Management Plan

Sharon Hills Preserve

June 2010

LEGACY LAND CONSERVANCY

LEGACY Land Conservancy
Protecting and Preserving Southern Michigan

Management Plan for the Sharon Hills Preserve

Sharon Township, Washtenaw County, Michigan

Prepared by Elizabeth Durfee
June 2010

This document expands on the research and recommendations provided by Andy Henriksen, District Forester, Forestry Assistance Program, in 2006. The plan contains a description of the Preserve, management objectives, and management actions. Management actions are broken down into short term (0-3 years), mid term (3-8 years), and long term goals (8 years or more), as well as immediate and annual needs. Where possible the personnel, time, and cost needed to implement specific management actions are estimated and additional resources and references are suggested.

Thank you to Dana Wright and the Legacy Land Conservancy Staff, and steward Billy Kirst for their assistance with the preparation of this document.

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INTRODUCTION

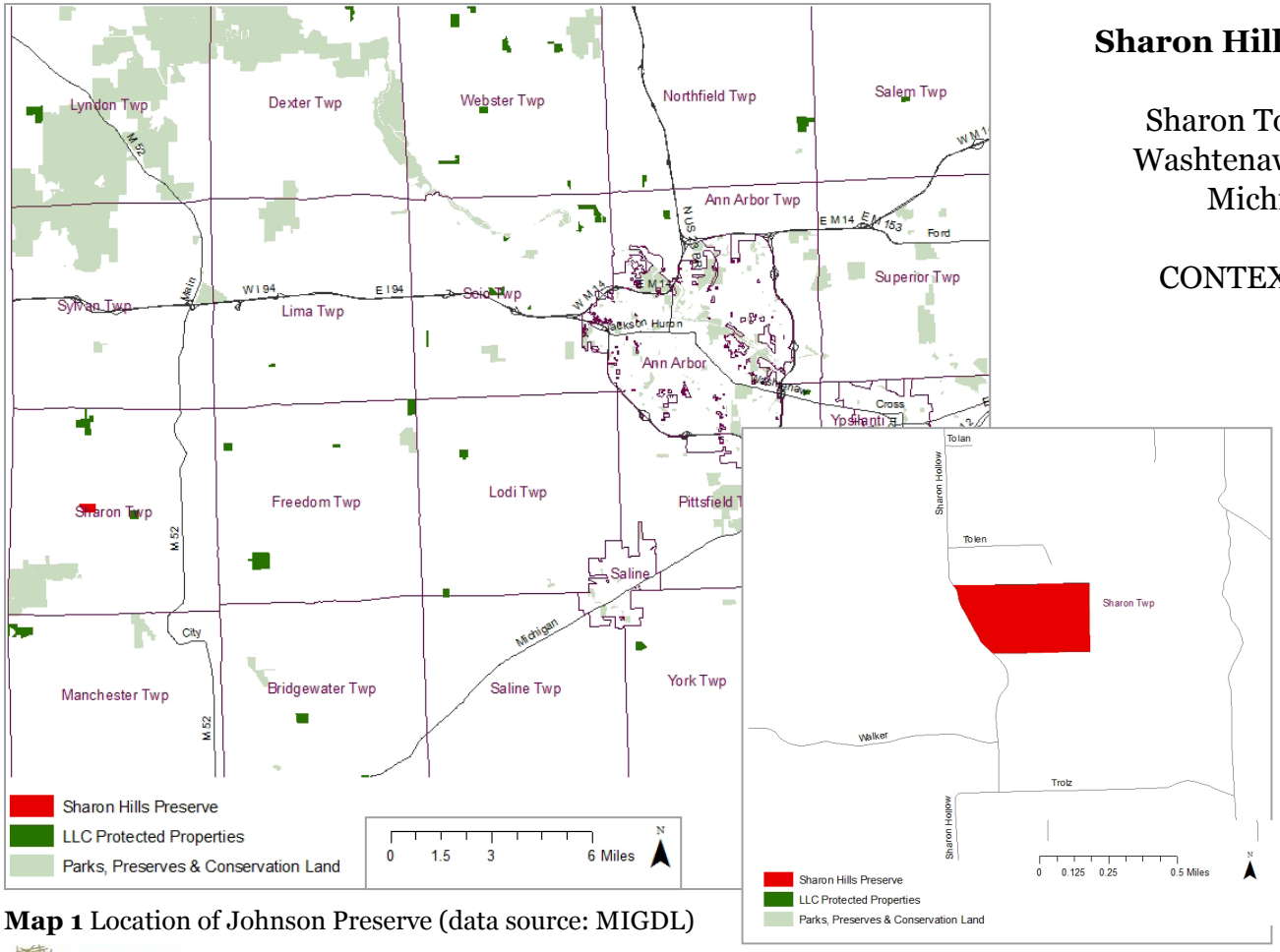
Legacy Land Conservancy Preserves

Legacy Land Conservancy (Legacy) seeks to preserve land that varies in location and represents a variety of functions and ecosystem types. The specific characteristics of the property and availability of assets and resources, such as funding or a Preserve Adopter, also influence the selection of properties to preserve.

General Property Description

The Sharon Hills Preserve is located off Sharon Hollow Road, between Tolen Drive and Walker Road in Sharon Township, Washtenaw County, Michigan. The Preserve is 57.5 acres and is accessible from Sharon Hollow Road.

The Preserve has a diverse mix of mature oak-kettle wetlands, oak savannah remnants, oak-hickory forest, black walnut and aspen stands, and rolling open space. Property boundaries are marked by signs. A trail network runs throughout the Preserve.



Sharon Hills Preserve

Sharon Township,
Washtenaw County,
Michigan

CONTEXT MAP

Map 1 Location of Johnson Preserve (data source: MIGDL)

Land Use History

The property was the site of a sand pit and was logged in the late 1920's. It was more recently used for agriculture and livestock pasture, changing hands regularly due to the poor soil quality and steep slopes. With the exception of a wood lot in the northeastern section of the property, the remainder of the forest has filled in since the 1940's.

Acquisition

The property was donated by David and Ellie Shappirio, John Allen, Edith Maynard and Sally Allen, all University of Michigan professors on December 18, 2000. The professors had used the property for entomological research. At the completion of their research, the land was donated to the Conservancy for public access.

Surrounding Uses

Adjacent land uses include: agricultural fields to the north; forest to the east and south; and patches of forest, grassland, and agricultural fields to the west.

Connectivity

Sharon Hills Preserve is located at the western edge of the rolling Sharon Short Hills. The Sharon Short Hills are geologically characterized as an end moraine of coarsely textured till. This locally important geological formation is part of the Jackson interlobate area, formed between three glacial lobes between 13,000 and 16,000 years ago. End moraines are ridges of unconsolidated debris deposited at the end of the glacier and mark the maximum advance of the glacier.

The Preserve is northeast of the Sharonville State Wildlife Management Area, Sharon Mills County Park, and north of the Sharon Hollow Preserve.

Sharon Hills Preserve

Sharon Township,
Washtenaw County,
Michigan

SURROUNDING
LAND USE

Map 3 Aerial Image of the Sharon Hills Preserve and surrounding land uses (data source: MI DTMB)

Classification and Purpose

The Sharon Hills Preserve is an open-access preserve. Passive, pedestrian recreation is allowed. Access to the Preserve is located at the trail head off Sharon Hills Road.

The purpose of this management plan is to supplement the management plan provided by Andy Henriksen, District Forester, Forestry Assistance Program in 2006 to guide management of the Sharon Hills Preserve. The plan provides current and future land managers, stewards, and the community at large with information about the Preserve to aid in ensuring long term protection.

The primary management objectives for Sharon Hills Preserve include maintaining the ecological integrity of the Preserve by removing invasive species and restoring native ecosystems and modeling behavior to demonstrate how private landowners could manage property and natural areas.

Preserve: Sharon Hills

Location: Sharon Township, Washtenaw County

Assets/ Characteristics	High Quality	Low Acquisition Costs	Low Stewardship Costs	Preserve Adopter Potential	Size		
Function	Teaching Tool/ Educational Opportunity	Research Potential	Urban Preserve	Proximity to other Protected Land	Community Use		
Ecosystem	Prairie	Woodland	River Corridor	Fen	Bog	Marsh	Farmland	Organic Farmland

SITE DESCRIPTION

Soils

The soil types documented in this area include:

- BoE Boyer-Kidder Complex
- HN Houghton Muck

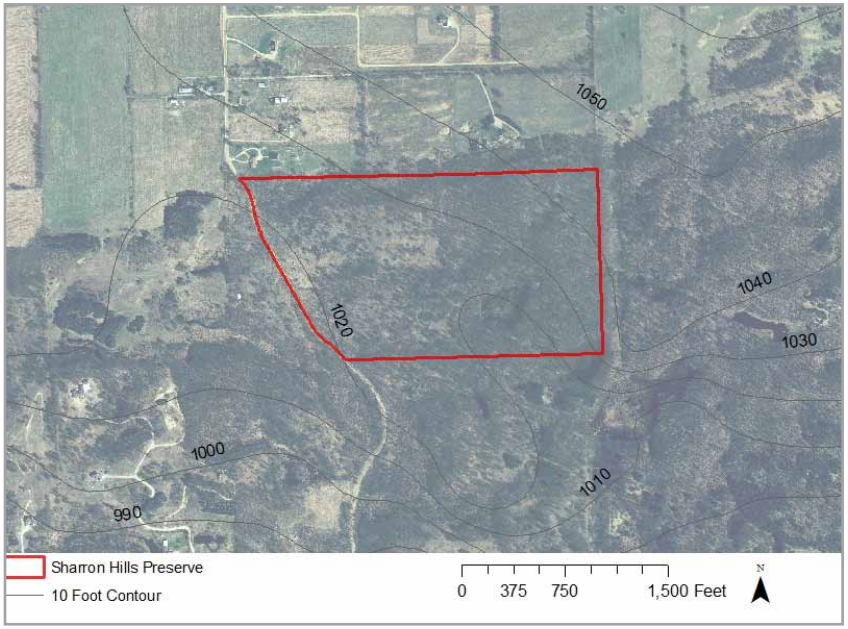
See Appendix D for more detailed soil information.

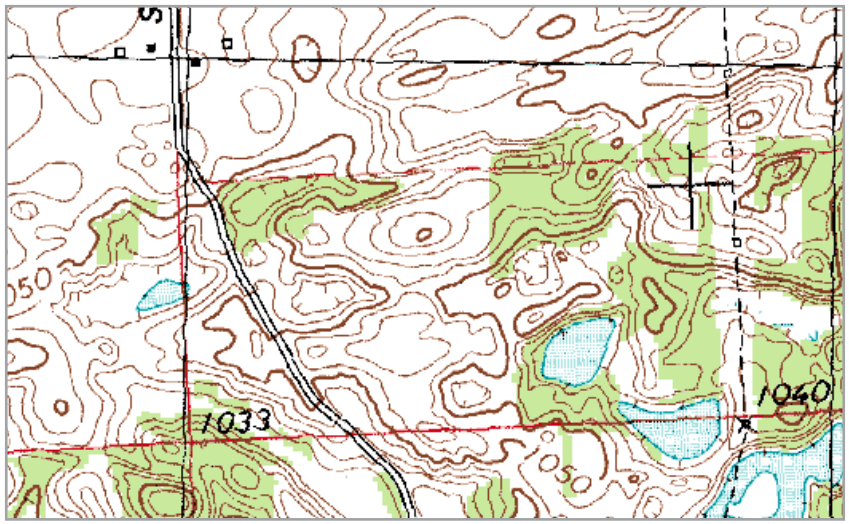
Topography

The topography of the Preserve consists of rolling hills with some steeper slopes and ravines. Elevation is approximately 1020 to 1050 feet above sea level (Map 3 & 4).

Hydrology

Areas with wetland and inundated shrub swamp are present in the southeastern portion of the Preserve.





Map 3 Aerial image of the Sharon Hills Preserve with contour lines (above)**Map 4** Sharon Township topographical map clip (data sources: MI DNRE, MI DTMB)

Ecology

There are a range of ecological habitats present in the Preserve, including meadow, wetland, shrub swamp, and mixed oak forest. Historically the area consisted of oak barrens and remnants of this community dominate the Preserve.

Oak barrens is a fire dependent community characterized by a 50-60% canopy of oaks. Once occupying significant portions of the Lower and Upper Peninsulas in Michigan, oak barrens have been reduced to degraded remnants.

Vegetation of this ecosystem is dominated by black and white oak and also includes red maple, black cherry, aspen species, and other oaks. The subcanopy typically consists of sassafras and hickory, dogwood, and cherry species. The ground layer consists of grasses and forbs. Fire is necessary to creating and maintaining an open canopy and diverse ground layer (MNFI).

Refer to description of ecological management units created by Andy Henriksen, District Forester, Forestry Assistance Program in 2006 for more detailed information.

Figure 1 Ecological communities within the Sharon Hills Preserve. From top: lowland hardwoods, wetland, and field

Invasive Species

The primary invasive species in the Preserve include autumn olive (*Elaeagnus umbellata*), garlic mustard (*Alliaria petiolata*), spotted knapweed (*Centaurea stoebe*), and multiflora rose (*Rosa multiflora*) (Figure 2). Additional species include Japanese hedge parsley (*Torilis japonica*), hawkweed (*Hieracium caespitosum*), and yellow sweet clover (*Melilotus officinalis*). Garlic mustard is present in the higher quality areas in the northern portion of the Preserve as well as the shrubbier, primary growth forests to the south and should be monitored and pulled, especially along the trail. Spotted knapweed is pervasive in the open, field areas and removing it will likely require spraying it with an herbicide. Sections of autumn olive and multiflora rose should also be cleared annually.

Figure 2 Garlic mustard adjacent to woodland trail in the north west region of the Preserve

MANAGEMENT OBJECTIVES

Overview of Goals

The primary management goals for the Sharon Hills Preserve include:

- **Maintaining the woodlot by removing invasive species starting with the highest quality areas in the north east of the Preserve ***
- **Protecting the wetland and prairie remnant**
- **Utilizing the Preserve to educate community members about ecological habitats, species, invasive species removal, and managing natural areas**
- **Improving trail signs, marks and maps and continuing to maintain existing trails for visitor use**
- **Establishing regular workdays for invasive species removal and trail maintenance**
- **Consider long term management strategies such as harvesting timber**
- **Evaluate the long term impact of horseback riding in the Preserve**

* **Note:** See Appendix E for detailed information on the Forestry Management Plan for Sharon Hills Preserve.

Donor Intent

The property was donated to be used and perpetually maintained as a nature preserve. Use is limited to passive, quiet, non-vehicular uses, with no development other than a pedestrian trail. Construction of a small parking area is permitted.

Management Obligation

Legacy is required to monitor the Preserve annually. Photo monitoring points have been created for this purpose. Per the request of the donor, trails and a parking area have been created and maintained.

Management Status

A trail loop from the parking area heading to and along the northern boundary was constructed in 2001. Trail markers were placed on trees and then replaced with painted white triangles in 2004, however additional marking of trails and preserve boundaries is recommended. Trails are mowed regularly. A number of workdays have been held at the Preserve and invasive species removed. A portion of the woodland was burned in 2005.

Improvements

Significant trail demarcation is necessary. Placing wayfinding signs and trail markers throughout the Preserve will increase visitor's enjoyment of the Preserve. Regular trail maintenance, including moving and transplanting native species that lie in the path, is necessary.

Restoration & Invasive Species Control

The property has excellent restoration potential and should be burned periodically to control invasive species and encourage native species. Higher quality areas including the hardwood forest along the north of the Preserve (Unit A), the prairie remnant in the northeast of the Preserve (Unit B), and the wetland in the southeast of the Preserve (Unit C) should be maintained and enhanced by removing invasive species and burning (Map 5).

IMPLEMENTATION

Management Units

Management units have been created to aid in identifying areas to prioritize (Map 4).

Areas to prioritize include:

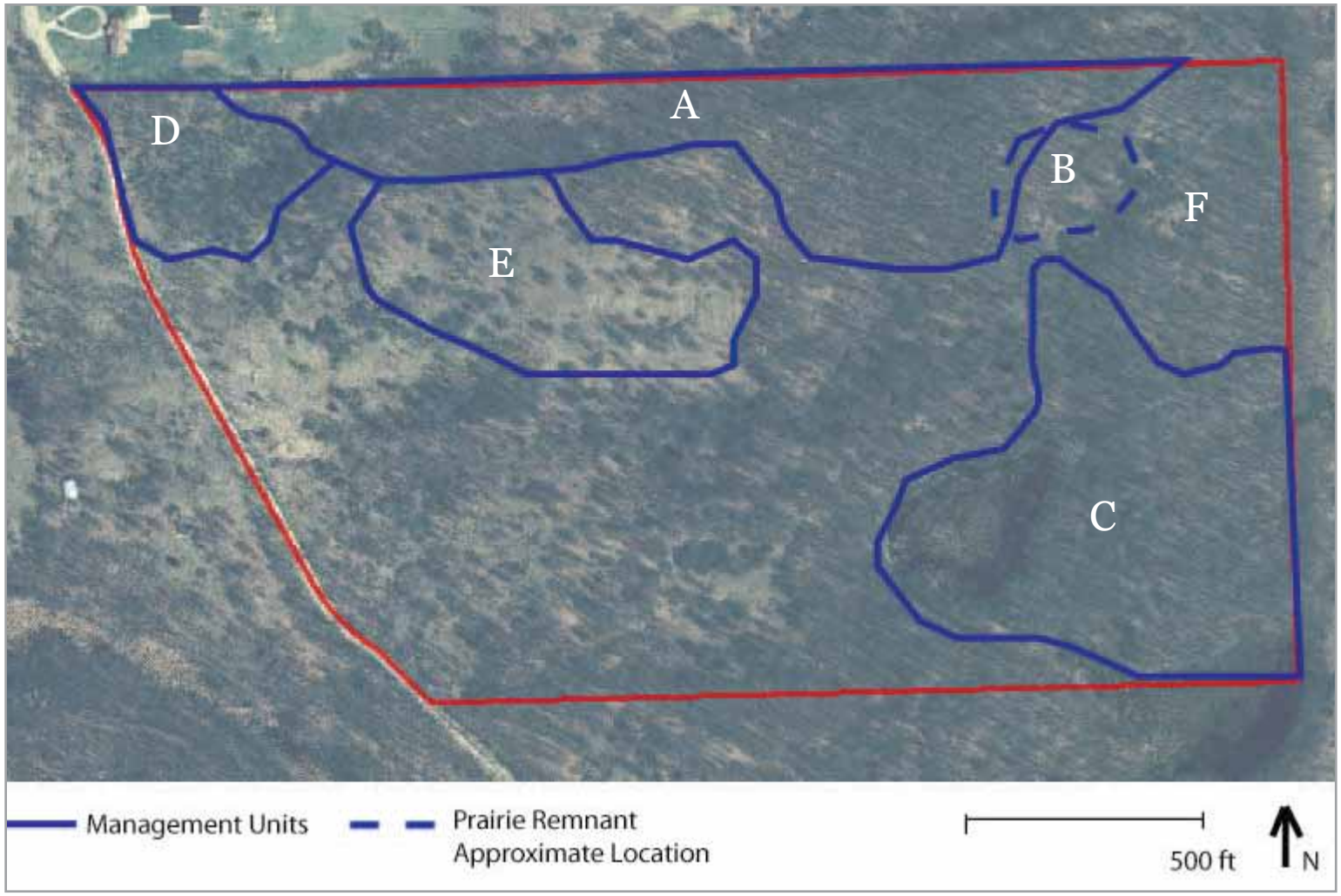
A. Lowland hardwoods and dry hardwoods
B. Prairie remnant habitat
C. Wetland/southeastern corner

Second priority areas:

D. Black walnut stand in northwest corner
E. Open meadow
F. Northeast corner, hardwoods and aspen stand

For more information about specific management needs in each of the 12 ecological units, refer to the management plan created by Andy Henriksen, District Forester, Forestry Assistance Program in 2006 on file at Legacy. This plan contains the following units:

Unit 1: Black Walnut (1.6 acres)
Unit 2: Lowland Hardwoods (7.3 acres)
Unit 3: Dry Hardwoods (8.6 acres)
Unit 4: Aspen Stand (0.8 acres)
Unit 5: Dry Hardwoods (12.4 acres)
Unit 6: Shrubby Meadow (4.0 acres)
Unit 7: Shrubby Meadow (1.8 acres)
Unit 8: Aspen Stand (1.6 acres)
Unit 9: Wetland (1.0 acres)
Unit 10: Wetland (2.2 acres)
Unit 11: Early Successional Forest (19.5 acres)
Unit 12: Grassland (11.0 acres)



Map 5 Management units for the Sharon Hills Preserve (data source: MI DTMB)

Management Actions

1. Conduct a biological survey of plants and animals. In order to identify all species present within an area, a survey should be conducted least 3 times during spring, summer, and fall. The time required to conduct a survey varies depending on plant community, travel time, size and accessibility of site, and surveyor. An inventory of 10 acres would average about 2 hours, times 3 visits would amount to approximately 30-40 minutes/acre. It would take an estimated 30 hours, over 3 visits, plus approximately 10 hours in the office to conduct a plant survey at the 57 acre Sharon Hills Preserve. The cost to contract a professional is also variable and may range from $60-100/hour. In total, an investment of 40 hours and $2,400-$4,000 and may be required for a professional plant inventory.

Time Frame:	**Immediate**
Personnel Needed:	**Professional Contract**
Estimated Cost:	**$2,400 - $4,000**
Approximate Time:	**40 Hours**
Resources:	**Greg Vaclavek,** **Native Plant Nursery LCC** **734-677-5860** **plants@nativeplant.com;** **David Mindell** **PlantWise** **734-665-7168** **Plantwise@aol.com**

2. Identify a Preserve Adopter and establish a regular steward group to assist Legacy with managing volunteer work days and monitoring of the Preserve.

Time Frame:	**Immediate**
Personnel Needed:	**Staff**

3. Install new Preserve sign. Current sign reads Washtenaw Land Trust.

Time Frame:	**Immediate**
Personnel Needed:	**Staff**
Estimated Cost:	**$175**
Approximate Time:	**1-2 Hours to install, plus time for designing and ordering**

4. Collect GPS points to map out:

a) Rare species (1-2 hours)

b) Trail system (4-6 hours)

c) Management zones (4-6 hours)

Time Frame:	**Within 0-2 years**
Personnel Needed:	**Staff or volunteer**
Estimated Cost:	**$50-$200 for GPS equipment**
Approximate Time:	**9-13 Hours total**
Tools:	**GPS unit**
Resources:	**http://www.thegpsstore.com/Garmin-BirdsEye-Satellite-Imagery-Card-P2330.aspx, http://www.thegpsstore.com/Handheld-GPS-C2.aspx**

4. Remove invasive species.

First priority areas:

Unit A Hardwood Lowland and Dry Hardwoods:

Begin restoration in the high-quality oak-hickory community in the eastern area of the Preserve where a diverse understory already exists. Remove invasive shrubs (primarily autumn olive) first, and then remove invasive herbaceous species including garlic mustard and Japanese hedge parsley.

- Initiate regular workdays to remove garlic mustard. Garlic mustard is most visible in spring when second years flower. Demonstrate and teach about management strategies landowners can use on their own property.

Time Frame:	**Immediate, annual**
Personnel Needed:	**Staff, 10-25 volunteers**
Approximate Time:	**ongoing 5-10 years**
Tools:	**bags**

- Control woody invasives.

Time Frame:	**Immediate, annual**
Personnel Needed:	**Staff, 10-25 volunteers**
Approximate Time:	**ongoing 5-10 years**
Tools:	**hand saws, loppers, herbicide**

- Thin gray dogwood and cherries to stimulate Pennsylvania sedge and other native herbaceous species.

Time Frame:	**3-8 years**
Personnel Needed:	**staff**
Approximate Time:	**20-40 hours**
Tools:	**chainsaw**

- Burn to aid in removal of invasives and to promote native herbaceous species. A hot fall burn before the leaves drop would be optimal.

Time Frame:	**Immediate, annual**
Personnel Needed:	**contractor**
Approximate Time:	**ongoing every 2-3 years**

Unit B Prairie Remnant

Remove invasives, including garlic mustard and autumn olive, from the prairie and adjacent land. Consider sowing in native grasses and forbs to enhance the ecological quality of the remnant and reduce opportunity for invasive species. Monitor annually for spread of invasive species.

Time Frame:	**Immediate, annual monitoring**
Personnel Needed:	**Staff, 3-5 volunteers**
Approximate Time:	**1 workday**
	Loppers, handsaws, herbicide, plastic bags

Unit C Wetland

Initiate regular volunteer workdays to remove invasive species from the wetland area.

- Remove multi-flora rose and autumn olive from woodland surrounding the wetland.
- Remove invasive species including reed canary grass. A foliar spray should be used when grass is flowering.

Time Frame:	**Initiate immediately, complete within 3-5 years**
Personnel Needed:	**Staff, 10-15 volunteers**
Approximate Time:	**8-10 workdays**
Tools:	**Loppers, handsaws, herbicide**

Second priority areas:

Unit D Black Walnut Grove, northwest corner

- Remove autumn olive
- Thin cherries and gray dogwood to provide more light and space for oaks, walnuts, and herbaceous species.

Time Frame:	**Within 3-5 years**
Personnel Needed:	**Staff, 2-5 volunteers**
Approximate Time:	**2-3 workdays**
Tools:	**Loppers, handsaws, herbicide**

Unit E Open Meadow

Maintain the open field or encourage toward an oak-hickory woodland by removing invasive species and encouraging native species. Annual herbaceous control is recommended. Without management, it is likely that the field will be overcome by autumn olive with a walnut, cherry and dogwood overstory.

- Spotted knapweed, bouncing bet, yellow hawkweed, yellow clover, and cow vetch could be sprayed with an herbicide.
- Autumn olive should be removed from the interior of the field out.
- This area could be burned to remove woody invasives.
- Introduce native grasses to increase biodiversity. Sow seeds on open soil, under recently cut shrubs, and after burning. It may take 5-20 years to see native grass establishment.

Time Frame:	**Initiate within 3-5 years**
Personnel Needed:	**Staff, volunteers, contract professional for spraying herbicide**
Approximate Time:	**ongoing workdays 10-15 years**
Tools:	**Loppers, handsaws, herbicide**

Unit F Northeast corner with aspen grove

Begin to remove invasive species from this area after invasives have been removed from the adjacent higher quality areas to the west and south.

Time Frame:	**Within 8 years or more**
Personnel Needed:	**Staff, volunteers**
Approximate Time:	**4-6 Workdays**
Tools:	**Loppers, handsaws, herbicide**

6. Maintain trails.

- Grassy trail and parking area should be mowed regularly during the growing season.
- Woodland trails should be lined with limbs and logs as necessary.
- Trail markers should be visible throughout the Preserve.

Time Frame:	**Within 0-2 years**
Personnel Needed:	**Staff and volunteers**
Tools & Materials:	**Paint or trail markers, mower, limbs and logs to mark trails, trail maps**

7. Photo monitor. Legacy is required to photo monitor annually. This will allow the changes to be monitored over time. Photo monitoring points have been established.

8. Evaluate impact of horses on trail. Horses may contribute to erosion on steeper trails and horseback

Time Frame:	**Annually**
Personnel Needed:	**Staff or volunteer**
Approximate Time:	**2 Hours**

riding should be monitored. Horses are not currently permitted in the Preserve, however the extent of riding is minimal and the impact of horseback riding may be negligible. Trails should be monitored to determine whether damage occurs over time. A fee for horseback riding could be considered. Alternatively, riders could participate in trail maintenance.

Time Frame:	**Within 3-5 years**
Personnel Needed:	**Staff, volunteers**
Approximate Time:	**1-3 Hours to walk trails**

9. Install a trail map and educational sign at Preserve entrances. A sign with a map of the Preserve, trails, and adjacent trail systems should be installed to aid visitors in navigating the Preserve. Additionally, an educational sign with information about the Preserve and its ecosystems, invasive, rare or notable species to be on the look out for, as well as information about Legacy would enhance the visitor's experience and provide additional publicity for Legacy.

Time Frame:	**Within 3-5 year**
Personnel Needed:	**Staff, volunteer, or student to design maps and signs**
Estimated Cost:	**$200/sign**
Approximate Time:	**1-2 hours to install each**

10. Organize a stewardship campaign to raise funds for preserve management.

11. Hold educational workshops and guided walks to educate community members.

Time Frame:	**Within 3-8**
Personnel Needed:	**Staff**

12. **Consider managing hardwood stands by harvesting timber and thinning out less desirable species.** Thinning the woodland will allow more space for desired species. Harvesting may serve as a source of revenue for the Preserve.

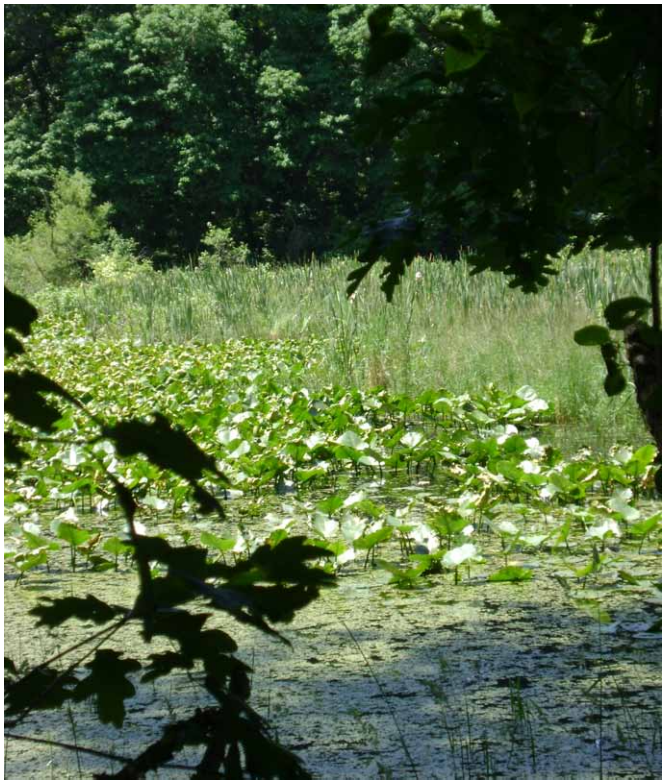
13. **Monitor for oak wilt.** Oak wilt is a fungus that affects oak species. It spreads underground through roots or by insect vectors. Symptoms of the disease include leaf discoloration and wilting. Trees are often defoliated within a few weeks of becoming infected. Managing for oak wilt includes preventing new infection centers (removing infected trees, avoiding injuring healthy trees), controlling existing infection centers (trenching to disrupt grafted root systems to form "barrier lines"), using chemicals to disrupt roots, or using fungicides.
(source: http://www.na.fs.fed.us/spfo/pubs/howtos/ht_oakwilt/toc.htm#intro)

14. **Evaluate effectiveness of management strategies.** Compare data from biological surveys with species diversity and abundance from other local natural areas, such as those managed by Natural Area Preservation of the City of Ann Arbor. Monitor for wetland indicator species.

15. **Update management plan** every 3-5 years or as needed. If rare or uncommon species are discovered, management should be modified to prioritize their habitat/the species, and to ensure that management will not harm the species.

CONCLUSION

The Sharon Hills Preserve is a large preserve that has significant ecological and recreational value. To increase preserve visitors' enjoyment and safety, trail markers and maps should be provided. Restoration efforts should focus on the hardwood forest in the northern portion of the Preserve, where removing woody and herbaceous invasives and burning is required. Maintaining the prairie remnant will also require that invasives are monitored and removed. Additional restoration efforts should focus on protecting the quality of the wetland and shrub swamp in the south east of the Preserve. The size, ecological diversity and quality, and restoration needs make the Sharon Hills Preserve amenable to educational walks and informative workshops on invasive species removal strategies. Long term management of the Preserve should seek to increase the ecological and community value of this site.



APPENDIX A
Map and Directions

Directions:

From I-94, take exit onto M-52 and go south to Grass Lake Road. Go west to Sharon Hollow Road, and then south 2 miles. The Preserve is on the east side of the road. Space for parking is available in a small, grassy lot.

APPENDIX B
Legal Documentation

Legal Description of property (Tax ID O-15-16-300-007): Township of Sharon, County of Washtenaw, and State of Michigan to-wit: That part of the south ½ of the SW ¼ of Section 16, Town 3 South, Range 3 East, Sharon Township, Washtenaw County, Michigan lying East of Sharon Hollow Road.

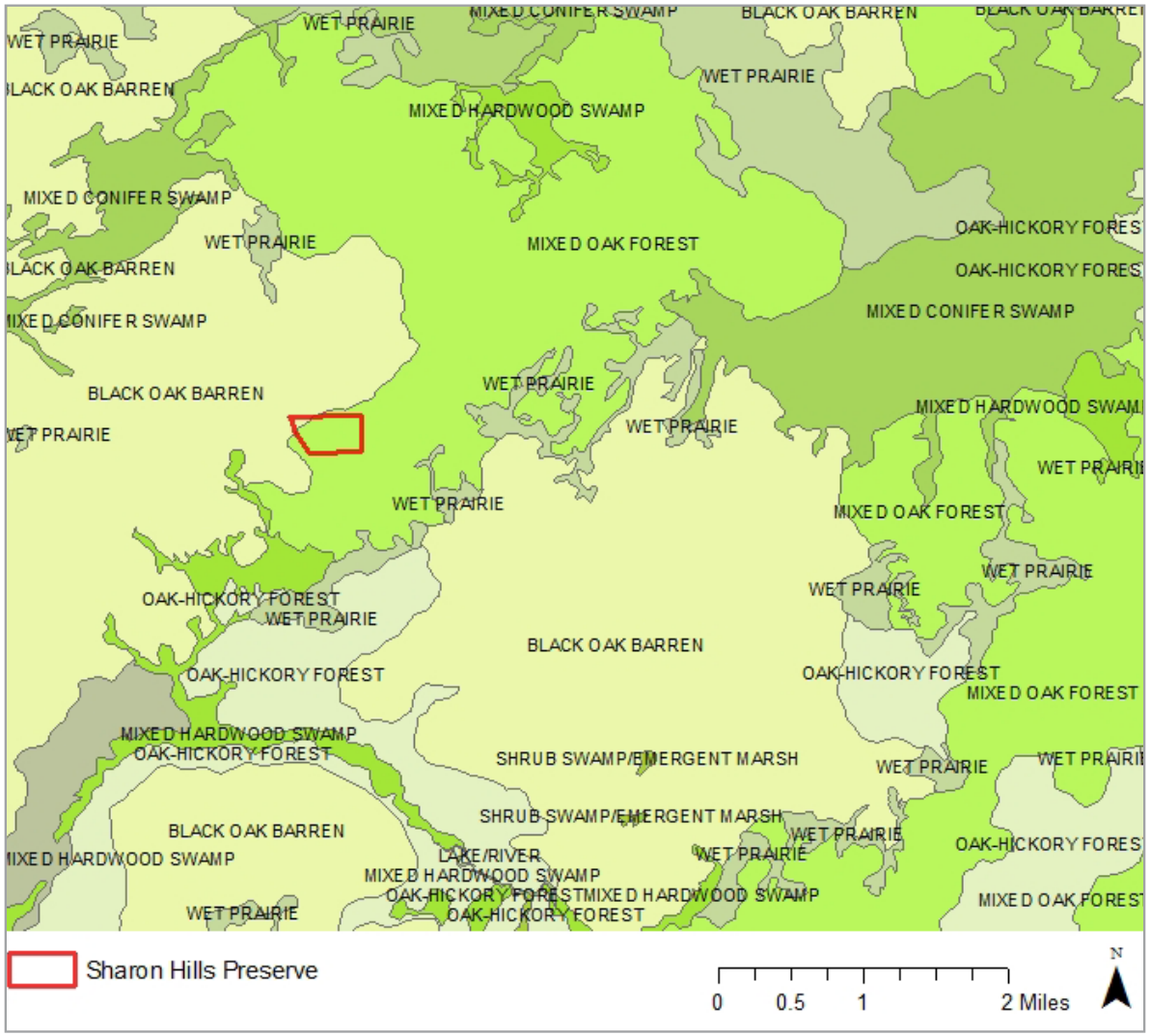
Restrictions on Use:

The property must be used and perpetually maintained for the purposes of a nature preserve, limited to passive, quiet, non-vehicular uses, with no development other than a pedestrian trail system and a small parking area at Sharron Hollow Road, or other charitable purposes similar or related to the foregoing purposes served by the Grantee as a public charity exempt from taxation under the Internal Revenue Code Section 501(c)(3) of 1986, as amended.

note: as of June 2010 equestrian use is allowed on a provisional basis for two years. This will be re-examined in June of 2012.

Name and Location of Key Documents: warranty deed, environmental assessment, title insurance, and aerial photos are on hand at Legacy's office in Sharon Hills hard folder and on the server in the folder: \\Npserv-llc\sharedfiles\Land\PRESERVES\Sharon Hills Preserve.

APPENDIX C
Historic Land Ecology Map



Map 2 Historic land cover circa 1800 (data source: SEMCOG)

Sharon Hills Preserve

Sharon Township,
Washtenaw County,
Michigan

LAND COVER
CIRCA 1800

Presettlement vegetation consisted primarily of mixed oak forest. A small portion of the northwest corner of the Preserve consisted of black oak barren.

APPENDIX D
Detailed Soils Report - USDA

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Oceans
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:4,450 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 16N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Washtenaw County, Michigan
Survey Area Data: Version 9, Jun 22, 2009

Date(s) aerial images were photographed: 7/9/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Washtenaw County, Michigan (MI161)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
BoE	Boyer-Kidder complex, 15 to 35 percent slopes	75.8	96.1%
Hn	Houghton muck	2.7	3.5%
SpB	Spinks loamy sand, 0 to 6 percent slopes	0.1	0.1%
SpC	Spinks loamy sand, 6 to 12 percent slopes	0.3	0.4%
Totals for Area of Interest		**78.9**	**100.0%**

Washtenaw County, Michigan

BoE—Boyer-Kidder complex, 15 to 35 percent slopes

Map Unit Setting

Elevation: 570 to 980 feet
Mean annual precipitation: 33 to 40 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 140 to 180 days

Map Unit Composition

Boyer and similar soils: 50 percent
Kidder and similar soils: 35 percent
Minor components: 15 percent

Description of Boyer

Setting

Landform: Escarpments on ice-contact slopes
Landform position (two-dimensional): Shoulder, footslope, summit, toeslope, backslope
Landform position (three-dimensional): Base slope, interfluve, side slope, nose slope, crest, head slope
Down-slope shape: Convex, linear
Across-slope shape: Concave, convex

Properties and qualities

Slope: 15 to 35 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 25 percent
Available water capacity: Low (about 4.5 inches)

Interpretive groups

Land capability (nonirrigated): 7e

Typical profile

0 to 8 inches: Loamy sand
8 to 18 inches: Loamy sand
18 to 32 inches: Sandy loam
32 to 60 inches: Gravelly coarse sand

Description of Kidder

Setting

Landform: Escarpments on ice-contact slopes
Landform position (two-dimensional): Backslope, shoulder, footslope, summit, toeslope
Landform position (three-dimensional): Side slope, nose slope, crest, head slope, base slope, interfluve
Down-slope shape: Linear, convex
Across-slope shape: Convex, concave

Properties and qualities

Slope: 15 to 35 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.9 inches)

Interpretive groups

Land capability (nonirrigated): 6e

Typical profile

0 to 13 inches: Sandy loam
13 to 36 inches: Sandy clay loam
36 to 60 inches: Sandy loam

Minor Components

Fox

Percent of map unit: 4 percent
Landform: Escarpments on ice-contact slopes, escarpments on kames, escarpments on outwash plains, escarpments on terraces, escarpments on valley trains
Landform position (two-dimensional): Shoulder, footslope, summit, toeslope, backslope
Landform position (three-dimensional): Crest, head slope, base slope, interfluve, side slope, nose slope
Down-slope shape: Linear, convex
Across-slope shape: Convex, concave

Spinks

Percent of map unit: 4 percent
Landform: Escarpments on outwash plains, escarpments on valley trains, escarpments on terraces, escarpments on ice-contact slopes
Landform position (two-dimensional): Toeslope, backslope, shoulder, footslope, summit
Landform position (three-dimensional): Side slope, nose slope, crest, head slope, base slope, interfluve
Down-slope shape: Convex, linear
Across-slope shape: Concave, convex

Oshtemo

Percent of map unit: 4 percent
Landform: Hills on outwash plains, hills on valley trains, hills on ice-contact slopes, hills on beach ridges
Landform position (two-dimensional): Backslope, shoulder, footslope, summit, toeslope
Landform position (three-dimensional): Nose slope, crest, head slope, base slope, interfluve, side slope
Down-slope shape: Convex, linear
Across-slope shape: Concave, convex

Riddles

Percent of map unit: 3 percent

Minor Components

Palms

Percent of map unit: 4 percent
Landform: Depressions on lake plains, depressions on moraines, depressions on till plains
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear

Adrian

Percent of map unit: 3 percent
Landform: Depressions on moraines, depressions on till plains, depressions on outwash plains, depressions on lake plains
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear

Edwards

Percent of map unit: 3 percent
Landform: Depressions on moraines, depressions on till plains, depressions on lake plains, depressions on outwash plains
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear

SpB—Spinks loamy sand, 0 to 6 percent slopes

Map Unit Setting

Elevation: 570 to 980 feet
Mean annual precipitation: 33 to 40 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 140 to 180 days

Map Unit Composition

Spinks and similar soils: 85 percent
Minor components: 15 percent

Description of Spinks

Setting

Landform: Knolls on moraines, knolls on terraces, knolls on valley trains, knolls on strand plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Sandy glaciofluvial deposits

Properties and qualities

Slope: 0 to 6 percent

Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): 3s
Land capability (nonirrigated): 3s

Typical profile

0 to 10 inches: Loamy sand
10 to 22 inches: Loamy sand
22 to 85 inches: Fine sand
85 to 90 inches: Fine sand

Minor Components

Boyer

Percent of map unit: 3 percent
Landform: Knolls on terraces, knolls on valley trains, knolls on kames, knolls on strand plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Convex

Oshtemo

Percent of map unit: 3 percent
Landform: Knolls on beach ridges, knolls on moraines, knolls on valley trains, knolls on strand plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Convex

Thetford

Percent of map unit: 3 percent
Landform: Drainageways on beach ridges, drainageways on strand plains, drainageways on lake plains, drainageways on till plains, drainageways on moraines
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Convex

Seward

Percent of map unit: 3 percent
Landform: Knolls on strand plains, knolls on ground moraines, knolls on till plains, knolls on lake plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Convex

Oakville

Percent of map unit: 3 percent
Landform: Knolls on beach ridges, knolls on lake plains, knolls on kames, knolls on strand plains, knolls on moraines
Landform position (three-dimensional): Rise

SpC—Spinks loamy sand, 6 to 12 percent slopes

Map Unit Setting

Elevation: 570 to 980 feet
Mean annual precipitation: 33 to 40 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 140 to 180 days

Map Unit Composition

Spinks and similar soils: 85 percent
Minor components: 15 percent

Description of Spinks

Setting

Landform: Hills on outwash plains, hills on valley trains, hills on ice-contact slopes, hills on moraines
Landform position (two-dimensional): Footslope, summit, toeslope, shoulder, backslope
Landform position (three-dimensional): Side slope, nose slope, crest, head slope, base slope, interfluve
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Sandy glaciofluvial deposits

Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability (nonirrigated): 3e

Typical profile

0 to 10 inches: Loamy sand
10 to 22 inches: Loamy sand
22 to 85 inches: Fine sand
85 to 90 inches: Fine sand

Minor Components

Boyer

Percent of map unit: 3 percent
Landform: Hills on outwash plains, hills on kames, hills on valley trains, hills on ice-contact slopes
Landform position (two-dimensional): Backslope, footslope, summit, toeslope, shoulder
Landform position (three-dimensional): Side slope, interfluve, base slope, head slope, crest, nose slope
Down-slope shape: Linear
Across-slope shape: Convex

Thetford

Percent of map unit: 3 percent
Landform: Drainageways on beach ridges, drainageways on outwash plains, drainageways on lake plains, drainageways on till plains, drainageways on ice-contact slopes
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Side slope, base slope
Down-slope shape: Linear
Across-slope shape: Convex

Seward

Percent of map unit: 3 percent
Landform: Hills on lake plains, hills on till plains, hills on ground moraines, hills on ice-contact slopes
Landform position (two-dimensional): Shoulder, backslope, footslope, summit, toeslope
Landform position (three-dimensional): Head slope, crest, nose slope, side slope, interfluve, base slope
Down-slope shape: Linear
Across-slope shape: Convex

Oakville

Percent of map unit: 3 percent
Landform: Knolls on ice-contact slopes, knolls on outwash plains, knolls on kames, knolls on lake plains, knolls on beach ridges
Landform position (two-dimensional): Backslope, footslope, summit, toeslope, shoulder
Landform position (three-dimensional): Nose slope, side slope, interfluve, base slope, head slope, crest
Down-slope shape: Linear
Across-slope shape: Convex

Oshtemo

Percent of map unit: 3 percent
Landform: Hills on outwash plains, hills on valley trains, hills on ice-contact slopes, hills on beach ridges
Landform position (two-dimensional): Shoulder, backslope, footslope, summit, toeslope
Landform position (three-dimensional): Side slope, interfluve, base slope, head slope, crest, nose slope
Down-slope shape: Linear
Across-slope shape: Convex

APPENDIX E

Forestry Management Plan - Andy Hendrikson

SUMMARY

The forest management plan has 12 units within the 70 acres of the Preserve. Below is the summarization of the tasks that should be completed for each unit.

Summary of forest management plan

Unit 1

Black walnut stand

- Prune 20 to 40 of best trees to improve nut production
- Cut a few trees that are close to each other, but then wait till 2008 to see results and update management plan

Unit 2

Lowland Hardwoods

- No management is needed as the Box elders will be pushed out, wait till 2008 to see results and update management plan

Unit 3 & 5

Dry Hardwoods

- Thin stand to 80-90sq'
- Want trees of all sizes (see graph in management plan)
- Remove trees that have defects (lean, decay, multiple trunks etc..)

Unit 4 & 8

Aspen stands

- Want to let the Oaks and Cherry trees grow
- Thin out neighboring trees to these trees, look at crown and proximity to target tree

Unit 6 & 7

Shrubby/Meadow

- Control invasive species

Unit 11

Early Successional Forest

- Let have time to grow and check in 2008 to determine management techniques

Unit 12

Grass area

Annual mowing, to keep area open and let grasses generate

Control Invasive species

Forest Stewardship Plan for Sharon Hills Preserve

Approximately 68 acres in the SW ½ of the SW ¼ of Section 16, T 3 S, R 3 E
Sharon Twp., Washtenaw Co., MI

General Information

Landowner:	Washtenaw Land Trust	**Address:**	1100 N. Main St Ann Arbor, MI 48104
Contact:	Janae Reneaud, Development and Grants Manager		
Telephone:	(734) 302-5263	**Township:**	Sharon
County:	Washtenaw	**Sec:**	16
Fields:	Units 1 through 8, 11, 12	**Acres in plan:**	Approx. 68

Objectives

The goal is to improve the quality of habitat for a variety of forest, wetland and grassland wildlife species, by increasing the amount of and quality of cover and food available on the property. This will be accomplished through Forest Stand Improvement techniques, invasive species control, and prescribed fire.

Soils

The soil types present on this property are (see included property map – soil delineations and labels are in green):

BoE - Boyer-Kidder Complex, 15 To 35 Percent Slopes
Kidder. This is a well drained loamy soil. Permeability is moderate in the part of the soil and moderately rapid in the lower part. The available water capacity is high. Surface runoff is slow to rapid depending on slope. Natural fertility is medium.
Boyer. This is a well drained sandy soil, underlain by gravelly sand at depths of 20 to 40 inches. Permeability is moderately rapid in the upper part and very rapid in the lower part. Available water capacity is low. Runoff is very slow to rapid depending on slope. Natural fertility is low for the loamy sand type and medium for the sandy loam.

This is a well suited soil for forest management and tree growth. There are moderate concerns with equipment limitations and erosion hazards due to slope.

Forestry Specific Soil Qualities:
Red oak site index^{50}: **66*** (Good)
The productivity class: **4**** (Very Good)

* Site Index is the anticipated height of dominant and codominant trees in a managed forest after a set period of time, in this case 50 years.
** Productivity class is a measure of wood production, measured in cubic meters per hectare per year. 4 m^3/ha./year = 288 board feet per acre per year.

All of the upland areas contain this soil type.

Hn - Houghton Muck
Houghton (Lupton). This is a very poorly drained, deep organic soil. Permeability is moderately slow to moderately rapid. Available water capacity is high. Runoff is very slow or ponded. The seasonally high water table is at or above the surface from early fall to late spring. Natural fertility is high.

This soil is found only in the two wetland areas in the southeast portion of the property.

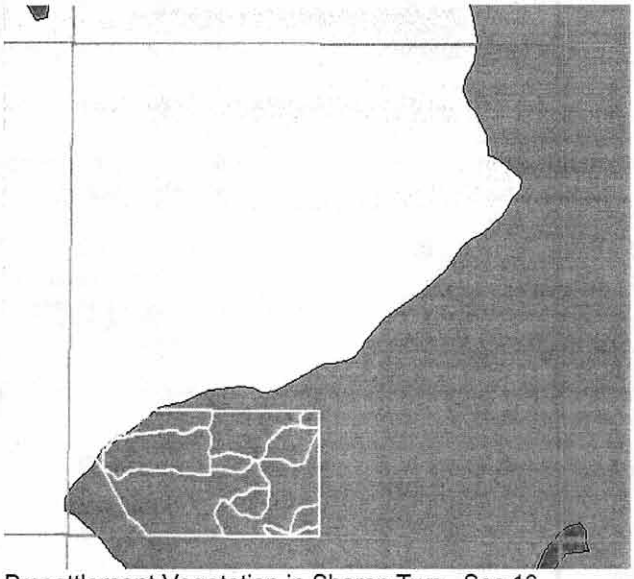
GEOLOGY

This property is located on a geological landform called the Jackson Interlobate. Specifically, it is within Ecological Sub-subsection VI.1.3, the northern portion of an interlobate area between three glacial lobes, which formed approximately 13,000 to 16,000 years B.P. The interlobate is more than 150 miles long. This sub-subsection consists of most of the northeastern two-thirds of the interlobate, which is characterized by relatively steep end-moraine ridges surrounded by pitted outwash deposits; kettle lakes and wetlands are common within the outwash. Refer to Appendix A for a detailed description of this ecological classification.

PROPERTY HISTORY

Prior to European settlement, the vegetation present on the majority of this site was classified as Mixed Oak Forest (the greenish gold color below). A small portion of the Northwest corner of the property was classified as Black Oak Barren (beige). In reality, it is likely that the property is actually a transitional area between the two cover types, the boundary line being much broader than such a map can indicate.

Remnants of both these ecosystem types are present on this property. Most of the forested acreage contains tree species typical of a mixed oak forest, and there are small remnants of prairie grass species scattered throughout the property.

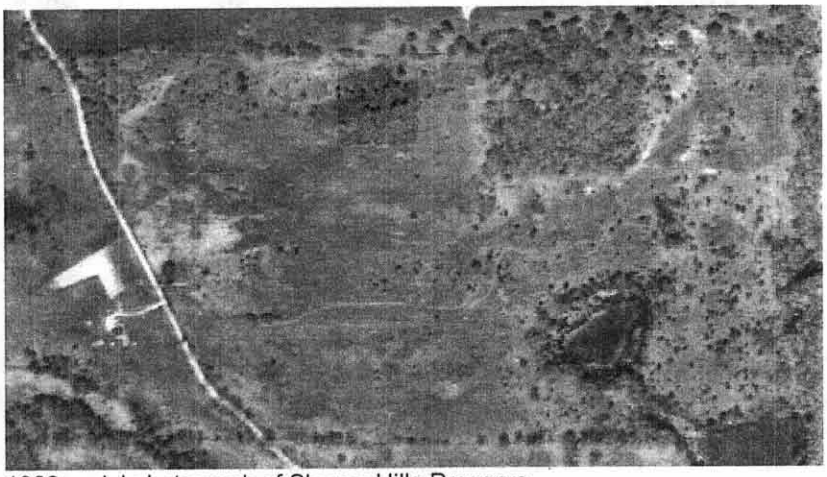


Presettlement Vegetation in Sharon Twp., Sec 16.

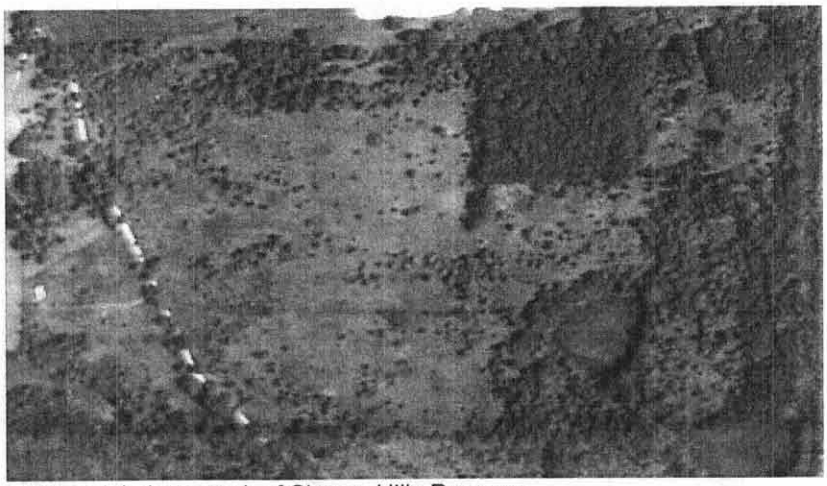
Aerial photographs dating back to the 1940's show this property as largely devoid of trees, except for a small rectangular wood lot in the east half of the property along the northern property border. This woodlot coincides with the area that currently has the most mature trees on the property. The property was likely used for agriculture and livestock pasture. Additionally a few structures can be seen near Sharon Hollow Rd., the foundations of which are still present today.

Aerial photographs from 1969 and 1978 show a slow return of tree and shrub cover to the property, likely as a result of reduced livestock grazing pressure.

1940 aerial photograph of Sharon Hills Preserve.



1969 aerial photograph of Sharon Hills Preserve.

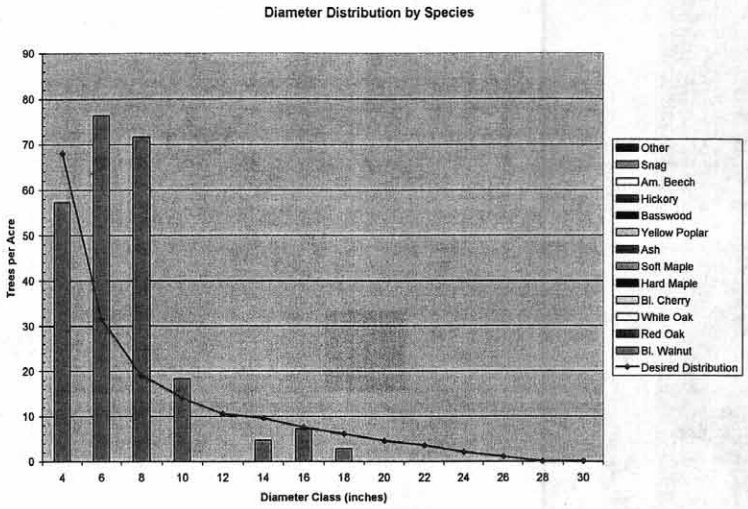


1978 aerial photograph of Sharon Hills Preserve.

========== MANAGEMENT UNIT 1 ==========
BLACK WALNUT STAND – APPROXIMATELY 1.6 ACRES

Current Conditions

This small area contains the only significant concentration of black walnuts on the property. They are all relatively small in size, with the largest concentration in the 6 to 8 inch diameter class. There aren't many other tree species growing here. **Basal area* for this site is 75.**



Diameter Class (in.)	Current #Trees/Ac	Desired #Trees/Ac
4	57.3	68
6	76.4	31.5
8	71.6	19
10	18.3	14
12	0.0	10.5
14	4.7	9.5
16	7.2	7.5
18	2.8	6
20	0.0	4.5
22	0.0	3.5
24	0.0	2
26	0.0	1
28	0.0	0
30	0.0	0
	238.3	177

*Basal Area (BA), an important indicator of tree density, is the cross sectional area of each tree stem, measured at 4.5' from the ground. Basal Area is usually measured on a per acre basis, with totals usually between 60 and 140 square feet per acre, and an ideal range of 70 to 110. When a stand has a BA that is too low, it indicated the site is underpopulated with trees, and space is not being used efficiently. When BA is too high, it indicates the stand is too crowded, and the trees are likely growing at a much reduced rate, and under higher stress levels due to the competition.

STAND-SPECIFIC GOALS

Increase the stand density, and improve the value and health of high-valued individual crop trees, and reduce populations of invasive species.

MANAGEMENT RECOMMENDATIONS

Because the Basal Area is somewhat low currently, it would not be advisable to remove many trees from this site. The exception might be the occasional tree that definitely has no potential future timber value or other inherent value, particularly where such a tree is in close proximity to a more desirable tree. However, given the relatively sparse density, these activities can be postponed for several years, if needed, without adversely effecting stand productivity.

Pruning – perform in 2008

Given the high timber value of black walnut as well as the aesthetic and wildlife value of the species, it would be appropriate to prune 20 to 40 of the best future crop trees per acre. Even if timber value isn't a consideration for this property, proper pruning can improve nut production for wildlife and improve a tree's form, reducing the chance of structural failure or other problems. Refer to **Appendix B** and the enclosed "Pruning Forest Trees" for more information.

Invasive Species Control - ongoing

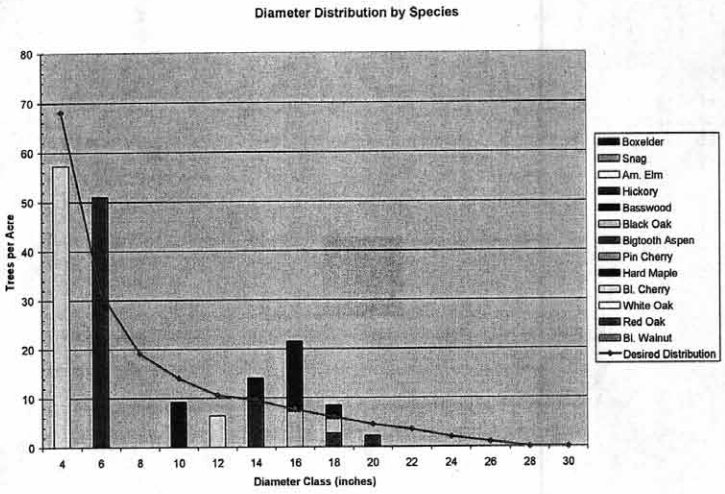
A common concern throughout all of this property is invasive species. On all the management units regular scouting for and, as resources allow, control of invasive species should be incorporated into the management. High risk species include garlic mustard, Asian honeysuckles, multiflora rose, and autumn olive. Of these, garlic mustard has the potential to be the most serious threat. If small pockets are detected they should be controlled immediately.

Refer to the enclosed "Invasive Plants of Ohio" for details on identification and control techniques.

========== MANAGEMENT UNIT 2 ==========
LOWLAND HARDWOODS – APPROXIMATELY 7.3 ACRES

CURRENT CONDITIONS

This is a small area of lowland forest in the northwest part of the property along what appears to be a small drainage way. This area is dominated by mid-sized boxelder, especially to the west, and transitions into the more mature hardwoods to the east. Timber value is relatively low here due to the dominance of boxelder, which is not a commercially viable species. **Basal Area is 90**.



Diameter Class (in.)	Current #Trees/Ac	Desired #Trees/Ac
4	57.3	68
6	50.9	31.5
8	0.0	19
10	9.2	14
12	6.4	10.5
14	14.0	9.5
16	21.5	7.5
18	8.5	6
20	2.3	4.5
22	0.0	3.5
24	0.0	2
26	0.0	1
28	0.0	0
30	0.0	0
	170.1	177

STAND-SPECIFIC GOALS

Maintain the stand density, improve species diversity and increase number of climax forest species, improve the value and health of high-valued individual crop trees, and reduce populations of invasive species.

MANAGEMENT RECOMMENDATIONS

Boxelder is typically considered an early successional species; they are often the first species to colonize a disturbed area or an idle field. However, like most early successional species, they do not do particularly well in established woodlands where there is significant shade. Because of this, with no management at all eventually the boxelder trees would likely be replaced with other species over time. Due to the small size, low basal area, relatively low timber or wildlife value it may be best to simply do no timber management at this time.

Pruning
Pruning is not recommended in this unit, due to the low value of the trees.

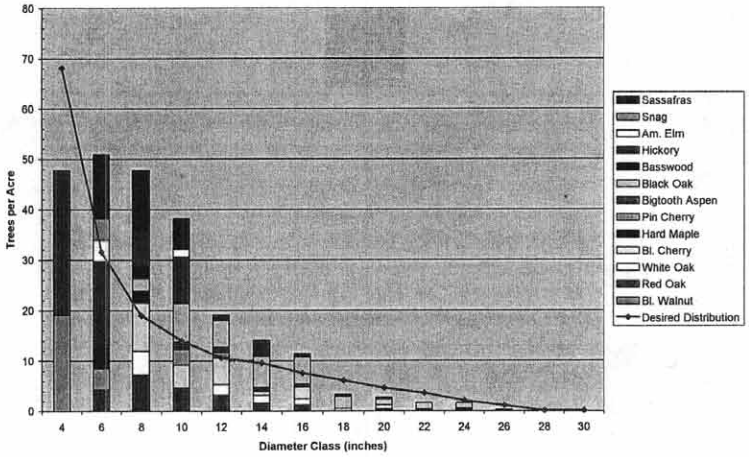
Invasive Species Control - ongoing
Invasive species monitoring and control should be done in this unit. Refer to the enclosed "Invasive Plants of Ohio" for details on identification and control techniques.

========== MANAGEMENT UNIT 3 AND 5 ==========
DRY HARDWOODS – APPROXIMATELY 8.6 AND 12.4 ACRES, RESPECTIVELY

CURRENT CONDITIONS

These two units comprise the majority of the wooded acreage of the property and are the most representative of the climax cover type for this area - dry hardwoods, or mixed oak forest. As can been seen on the aerial photos on page 4, all but a small part of this forest has grown up since the mid 20th century and is relatively young. There are many different species of trees present on these two units, most of which are typical and appropriate for this forest type. Several of the species and species group present are indicated in the graph below, but likely others are present as well that did not fall within the survey plots. It should be noted that in the graph below, the hickory classification contains multiple species of hickories, and "white oak" contains bur oak as well as true white oak.

Generally, the stand is dominated by smaller trees, 6 to 16 inches in diameter, of mixed species. **Basal Area is 119.**



Diameter Class (in.)	Current #Trees/Ac	Desired #Trees/Ac
4	47.7	68
6	50.9	31.5
8	47.7	19
10	38.2	14
12	19.1	10.5
14	14.0	9.5
16	11.3	7.5
18	3.3	6
20	2.7	4.5
22	1.6	3.5
24	1.6	2
26	0.2	1
28	0.0	0
30	0.0	0
	238.5	177

STAND-SPECIFIC GOALS

Reduce the stand density to increase growth rates of crop trees; improve the value and health of high-valued individual crop trees; and reduce populations of invasive species.

MANAGEMENT RECOMMENDATIONS

Forest Stand Improvement – perform in 2007

This stand has a higher basal area than any of the previously mentioned stands at 119 ft^2/acre. As such, it would be appropriate to thin the stand to a basal area of 80 to 90 square feet. This would reduce the competition between trees, increasing the growth rate of the remaining trees, and improving the species diversity, tree health, and productivity.

In the graph above, the green line indicates the ideal sustainable condition for a mature forest stand. By having a diameter distribution near this line, it allows for a few trees from each size to be lost each year without compromising the "supply" of trees to the next higher diameter group. For instance, if you have 19 8-inch diameter trees per acre, you could lose 5 of them (to storm damage, management activities, etc.) as they grow out of that size class and into the 10 inch class, which ideally would contain

14 trees per acre. This distribution will allow you to always have trees of all sizes present on the site indefinitely, while also maintaining a highly productive overall stand density, and allowing adequate sunlight to encourage regeneration.

Given this concept, a thinning to remove some of the trees to bring the existing diameter distribution closer to the green line in the graph is recommended. Specifically, the following thinning regime should be followed:

Diameter class	# of trees to remove (per acre)
8" (7.0" – 8.9")	28
10" (9.0" – 10.9")	24
12" (11.0" – 12.9")	19
14" (13.0" – 14.9")	9
16" (15.0" – 16.9")	5

These numbers are simply the difference between the current stocking levels and the desired levels.

Select trees to remove that have poor form, defects, lean, decay, multiple trunks, many low branches, are in close proximity to higher valued trees, or are of a species that are undesired, or over-represented on the site.

It is often easiest to delineate several smaller management units of perhaps just a few acres each and mark trees with plastic flagging, so that changes can be made easily. Once the trees are selected, they can be marked with permanent paint.

The trees should be cut in the winter, to eliminate the chance of an Oak Wilt outbreak, which is transmitted by bark beetles that are attracted to cut trees during the warmer months. Since oaks often have root grafts between adjacent trees, a bark beetle can spread the disease from a stump to an adjacent live tree.

Refer to the "Forest Stand Improvement" Conservation Information Sheet and Appendix C for more information.

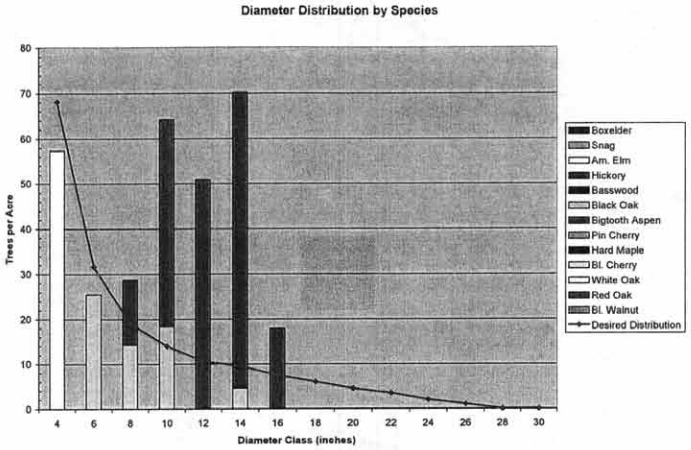
Pruning – perform in 2012
Pruning could be considered for a small number of high-valued trees in this unit, but is likely a lower priority than other management activities.

Invasive Species Control - ongoing
Invasive species monitoring and control should be done in this unit. Refer to the enclosed "Invasive Plants of Ohio" for details on identification and control techniques.

========== MANAGEMENT UNIT 4 AND 8 ==========
ASPEN STAND – APPROXIMATELY 0.8 AND 1.6 ACRES, RESPECTIVELY

CURRENT CONDITIONS

These two areas contain a dense monoculture of bigtooth aspen trees, 8 to 16 inches in diameter. Aspen trees are early successional trees that often are the first species to colonize an area. However, they are not shade tolerant, so if left unmanaged, more shade tolerant species will tend to replace the aspen over time. **Basal area is 195.**



Diameter Class (in.)	Current #Trees/Ac	Desired #Trees/Ac
4	57.3	68
6	25.5	31.5
8	28.6	19
10	64.2	14
12	50.9	10.5
14	70.2	9.5
16	17.9	7.5
18	0.0	6
20	0.0	4.5
22	0.0	3.5
24	0.0	2
26	0.0	1
28	0.0	0
30	0.0	0
	314.6	177

STAND-SPECIFIC GOALS

Encourage and expedite the conversion to dry hardwood forest type species; improve the value and health of high-valued individual crop trees, and reduce populations of invasive species.

MANAGEMENT RECOMMENDATIONS

Crop Tree Release – perform in 2009

If conversion to a mixed oak stand (similar to units 3 and 5) is desired, than a crop tree release of the non-aspen trees can be performed. Crop Tree Release is a type of thinning that first identifies individual crop trees, then "releases" them by removing all the surrounding trees that physically interfere with them (i.e. have crowns that touch). In this case, the crop trees might be the few white oaks and cherry trees mixed in with the aspen.

The benefits of this management option are that it doesn't require a lot of labor, and will ultimately yield a climax forest type that is similar to the adjacent management units, with the same mix of species. However, this transition could take many years.

Refer to Appendix D for more information on Crop Tree Management.

Pruning

Pruning is not recommended in this unit, due to the low value of the trees.

Invasive Species Control - ongoing

Invasive species monitoring and control should be done in this unit. Refer to the enclosed "Invasive Plants of Ohio" for details on identification and control techniques.

========== MANAGEMENT UNIT 6 AND 7 ==========

SHRUBBY MEADOW – APPROXIMATELY 4.0 AND 1.8 ACRES, RESPECTIVELY

CURRENT CONDITIONS

These two units grassy open areas. Dominant vegetation is smooth brome grass, raspberries and other brambles, junipers, autumn olives, and prickly ash. There are a few larger (10" diameter) black cherry trees and a few oak saplings present. Unit 6 contained a few clumps of big blue stem which may be remnants of the black oak barrens found in the area prior to European settlement.

STAND-SPECIFIC GOALS

Reduce populations of invasive species.

MANAGEMENT RECOMMENDATIONS

Invasive Species Control - ongoing

The biggest concern with this area is the presence of invasive species. Because this area is more open, it is more prone to colonization by autumn olive shrubs, which are present. These should be controlled, if resources are available to do so. Refer to the enclosed "Invasive Plants of Ohio" for details on identification and control techniques.

========== MANAGEMENT UNIT 11 ==========
EARLY SUCCESSIONAL FOREST – APPROXIMATELY 19.5 ACRES

CURRENT CONDITIONS

This area is dominated by smooth brome grass, with many clumps and individual autumn olive shrubs, and scattered black cherry, elm, and red oak trees, most 6 to 10 inches in diameter.

STAND-SPECIFIC GOALS

Reduce populations of invasive species.

MANAGEMENT RECOMMENDATIONS

This area is in an early successional stage, and would be difficult to alter significantly. Pruning and thinning around some of the desired trees may facilitate quicker conversion to a closed canopy forest. However, for the most part, this area just needs time for more trees to seed in, grow and start to shade out the open land vegetation.

Invasive Species Control - ongoing

There is a significant population of autumn olive throughout this unit. Controlling this species would yield quicker establishment of desired native tree and shrub species, thus expediting the conversion to a mature forest. Refer to the enclosed "Invasive Plants of Ohio" for details on identification and control techniques.

========== MANAGEMENT UNIT 12 ==========

GRASSLAND – APPROXIMATELY 11.0 ACRES

CURRENT CONDITIONS

This area is the central open area in the west part of the property. It is dominated by smooth brome, and contains some areas of Christmas fern, and quite a bit of Queen Anne's lace. There are some scattered ash, red oak, black cherry, apples, American elm and red cedar trees, most less than 12" in diameter. There are also many autumn olive shrubs scattered throughout.

MANAGEMENT RECOMMENDATIONS

Many different things could be done with this area including annual mowing to perpetuate the grass cover, planting of prairie grasses and wildflowers, burning to attempt to naturally regenerate prairie species, planting trees and shrubs, or doing nothing at all.

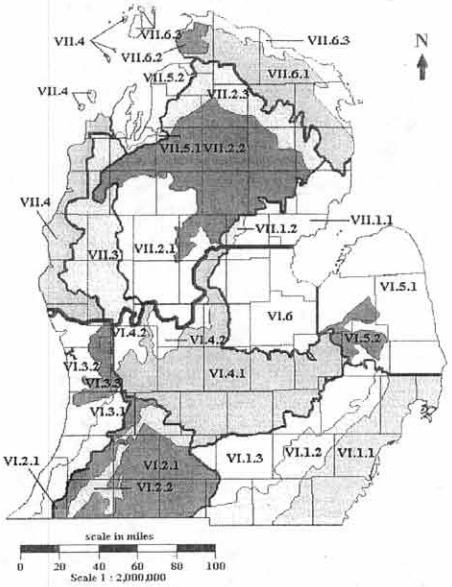
Due to the wide range of options, this unit will be planned at a later date, following further discussions with the landowners. However, as with the other units, invasive species should be controlled, as resources allow.

APPENDIX A – SUGGESTED SCHEDULE OF MANAGEMENT ACTIVITIES FOR 10 YEARS (2006-2016)

Years	Management Unit	Activity
Ongoing	All	Invasive Species Monitoring and Control
2007	Unit 3, Unit 5	Forest Stand Improvement
2008	Unit 1	Prune Crop Trees
2009	Unit 4, Unit 8	Light Crop Tree Release
2012	Unit 3, Unit 5	Prune Crop Trees

APPENDIX B – REGIONAL LANDSCAPE ECOSYSTEMS

Figure 5. Regional Landscape Ecosystems of Michigan's Lower Peninsula



SUB-SUBSECTION VI.1.3. Jackson Interlobate

Coarse-textured end moraine, outwash, and ice-contact topography; oak savanna and oak-hickory forest, hardwood swamps, prairie fens, bogs.

DISCUSSION: Sub-subsection VI.1.3 is the northern portion of an interlobate area between three glacial lobes, which formed approximately 13,000 to 16,000 years B.P. The interlobate is more than 150 miles long. This sub-subsection consists of most of the northeastern two-thirds of the interlobate, which is characterized by relatively steep end-moraine ridges surrounded by pitted outwash deposits; kettle lakes and wetlands are common within the outwash.

ELEVATION: 750 to 1,280 feet (229 to 390 m).

AREA: 2,581 square miles (6,689 sq km).

STATES: Michigan.

CLIMATE: Growing season is 140 to 150 days, generally decreasing to the north (Eichenlaub *et al.* 1990). Danger of late spring frosts is great due to numerous lowland depressions (outwash and kettle lakes). Average snowfall is 40 to 50 inches; greatest amounts are in the extreme north and extreme south. Annual precipitation is 30 to 32 inches, with highest amounts in the south. Extreme minimum temperature ranges from -22½F to -28½F, with coldest values in the north.

BEDROCK GEOLOGY: The underlying Mississippian and Pennsylvanian bedrock, primarily sandstone (Dorr and Eschman 1984, Milstein 1987), is locally exposed at the surface in Jackson and Hillsdale Counties at the southwestern end of the sub-subsection (Akers 1938). Drift thickness is generally less than 100 feet in both of these counties. In the northeastern part, bedrock is overlain by 250 to 300 feet of glacial drift.

LANDFORMS: Sub-subsection contains broad expanses of outwash sands that surround sandy and gravelly end moraines and ground moraines. End and ground moraines remain as islandlike hills surrounded by flat outwash. Large linear segments of end moraine, broken only by narrow outwash channels, are typically located along the margins of the sub-subsection.

Sub-subsection VI.1.3 also includes areas of icecontact topography. Kettle lakes, kames, eskers, and segments of outwash channel are the predominant features of the icecontact areas. At the west edge of the sub-subsection, the topography is more gentle; broad, coarsetextured ridges are surrounded by deposits of outwash sand.

Both on the outwash channels and on the groundmoraine ridges, slopes are generally in the 0 to 6 percent class; on the endmoraine and icecontact ridges, slopes can be as steep as 25 to 40 percent. Most of the small segments of end moraine surrounded by outwash have slopes predominantly in the 0 to 6 percent and 6 to 12 percent classes. The large blocks of end moraine at the margins of the sub-subsection commonly have steeper slopes in the 12 to 25 percent or 25 to 40 percent classes.

LAKES AND STREAMS: Many kettle lakes and ponds on the pitted outwash, end moraines, and ice-contact topography. Extensive wetlands surround many of the lakes and occupy entire ice-block depressions. Both marl and peat deposits were extensively mined in the past.

The headwaters of many major rivers originate in the extensive wetlands of the sub-subsection. These include the Huron, Grand, Kalamazoo, and St. Joseph Rivers.

SOILS: The soils of the moraines are typically well and excessively well drained. Drainage conditions on the outwash are more variable, ranging from excessively well drained to very poorly drained. Thick outwash deposits are usually characterized by excessively well drained conditions. Shallow outwash deposits are underlain in some places by bedrock or finetextured till and lacustrine deposits, causing poor or very poor drainage conditions. On icecontact topography, soils are typically excessively drained on the upland kames and eskers and poorly or very poorly drained in the kettles and outwash channels. Where the topography is steep, organic soils can be 10 to 15 feet deep in narrow outwash channels.

Soil textures range from sand to clay; the most common soil texture is sandy loam on the moraine ridges and sand on the outwash plains. The circumneutral glacial drift that forms the moraines is largely derived from the local limestone bedrock. Illuviation is responsible for the formation of a clayrich (argillic) horizon in many of the soils on moraines, providing better waterholding capacity than many of the outwash soils. In the icecontact areas, soils are sands and gravels. The Soil Conservation Service (1967) classifies the soils of the sub-subsection as Hapludalfs with Argiudolls.

PRESETTLEMENT VEGETATION: Vegetation reflects underlying differences in landform and topography. On the sandy moraines, open savannas of black oak, white oak, and hickory were common. GLO surveyors described the open oak forests as "barrens," "oak openings," "barren and scrubby timber," or "scattered timber." Chapman (1984) cites several references linking the open stand conditions to frequent burning by Native Americans. Savanna and prairie were absent or uncommon on the steeper endmoraine blocks at the margins of the sub-subsection, but bur oak savannas were located on the smaller "islands" of gently sloping ground moraine and end moraine at the western edge of the sub-subsection. Other dominants of the oak savannas were white oak, black oak, and chinquapin oak.

Most of the wetlands on the end moraines were shrub or tree swamps located in lower slope position or in small depressions. Wetlands on the lower slopes were typically hardwood swamps. Kettle lakes and swampy depressions on the moraines typically supported shrub swamp, hardwood swamp, or tamarack swamp.

The outwash channels supported large wetlands of several types. At the margins between the uplands and the outwash, calcareous seepages often supported fens. Tamarack grew near the upland margins of the fens. Grass and sedge meadows were found growing adjacent to streams on large areas of the outwash channels.

Swamp forests were most common along margins of major streams on the outwash. Tamarack was common along lake edges and in kettles or depressions in the outwash.

On droughty ice-contact topography, black oak (probably including some northern pin oak) was commonly the dominant forest species. White oak and hickory were also common on slightly moister icecontact sites, and red oak occupied moist foot slopes.

In areas of ice-contact topography, wetlands were commonly restricted to narrow belts surrounding kettle lakes. These consisted of shrub, hardwood, or conifer swamps. Kettles were sometimes completely occupied by either swamp or bog vegetation.

NATURAL DISTURBANCE: According to recent accounts, lightning fires occasionally occur in both uplands and wetlands within the sub-subsection. In the GLO notes, there were isolated mentions of fires resulting from Native-American activities, as well as numerous historic references to Native-American fires in the oak savannas or barrens of the sub-subsection.

PRESENT VEGETATION AND LAND USE: Most of the uplands have been farmed, except the steepest end moraines and ice-contact ridges, which have been maintained as woodlots or are now either recreational or wildlife management areas. Many of these steep ridges have been pastured in the past. Oak savannas either have been converted to farm land or have grown into closedcanopy oak forests due to fire suppression.

Both agricultural lands and the steeper forested lands are now being rapidly converted to residential developments, especially near metropolitan Detroit. Both residential development and agricultural land use have resulted in rapid eutrophication of lakes and degradation of many wetlands. Road construction and ditching have also modified the hydrology of many wetlands.

RARE PLANT COMMUNITIES: Oak savannas, once prevalent on large parts of the landscape, have been destroyed by agriculture or degraded by fire exclusion.

RARE PLANTS: *Baptisia lactea* (prairie false indigo), *Baptisia leucophaea* (cream wild indigo), *Cacalia plantaginea* (prairie Indian-plantain), *Celtis tenuifolia* (dwarf hackberry), *Cypripedium candidum* (white lady's-slipper), *Eleocharis caribaea* (spike-rush), *Eryngium yuccifolium* (rattlesnake-master), *Eupatorium sessilifolium* (upland boneset), *Filipendula rubra* (queen of the prairie), *Gentiana puberulenta* (downy gentian), *Muhlenbergia richardsonis* (mat muhly), *Sporobolus heterolepis* (prairie dropseed), *Valeriana ciliata* (edible valerian).

RARE ANIMALS: *Ammocrypta pellucida* (eastern sand darter), *Ammodramus henslowii* (Henslow's sparrow), *Cryptotis parva* (least shrew), *Dendroica discolor* (prairie warbler), *Dendroica cerulea* (cerulean warbler), *Nerodia erythrogaster neglecta* (copperbelly water snake), *Neonympha mitchelli mitchelli* (Mitchell's satyr), *Oarisma poweshiek* (Poweshiek skipper), *Oecanthus laricis* (tamarack tree cricket), *Papaipema beeriana* (blazing star borer), *Sistrurus catenatus catenatus* (eastern massasauga rattlesnake), *Tachopteryx thoreyi* (greyback).

NATURAL AREAS: State Natural Areas: Haven Hill; Michigan Nature Association Preserves: Goose Creek Grasslands, Lakeville Swamp, Lefglen, Dwarf Hackberry Trees, Timberland Swamp, Burr Memorial Prairie, Haehnle Memorial, Sand Prairie, Harvey N. Ott; The Nature Conservancy Preserves: Sharon Hollow, Jonathan Woods; Other: George Reserve, Seven Ponds Nature Center, Park Lyndon, Whitehouse Nature Center, Columbia Nature Sanctuary.

PUBLIC LAND MANAGERS: State Game Areas: Onsted, Gregory, Sharonville, Somerset; State Recreation Areas: Waterloo, Highland, Bald Mountain, Pinckney, Holly, Island Lake, Proud Lake, Pontiac Lake, Brighton, Ortonville, Metamora-Hadley; State Parks: Hayes; State Wildlife Areas: Unadilla; Metroparks: Indian Springs, Kensington, Stony Creek; County Parks: Park Lyndon, Independence Oaks.

CONSERVATION CONCERNS: Urban and residential development is destroying many of the lakes and wetlands of the sub-subsection, especially northwest of Detroit. Upland forests, important for wildlife habitat and migration corridors, are also being rapidly fragmented by residential developments.

BOUNDARIES: Sub-subsection VI.1.3 has physiography and soils similar to Sub-subsection VI.5.2, but has a longer growing season (Albert *et al*. 1986).

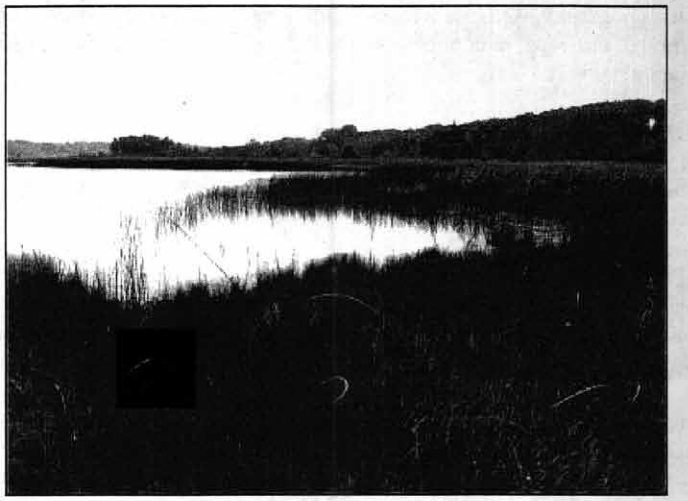


Figure 19.—*Sub-subsection VI.1.3: Stearns Lake, Livingston County, Michigan. This sub-subsection is an area of steep, sandy end-moraine ridges and flat, poorly drained sandy outwash. Kettle lakes within the outwash are often bordered by broad wetlands, including marshes, wet meadows, and prairie fens. At the time of European settlement, the uplands supported savannas of white oak and black oak; with fire exclusion, these savannas have converted to oak forest. Photo by G. Reese.*

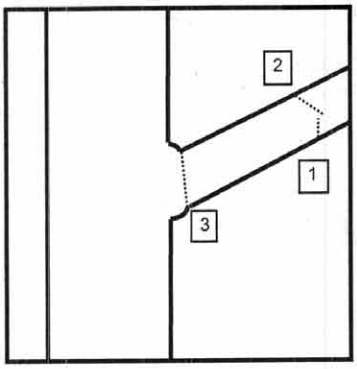
Albert, Dennis A. 1995. Regional landscape ecosystems of Michigan, Minnesota, and Wisconsin: a working map and classification. Gen. Tech. Rep. NC-178. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station.
Northern Prairie Wildlife Research Center Online.
http://www.npwrc.usgs.gov/resource/1998/rlandscp/rlandscp.htm
(Version 03JUN98).

APPENDIX C - PRUNING FOREST TREES:

Pruning trees is an excellent way to improve the value of a standing tree for a future harvest. It is most effective when done on trees that won't be harvested for 15 or more years to allow for adequate healing time. Also, due to its labor intensity, pruning should be done only on select trees with few or no defects that will produce the highest quality logs in the future. Concentrate pruning efforts on trees that are of a high-valued species (oak, cherry, hard maple, walnut, etc.), have straight, upright trunks, and have no splits, forks, other defects, or branches larger than 2 inches in diameter within the first 9 or 17 feet of trunk (larger limbs take too long to heal after they've been cut). It is not cost-effective to prune all or most trees in a woodlot; however, if you have a lot of spare time (which certainly most folks don't) it may be worth the effort.

Trees should be pruned to a height of 17 feet when possible. This will allow for the harvest of at least one 16 foot log from the lower portion of the tree. If this is not possible, prune at least enough to allow for one clean 8 foot log to be harvested.

Pruning can be done just about anytime, but is usually best in the dormant season. One reason for this is that most of the tree's nutrients and food reserves are stored in the roots at this time, not in the leaves and branches, so you won't be removing much of that material. Also, pruning wounds can be entry points for some diseases and insects, which typically are most prevalent in the summer and fall. Because of this, certain trees like oaks and elms, which are susceptible to oak wilt and Dutch elm disease, should never be pruned during the growing season.



Pruning cuts should be made just outside the branch collar, not flush with the trunk. Flush cuts leave too much surface area resulting in higher chances of disease and much slower healing. A three cut technique works best as it eliminates the chance of bark being peeled from the trunk and allows the branch to be cut right at the collar without having the weight of the branch to deal with. The first cut should be made on the underside of the branch, a foot or so from the trunk, about one quarter of the way through the branch. The second cut should meet the first cut from the top of the branch. The third cut should be made just out side the branch collar (the slightly swollen area where the branch and trunk meet).

APPENDIX D - GIRDLING OF TREES:

Often times it is desirable to kill a tree in a forest setting, when it is a low valued species, has poor form which makes in unmerchantable, or is interfering with surrounding, more valuable crop trees. A good way to do this is by girdling the tree. Girdling is the process of cutting a notch into the stem of the tree to stop the flow of materials from roots to leaves and vice-versa, thus killing it. This can be better than simply felling the tree to the ground for a number of reasons. First, a tree that is felled will often damage or get hung up in surrounding trees on the way down. By leaving the tree standing, it will fall to the ground limb by limb over several years, causing much less damage to the neighboring trees. Also, a large snag (standing dead tree) is a valuable resource to wildlife. A standing dead tree will allow just about as much light in to the floor as no tree at all, and will not create a large open pocket where windthrow damage may be a problem.

Using a chainsaw, cut a groove into the tree all the way around it at a convenient height. For trees over 12" in diameter, two cuts about three or four inches apart, and about 2 inches deep works best. For trees 8" to 12", two cuts about an inch deep are recommended. Smaller trees should be girdled with two cuts 1/2" deep. If a cut is too deep on a small or partially decayed tree, it will weaken it to the point where a strong wind can break it off, creating a hazard. Common sense should be used to determine how deep to cut. If a chainsaw is not available, a hatchet can be used.

APPENDIX E - CROP TREES AND THINNING:

Crop tree management is a very effective way to manage your trees. It basically concentrates all of your efforts to improve the growing conditions for the trees you want to harvest in the future. This is accomplished by providing more growing room to the crop trees by removing select neighboring trees. Studies show that growth rates of trees can as much as double after a crop tree release.

The first step is to pick out your crop trees. Crop trees should be any trees that you want to see an increased growth response in. These trees may include trees with straight stems and few branches for timber production, wildlife mast producing trees (e.g. white oak for deer), or other species that are aesthetically pleasing (e.g. sugar maple for it's fall color). Generally, crop trees should be selected when they are at least 4 inches in diameter; smaller trees can be ignored. Crop trees should also be selected that are young enough to benefit from the release. Trees at least 20 years younger than the mature tree age for a stand should be targeted. In most cases, there should be no more than 20 or 30 crop trees selected per acre and they should be spaced at a distance in feet of at least 1.5 x DBH [diameter of crop tree in inches at 4.5' from ground]. (example: two 20" dbh trees should be about 30' apart).

When you have chosen and marked your crop trees, then go back and thin out any of the trees that are interfering with (touching) the crown of your crop tree. After the trees are removed, there should not be any branches touching the crop tree's crown on any side. If, however, you have two really good looking trees close together, don't worry about keeping them both, as they will each still receive a release on three sides after the thinning. Just try and open up around them a little.

This process should be done with moderation in mind. If you get too much sun on the sides of the crop trees they will send out sprouts on the trunk of the tree in an attempt to shade itself. This will lower the quality of the timber and the value of the tree. If you are only removing the trees that are touching the crown, though, this should not be a concern.

It is OK to have only 5 crop trees per acre. Do not be concerned so much with the number of crop trees per acre as with the spacing. Part of managing your woodland is having some "filler" trees, as they will not all be "trophy" trees. The more crop trees per acre that you have the more brushy appearance the woods is going to have due to increased sunlight after their release. This is good for wildlife, however it may not be as aesthetically pleasing.

Economic Rotation:
The economic rotation of hardwoods in this region is between 20 and 24 inches DBH (diameter at breast height). This means that for maximum financial return on your woodlot, generally you should be harvesting your crop trees while they are in this diameter range. This does not mean that you can't harvest trees smaller than this, but rather that your best trees that are really going to make a good profit should be cut at this size. It also does not mean that you shouldn't have trees bigger than 24 inches; it is merely a rule of thumb. Note: Economic rotation takes into account wind damage, lightning strikes and decay fungus that can work against you growing them any longer.

STATE OF MICHIGAN

JENNIFER M. GRANHOLM
GOVERNOR

DEPARTMENT OF NATURAL RESOURCES
LANSING

REBECCA A. HUMPHRIES
DIRECTOR

June 12, 2006

Andrew Henriksen
Washtenaw Conservation District
7203 Jackson Rd.
Ann Arbor MI 48103

RE: **Sharon Hills Preserve**

Dear Andrew Henriksen:

Thank you for using the Michigan DNR Endangered Species Assessment website. Based on the information you have provided, project activities may proceed. It has been determined that federal and state endangered, threatened, special concern species, exemplary natural plant communities, or unique natural features are **not known to occur** at or near the location specified:

Washtenaw County, T03S R03E Section 16.

The location of the request was checked against known localities for rare species and unique natural features, which are recorded in a statewide database. This continuously updated database is a comprehensive source of information on Michigan's endangered, threatened and special concern species, exemplary natural communities and other unique natural features. Records in the database indicate that a qualified observer has documented the presence of special natural features at a site. The absence of records may mean that a site has not been surveyed. Records may not always be up-to-date. In some cases, the only way to obtain a definitive statement on the presence of rare species is to have a competent biologist perform a field survey.

Michigan's endangered and threatened species are protected under Part 365 of the Natural Resources and Environmental Protection Act, Act 451 of the Michigan Public Acts of 1994. Federally listed species are protected under the United States Endangered Species Act of 1973. Special concern species, exemplary natural communities and other unique natural features are not legally protected by state or federal endangered species legislation, but they are considered to be rare and should be protected to prevent future listing.

Thank you for your advance coordination in addressing the protection of Michigan's natural resource heritage. Responses and correspondence can be sent to: Endangered Species Review, Michigan Department of Natural Resources, Wildlife Division - Natural Heritage Program, PO Box 30180, Lansing, MI 48909. If you have further questions, please call 517-373-1263 or e-mail DNR-EndangeredSpecies@michigan.gov.

STEVENS T. MASON BUILDING * P.O. BOX 30028 * LANSING, MICHIGAN 48909-7528
www.michigan.gov * (517)373-2329

Department of Natural Resources

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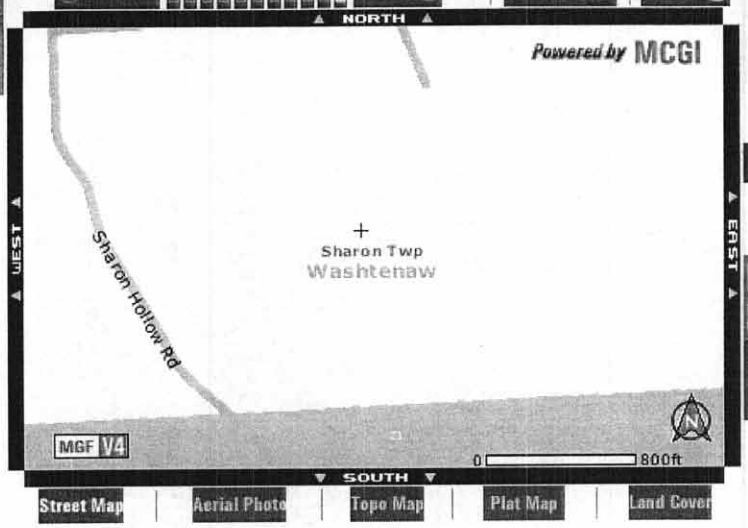
Michigan Natural Features Inventory

MICHIGAN 00000

ENDANGERED SPECIES ASSESSMENT

Print Map | Save Map | Email Map | Clear Map | Enlarge Map
Zoom Out | Zoom In | Re-center | Identify



Street Map | Aerial Photo | Topo Map | Plat Map | Land Cover

Location Overview

My Points of Interest

Refresh Map

Unique Natural Feature(s)
No Listed Features

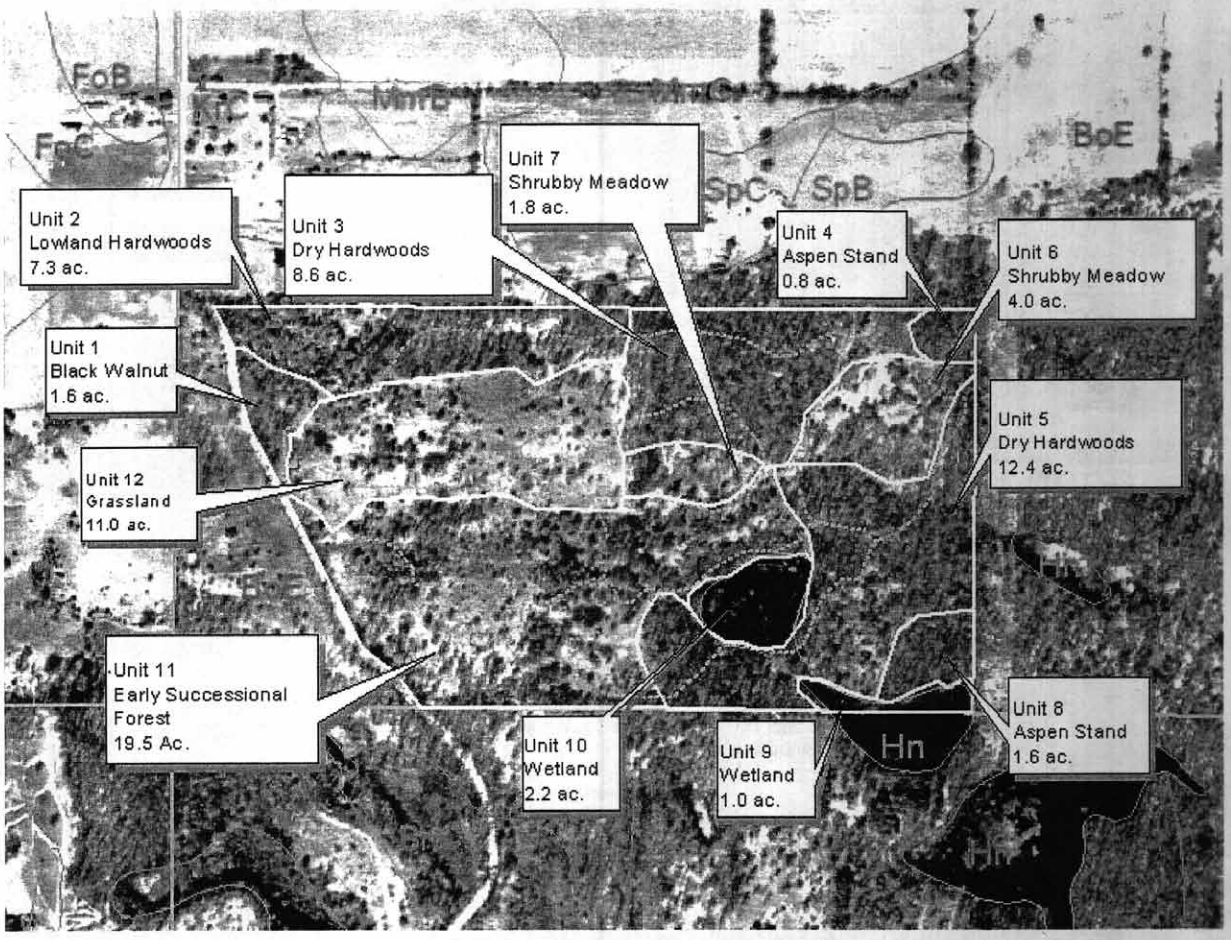
Search Results For:
Lat:42.207637, Lon:-84.086943 TRS:03S, 03E, 16

No unique natural features are known to occur at or near your site of interest.

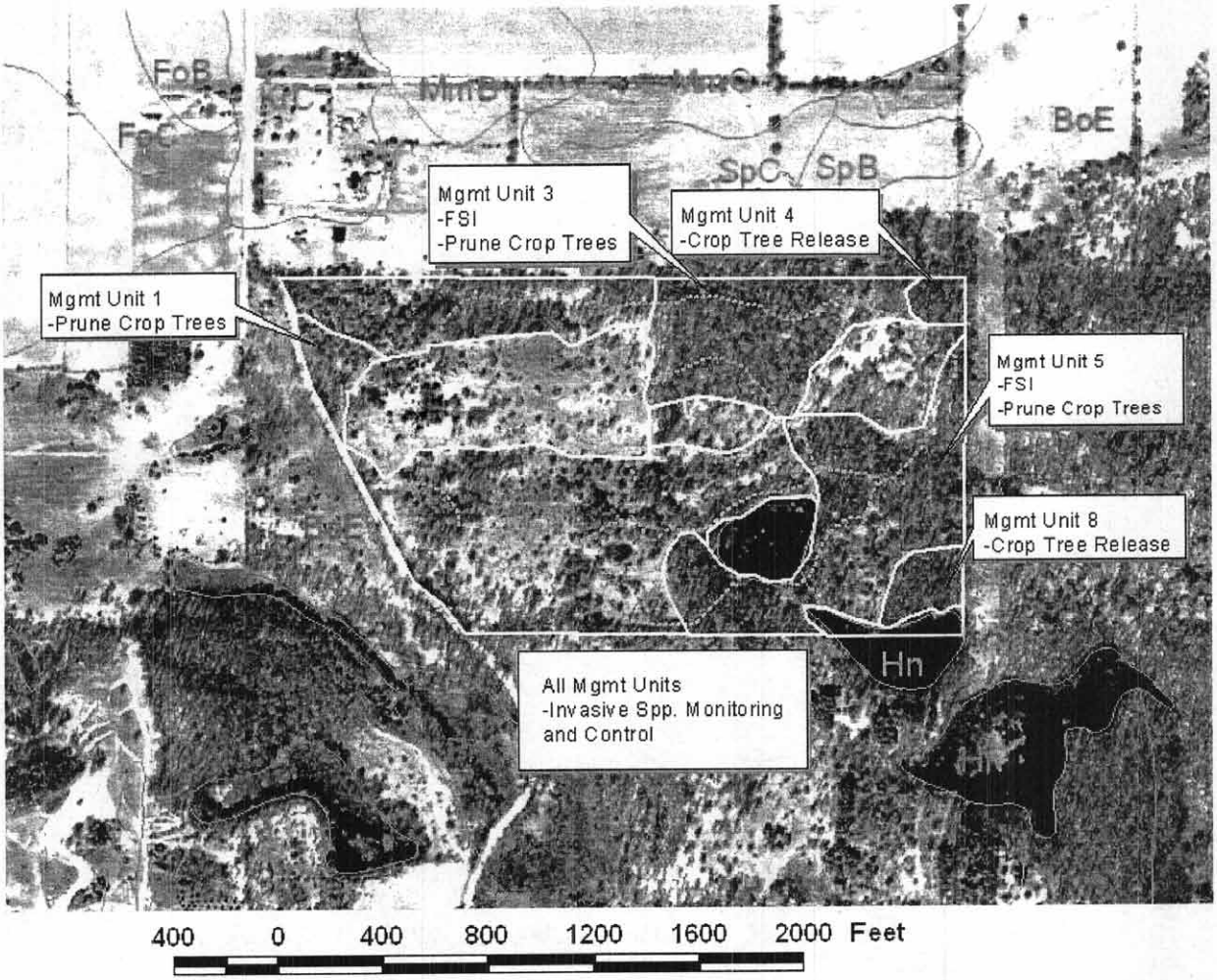
To request a formal review of your selected site please click the Request Review button below.

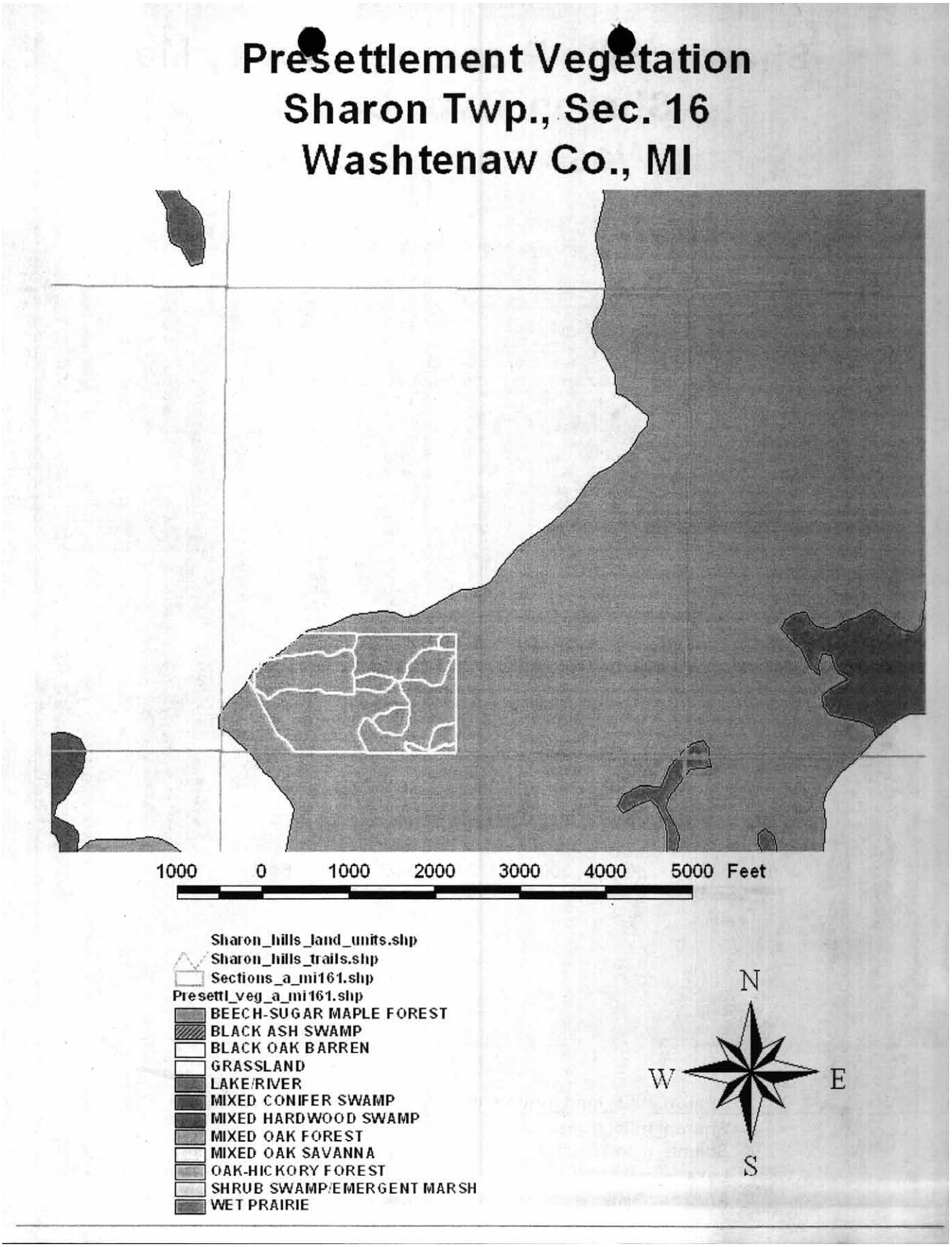
Request Review

Sharon Hills Preserve
Sharon Twp., Sec. 16
Washtenaw Co., MI



Sharon Hills Preserve Activity Map
Sharon Twp., Sec. 16
Washtenaw Co., MI




Presettlement Vegetation
Sharon Twp., Sec. 16
Washtenaw Co., MI
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BEECH-SUGAR MAPLE FOREST
BLACK ASH SWAMP
BLACK OAK BARREN
GRASSLAND
LAKE/RIVER
MIXED CONIFER SWAMP
MIXED HARDWOOD SWAMP
MIXED OAK FOREST
MIXED OAK SAVANNA
OAK-HICKORY FOREST
SHRUB SWAMP/EMERGENT MARSH
WET PRAIRIE
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S


WASHTENAW COUNTY, MICHIGAN — SHEET NUMBER 29
R. 3 E.

SOIL LEGEND

WASHTENAW COUNTY, MICHIGAN

The first capital letter is the first letter of the soil name. The lower case letter that follows separates mapping units beginning with the same capital letter. A second capital letter indicates the slope class. Symbols without slope letters are for nearly level soils or for miscellaneous land types, which may have a wide slope range.

SYMBOL	NAME
Ad	Adrian muck
BbA	Blount loam, 0 to 2% slopes
BbB	Blount loam, 2 to 6% slopes
BnB	Boyer loamy sand, 0 to 6% slopes
BnC	Boyer loamy sand, 6 to 12% slopes
BnD	Boyer loamy sand, 12 to 18% slopes
BnE	Boyer loamy sand, 18 to 25% slopes
BnF	Boyer loamy sand, 25 to 40% slopes
BoE	Boyer-Kidder complex, 15 to 35% slopes
Br	Brookston loam
Cc	Cohoctah fine sandy loam, frequently flooded
CoB	Conover loam, 0 to 4% slopes
CpA	Conover-Brookston loams, 0 to 2% slopes
DoA	Dixboro-Kibbie fine sandy loams, 0 to 4% slopes
Ed	Edwards muck
Ee	Edwards muck, shallow variant
Fd	Fill land
FoA	Fox sandy loam, 0 to 2% slopes
FoB	Fox sandy loam, 2 to 6% slopes
FoC	Fox sandy loam, 6 to 12% slopes
FoD	Fox sandy loam, 12 to 18% slopes
FoE	Fox sandy loam, 18 to 25% slopes
FpB	Fox cobbly sandy loam, cobbly variant, 2 to 6% slopes
FpC	Fox cobbly sandy loam, cobbly variant, 6 to 12% slopes
FpD	Fox cobbly sandy loam, cobbly variant, 12 to 18% slopes
Gf	Gilford sandy loam
Gr	Granby fine sand
Hn	Houghton muck
Ho	Hoytville silty clay loam
KeB	Kendallville loam, 2 to 6% slopes
KeC	Kendallville loam, 6 to 12% slopes
KnA	Kibbie fine sandy loam, 0 to 4% slopes
KrB	Kidder sandy loam, 2 to 6% slopes
KrC	Kidder sandy loam, 6 to 12% slopes
KrD	Kidder sandy loam, 12 to 18% slopes
Ln	Lamson-Colwood complex
MaA	Macomb loam, 0 to 4% slopes
Mb	Made land
MdA	Matherton sandy loam, 0 to 4% slopes
MfA	Metamora sandy loam, 0 to 4% slopes
MmB	Miami loam, 2 to 6% slopes
MmC	Miami loam, 6 to 12% slopes
MmD	Miami loam, 12 to 18% slopes
MmE	Miami loam, 18 to 25% slopes
MmF	Miami loam, 25 to 35% slopes
MoB	Morley loam, 2 to 6% slopes
MoC	Morley loam, 6 to 12% slopes
MoD	Morley loam, 12 to 18% slopes
MoE	Morley loam, 18 to 25% slopes
NaA	Nappanee silty clay loam, 0 to 2% slopes
NaB	Nappanee silty clay loam, 2 to 6% slopes
OaB	Oakville fine sand, 0 to 6% slopes
OaC	Oakville fine sand, 6 to 12% slopes
OsB	Oshtemo loamy sand, 0 to 6% slopes
OsC	Oshtemo loamy sand, 6 to 12% slopes
OwB	Owosso-Miami complex, 2 to 6% slopes
OwC	Owosso-Miami complex, 6 to 12% slopes
Pa	Palms muck
Pc	Pella silt loam
Pe	Pewamo clay loam
RdB	Riddles sandy loam, 2 to 6% slopes
RdC	Riddles sandy loam, 6 to 12% slopes
Sb	Sebewa loam
SeB	Seward loamy fine sand, 2 to 6% slopes
SeC	Seward loamy fine sand, 6 to 12% slopes
SfB	Seward sandy loam, loamy subsoil variant, 2 to 6% slopes
SnB	Sisson fine sandy loam, 2 to 6% slopes
SnC	Sisson fine sandy loam, 6 to 12% slopes
So	Sloan silt loam, wet
SpB	Spinks loamy sand, 0 to 6% slopes
SpC	Spinks loamy sand, 6 to 12% slopes
SpD	Spinks loamy sand, 12 to 18% slopes
SpE	Spinks loamy sand, 18 to 25% slopes
SrB	Spinks-Oshtemo loamy sands, 0 to 6% slopes
StB	St. Clair clay loam, 2 to 6% slopes
StC	St. Clair clay loam, 6 to 12% slopes
StD	St. Clair clay loam, 12 to 18% slopes
StE	St. Clair clay loam, 18 to 35% slopes
TeA	Tedrow loamy fine sand, 0 to 4% slopes
ThA	Thetford loamy sand, 0 to 4% slopes
WaA	Wasepi sandy loam, 0 to 4% slopes
Ws	Wauseon fine sandy loam
YpA	Ypsi sandy loam, 0 to 4% slopes

7/02