

SWWD CD-P86 Natural Resources Management Plan

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1. Introduction

A major component of the South Washington Watershed District (SWWD) Greenway Corridor Plan is to create a natural corridor that connects the northern parts of the District with the Mississippi River. The corridor alignment generally follows a natural drainageway that runs north-south through the center of the District. Key parcels included in the SWWD Greenway corridor include the Cottage Grove Ravine Park, Woodbury chain of lakes and Lake Elmo Park Reserve just north of the District.

One critical link in the corridor is a series of natural depressions that form the backbone of the District's central stormwater conveyance route. Known as CD-P86, this ponding area provides the critical connection between the City of Woodbury's trunk stormwater system and a natural drainageway through Cottage Grove that discharges into the Mississippi River. **Figure 1** identifies the location of CD-P86 and illustrates its importance to a contiguous District-wide corridor.

The current landscape adjacent to CD-P86 is dominated by row crop agricultural land. A conservation easement agreement with the Minnesota Department of Natural Resources (DNR) will protect the area from development and insure the site will be conserved and managed as a natural area. The purpose of this Natural Resources Management Plan (NRMP) is to establish a framework for future restoration efforts on portions of the site including areas both inside and outside of the conservation easement. The plan provides information on the current conditions of the site, and includes recommendations for site preparation, seeding and planting, wildlife improvement, maintenance and monitoring, and cost estimates. In addition to natural resource management this plan identifies location of a proposed Washington County Parks regional trail connection. This NRMP is tied directly to the DNR Conservation Easement document and easement area. Data used for the plan include the results of the SWWD Greenway Corridor Plan, Woodbury Natural Resources Inventory, Cottage Grove Natural Resources Inventory and a detailed environmental assessment completed for the SWWD Greenway Corridor downstream of CD-P86.

2. Goals and Objectives

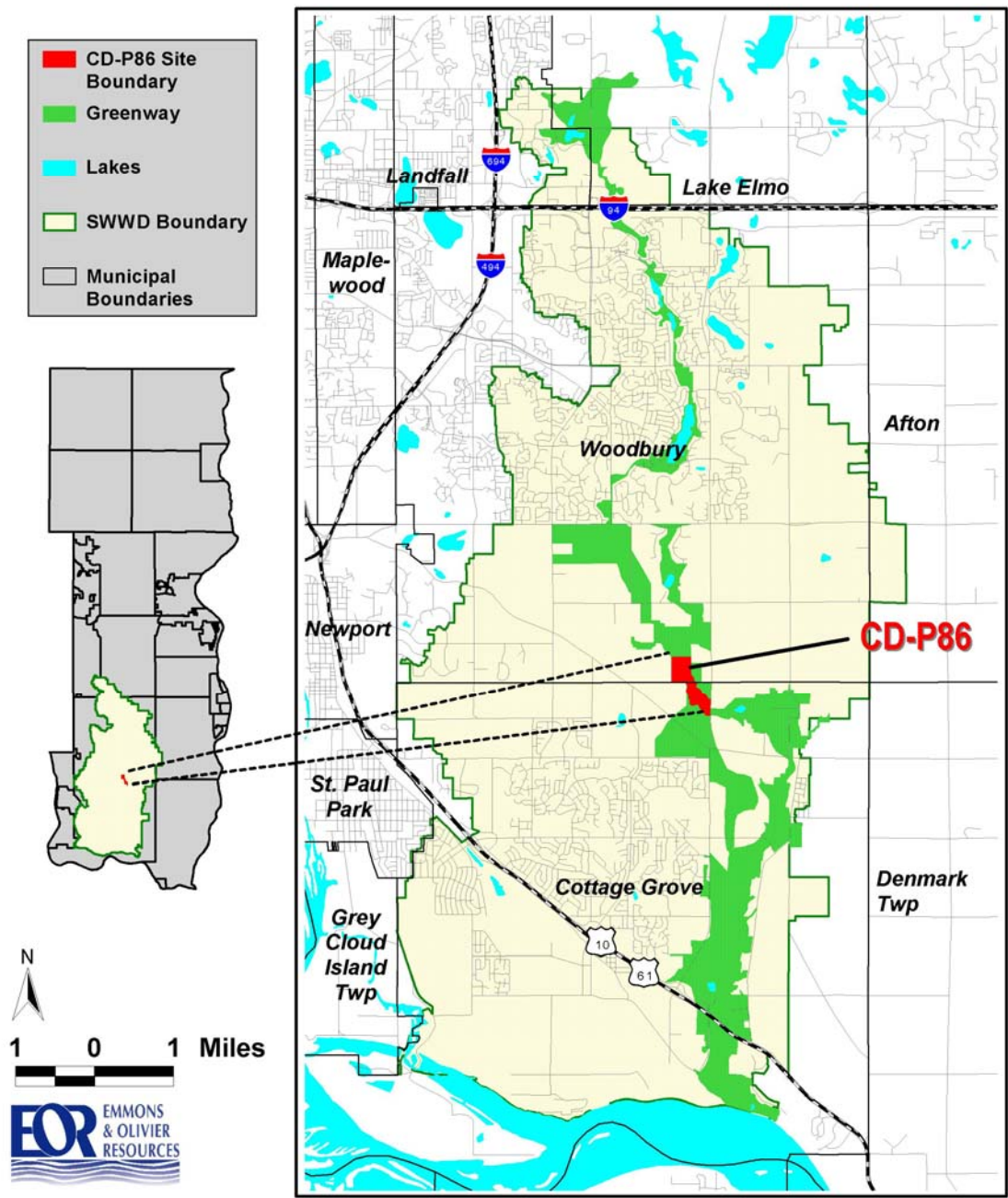
The goal of this NRMP is to develop an ecologically-based Management Plan that improves, protects and maintains the ecological functions of CDP-86. Specific objectives include:

1. Establish corridor connections between CD-P86 and areas to the north and south. The northern terminus of the Corridor would link to Lake Elmo Regional Park, and on the south, would connect with the Mississippi River near the 3M Facility.
2. Reestablish native plant communities representative of those present prior to European settlement. Target natural communities include oak forest, woodland and savanna, dry prairie, and wet/mesic prairie and ephemeral wetlands.
3. Enhance wildlife habitat through establishment of plant communities, habitat structures and connections to other adjacent habitats.
4. Provide open space, passive recreation and environmental education opportunities to present and future residents of local communities.
5. Improve and maintain natural stormwater functions including: infiltration, groundwater recharge, rate/volume control, and pollutant and sediment reduction.



Figure 1

South Washington Watershed District
CD-P86 Natural Resources Management Plan
Site Location Map



3. Physical Conditions

The physical conditions of this site include the geology, soils, slopes, aspect, water resources, hydrogeology, as well as past and current land uses.

A. Geology

The site is dominated by depressions formed by ice block deposits during the retreat of recent glaciers. Ice blocks broke off of the glaciers and melted to form many of the land-locked depressions located in this landscape. Beneath these depressions are sand and gravel outwash deposits. These linear outwash deposits have the potential to infiltrate and convey significant amounts of stormwater. Bedrock is found at or near the surface south of the Woodbury/Cottage Grove boundary to the east of the project site.

B. Soils

Soils are predominantly moderately well to well drained silt loams. These soils provide moderate infiltration, provided that they are not subject to compaction from vehicle use or rain drop impact. Erosion is a concern, particularly on slopes. Dense vegetative cover provides effective protection from erosion.

Table 1 summarizes soils identified by the Washington County Soil Survey

Table 1. CD-P86 Soil Survey Data

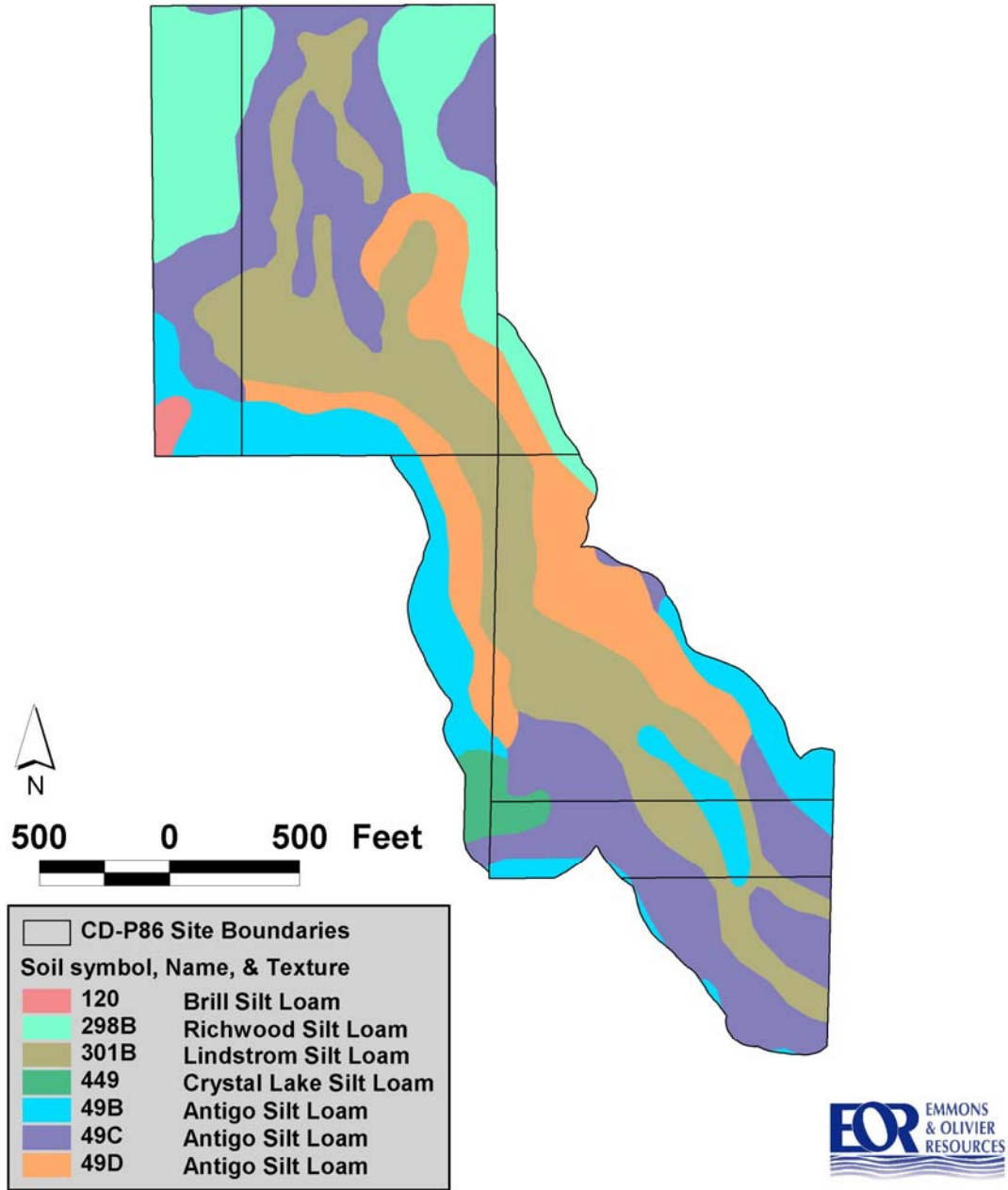
Map Symbol	Soil Series	Percent Slope
49	Antigo silt loam	0-2
49B	Antigo silt loam	2-6
49C	Antigo silt loam	6-12
120	Brill silt loam	flat
298	Richwood silt loam	0-2
301B	Lindstrom silt loam	2-4
449	Crystal Lake silt loam	flat
529B	Ripon silt loam	2-6
529C	Ripon silt loam	6-12

C. Topography Slope and Aspect

Slopes on the site are mostly moderate with the lower-most areas having flat topography. The site runs northwest to southeast with equal portions of the site having northwest and southeast exposures.

Figure 2

South Washington Watershed District
CD-P86 NRMP - Soils Survey



4. Vegetation

A. Pre-European-Settlement Plant Communities

Prior to European settlement, plant communities were much different from today. According to Marschner's map of Pre-Settlement Vegetation (Marschner 1974), the site contained a mixture of "oak openings and barrens" and "dry prairie" vegetation types. Oak openings (oak woodland) occurred on northeast-facing slopes, while dry prairie occurred on southwest-facing slopes. Intermediate between these two plant communities, oak savanna occurred.

The following section describes plant communities present before European settlement. Information for this section is adapted from *Minnesota's Native Vegetation: A Key to Natural Communities. Version 1.5*, Minnesota Department of Natural Resources, Natural Heritage Program, 1993 and Natural Resource Inventory data for similar landscape settings in southern Washington County, Minnesota.

Dry Sand-Gravel Prairie: Dry Prairies (Sand-Gravel subtype) typically occurred on sandy, well-drained soils of outwash plains and river terraces. These prairies were often located on south-southwest facing slopes much like the slopes within the site. Sand-Gravel Prairies in this area were often dominated by relatively short, sparse grasses and sedges, with a good diversity of forb species. Typical grasses included little bluestem, side-oats grama and hairy grama, prairie junegrass, needle grass, plains muhly, prairie dropseed, Wilcox's panic grass, blue grama, and sand reedgrass. Some widespread, characteristic forbs included dotted blazing star, pasque flower, prairie golden-aster, stiff sunflower, silky aster, stiff goldenrod, gray goldenrod, Missouri goldenrod and narrow-leaved puccoon, as well as rough blazing star, buffalo-bean, silverleaf, Louisiana sagewort, prairie larkspur, hoary puccoon, prairie smoke, and wood lily. Three sub-shrubs - leadplant, prairie rose, and wolfberry - were also generally present.

Dry Oak Savanna: Dry Oak Savanna communities were intermediate between prairie habitats and woodland, and were characterized by widely spaced to clumped stands of large, spreading bur oak over a ground layer dominated by prairie species similar to those listed in previous paragraph. Dry Oak Savanna communities existed on topography such as the moderately sloping south-southwest facing slopes and well drained soils of this site.

Oak Woodland: Oak Woodlands occurred on dry to mesic sites, similar to the areas of moderately to well drained substrates found on this site. Typical oak woodlands contained a patchy tree canopy and an understory dominated by shrubs and tree saplings. The canopy was typically dominated by bur oak, with occasional pin oak, white oak, aspen, or paper birch. Canopy species were relatively short, with a wide, spreading crown and heavy, low branches. The shrub layer ranged in density from sparse to thicker pockets. Understory forbs and grasses occurred in moderate abundance, and sometimes scattered prairie openings occurred with high plant diversity.

Mesic/Dry Oak Forest: Mesic/Dry Oak Forest occurred on more mesic sites, on north to northeast-facing slopes. Mesic/Dry Oak Forest also occurred in areas that were historically more woodland, but in the absence of fire, succeeded to a more closed canopy forest. Common tree species included white, red and bur oak, and basswood with ironwood, butternut, bitternut hickory, black cherry, paper birch, and red maple in the subcanopy. Shrubs may have included chokecherry, hazelnut, gooseberry, and other fruiting shrubs. The ground layer

frequently included wild grape, Virginia creeper, poison ivy, wild geranium, black snakeroot and a variety of ferns and spring ephemerals such as round-lobed hepatica.

B. Existing Plant Communities and Vegetative Cover Types

Plant communities have been greatly altered from pre-settlement conditions. For the most part, very little native vegetation can be found on the site. Most of site contains agricultural and old field cover types. The natural plant communities found within the site are generally small, fragmented patches of oak woodland and savanna. **Figure 3** identifies existing vegetation (1997 photo interpretation) on the site.

Following is a brief description of the existing plant communities and vegetative cover types present on CD-P86.

Agricultural Land (soybeans & corn)

Row crops are established primarily on lower lying flat areas of the site.

Low Quality Dry Oak Savanna

Dominant species include small, shrubby bur oak averaging 6-8 inches in diameter with scattered boxelder, green ash and eastern red cedar. Although native grasses are uncommon, a good diversity of forbs is present including daisy fleabane, narrowleaf milkweed, stiff goldenrod, wild bergamot, and thimbleweed. This site contains many characteristic savanna plants including lead plant, goldenrod and a variety of shrubs. Several invasive exotic shrubs persist in the understory, including European buckthorn and Tartarian honeysuckle. Because this site contains a moderate diversity of native savanna species, it provides excellent oak savanna restoration possibilities.

Old Field

Areas of old field are dominated by smooth brome with very few scattered young aspen and boxelder. Other species include sheep sorrel, cinquefoil, ragweed, and bladder campion.

Non-native Dominated Wet Meadow

Several shallow depressions occur within the site that marginally supports wetland hydrology, soils and vegetation. Vegetation within these depressions is generally dominated by reed canary grass and stinging nettle.

Pine Plantation

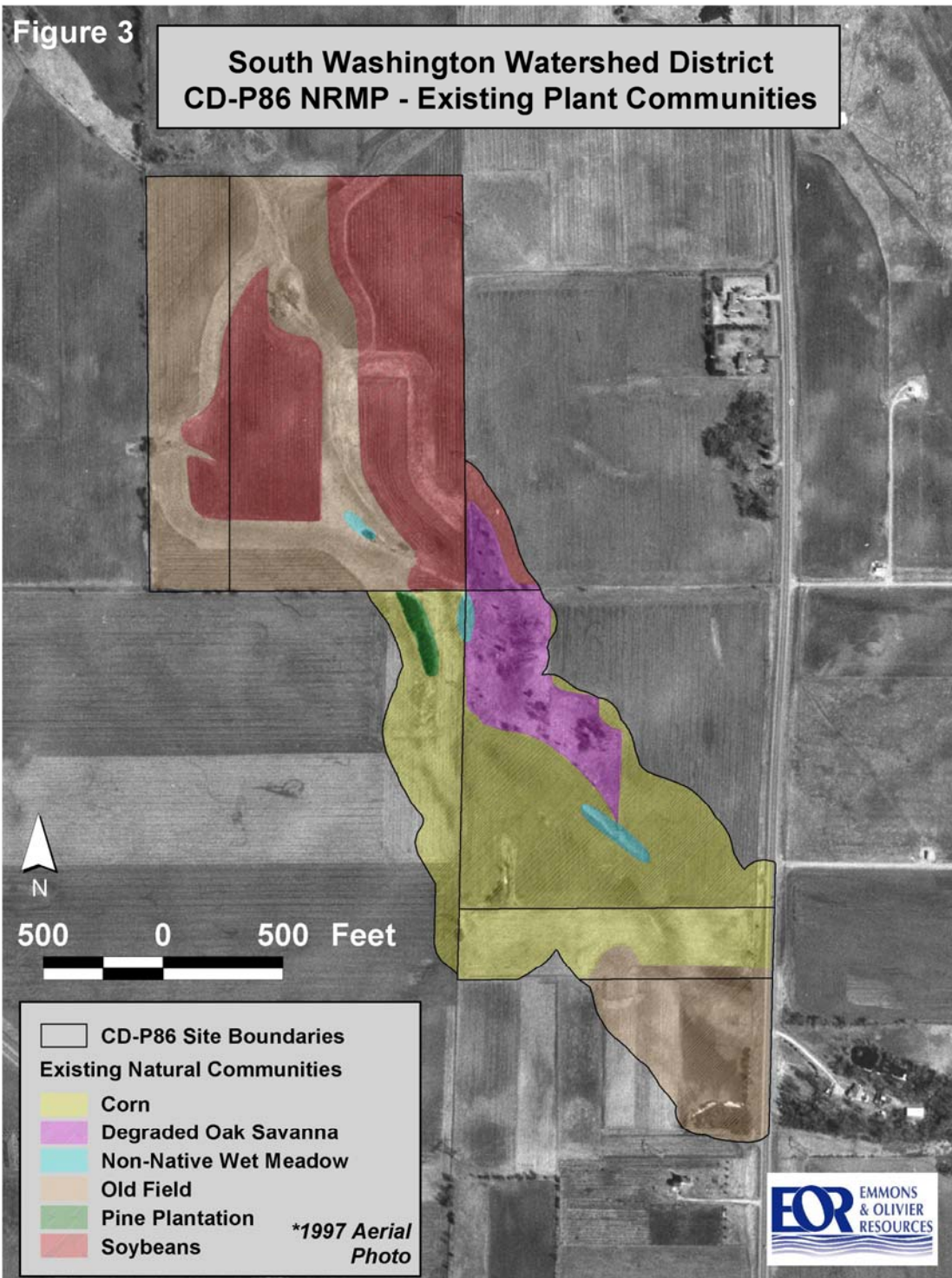
A small strip of red pine is planted along one of the steeper slopes within the site. Few other plant species occur within this area.

D. Rare Features

There are no known rare features within the project area. Natural Heritage Program data bases do not show records for threatened, endangered, or special concern species within, or adjacent to, CD-P86. There are also no records of high quality natural communities identified within CD-P86. State Endangered Kittentails (*Bessya bullii*) are known to occur about 2 miles southeast of the site in a similar type setting. Surveys of the CD-P86 area did not uncover any evidence of Kittentails. Loggerhead Shrikes (*Lanius ludovicianus*), listed as Threatened in Minnesota, are known to occur several miles to the south and may utilize old field habitat associated with CD-P86.

Figure 3

South Washington Watershed District
CD-P86 NRMP - Existing Plant Communities



C. Site Assessment with Respect to Proposed Plant Communities

Site assessment consists of evaluation of soils, slope, aspect, hydrology and past/present land uses to define the plant community (ies), best adapted to specific areas of the site. This assessment is then used to prescribe appropriate site preparation practices and seeding planting techniques required for successful plant community establishment. As a general rule, mesic soil conditions prevail on CD-P86 due to predominantly silt-loam soils. Slopes, which may either increase or decrease soil moisture conditions include predominantly northwest (more moist) or southeast (less moist) slopes. Based on personal observations and monitoring of surface water conditions on CDP-85, located just north of CDP-86, groundwater discharge is not known to occur within the site. Finer textured soils, however; do exist within depressional areas of the site. These depressions may contain ponded water for brief periods following spring runoff, but are otherwise dry. Land use is dominated by agricultural row crop and grassland. Portions of the site that are now typed as grassland or degraded oak savanna were likely grazed historically, however; no grazing occurs at the present within the site.

Plant community establishment and future maintenance activities should not interfere with the function of proposed infrastructure. Likewise, consideration should be given to such features as trails and access roads; that if planned for properly, can be used as fire breaks for controlled burns and other plant community maintenance activities.

D. Vegetation Management Recommendations

Vegetation Management Recommendations can be described in three steps:

1. Site Preparation and Plant Community Pre-establishment: Activities that prepare the site for planting, seeding. Where invasive species occur, control of these species is established prior to seeding or planting.
2. Seeding and Planting: Seeding and Planting includes a wide variety of approaches that may include:
 - a. Encouraging native seed banks or vegetative propagals to establish new native plant populations.
 - b. Introduction of tree, shrub, grass and forb seeds though drilling, broadcast, timed as either dormant or nondormant seeding.
 - c. Planting bare-root, burlap or containerized trees, shrubs, grasses and forbs.

A. Site Preparation and Plant Community Pre-Establishment

Site preparation and plant community pre-establishment areas are shown in **Figure 4**. For individual acreages, please refer to **Table 2** in Section 12, Budget and Scheduling.

1. Area I - Agricultural Areas

- 1.1 *Final Crop Harvest*
- 1.2 *Invasive Species Control - Herbaceous Species:* Apply mid to late May application of glyphosate herbicide to cool season grass dominated areas. Apply glyphosate or appropriate selective herbicide during middle to late summer (but before target species go to seed) to control annual weeds.
- 1.3 *Seedbed Preparation:* Following a regimen of herbicide treatments disc site to a minimum depth of 3 inches.

2. Area II - Old Field

- 2.1 *Invasive Species Control - Herbaceous Species:* Apply mid to late May application of glyphosate herbicide to cool season grass dominated areas. Apply glyphosate or appropriate selective herbicide during middle to late summer (but before target species go to seed) to control annual weeds.
- 2.2 *Invasive Species Control – Controlled Burns:* Once vegetation has died back and dried out sufficiently, conduct a controlled burn of all treated areas. If conditions are too wet or if density of vegetation is not sufficient to carry a burn, mow in place of the controlled burn.
- 2.3 *Seedbed Preparation:* Following a regimen of herbicide treatments, disc site to a minimum depth of 3 inches.

3. Area III - Degraded Oak Savanna

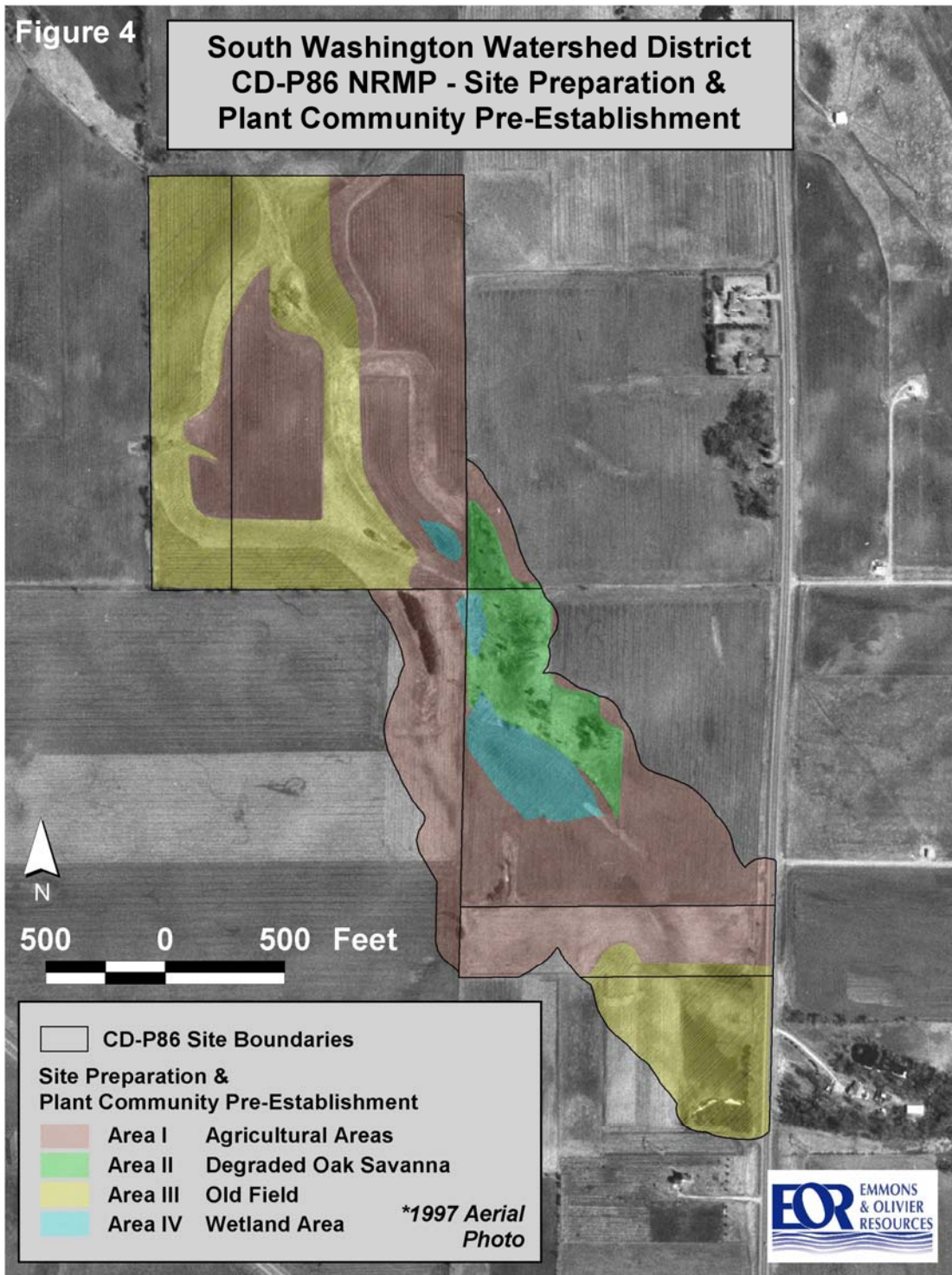
- 3.1 *Invasive Species Control - Woody Species:* Flag all desirable woody species to keep; cut invasive species targeted for immediate removal from the Degraded Oak Savanna. Larger trees (DBH > 8") shall be girdled or treated with a hypohatchet and left standing. Cutting should be conducted during mid-summer, but prior to fruit/seed production on buckthorn. All woody material should be inspected to insure that seed material (primarily buckthorn fruits) are not attached and should be piled for chipping and mulching. All cut stumps and cuts made to girdle trees should be treated with a basal application of Garlon-4, or other approved herbicide, within twenty-four hours of cutting or girdling.
- 3.2 *Invasive Species Control - Herbaceous Species:* Apply mid to late May application of glyphosate herbicide to cool season grass dominated areas. Apply glyphosate or appropriate selective herbicide during middle to late summer (but before target species go to seed) to control annual weeds.
- 3.3 *Invasive Species Control – Controlled Burns:* Once vegetation has died back and dried out sufficiently, conduct a controlled burn of all treated areas. If conditions are too wet or if density of vegetation is not sufficient to carry a burn, mow in place of the controlled burn.
- 3.4 *Seedbed Preparation:* Following a regimen of herbicide treatments disc site to a minimum depth of 3 inches.

4. Area IV. Wetland Area

- 4.1 *Invasive Species Control - Herbaceous Species:* Apply mid to late May application of glyphosate herbicide to cool season grass dominated areas. Apply glyphosate or appropriate selective herbicide during middle to late summer (but before target species go to seed) to control annual weeds.
- 4.2 *Invasive Species Control – Controlled Burns:* Once vegetation has died back and dried out sufficiently, conduct a controlled burn of all treated areas. If conditions are too wet or if density of vegetation is not sufficient to carry a burn, mow in place of the controlled burn
- 4.3 *Seedbed Preparation:* Following a regimen of herbicide treatments disc site to a minimum depth of 3 inches.

Figure 4

**South Washington Watershed District
CD-P86 NRMP - Site Preparation &
Plant Community Pre-Establishment**



B. Proposed Natural Communities and Seeding/Planting Recommendations

Natural communities proposed for CD-P86 include a rich mosaic of woodland, savanna, prairie, wetland, and forest. To the degree possible, proposed natural communities are selected to mimic those natural communities that would be expected to occur based on site characteristics. The following describes the composition, structure and landscape relationship of each of the natural communities proposed for the site. **Figure 5** depicts the location of proposed natural communities. **Appendix A** provides species lists for each natural community.

1. Floodplain Meadow/Mesic Prairie

Floodplain Meadow is proposed for the lower flat area of this site. This area can be subject to occasional flood events. Most of the floods that have historically occurred are spring floods resulting from snowmelt runoff and precipitation. During the spring, the site may be under one to two feet of water, while later in the summer, site conditions may be very dry. The dry/mesic prairie mix is designed to accommodate both extremes and contains a mixture of warm season grasses that are generally dormant during spring floods, along with species adapted to more moist conditions.

Seeding and Planting: For this area, apply cover crop and grass/forb seed mix with Truax Drill or Trillium Seeder as a dormant fall seeding after soil temperature fall below 54° F. For areas below the inundation area, apply cover crop and grass/forb seed mix with a Truax Drill in late-spring, after flooding threat is gone. Apply mulch and anchor with straw crimper.

2. Dry Oak Savanna/Woodland

Dry Oak Savanna/Woodland is proposed for portions of the site with south and west facing slopes, above the lower flat area. As part of the Oak Savanna/Woodland reclamation, some of the existing trees and snags will be retained to provide some canopy cover as well as snag habitat for wildlife.

Seeding - Grasses and Forbs: Apply cover crop and grass/forb seed mix with Truax Drill or Trillium Seeder. Seeding may be completed as either a dormant seeding or spring seeding. Apply mulch and anchor with straw crimper. Specific areas marked for seeding oak acorns should not be planted to prairie grasses and forbs until oak seedlings have had adequate time to establish themselves.

Seeding - Acorns: Planting acorns provides a cost-effective alternative to seedlings and helps to establish a more “authentic look” to the oak savanna by creating scattered patches of dense oak grubs, as opposed to single trees or small groups of trees established from seedlings. Acorns can be collected locally from Cottage Grove Ravine Park with the help of volunteers. Bur oak and pin oak acorns should be gathered in the fall. Collected acorns should be soaked in water with those floating to the surface discarded. Plant acorns two-inches deep, with nuts randomly spaced, one to two feet apart. Nuts can also be broadcast and then tilled in as part of woodchip mulch, provided that they are not buried more than two inches deep. Bur oaks, which require cold stratification, will germinate in the spring, while pin oak will germinate immediately, given proper soil conditions. Oak acorns should be planted in small, scattered patches and at good densities. The boundaries of each patch should be permanently marked with fire-proof stakes so that patches can be relocated. For the first two to three years, competing grasses and forbs should be weeded to enable the oak seedlings to become established. Once oak seedlings are established, interseed low-growing oak savanna grasses and forbs into oak seeding area, and oak seeding areas can be managed with the rest of the site using controlled burns.

Trees and Shrub Planting: Oak trees should be planted at an average rate of 40 trees/acre with an equal number of white, bur, red, and northern pin oak of local genotype planted. Shrub species should be planted at a rate of 40 shrubs/acre with shrub planting divided equally among the shrub species planted. Trees and shrubs should be planted randomly as both individuals and as small

groups. The density of trees and shrubs should be higher adjacent to edges abutting oak woodland and lower adjacent to edges abutting prairie. All trees and shrubs should be protected with hardware mesh enclosures to a height of five feet to protect against deer browsing and rodent damage. Tubes may also be used for tree seedlings without branches.

3. Mesic/Dry Oak Forest

Mesic/Dry Oak Forest is proposed for the east and north facing slopes. After invasive species are removed and control established, grasses and forbs can be broadcast seeded and trees and shrubs interplanted between residual trees.

Seeding and Planting - Grasses and Forbs: Following removal and treatment of invasive species, broadcast-seed grass and forb seed mix.

Tree and Shrub Planting: Trees and shrubs should be planted randomly at a rate of 75 trees/acre and 75 shrubs/acre. Shrubs should be distributed across site according to individual species preference with respect to dryness of soil and/or position on slope. All trees and shrubs should be protected with hardware mesh enclosures to a height of five feet to protect against deer browsing and rodent damage. Tubes may also be used for tree seedlings without branches.

4. Wetland

Small ephemeral wetland basins are proposed for the three lowest elevations within CD-P86.

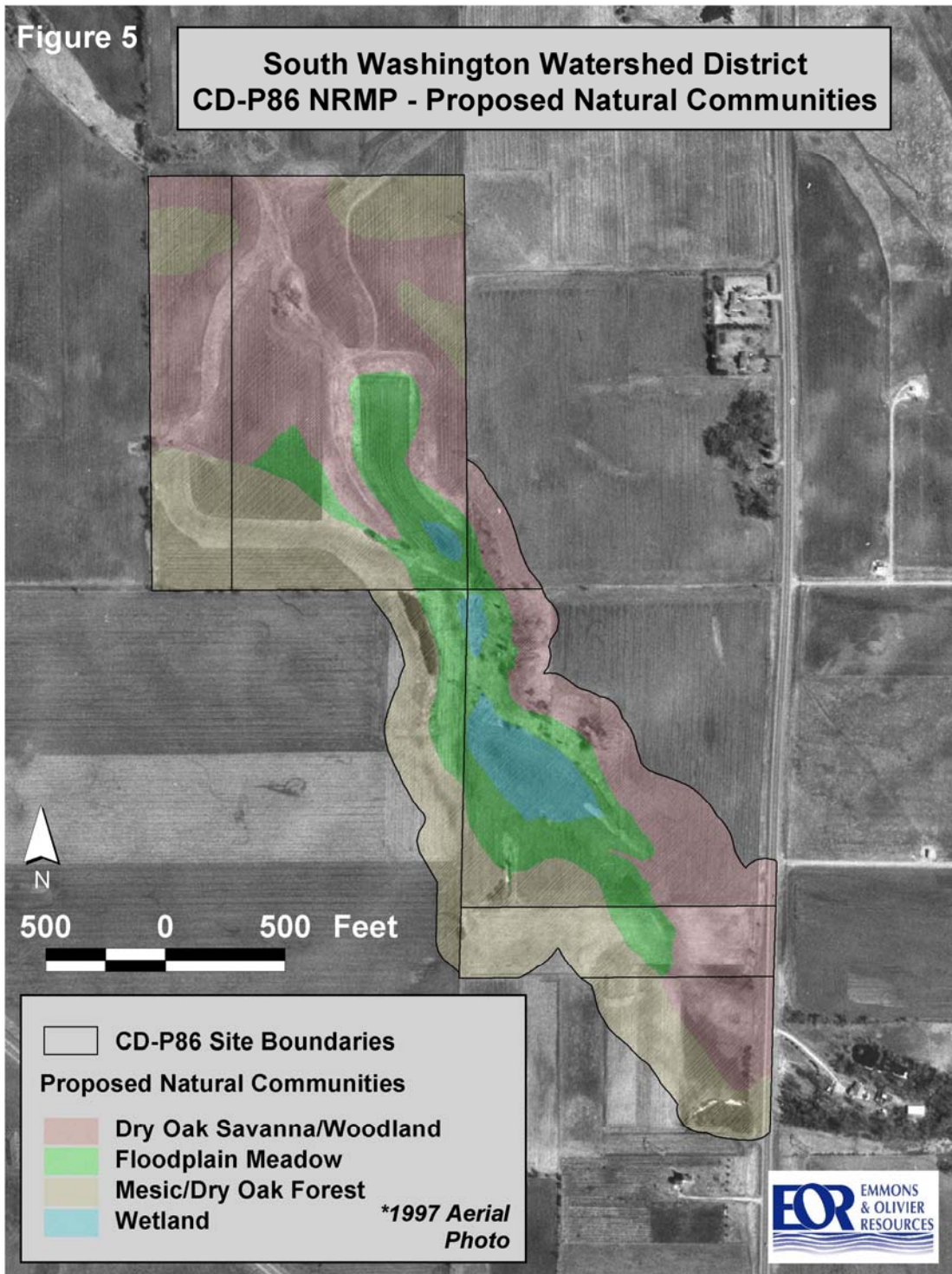
Seeding and Planting - Grasses and Forbs: Following removal and treatment of invasive species broadcast-seed grass and forb seed mix.



Photo of Existing Low Areas in CD-P86

Figure 5

South Washington Watershed District
CD-P86 NRMP - Proposed Natural Communities



5. Water Resources

The current surface water flow patterns of the area are characterized by discontinuous drainage patterns and numerous dry depressions. The numerous depressions do not show evidence of surface overflow on any regular basis. A review of existing topography, soils, geology, and landscape forms indicates that infiltration and evapotranspiration are the dominant surface water mechanisms in the hydrologic cycle for the local area.

A. Lakes

There are no lakes in the immediate project area. Bailey Lake is about one mile north of the site and may in the future contribute surface water to CD-P86. Gables Lake is south of CD-P86 and currently does not receive surface water from the site area. Cottage Grove Ravine Park Lake is approximately 4 miles south of the site.

B. Streams

There are no streams running through or adjacent to this site.

C. Wetlands

Three small reed canary grass depressions were identified as part of a natural resource inventory of the site but they were extremely dry at the time of the survey and do not likely exhibit wetland hydrology. The SWWD Wetland Management Plan does not identify any wetlands within the site.

D. Groundwater

Recent drilling indicates subsurface materials are very sandy, typically glacial outwash, which confirms geologic mapping of the area. The water table encountered in the area of CD-P86 is relatively deep and does not intersect the surface. The introduction of regional flows into the study area is still being assessed for the magnitude, timing and duration. The most likely time for regional overflow to be introduced in this area in significant quantities appears to be in a large spring snowmelt-runoff event. This area functions as a groundwater recharge area. There are no springs outletting to the surface of this site.

Groundwater Sensitivity

The Minnesota Geologic Survey has mapped sensitive areas to groundwater pollution as part of the geologic atlas series. Within the site, the Water Table Aquifer and Prairie du Chien (PdC) Aquifer are both vulnerable to groundwater pollution. The study area is designated as high sensitivity. Areas adjacent to the study area are rated as very high sensitivity, specifically near Gables Lake which is south and east of CD-P86. High groundwater sensitivity in the area is due to coarse grained deposits found beneath the surface.

E. Stormwater Quality and Quantity

Past surface water quality monitoring in the District has indicated good water quality in terms of groundwater recharge waters. Impacts on groundwater quality, if any, are usually associated with recharge of poorly treated surface waters. The surface waters will be well treated and of good quality prior to any recharge to the local groundwater system.

F. Water Resource Management Recommendations

The area protected by the DNR easement will serve to improve water resources in the District. First, the site will be set aside as a natural area producing very little storm water runoff and functioning as a groundwater recharge area. Significant buffers of natural vegetation will help protect the site from runoff produced in adjacent areas and help to stabilize the site itself. When CD-P86 becomes part of the trunk stormwater facility for the District, a considerable amount of surface water can be retained and infiltrated within the basin. Downstream waterbodies such as the Mississippi River will benefit from this basin's natural ability to retain and infiltrate significant volumes of stormwater. Ephemeral wetlands that may form with the additional volumes of stormwater will be dominated by wet/mesic vegetation and buffered by savanna and woodland uplands.



Photo of CD-P86 showing Degraded Savanna and Agricultural Land.

6. Wildlife Resources

A. Existing Habitat

Most of the wildlife species currently found within the project area are likely to be well adapted for open habitat and agricultural areas. Since the diversity of habitat types is very limited, the project area does not support a wide variety of wildlife species. There is no reliable source of water within CD-P86 and winter cover is nearly nonexistent. In fact, permanent year-round cover is extremely limited within the general vicinity.

Wildlife species noted on the nearby Shepard Farm Property (west of the site) include grey fox, coyote, deer, raccoon, opossum, great-horned owl, red-tailed hawk, downy wood pecker, hairy woodpecker, mallard, wood duck, blue-winged teal, blue heron and snowy egret. Although many of these species associate with the forest and wetland habitat on the Shepard Farm site, some of these species may occasionally travel through the more open, agricultural areas typical of CD-P86. There are no known listed animals found within the project area and very few within the general vicinity.

B. Future Habitat

Diversity and quality of wildlife habitat will greatly increase once management activities begin. Agricultural and exotic/invasive vegetation will be replaced by native vegetation and different types of natural habitat. Forests, woodlands, savannas, meadows and wetlands will habitat for many different species of wildlife. See **Figure 5** for location and assemblage of natural communities.

The habitat created will be of significant size to function both as a travel corridor for migrants and habitat for permanent and seasonal residents. Species requiring interior space will feel safe within the protected areas of CD-P86 and edge-favoring species will utilize the interface between adjacent landuses and natural areas. Loggerhead shrikes can be found occasionally within the project vicinity. The restoration activities proposed as part of this plan may provide habitat for this rare bird.

C. Wildlife Management Recommendations

A primary objective of these recommendations is to increase abundance and diversity of wildlife with emphasis on rare and unique species. It is assumed that habitat-generalist species will continue to exist and will, in all likelihood, increase in numbers. The foundation for wildlife habitat improvements is reclamation of natural communities. By creating a diverse mosaic of natural communities that mimic, to the degree possible, historic ecosystems, more habitat niches will be created for a greater diversity of wildlife. To maximize benefits to wildlife from plant community reclamation, emphasis is placed on woody and herbaceous species with high value for wildlife food and cover. Species lists are included in **Appendix A** for each of the proposed plant communities.

Following are additional recommendations to improve wildlife habitat:

1. Retain dead/dying snags that are either standing or down. Snags provide excellent habitat for cavity nesting birds and mammals and support large populations of insects that serve as an important food source for wildlife.
2. Tree plantings should maximize visual screening for wildlife.
3. Place bird nesting boxes within project area.

7. Adjacent Land Use

Currently most adjacent land consists of agricultural and large lot residential use. To the east of the site is an old dump, currently within the MPCA VIC program. The site is capped and is no longer being used for disposal. A large stormwater pumping facility north of the site pumps water to the large depression (CD-P85) immediately north of CD-P86. The entire basin is owned by the City of Woodbury and is managed as an infiltration basin. Current land uses do not create significant conflicts with the proposed natural area other than herbicide drift from adjacent agricultural fields.

Future use for the area is likely to be primarily residential. As development occurs throughout the area, more and more pressure will be put on the agricultural lands to convert to homes. Screening from residences will provide security for wildlife using the area and buffers will provide protection from stormwater runoff impacts. White-tailed deer residing in the natural area may become a nuisance for some homeowners if their landscaping plans include delectable shrubs and forbs.

8. Contaminants

3M manages a VIC (Voluntary Investigation and Cleanup) site located less than one mile east of CD-P86. Although the site is in close proximity, remediation has not been determined to be necessary within the CD-P86 site. No evidence of contaminants has been found within the project area.

9. Infrastructure

Due to agricultural land use, there are no existing recreational facilities or lands in the areas of Woodbury and Cottage Grove near this site. The majority of the proposed greenway/stormwater corridor is undeveloped or agricultural. Potential opportunities for the CD-P86 site include passive recreation and trail connections to active parks and interpretive nature areas.

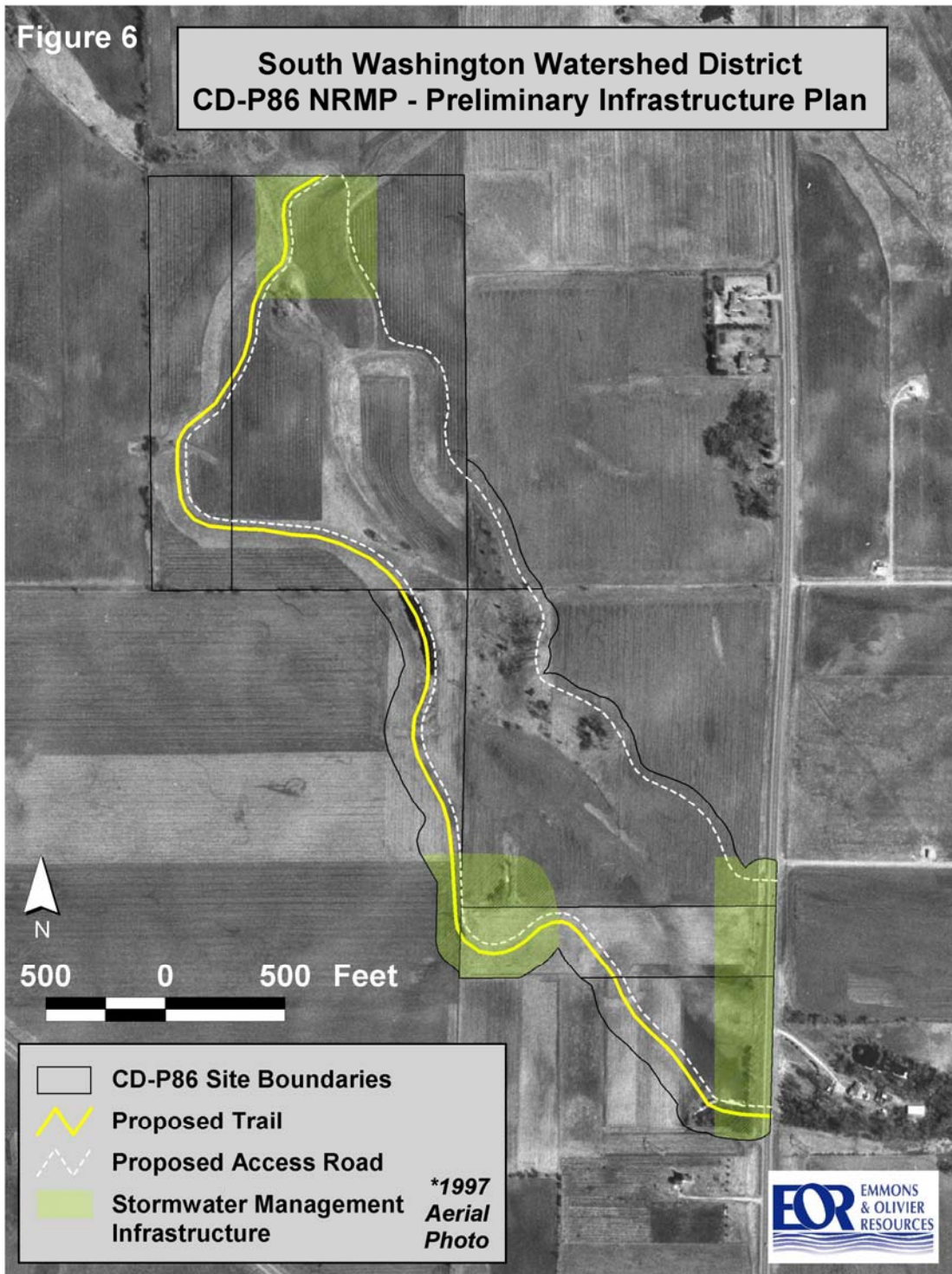
There are no developed recreational facilities planned with the CD-P86 site except for the proposed trail. The proposed trail will be developed in accordance with State Aid Minimum Bicycle Path Standards for Off-Road Bikeways. The trail is expected to be 10' wide bituminous with a 10 wide mown shoulder.

Stormwater conveyance structures may be necessary within the CD-P86 site. Although not determined at this time, it may be necessary to construct structures or facilities serving as regional stormwater conveyance mechanisms. Access roads may also be necessary to construct, install, maintain and monitor the facilities. The access roads shall be vegetated with an improved subgrade to support vehicles and be gated to prevent unauthorized entry.

See **Figure 6** for a preliminary plan of proposed infrastructure in CD-P86.

Figure 6

South Washington Watershed District
CD-P86 NRMP - Preliminary Infrastructure Plan



10. Human Impact Management

Several issues exist, which may potentially conflict with carrying out proposed management recommendations. Some of these management issues include:

ATV Trails

Several ATV trails exist in the degraded oak savanna area. In addition to causing general disturbance, these trails create soil compaction and erosion within the degraded oak savanna. Signage and periodic patrolling may be necessary to prevent ATV use of the area.

Stormwater Uses

Depending on degree of development and frequency of use as a regional stormwater management facility, this basin may require special stormwater management practices. Buffers may need to be maintained and volumes of stormwater may need to be controlled in order to insure surface water is managed properly and the capacity of the basin is not exceeded.

Agricultural Uses/Herbicide Drift

Topsoil erosion and herbicide drift are two impacts associated with adjacent agricultural uses. Dense buffers of tall residual vegetation will help to minimize impacts from both erosion and herbicide drift.

Proposed Trail Issues

Proposed trails will fragment the site, and provide additional accessibility. Uses such as off-road biking can cause significant damage to the sensitive natural vegetation and highly erodible soils. Off-trail hiking can also trample vegetation and cause disturbances to wildlife. Signage and periodic patrolling will be necessary to insure trail users use the area appropriately.

Wildlife Road Crossings

As the adjacent areas become more developed and CD-P86 becomes an important link in the SWWD Greenway, wildlife passage through the site will become more prevalent. Currently wildlife can travel through the undeveloped agricultural areas but once these areas convert to homes, their travel patterns will be interrupted. They will begin using, almost exclusively, the greenway corridor. Critical crossings such as County Rd 19 between this site and Gables Lake will become very hazardous for wildlife and humans traveling in vehicles. Future considerations should be given to creating a wildlife crossing that provides safe access for wildlife and will possibly prevent numerous vehicular accidents.

11. Special Resources

The natural depression or valley of the site will provide aesthetically pleasing views from both the proposed trail and County Rd. 19. The trail will skirt the area providing a panoramic view of the valley. This natural depression will be revegetated with native vegetation and will be reminiscent of presettlement communities.

Aside from the geologic formations functioning as a significant regional groundwater recharge area there are no unique features within the site.

12. Budget and Schedule

Table 2 shows the budget and schedule for vegetation management and reestablishment activities.

Table 2. Construction Budget and Schedule

Task	SWWD CD-P86 NRMP				
	Unit	Cost/Unit	Quantity	Cost	Timeline
Area I - Agricultural Areas					
1.1 Final Crop Harvest	Ac	\$0.00	59	\$0.00	Fall 2002
1.2 Invasive Herbaceous Species Control	Ac	\$100.00	59	\$5,900.00	Spring 2003
1.3 Seed Bed Preparation	Ac	\$100.00	59	\$5,900.00	Fall 2003
Area II - Old Field					
2.1 Invasive Herbaceous Species Control	Ac	\$100.00	35	\$3,500.00	Spring 2003
2.2 Controlled Burn	Ac	\$100.00	35	\$3,500.00	Spring 2003
2.3 Seed Bed Preparation	Ac	\$100.00	35	\$3,500.00	Fall 2003
Area III - Degraded Oak Savanna					
3.1 Remove Woody Invasive Species/Apply Herbicide	Ac	\$1,000.00	8	\$8,000.00	Summer 2003
3.2 Invasive Herbaceous Species Control	Ac	\$100.00	8	\$800.00	Spring 2003
3.3 Controlled Burn	Ac	\$100.00	8	\$800.00	Spring 2003
3.4 Seed Bed Preparation	Ac	\$100.00	8	\$800.00	Fall 2003
Area IV - Wetland Area					
4.1 Invasive Herbaceous Species Control	Ac	\$100.00	1	\$100.00	Spring 2003
4.2 Controlled Burn	Ac	\$100.00	1	\$100.00	Spring 2003
4.3 Seed Bed Preparation	Ac	\$100.00	1	\$100.00	Fall 2003
Planting and Seeding Schedule					
Mesic Prairie/Floodplain Meadow - Grasses/Forbs	Ac	\$1,500.00	18	\$27,000.00	Fall 2003
Dry Oak Savanna/Woodland - Grasses/Forbs/Acorns	Ac	\$2,000.00	46	\$92,000.00	Fall 2003
Dry Oak Savanna/Woodland - Plant Oak Seedlings, Trees, Shrubs	Ac	\$2,000.00	46	\$92,000.00	Spring 2004
Mesic/Dry Oak Forest - Grass/Forb Seeding	Ac	\$1,500.00	35	\$52,500.00	Fall 2003
Mesic/Dry Oak Forest - Plant Oak Seedlings, Trees, Shrubs, and Plants	Ac	\$2,000.00	35	\$70,000.00	Spring 2004
Wetland Areas - Grass/Forb Seeding	Ac	\$1,500.00	4	\$6,000.00	Spring 2004
Vegetation Management and Establishment Subtotal				\$ 372,500.00	

Table 3 shows the annual estimates for construction, monitoring and contract management through the Spring of 2005.

Table 3. Annual Budgeting Table

Fall of 2002	
Construction	\$0.00
Site Monitoring	\$250.00
Subtotal	\$250.00
Spring of 2003	
Construction	\$14,700.00
Site Monitoring	\$250.00
Construction Contract Management	\$1,500
Subtotal	\$16,450.00
Summer of 2003	
Construction	\$8,000
Site Monitoring	\$250.00
Construction Contract Management	\$800.00
Subtotal	\$9050.00
Fall of 2003	
Construction	\$181,800.00
Site Monitoring	\$250.00
Construction Contract Management	\$18,000.00
Subtotal	\$200,050.00
Spring of 2004	
Construction	\$168,000.00
Site Monitoring	\$250.00
Construction Contract Management	\$16,000.00
Subtotal	\$184,250.00
Summer of 2004	
Site Monitoring	\$300.00
Vegetation Maintenance	\$5,000.00
Subtotal	\$5,300.00
Fall of 2004	
Site Monitoring	\$300.00
Vegetation Maintenance	\$5,000.00
Subtotal	\$5,300.00
Spring of 2005	
Site Monitoring	\$300.00
Vegetation Maintenance	\$5,000.00
Subtotal	\$5,300.00

Total Estimated Costs Through Spring of 2005 \$425,950.00

Table 3 shows the total estimated cost to implement the SWWD CD-P86 NRMP is \$425,950. This includes cost for final design, permitting, inspection, plant material and a broad range of reclamation management practices to be carried out over a period of 4 years.

13. Management Authority

Many stakeholders will have interest in the CD-P86 property. South Washington Watershed District will act as the principle manager of the property but other parties involved include Washington County, City of Woodbury and City of Cottage Grove. The District will monitor vegetation on the site to insure restoration activities are successful. As the area becomes part of the central stormwater management facility for the District, the District is expected to take the lead role in managing the area in this capacity. County and City management roles will be primarily related to trails and park/open space management issues. The District will rely on County and City staff for enforcement of violations within the natural area.

Appendix A. Proposed Natural Community Species Planting Lists
MNDOT 25A Modified (25B)
Wetland and Floodplain Meadow Seed Mix

Grasses		
Common Name	Botanical Name	% of Mix
Big bluestem	<i>Andropogon gerardii</i>	5.00
Brome fringed	<i>Bromus ciliatus</i>	5.00
Bluejoint	<i>Calamagrostis canadensis</i>	0.10
Sedge bottle-brush	<i>Carex comosa</i>	1.00
Switchgrass wildtype	<i>Panicum virgatum</i>	1.00
Sedge tussock	<i>Carex stricta</i>	0.50
Indian grass	<i>Sorghastrum nutans</i>	6.00
Sedge fox	<i>Carex vulpinoidea</i>	0.40
Wheat grass slender	<i>Elymus trachycaulus</i>	6.00
Wild rye virginia	<i>Elymus virginicus</i>	6.00
Grass reed manna	<i>Glyceria grandis</i>	0.30
Grass fowl manna	<i>Glyceria striata</i>	0.20
Rye grass annual	<i>Lolium italicum</i>	10.00
Regreen	N/A	42.00
Bluegrass fowl	<i>Poa palustris</i>	5.00
Bulrush green	<i>Scirpus atrovirens</i>	0.30
Wool grass	<i>Scirpus cyperinus</i>	0.30
Bulrush softstem	<i>Scirpus validus</i>	1.00
Prairie cordgrass	<i>Spartina pectinata</i>	2.00
Wild rye virginia	<i>Elymus virginicus</i>	6.00
Forbs		
Common Name	Botanical Name	% of Mix
Canada anemone	<i>Anemone canadensis</i>	0.10
Milkweed marsh	<i>Asclepias incarnata</i>	0.50
Aster new england	<i>Aster novae-angliae</i>	0.60
Aster swamp	<i>Aster puniceus</i>	0.60
Tick trefoil showy	<i>Desmodium canadense</i>	0.40
Weed joe-pye	<i>Eupatorium maculatum</i>	0.40
Boneset	<i>Eupatorium perfoliatum</i>	0.30
Sunflower early (oxeye)	<i>Heliopsis helianthoides</i>	0.70
Blue flag iris	<i>Iris virginica-schreivi</i>	0.50
Rush common	<i>Juncus effusus</i>	0.20
Blazing star meadow	<i>Liatris ligulistylis</i>	0.40
Blazing star prairie	<i>Liatris pycnostachya</i>	0.40
Great blue lobelia	<i>Lobelia siphilitica</i>	0.10
Monkey flower	<i>Mimulus ringens</i>	0.10
Bergamot	<i>Monarda fistulosa</i>	0.60
Goldenrod grass-leaved	<i>Solidago graminifolia</i>	0.20
Vervain blue	<i>Verbena hastata</i>	0.50
Ironweed	<i>Vernonia fasciculata</i>	0.20
Culvers root	<i>Veronicastrum virginicum</i>	0.10
Golden alexanders	<i>Zizia aurea</i>	0.40
Black-eyed susan	<i>Rudbeckia hirta</i>	0.60
Total:		100.0

Dry Oak Savanna/Woodland

MNDOT Modified (5B) – Savanna & Woodland Edge Seed Mix		
Common Name	Botanical Name	% of Mix
Hyssop, fragrant-giant	<i>Agastache foeniculum</i>	0.25
Bluestem, big	<i>Andropogon gerardi</i>	5.0
Anemone, Canada	<i>Anemone canadensis</i>	0.25
Milkweed, marsh	<i>Asclepias incarnata</i>	0.25
Milkweed, butterfly	<i>Asclepias tuberosa</i>	0.25
Aster, smooth-blue	<i>Aster laevis</i>	0.25
Aster, large-leaved	<i>Aster macrophyllus</i>	0.25
Milkvetch, Canada	<i>Astragalus canadensis</i>	0.25
Gramma, sideoats	<i>Bouteloua curtipendula</i>	4.0
Wood chess, hairy	<i>Bromus purgans</i>	4.0
Tic-trefoil, showy	<i>Desmodium canadense</i>	0.25
Wild rye, Canada	<i>Elymus canadensis</i>	6.0
Bottle brush grass	<i>Elymus hystrix</i>	2.0
Wheat grass, slender	<i>Elymus trachycaulus</i>	10.0
Wild rye, Virginia	<i>Elymus virginicus</i>	6.0
Sunflower, early	<i>Heliopsis helianthoides</i>	0.25
Lobelia, great-blue	<i>Lobelia siphilitica</i>	0.25
Rye grass, annual	<i>Lolium italicum</i>	10.0
Monkey flower	<i>Mimulus ringens</i>	0.25
Bergamot, wild	<i>Monarda fistulosa</i>	0.25
ReGreen	NA	36.0
Switch grass	<i>Panicum virgatum</i>	2.0
Black-eyed Susan	<i>Rudbeckia hirta</i>	0.25
Golden-glow, wild	<i>Rudbeckia laciniata</i>	0.25
Brown-eyed Susan	<i>Rudbeckia triloba</i>	0.25
Bluestem, little	<i>Schizachyrium scoparium</i>	5.0
Aster, upland-white	<i>Solidago ptarmicoides</i>	0.25
Goldenrod, stiff	<i>Solidago rigida</i>	0.25
Indian grass	<i>Sorghastrum nutans</i>	5.0
Spiderwort, prairie	<i>Trandescantia bracteata</i>	0.25
Vervain, blue	<i>Verbena hastata</i>	0.25
Alexander's, golden	<i>Zizia aurea</i>	0.25
	Total:	100.0
Rate: 30 lbs/acre (33 kg/ha).		
Description: Native woodland edge mix for use on forest transition areas. Reaches a height of approximately 36 to 48 inches. This mix can tolerate up to 50% shade.		

Dry Oak Savanna/Woodland (continued)

Trees

Common Name	Botanical Name	T/A
White oak	<i>Quercus alba</i>	10
Northern pin oak	<i>Quercus ellipsoidalis</i>	10
Bur oak	<i>Quercus macrocarpa</i>	10
Red oak	<i>Quercus rubra</i>	10
Basswood	<i>Tilia americana</i>	10
	Total:	40 T/A

Shrubs

Common Name	Botanical Name	S/A
Juneberry	<i>Amelanchier laevis</i>	5
Leadplant	<i>Amorpha canescens</i>	5
New Jersey tea	<i>Ceanothus americanus</i>	5
Gray dogwood	<i>Cornus foemina</i>	5
Hawthorne species	<i>Crataegus spp.</i>	5
Sandcherry	<i>Prunus pumila</i>	5
Choke cherry	<i>Prunus virginiana</i>	5
Currant species	<i>Ribes spp.</i>	5
Red raspberry	<i>Rubus strigosus</i>	5
Common snowberry	<i>Symphoricarpos albus</i>	5
	Total:	40 S/A

Mesic/Dry Oak Forest

MNDOT Modified (5B) – Savanna & Woodland Edge Seed Mix		
Common Name	Botanical Name	% of Mix
Hyssop, fragrant-giant	<i>Agastache foeniculum</i>	0.25
Bluestem, big	<i>Andropogon gerardi</i>	5.0
Anemone, Canada	<i>Anemone canadensis</i>	0.25
Milkweed, marsh	<i>Asclepias incarnata</i>	0.25
Milkweed, butterfly	<i>Asclepias tuberosa</i>	0.25
Aster, smooth-blue	<i>Aster laevis</i>	0.25
Aster, large-leaved	<i>Aster macrophyllus</i>	0.25
Milkvetch, Canada	<i>Astragalus canadensis</i>	0.25
Gramma, sideoats	<i>Bouteloua curtipendula</i>	4.0
Wood chess, hairy	<i>Bromus purgans</i>	4.0
Tic-trefoil, showy	<i>Desmodium canadense</i>	0.25
Wild rye, Canada	<i>Elymus canadensis</i>	6.0
Bottle brush grass	<i>Elymus hystrix</i>	2.0
Wheat grass, slender	<i>Elymus trachycaulus</i>	10.0
Wild rye, Virginia	<i>Elymus virginicus</i>	6.0
Sunflower, early	<i>Heliopsis helianthoides</i>	0.25
Lobelia, great-blue	<i>Lobelia siphilitica</i>	0.25
Rye grass, annual	<i>Lolium italicum</i>	10.0
Monkey flower	<i>Mimulus ringens</i>	0.25
Bergamot, wild	<i>Monarda fistulosa</i>	0.25
ReGreen	NA	36.0
Switch grass	<i>Panicum virgatum</i>	2.0
Black-eyed Susan	<i>Rudbeckia hirta</i>	0.25
Golden-glow, wild	<i>Rudbeckia laciniata</i>	0.25
Brown-eyed Susan	<i>Rudbeckia triloba</i>	0.25
Bluestem, little	<i>Schizachyrium scoparium</i>	5.0
Aster, upland-white	<i>Solidago ptarmicoides</i>	0.25
Goldenrod, stiff	<i>Solidago rigida</i>	0.25
Indian grass	<i>Sorghastrum nutans</i>	5.0
Spiderwort, prairie	<i>Tradescantia bracteata</i>	0.25
Vervain, blue	<i>Verbena hastata</i>	0.25
Alexander's, golden	<i>Zizia aurea</i>	0.25
	Total:	100.0
Rate: 30 lbs/acre (33 kg/ha).		
Description: Native woodland edge mix for use on forest transition areas. Reaches a height of approximately 36 to 48 inches. This mix can tolerate up to 50% shade.		

Mesic/Dry Oak Forest (continued)

Trees

Common Name	Botanical Name	Trees/Acre
Paper bark birch	<i>Betula papyrifera</i>	5
Trembling aspen	<i>Populus tremuloides</i>	5
Northern pin oak	<i>Quercus ellipsoidalis</i>	15
Bur oak	<i>Quercus macrocarpa</i>	20
Red oak	<i>Quercus rubra</i>	10
Basswood	<i>Tilia americana</i>	20
Total:		75 T/A

Shrubs

Common Name	Botanical Name	Shrubs/Acre
Juneberry	<i>Amelanchier laevis</i>	10
Leadplant	<i>Amorpha canescens</i>	5
New Jersey tea	<i>Ceanothus americanus</i>	10
Gray dogwood	<i>Cornus foemina</i>	5
American hazel	<i>Corylus americana</i>	5
Hawthorne species	<i>Crataegus sp.</i>	10
Choke cherry	<i>Prunus virginiana</i>	10
Currant species	<i>Ribes spp.</i>	10
Red raspberry	<i>Rubus strigosus</i>	10
Total:		75 S/A

Plants Within Planted Shrubs and Trees

Common Name	Botanical Name	Plants/Acre
Enchanter's nightshade	<i>Circaea lutetiana</i>	680
False Solomon's seal	<i>Smilacina racemosa</i>	680
Lopseed	<i>Phryma leptostachya</i>	680
Pointed-leaved tick trefoil	<i>Desmodium glutinosum</i>	680
Poke milkweed	<i>Asclepias exaltata</i>	680
Rue anemone	<i>Anemonella thalictroides</i>	680
Shining bedstraw	<i>Galium concinnum</i>	680
Showy goldenrod	<i>Solidago speciosa</i>	680
Spreading dogbane	<i>Apocynum androsaemifolium</i>	680
Star-flowered Solomon's seal	<i>Smilacina stellata</i>	680
Tall meadow rue	<i>Thalictrum dasycarpum</i>	680
White snakeroot	<i>Eupatorium rugosum</i>	680
Wild geranium	<i>Geranium maculatum</i>	680
Wood anemone	<i>Anemone quinquefolia</i>	680
Woodland sunflower	<i>Helianthus hirsutus</i>	680
Zig-zag goldenrod	<i>Solidago flexicaulis</i>	680
Pennsylvania sedge	<i>Carex pensylvanica</i>	10,900
Total:		21,780 P/A