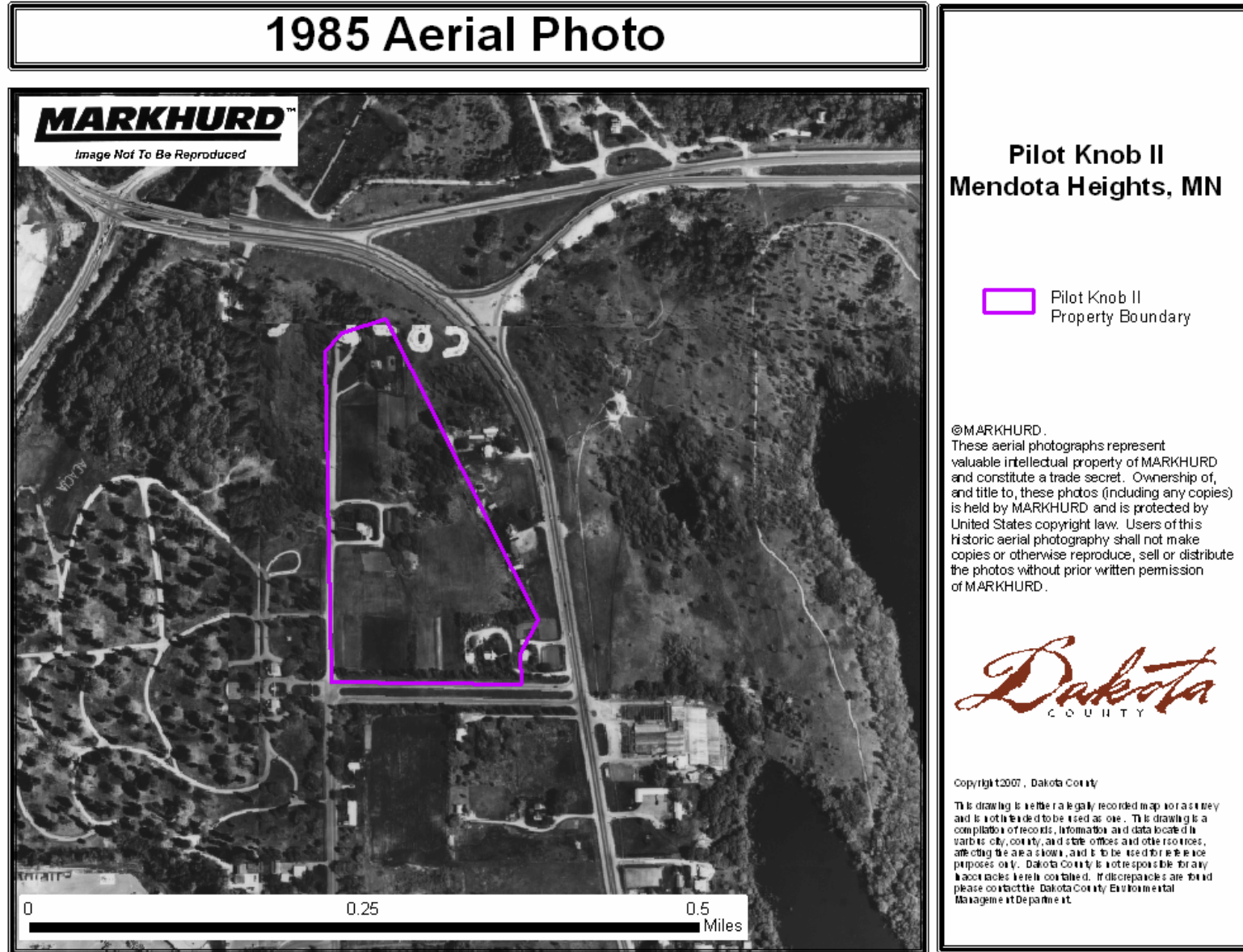


Figure 6: 1985 Aerial Photo of Pilot Knob Hill
(Photo and layout courtesy of Dakota Co. Farmland and Natural Areas Program)

Current Vegetation at Pilot Knob Hill

The existing land cover in the Pilot Knob Hill Phase II project area was field surveyed from September to November 2007, and in Phase I in September 2005 (Great River Greening, 2005) and mapped in Figure 8. The units on the map are described below.

Old Field



In Phase II, the old field is fairly typical in that the herbaceous layer is dominated by non-native smooth brome, poa, and overabundant native Canada and stiff goldenrod. It has a high stem density of invasive Siberian elm, black walnut, and green ash. Red cedar, gray dogwood, box elder, aspen and other species are present in lower numbers.

In Phase I, the vegetation of this area is highly disturbed and dominated mostly by a dense cover of a wide diversity of exotic or invasive native plant species. Major dominant species on the site include Kentucky bluegrass (*Poa pratensis*), quackgrass (*Agropyron repens*), burdock (*Arctium minus*), common buckthorn (*Rhamnus cathartica*), giant goldenrod (*Solidago gigantea*), Canada goldenrod (*Solidago canadensis*), white sweet clover (*Melilotus alba*), and yellow sweet clover (*Melilotus officinalis*).

Some native plant species that would occur in prairies and savannas are also present. These include stiff goldenrod (*Solidago rigida*), wild bergamot (*Monarda fistulosa*), dogbane (*Apocynum androsaemifolium*), white snakeroot (*Eupatorium rugosum*), wolfberry (*Symphoricarpos occidentalis*), nannyberry (*Viburnum lentago*), jerusalem artichoke (*Helianthus tuberosus*), gray dogwood (*Cornus racemosa*), yarrow (*Achillea millefolium*), short sedge (*Carex brevior*), and woodland sedge (*Carex blanda*).

Turf

Several acres in phase II are in turf, including the yards around the two remaining homesites and an expanse between the two homes. This area has been mowed regularly. It has common weeds in it including quack grass, but is relatively free of spotted knapweed and other invasive species in the area.

Vegetable Garden

A large vegetable garden was in production until 2007. This area is adjacent to the turf and is now being colonized by weedy species. Raspberry and assorted fencing are also in this classification.

Detention Pond

There is a stormwater detention pond in the southeast corner of the site, collecting run off from Valencour Circle. However, even in heavy rainfall periods, standing water does not collect. Due to the steep slopes and highly disrupted nature of this area, it presents no unique planting opportunities.

Pilot Knob Hill Natural Resource Management Plan

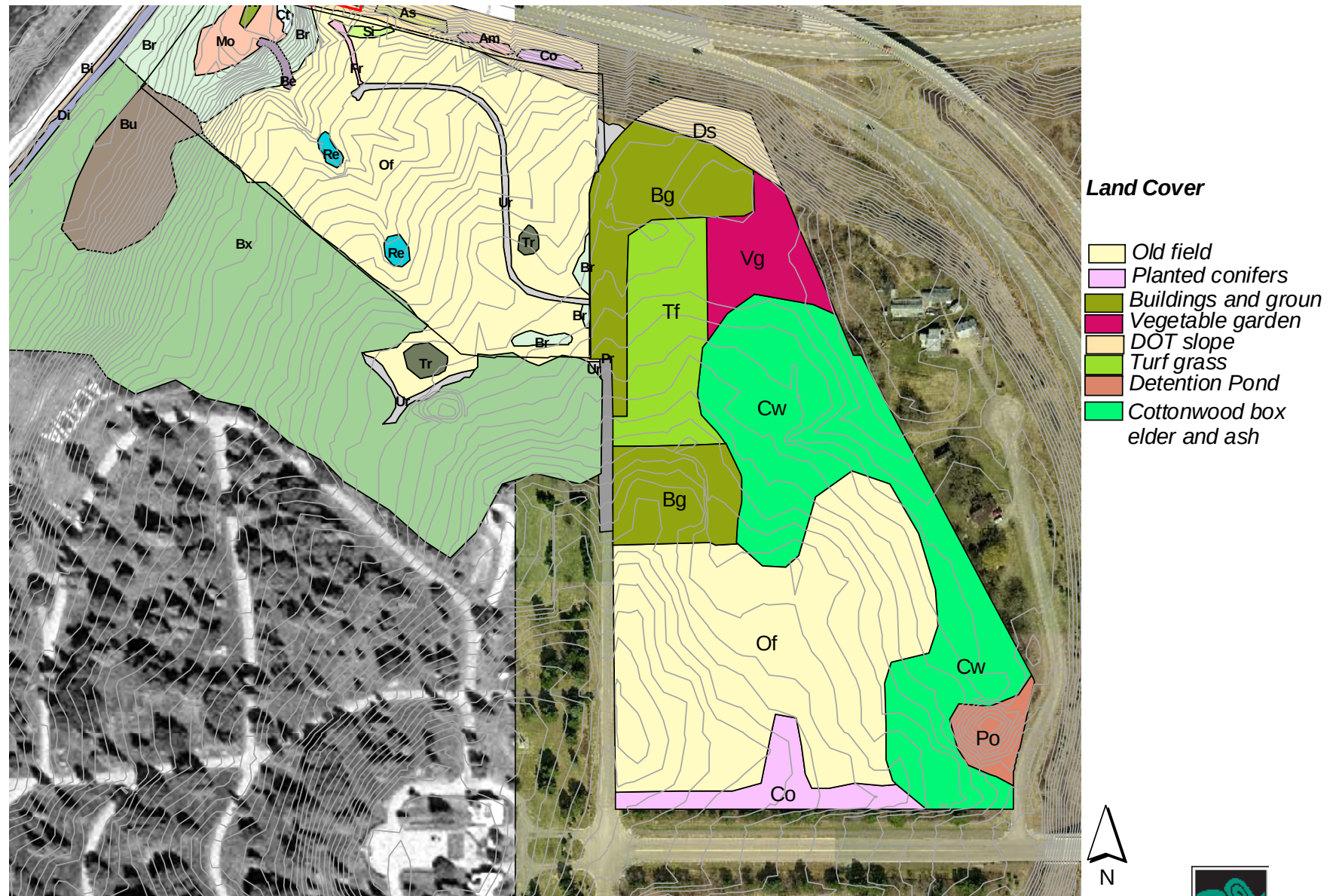


Figure 7: Current Land Cover (2006 Color Aerial courtesy of Dakota Co.)

0 400 800 Feet

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Box Elders and Planted Conifers (Phase I only)

This is a large area of woods on the Acacia Cemetery property composed mostly of box elders that invaded the area since the early 1960s (Figures 4, 5 and 6). Stands of invasive trees like this are not recognized as native plant communities, as they originate primarily on human-disturbed sites. Several patches of planted conifers planted before 1970 also occur within this woods and contain white spruce (*Picea alba*), red pine (*Pinus resinosa*), and arbor vitae (*Thuja* sp.). Other trees in these woods include cottonwood, green ash, black walnut, Siberian elm, and American elm. Underneath the trees in these woods is a dense thicket of common buckthorn, a highly invasive exotic species that crowds out native trees and wildflowers. Garlic mustard (*Alliaria petiolata*) is an exotic plant that has invaded the ground in these woods. Other common native herbs include wood nettle (*Laportea canadensis*), moonseed (*Menispermum canadense*), lady fern (*Athyrium angustum*), enchanter's nightshade (*Circaea lutetiana*), sweet-scented bedstraw (*Galium triflorum*), and white snakeroot (*Eupatorium rugosum*). Stacks of marble tiles, slate roof shingles, and limestone blocks are stored in a small portion of this area.



Bur Oaks

This is a small stand of large bur oak trees on the Acacia Cemetery property that were present in 1945 (Figure 4) and likely originated from trees that occupied the area before the time of European settlement. These trees grew up in an open setting and not in woods, as they have broad crowns with spreading, horizontal limbs. A large American elm, (*Ulmus americana*), is also present within the woods. The herbs on the ground are species typical of shaded woods on heavy, moist soils, including wood nettles, and other species seen in the Box Elder and Planted Conifers woods.



DOT Slope

This is an engineered, north-facing slope along the south side of highway 55. In Phase I, the slope consists predominantly of grassy vegetation with a narrow band of planted trees and shrubs that were mapped separately. Below the band of trees and shrubs, the slope is dominated by exotic species: smooth brome (*Bromus inermis*), Kentucky bluegrass, and bird's foot trefoil. The upper half of the slope, above the planted trees, the vegetation is much the same as the area mapped as Old Field. Several species of native prairie grasses and forbs were also planted by MNDOT into this area but these did not establish very well due to poor seed, insufficient site preparation, and /or lack of maintenance. These prairie species include big bluestem, Indian grass, little bluestem, and black-eyed Susan (*Rudbeckia hirta*). Controlled burns on the upper part of the slope would help re-establish the planted prairie grasses.



Road cut slope, NE end Phase II

In Phase II, the slope for the roadcut, owned in part by DOT and part contained in the Phase II boundary, several trees including Lombardy poplar, conifers, and desirable oaks are growing. Within the project boundary, the understory vegetation includes invasive reed canary grass, but also native river bulrush and extensive wild bergamot. Box elder trees are beginning to take over. On the DOT slope in Phase II, there are no highly invasive trees or shrubs whose removal is necessary like Phase I.

Planted Conifers

In Phase I, this is an area of pines (Ponderosa pine or red pine) and white spruce planted by MNDOT.

In Phase II, conifers have been planted along a roadside easement along Acacia Blvd at the south end of the site where many mature evergreens and some hardwoods were planted decades ago. Shrubs are also ornamental. Conifers include Scotch pine (*Pinus sylvestris*), red pine (*Pinus resinosa*) and white spruce (*Picea alba*). Box elder and aspen have volunteered; on the shady north side of this planting, many other trees are volunteering.

Cottonwood, box elder and green ash

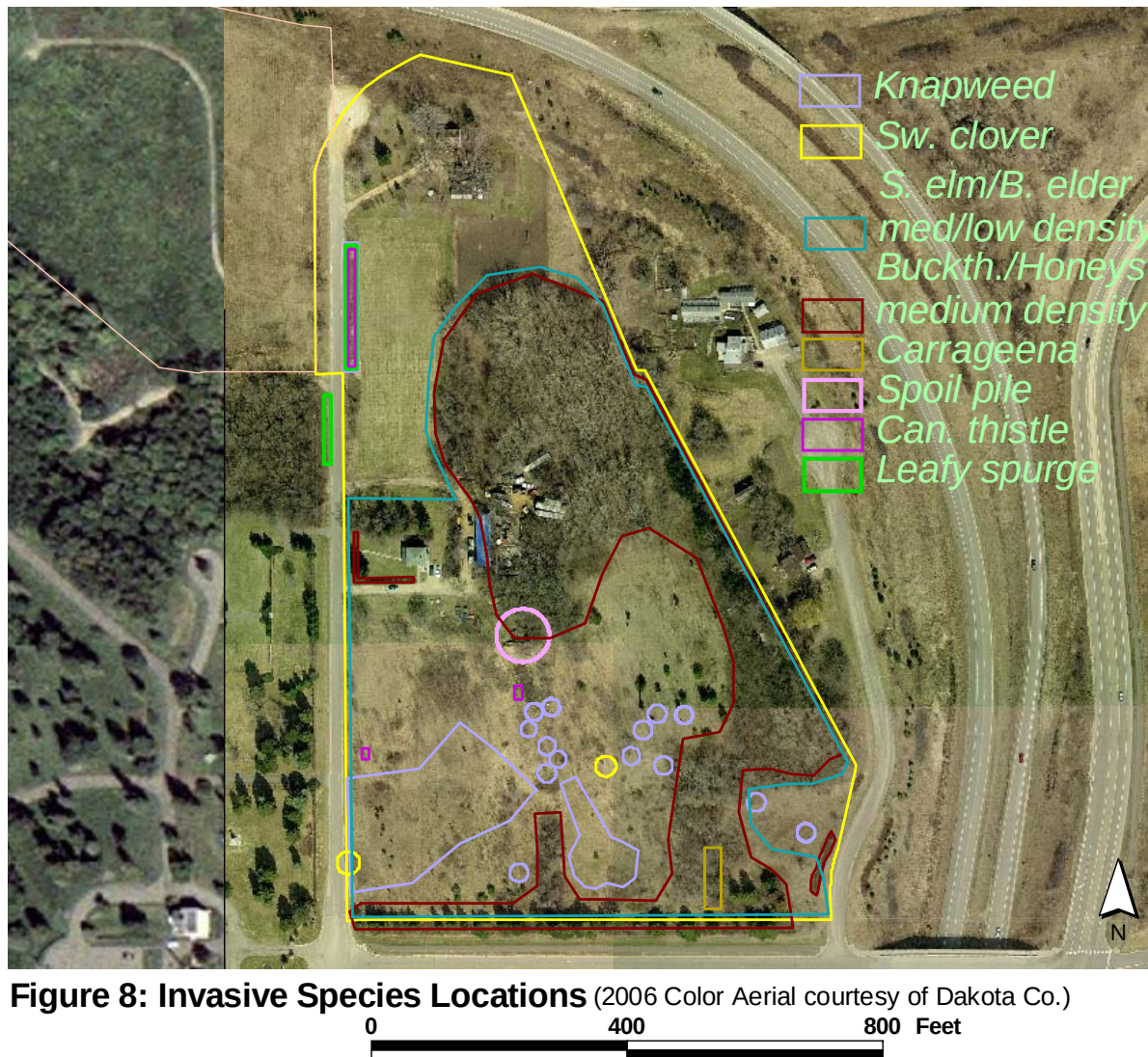
The large east-central forested area of Phase II is comprised largely of cottonwood, box elder and green ash in the canopy. The shrub layer is predominately invasive buckthorn, but the desired elderberry bush is found along some of the perimeter. The understory in this area is in very poor condition.

Buildings and Grounds

This classification includes the cultural areas of homes and outbuildings, driveways, utilities, roads, turf and trees-in-turf. These areas will be highly modified by the house and outbuilding removal process.

Invasive Species

Invasive species span the spectrum of existing land covers. Figure 8 identifies species that are on the verge of expanding. Other species such as poa and smooth brome are ubiquitous and therefore not mapped.



Native Plant Communities Recommended for Restoration at Pilot Knob Hill

Mesic (moist soil) prairie, wet prairie, dry prairie and mesic oak savanna are native plant communities that once existed on Pilot Knob and would be excellent target communities for restoration. These communities have a continuous display of wildflowers throughout the growing season. In the fall the prairie grasses turn a combination of rich orange-red and blue colors. Figure 10 shows a proposed layout of these communities in the project area. Descriptions of the native plant community types recommended for restoration at Pilot Knob are given below. A step-by step timeline for restoring these native plant communities is given in the next section.

Mesic Prairie:

Within the project area on the north side of Pilot Knob, the open prairies were mostly mesic prairie as the site is dominated mostly by moist, loamy soils. Mesic prairie is a diverse, tallgrass prairie community on moderately-drained to well-drained sites on uplands. This community type ranges from dry-mesic to wet-mesic in nature. Dominant grasses are big bluestem, Indian grass, porcupine grass, prairie dropseed, and little bluestem. Other important grasses and sedges include Leiberg's panic grass, switchgrass, Mead's sedge, Kalm's

brome, and slender wheatgrass. Little bluestem, sideoats grama grass, and porcupine grass are more common in dry-mesic phases of this type. Switch grass, prairie cordgrass, and slender wheatgrass are more common in the wet-mesic phase. Some of the more common forbs include heart-leaved alexanders, Canada goldenrod, wild bergamot, Maximilian sunflower, gray-headed coneflower, purple prairie clover, and prairie phlox. Shrubs, varying from well scattered to clumped, typically include leadplant and prairie rose.



Mesic Prairie in June, Redwood County

© Minnesota DNR

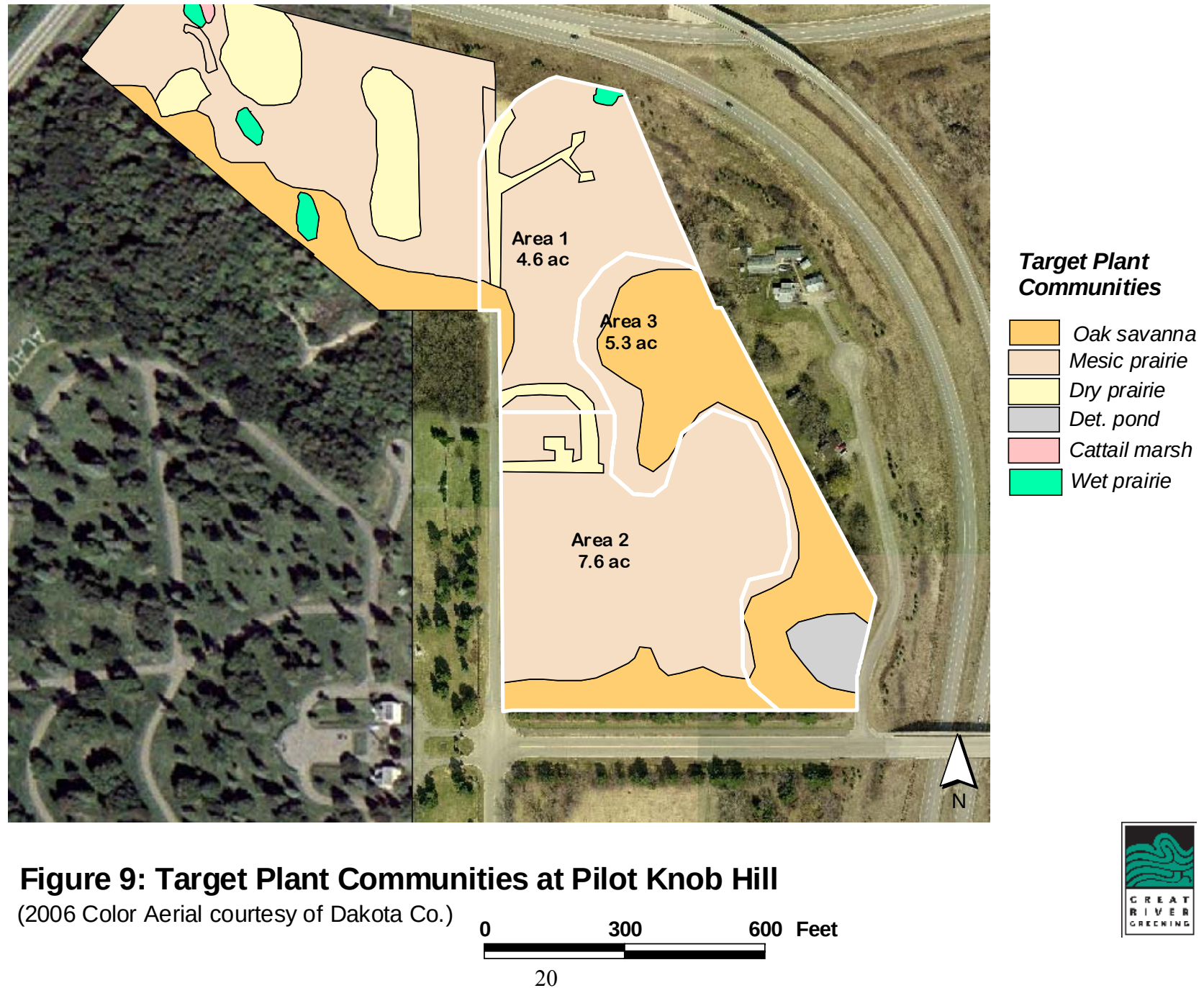


Figure 9: Target Plant Communities at Pilot Knob Hill

(2006 Color Aerial courtesy of Dakota Co.)

Oak Savanna:



Oak Savanna in the Fall, Scott County

© Minnesota DNR

Dry to mesic savanna and woodlands were common communities in Minnesota in the transition zone between open prairies and dense hardwood forests. On Pilot Knob, these communities occupied drainages where the fire frequency was not as great as in open, treeless prairies. These areas had scattered to clumped trees composed mostly of bur oak, a relatively fire-resistant tree when mature. Northern pin oak, which is somewhat less fire resistant, was also frequent in the landscape. In natural savannas, the stature and spacing of trees is somewhat variable: areas with a high frequency of fire tend to have fewer, more widely-spaced trees within a matrix of prairie vegetation; and areas with low fire frequency tend to have more dense woody vegetation. In open savannas on

mesic sites, the dominant vegetation between trees is mesic prairie; on dry sites the dominant vegetation is dry prairie. In areas of dense trees, the vegetation contains many species that are tolerant of partial to full shade that occur in oak woodlands.

At Pilot Knob, we recommend restoration of open oak savanna to recreate one of the prevalent native plant communities that used to occur in the region, and provide transition zone and screenings around the south and east perimeters.

A good source of local ecotype acorns is the stand of bur oaks growing on the adjacent Acacia Cemetery. Other native oak stands within 30 miles would also be a good source; manicured sites are especially well suited for acorn collection. Bur oaks generally produce acorns around August 20 and produce acorns every year.

Dry Prairie:



Dry Prairie in June, Hennepin County

© Minnesota DNR

Dry hill prairie likely covered the driest tops of hills and ridges at Pilot Knob. The dominant grasses in the most excessively-drained areas are mid-height to short grasses, including porcupine grass, little bluestem, side-oats grama, and junegrass. On lower, more mesic slopes, such as at mid-slope on steep hillsides, big bluestem usually co-dominates with the short to mid-height grasses. Common forbs in this type include pasque flower, stiff sunflower, silky aster, stiff goldenrod, rough blazing star, purple prairie clover. Two very common native shrub species are leadplant and prairie rose. This community is very similar in composition to dry oak savanna but lacks the scattered to clumped oaks and species adapted to low to moderate shade.

At Pilot Knob, we recommend planting dry prairie on the driest, most well-drained areas, such as on the upper parts of steep west-facing slopes. Dry prairie vegetation is shorter in stature and facilitates better views from topographic high points in the site. Including dry prairie in the restoration will also increase the diversity of different grasses and wildflowers in the site.

Wet Prairie:



Wet Prairie, Dakota County

© Minnesota DNR

This is a wetland prairie community that occurs on poorly-drained mineral soils that may be slightly flooded during wet seasons in the spring. The dominant grasses and sedges are prairie cord-grass, big bluestem, bluejoint, woolly sedge, and switchgrass. Often other sedges are common, including Sartwell's sedge, dark green bulrush, and Buxbaum's sedge. Common forbs include Virginia mountain mint, giant

goldenrod, golden alexanders, spotted water-hemlock, New England aster, and giant sunflower. Shrubs are sometimes common in these communities, including red-osier dogwood, slender willow, pussy willow, and Bebb's willow.

In Phase I, we are planting wet prairie in three areas of wet, mineral soils that are wet for much of the growing season. These areas are in low, level areas in drainages. Reed canary grass, an invasive exotic species of wetlands, currently dominates most of these areas in the site. In Phase II, the DOT slope in the northeast is moister due to the seepage from the top of the hill and its north aspect. It is this one spot where wet prairie reconstruction is recommended.

Plant Species Lists:

Lists of plant species for the native plant communities recommended for restoration in the site are given in Appendix A. These lists include a complete list of species that occur in the community type in the region. These species lists were

determined from an analysis of numerous vegetation plots collected in remnant native plant communities in east-central Minnesota by ecologists of the Minnesota Department of Natural Resources (MN DNR) (Dunevitz and Lane 2004). Additional refinements of the lists were done by examining plant species lists taken by MN DNR ecologists from several nearby reference sites identified in the MN DNR's Rare Features Database. These reference sites include mesic oak savanna at Fort Snelling State Park (MCBS 1995); dry oak savanna at the Lawrence Wayside (Scott County; MCBS 2002); mesic prairie and oak woodland at the Katherine Ordway Natural History Study Area (Macalester College, Dakota County); mesic prairie at the Black Dog Prairie Preserve Scientific and Natural Area (Dakota County); and mesic prairie at Thomas Lake Prairie (City of Eagan, Dakota County; MCBS 1997). For Phase II, the species lists were refined to include those believed to be important in the reconstruction process (Packard 1999) and those recommended for exposed clay soil (Prairie Moon Nursery 2007).

An Implementation Plan for Restoring Native Plant Communities at Pilot Knob

Pilot Knob Phase II is a more typical site for prairie and savanna restoration than Phase I, as a large part of it is currently old field and turf. Nonetheless, it will be challenging as several invasive species are threatening. Once restored the combined acreage with Phase I will bring about a large waving prairie and savanna with diverse wildflowers supporting bird and other animal life, and provide an enjoyable site for visitors and motorists.

The key recommendations to accomplish a successful restoration at Pilot Knob are:

- Adopt an “adaptive management” approach,
- Invest properly in invasive species control and site preparation.
- After the seed is sown, make a three-year investment to help ensure the native plants get established.
- Annual maintenance, including a three-year burn cycle.

As with all natural area restorations, we encourage Mendota Heights to adopt an “adaptive management” approach to the restoration of this important site. Because of variables due to such things as weather, seed bank, advancements in the restoration field, and new exotic species, the knowledge of the site will increase as the work progresses. This knowledge should be used to revise and adapt the management approach as the work progresses. When adapting the management

methods and approach, the objectives should be kept in mind to guide the decisions.

Unlike Phase I, the Phase II site lends itself well to a phased in approach, with three areas identified as restoration blocks. This phasing allows for the areas of greatest ecological value to be restored first. Fortunately, the priority areas are also the least expensive to restore.

For Phase II, the recommendations are categorized as either whole site considerations, or by Area. Specific recommendations follow.

WHOLE SITE CONSIDERATIONS

Mark the property lines

The property lines, especially on the east, are unclear in the field. Getting a professional survey and then marking the property lines is essential for communicating with on-the-ground restoration personnel.

Invasive Species Control

Spotted Knapweed Control

Spotted knapweed poses several problems. In the areas that it has already infested, it will become dominant in part via chemicals it emits into the soil to prevent germination of other species; these chemicals can linger in the soil for several years. Through prolific airborne seed production it can be exponentially invasive, especially where the soil is worked and exposed; seeds can remain viable in the soil for seven years (MN DNR 2002).

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The knapweed at Phase II is found in four distinct populations. In Area 1, there is an established roadside population under the utility poles (along with leafy spurge) that is being controlled with mowing by Public Works, and along a small area near the cul-de-sac. In Area 2, there are two pioneering populations, one along the mowed area and lane of the current Gathering Area (see Figure x), and a second at the MN DOT retention pond. Also in the southwest corner of Area 2 is the large core population that has infested several acres of the southwest corner. This is by far the most problematic area, with a high level of infestation and signs of expansion. Along with knapweed, exotic mustard is prevalent, and there is a patch of sweet clover, another invasive species with similar behavior and control.

As with any invasive species, the approach will be, in order of priority, to: 1) stop further spreading; 2) attack the periphery and restrict the range; and 3) attack the core populations and infestations. Knapweed is also spread by contaminated topsoil from which it can hitch a ride on boots and equipment including cars, mowers and tracked vehicles.

Stop further spreading

In Area 1, the infested areas are relatively small. The biggest threat they pose is in spreading from infested soil getting on equipment tires, especially since the soil will be worked in the area and heavy equipment will be used to remove the poles and road. We recommend covering these two areas with 4" or more of shredded hardwood mulch made from the trees and shrubs in the area. This covering should take place before other activities in the area. This will smother the invasive knapweed (and leafy spurge and Canada thistle) plants for several years until the

prairie vegetation becomes established and greatly reduce (though probably not eliminate) the number of knapweed and leafy spurge plants that grow there.



Infested areas to be mulched

To help protect Area 1 from airborne seeds coming from Area 2, the row of tall trees and shrubs on the north side of the south house will largely remain intact for two years, with the exception of girdling the box elder and spruce, until the prairie vegetation becomes established and control of the south population of knapweed is achieved.

Throughout the site, with the main focus being on the southern half, the knapweed plants should not be allowed to go to seed. This can be done through a variety of methods, including spraying, pulling, and mowing/cutting throughout the growing season. Knapweed has an extended blooming period, from early July through October, with the main blooming period in July, so diligence is required. Mowers used in any infested areas should be thoroughly cleaned at the infestation site to prevent further spread. Mowers were the main source of spread

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for the existing gathering area and are often a vector for the seed. Mendota Heights will implement an equipment cleaning protocol for future mowing equipment using existing high-pressure sprayers (Kullander, pers. comm..)

The southwest corner and the current temporary Gathering Area need to be closed to public for two or three years, until the knapweed is under control and the threat of spreading on boots and equipment is minimized. In the southwest corner, we recommend fencing off the infested area (after tree removal, see below) to prevent the spread of seed via foot, vehicle and equipment traffic. This ‘psychological’ fencing will be semi-permanent (~ 3 years); a typical structure is t-posts with a single strand of smooth wire, appropriate markings and safety flags, and interpretation. In addition, a temporary parking area further north, at the southernmost driveway, with a trail spur, will be used until the knapweed is under control. This will require a temporary gate to be installed north of the temporary lot, and some vegetation barriers along the east side of the road and the east side of the lot, achieved easily by felling nearby trees. The existing gravel surface can be used or can be removed and seeded to turf while it is a temporary lot.

At the temporary Gathering Area, posted signs without fence are recommended. Visitor use is anticipated to be much lighter in this area than in the SW corner.

Interpretation

An interpretive sign might read:

This area is infested with spotted knapweed, a highly invasive exotic species. Please do not access this area as seeds are known to hitch a ride on shoes, boots, and clothes.

If you see this plant outside of the fenced area, please report it to xxx-xxxx or leave a note in the box. Thank you.

Managers: Be sure to thoroughly clean equipment and boots before leaving this area. As feasible, work in this area at the end of the day so you don’t track seed to other parts of the site after working in here.



Knapweed fencing and sign posts, general location

Reduce perimeter

Beyond the prevention of seed production, the smaller pioneering populations and the edge of the main infestation should be reduced with more intensive control including spot spraying and pulling. The knapweed at the MN/DOT retention pond and at the gathering space should be intensively controlled for several years, as should the perimeter of the main population.

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Attack the core population

In addition to preventing any of the core population from going to seed, elimination of the core population should be achieved as quickly as possible. Before the fencing is installed, the trees should be removed as their removal will bring a flush of knapweed due to the soil disturbance and increased sunlight. Tree removal should be followed by a shallow spring harrowing, to also flush the seed bank, followed by a spring boom spray followed by spot treatments throughout the growing season. Inexpensive cover crops will be sown to test the potency of knapweed's allelopathic chemicals on germination. This process should be repeated in year 2 and perhaps year 3. Control of the knapweed needs to be gained before the Area 2 prairie restoration can begin.

Maintenance: Early detection, rapid response.

As part of the annual maintenance, the entire site should be surveyed for knapweed. Detecting new populations early and eradicating them before they can become established is a key to efficient and effective control.

Leafy Spurge

A population of leafy spurge has been identified on both sides of Pilot Knob Road near the northeast corner of the Acacia property. The east population will be controlled with the mulch used for spotted knapweed. The west population is in the road right of way; control will be coordinated with Public Works which has already been mowing it closely. Preventing the spread is the most important.

Sweet Clover

Two small populations of sweet clover have been documented at the site, one at the future parking pull off and one in the southeast portion of the site. Sweet clover has the ability to infest prairies and although currently small, its control should also be a priority. Its control will follow the same path as the spotted knapweed. It is noteworthy that sweet clover benefits from prescribed burns so it can be problematic for prairies even when they are in the maintenance phase. It oftentimes fluctuates on a multi-year cycle in established prairies, where every fifth year or so it is a dominant plant.

The existing patch by the pull-off will be mulched. The pioneering plants will be pulled and/or sprayed.

Garlic Mustard

Garlic mustard has also been found on the site. It is invasive to woodlands and forests, overtaking the understory. While it may become invasive in the existing woodland, it will not persist in prairie or savanna and it can be largely ignored at this time.

Canada thistle

Canada thistle is a difficult and tenacious invasive species. A small population of it has been documented at the site; its control should be a priority before it gets worse. This is best achieved with a variety of methods, primarily spraying.

Bird's-foot trefoil and crown vetch

Bird's-foot trefoil is well established in the MN-DOT retention pond, very likely purposefully planted there as part of the process. Trefoil can be invasive even to established prairies.

Crown vetch is widespread in the DOT slope. It too has the potential to invade prairie reconstructions.

We recommend control of both of these species, primarily through spraying.

Buckthorn and Honeysuckle

These two woody shrubs can become highly invasive in savannas. The current level of infestation is low but should be treated to prevent the problem from getting worse. We recommend controlling these shrubs with a combination of cutting and stump treating, and basal bark chemical application. Fall is the best time to treat as they are easy to spot in the first half of November. Two years of control are recommended.

Siberian elm and box elder

Siberian elm is an invasive tree species that is a prolific seed producer. It can overwhelm areas when they are being planted. It is currently found throughout the southern half of the site in patches. Its control is needed before the soil is worked. This is best achieved through cutting and stump treatment, and chainsaw girdling with chemical application. The girdling method is much more cost-effective and leaves standing dead material, prime habitat for woodpeckers and other wildlife; it should be the primary method of control except where trees need to be removed for other reasons.

Box elder is an overabundant native tree, one that can also dominate and overwhelm prairie plantings. Box elder has both female seed-bearing trees, and male trees. Control of the female trees, to disrupt the seed production, is required as part of the prairie restoration. Girdling and cut-stump treatment are the recommended methods.

Russian olive and Lombardy poplar.

Both of these species are exotic species present in small numbers at the north homesite. Russian olive is invasive in many natural areas including prairie restorations (MN DNR 2002). Lombardy poplar can be invasive with root suckers in some situations.

Cottonwood

Cottonwood is an overabundant native tree species at this site, found in the wooded area. It is a prolific seed producer capable of colonizing an area especially when the soil is exposed. However, sprouts can be fairly easily controlled by mowing and burning so a simple reduction in cottonwood will be the goal. Girdling the cottonwood trees along the north edge of the wooded area and leaving them standing will reduce the seed amount and provide woodpecker habitat.



Snags are wildlife trees

Scotch Pine and Spruce

Scotch pine is a mildly invasive exotic species. It is found along the southern edge, seeded in by the mature trees of the Acacia Grand Entrance easement. It should be removed as part of the general clearing of the area.

Spruce is also not native to the area, but not considered invasive. Some spruce trees on site are quite large. These can be girdled and left standing, to create wildlife habitat, and to get the public accustomed to their removal.

Siberian peashrub

A stand of large non-native invasive pea shrub exists in the southeast corner of the site at one of the former home sites. This may become invasive once restoration begins. It is best controlled with a cut-stump treatment, and stacking the cut material on site rather than risk the spread of seed by hauling it elsewhere.

Smooth brome, reed canary grass, bluegrass (poa), and overabundant Canada goldenrod

All of these species are addressed as part of the restoration and do not need to be addressed separately.

Spoil area

An area south of the masonry house is currently being used as a spoil pile and/or borrow pit. It is severely infested with a number of exotic species, including one which we have not yet identified. This area is best treated by leveling and covering under deep mulch, followed by spot treatment throughout the growing season. It is also a logical area for a fire ring.

Early Detection, Rapid Response

The past several years have seen the rise of several invasive species, and the establishment of several new ones in the area. These include Russian thistle, cheat grass, wild parsnip, and Queen Anne's lace. These are often spread along roadsides via mowing equipment and vehicles. A trained ecologist should perform an invasive species survey of the area on an annual basis to prevent these newcomers from becoming established.

Unified Strategy with Neighbors

The City and its restoration partner should pursue working relationships with the surrounding landowners, for a unified

weed control strategy. This includes Acacia Cemetery and their Grand Entrance, homeowners to the east, and DOT rights-of-way. The invasive species control does not necessarily have to be as complete in these 'buffer' lands; eliminating seed production and dispersal is the primary goal.

Off-Road Vehicle Barriers

Off-road vehicles can wreak havoc on a natural area, destroying habitat and vectoring invasive species. Without prevention, trespass may increase in the absence of homeowners. In addition to the design measures of parking lot boulders and gates, standing vegetation can be used as barriers. The south side is protected via the vegetation. The southeast corner is protected both by existing vegetation and the detention pond. No vegetation will be removed around the perimeter of the southeast corner; invasive species there will be girdled and left standing.

Boulders for the permanent lot can be collected on-site if artificial boulder piles are discovered around the former homesites. However, scattered boulders in the landscape provide important micro-habitat and should be left in place.

Neighbors are typically the source of ATV and snowmobile trespass. With the limited number of neighbors, and no trespass problems of this type to date, any future problems with this trespass might quickly be solved with education and enforcement. Barriers for these vehicles are not deemed necessary at this time.

PHASED AREA CONSIDERATIONS

Area 1 Prairie Reconstruction

Site Prep

It is reported that the house and outbuildings will be removed shortly before restoration. Any additional site prep such as fence removal, driveway removal, and cleanup, also needs to be completed prior to restoration. The utility poles and lines should also be removed; it is reported that underground utilities, including DOT fiber optics and underground power to the DOT fiber optics, will likely still be present and active (Kullander, pers. comm.). Active removal of the roadbed is strongly encouraged, as it can then be restored to prairie, providing a continuous cover of vegetation, important for some of the smaller terrestrial wildlife. Removal of the poles and roadbed will greatly improve the opportunities for visitors' to get a sense of Minnesota's natural heritage.

This area is largely mowed turf, former vegetable garden, and former homesite. Small and intermediate trees will be removed and used to mulch the knapweed infestation site (see above for more detail). Four large trees, two silver maple and two green ash can remain. While these trees are not native to oak savannas, they have an open-grown structure that will provide the right amount of shade to allow the installation of savanna understory plants, while providing a sense of savanna to visitors for the next 30 years while the oak trees elsewhere on the site mature. Several limbs on these trees will be girdled to allow for more sunlight, and provide wildlife habitat.

Soil prep will include a single season of two sprayings and 2-3" harrowing and sod-busting, followed by seeding. Because of

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the sod structure, we recommend using a seed drill (rather than broadcasting the seed), followed by an overseeding to add diversity and reduce the 'row look'. Overseeding is an excellent volunteer event opportunity which could take place in fall of 2008. This area can then be put on the same maintenance schedule as Phase I, to include mowing, spot treatment of exotics, and eventually burning.

Note: It is clear that the Pilot Knob hill is a Dakota burial ground (White and Woolworth, 2004). For the restoration in Phase I, repeated harrowing to a depth of 2" was deemed acceptable to stakeholders. For Phase II, this technique is acceptable and in most areas preferred over working the soil to 4".

Prairie Reconstruction and Savanna Understory Installation

Mesic prairie mix is recommended for most of Area 1, except dry prairie is recommended where a thin layer of soil exists over former roadbed, homesite, etc. (see Figure xx). At the periphery, these mixes will be blended to prevent a hard edge.

Wet prairie species will be restored to a moister area on the slope of the road cut, currently infested with reed canary grass. A small seep also exists nearby, currently populated largely by native river bulrush (*Scirpus fluviatilis*); this area is too small for supplemental seeding or planting.

Under the drip-line of the large trees and extending north to the property edge, a savanna understory mix will be sowed. Once established, this area can then be a source of savanna understory seed for sowing in other areas on-site.

A minimally intrusive method of prairie establishment, being used at William O'Brien State Park, was investigated as part of this management plan. The native plant diversity of the final restorations using is unacceptably low so this method is not recommended.

Seeding will be followed by prairie establishment phase for three years. This establishment typically requires establishment mowing three times a year for two years, spot treatment of exotics, limited over-seeding, and a mixture of mowing and burning in year three. After that, the maintenance phase is typically spot treatment of exotics and a controlled burn or burn alternative every three years.

Note: For all prairie seeding areas, we strongly recommend a seed mix that is diverse and heavy on the forb seed, at least 3# and preferably 5#/acre. While this adds to the cost significantly, it also leads to greater diversity, which is important for beauty, function, and bird life. Species must be appropriate for the region and be of local eco-type. We also recommend the full seeding rate for grasses (≥ 10 pounds/acre), since they will compete well with invasive species and incoming weeds. If the forb rate is reduced, however, grass rate must also be reduced.

Tree Row Removal

The tree row at the border between Area 1 and 2 will be phased out over three or four years. Year 1, invasive species and large spruce will be girdled and left standing, to create woodpecker habitat and allow the public to become accustomed to their removal. Once the invasive species are under control in Area 2 and Area 1 is vegetated, then the shrub under-story can be

removed and larger trees limbed up. Finally, the tree row will be removed in preparation for seeding Area 2.

Area 2 Prairie and Savanna Reconstruction

Tree removal

Once the knapweed, sweet clover, and other invasive species are under control, this area should be cleared of the trees and shrubs, with the exception of a few red cedar and the gray dogwood. They will be removed, hauled to the roadside, and hauled away for use as bio fuel. Many of the trees are green ash and black walnut. There is a general statewide call to reduce ash inventory in the state to reduce the impacts of emerald ash borer, an exotic insect that is devastating ash trees in nearby states (MDA 2007); removing the green ash can be considered part of that effort. Tree removal will be phased over ten years in the savanna installation areas, as red cedar and aspen can act as a nurse crop for oaks.

Prairie Reconstruction and Savanna Understory Installation

Site prep here can run a wide spectrum, with several acceptable options. We recommend spraying, followed by raking off the dead thatch (as an alternative to burning), and a second spraying. Due to global warming concerns and the smoke management needs at Pilot Knob Hill, we feel that a burn alternative is preferable and less expensive for the *site prep* stages. This soil prep can happen over the course of a single growing season, followed by a fall seeding with cover crop.

We strongly recommend a seed mix that is diverse and heavy on the forb seed (at least 3# and preferably 5#/acre). Mesic prairie mix is recommended for most of the site, except dry prairie is recommended where a thin layer of soil exists over

former roadbed, homesite, etc. (see Figure xx). At the periphery, these mixes should be blended to prevent a hard edge.

In the areas partially shaded by the easement trees, a savanna understory mix will be sown. Seeding will be followed by prairie establishment phase for three years. This establishment typically requires establishment mowing three times a year for two years, spot treatment of exotics, limited over-seeding, and a mixture of mowing and burning in year three. After that, the maintenance phase is typically spot treatment of exotics and a controlled burn or burn alternative every three years.

Savanna Oaks Installation

After the establishment Rx burn, we recommend planting oak trees. Bur oaks are the specific species we recommend, and as in Phase I, local acorns from sites such as Acacia cemetery is the ideal source of acorns.

Several acceptable options exist. We recommend collecting ~1000 acorns from local sources, and planting them into the ground. When seedlings arise, they will need to be protected from herbivory by rabbits, voles, and overabundant deer. We recommend a rigid mesh protector during the growing season, and a tree cone with mesh top in the winter for added protection from girdling by voles. Once the bark gets hardy enough, the rigid mesh will work year round. Winter and spring protection will have to be provided until the terminal bud is 8' or higher, beyond the reach of browsing deer. This is an excellent volunteer activity.



Tree cones with browse mesh installed by volunteers

Area 3

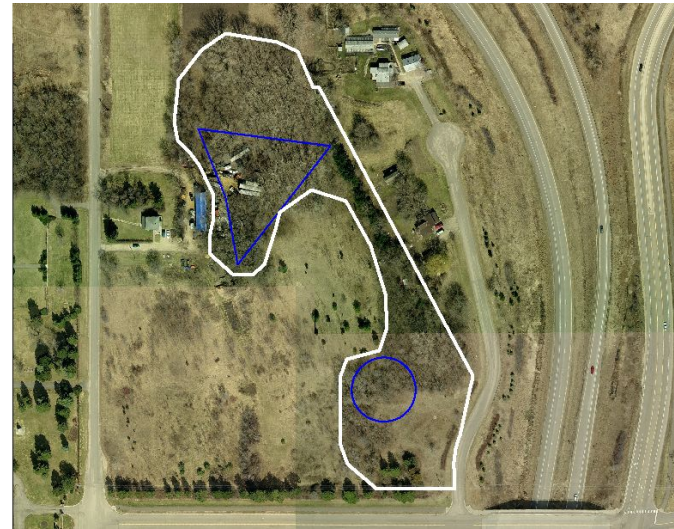
We recommend a gradual reduction of the wooded area, converting to prairie, and within the remaining wooded area, a gradual replacement of existing trees with oaks, to begin the savanna reconstruction. Basic savanna understory reconstruction will be included with the oak planting.

There is the potential for a biofuels program to develop that could be used to aggressively clear cut areas for restoration and use the wood for biofuel power generation. If such a biofuels program minimizes the cost of site prep, then we recommend pursuing it. Interpretation will be required to gain public acceptance of the clearcutting. Snags and other wildlife trees should be spared from removal in such a scenario. In the meantime, we recommend beginning a gradual reconstruction of oak savanna.

Screening with existing trees and shrubs between the site and neighbors to the east has been requested by at least one stakeholder. This is easily accommodated.

Site prep

In addition to the invasive species control described earlier, we recommend clearcutting select areas to create gap openings. Recommended priority areas are the ravine area east of the south homesite, and surrounding the open grown tree in the southeast portion. Cut tree material can be bucked up and stacked on the forest floor around the gaps to save removal costs and help nurse the young oaks. Excess can be removed for firewood, bio fuel, or other purposes.



Area 3 savanna restoration priorities

Oak savanna reconstruction

Once the site is prepped, acorns can be planted. A basic understory mix should also be sown by hand in the area, a mix

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that includes hardy and common natives suitable for the shade component that will colonize well, such as Pennsylvania sedge, wild bergamot, golden glow, and wild rye.

We recommend collecting local acorns and planting them in these areas. In the following fall, seedlings will need to be located and then protected from deer, rabbits, voles, etc. The most cost-effective way is to install a tree cone/browse mesh system that requires little maintenance. Winter protection will have to be provided until the terminal bud is 8' or higher, beyond the reach of browsing deer.

Ideally, but not required, the protective cones will be removed for the summer and reinstalled before winter. Once the bark gets hardy and tough, the rigid mesh will work year round. Winter protection will have to be provided until the terminal bud is 8' or higher, beyond the reach of browsing deer.

Another very good option is to collect acorns for custom growing at a local nursery for two years for later planting as seedlings. The same protection regime will need to be followed.

Labor Forces

Dakota County Corrections has two labor forces that are appropriate for the restoration activities.

Sentence to Serve (STS) is comprised of offenders who are putting in community service time. STS consists of a paid crew supervisor, typically trained in enforcement, and "day of" crews who meet and work for the day. Our wide experience with county STS crews are that they work well for large, straightforward projects, with a significant amount of on-site

direction by an ecologist. We do not recommend them for spraying or controlled burns unless they are specifically trained and certified to do so by the state. Dakota County STS reports that the crew supervisor has chainsaw and power brush cutting capabilities, and that in the summer months they typically do paid work for municipalities, while in the winter months they are more available for assistance for free.

Also available is a Dakota County work crew of inmates. These inmates have incentives for working hard. Our limited experience working with inmate crews is that they are hard working; using them is appropriate at sites where the public will not be alarmed. We feel they are appropriate to help with the restoration activities at Pilot Knob Hill.

Working with volunteers is of utmost importance as they are the stakeholders in the restoration. Volunteering builds constituency, and engages and educates citizens. Restoration is an excellent way for volunteers to connect with their local natural area, a connection that is on a steep decline for the nation's urban, suburban, and rural children (Louv 2005). Large groups of volunteers build a strong sense of community, and are generally immediately cost-effective when doing large manual projects. Trained volunteers who return to the site can be very valuable in cost savings but also as stewards with long term ownership of the restoration, reporting back on new invasive species populations for example, or pulling the lone stray knapweed.

Global Warming and Bio Fuels

A great deal of new information is coming out on the role of natural communities in terrestrial carbon management, as part of a larger concern over global warming. While more detailed

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analysis is needed on the effects of wooded areas vs. grasslands, it is clear that natural communities with deep-rooted natives are much better at carbon management than turf grasses, especially those that require mowing. Converting hardscapes and other impervious surfaces are also beneficial, as is water retention.

As an offshoot of global warming concerns, bio fuels appear to have a role. Bio fuels still release carbon, but unlike fossil fuels, that carbon release is partially offset by the increased carbon sequestration of the vegetation that remains behind.

Great River Greening believes it is important to incorporate this data into our restoration recommendations and activities. As seen in this natural resource management plan, we encourage any cut wood going to a bio fuel plant or other utilitarian purpose such as firewood for MMDC or other stakeholders. We typically no longer recommend brush pile burning on-site, and recommend alternatives to controlled burning for some applications.

Wildlife Habitat Management at Pilot Knob Hill

The cornerstone of wildlife habitat management is vegetation management. Pilot Knob Hill will eventually be prairie and savanna, the rarest communities in the region and some of the most important for wildlife species (MN DNR 2006).

Pilot Knob Hill is in the St. Paul Baldwin Plains and Moraines ecological subsection. This subsection is in the top tier of the state's subsections for species richness of wildlife 'species of greatest conservation need' (SGCN), and the township which includes Pilot Knob Hill is one of the three highest ranking in the subsection for SGCN records. Furthermore, prairie and oak savanna are the top two habitats used by SGCN in the subsection (MN DNR 2006c). This is compelling information for underscoring the importance for managing for wildlife in the area.

The Phase II site offers some specific opportunities beyond general vegetation management for wildlife habitat given the varied existing conditions, and the enlarged size of the natural area. A few species will find all their habitat needs can be met at Pilot Knob Hill. Many other species will use the site in combination with adjacent areas, particularly the rest of the Minnesota River corridor, and adjacent Fort Snelling State Park.

Grassland wildlife species are expected to be of more concern in the next few years. Many agricultural lands are being taken out of the Conservation Reserve Program (CRP), a set-aside program that puts marginal ag lands into permanent grassland habitat for a period of 10 years. Predictions are that grassland

birds will start to decline from today's levels, which are already much lower than they were several decades ago (National Audubon Society).

Bird Surveys and Habitat

We anticipate that Pilot Knob Hill's habitat value for bird life is best found in the variety of communities found there and its location in the river corridor and proximity to Fort Snelling State Park. The acreage is relatively small for area-sensitive grassland birds such as Henslow's sparrow, eastern meadowlark and bobolink. One possible exception is that with the unbroken vista to the west, it may effectively appear to birds to be a larger grassland.

Bird Surveys

Bird surveys will help to document the effects of restoration on bird life. The data collected should be incorporated into future management decisions.

Surveys by volunteers are an excellent way to gather bird information, especially since Pilot Knob Hill is already known as an excellent birding spot. Greening has had success partnering with the St. Paul Audubon Society for getting annual volunteer bird surveys; Audubon Minnesota is developing a standardized and rigorous protocol for volunteer monitoring of birds which will likely include training. Audubon Minneapolis is interested in evaluating the site as potential red-headed woodpecker habitat (Meyers, pers. comm.)

Woodpeckers

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As mentioned in the vegetation management section, standing dead trees are excellent habitat for woodpeckers (and squirrels, bats, foxes etc.), both common and rare. The rare red-headed woodpecker has been documented at Fort Snelling State Park, and Pilot Knob Hill can be seen as an enlargement of the habitat for this species. Red-headed woodpecker's ideal habitat is mature oak savanna with short understory (

Bluebirds

Bluebirds have suffered a decline over the past several decades as well, largely due to a loss in their nesting sites. Bluebirds are a species that thrives at the transition between wooded areas and grassland openings. Installation of two pairs of bluebird nest boxes on the north edge of Area 3N is recommended. Typically, tree swallows will occupy half of the nest boxes. These boxes require annual maintenance, a popular volunteer activity.

Field sparrow

Field Sparrow, while relatively common recently, is a Minnesota species of greatest conservation need (MN DNR 2006a; MN DNR 2006b) and a common bird in decline (National Audubon Society, 2007d.). Field sparrow should also thrive at the transition between wooded areas and grassland openings. No specific enhancements are recommended at this time, however if the bird survey documents field sparrows at the site, future vegetation management should keep that in mind.

Aerial predators

Birds of prey are very likely to use the Pilot Knob site, with its very rare plant communities it offers habitat that is not readily found elsewhere. Many common birds of prey such as red

tailed hawk, bald eagle, and migrating broad-winged hawks will very likely be observed from Pilot Knob Hill. Rare species including northern harrier, Peregrine falcon (known to nest on the Mendota bridge in recent years), and loggerhead shrike, documented at Fort Snelling State Park, may also use the site. Some birds of prey will soar above the open habitat, while others will perch on nearby trees. Loggerhead shrikes are known to frequent utility wires and thorny bushes (National Audubon Society, 2007e).

Snake Hibernaculum

A snake hibernaculum is an underground chamber that snakes use for winter hibernation. Manmade structures such as old wells, rock and log piles, retaining walls and building foundations, and natural features such as ant mounds and rodent or crayfish burrows are examples of snake hibernation sites ((Toronto Zoo, no date). Creating snake hibernacula is a key to their conservation, as many are destroyed with urban expansion. At Pilot Knob Hills, harmless species including common garter snake and red-bellied snakes are most likely to inhabit the hibernaculum. Fox snake, an SGCN species, is known to be in the area (Harper, MN DNR, pers. comm.) and may also inhabit the hibernaculum. Other animals may use the chamber as well.

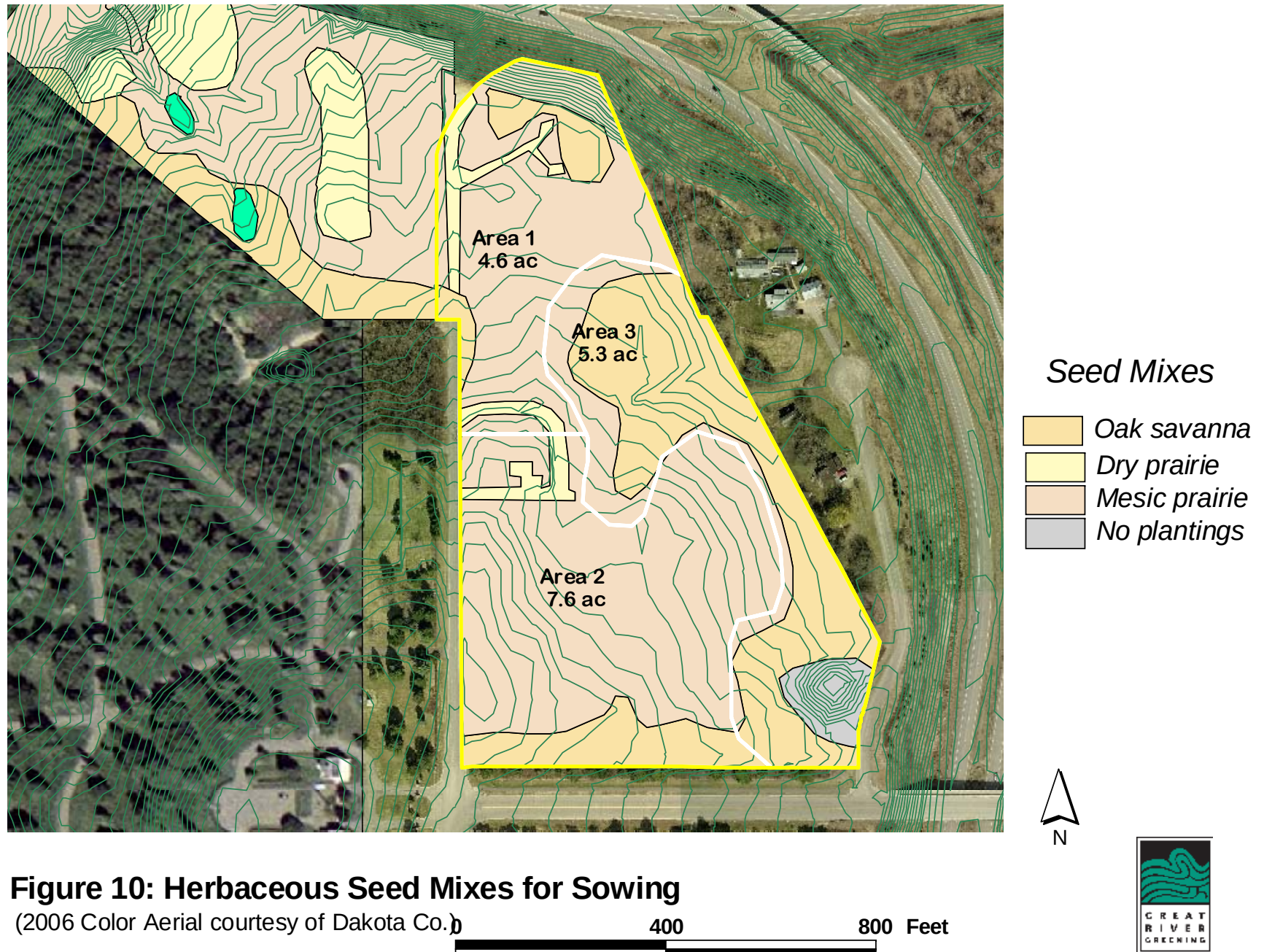
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Hibernaculum construction. Photo courtesy Toronto Zoo.

create a hibernaculum. The top will be mounded above grade to allow for some settling, and covered with soil. Logs, rocks, and a small hole will be above ground. In April or May, snakes emerge and proceed to mate in an intriguing wildlife display. This hibernaculum will be off of the trail, with interpretation, so only focused willing visitors observe the hibernaculum. It may take several years for the snakes to begin using the hibernaculum.

We recommend excavating a corner of the foundation of the former north house and re-filling in a detailed manner with concrete and masonry construction materials and rubble to



Implementation Schedules

Table 1: Whole Site Treatments

Year – I.D.	Timeline	Activity	Technique	Estimated Cost/Unit	Estimated Cost
2008-1	Jan - Mar	SW: Remove trees	Cut/stump treat, haul. Girdle and leave at edge until fence is installed.	\$1500/ac	\$3,800
2008-2	Jan - Mar	Invasive tree control – sib. Elm, box elder, cottonwood, spruce, tree row	Chainsaw girdle with chemical; leave standing		\$2,350
2008-3	Apr - May	Knapweed control: SW- Install Fencing; Gathering - Install and post signs	SW - t-post with smooth wire and interpretation; Gathering – no wire		\$3,300
2008-4	Apr - May	Knapweed control: SW - Harrow, and first boom spray, sow cover crop; Gathering – Rake, spot spray and sow	Boom spray with Transline; oat cover crop		\$1,400
2008-5	Apr - Oct	Knapweed control: Spot treatment, SW and Gathering. No plants going to seed, attack perimeter populations, survey site	Cut, pull, spray. Multiple visits		\$3,000
2008-6	May - June	Survey and mark boundary	Professional surveyors		City in-kind
2008-7	June	Canada thistle control	Transline spot spray		\$100
2008-8	Sept - Oct	Bird's-foot trefoil, crown vetch control	Spray		\$500
2008-9	November	Buckthorn and honeysuckle control	Basal bark, limited cut/stump treat		\$1,000
2009-1	Apr - May	Knapweed control: SW - Harrow, and second boom spray, sow cover crop; Gathering – Rake, spot spray and sow	Boom spray with Transline; oat cover crop		\$1,400
2009-2	Apr - Oct	Knapweed control: Spot treatment, SW and Gathering. No plants going to seed, attack perimeter populations, survey site	Cut, pull, spray. Multiple visits		\$3,000

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2009-3	June	Canada thistle control	Transline spot spray		\$100
2009-4	Sept - Oct	Bird's-foot trefoil control	Spray		\$300
2009-5	November	Buckthorn and honeysuckle control	Foliar spray, basal bark, cut stump.		\$1,000
2010-1	Apr - Oct	Knapweed control: Spot treatment, SW and Gathering. No plants going to seed, attack perimeter populations, survey site	Cut, pull, spray. Multiple visits		\$3,000
2010-2	Sept - Oct	Bird's-foot trefoil control	Spray		\$300
				Sub-Total for Whole Site	\$24,550
2011-17		Invasive Species Control, Gen'l	Varied		\$1,000/yr*7=\$7,000
				Total for Whole Site	\$31,550

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Table 2: Area 1 Prairie Reconstruction

Year – I.D.	Timeline	Activity	Technique	Estimated Cost/Unit	Estimated Cost
2008-1	Jan-April	Sm. and intermediate tree removal	Cut/ stump treat/stack. Remove for use, or chip later		\$3,000
2008-2	Jan-April	Roadside vegetation barriers	Fell nearby trees along roadside		\$150
2008-3	April	Mulch roadside knapweed areas, spoil area	4” deep minimum		\$4,500
2008-4	Apr - May	Site prep: first spray	Boom spray with Roundup	\$55/acre plus oversight	\$375
2008-5	May-August	Remove roadbed and replace with engineered soil surface. Remove utility poles.	In conjunction with other city road work.		City In-Kind
2008-6	September	Site prep: second spray, harrow to bust sod.	Shallow harrowing	\$200/acre, plus oversight	\$1,150
2008-7	Sept - Oct	Seed prairie and savanna mixes	Seed drill	\$1,500/acre plus oversight	\$8,250
2008-8	Sept - Oct	Fall volunteer event “kick off”	Overseeding, slope seeding, invasives removal, etc. 30-100 people		\$5,000 - \$15,000
2009-1	Apr - Oct	Establishment mowing 3x, spot treatment	mow when 8-10” high to 4-6”	\$300/acre, plus oversight	\$1,650

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2010-1	Apr - Oct	Establishment mowing 3x, spot treatment	mow when 8-10" high to 4- 6"	\$300/acre, plus oversight	\$1,650
2011-1	Apr - Oct	Establishment mowing 1x; Rx burn	mow when 8-10" high to 4- 6". Spring or fall burn		\$5,000
				Subtotal for Area 1	\$30,725- \$40,725
2012	Apr - Oct	Maintenance	Spot treatment, overseeding		\$500/yr
2013	Apr - Oct	Maintenance	Spot treatment, overseeding		\$500/yr
2014	Apr - Nov	Maintenance	Spot treatment, overseeding, Rx burn		\$500/yr \$3000
2015	Apr - Oct	Maintenance	Spot treatment, overseeding		\$500/yr
2016	Apr - Oct	Maintenance	Spot treatment, overseeding		\$500/yr
2017	Apr - Nov	Maintenance	Spot treatment, overseeding, Rx burn		\$500/yr \$3000
				Est. Total for Area 1	\$39,725- \$49,725

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Table 3: Area 2 Prairie and Savanna Reconstruction

Year – I.D.	Timeline	Activity	Technique	Estimated Cost/Unit	Estimated Cost
2010-1	Jan -March	Tree removal	Chainsaw and haul. Treat cut stumps. Dep’t of Corrections assistance.	\$2,000/acre	\$16,000
2010-2	Apr - Oct	Site Prep.	Spray, Rake, Spray	\$200/acre plus oversight	\$1,760
2010-3	Sept - Nov	Seeding	No-till drill with high diversity mix	\$1,500/acre plus oversight	\$13,200
2011-1	Apr - Oct	Establishment	Mowing 3x, spot treatment, possible overseeding	\$300/acre plus oversight	\$2,550
2012-1	Apr - Oct	Establishment	Mowing 3x, spot treatment, possible overseeding	\$300/acre plus oversight	\$2,550
2013-1	Mar - Nov	Establishment	Rx burn, mowing 1x, spot treatment, possible overseeding		\$6,000
2013-2	August	Plant 1000 or more local acorns, in bare spots.	Hand collect; “step” or trowel in.		\$1,000
2014-1	Apr – Nov	Maintenance	Spot Treatment, possible overseeding.		\$1,000
2014-2	August	Plant 1000 or more local acorns, in bare spots.	Hand collect; “step” or trowel in.		\$1,000
2014-3	Sept - Oct	Find and protect oak seedlings from winter herbivory, 2013 planting	Tree cone w/ browse mesh	\$6/tree	\$150
2015-1	Apr- Nov	Maintenance	Spot treatment, possible overseeding		\$1,000
2015-2	Sept - Oct	Find and protect oak seedlings from winter herbivory, 2014 planting	Tree cone w/ browse mesh	\$6/tree	\$150
				Sub-Total	\$46,360
2016	Apr - Nov	Annual Maintenance	Spot Treatment, possible overseeding. Rx burn		\$1,000 to \$5,000
2017	Apr - Nov	Annual Maintenance	Spot Treatment, possible overseeding.		\$1,000
				Total	\$53,360

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Table 4: Area 3 Savanna and Prairie Reconstruction

Year – I.D.	Area	Timeline	Activity	Technique	Estimated Cost/Unit	Estimated Cost
2008-1	3S	August	Control Peashrub	Cut/stump treat/stack local		\$500
2009-1	3N	Jan -March	Site Prep west edge of ravine, acre 1 of 2	Clearcut	\$5000/ac	\$5,000
2009-2	3S	Jan - March	Site prep, centered around open-grown tree, .5 acre of 1	Clearcut	\$5000/ac	\$2,500
2009-3	3N	March - May	Sow understory seed acre 1 of 2	Hand broadcast and rake in	\$300/ac	\$300
2009-4	3S	March-May	Sow understory seed acre .5 of 1	Hand broadcast and rake in	\$300/ac	\$150
2009-5	3N	August	Plant 1000 local acorns acre 1 of 2	Hand collect, “step” or trowel in.		\$500
2009-6	3S	August	Plant 1000 local acorns acre .5 of 1	Hand collect, “step” or trowel in.		\$250
2010-1	3N	Jan-March	Site Prep west edge of ravine, acre 2 of 2	Clearcut	\$5000/ac	\$5,000
2010-2	3S	Jan-March	Site Prep centered around open-grown tree, 2 nd .5 acre of 1	Clearcut	\$5000/ac	\$2,500
2010-3	3N	March-May	Sow understory seed, acre 2 of 2	Hand broadcast and rake in	\$300/ac	\$300
2010-4	3S	March-May	Sow understory seed, acre .5 of 1	Hand broadcast and rake in	\$300/ac	\$150
2010-5	3N	August	Plant 1000 local acorns, acre 2 of 2	Hand collect, “step” or trowel in.		\$500
2010-6	3S	August	Plant 1000 local acorns, 2 nd .5 acre of 1	Hand collect, “step” or trowel in.		\$250
2010-7	3N	September-October	Find and protect oak seedlings from winter herbivory acre 1 of 2	Tree cone w/ browse mesh	\$6/tree	\$150
2010-8	3S	September-October	Find and protect oak seedlings from winter herbivory 2 nd .5 acre of 1	Tree cone w/ browse mesh	\$6/tree	\$150
2010 -9	3N	November-December	Phased removal of woody encroachment	Girdle and leave standing trees and shrubs, 5-10’ in from existing perimeter. Sow aggressive savanna and prairie seed mix.		\$400
2011-1	3N	September-October	Find and protect oak seedlings from winter herbivory, acre 2 of 2	Tree cone w/ browse mesh	\$6/tree	\$150 est.
2011-2	3S	September-October	Find and protect oak seedlings from winter herbivory, acre 1 of 1	Tree cone w/ browse mesh	\$6/tree	\$150 est.
2011 -3	3N	August-December	Phased removal of woody encroachment.	Girdle and leave standing trees and shrubs, 5-10’ in from existing perimeter. Sow aggressive savanna and prairie seed		\$400

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				mix.		
2011-4	3S	August-December	Phased removal of woody encroachment	Girdle and leave standing trees and shrubs, 5-10' in from existing perimeter. Sow aggressive savanna and prairie seed mix.		\$400
2012 -1	3N	August-December	Phased removal of woody encroachment	Girdle and leave standing trees and shrubs, 5-10' in from existing perimeter. Sow aggressive savanna and prairie seed mix.		\$400
2012-2	3S	August-December	Phased removal of woody encroachment	Girdle and leave standing trees and shrubs, 5-10' in from existing perimeter. Sow aggressive savanna and prairie seed mix.		\$400
2012-3	3N	May, September-October	Reduce competition. Change to mesh in summer, cone/mesh in winter (optional). 2 acres.	Bark protected until hardy. Terminal bud protected until 8' tall.		\$300
2012-4	3S	May, September-October	Reduce competition. Change to mesh in summer, cone/mesh in winter (optional). 1 acres.	Bark protected until hardy. Terminal bud protected until 8' tall.		\$150
2013 -1	3N	August-December	Phased removal of woody encroachment	Girdle and leave standing trees and shrubs, 5-10' in from existing perimeter. Sow aggressive savanna and prairie seed mix.		\$400
2013-2	3S	August-December	Phased removal of woody encroachment	Girdle and leave standing trees and shrubs, 5-10' in from existing perimeter. Sow aggressive savanna and prairie seed mix.		\$400
2013-3	3N	May, September-October	Reduce competition. Change to mesh in summer, cone/mesh in winter (optional). 2 acres.	Bark protected until hardy. Terminal bud protected until 8' tall.		\$300
2013-4	3S	May, September-October	Reduce competition. Change to mesh in summer, cone/mesh in winter (optional). 1 acres.	Bark protected until hardy. Terminal bud protected until 8' tall.		\$150
2014 -1	3N	August-December	Phased removal of woody encroachment	Girdle and leave standing trees and shrubs, 5-10' in from existing perimeter. Sow aggressive savanna and prairie seed mix.		\$400

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			Increase understory diversity	Collect savanna seed from Area 1; overseed in understory. Purchase seed if nec.		\$500
2014-2	3S	August-December	Phased removal of woody encroachment	Girdle and leave standing trees and shrubs, 5-10' in from existing perimeter. Sow aggressive savanna and prairie seed mix.		\$400
			Increase understory diversity	Collect savanna seed from Area 1; overseed in understory. Purchase seed if nec.		\$300
2014-3	3N	May, September-October	Reduce competition. Change to mesh in summer, cone/mesh in winter (optional). 2 acres.	Bark protected until hardy. Terminal bud protected until 8' tall.		\$300
2014-4	3S	May, September-October	Reduce competition. Change to mesh in summer, cone/mesh in winter (optional). 1 acres.	Bark protected until hardy. Terminal bud protected until 8' tall.		\$150
2015 -1	3N	August-December	Phased removal of woody encroachment	Girdle and leave standing trees and shrubs, 5-10' in from existing perimeter. Sow aggressive savanna and prairie seed mix.		\$400
			Increase understory diversity	Collect savanna seed from Area 1; overseed in understory. Purchase seed if nec.		\$500
2015-2	3S	August-December	Phased removal of woody encroachment	Girdle and leave standing trees and shrubs, 5-10' in from existing perimeter. Sow aggressive savanna and prairie seed mix.		\$400
			Increase understory diversity	Collect savanna seed from Area 1; overseed in understory. Purchase seed if nec.		\$300
2015-3	3N	May, September-October	Reduce competition. Change to mesh in summer, cone/mesh in winter (optional). 2 acres.	Bark protected until hardy. Terminal bud protected until 8' tall.		\$300
2015-4	3S	May, September-October	Reduce competition. Change to mesh in summer, cone/mesh in winter (optional). 1 acres.	Bark protected until hardy. Terminal bud protected until 8' tall.		\$150

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2016 -1	3N	August-December	Phased removal of woody encroachment	Girdle and leave standing trees and shrubs, 5-10' in from existing perimeter. Sow aggressive savanna and prairie seed mix.		\$400
			Increase understory diversity	Collect savanna seed from Area 1; overseed in understory. Purchase seed if nec.		\$500
2016-2	3S	August-December	Phased removal of woody encroachment	Girdle and leave standing trees and shrubs, 5-10' in from existing perimeter. Sow aggressive savanna and prairie seed mix.		\$400
			Increase understory diversity	Collect savanna seed from Area 1; overseed in understory. Purchase seed if nec.		\$300
2016-3	3N	May, September-October	Reduce competition. Change to mesh in summer, cone/mesh in winter (optional). 2 acres.	Bark protected until hardy. Terminal bud protected until 8' tall.		\$300
2016-4	3S	May, September-October	Reduce competition. Change to mesh in summer, cone/mesh in winter (optional). 1 acres.	Bark protected until hardy. Terminal bud protected until 8' tall.		\$150
2017 -1	3N	August-December	Phased removal of woody encroachment	Girdle and leave standing trees and shrubs, 5-10' in from existing perimeter. Sow aggressive savanna and prairie seed mix.		\$400
			Increase understory diversity	Collect savanna seed from Area 1; overseed in understory. Purchase seed if nec.		\$500
2017-2	3S	August-December	Phased removal of woody encroachment	Girdle and leave standing trees and shrubs, 5-10' in from existing perimeter. Sow aggressive savanna and prairie seed mix.		\$400
			Increase understory diversity	Collect savanna seed from Area 1; overseed in understory. Purchase seed if nec.		\$300
2017-3	3N	May,	Reduce competition. Change to	Bark protected until hardy. Terminal bud		\$300

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		September-October	mesh in summer, cone/mesh in winter (optional). 2 acres.	protected until 8' tall.		
2017-4	3S	May, September-October	Reduce competition. Change to mesh in summer, cone/mesh in winter (optional). 1 acres.	Bark protected until hardy. Terminal bud protected until 8' tall.		\$150
					Sub-Total	\$30,400

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Table 5: Wildlife Habitat Improvements

Year – I.D.	Timeline	Activity	Technique	Estimated Cost/Unit	Estimated Cost
2008-1	May-June	Excavate and install snake hibernaculum	Excavate, fill, cover. Rubble only, no wood		\$1,500 City in-kind
2008-2	September-October	Install bluebird houses			\$300
2009-2017	September-October	Maintain bluebird houses	Clean and leave open by volunteers		\$0
2009-2017	Year Round	Annual Bird and Snake Surveys	Volunteer coordination		\$500x9=\$4500
2009-2017	Any	Create Snags for Woodpeckers, etc.	Girdle trees and limbs as part of other management		n/c
				Sub-Total	\$6,300

Recommendations for Trails, Overlook, and Interpretive Information

Trails

It is recommended that trail construction follow the same construction procedure as in Phase I.

The main trail connecting to Phase I would be 4 feet wide and constructed of compacted crushed Class V limestone gravel. This would be the trail on the western edge of the Phase II site. The remainder of the trails would be low maintenance mowed trails. The trail location has been kept primarily along the western edge of the Phase II site (see Figure 11). This alignment is intended to preserve the restoration area for wildlife habitat consideration. The trail on the south half would be a loop trail allowing visitors the option of having a smaller journey through the site or continuing on to the northern part of the site. On the northern portion of the trail visitors can continue exploring the site and either take the trail west to the Phase I restoration area or take a trail north towards Highway 55. This northern leg of the trail would bring visitors near the proposed snake hibernacula area and also gain access to a view of St. Peter's Cemetery on the other side of Highway 55, framed by remaining large trees.

It is also recommended to connect up the bike path on the north side of Acacia Blvd. to the entrance and parking lot area. There would be an area set aside in the parking area for visitors to lock their bikes up and visit the site on foot (see

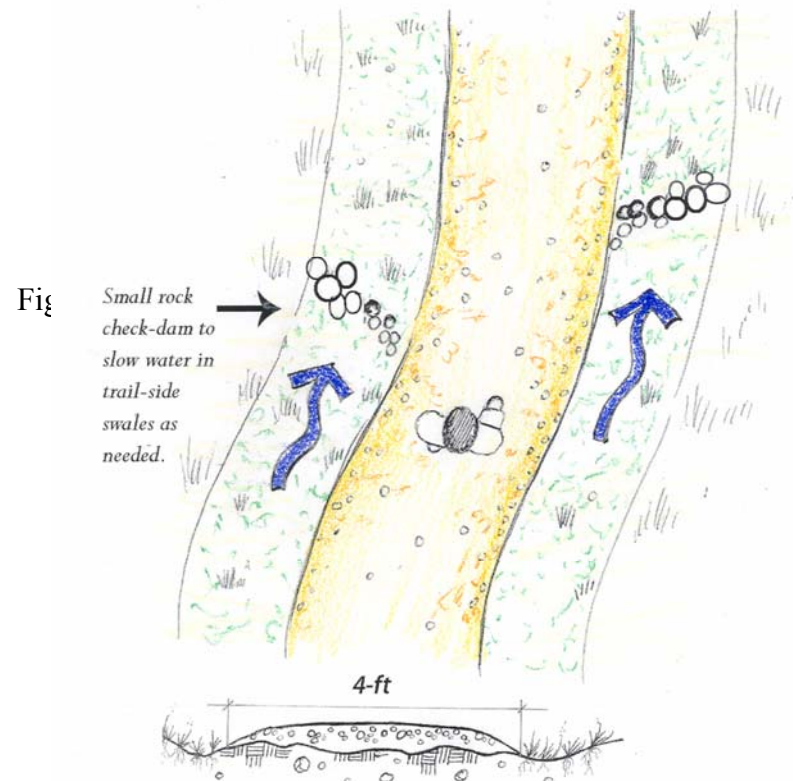


Illustration by Dan Shaw

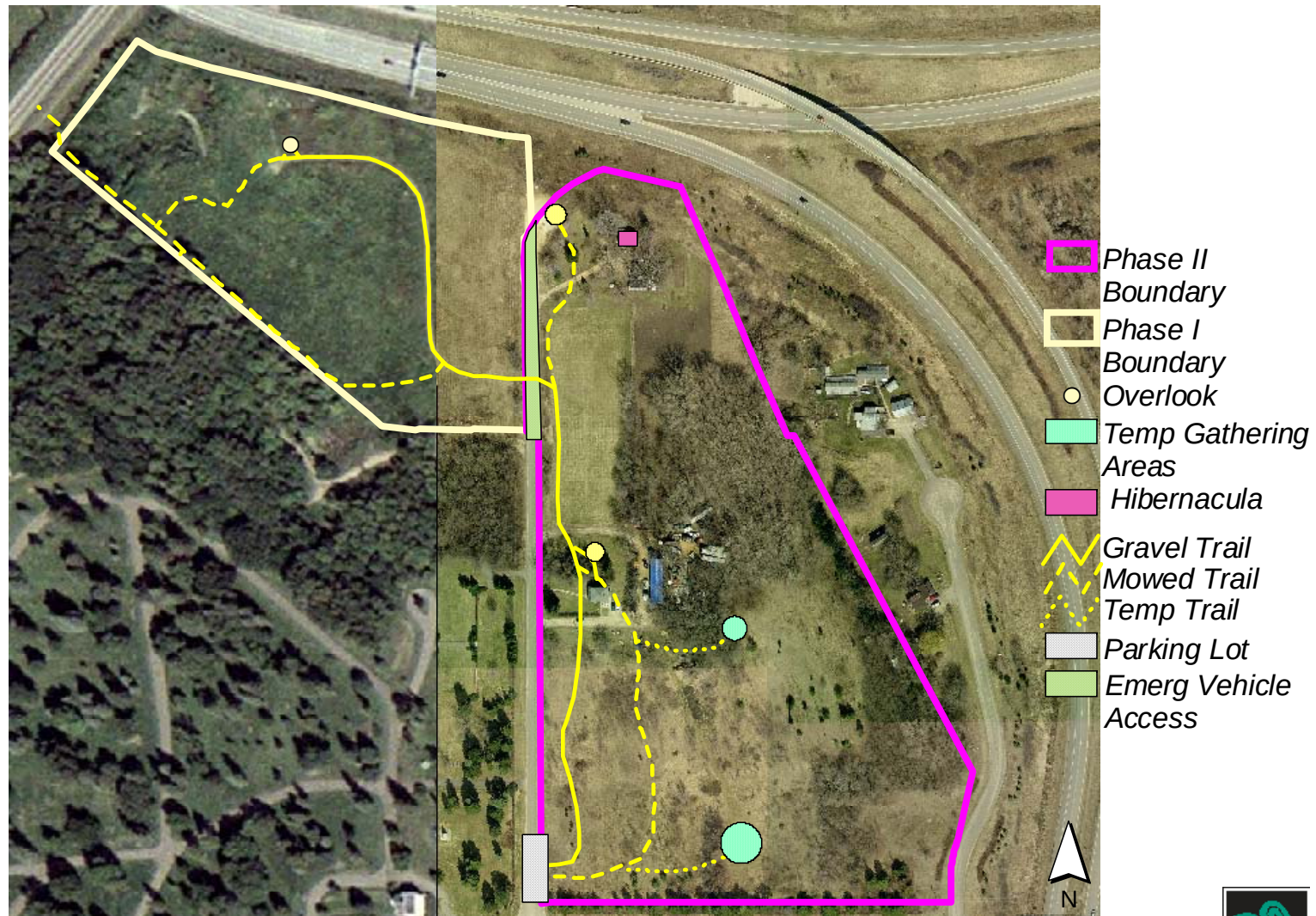


Figure 11: Phase I & Phase II Trails and Overlooks

(2006 Color Aerial courtesy of Dakota Co.)



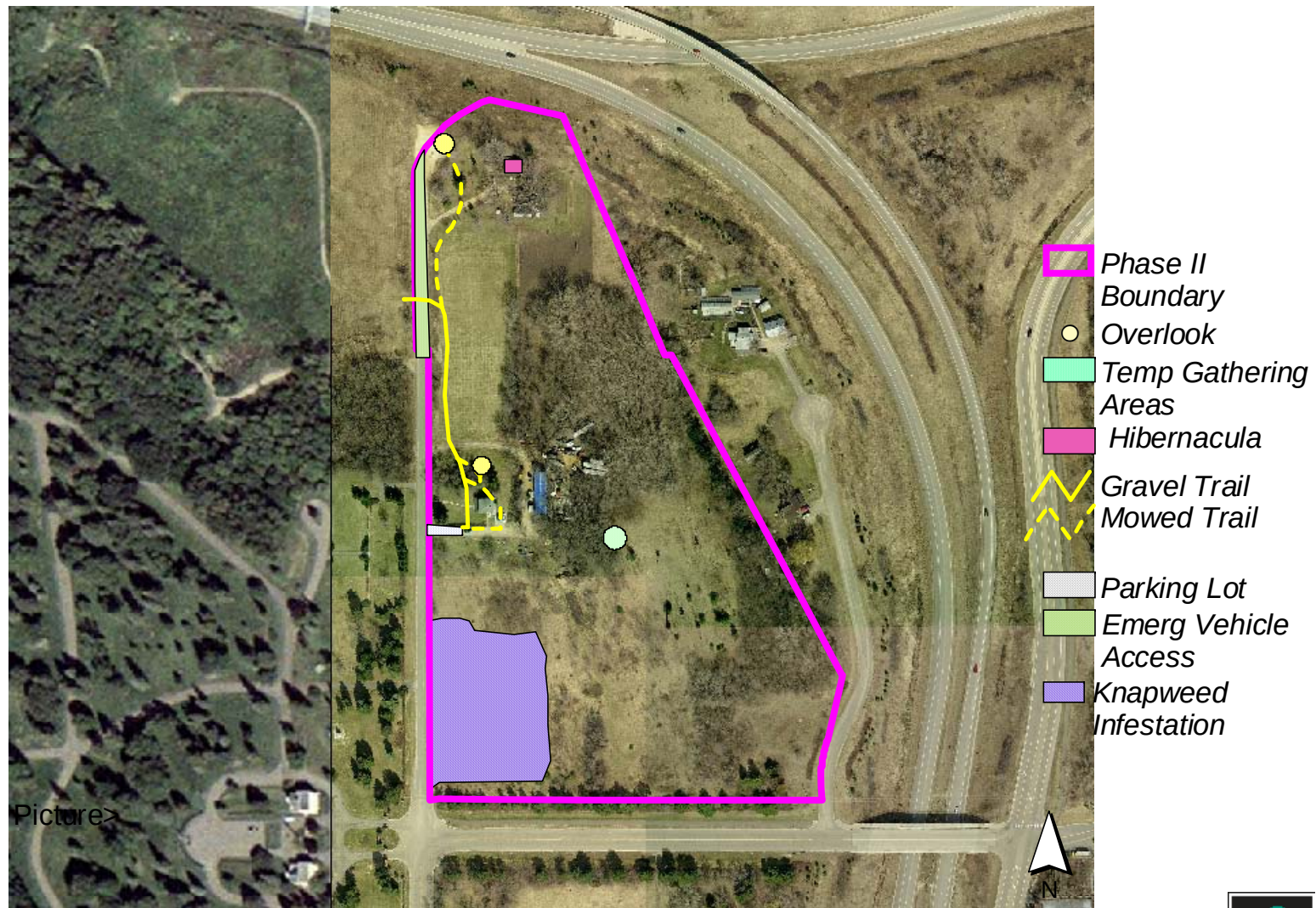


Figure 12: Proposed Temporary Trails and Overlook Locations at Pilot Knob Phase II

(2006 Color Aerial courtesy of Dakota Co.)

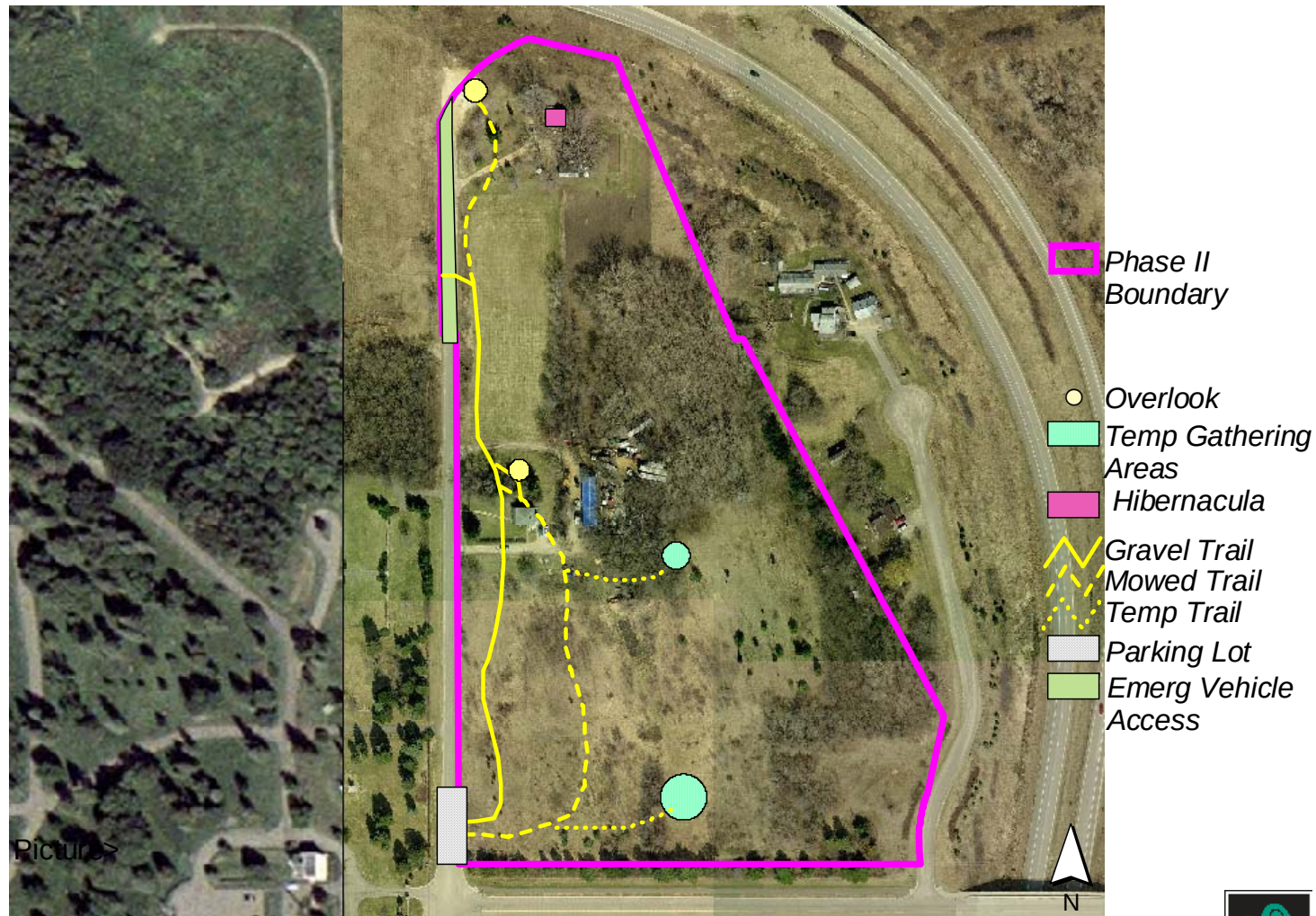


Figure 13: Proposed Trails and Overlook Locations at Pilot Knob Phase II

(2006 Color Aerial courtesy of Dakota Co.)

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Overlooks

The primary views are still located at the overlook area in the Phase I restoration. In Phase II there would be two overlooks where visitors would be able to pull off the path and stop. The first overlook would be at about the midway point of the site. Here there is a view towards Saint Paul of the old Highland Park Water Tower. The second overlook would be at the northern end of Phase II at the edge of where Pilot Knob Road ends. There is a glimpse into St. Peter's Cemetery from this point and also allows the visitor to look back at the journey they have made.

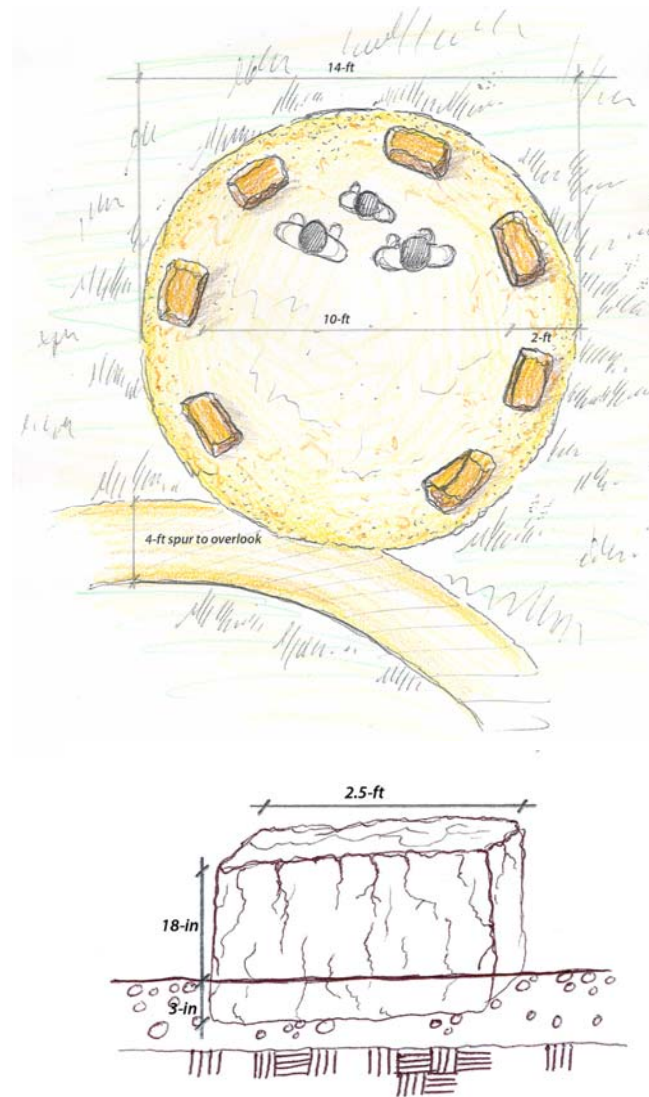
Recommended Overlook Design and Materials:

The 3 overlooks will be based on a circular design. This said there are two options for the design of the overlooks to consider: Option 1 would be keeping in tune with the recommendations in the Phase I proposal but having each overlook a little different. Option 2 would be to consult with a public artist to design the overlooks.

Option 1:

The proposed overlooks would be constructed with approximately 3-4 inches of crushed limestone or stone placed and compacted over the existing ground surface. The main overlook located in Phase I would be a 14 foot diameter circle with the other two being 10 foot diameter circles. The main overlook would still have sitting stones placed around the circle allowing visitors to have a rest and lookout over the river valley. Seven sitting stones, each representing one of the seven branches of Dakota, would be placed around the perimeter of the ring. Each stone should be approximately 3 feet in length. These stones would be anchored approximately 2-3 inches into the crushed limestone and would extend approximately 16-18 inches above the ground to provide a sitting area. It may be beneficial to place some soil on the edges of the overlook to

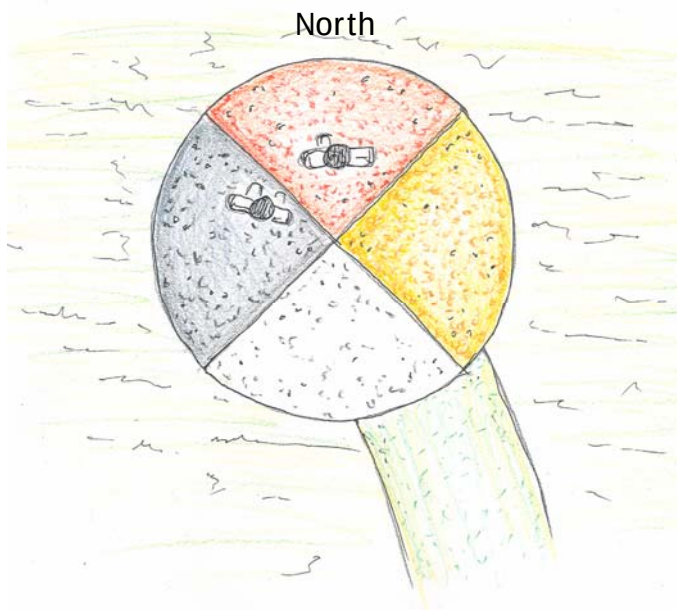
provide a growing medium for plants and to prevent erosion of the crushed stone.



Main Overlook, Illustration by Dan Shaw

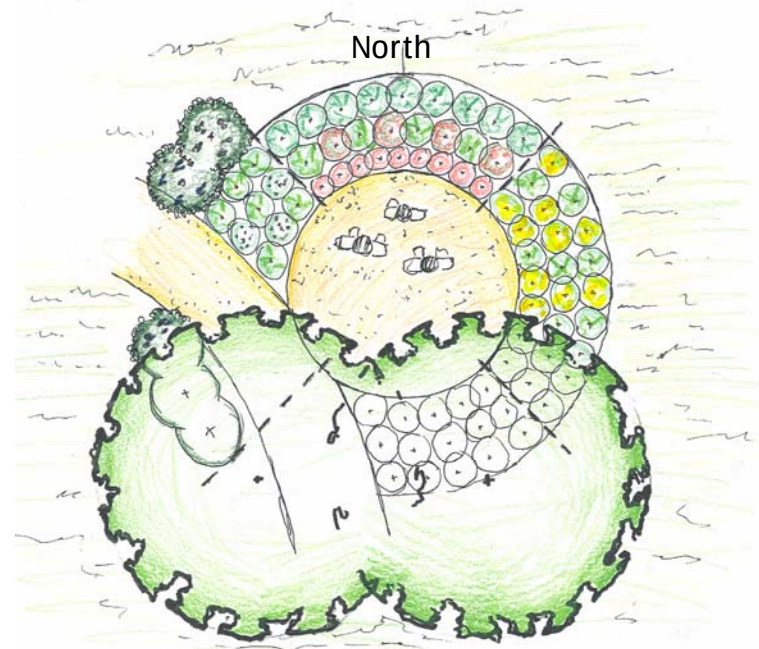
Pilot Knob Hill Natural Resource Management Plan

The northern most overlook would stay rather simple. Different colored stone would be used for the circle denoting the four cardinal directions: North – Red limestone, East – Yellow Limestone, South – White Limestone, West – Dresser Trap. Steel edging would be used around the perimeter of the circle as well as to separate the colored stone.



Northern Overlook, Illustration by Todd Rexine

The overlook at the midway point of Phase II would be a garden overlook again based on the cardinal points of the compass. The circular pad would still be 10 feet across and be constructed of compacted crushed limestone. The garden area would encompass a 4 foot area surrounding the gravel circle. Possible species to include could be: North – Red (Little Bluestem, Prairie Phlox, Prairie Smoke), East – Yellow (Lance Leaf Coreopsis, False Sunflower, Prairie Dropseed), South – White (Alum Root, Whorled Milkweed, Heath Aster, Prairie Dropseed, Quaking Aspen), West – Black (Black Eyed Susan, Prairie Dropseed, Black Chokeberry). Steel edging would be used to separate the garden planting from the prairie and around the compacted gravel pad.



Garden Overlook, Illustration by Todd Rexine

Option 2:

OHEYAWAHI
the hill much visited

a proposal for interpretive signs and an overlook submitted by seitu jones 07/07

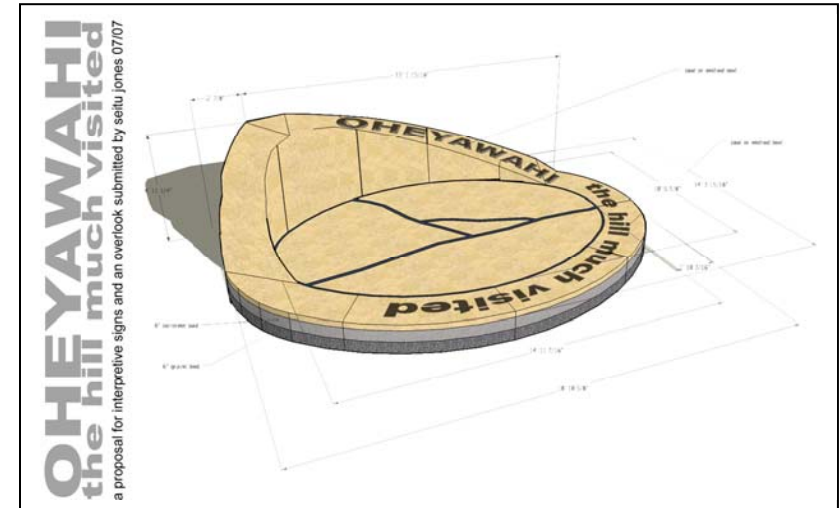
The composite image consists of three parts. At the top is a photograph of a grassy hill with a paved overlook and a parking lot, with the Minneapolis skyline visible in the distance. Below this is a perspective drawing of the overlook, showing a circular wall with a Dakota symbol and text. To the right is a site plan showing the hill's topography and the location of the overlook. Below the site plan is a photograph of the hill's base, showing the Dakota symbol and text.

perspective

The wall of the overlook is designed to represent the shape of Oheyawahi or the shape of Unkethi, the Dakota god of water and the underground. The oval base suggests the Dakota symbol for "the great spirit is everywhere." The lines inside the oval are recall a map of where the Minnesota and Mississippi come together creating "mdote" or the center of the world. The overlook will be constructed of cut Kasota limestone or cast concrete with text cast or etched into the surface.

site plan

The site plan follows the planting schedule in the Pilot Knob Natural Resource Management Plan.



Images by Seitu Jones

Pilot Knob Hill Natural Resource Management Plan

Group Gathering Spaces

There has been much discussion on having designated areas for larger group gatherings. These areas would remain in a prairie state during the majority of the year, but at the request of an applicant through a city permit, select areas could be mowed to accommodate groups. The two spaces are of different sizes to accommodate varying size groups. The larger of the spaces is located on the southern portion of the site and would allow for a 100 foot diameter area. This location was chosen because the topography lends a gentler slope for a larger space. The location also appears to be used already for gatherings as it is currently mowed. To demark this location, seven oaks could be planted on the outer edge of the circle, to represent the seven branches of the Dakota. The second location is located to the east of the current brick house. It is a smaller space with a diameter of about 40 feet. This location could also be demarked by oak trees. With the smaller space the oaks would be located at the four cardinal points of the compass.



Illustration by Todd Rexine

Pilot Knob Hill Natural Resource Management Plan

Interpretive Signs

Interpretive information is a crucial experiential component for a locality with such a storied past. Interpretive information could highlight natural and cultural history while interweaving art and storytelling traditions. Simple and clean markers at the main entry points of Pilot Knob are recommended. The main entrance to Pilot Knob presents an opportunity for a monument featuring the history of the site. Features to highlight in interpretation could include:

- Native Prairies and Savannas
- Dakota History
- Post European Settlement History
- Glacial River Warren and The Minnesota River Valley
- Decorah Shale and Fossils
- Migratory Birds
- The Restoration of Native Plant Communities at Pilot Knob

Interpretive information should be developed by individuals with special knowledge of certain topics. The Pilot Knob Preservation Association has volunteered the expertise and resources of its members to prepare interpretive historical materials.

A notice board or weather-proof box located near the main interpretive display should be included to post announcements of upcoming events at the site, such as volunteer events, and progress reports on the restoration work. A weather-proof announcement/update box could also be posted at the bike trail entrance at the west end of the site.

At the entrance there is also an opportunity to have visitors notify the city of potential invasive species on the site. Small maps could be made available for visitors to write on and leave. All that would be needed is a small sign and weatherproof drop box. This would be in conjunction with the notice board.

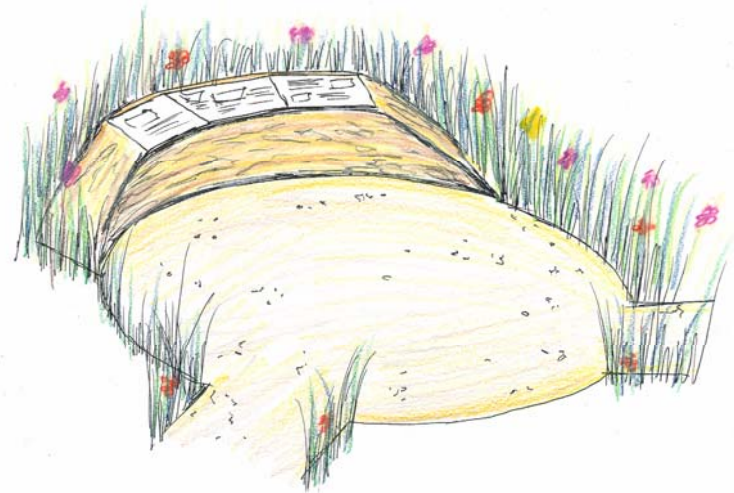
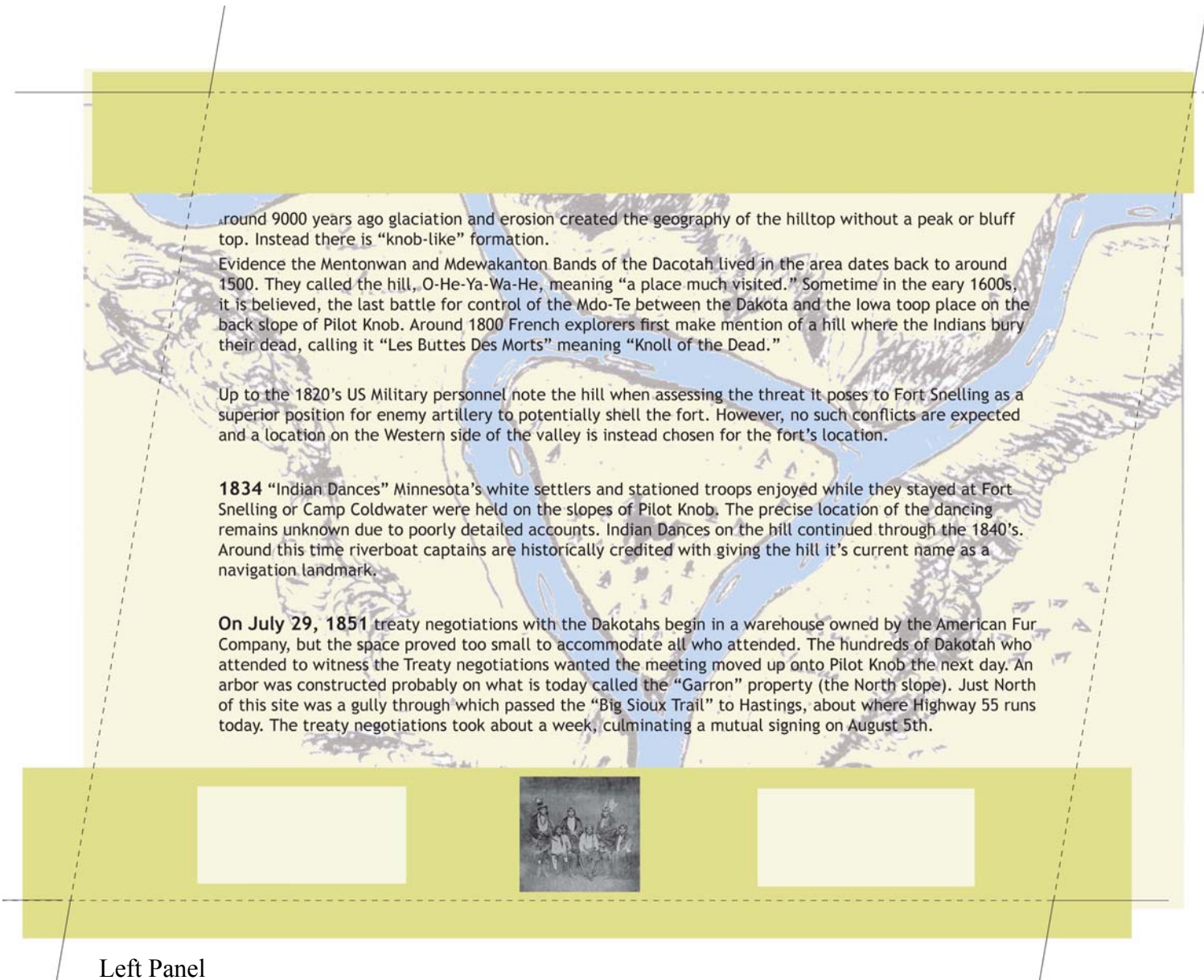


Illustration by Todd Rexine

Pilot Knob Hill Natural Resource Management Plan

Monument Entry Sign

Images used in entry sign examples from the Minnesota Historical Society. Text from www.dakotahistory.org/county/pilotknob.asp.



Welcome to Oheyawahí “a hill much visited”

In an original bill written by US Senator Steven Douglas for the creation of the Minnesota Territory, Pilot Knob was proposed as the place for the new capitol. Henry Sibley, though, rejected the site and suggested Saint Paul - which became the capitol and remains so to this day. Henry Sibley owned the land at the time and didn't want to compromise his integrity by profiting from the land sale involved to transfer Pilot Knob into government ownership.

1852 Just one year after the Treaty, construction began on a new St. Peter's Church (the previous church had been located below the present site since 1842). Most of the funds came from Henry Sibley and construction finished in 1853. Like many Christian churches built during that era it was purposely placed on a site previously used for Indian ceremonies.

Through the late 1800's, as local historians tried to compile information on the founding of the area, the idea that the Treaty of 1851 was signed on Pilot Knob was investigated because of uncertainty as to where the treaty signing had actually taken place.

1922 The Daughters of the American Revolution had placed a plaque on Pilot Knob commemorating the signing of the Treaty of 1851. The plaque can be seen today just inside the gates of Acacia Cemetery.

The plaque read: *"1851-1922 To commemorate the Treaty at Mendota negotiated on PILOT KNOB whereby the Sioux Indians ceded their lands in the Territory of Minnesota and State of Iowa to the United States Government. Placed by Mendota Chapter, Daughters of the American Revolution. SAINT PAUL, MINN."*

The first efforts to preserve Pilot Knob as a historic site were proposed in the Minnesota State Legislature in 1925. Those efforts proved unsuccessful, however. This was mid-way through the construction of the Mendota Bridge (1924-1926), and there may have been concerns that designating the hill a historic site would jeopardize the bridge project.

1926 Acacia Cemetery purchased Pilot Knob and started a landscaping project to create Acacia Park. As part of that project they removed the top 20 feet of the hill - the distinguishing knob-like formation for which the hill was named! Digging on the hill also turned up Indian remains in the 1920s. An arbor was constructed at the top of the hill similar to the one shown in paintings of the signing of the Treaty of 1851 in a likely inaccurate recreation (given that the accuracy of the paintings on which it was based is questionable).



Middle Panel

Pilot Knob Hill Natural Resource Management Plan

1932 The Daughters of the American Revolution place another plaque and marker on the hill commemorating the 1851 treaty - the plaque says that the treaty was negotiated on Pilot Knob but the location of the marker is not the site of the treaty negotiation.

1960's Reconstruction of Highway 55 was underway. This project removed highway access to Pilot Knob resulting in dead ended roads today.

Early 1980's A reconstruction project was planned for the Mendota Bridge. Mendota Bridge was repaired and placed on the historic register in the early 1990s. During reconstruction, almost two million cubic yards of dirt were removed from the incline on the East end of the bridge. The steepness of the hill, though, is still apparent in aerial photographs. The Garron site (the place believed most likely for the actual signing of the Treaty of 1851) also went up for sale.

2002 Acacia Cemetery, disallowed from selling plots on the East side of Pilot Knob hill, places "investment land" along the cemetery's Northern border up for sale. This is soon followed by a development company's plans to build high-density townhomes in the area.

The proposed construction project becomes the center of a contraversey over encroaching development and the site's historic significance to both Native Americans and Minnesota's heritage.

June 23, 2003 Pilot Knob was officially nominated for placement on the National Register of Historic Places. In July 2003 discussions began on forming a non-profit group to advocate conservation of Pilot Knob and future solutions for what to do with the acreage. In August a self appointed sub-committee presented an exhibit at the Mendota Pow-wow (held on the grounds of St. Peter's Church in Mendota) hoping to raise awareness of Pilot Knob's historical significance and the threat posed by development.

As of this writing, Pilot Knob is not officially acknowledged nor preserved as a registered historic site.

Following is copied from: <http://www.dakotahistory.org/county/pilotknob.asp>



Pilot Knob Hill Natural Resource Management Plan

Large Interpretive Panel (32"x22") to be located at overlooks.

Top three-quarters devoted to description of the topic with the bottom section reserved for interesting facts or other educational opportunities

Prairie and Savanna Restoration

Restoration Process

Restoration of native plant communities varies from site to site. With Pilot Knob the restoration is spread out over multiple years. This is to allow for removal of undesirable plants through the use of herbicide sprays, burning and cutting.



Prairie Community

Prairies are areas of large open space composed primarily of various grasses and wildflowers. The plants can vary in height from 6-12" all the way up to 6 foot tall grasses.



Savanna Community

Savannas are comprised of both prairie plants and trees. The tree species tend to be oak trees with the prairie plants being those that can tolerate partial shade.



Ongoing Maintenance

The presence of fire in prairie and savanna communities is important in maintaining the diversity of plant species. Fire also helps to keep unwanted plant species out or under control.





Big Bluestem
(*Andropogon gerardii*)
Look for the turkey foot seed head.



Sidecoats Grama
(*Bouteloua curtipendula*)
Look for the seeds hanging to one side.

Native Plants

Watch for these plants as you walk the trails.



Little Bluestem
(*Schizachrium scoparium*)
Forms golden bronze clumps in the fall.

Butterfly Weed
(*Asclepias incarnata*)
Nectar source for a variety of butterflies.



Background image from Minnesota Historical Society all other images provided by Great River Greening

Snake Hibernacula

In the winter snakes require a place to hibernate. Being cold blooded they require a safe den underground that stays above freezing and does not flood. With more and more development and the grading of sites these dens are inadvertently filled in and reduce habitable areas for snakes.



Being a vital part of the food chain it was important to create habitat for snakes at Pilot Knob. Snakes tend to eat small rodents, such as mice, along with frogs and insects. In turn they are source of food for many larger mammals and birds.

At Pilot Knob there were houses removed for the restoration process to begin. This allowed a great opportunity to reuse the basement cavity of one of the houses for a hibernacula. Instead of just filling the whole with soil it was filled with a combination of concrete slabs, blocks, stones and soil. This mixture of materials allowed for the creation of multiple dens for snakes to hibernate in over the winter months.

Two common snake species to look for

Common Garter Snake (*Thamnophis sirtalis*)



Redbelly Snake (*Storeria occipitomaculata*)

Small interpretive panel (16"x20")

This size panel would be used along the trails at areas of interest to describe special features, habitats, species or views occurring at Pilot Knob.

Care should be taken on both the large and small interpretive panels so the wording engages both children and adults.

Recommendations for Parking and Pilot Knob Road

Parking

There is currently ample space at the southwest corner to create a parking lot. The parking lot would incorporate part of Pilot Knob Road north of Acacia Blvd. This would allow use of the existing asphalt road bed to create a portion of the parking lot with the rest of the space being comprised from the gravel area on the east side of Pilot Knob Rd. The parking lot would offer a good location to create some recessed planting areas to accept stormwater from the road bed and infiltrate it. Along with stone outcroppings, the recessed infiltration areas could help to define the parking lot and prohibit vehicles from the restoration area.

Bus parking can be accomplished with on street parking on Acacia Blvd. Visitors would be able to exit the bus onto the bike path and follow the bike path to the entrance area of Phase II, at the corner of Pilot Knob Road and Acacia Blvd.

Currently the north side of Acacia Blvd (between Pilot Knob Road and Valencour Circle) can accommodate parking for 14 school buses or 32 automobiles. With current city zoning codes there is available on street parking on both sides of Acacia Blvd and Pilot Knob Road south of Acacia Blvd.

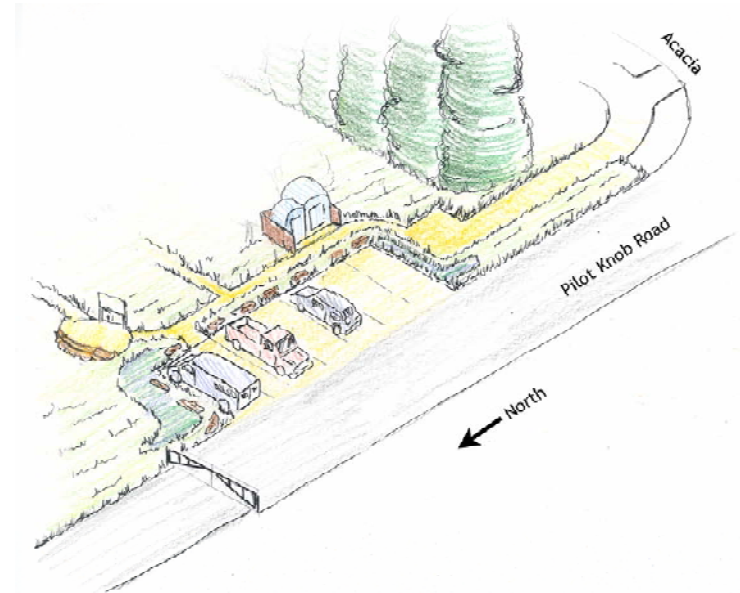


Illustration by Todd Rexine

Pilot Knob Hill Natural Resource Management Plan

Emergency Vehicle Access

Pilot Knob (north of Acacia Blvd.)

With the land on the west side of Pilot Knob being restored to prairie/savanna there it is not necessary for Pilot Knob Road to continue to the gravel cul-de-sac, on the northern end of the site between Phase I and Phase II. However, Acacia cemetery still needs to have access from Pilot Knob Road to the northern edge of the cemetery. There also needs to be an emergency vehicle access to the northern edge of the restoration. This being the case, there could be a metal swing gate installed on the northern end of the parking lot to allow access by Acacia cemetery and emergency vehicles. The asphalt road would remain to the northern property line between Acacia and Phase I restoration. At this point there are several options to consider for the section of Pilot Knob Road north of Acacia Cemetery.

Option 1: Leave Pilot Knob Road intact.

This would allow emergency vehicles access as needed to the end of Pilot Knob Road. It would create a physical barrier between Phase I and Phase II for wildlife. It would also continue to create a visual barrier between both Phases.

Option 2: Remove the asphalt from Pilot Knob Road and install a vegetated emergency vehicle access.

The remaining road bed north of the property line would be excavated and in its place a vegetate emergency access route would be installed. There are a number of products available that can be utilized to help stabilize the soil and give it the structural strength to support emergency vehicles. This would help unite both phases together and would visually break up the straight line that Pilot Knob Road currently creates.

The access will need to be planted as dry prairie and burned off as part of a prescribed burn. It would require the excavation of all the compactable gravel and having engineered soils installed. This would be a mix of angular rock and native or imported soil. If mowed it is recommended that it not all be mowed at the same time allowing for the prairie to cross over and break up the linear nature of the road. This will also allow cover for wildlife that will be crossing over the old road bed.

Marked posts would need to be installed to delineate the edge of the access area.

Upon conversations with Alcoa GeoSystems, Geoblock is a plantable structural system that would work for emergency vehicle access.

An option for the asphalt is to have it hauled out and milled for reuse on other roads. The gravel sub-base for the road would be able to be excavated and reused to construct some of the trails.

College of Architecture – University of Minnesota

A publication of students work for interpretive buildings for Pilot Knob was reviewed. The designs were comprehensive and insightful using various forms of construction. At this time buildings on the land does not fit the low impact restoration that the city is looking at. Also with the current funding and grants being used to procure the site a structure is not able to be located on Pilot Knob.

Table 6: Estimated Construction Costs

Year 1 Installation Estimate	
Crushed Limestone Trail (Phase 1 & north half Phase 2)	
Regrading before limestone placement	\$1,200
62 CY (16800 CF) crushed Class V limestone at 3" thick with placement	\$6,500
Rock check-dams in ditches	\$650
Oversight	\$800
<i>Construction Subtotal</i>	<i>\$9,150</i>
Main Overlook (Phase 1)	
3 CY crushed Class V limestone at 4" thick w/ placement	\$350
7 Boulders w/ placement (assume donated stone – cost is moving from Acacia property)	\$1,400
7 Boulders purchased and placed	\$2,800
Oversight	\$500
<i>Construction Subtotal</i>	<i>\$2,250-\$3,650</i>
Northern Overlook	
3 CY 3/4" crushed stone 4" thick w/ placement	\$500
Metal Edging Installed	\$400
Oversight	\$200
<i>Construction Subtotal</i>	<i>\$1,200</i>

Garden Overlook	
3 CY crushed Class V limestone at 4" thick w/ placement	\$350
Metal Edging Installed	\$500
Mulch	\$200
Plants Installed	\$1,600
Oversight	\$600
<i>Construction Subtotal</i>	<i>\$3,250</i>
Interpretive Signs at Overlooks	
Editing submitted written work	\$1,000
Materials and construction	\$6,000
Installation (labor, footings, etc.)	\$3,000
<i>Interpretive Sign Subtotal</i>	<i>\$10,000</i>
Fire Ring (10ft diameter)	
1.5 ton of 12-18" boulders installed	\$400
<i>Construction Subtotal</i>	<i>\$400</i>
TOTAL	\$26,250 – \$27,650

Table 7: Estimated Construction Costs, Parking Lot Area

South End Installation Estimate
(to be completed once Knapweed is under control)

Connection to Bike Trail on Acacia Blvd	
12 CY (324 CF) crushed Class V limestone a 4" thick to path	\$2,750
Parking Area	
Rough grading	\$2,000
50 CY (1350 CF) crushed Class V limestone at 12" thick w/ placement	\$6,000
Placement soil and seeding on edges of Class V to prevent erosion	\$1,000
20 Boulders w/ placement (donated – cost is moving from Acacia property)	\$3,000
20 Boulders purchased and placed	\$6,000
450 SF Infiltration Basin installed	\$1,800
Oversight	\$1,600
<i>Construction Subtotal</i>	<i>\$15,400-\$18,400</i>
Entrance Interpretive Monument	
Editing submitted written work	\$1,000
Graphics design for large 3-panel kiosk	\$6,000
Materials and construction	\$10,000
Installation (labor, footings, etc.)	\$3,000
Simple interpretive sign (alternative to kiosk)	\$6,000
<i>Interpretive Sign Subtotal</i>	<i>\$6000 - \$20,000</i>
TOTAL	\$24,150 – \$41,150

Removal of Pilot Knob and installation of Emergency Vehicle access and gates to be overseen by the city of Mendota Heights

Table 8: Summary of Estimated Costs by Year

YEAR	RESTORATION		CONSTRUCTION
	Basic	Optional Enhancements/Volunteer Events	Trail/Overlook/ Parking Lot
2008	\$33,375	\$16,800	(Phase I and Phase II Area 1, north trails, Overlooks, and signage) \$27,650
2009	\$16,650		
2010	\$45,810		Area 2 (Parking lot, remaining trails, signs) \$41,150
2011	\$10,150		
2012	\$5,800		
2013	\$10,250		
2014	\$9,200		
2015	\$5,200		
2016	\$10,050		
2017	\$8,050		
TOTAL	\$154,535	\$16,800	\$68,800

Recommendations for Involving Community Volunteers

Volunteers can be a way to contain costs, depending on how much advance organizing, event day assistance, and supplies (box lunches, rented Bifs) are needed. Informal groups of hard-working, committed volunteers that need minimal oversight and do not require additional supplies or organizing (volunteer recruiting, rented toilets, and box lunches) are the most beneficial in terms of containing cost. Many local community members are already enthused about the potential acquisition and restoration of the site and should be a great source of assistance to the project.

A large volunteer event of 100 or more volunteers generally requires funding for training, advertising, recruitment, event supplies, and advance site prep. When funding is obtained, these events are an excellent way to raise awareness and publicity, foster deeper connections to the site, and recruit new volunteers, all while performing meaningful work. Activities that can be performed at least in part by volunteers are noted in the implementation schedules and below.

Potential activities that can be handled by volunteers:

- tree planting
- hauling and stacking previously cut brush
- planting native forb (wildflower) seedlings
- weed pulling (maintenance)
- monitoring the natural area

Great River Greening has extensive experience in successfully organizing large groups of volunteers in restoration activities, including tree and shrub plantings, exotic species removal and

prairie seed collection and seeding. To date, Great River Greening has engaged more than 15,000 community volunteers in these types of activities at many sites in the Twin Cities metropolitan river valleys. Our successful approach relies on our trained volunteer supervisors who educate and train volunteers to conduct restoration activities properly in well-defined work units.

Recruiting and Engaging Volunteers

Recruiting volunteers from neighborhoods and businesses or other institutions close to the location of a restoration project is always a priority for Great River Greening. We recruit individuals and families for our events, as well as larger groups. Groups of community members already united for their own reasons often appreciate opportunities to participate in enjoyable hands-on activities that serve the wider community. Ecological restoration projects are a great match for many individuals and groups searching for volunteer opportunities.

Groups to contact for recruiting volunteers include:

- Community organizations (like the Pilot Knob Preservation Association)
- Neighborhood block clubs
- Schools and colleges (many have service learning programs)
- Churches
- Scout troops
- Garden clubs
- Local businesses
- Civic organizations
- Volunteer recruitment organizations, (eg. Twin Cities Volunteer Resource Center)
- Community volunteer programs for employees of local corporations (for example, in the Twin Cities, 3M, H.B. Fuller,

Comcast, Cargill and other corporations encourage their employees to volunteer)

Event publicity can be done by word-of-mouth, and with fliers, press releases to community newspapers, newsletters, websites and email listservs.

Organizing Volunteer Events

Volunteers enjoy well-organized events. When volunteers' basic needs are met and their time is used well at an event, they enjoy themselves, experience a sense of satisfaction, and are more likely to volunteer again. Educating volunteers about the purposes and benefits of the restoration activities, and training them to properly conduct the activities are essential to holding a well-organized, satisfying volunteer event.

Greening has conducted dozens of volunteer events with people of all ages. We have held events for only a handful of volunteers and events with as many as 1,100 volunteers. Our events are typically 3 hours long, and are usually held on Saturday mornings. Following are the steps we take to conduct our events.

Planning the volunteer event

- Define the location and field activities of the event, considering event logistics like parking location, registration area and wrap-up/lunch area.
- Estimate the number of volunteers required for the field work and other volunteer event needs. The kinds of volunteers we typically recruit include:
- Not all activities will be appropriate for volunteers of all ages and recruitment will need to reflect this. (For example, brush hauling is unsafe for young children)
- Trained volunteer supervisors (to lead and instruct restoration volunteers).
- Parking volunteers (to direct traffic--especially important for large events).
- Registration volunteers
- Food table volunteers
- Event cleanup volunteers
- Recruit and register volunteers in advance (especially for large events).
- Confirm registration with volunteers, and provide site maps, directions and event information (by mail or email).

Organizing the field work

- Before the event, organize the restoration work area into "work units." A work unit is the defined area for work to be completed by 20 volunteers and 2 volunteer supervisors during the event time period.
- All work units are well-marked, and all necessary materials (plants, woodchip, water for plantings, for example) and tools are provided at the event site. Occasionally (particularly for

very large events), we ask volunteers to bring their own hand tools to supplement the ones we provide.

- Trained volunteer supervisors arrive at the event shortly before the restoration volunteers and orient themselves to their work units and the event activities.

Volunteer organization at the event

- Posted signs direct volunteers to parking and registration areas.
- Restroom facilities are located in convenient locations. (We usually rent “biffs.”)
- All volunteers go to the registration area to sign in, and are assigned to work units.
- Coffee and snacks are provided. (These are often donated by local businesses.)
- Field staff is trained in first aid. Cell phones and first aid equipment are available. An emergency plan is in place in case of an accident. Staff informs volunteer supervisors of the plan during their orientation. For very large events, a trained nurse or other medical staff is present at the event site.
- Water is provided at work units and the event wrap-up area.

Field activities at the event

- Volunteer supervisors direct their volunteers to their work units and provide a 10-minute training about the purpose of the project and activities, demonstrate proper methods, identify any safety concerns and answer questions.
- Volunteer supervisors oversee the activities of the volunteers, ensuring proper methods are used.
- Staff oversees volunteer supervisors to ensure work is happening appropriately and on schedule.

Groups that finish the work in their units early are asked to shift to assist in another work unit so all the work in the project area can be completed by the end of the event.

- Water is provided at the work units.

Thanking the volunteers

- When the field work period of the event is completed, volunteers gather at a central location for snacks or lunch and a short presentation.
- Event hosts thank the volunteers for their work and provide additional information about the project. Greening typically invites partner organizations and local public officials to make presentations during the event wrap-up. This is a good time and location for partners or local groups to display booths.
- After the event, we mail postcards to volunteers thanking them for their participation.

Evaluating the event

- We request comments about our events from participants, both while they are at the event and after the event. For most events, we typically survey our volunteer supervisors and a subset of the volunteer participants to help identify where we need to improve.
- Staff holds a debriefing after each event to further improve our efforts.

Training volunteer supervisors

- Great River Greening already has a network of volunteer supervisors who lead work groups at Greening events

Pilot Knob Hill Natural Resource Management Plan

- Volunteers willing to serve as supervisors participate in our basic training, where they learn about their role at Greening events. A supervisor's role is to educate volunteers about the purpose of the project and event activities, to help motivate the volunteers and help them enjoy the activities, and to help ensure they use proper techniques.
- In addition to the basic training, we also offer advanced training to volunteer supervisors to expand their knowledge of ecological restoration activities. Topics have included exotic species control, prairie plant identification and an introduction to the natural communities of the Twin Cities area.

Potential Volunteer Events

Greening has experience engaging volunteers in the following management activities:

- Planting native trees and shrubs
- Planting wildflower and grass seedlings
- Collecting and broadcasting prairie seed
- Removing exotic species seedlings using weed wrenches
- Hauling exotic species brush that has been cut by professional crews

Volunteer Site Monitors

Volunteers can also assist the monitoring and management of the site by periodically walking through the site and reporting on management problems (trash, vandalism, new exotic weed problems) to the City's parks department. They can also record observations of interesting birds or other creatures they encounter. The City of Maplewood (see "Nature Center Volunteers" in www.maplewoodmn.com) has a good program that could serve as a model. In this program, trained volunteers visit their designated natural areas once a month, fill out a monitoring form that they submit to city staff.

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Appendix A: Plant Species for Restoration at Pilot Knob

Mesic Prairie – page 1

SOUTHERN MESIC PRAIRIE				
List of Potential Plant Species ¹			Species in PRI Standard Grass & Wildflower Seed Mixes ² (% of mix) ³	Other Species Recommended for Planting
Genus	Species	Common Name		
Understory Trees				
Populus	tremuloides	Quaking aspen		
Quercus	macrocarpa	Bur oak		
Quercus	ellipsoidalis	Northern pin oak		
Juniperus	virginiana	Red cedar		
Shrubs				
Amorpha	canescens	Lead-plum	4% b.w.	
Amorpha	nana	Fragrant false indigo		X
Artemisia	frigida	Prairie sagewort		
Cornus	racemosa	Gray dogwood		
Cornus	sericea	Red-osier dogwood		
Corylus	americana	American hazelnut		
Prunus	americana	Wild plum		
Prunus	virginiana	Chokecherry		
Rhus	glabra	Smooth sumac		
Rhus	typhina	Staghorn sumac		
Rosa	arkansana	Prairie rose		X
Rosa	blanda	Smooth wild rose		
Rubus	occidentalis	Black raspberry		
Rubus	idaeus	Red raspberry		
Salix	humilis	Prairie willow		
Spiraea	alba	Meadowsweet		
Symphoricarpos	cnx.	Snowberry		
Forbs				
Achillea	millefolium	Yarrow	2% b.w.	
Agastache	foeniculum	Fragrant giant hyssop	3% b.w.	clay
Allium	stellatum	Prairie wild onion		X
Allium	canadense	Wild garlic		
Anemone	cylindrica	Long-headed thimbleweed		
Anemone	virginiana	Virginia thimbleweed		
Anemone	canadensis	Canada anemone		II
Antennaria	spp.	Pussytoes		
Apocynum	androsaemifolium	Spreading dogbane		
Apocynum	sibiricum	Clasping dogbane		
Artemisia	ludoviciana	Western mugwort		X
Artemisia	campestris	Tall wormwood		
Asclepias	tuberosa	Butterfly-weed		
Asclepias	ovalifolia	Oval-leaved milkweed		
Aster	oolentangensis	Sky-blue aster		X
Aster	ericoides	Heath aster		X
Aster	lanceolatus	Panicle aster		X
Aster	novae-angliae	New England aster		clay X
Aster	laevis	Smooth aster	4% b.w.	clay
Astragalus	agrestis	Field milk-vetch		clay
Astragalus	canadensis	Canada milk-vetch		X
Campanula	rotundifolia	Harebell		
Chrysopsis	villosa	Prairie golden aster		

Mesic Prairie – page 2

<i>Cirsium</i>	<i>muticum</i>	Swamp thistle			
<i>Cirsium</i>	<i>flodmani</i>	Prairie thistle			
<i>Comandra</i>	<i>umbellata</i>	Bastard toad-flax			II
<i>Coreopsis</i>	<i>palmata</i>	Stiff tickseed	4% b.w.		
<i>Dalea</i>	<i>purpurea</i>	Purple prairie-clover	14% b.w.		clay
<i>Dalea</i>	<i>candida</i>	White prairie-clover	4% b.w.		clay
<i>Desmodium</i>	<i>canadense</i>	Canadian tick-trefoil	1% b.w.		
<i>Erigeron</i>	<i>strigosus</i>	Daisy fleabane			
<i>Euphorbia</i>	<i>corollata</i>	Flowering spurge			
<i>Euthamia</i>	<i>graminifolia</i>	Grass-leaved goldenrod			
<i>Fragaria</i>	<i>virginiana</i>	Common strawberry			
<i>Galium</i>	<i>boreale</i>	Northern bedstraw			
<i>Galium</i>	<i>triflorum</i>	Three-flowered bedstraw			
<i>Gentiana</i>	<i>andrewsii</i>	Closed gentian			X
<i>Geum</i>	<i>triflorum</i>	Prairie smoke			
<i>Glycyrrhiza</i>	<i>lepidota</i>	Wild licorice			X
<i>Hedeoma</i>	<i>hispidula</i>	Mock pennyroyal			
<i>Helenium</i>	<i>autumnale</i>	Autumn sneezeweed			
<i>Helianthus</i>	<i>maximiliani</i>	Maximilian's sunflower			X
<i>Helianthus</i>	<i>giganteus</i>	Giant sunflower			
<i>Helianthus</i>	<i>pauciflorus</i>	Stiff sunflower	2% b.w.		
<i>Helopsis</i>	<i>helianthoides</i>	Ox-eye	5% b.w.		clay
<i>Heuchera</i>	<i>richardsonii</i>	Alum-root			
<i>Hypoxis</i>	<i>hirsuta</i>	Yellow star-grass			
<i>Krigia</i>	<i>biflora</i>	Two-flowered Cynhia			
<i>Kuhnia</i>	<i>eupatorioides</i>	False bonaset			
<i>Lactuca</i>	<i>spp.</i>	Wild lettuce			
<i>Lathyrus</i>	<i>palustris</i>	Marsh vetchling			
<i>Lathyrus</i>	<i>venosus</i>	Veiny pea			
<i>Lespedeza</i>	<i>capitata</i>	Round-headed bush-clover	1% b.w.		clay
<i>Liatis</i>	<i>aspera</i>	Rough blazing star	1% b.w.		
<i>Liatis</i>	<i>ligulistylis</i>	Northern plains (meadow) blazing star	2% b.w.		
<i>Liatis</i>	<i>pycnostachya</i>	Gay feather (tall blazing star)	2% b.w.		
<i>Lilium</i>	<i>philadelphicum</i>	Wood lily			X
<i>Lithospermum</i>	<i>canescens</i>	Hoary puccoon			
<i>Lobelia</i>	<i>spicata</i>	Rough-spiked Lobelia			X
<i>Lupinus</i>	<i>perennis</i>	Wild lupine	3% b.w.		
<i>Mirabilis</i>	<i>hirsuta</i>	Hairy four-o'clock			
<i>Monarda</i>	<i> fistulosa</i>	Wild bergamot	4% b.w.		clay
<i>Oenothera</i>	<i>biennis</i>	Common evening-primrose			
<i>Oxalis</i>	<i>cnx.</i>	Wood-sorrel			
<i>Pedicularis</i>	<i>canadensis</i>	Wood-betony			X
<i>Pedicularis</i>	<i>argophyllum</i>	Silvery scurf-pea			X
<i>Phlox</i>	<i>pilosa</i>	Prairie phlox			X
<i>Physalis</i>	<i>heterophylla</i>	Clammy ground-cherry			
<i>Physalis</i>	<i>virginiana</i>	Ground-cherry			
<i>Polygala</i>	<i>sanguinea</i>	Purple milkwort			
<i>Polygala</i>	<i>polygama</i>	Racemed milkwort			
<i>Potentilla</i>	<i>simplex</i>	Old-field cinquefoil			
<i>Potentilla</i>	<i>arguta</i>	Tall cinquefoil			X
<i>Prenanthes</i>	<i>racemosa</i>	Smooth rattlesnake-root			X
<i>Pycnanthemum</i>	<i>virginianum</i>	Virginia mountain-mint			X

Mesic Prairie – page 3

<i>Ratibida</i>	<i>pinnata</i>	Gray-headed coneflower			clay	X
<i>Rudbeckia</i>	<i>hirta</i>	Black-eyed Susan	16% b. w.		clay	
<i>Scutellaria</i>	<i>leonardi</i>	Leonard's skullcap				
<i>Stiphium</i>	<i>perfoliatum</i>	Cup-p-lant				
<i>Sisyrinchium</i>	<i>campestre</i>	Field blue-eyed grass				
<i>Smilacina</i>	<i>stellata</i>	Starry false Solomon's-seal				
<i>Solidago</i>	<i>rigida</i>	Stiff goldenrod	6% b. w.		clay	
<i>Solidago</i>	<i>canadensis</i>	Canada goldenrod				
<i>Solidago</i>	<i>gigantea</i>	Giant goldenrod				
<i>Solidago</i>	<i>memoralis</i>	Gray goldenrod	1% b. w.			
<i>Solidago</i>	<i>parviflora</i>	Upland white aster/goldenrod	2% b. w.			
<i>Solidago</i>	<i>speciosa</i>	Showy goldenrod				
<i>Stachys</i>	<i>palustris</i>	Woundwort				X
<i>Thalictrum</i>	<i>dasycarpum</i>	Tall meadow-rue				
<i>Tridacantha</i>	<i>bracteata</i>	Bracted spiderwort				
<i>Verbena</i>	<i>stricta</i>	Hoary verberna	15% b. w.			
<i>Vernonia</i>	<i>fasciculata</i>	Bunched ironweed				X
<i>Veronicastrum</i>	<i>virginicum</i>	Culver's root				X
<i>Vicia</i>	<i>americana</i>	American vetch				
<i>Viola</i>	<i>pedatifida</i>	Prairie bird-foot violet				
<i>Viola</i>	<i>pedata</i>	Bird-foot violet				
<i>Zizia</i>	<i>aptera</i>	Heart-leaved alexanders				X
<i>Zizia</i>	<i>aurea</i>	Golden alexanders	3% b. w.			
Grasses, Rushes and Sedges						
<i>Andropogon</i>	<i>gerardii</i>	Big bluestem	35% pls			
<i>Bouteloua</i>	<i>curtipendula</i>	Side-oats grama	8% pls		clay	
<i>Bromus</i>	<i>kalmii</i>	Kalm's brome				X
<i>Carex</i>	<i>bicknellii</i>	Bicknell's sedge				
<i>Carex</i>	<i>meadii</i>	Mead's sedge				X
<i>Carex</i>	<i>tenera</i>	Marsh-straw sedge				
<i>Carex</i>	<i>scoparia</i>	Pointed-broom sedge				
<i>Carex</i>	<i>siccata</i>	Hay sedge				
<i>Elymus</i>	<i>canadensis</i>	Canada wild rye	4% pls			
<i>Elymus</i>	<i>trachycaulis</i>	Slender wheatgrass			clay	
<i>Eragrostis</i>	<i>spectabilis</i>	Purple lovegrass				
<i>Koeleria</i>	<i>pyramidalata</i>	June-grass				
<i>Muhlenbergia</i>	<i>mexicana</i>	Mexican satin-grass				
<i>Muhlenbergia</i>	<i>glomerata</i>	Clustered muhly grass				
<i>Muhlenbergia</i>	<i>frondosa</i>	Swamp satin-grass				
<i>Muhlenbergia</i>	<i>racemosa</i>	Marsh muhly grass				
<i>Panicum</i>	<i>oligosanthos</i>	Few-flowered panic grass			clay	
<i>Panicum</i>	<i>leibergii</i>	Leiberg's panic grass				X
<i>Panicum</i>	<i>virgatum</i>	Switchgrass	2.5% pls			
<i>Panicum</i>	<i>perlongum</i>	Long-leaved panic grass			clay	
<i>Panicum</i>	<i>commonianum</i>	White-haired panic grass				
<i>Panicum</i>	<i>capillare</i>	Witch grass				
<i>Schizachyrium</i>	<i>scoparium</i>	Little bluestem	25% pls			
<i>Sorghastrum</i>	<i>nutans</i>	Indian grass	25% pls			
<i>Spartina</i>	<i>pectinata</i>	Prairie cord-grass			clay	
<i>Sporobolus</i>	<i>heterolepis</i>	Prairie dropseed	0.5% b. w.			
<i>Stipa</i>	<i>spartea</i>	Porcupine-grass				
Ferns and Fern Allies						

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Ferns and Fern Allies				
<i>Equisetum</i>	<i>laevigatum</i>	Smooth scouring-rush		
<i>Equisetum</i>	<i>hyemale</i>	Tall scouring-rush		
<i>Equisetum</i>	<i>arvense</i>	Field horsetail		

¹ Modified from a compilation of MNDNR vegetation plot data from East-Central Minnesota: see "Species Lists for Terrestrial and Palustrine Native Plant Communities in East-central Minnesota" by C. Lane & H. Texler (at www.greatrivergreening.org)

² From Prairie Restorations, Inc. (www.prairieresto.com/seed_mixes.htm)

³ % refers to % of grass mix or % of wildflower mix. pls = pure live seed; b.w. = bulk weight

Clay species modified from Prairie Moon Nursery Mesic Clay Mix

(http://www.prairiemoon.com/store/template/product_detail.php?IID=747&SID=4bd9277f2a1ff1c813d8f20fc9ecd903)

Dry Prairie – page 1

DRY PRAIRIE				
List of Potential Plant Species ¹				
Genus	Species	Common Name	Species in PRI Standard Grass & Wildflower Seed Mixes ² (% of forb or grass mix) ³	Other Species Recommended for Planting
Trees				
<i>Juniperus</i>	<i>virginiana</i>	Red cedar		
<i>Prunus</i>	<i>serotina</i>	Black cherry		
<i>Quercus</i>	<i>macrocarpa</i>	Bur oak		
<i>Quercus</i>	<i>ellipsoidalis</i>	Northern pin oak		
<i>Quercus</i>	<i>rubra</i>	Northern red oak		
Shrubs				
<i>Amorpha</i>	<i>canescens</i>	Lead plant		
<i>Artemisia</i>	<i>frigida</i>	Prairie sagewort	5% d.w.	
<i>Ceanothus</i>	<i>americanus</i>	American New Jersey tea		
<i>Corylus</i>	<i>americana</i>	American hazelnut		
<i>Prunus</i>	<i>americana</i>	Wild plum		
<i>Rhus</i>	<i>glabra</i>	Smooth sumac		
<i>Rosa</i>	<i>arkansana</i>	Prairie rose	1% d.w.	
<i>Rosa</i>	<i>cnx</i>	Smooth wild rose		
<i>Rubus</i>	<i>occidentalis</i>	Black raspberry		
<i>Symphoricarpos</i>	<i>cnx</i>	Snowberry		
<i>Toxicodendron</i>	<i>rydbergii</i>	Poison ivy		
<i>Zanthoxylum</i>	<i>americanum</i>	Prickly ash		
Forbs				
<i>Achillea</i>	<i>millefolium</i>	Yarrow	2% d.w.	
<i>Allium</i>	<i>stellatum</i>	Prairie wild onion		X
<i>Ambrosia</i>	<i>artemisiifolia</i>	Common ragweed		
<i>Ambrosia</i>	<i>psilostachya</i>	Western ragweed		
<i>Anemone</i>	<i>cylindrica</i>	Long-headed thimbleweed		X
<i>Anemone</i>	<i>patens</i>	Pasque-flower		
<i>Antennaria</i>	spp.	Pussytoes		
<i>Arabis</i>	<i>divaricarpa</i>	Spreading rock-cress		
<i>Artemisia</i>	<i>campestris</i>	Tall wormwood		
<i>Artemisia</i>	<i>ludoviciana</i>	Western mugwort		X
<i>Artemisia</i>	<i>dracunculifolia</i>	Estragon		
<i>Asclepias</i>	<i>verticillata</i>	Whorled milkweed		
<i>Asclepias</i>	<i>viridiflora</i>	Green milkweed		
<i>Asclepias</i>	<i>syriaca</i>	Common milkweed		
<i>Asclepias</i>	<i>ovalifolia</i>	Oval-leaved milkweed		
<i>Asclepias</i>	<i>tuberosa</i>	Butterfly-weed		X
<i>Aster</i>	<i>ericoides</i>	Heath aster	2% d.w.	
<i>Aster</i>	<i>sericeus</i>	Silky aster		X
<i>Aster</i>	<i>oblongifolius</i>	Aromatic aster		
<i>Aster</i>	<i>oolentangulensis</i>	Sky-blue (azure) aster	2% d.w.	
<i>Aster</i>	<i>preanthoides</i>	Crooked-stemmed aster		
<i>Aster</i>	<i>laevis</i>	Smooth aster		
<i>Astragalus</i>	<i>crassiscarpus</i>	Buffalo-bean		X
<i>Calypophus</i>	<i>serrulata</i>	Toothed evening primrose		
<i>Campanula</i>	<i>rotundifolia</i>	Harebell		X

Dry Prairie – page 2

<i>Chenopodium</i>	<i>desiccatum</i>	Narrow-leaved lamb's quarters		
<i>Chrysopsis</i>	<i>villosa</i>	Prairie golden aster		
<i>Cirsium</i>	<i>flodmani</i>	Prairie thistle		
<i>Comandra</i>	<i>umbellata</i>	Bastard toad-flax		
<i>Coreopsis</i>	<i>palmaria</i>	Stiff tickseed	6% d. w.	
<i>Cycloloma</i>	<i>aripilicifolium</i>	Winged pigweed		
<i>Dalea</i>	<i>purpurea</i>	Purple prairie-clover	16% d. w.	
<i>Dalea</i>	<i>villosa</i>	Silky prairie-clover		
<i>Dalea</i>	<i>candida</i>	White prairie-clover	4% d. w.	
<i>Delphinium</i>	<i>virescens</i>	Prairie larkspur		X
<i>Erigeron</i>	<i>strigosus</i>	Daisy fleabane		
<i>Erysimum</i>	<i>inconspicuum</i>	Small-flowered wallflower		
<i>Euphorbia</i>	<i>corollata</i>	Flowering spurge		
<i>Euphorbia</i>	<i>glyptosperma</i>	Ridge-seeded spurge		
<i>Hedeoma</i>	<i>hispida</i>	Mock pennyroyal		
<i>Helianthemum</i>	<i>bicknellii</i>	Hoary frostweed		
<i>Helianthus</i>	<i>pauciflorus</i>	Stiff sunflower		X
<i>Isanthus</i>	<i>brachiatus</i>	False pennyroyal		
<i>Kuhnia</i>	<i>eupatorioides</i>	False boneset		X
<i>Lactuca</i>	<i>spp.</i>	Wild lettuce		
<i>Lathyrus</i>	<i>venosus</i>	Venny pea		
<i>Lepidium</i>	<i>densiflorum</i>	Green-flowered pepper-grass		
<i>Lespedeza</i>	<i>capitata</i>	Round-headed bush-clover	2% d. w.	
<i>Liatris</i>	<i>punctata</i>	Dotted blazing star		
<i>Liatris</i>	<i>aspera</i>	Rough blazing star	3% d. w.	
<i>Linum</i>	<i>sulcatum</i>	Grooved yellow flax		
<i>Lupinus</i>	<i>perennis</i>	Wild lupine	6% d. w.	
<i>Lithospermum</i>	<i>canescens</i>	Hoary puccoon		X
<i>Lithospermum</i>	<i>carolinense</i>	Hairy puccoon		
<i>Lithospermum</i>	<i>incisum</i>	Narrow-leaved puccoon		
<i>Mirabilis</i>	<i>hirsuta</i>	Hairy four-o'clock		
<i>Monarda</i>	<i>fistulosa</i>	Wild bergamot	2% d. w.	
<i>Oenothera</i>	<i>biennis</i>	Common evening-p примrose		
<i>Oenothera</i>	<i>clelandii</i>	Cleland's evening-primrose		
<i>Onosmodium</i>	<i>molle</i>	False gromwell		
<i>Oxalis</i>	<i>cmx.</i>	Wood-sorrel		
<i>Pedionelum</i>	<i>argophyllum</i>	Silvery scurf-pea		X
<i>Pedionelum</i>	<i>esculentum</i>	Prairie-tunip		X
<i>Penstemon</i>	<i>grandiflorus</i>	Large-flowered beard-tongue		
<i>Penstemon</i>	<i>gracilis</i>	Slender beard-tongue		
<i>Physalis</i>	<i>virginiana</i>	Ground-cherry		
<i>Physalis</i>	<i>heterophylla</i>	Clammy ground-cherry		
<i>Polygonum</i>	<i>tenue</i>	Slender knotweed		
<i>Potentilla</i>	<i>arguta</i>	Tall cinquefoil		
<i>Ratibida</i>	<i>pinnata</i>	Gray-headed coneflower		X
<i>Rudbeckia</i>	<i>hirta</i>	Black-eyed Susan	18% d. w.	
<i>Scutellaria</i>	<i>leonardi</i>	Leonard's skullcap		
<i>Senecio</i>	<i>plattensis</i>	Prairie ragwort		
<i>Silene</i>	<i>antirrhina</i>	Sleepy catchfly		
<i>Solidago</i>	<i>nemoralis</i>	Gray goldenrod	4% d. w.	
<i>Solidago</i>	<i>missouriensis</i>	Missouri goldenrod		
<i>Solidago</i>	<i>rigida</i>	Stiff goldenrod	2% d. w.	

Solidago	ptarmicoides	Upland white aster (goldernod)	3% d. w.	
Solidago	canadensis	Canada goldernod		
Solidago	speciosa	Showy goldernod	1% d. w.	
Thalictrum	dasycarpum	Tall meadow-rue		
Tradescantia	bracteata	Bracted spiderwort		X
Verbena	stricta	Hoary vervain	18% d. w.	
Veronicastrum	virginicum	Culver's root		X
Viola	pedatifida	Prairie bird-foot violet		X
Zizia	aurea	Golden alexanders	3% d. w.	
Zizia	aptera	Heart-leaved alexanders		X
Grasses, Rushes and Sedges				
Andropogon	gerardii	Big bluestem		
Aristida	basiramea	Base-branched three-awn		
Bouteloua	curtipendula	Side-oats grama	35% pls wt.	
Bouteloua	gracilis	Blue grama	10% pls wt.	
Bouteloua	hirsuta	Hairy grama		
Bromus	kalmii	Kalm's brome		
Calamovilfa	longifolia	Sand reed-grass		
Carex	tenera	Marsh-straw sedge		
Carex	muhlenbergii	Muhlenberg's sedge		
Carex	siccata	Hay sedge		
Cenchrus	longispinus	Sandbur		
Cyperus	schweinitzii	Schweinitz' cyperus		
Cyperus	lupulinus	Hop-like cyperus		
Cyperus	spp.			
Elymus	canadensis	Canada wild rye		
Elymus	trachycaulis	Slender wheatgrass		
Eragrostis	spectabilis	Purple lovegrass		
Koeleria	pyramidata	June-grass	1% d. w.	
Muhlenbergia	cuspidata	Plains muhly		
Panicum	perlongum	Long-leaved panic grass		
Panicum	oligosanthus	Few-flowered panic grass		X
Panicum	wilcoxianum	Wilcox's panic grass		
Panicum	leibergii	Leiberg's panic grass		
Schizachyrium	scoparium	Little bluestem	53% pls wt.	
Sorghastrum	nutans	Indian grass		
Sporobolus	cryptandrus	Sand dropseed	0.5% d. w.	
Sporobolus	heterolepis	Prairie dropseed	0.5% d. w.	
Stipa	spartea	Porcupine-grass		X
Stipa	comata	Needle-and-thread grass		
Vulpia	octoflora	Eight-week fescue		
Ferns and Fern Allies				
Equisetum	laevigatum	Smooth scouring-rush		
Selaginella	rupestris	Rock spikemoss		

Wet Prairie – page 1

WET PRAIRIE				
List of Potential Plant Species ¹			Species in PRI	Other Species
Genus	Species	Common Name	Standard Grass & Wildflower Seed Mixes ² (% of forb or grass mix) ³	Recommended for Planting
Shrubs				
<i>Cornus</i>	<i>racemosa</i>	Gray dogwood		
<i>Cornus</i>	<i>sericea</i>	Red-osier dogwood		X
<i>Salix</i>	<i>bebbiana</i>	Bebb's willow		
<i>Salix</i>	<i>discolor</i>	Pussy willow		
<i>Salix</i>	<i>petiolaris</i>	Slender willow		
<i>Spiraea</i>	<i>alba</i>	Meadowsweet		
Forbs				
<i>Agastache</i>	<i>foeniculum</i>	Blue giant-hyssop		
<i>Alisma</i>	<i>subcordatum</i>	Water plantain	2% b.w.	
<i>Anemone</i>	<i>canadensis</i>	Canada anemone	1% b.w.	
<i>Apios</i>	<i>americana</i>	Groundnut		
<i>Apocynum</i>	<i>sibiricum</i>	Clasping dogbane		X
<i>Asclepias</i>	<i>incarnata</i>	Swamp milkweed	3% b.w.	
<i>Aster</i>	<i>lanceolatus</i>	Panicked aster	5% b.w.	
<i>Aster</i>	<i>novae-angliae</i>	New England aster	2% b.w.	
<i>Aster</i>	<i>pubentior</i>	Flat-topped aster		
<i>Aster</i>	<i>punicus</i>	Red-stemmed aster		X
<i>Calystegia</i>	<i>sepium</i>	Hedge bindweed		
<i>Campanula</i>	<i>aparinoides</i>	Marsh bellflower		
<i>Castilleja</i>	<i>coccinea</i>	Indian paintbrush		
<i>Chelone</i>	<i>glabra</i>	White turtlehead		X
<i>Chenopodium</i>	<i>desiccatum</i>	Narrow-leaved lamb's quarters		
<i>Cicuta</i>	<i>maculata</i>	Spotted water-hemlock		X
<i>Cirsium</i>	<i>muticum</i>	Swamp thistle		
<i>Desmodium</i>	<i>canadense</i>	Canadian tick-trefoil	3% b.w.	
<i>Epilobium</i>	<i>cm2</i>	Willow-herb		
<i>Eupatorium</i>	<i>maculatum</i>	Spotted Joe-pye weed	16% b.w.	
<i>Eupatorium</i>	<i>perfoliatum</i>	Common boneset	4% b.w.	
<i>Euphorbia</i>	<i>corollata</i>	Flowering spurge		
<i>Euthamia</i>	<i>graminifolia</i>	Grass-leaved goldenrod	1% b.w.	
<i>Fragaria</i>	<i>virginiana</i>	Common strawberry		
<i>Gentiana</i>	<i>andrewsii</i>	Closed gentian		X
<i>Geum</i>	<i>alepicum</i>	Yellow avens		
<i>Helenium</i>	<i>autumnale</i>	Autumn sneezeweed		X
<i>Helianthus</i>	<i>giganteus</i>	Giant sunflower	2% b.w.	
<i>Helianthus</i>	<i>grosseserratus</i>	Sawtooth sunflower		
<i>Helopsis</i>	<i>helianthoides</i>	Ox eye	3% b.w.	
<i>Hypericum</i>	<i>pyramidalum</i>	Great St. John's wort	3% b.w.	
<i>Hypoxis</i>	<i>hirsuta</i>	Yellow star-grass		X
<i>Iris</i>	<i>versicolor</i>	Northern blue flag	8% b.w.	
<i>Iris</i>	<i>virginica</i>	Southern blue flag		
<i>Krigia</i>	<i>biflora</i>	Two-flowered Cynthia		
<i>Lathyrus</i>	<i>pulstris</i>	Marsh vetchling		X
<i>Lathyrus</i>	<i>venosus</i>	Veiny pea		

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<i>Liatris</i>	<i>ligulistylis</i>	Northern plains blazing star		
<i>Liatris</i>	<i>pycnostachya</i>	Gay feather (tall blazing star)	8% b. w.	
<i>Lilium</i>	<i>michiganense</i>	Michigan lily		X
<i>Liparis</i>	<i>loeselii</i>	Loesel's tway blade		
<i>Lobelia</i>	<i>siphilitica</i>	Great lobelia		X
<i>Lobelia</i>	<i>spicata</i>	Rough-spiked lobelia		
<i>Lycopus</i>	<i>americanus</i>	Cut-leaved bugleweed		
<i>Lycopus</i>	<i>uniflorus</i>	Northern bugleweed		
<i>Lysimachia</i>	<i>ciliata</i>	Fringed loosestrife		
<i>Lysimachia</i>	<i>quadriflora</i>	Prairie loosestrife		
<i>Lythrum</i>	<i>alaum</i>	Wing-angled loosestrife		
<i>Mentha</i>	<i>arvensis</i>	Common mint		
<i>Mimulus</i>	<i>ringens</i>	Purple monkey-flower		
<i>Monarda</i>	<i> fistulosa</i>	Wild bergamot	4% b. w.	
<i>Oenothera</i>	<i>perennis</i>	Perennial evening-primrose		
<i>Oxalis</i>	<i>cmx</i>	Wood-sorrel		
<i>Oxypolis</i>	<i>rigidior</i>	Cowbane		
<i>Pedicularis</i>	<i>canadensis</i>	Wood-betony		
<i>Pedicularis</i>	<i>lanceolata</i>	Swamp lousewort		
<i>Polygala</i>	<i>sanguinea</i>	Purple milkwort		
<i>Polygala</i>	<i>senega</i>	Seneca snakeweed		
<i>Polygonum</i>	<i>amphibium</i>	Water smartweed		
<i>Polygonum</i>	<i>punctatum</i>	Dotted smartweed		
<i>Potentilla</i>	<i>simplex</i>	Old-field cinquefoil		
<i>Prenanthes</i>	<i>racemosa</i>	Smooth rattlesnake-root		
<i>Pycnanthemum</i>	<i>virginianum</i>	Virginia mountain-mint	2% b. w.	
<i>Ratibida</i>	<i>pinnata</i>	Gray-headed coneflower		
<i>Rudbeckia</i>	<i>hirta</i>	Black-eyed Susan	6% b. w.	
<i>Rudbeckia</i>	<i>laciniata</i>	Goldenglow		
<i>Sagittaria</i>	<i>latifolia</i>	Giant arrowhead	2% b. w.	
<i>Scutellaria</i>	<i>galericulata</i>	Marsh skullcap		
<i>Senecio</i>	<i>pseudaurus/aurus</i>	Golden ragwort		X
<i>Silphium</i>	<i>perfoliatum</i>	Cup-plant		X
<i>Smilacina</i>	<i>stellata</i>	Starry false Solomon's-seal		
<i>Solidago</i>	<i>canadensis</i>	Canada goldenrod		
<i>Solidago</i>	<i>gigantea</i>	Giant goldenrod		X
<i>Solidago</i>	<i>ridgelyi</i>	Riddell's goldenrod		
<i>Solidago</i>	<i>rigida</i>	Stiff goldenrod	2% b. w.	
<i>Stachys</i>	<i>palustris</i>	Woundwort		X
<i>Teucrium</i>	<i>candense</i>	Germander		X
<i>Thalictrum</i>	<i>dasycarpum</i>	Tall meadow-rue	1% b. w.	
<i>Verbena</i>	<i>hasata</i>	Blue vervain	16% b. w.	
<i>Vernonia</i>	<i>fasciculata</i>	Bunched ironweed	1% b. w.	
<i>Veronicastrum</i>	<i>virginicum</i>	Culver's root	1% b. w.	
<i>Vicia</i>	<i>americana</i>	American vetch		
<i>Viola</i>	<i>cm1</i>	Violet		
<i>Zizia</i>	<i>aurca</i>	Golden alexanders	3% b. w.	
Grasses, Rushes and Sedges				
<i>Agrostis</i>	<i>hyemalis</i>	Rough bent-grass		
<i>Andropogon</i>	<i>gerardii</i>	Big bluestem	38% pls wt.	
<i>Bromus</i>	<i>ciliatus</i>	Fringed brome		
<i>Calamagrostis</i>	<i>canadensis</i>	Bluejoint	15% b. w.	

Carex	bebbii	Bebb's sedge		
Carex	buxbaumii	Buxbaum's sedge		
Carex	granularis	Granular sedge		
Carex	haydenii	Hayden's sedge		
Carex	interior	Inland sedge		
Carex	lacustris	Lake-sedge		X
Carex	sartwellii	Sartwell's sedge		X
Carex	scoparia	Pointed-broom sedge		
Carex	stipata	Awl-fruited sedge		
Carex	stricta	Tussock-sedge		
Carex	tenera	Marsh-straw sedge		
Carex	tetanica	Wood-sedge		
Carex	pellita	Woolly sedge		X
Eleocharis	compressa	Flattened spike-rush		
Elymus	canadensis	Canada wild rye	10% pls wt.	
Elymus	trachycaulis	Slender wheatgrass		
Eriophorum	angustifolium	Narrow-leaved cotton-grass		
Glyceria	stricta	Fowl manna-grass		
Hierochloa	odorata	Sweet grass		
Juncus	nodosus	Knotty rush		
Juncus	tenuis	Path rush		
Juncus	vaseyi	Vasey's rush		
Juncus	dudleyi	Dudley's rush		
Leersia	oryzoides	Rice cut grass		
Muhlenbergia	frondosa	Swamp satin-grass		
Muhlenbergia	glomerata	Clustered muhly grass		
Panicum	virgatum	Switchgrass	10% pls wt.	
Poa	palustris	Fowl meadow-grass		X
Scirpus	atrovirens	Dark green bulrush	1% b.w.	
Scirpus	cyperinus	Wool-grass	2% b.w.	
Sorghastrum	nutans	Indian grass	6% pls wt.	
Spartanium	eurycarpum	Giant bur-reed	1% b.w.	
Spartina	pectinata	Prairie cord-grass	15% b.w.	
Sphenopholis	obtusata	Prairie wedge-grass		
Ferns and Fern Allies				
Equisetum	arvense	Field horsetail		
Equisetum	pratense	Meadow horsetail		
Onoclea	sensibilis	Sensitive fern		

¹ Modified from a compilation of MNDNR vegetation plot data from East-Central Minnesota: see "Species Lists for Terrestrial and Palustrine Native Plant Communities in East-central Minnesota" by C. Lane & H. Texler (at www.greatrivergreening.org).

² From Prairie Restorations, Inc. (www.prairieresto.com/seed_mixes.htm)

pls = pure live seed; b.w. = bulk weight

Oak Woodland – Page 1

DRY-MESIC OAK WOODLAND				
List of Potential Plant Species ¹			Species	Recommended
Genus	Species	Common Name	Recommended for Planting on Woodland Edges at Pilot Knob	Species Available as Seed from Prairie Moon Nursery ²
Canopy Trees (>10m)				
<i>Acer</i>	<i>negundo</i>	Box elder		
<i>Acer</i>	<i>rubrum</i>	Red maple		
<i>Betula</i>	<i>papyrifera</i>	Paper-birch		
<i>Carya</i>	<i>cordiformis</i>	Bitternut hickory		
<i>Celtis</i>	<i>occidentalis</i>	Hackberry		
<i>Fraxinus</i>	<i>pennsylvanica</i>	Green ash		
<i>Ostrya</i>	<i>virginiana</i>	Ironwood		
<i>Prunus</i>	<i>serotina</i>	Black cherry	X	
<i>Quercus</i>	<i>alba</i>	White oak		
<i>Quercus</i>	<i>ellipsoidalis</i>	Northern pin oak		
<i>Quercus</i>	<i>macrocarpa</i>	Bur oak		
<i>Quercus</i>	<i>rubra</i>	Northern red oak		
<i>Tilia</i>	<i>americana</i>	Basswood		
<i>Ulmus</i>	<i>americana</i>	American elm		
Understory Trees				
<i>Acer</i>	<i>negundo</i>	Box elder		
<i>Acer</i>	<i>rubrum</i>	Red maple		
<i>Acer</i>	<i>saccharum</i>	Sugar maple		
<i>Betula</i>	<i>papyrifera</i>	Paper-birch		
<i>Carya</i>	<i>cordiformis</i>	Bitternut hickory		
<i>Celtis</i>	<i>occidentalis</i>	Hackberry		
<i>Fraxinus</i>	<i>pennsylvanica</i>	Green ash		
<i>Ostrya</i>	<i>virginiana</i>	Ironwood		
<i>Prunus</i>	<i>serotina</i>	Black cherry		
<i>Quercus</i>	<i>alba</i>	White oak		
<i>Quercus</i>	<i>rubra</i>	Northern red oak		
<i>Tilia</i>	<i>americana</i>	Basswood		
<i>Ulmus</i>	<i>americana</i>	American elm		
<i>Ulmus</i>	<i>rubra</i>	Slippery elm		
Shrubs				
<i>Cornus</i>	<i>alternifolia</i>	Pagoda dogwood		
<i>Cornus</i>	<i>racemosa</i>	Gray dogwood	X	
<i>Corylus</i>	<i>americana</i>	American hazelnut	X	
<i>Corylus</i>	<i>cornuta</i>	Beaked hazelnut		
<i>Prunus</i>	<i>virginiana</i>	Chokecherry		
<i>Ribes</i>	<i>cynosbati</i>	Prickly gooseberry		
<i>Ribes</i>	<i>missouriense</i>	Missouri gooseberry		
<i>Rosa</i>	<i>blanda</i>	Smooth wild rose		
<i>Rubus</i>	<i>cml</i>	Blackberry		
<i>Rubus</i>	<i>idaeus</i>	Red raspberry		
<i>Sambucus</i>	<i>racemosa</i>	Red-berried elder		
<i>Symphoricarpos</i>	<i>cmx</i>	Snowberry		
<i>Toxicodendron</i>	<i>rydbergii</i>	Poison ivy		
<i>Viburnum</i>	<i>lentago</i>	Nanny berry	X	

Oak Woodland – Page 2

<i>Viburnum</i>	<i>rafinesquianum</i>	Dowry arrow-wood	X	
<i>Zanthoxylum</i>	<i>americanum</i>	Prickly ash		
Vines				
<i>Parthenocissus</i>	<i>spp.</i>	Virginia creeper		
<i>Vitis</i>	<i>riparia</i>	Wild grape		
<i>Smilax</i>	<i>hispida</i>	Green-briar		
Forbs				
<i>Actaea</i>	<i>rubra</i>	Red haneberry	X	
<i>Amphicarpaea</i>	<i>bracteata</i>	Hog-pearl	X	
<i>Anemone</i>	<i>acutiloba</i>	Sharp-lobed hepatica		
<i>Apocynum</i>	<i>androsacemifolium</i>	Spreading dogbane	X	
<i>Aquilegia</i>	<i>canadensis</i>	Columbine	X	
<i>Aralia</i>	<i>nudicaulis</i>	Wild sarsaparilla	X	
<i>Aralia</i>	<i>racemosa</i>	American spikenard		
<i>Arisaema</i>	<i>triphyllum</i>	Jack-in-the-pulpit	X	X
<i>Aster</i>	<i>cordifolius</i>	Heart-leaved aster	X	
<i>Campanula</i>	<i>americana</i>	American bell flower	X	X
<i>Caulophyllum</i>	<i>thalictroides</i>	Blue cohosh	X	
<i>Circaea</i>	<i>luteitana</i>	Canada enchant'er's nightshade	X	
<i>Cryptotaenia</i>	<i>canadensis</i>	Honewort		
<i>Desmodium</i>	<i>glutinosum</i>	Pointed-leaved tick-trefoil	X	X
<i>Erigeron</i>	<i>philadelphicus</i>	Philadelphia fleabane		
<i>Eupatorium</i>	<i>rugosum</i>	Common snakeroot	X	X
<i>Eragaria</i>	<i>virginiana</i>	Common strawberry	X	X
<i>Galium</i>	<i>aparine</i>	Cleavers		
<i>Galium</i>	<i>boreale</i>	Northern bedstraw	X	X
<i>Galium</i>	<i>concinnum</i>	Elegant bedstraw		
<i>Galium</i>	<i>triflorum</i>	Three-flowered bedstraw		
<i>Geranium</i>	<i>maculatum</i>	Wild geranium	X	X
<i>Geum</i>	<i>canadense</i>	White avens	X	
<i>Hackelia</i>	<i>spp.</i>	Sticksseed		
<i>Helianthus</i>	<i>strigosus</i>	Woodland sunflower	X	
<i>Helopsis</i>	<i>helianthoides</i>	Ox-eye	X	X
<i>Hydrophyllum</i>	<i>virginianum</i>	Virginia waterleaf	X	X
<i>Impatiens</i>	<i>spp.</i>	Touch-me-not		
<i>Laportea</i>	<i>canadensis</i>	Wood-nettle		
<i>Lathyrus</i>	<i>ochroleucus</i>	Pale vetchling		
<i>Matanthenum</i>	<i>canadense</i>	Canada mayflower		
<i>Mitella</i>	<i>diphylla</i>	Two-leaved miterwort		
<i>Monotropa</i>	<i>uniflora</i>	Indian pipe		
<i>Osmorhiza</i>	<i>claytonii</i>	Clayton's sweet cicely	X	X
<i>Osmorhiza</i>	<i>longistylis</i>	Anise-root		
<i>Phryma</i>	<i>leptostachya</i>	Lopseed	X	
<i>Pilea</i>	<i>spp.</i>	Cleanweed		
<i>Polygonatum</i>	<i>pubescens</i>	Hairy Solomon's-seal		
<i>Polygonatum</i>	<i>biflorum</i>	Giant Solomon's-seal		
<i>Ranunculus</i>	<i>abortivus</i>	Kidney-leaf buttercup		
<i>Ranunculus</i>	<i>recurvatus</i>	Hooked crowfoot		
<i>Sanguinaria</i>	<i>canadensis</i>	Bloodroot	X	X
<i>Sanicula</i>	<i>gregaria</i>	Gregarious black snakeroot	X	
<i>Sanicula</i>	<i>marilandica</i>	Mariland black snakeroot	X	
<i>Smilacina</i>	<i>racemosa</i>	Racemose false Solomon's-seal		

<i>Smilax</i>	cnx.	Carion-flower			
<i>Stellaria</i>	<i>longifolia</i>	Long-leaved chickweed			
<i>Thalictrum</i>	<i>dioicum</i>	Early meadow-rue		X	X
<i>Urtica</i>	<i>dioica</i>	Stinging nettle			
<i>Uvularia</i>	<i>grandiflora</i>	Yellow bellwort		X	
<i>Veronicastrum</i>	<i>virginicum</i>	Culver's root		X	X
<i>Viola</i>	cn4	Violet			
Grasses, Rushes and Sedges					
<i>Andropogon</i>	<i>gerardii</i>	Big bluestem		X	X
<i>Bromus</i>	<i>latiglumis</i>	Woodland brome		X	
<i>Bromus</i>	<i>pubescens (purgans)</i>	Hairy wood chess		X	X
<i>Carex</i>	<i>blanda</i>	Woodland sedge		X	
<i>Carex</i>	<i>gracillima</i>	Graceful sedge		X	X
<i>Carex</i>	<i>pennsylvanica</i>	Pennsylvania sedge		X	
<i>Carex</i>	<i>sprengelii</i>	Sprengel's sedge		X	X
<i>Carex</i>	<i>radiata</i>	Stellate sedge		X	
<i>Elymus (Hystrix)</i>	<i>hystrix</i>	Bottlebrush grass		X	X
<i>Festuca</i>	<i>subverticillata</i>	Nodding fescue			
<i>Oryzopsis</i>	<i>asperifolia</i>	Mountain rice grass			
<i>Oryzopsis</i>	<i>racemosa</i>	Black-fruited rice grass		X	
Ferns and Fern Allies					
<i>Athyrium</i>	<i>filix-femina</i>	Lady-fern		X	
<i>Botrychium</i>	<i>virginianum</i>	Rattlesnakefern			
<i>Osmunda</i>	<i>claytoniana</i>	Interrupted fern			
<i>Pteridium</i>	<i>aquilinum</i>	Bracken			

¹ Modified from a compilation of MNDNR vegetation plot data from East-Central Minnesota: see "Species Lists for Terrestrial and Palustrine Native Plant Communities in East-central Minnesota" by C. Lane & H. T. Exler (at www.greatrivergreening.org).

² Prairie Moon Nursery, Winona, MN (www.prairiemoon.com). Note: Prairie Moon's standard woodland and savanna edge seed mixes are not recommended because they contain species that do not occur in this region.

Appendix B: Resources for Restoration And Management

Equipment:

Tree planting and seeding equipment:

Forestry Suppliers, Inc.
205 West Rankin St.
Jackson, MS 39201
(800) 647-5368
www.forestry-suppliers.com

Ben Meadows Company
3589 Broad St.
Atlanta, GA 30341
(800) 241-6401
www.benmeadows.com

Prairie restoration:

Seed:

Minnesota Native Landscapes
14088 Hwy. 95 NE
Foley, MN 56329
(320) 968-4222
www.mnnativelandscapes.com

Prairie Moon Nursery
31837 Bur Oak Lane
Winona, MN 55987-9515
507-452-1362
www.prairiemoon.com

Prairie Restorations, Inc.
P.O. Box 327
Princeton, MN 55371
(763) 633-4342
www.prairieresto.com

Shooting Star Native Seeds
P.O. Box 648
Spring Grove, MN 55974-0648
(507) 498-3944
www.shootingstarnativeseed.com

Spring Lake Restoration Nurseries
21938 Mushtown Rd.
Prior Lake, MN 55372
952-447-1919
<http://www.appliedeco.com/slrn/>

Potted plants:

Dragonfly Gardens
PO Box 192, Amery, WI 54001.
(715) 268-6155; www.dragonflygardens.net

Hild & Associates
326 Glover Rd. S.
River Falls, WI 54022
800-790-9495; ghild@hildnatives.com

Landscape Alternatives
25316 St. Croix Trail
Shafer, MN 55074
(651) 257-4460; landscapealt@earthlink.net

Prairie Moon Nursery
31837 Bur Oak Lane
Winona, MN 55987-9515
507-452-1362; www.prairiemoon.com

Prairie Restorations, Inc.
P.O. Box 327
Princeton, MN 55371
(763) 633-4342; www.prairieresto.com

Ramsey County Corrections Nursery
297 S. Century Ave
St. Paul, MN 55119
651-266-1510; sean.uslabar@co.ramsey.mn.us

Spring Lake Restoration Nurseries
21938 Mushtown Rd.
Prior Lake, MN 55372
952-447-1919, <http://www.appliedeco.com/slrn/>

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Local Ecotype Trees:

(bare root seedlings)
MN DNR State Forest Nursery
General Andrews Nursery
PO Box 95 Willow River, MN 55795
tel. (218) 372-3183
www.dnr.state.mn.us/forestry/nurseries/ordering

(potted, b&b trees and shrubs)
Out Back Nursery
15280 110th St. S.
Hastings, MN 55033
651-438-2771
www.outbacknursery.com

(bareroot, potted, b&b - specify local stock)
Bailey Nurseries
1325 Bailey Rd.
St. Paul, MN 55119-6313
651-768-3378
www.baileynurseries.com

Restoration contractors:

Bidwell Maintenance
(heavy equip. for site prep)
75 Bidwell St.
St. Paul, MN 55107

Great River Greening
35 W. Water St., Suite 201
St. Paul, MN 55107-2016
651-665-9500
www.greatrivergreening.org

Minnesota Native Landscapes
14088 Hwy. 95 NE
Foley, MN 56329
(320) 968-4222
www.mnNativeLandscapes.com

Prairie Restorations, Inc.
P.O. Box 327
Princeton, MN 55371
(763) 633-4342
www.prairieresto.com

Contacts:

United States Fish and Wildlife Service (USFWS)
Minnesota Valley National Wildlife Refuge
Patricia Martinkovic, Refuge Manager
3815 E. 80th St.
Bloomington, MN 55425-1600
(952) 854-5900
Patricia_Martinkovic@fws.gov

Pilot Knob Hill Natural Resource Management Plan
Minnesota Department of Natural Resources (DNR)

Division of Wildlife:

Bryan Lueth, Urban Wildlife Manager
5463 – C W Broadway
Forest Lake, MN 55025
651-296-3779
bryan.lueth@dnr.state.mn.us

Division of Forestry:

Art Widerstrom, Area Forester
800 Oak Savanna Lane
Cambridge, MN 55008
763-689-7101

art.widerstrom@dnr.state.mn.us

Division of Ecological Services

Hannah Texler, Regional Ecologist
1200 Warner Rd., St. Paul, MN 55106
651-772-7570
hannah.texler@dnr.state.mn.us

Minnesota Department of Transportation

Paul Voight
651-284-3791 (w)
651-470-5956 (cell)

Appendix C1: Potential Funding Sources for the Pilot Knob Restoration and Management Project as of October 22, 2005

The Pilot Knob natural resource restoration project has many components that are compelling for funders:

- it is highly visible,
- it has a nationally significant role in the history of the Dakota people and European settlement of the region,
- it connects to existing natural areas in the Minnesota River Valley,
- prairie and savanna communities are high priority habitats for restoration due to their rarity,
- the work provides meaningful opportunities for volunteers.

There are many different potential sources for funding natural resource restoration work and associated volunteer events.

Several federal, state, and local government grant programs, as well as private corporations and foundations, have funded restoration projects like Pilot Knob. Most grants require some amount of match: either as cash match only, or as cash and/or in-kind match.

While there are no guarantees for fundraising, the City of Mendota Heights can anticipate that substantial funding for the restoration project can be generated through grants. If selected to coordinate the restoration work, Great River Greening can work with the City to secure grant funds for the project.

Potential Source	Potential Amount	Status as of October 22, 2005
Mississippi River Fund (National Park Service Foundation)	\$37,000	city letter submitted Sept. 2005 for March 2006 decision; requires 50% match, which can include in-kind
Pilot Knob Preservation Association	\$1,000 plus in-kind	PKPA also offers in-kind assistance to develop interpretive information and provide volunteers to assist with restoration work.
Dakota County	\$10,000	approved by the Dakota County Board on October 18, 2005
Great River Greening (GRG)	\$8,000	contingent on using GRG's assistance; requires 50% cash match; restoration funds from Metro Conservation Corridors

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Dakota County Soil and Water Conservation District	\$5,000	verbal interest in funding and helping secure other funding
Friends of the Minnesota Valley	\$2,500	verbal commitment
Sierra Club	\$500	verbal commitment
Friends of the Mississippi River		Verbal commitment. Grant funds available through the Metro Conservation Corridors program. FMR also has members in the region and can bring many volunteers.
Minnesota Historical Society - State Grants-in-Aid		grant program helps fund installation of structures for and development of interpretive information; priority is given to projects involving properties that are listed or eligible for listing on the National Register of Historic places. Maximum grant of \$6,000. Requires 1:1 match. Pre-application deadline likely in July 2006. See: www.mnhs.org/about/grants/stgrantscontents.html
HRK Foundation		foundation with interest in restoration through "Community Building...to encourage responsible land use and promote conservation and preservation of community resources." See www.hrkfoundation.org .
Conservation Partners – DNR		restoration grants available historically; status of future funding unknown; restoration of native plant communities; reforestation; protection of wetlands; and abatement of soil erosion. Plantings must consist only of native species; requires 1:1 match though match may be in-kind
Metro Greenways restoration		restoration grants through Metro Conservation Corridors; application round likely in early 2006; no maximum award, but has awarded up to \$50,000 in past. For info, see www.dnr.state.mn.us/grants/land/metrogreen.html . Contact: Kate Drewry kate.drewry@dnr.state.mn.us
Lower Minnesota River Watershed District		Some watershed districts have funded restoration work, particularly as related to improving water quality in the watershed See http://www.watershreddistrict.org/ . Contact Terry Schwalbe [terrys@lowermn.com] about a potential partnership.
National Fish & Wildlife Foundation (NFWF) Challenge Grants		letter deadline Sept 15; http://www.nfwf.org/guidelines.cfm ;
National Fish & Wildlife Foundation (NFWF) General Matching Grant		in our region, the most likely projects to be funded are demonstration projects that show new approaches to restoration; could show how restoration could be done on a Native American burial ground.

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Roadsides for Wildlife - DNR	\$500	Revegetation of roadsides with native grass and forb seed, demonstration plots on biological weed control, and native seed planting and harvesting equipment. \$350/acre max cost-share; \$500 rough estimate http://www.dnr.state.mn.us/grants/habitat/roadsides.html
Minnesota ReLeaf - DNR		Purchasing and planting of predominantly native trees to conserve energy, benefit wildlife, and establish community windbreaks; actions to preserve and maintain healthy community forests; educational programs in conjunction with these activities; and conducting tree inventories for land use and comprehensive planning
Legislative Commission on Minnesota Resources (LCMR)		This commission, staffed by state legislators, solicits, evaluates and recommends natural resources projects for legislative funding from the Minnesota Environment and Natural Resources Trust Fund. Application deadlines are biennial. www.commissions.leg.state.mn.us/lcmr/lcmr.htm .
MN Office of Environmental Assistance		www.moea.state.mn.us/
MN Pollution Control Agency		http://www.pca.state.mn.us/netscape4.html
USDA – Natural Resources Conservation Service (NRCS)		The Wildlife Habitat Improvement Program of USDA-NRCS may be a possible source of funding. http://www.nrcs.usda.gov/
Native American Tribes		
Additional Foundations		
Individuals		
Corporations		
Potential Total as of 10/03/05	\$64,500	

Appendix C2: Current Funding Sources as of November, 2007

Funding source	notes
NEA (Artist fee)	http://www.arts.gov/grants/apply/GAP08/Challenge.html due June 1
Prairie Island	
Bess Spiva Timmons Foundation	Artist Fee - 3/12/2007, no word back yet
Target Store Grant	Artist Fee -5/31/2007
Archie D and Bertha H Walker Foundation	Artist Fee - 6/7/2007
MPCA	for interpretive facilities: signs, trails, overlook, and design of those facilities: to be done by 6/08
Acacia Cem.	used for buckthorn removal at acacia in 2006
PKPA	Paid directly to the city; site prep in 2006
Starbucks	site prep in 2006
Matt Entenza	site prep in 2006
Dak SWCD	see list to use for in contract, site prep in 2006
Cons. Partners grant	use in 2007, reimbursement to city, used for restoration in 2007 - seeding!
GRG MeCC Phase II	used for site prep, especially in 2006, some in 07
Friends of MN Valley MeCC Phase II	used for oak tree in MnDOT ROW
Dak. County Cap. Improve.	Prefer used for capital improvements - trees, plants, etc.; Is ok if used for trail, etc. if it attracts match funds
Mn Hist Soc	Pay for signs only! See acceptance form for details.
Lower Mn River Watersh. Dist	used for various restoration in 2007 - reimbursement to city
Total received for restoration and facilities	\$82,659

Appendix D: Reasonable Replacement Costs for Tree/Shrub Removal on Mn/DOT Right of Way

from: Paul G. Voigt

Natural Resource Specialist-

Horticulturist Senior Office of Environmental Services

Phone: (651) 284-3791

E-mail: paul.voigt@dot.state.mn.us

The following table can be used as a general guideline as to how Mn/DOT may determine the value of replacing or paying for removed vegetation on its Right of Way. These numbers

are based on the “reasonable replacement cost” method of valuating trees and shrubs. These are only a general guideline, and these figures could change based on several factors including but not limited to species, condition, location, historical significance, etc. I would say based on our field visit of the Pilot Knob site on October 11th, 2005 that the following figures should be a good for the potential removal of Mn/DOT trees and shrubs. The per plant cost figures are based on the average of the average bid prices for contracted Mn/DOT landscape projects between 01/01/02 and 12/31/04 (3 contract years). This bid price would include the preparation of the site, planting of the tree according to Mn/DOT specification 2571, and maintaining the tree for a period of 2 years

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PLANT TYPE	SIZE RANGE OF REQUESTED REMOVAL	REPLACEMENT QUANTITY	REPLACEMENT COSTS PER PLANT
Coniferous tree	Up to 8' height	1 for 1 w/ a 5' height coniferous B&B tree	\$277.00 (1 x \$277.00 = \$277.00 per tree removed)
Coniferous tree	Over 8' height up to 14' height	2 for 1 w/ a 5' height coniferous B&B tree	\$277.00 (2 x \$277.00 = \$554.00 per tree removed)
Coniferous tree	Over 14' height up to 20' height	3 for 1 w/ a 5' height coniferous B&B tree	\$277.00 (3 x \$277.00 = \$831.00 per tree removed)
Deciduous tree	*1"dbh – 8"dbh	1 for 1 w/ a 2" caliper deciduous B&B tree	\$348.00 (1 x \$348.00 = \$348.00 per tree removed)
Deciduous tree	Over 8"dbh - 14" dbh	2 for 1 w/ a 2" caliper deciduous B&B tree	\$348.00 (2 x \$348.00 = \$696.00 per tree removed)
Deciduous tree	Over 14 dbh -20" dbh	3 for 1 w/ a 2" caliper deciduous B&B tree	\$348.00 (3 x \$348.00 = \$1044.00 per tree removed)
Deciduous shrub	4' height – 10' height	1 for 1 w/ a 4' height containerized deciduous shrub	\$60.00 (1 x \$60.00 = \$60.00 per shrub removed)

*dbh refers to the diameter of the tree at breast height (4.5' above the ground).

Appendix E: Plan Amendments

The writers of this plan have worked hard to provide reasonable and accurate estimates of the work and costs involved in the proposed restoration and management project at Pilot Knob. However, no natural resource management plan can predict all of the potential situations or changes that might arise in the future that require significant deviations from the approved plan. Unforeseen situations that might require amendments to the plan might include:

- Catastrophic weather events that knock over trees into the project site, requiring additional tree removal
- An excessive rainfall event immediately following soil raking that will require unforeseen additional measures to control erosion
- Poor quality plant seed that fails to germinate properly, requiring an additional seeding
- Inflation of prices for materials and labor, especially 5-10 years from now

- A severe drought that kills plant seedlings before they can root themselves deeply into the soil
- Nursery stock shortages
- Unforeseen plant diseases
- Responding to and working with adjacent landowners such as Acacia Park Cemetery and MNDOT

Other situations that might also merit a deviation from the approved plan could include potential new designs, materials and costs for alternatives to the constructed areas (trails, overlook, parking lot, interpretive structures) or native plant communities that were not considered by the time the final draft of the plan was written and approved.

Prior to any significant plan and implementation revisions consisting of major departures that are not consistent with the overall goal and intent of the plan, Dakota County and DNR Metro Greenways, and their appropriate representatives, will be contacted by the City and must jointly agree to any significant plan revisions prior to implementation.

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Appendix F: Bird Species of Greatest Conservation Need (SGCN) Found at Fort Snelling State Park

C = Common -present, relatively easy to find

U = Uncommon - observed, may be difficult to find

O = Occasional -may or may not be present in any year

R = Rare -has occurred at least once, may or may not be expected to recur

SPC = Special Concern

THR = Threatened

END = Endangered

(Source: Harper, MN DNR, pers. comm.)

Common Name	Scientific Name	Spr	Sum	Fall	Win	MN Status	Fed
Status							
American Bittern	<i>Botaurus lentiginosus</i>	O	O	O			
American Black Duck	<i>Anas rubripes</i>	O			O		
American White Pelican	<i>Pelecanus erythrorhynchos</i>	O		O		SPC	
American Woodcock	<i>Scolopax minor</i>	O	R	U			
Bald Eagle	<i>Haliaeetus leucocephalus</i>	U	U	U	O	SPC	THR
Bay-breasted Warbler	<i>Dendroica castanea</i>	U	U	U			
Belt's Vireo	<i>Vireo belli</i>	R	R	R			
Black Tern	<i>Chlidonias niger</i>	U	U	U			
Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>	U	U	U			
Black-crowned Night-Heron	<i>Nycticorax nycticorax</i>	U	U	U			
Black-throated Blue Warbler	<i>Dendroica caerulescens</i>	O		O			
Blue-winged Warbler	<i>Vermivora pinus</i>	R	R	O			
Bobolink	<i>Dolichonyx oryzivorus</i>	O	O	R			
Brown Thrasher	<i>Toxostoma rufum</i>	U	U	U			
Canada Warbler	<i>Wilsonia canadensis</i>	U		U			
Cape May Warbler	<i>Dendroica tigrina</i>	U		U			
Common Loon	<i>Gavia immer</i>	O		O			
Common Moorhen	<i>Gallinula chloropus</i>	R	R	O		SPC	
Common Nighthawk	<i>Chordeiles minor</i>	U	U	U		THR	
Common Tern	<i>Sterna hirundo</i>	O		O			
Connecticut Warbler	<i>Oporornis agilis</i>	R		R			
Dickcissel	<i>Spiza americana</i>	O	O				
Dunlin	<i>Calidris alpina</i>	O		O			
Eared Grebe	<i>Podiceps nigricollis</i>	O		O			
Eastern Meadowlark	<i>Sturnella magna</i>	O	O	O			
Eastern Wood-Pewee	<i>Contopus virens</i>	O	O	O			
Field Sparrow	<i>Spizella pusilla</i>	O	O	O			
Forster's Tern	<i>Sterna forsteri</i>	U	U	U		SPC	
Franklin's Gull	<i>Larus pipixcan</i>	U		U		SPC	
Golden-winged Warbler	<i>Vermivora chrysoptera</i>	U		U			
Grasshopper Sparrow	<i>Ammodramus saviannarum</i>	O	O	O			
Greater Yellowlegs	<i>Tinga melanoleuca</i>	O		O			
Horned Grebe	<i>Podiceps auritus</i>	U		U		THR	
King Rail	<i>Rallus elegans</i>		R			END	
Least Bittern	<i>Ixobrychus exilis</i>	O	O	O			
Least Flycatcher	<i>Empidonax minimus</i>	O	U	O			
Lesser Scaup	<i>Aythya affinis</i>	U		U			
Loggerhead Shrike	<i>Lanius ludovicianus</i>	O	R	O		THR	
Louisiana Waterthrush	<i>Seiurus motacilla</i>	R	U			SPC	
Marsh Wren	<i>Cistothorus palustris</i>	U		U			
Northern Goshawk	<i>Accipiter gentilis</i>			O			
Northern Harrier	<i>Circus cyaneus</i>	U		U			
Northern Pintail	<i>Anas acuta</i>	U	U	U			
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	U	U	U			

Appendix F: cont'd

Common Name	Scientific Name	Spr	Sum	Fall	Win	MN Status	Fed Status
Olive-sided Flycatcher	<i>Contopus cooperi</i>	U	U	U			
Ovenbird	<i>Seiurus aurocapillus</i>	C	O	C			
Peregrine Falcon	<i>Falco peregrinus</i>	U	U	U		THR	
Piping Plover	<i>Charadrius melodus</i>	R		R		END	END
Prothonotary Warbler	<i>Protonotaria citrea</i>	R	O	R			
Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>	O	O	O			
Red-necked Grebe	<i>Podiceps grisegena</i>	U		U			
Red-shouldered Hawk	<i>Buteo lineatus</i>	O				SPC	
Rose-breasted Grosbeak	<i>Phoebastria ludovicianus</i>	C	C	C			
Ruddy Turnstone	<i>Arenaria interpres</i>	R		R			
Rusty Blackbird	<i>Euphagus carolinus</i>	U		U			
Sedge Wren	<i>Cistothorus platensis</i>	U	U	U			
Semipalmated Sandpiper	<i>Calidris pusilla</i>	O	O	O			
Short-billed Dowitcher	<i>Limnodromus griseus</i>	O	O	O			
Short-eared Owl	<i>Asio flammeus</i>	O	O	O	R	SPC	
Swamp Sparrow	<i>Meospiza georgiana</i>	C	C	C			
Trumpeter Swan	<i>Cygnus buccinator</i>	R		O		THR	
Veery	<i>Catharus fuscescens</i>	U	R	O			
Virginia Rail	<i>Rallus limicola</i>	U	U	U			
Western Grebe	<i>Aechmophorus occidentalis</i>	O					
Whimbrel	<i>Numenius phaeopus</i>	R		R			
Whip-poor-will	<i>Caprimulgus vociferus</i>	R		R			
White-rumped Sandpiper	<i>Calidris fuscicollis</i>	O					
White-throated Sparrow	<i>Zonotrichia albicollis</i>	C		C			
Willow Flycatcher	<i>Empidonax traillii</i>	U	U	U			
Wilson's Phalarope	<i>Phalaropus tricolor</i>	O		O		THR	
Winter Wren	<i>Troglodytes troglodytes</i>	U		U			
Wood Thrush	<i>Hylocichla mustelina</i>	U	U	U			
Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>	U	U	U			

Appendix G: Rare Animal Features within 1.5 Miles of Pilot Knob Hill

(source: Harper, MN DNR, pers. comm.)

Birds	
Bald Eagle	<i>Haliaeetus leucocephalus</i>
Bell's Vireo	<i>Vireo bellii</i>
Louisiana Waterthrush	<i>Seiurus motacilla</i>
Peregrine Falcon	<i>Falco peregrinus</i>
Reptiles	
Blanding's Turtle	<i>Emydoidea blandingii</i>
Eastern Fox Snake	<i>Elaphe vulpina gloydi</i>
Milk Snake	<i>Lampropeltis triangulum</i>
Insects	
Karner Blue Butterfly	<i>Lycaeides melissa samuelis</i>
Mussel	
Black Sandshell	<i>Ligumia recta</i>
Ebonyshell	<i>Fusconaia ebena</i>
Elktoe	<i>Alasmidonta marginata</i>
Fawnfoot	<i>Truncilla donaciformis</i>
Hickorynut	<i>Obovaria olivaria</i>
Higgins Eye	<i>Lampsilis higginsii</i>
Monkeyface	<i>Quadrula sparsa</i>
Mucket	<i>Actinonaias ligamentina</i>
Purple Wartyback	<i>Cyclonaias tuberculata</i>
Rock Pocketbook	<i>Arcidens confragosus</i>
Round Pigtoe	<i>Pleurobema sintoxia</i>
Scaleshell	<i>Leptodea leptodon</i>
Sheepnose	<i>Plethobasus cyphus</i>
Wartyback	<i>Quadrula nodulata</i>
Fish	
Pallid Shiner	<i>Hybopsis amnis</i>
Pugnose Shiner	<i>Notropis anogenus</i>
Shovelnose Sturgeon	<i>Scaphirhynchus platyrhynchus</i>