Western Pennsylvania Conservancy

ALLEGHENY COUNTY PARKS ECOLOGICAL ASSESSMENT AND ACTION PLAN

HARTWOOD ACRES PARK

Prepared for the Allegheny County Parks Foundation
July, 2019

Allegheny County
Parks Foundation

FOREWORD

With nine parks encompassing over 12,000 acres, Allegheny County boasts one of the largest regional park systems in the country. While recreational activities make each park a unique destination, nature is the common thread that connects our parks and is our most treasured – and jeopardized – asset. The abundant resources found in our parks' forests, meadows and streams provide vital habitat for flora and fauna that clean our air and water, pollinate our plants and connect the web of life. We are stewards of these natural sanctuaries and are working to protect them for future generations.

In 2017, the Allegheny County Parks Foundation together with the Allegheny County Parks, partnered with the Western Pennsylvania Conservancy (WPC) to conduct an Ecological Assessment and Action Plan in Hartwood Acres Park. This study evaluates the park's natural resources and ecological assets and recommends an implementation plan for protecting, preserving and improving the environmental health of the park.

Hartwood Acres Park is a unique destination, originally designed as a private residence for a family of equestrians to replicate an English countryside manor. The Tudor-style Hartwood Mansion, a popular regional attraction, with stables, is surrounded by more than nine miles of trails for walking, hiking, cross-country skiing and horseback riding. Hartwood Acres was purchased from the Lawrence family by Allegheny County in 1969 and opened to the public in 1976.

The grounds offer a diverse ecosystem with a range of mature forests in good condition, forested areas with some ecological damage from invasive species and other areas substantially impacted by invasives. The challenges ahead are to protect the healthy areas against oak wilt, manage the spread of invasive species, and plant trees and shrubs in some open areas to encourage wildlife habitat and discourage additional invasive spreading.

WPC identified several problem areas in Hartwood Acres Park that would benefit from green infrastructure to manage stormwater. It recommends converting several mowed areas to native meadows to provide a richer wildlife and pollinator habitat. The report suggests installing deer fencing to protect areas from extensive deer over browsing and creating a comprehensive trail development and management plan to protect tender native plants. WPC suggests adding interpretive signage to help educate and recruit the public to cooperate in the conservation of sensitive ecological areas.

We are deeply grateful to the Benedum Foundation and the Garden Club of Allegheny County for providing the funding to make this report possible. We also thank the outstanding staff at the Western Pennsylvania Conservancy and Allegheny County Parks for their expertise and insightful contributions to this report. We look forward to working with the County Parks staff and other partners to prioritize and implement these recommendations and to continue this important work in all of the Allegheny County Parks.

Caren Glotfelty
Executive Director
July 2019

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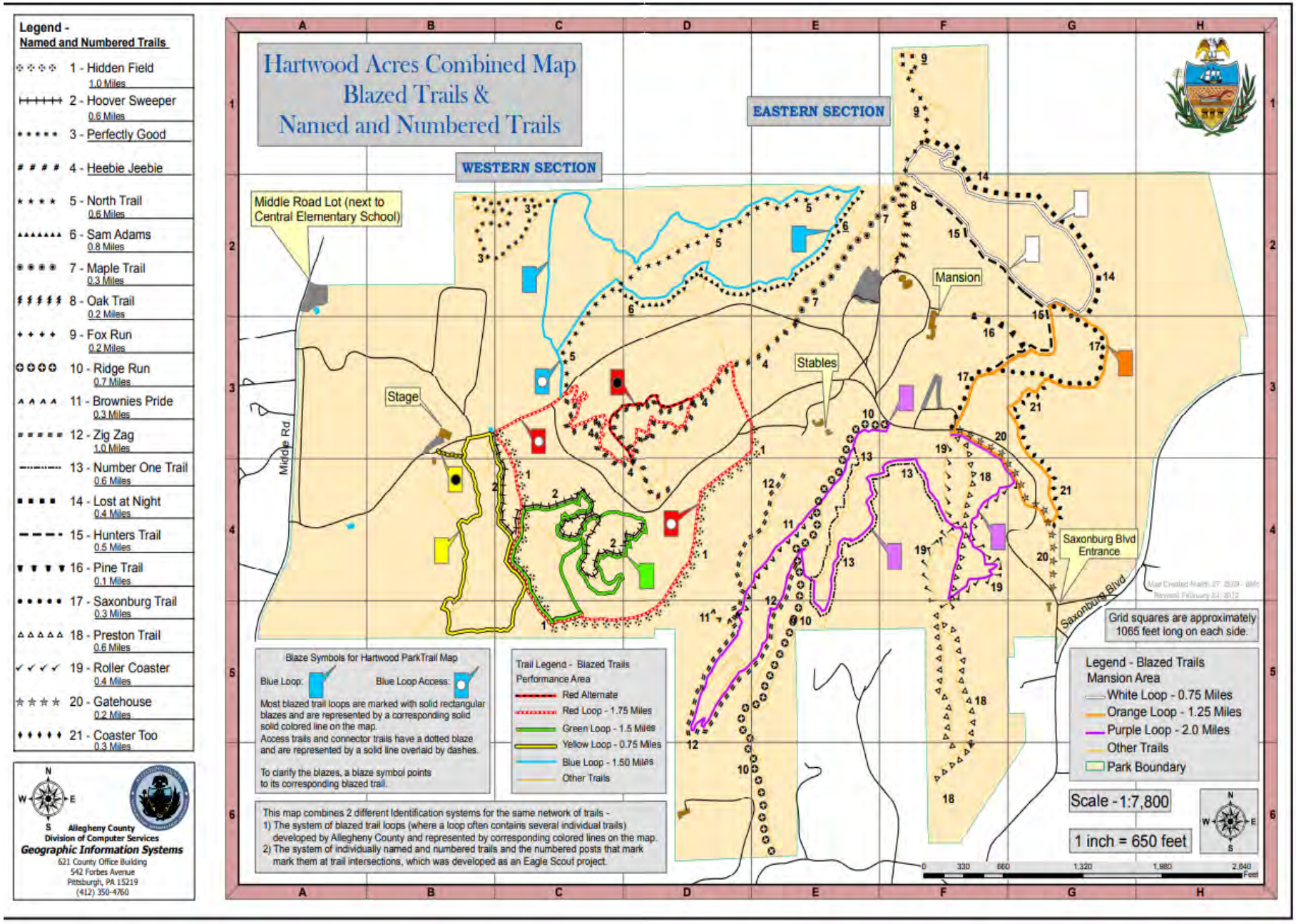
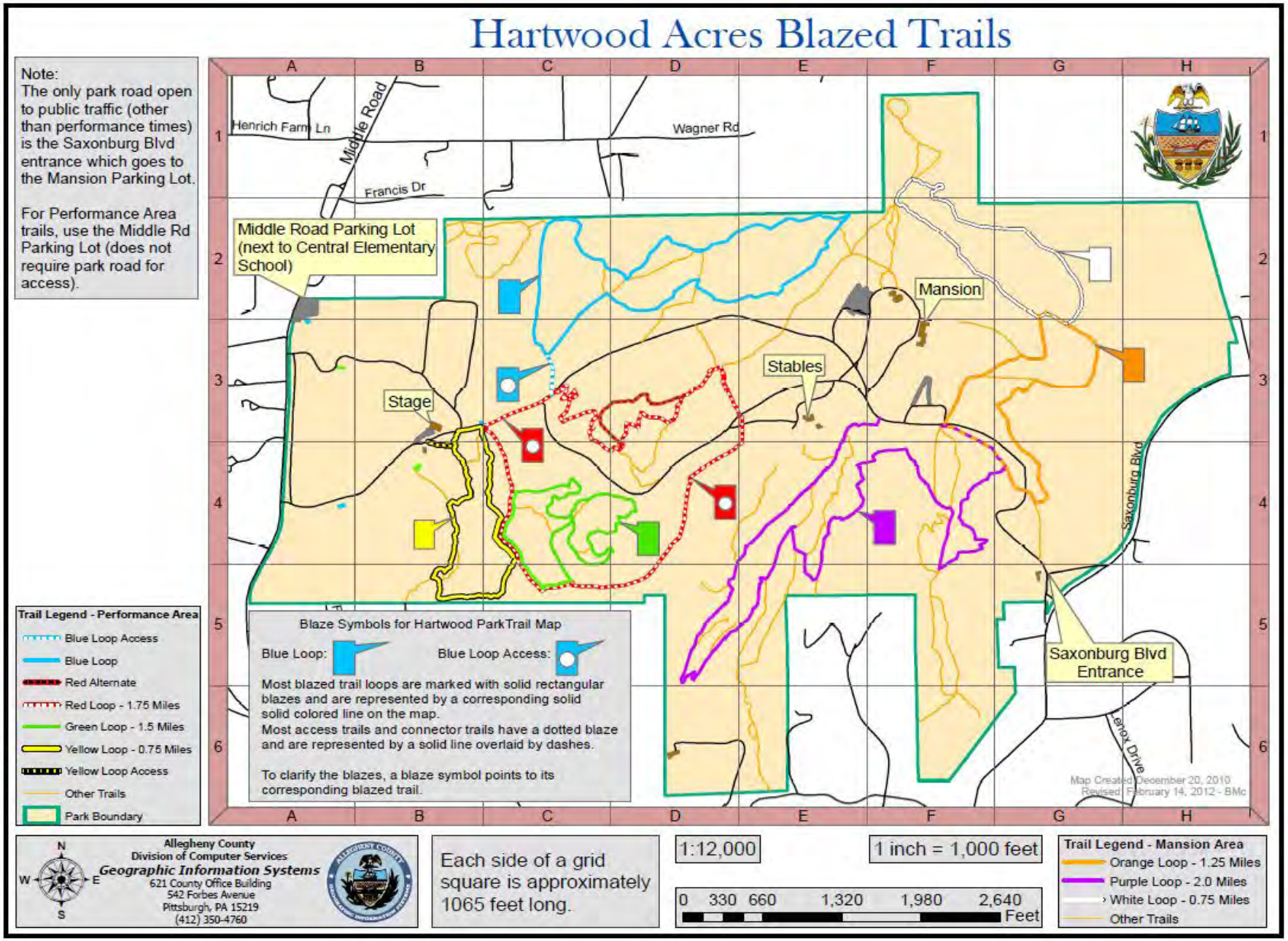

Legend -
Named and Numbered Trails
1 - Hidden Field 1.0 Miles
2 - Hoover Sweeper 0.6 Miles
3 - Perfectly Good
4 - Heebie Jeebie
5 - North Trail 0.6 Miles
6 - Sam Adams 0.8 Miles
7 - Maple Trail 0.3 Miles
8 - Oak Trail 0.2 Miles
9 - Fox Run 0.2 Miles
10 - Ridge Run 0.7 Miles
11 - Brownies Pride 0.3 Miles
12 - Zig Zag 1.0 Miles
13 - Number One Trail 0.6 Miles
14 - Lost at Night 0.4 Miles
15 - Hunters Trail 0.5 Miles
16 - Pine Trail 0.1 Miles
17 - Saxonburg Trail 0.3 Miles
18 - Preston Trail 0.6 Miles
19 - Roller Coaster 0.4 Miles
20 - Gatehouse 0.2 Miles
21 - Coaster Too 0.3 Miles
Allegheny County
Division of Computer Services
Geographic Information Systems
621 County Office Building
542 Forbes Avenue
Pittsburgh, PA 15219
(412) 350-4760
Hartwood Acres Combined Map
Blazed Trails &
Named and Numbered Trails
WESTERN SECTION
EASTERN SECTION
Middle Road Lot (next to Central Elementary School)
Middle Rd
Stage
Stables
Mansion
Saxonburg Blvd Entrance
Saxonburg Blvd
Blaze Symbols for Hartwood ParkTrail Map
Blue Loop:
Blue Loop Access:
Most blazed trail loops are marked with solid rectangular blazes and are represented by a corresponding solid solid colored line on the map.
Access trails and connector trails have a dotted blaze and are represented by a solid line overlaid by dashes.
To clarify the blazes, a blaze symbol points to its corresponding blazed trail.
Trail Legend - Blazed Trails
Performance Area
Red Alternate
Red Loop - 1.75 Miles
Green Loop - 1.5 Miles
Yellow Loop - 0.75 Miles
Blue Loop - 1.50 Miles
Other Trails
This map combines 2 different Identification systems for the same network of trails -
1) The system of blazed trail loops (where a loop often contains several individual trails) developed by Allegheny County and represented by corresponding colored lines on the map.
2) The system of individually named and numbered trails and the numbered posts that mark mark them at trail intersections, which was developed as an Eagle Scout project.
Grid squares are approximately 1065 feet long on each side.
Legend - Blazed Trails
Mansion Area
White Loop - 0.75 Miles
Orange Loop - 1.25 Miles
Purple Loop - 2.0 Miles
Other Trails
Park Boundary
Scale - 1:7,800
1 inch = 650 feet
0 330 660 1,320 1,980 2,640 Feet

Hartwood Acres Blazed Trails



SECTION I - INTRODUCTION, BACKGROUND & METHODS:

INTRODUCTION

1.1 BACKGROUND

History of Hartwood Acres - Allegheny County Parks System

Orginally home to John and Mary Flinn Lawrence, Mrs. Lawrence sold Hartwood Mansion and the adjacent property to the Allegheny County Parks Department in 1969, on the condition that she and her staff could live there until her passing. She died in 1974 and Hartwood Acres Park opened to the public in 1976. The mansion and its grounds were fashioned after a Tudor gothic-style architecture and inspired by an English country residence that Mrs. Lawrence and her husband visited in Oxfordshire, England. The mansion is one of Allegheny County's most popular tourist attractions, but the grounds of the park, largely wooded, also boasts a large outdoor amphitheater hosting many cultural events throughout the year as well as sculptures found throughout the park.

Hartwood Acres is one of the nine parks that comprise the Allegheny County Parks, a regional system that is managed by the Allegheny County Parks Department with legislative oversight by Allegheny County Council. Rich in recreational, natural, and historic resources and located within a 10 to 20 mile radius from downtown Pittsburgh, the nine parks - Boyce Park, Deer Lakes Park, Harrison Hills Park, Hartwood Acres Park, North Park, Round Hill Park, Settlers Cabin Park, South Park and White Oak Park – are meant to serve all of the communities and citizens of Allegheny County.

Allegheny County Parks Foundation

The Allegheny County Parks Foundation (ACPF) supports the improvement, preservation and restoration of nine county parks consisting of 12,000 acres strategically located throughout Allegheny County. The Parks Foundation assists in the transformation of these parks by assembling resources, improving assets, and mobilizing public and private stakeholders to advance strategies and aspirations to make the parks signature assets in Southwestern Pennsylvania.

"ACPF's overall mission is to help improve, conserve, maintain, protect, preserve and restore park facilities and open spaces, and also to support educational, recreational, natural and cultural activities. These efforts all work to enhance the quality of life for county residents, promote healthy lifestyles, improve the environment, and stimulate economic growth and vibrancy for the region. In partnership with Allegheny County, ACPF strives to enhance the park experience for all users.

The Allegheny County Parks Foundation has commissioned this report to provide scientific and technical guidance for future enhancements of Hartwood Acres Park.

Western Pennsylvania Conservancy

The Western Pennsylvania Conservancy (WPC) is one of the oldest and largest environmental organizations in the state. It has helped establish many state parks through its land protection programs, it shepherds the state's database of rare and endangered species, it provides assistance to landowners and communities wishing to protect their watersheds, and is the caretaker of Fallingwater. Its community greening program provides technical assistance and programming to communities desiring to enhance their local quality of life through green strategies including community gardens, tree plantings, and green infrastructure projects. This project has combined expertise from the WPC's Community Gardens and Greenspace Program and the Natural Heritage Program.

Purpose of the Project

The purpose of this project is to provide information on the current ecological conditions and maintenance activities of Hartwood Acres Park and present prioritized recommendations for actions that will enhance the quality and function of the park and improve the park experience for all visitors. The last assessment of the environmental conditions of the county parks was conducted for the Allegheny County Parks Comprehensive Master Plan and was released in 2002. A tremendous amount of change has taken place in the region since then. Allegheny County has been undergoing a transformation of its economy and local environment. Significant changes in the landscape are occurring due to pests and diseases affecting trees, including oak wilt and the emerald ash borer which has killed almost all ash trees in the region. Climate change is affecting storm and weather patterns, growth and introduction of invasive plants and animals as well as air and water quality. In addition, scientific knowledge about how to manage ecological systems and stresses has changed and a new era has begun with the application of green infrastructure to solve issues related to stormwater, erosion, energy consumption and alternative transportation.

All of this change brings the Allegheny County Parks to an opportune moment to reassess conditions, identify needs and opportunities, and craft recommendations for improving the parks both as living ecological systems and as beloved spaces for the many citizens who use them each year. This is the third ecological assessment and recommendation document that the Western Pennsylvania Conservancy has provided for Allegheny County Parks Foundation; Boyce Park concluded in January 2016, South Park concluded in January 2017, and Settlers Cabin Park will be completed concurrent with this project.

1.2 PROFILE OF HARTWOOD ACRES

Hartwood Acres Park is located 10 miles north of Pittsburgh's downtown in both Hampton and Indiana Townships. Though never initially intended to be a park, the opportunity arose in the late 1960s when Mary Flinn Lawrence offered her home and property to Allegheny County at an

The Hartwood Acres Mansion

extremely affordable cost. Having been privately operated and well maintained for 40 years to replicate the English countryside, the property was well positioned to become a park almost immediately after transferring ownership.

The central draw of this park for many visitors is the Hartwood Mansion. The Tudor gothic style mansion, originally designed by Alfred Hopkins and constructed in 1929 for John and Mary Flinn Lawrence (whose father, William Flinn, constructed the Liberty Tunnels in Pittsburgh and Holland Tunnel connecting Jersey City to Lower Manhattan and who is the namesake of Route 8 – William Flinn Highway), boasts an impressive collection of English and American antiques and artifacts. The Lawrence's were equestrians, and there was active horse stable on the grounds which predates the mansion itself.

The Hartwood Acres Mansion Gardens, located behind the Mansion Enterance

At 629 acres, it is one of the smallest parks in the Allegheny County parks system. Unlike other County parks, Hartwood Acres does not have any picnic groves or recreational or sports facilities. Yet the park does have more than nine miles of trails that are popular for walking, hiking, cross-country skiing and horseback riding.

Literature Cited

- Gangewere, R. Jay. July/August 1986. "Allegheny County Parks." Carnegie Magazine, Pittsburgh, PA

- United States History: Hartwood Mansion. Website: http://www.u-s-history.com/pages/h3237.html

- Interesting Pennsylvania and Beyond. 20 September 2016. Website: http://www.interestingpennsylvania.com/2016/09/hartwood-acres.html

1.3 ECOLOGICAL ASSESSMENT OF HARTWOOD ACRES METHODS

Team

The WPC team consisted of its community forestry staff including the community forester, director of community forestry, and outreach coordinator, as well as WPC's land protection specialist from the Land Conservation Program, two staff ecologists, and WPC's Natural Heritage Program science director.

Approach

The WPC team used aerial photographs to identify likely areas with forest cover. These photos were compared to older photos to identify locations that might have longer-term growth signifying potentially more ecologically significant locations. From these preliminary indications, the park was segmented into areas for further exploration. The field team included the WPC ecologists, community forester and outreach coordinator, and additional field staff. They visited the entire park and delineated sections and documented types of forest, types of understory vegetation or other features and conditions. WPC performed an Ecological Integrity Analysis by ranking each section of the park into four categories (Best, Good, Ok and Poor) based on their key environmental featues. These features include seeps, rock outcrops, slopes and open areas. In addition, the team also used a customized Geographical Information System (GIS) data collection application to map five distinct management zones that were broken into 61 ecological units (EU) (see section 2.10). Existing conditions of each unit were documented, analyzed and inventoried.

Problems were noted including erosion, soil compaction, dangerous trees or overgrowth, and conflicts between users and ecosystem. A green infrastructure survey was also completed to identify the most strategic locations to apply green infrastructure to manage stormwater runoff and improve the park's ecological function, aesthetics and sustainability.

Intended Users

This report and accompanying set of maps, charts and resources is intended for use by the Allegheny County Parks Foundation and the Allegheny County Parks Department staff to protect and restore the natural assets of Hartwood Acres Parks. The report is intended to facilitate project implementation and includes specific information on prioritizing projects and costs. The scientific information included in the report is intended for a general audience to provide useful and interesting information to the project partners and public alike.

WPC staff walk the trails of Hartwood Acres Park.

SECTION II - ECOLOGICAL OVERVIEW:

2.1 ECOLOGICAL OVERVIEW

This section provides a background and overview of the ecology of Hartwood Acres Park. The state of ecosystems today in the park is due to the interaction of the basic environmental conditions in the park; the plants, animals and other living organisms that inhabit our region; and the land management activities of people. Soils and geology are the foundation of the web of life, providing nutrients and shaping growing conditions for plants, which are the base of the food chain. The **Geology** and **Soils** sections below describe these features of the park in more detail.

Upon this environmental foundation, forests, meadows, and shrublands have developed in the natural landscapes of the park. The character of these plant communities reflects both the rich botanical heritage of our region, situated at the northern edge of the Appalachians, and the variety of human land uses over the past century that have had substantial impacts on the natural environment and the plants and animals that inhabit it. **Allegheny County's Ecological Heritage** provides a background for understanding Hartwood Acres Park's ecosystems in a regional context, while **Land Use and Ecological History of Hartwood Acres Park** describes the ways in which human activities have affected the development of natural communities in the park.

The breakdown of Hartwood Acres Park is about 75% forested land and 25 % land maintained as parkscape or lawn. The forested areas have largely had hands-off management as natural areas during the tenure of the park. The present-day ecological integrity of these forests ranges from mature forests in fairly good condition, to mature or mid-successional forests with some ecological damage, to early successional forests that are highly invaded. The primary management challenges for the natural forested areas of Hartwood Acres are the threat of oak wilt, the management of exotic invasive species, and the management of canopy gap areas where mature forest has not regenerated.


WPC Staff Evaluating Groundcover

Hartwood Acres Park is situated in a headwaters position in the landscape, with small tributaries originating between rolling hills. The watersheds of the park's waterways are almost entirely within the

park, except in the northwestern corner. As is common in high headwaters situations in our region, some waterways have intermittent flow in their upper reaches. Most are either situated in forested areas, or have a riparian buffer of natural vegetation. There are no known major water quality problems, although the impact of the dog park on the stream adjacent to it should perhaps be considered.

There are a few areas where improved stormwater management is needed within the park; primarily where roads converge above the stables, and in the northwestern corner of the park where portions of the watershed outside the park - including a school parking lot - drains into a stream within the park.

2.2 GEOLOGY

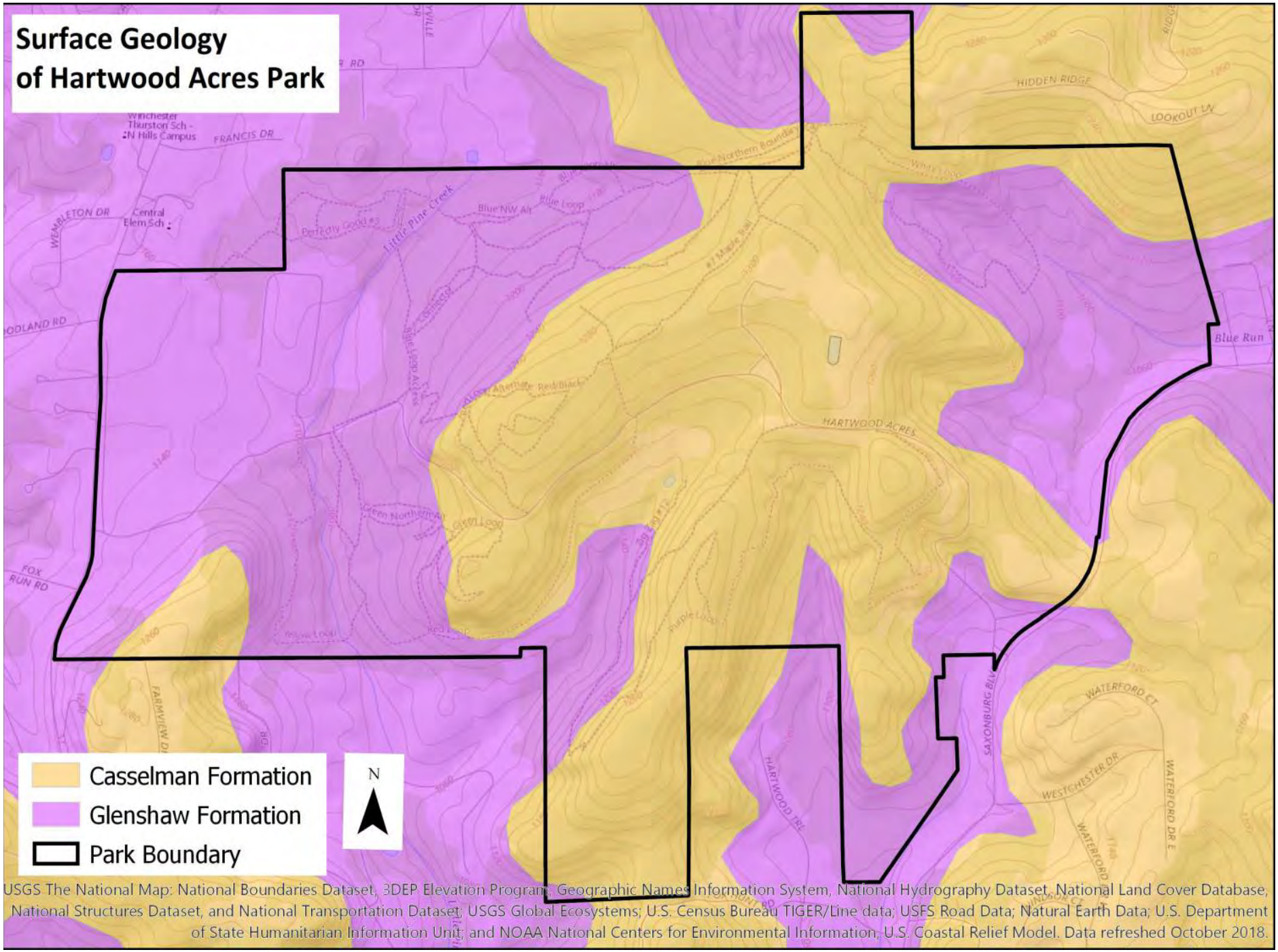
Surface geology refers to the bedrock layers closest to the surface of the earth. Bedrock is the foundation material for soil, and also greatly influences the chemistry of water bodies such as streams, rivers, and lakes. Surface geology can be a determining factor in the diversity of plant life on land, and animal life in streams and lakes.

Pennsylvania is divided into physiographic regions based on landforms and geological history. Hartwood Acres Park is located in the Pittsburgh Low Plateau section of the Appalachian Plateau province, characterized by low rolling hills that formed by the gradual erosion of stream valleys, rather than the tectonic upheavals that formed the Allegheny and Appalachian ranges. In this region, the surface geology layers were formed through sedimentary processes, and they have not been extensively folded by subsequent tectonic activity; today they lie horizontally or gently undulate over large distances. The Pittsburgh Low Plateau is within the unglaciated portion of the Appalachian Plateau province.

Geologists classify rock layers into groups and formations based on the time period in which they formed. Formations are also described according to their mineral composition, which greatly influences soil materials and plant life. There are two geological formations present as surface geology in Hartwood Acres, the Casselman Formation and the Glenshaw Formation. The hilltops and upper slopes of the park are Casselman Formation, and the valleys and mid-slopes are Glenshaw Formation.

A Casselman Formation from South Park (2015)

Both of these formations consist of layers of shale, siltstone, sandstone, red beds, thin impure limestone, and thin nonpersistent coal. They contain very little calcareous material, except for a limestone layer called the Ames limestone, which occurs at the boundary of the two formations. This 2-4' thick layer can form small outcroppings, and is notably rich in marine fossils. Where the Ames limestone is exposed on slopes by erosion that has cut through the geological layers, it may create a local zone roughly 5' to 10' in width that is enriched by calcareous materials. Besides this layer, the overwhelming character of the surface geology is acidic and mineral-poor.


Surface Geology
of Hartwood Acres Park
Casselman Formation
Glenshaw Formation
Park Boundary
N
HIDDEN RIDGE
LOOKOUT LN
FRANCIS DR
WEMBLETON DR
Central
Elem Sch
Little Pine Creek
Blue Run
HARTWOOD ACRES
FOX
RUN RD
WATERFORD CT
WESTCHESTER DR
WATERFORD DR E
HARTWOOD PKE
SAXONBURG BLVD
USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed October 2018.

2.3 SOILS

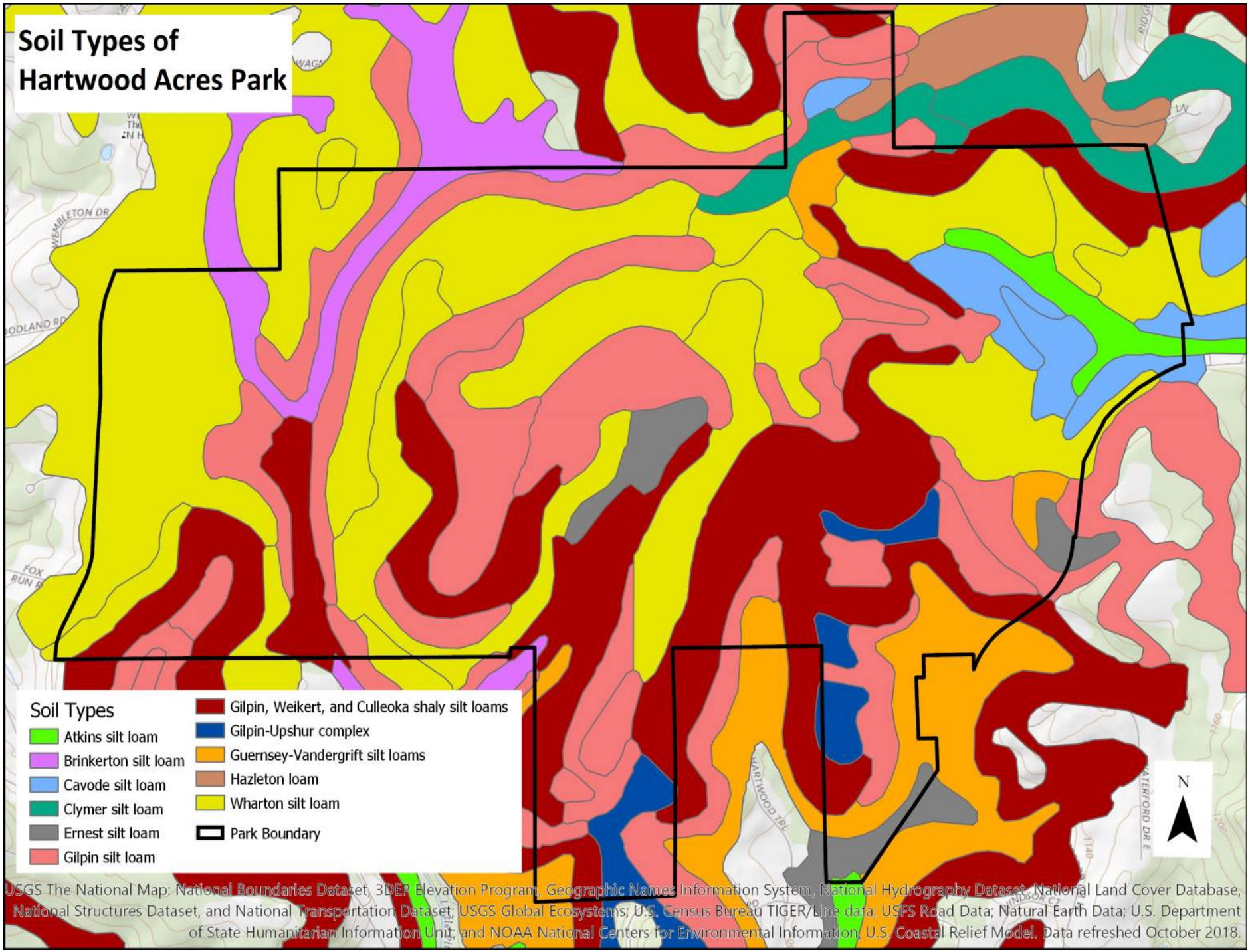
According to the Allegheny County Soil Survey, most of the soils in the park are strongly to extremely acid, and moderately well drained to well drained. This creates a dry-mesic growing environment on relatively level, north, or east facing areas; and a dry growing environment on steep, south- or west- facing areas. This is consistent with the presence of oak-dominated communities in much of the park. The flora is greatly influenced by the pH of the soil, and in general Hartwood Acres is characterized by a more acidic suite of species than many other county parks. The major soil types within the park are Gilpin silt loam, Wharton Silt Loam, and the "Gilpin, Weikert, and Culleoka shaly silt loam" type. In-situ soil pH testing confirms that the growing zone is usually 4.5-5.5, with a few anomalous areas of higher pH that may be related to past land use or local bedrock geology.

Gilpin soils and Wharton soils are strongly to extremely acid; where aspects are equal, Gilpin may provide a more xeric (low-moisture or dry) growing environment as it is well-drained and moderately deep to bedrock, while Wharton may provide a slightly more mesic (high-moisture or wet) growing environment as it is moderately well drained and deep or very deep to bedrock. However, aspect has a very strong influence on growing conditions as well, and may outweigh the difference between these soil types; both are found beneath.

Soil Testing in Hartwood Acres Park

The "Gilpin, Weikert, and Culleoka shaly silt loam" unit is assigned on very steep locations on valley sides where the soil may be rockier and shallower to bedrock. The complex name given to this unit is because areas not suitable for agricultural use or development were often mapped less precisely in the soil surveys. There is some correlation of these soils with the Allegheny Oak Plateau community type, although they are not exclusively found together.

Small areas of the park contain mesic or wetland soils. Stream channels and adjacent floodplains (which are generally narrow in the park due to


Soil Types of
Hartwood Acres Park
Soil Types
Atkins silt loam
Brinkerton silt loam
Cavode silt loam
Clymer silt loam
Ernest silt loam
Gilpin silt loam
Gilpin, Weikert, and Culleoka shaly silt loams
Gilpin-Upshur complex
Guernsey-Vandergrift silt loams
Hazleton loam
Wharton silt loam
Park Boundary
N
USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed October 2018.

topography) have alluvial (formed from deposition of material by water) soils of the Brinkerton, Atkins, or Ernest types. It is also likely that the soil types are poorly mapped in some wetland areas of the park. Some small wetland areas observed during fieldwork have no distinct soil types identified for them, and some stream channel areas are also mapped with the "Gilpin, Weikert, and Culleoka shaly silt loam" designation. Such imprecisions are common for small landscape variations, especially outside of areas suitable for agriculture or development.

2.4 ALLEGHENY COUNTY'S ECOLOGICAL HERITAGE

This region's natural ecosystems have developed over tens of thousands of years. Further south, the Southern Appalachian Mountains are one of the world's biodiversity hot spots, in part because of a hospitable climate and in part because ecological development was never reset by glaciation. Southwestern Pennsylvania is at the northern edge of this bioregion; the character and diversity of its plant and animal life show both an Appalachian and Midwestern influence, and it is markedly different than previously glaciated ecosystems just a short distance to the north. Southern influences extend into Allegheny County in particular because of the moderate climates along the major river corridors: the Ohio, Allegheny, Monongahela, and Youghiogheny.

There are no detailed descriptions of the region's ecosystems preserved before about 1900. Historical ecological assessment techniques such as pollen analysis conducted in other areas of the northeast show that significant ecosystem changes were set in motion in the 1600 and 1700s by the arrival of Europeans and the decline of Native American societies, who had influenced and managed natural landscapes for several thousand years previous to the arrival of European colonists. Furthermore, by the early 1900s, clearcutting for agricultural development and timber sale was already well advanced in the region, and early documentarians could only assess the remaining forest areas. However, despite these limitations, their work remains the best reference we have available for the original character of our region's forest ecosystems.

In the early 1900s, E. Lucy Braun catalogued the natural forest ecosystems of eastern North America, in a definitive work that can never be replicated because these systems have been so extensively altered in the years since. She placed southwestern Pennsylvania within the Cumberland and Allegheny Plateaus section of the original Mixed Mesophytic forest region (Braun 1950). This region extends from northern Alabama to glaciated northeastern Pennsylvania; Allegheny County is at the far northern end. The Mixed Mesophytic Forest is characterized by an exceptionally diverse tree canopy, and by a rich Appalachian-influenced herbaceous layer. {Dominant species of the climax forest in this region are the American beech (*Fagus grandifolia*), tulip tree (*Liriodendron tulipifera*), basswood (*Tilia sp.*), sugar maple (*Acer*

saccharum), American chestnut (*Castanea dentata*), sweet buckeye (*Aesculus octandra*), red oak (*Quercus rubra*), white oak (*Q. alba*), and eastern hemlock (*Tsuga canadensis*)}. According to Braun's work, Allegheny County lies within a subdivision of this region called the Low Hills Belt, characterized by a larger proportion of oak than is typical for Mixed Mesophytic Forest.

Otto Jennings of the Carnegie Museum of Natural History also wrote pioneering baseline ecological descriptions for the region in the early 1900s. He described two forest types for the region, a "White Oak Association" and a "Sugar maple – Beech Association". The White Oak Association is found on rolling uplands and rounded hills, and it is dominated by white oak, shagbark hickory, red maple, and other oak species. The Sugar maple – Beech Association is found on richer, moister soils such as floodplains, valleys, and lower slopes, and the canopy dominants are sugar maple, American beech, hickories (Carya spp.), red oak, white oak, white ash (Fraxinus americana), and American basswood. This association matches the valley areas found in some other county parks, such as Boyce, South and Settlers Cabin.

A Cultivated Field Border of Osage Orange (Management Zone 5)

In the last few centuries, since European colonization, this ecological baseline has undergone unprecedented changes; today's landscape reflects both the rich ecological heritage of the region, and the impact of many modern challenges such as forest pests, fragmentation, invasive species, and post-agricultural forest recovery. Tree species that were once a ubiquitous part of our region's forests, such as the American chestnut, American elm, white ash, and green ash, have been eliminated or greatly reduced in our forests by the introduction of exotic forest pests and diseases. More species may still be lost; oak, hemlock, and American beech are threatened by the gypsy moth, hemlock wooly adelgid, and beech bark disease complex, respectively. Invasive plant species have been introduced that are displacing

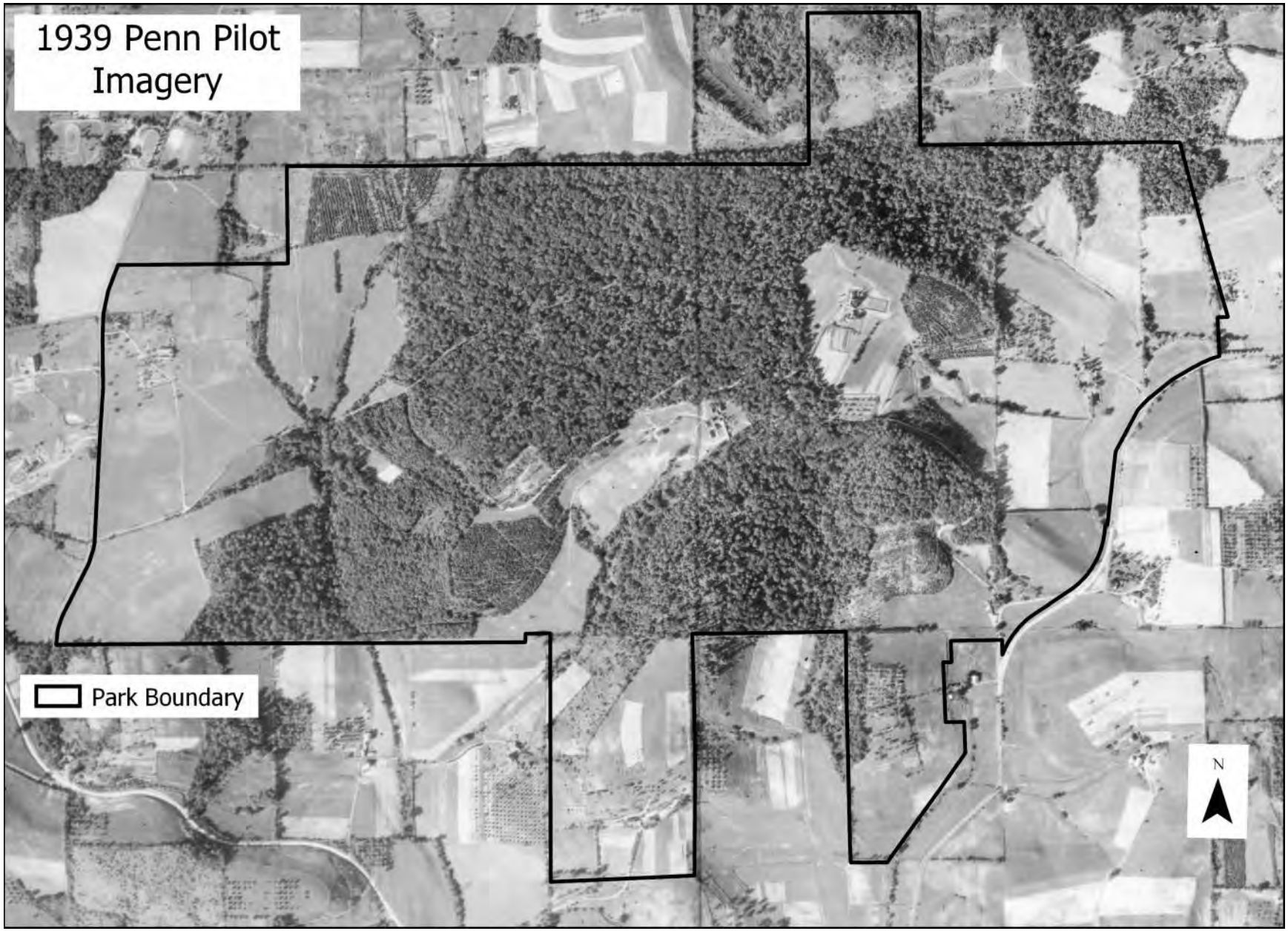
native species on a large scale. Excessive deer browse is also a modern problem that threatens forest regeneration and diversity, as deer were previously held in check by keystone predators such as wolves. The challenge in landscapes such as the Allegheny County Parks is to safeguard and improve the health of the remaining natural diversity, and to restore ecological health where it has been impaired.

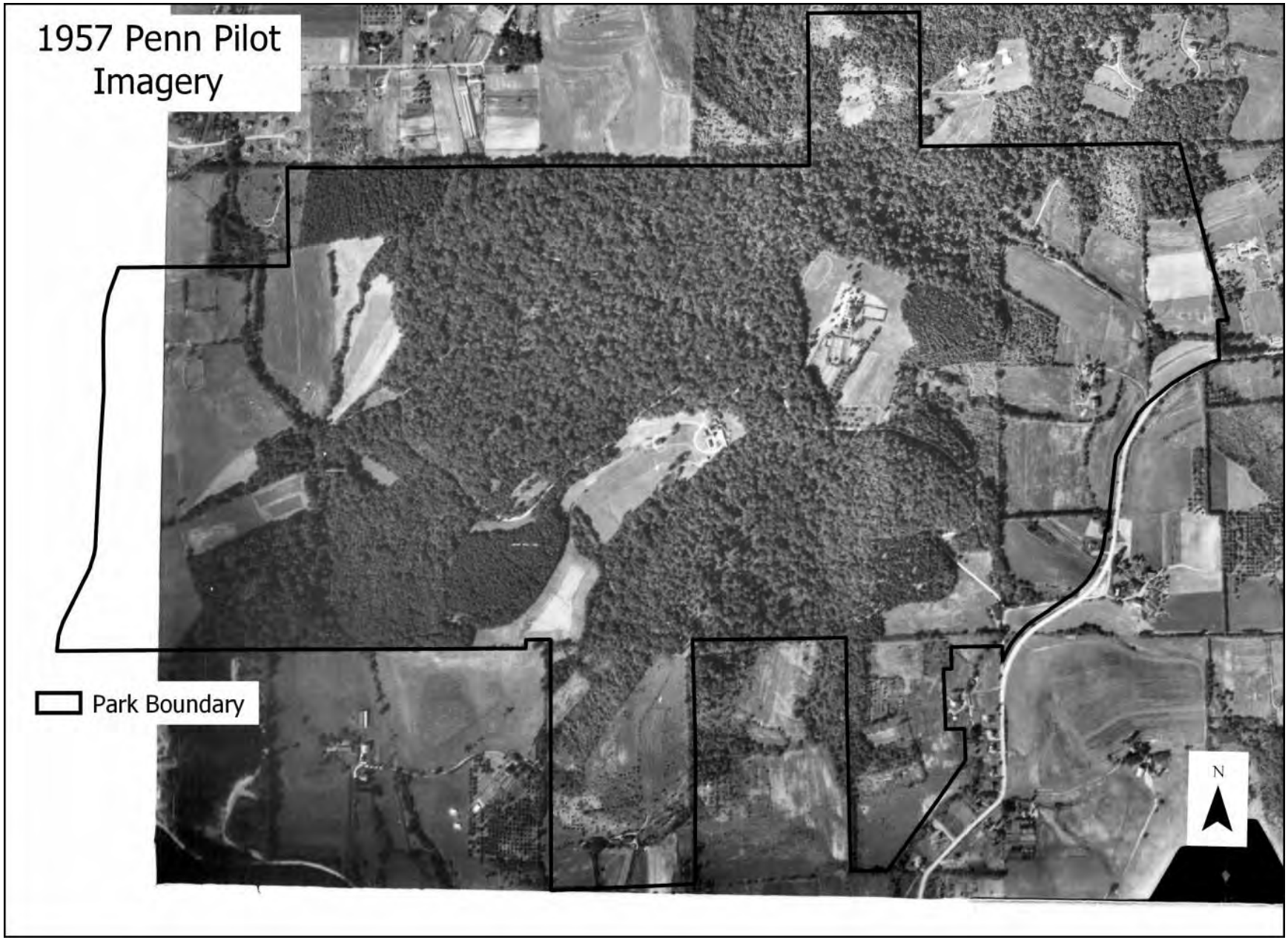
2.5 LAND USE AND ECOLOGICAL HISTORY OF HARTWOOD ACRES PARK

Hartwood Acres Park's history as an estate property has left much of the park relatively ecologically intact. Land use has changed remarkably little over the decades since the establishment of the estate in the 1920s that Allegheny County purchased in 1969. About 25 percent of the park is in non-forest uses such as the mowed areas that comprise the dog park, concert lawn, and grounds of the estate. About 75 percent of the park area is forested, while very small fractions are developed with hardscaping or buildings (0.5 percent), or wetland (0.2 percent). The present-day ecological integrity of the forested areas varies widely across the park, ranging from healthy mature forests, mid-successional forest, and highly invaded early successional forests. Many of these variations are related to past land use, as is detailed below.

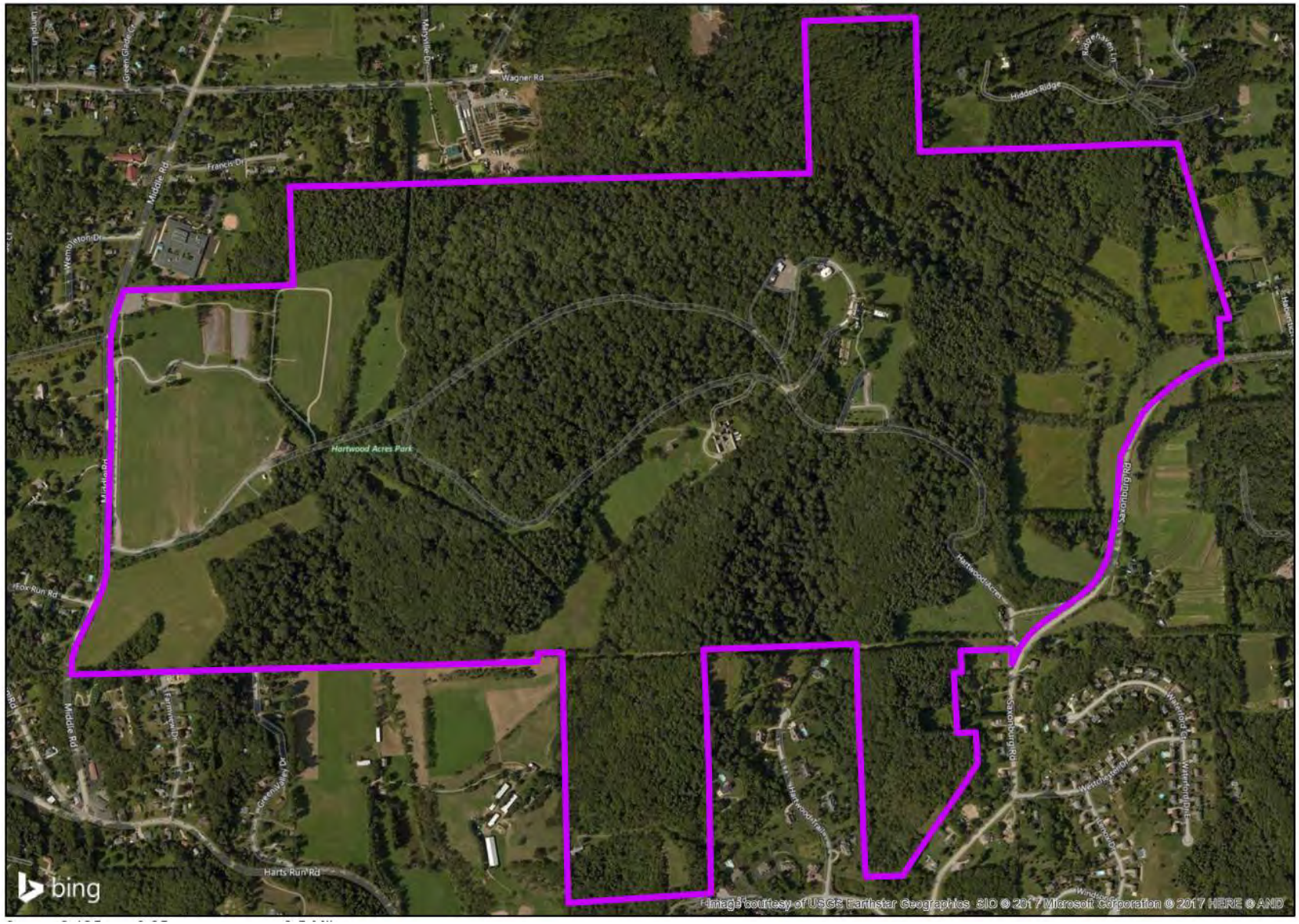

Sun Peaks through the Crown of a Tulip Tree - Hartwood Acres Park

Most forested areas have been continuously forested since before the establishment of the estate, although the total forest cover has increased slightly since that time due to reforestation in a few areas. However, it is likely that none of the park has original, old-growth forest. Most of Pennsylvania was logged between the late 1800s and early 1900s in commercial timber operations. This area may have been first logged even earlier due to its proximity to early settlements. Fire was also common in the dry, brushy areas that remained after clear-cut timber operations, which tends to favor the establishment of oak species. The older, predominantly oak forests of the park may be second- or third- growth that established around this time period. Much of the park area has fairly young forest visible in 1939 aerial photos, which is consistent with this hypothesis. In many of the continuously forested areas, the composition of the


1939 Penn Pilot
Imagery
Park Boundary
N


1957 Penn Pilot Imagery
Park Boundary
N

2018 Penn Pilot Imagery



regenerating future forest is more mesic (a mesic habitat is a type of habitat with a moderate or well-balanced supply of moisture) and less oak-dominated than the existing mature canopy. This transition is a natural process of succession in the absence of fire or other disturbance. While the oak layer may have established after clear-cutting and fire, the current conditions are shaded by existing forest canopy, with soils accumulating organic matter from leaf litter; these conditions facilitate the establishment of shade-tolerant and more mesic species. Oaks rarely establish under shade.

Some forested areas of the park have a distinctly two-tiered structure, with a layer of large mature canopy trees that is usually oak-dominated, and a layer of much smaller trees that is more mesic and successional in character, dominated by black cherry and red maple. This structure, where it appears that no medium-aged trees are present, indicates that regeneration was suppressed or removed for a long period in between the establishment of the old layer and the young layer. This may have been caused by management during the estate years to keep the understory open for fox hunting, or also by prolonged and severe deer over-browsing inhibiting regeneration.

A common practice in the early 20th century, especially during the 1930s when the Civilian Conservation Corps was operating, was the planting of conifers for forest reclamation. Several conifer plantations exist in the park that appear to date from this time period. These early conifer plantations were frequently established in areas that would not have naturally hosted coniferous forest, and frequently used non-native species such as Norway spruce. The plantations at Hartwood Acres Park are mostly of white pine, a native species common in this region, with some red pine included. Red pine is native further north, probably even in some areas of Pennsylvania, but not historically found growing naturally in Allegheny County. There appears to be a healthy deciduous forest layer developing underneath these conifer plantations. They will likely naturally transition slowly to deciduous forest as the older pine trees begin to die. However, it should be noted that conifer forests can leave lasting alterations on soil due to the acidic nature of the leaf litter. At this time no specific management is recommended for these areas.

Two Tiered Sucesional Forest - Hartwood Acres Park

Some portions of the park were primarily forested in 1939 but also had canopy gaps visible at that time; these gaps have recovered poorly. Forest has failed to develop in the gaps, and in many cases they are now filled with grapevine or exotic invasive species. It is not known why these canopy gaps existed; the timing is consistent with loss of American chestnut trees from chestnut blight, and the continued presence of American chestnut in some more intact forested areas supports the idea it may have once been more widespread in the park. Alternatively, perhaps small areas may have been logged for construction or fuel at the time of the estate construction and during its use. Some new canopy gaps have formed recently due to the death of ash trees from the emerald ash borer, although the damage is not extensive because ash was a very minor component of the park's forests.


An example of a canopy gap at Hartwood Acres Park

Today, the problem of forest regeneration in canopy gaps, in early successional forest areas, and even in mature forest areas is compounded by ongoing intense deer browse pressure combined with the ubiquitous presence of exotic invasive species. Mature forest areas have unnaturally sparse herb, shrub, and sapling layers, which threatens future tree canopy regeneration and makes them vulnerable to invasion by exotic species. Many early successional areas now have a dense presence of exotic species, and mature native forest communities are unlikely to develop again without intervention; in some cases, the density of exotic shrubs and vines may prevent mature forest cover of any kind from regenerating.

2.6 ECOLOGICAL INTEGRITY MAPPING

In Hartwood Acres Park, the forest quality varies widely across the park. However, distinctions between the plant species composition of the oldest areas and more recently established forests are not as strong as they are in some other parks, where the oldest forests in the park clearly serve as reservoirs for "conservative" plant species that require intact forest habitat and do not re-establish quickly after disturbance. This is primarily because the overall diversity of herbaceous plants in the park is substantially lower than expected for reference examples of these community types, with few conservative species present. The lack of diversity may be due to over-

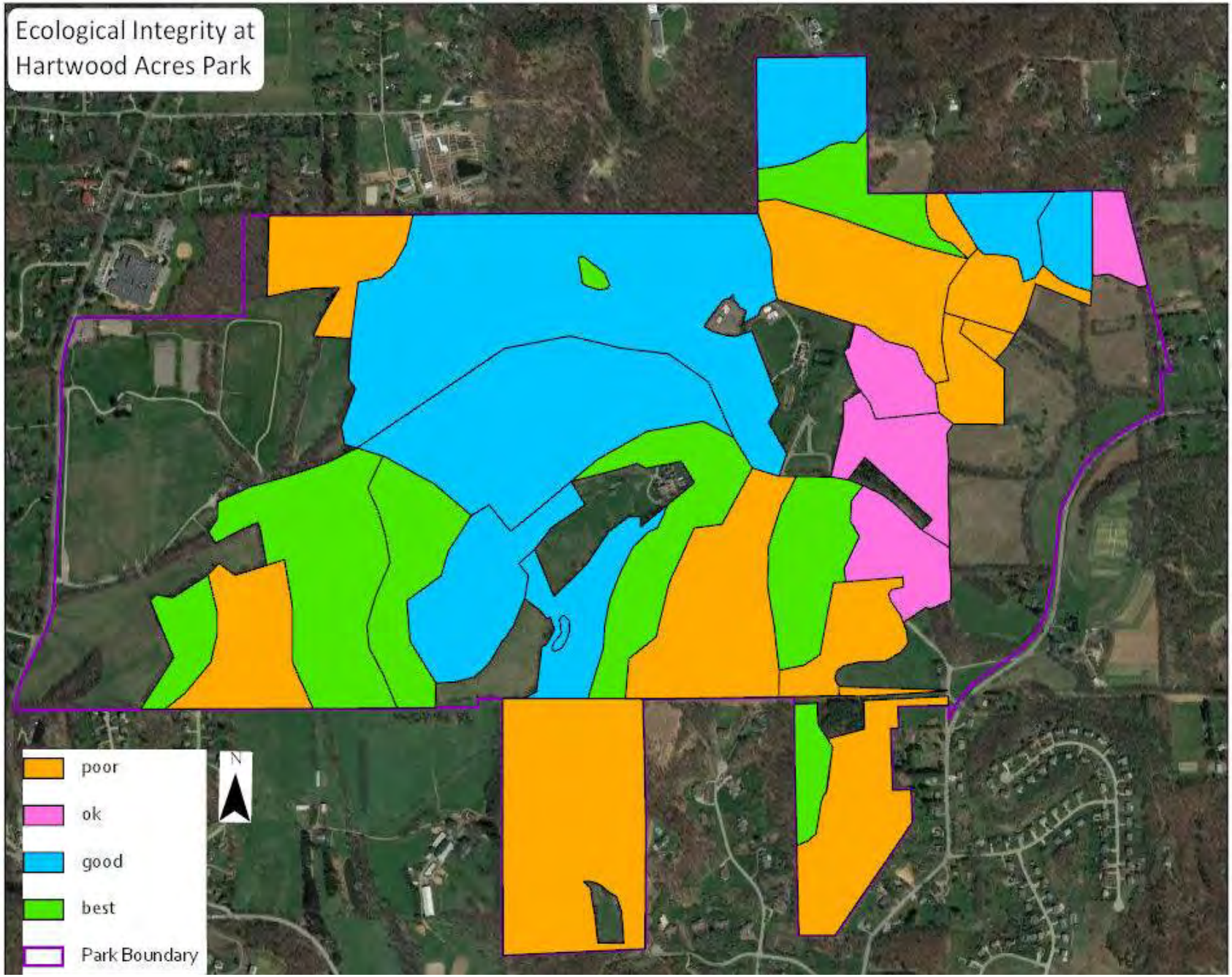
browsing by deer, or other impacts of past land use. Another factor in comparing this park to other county parks is that most of Hartwood Acres Park intact forest types are on acid soil, which in our region has naturally less diverse plant communities than more mineral-rich soils. Most of the areas of Hartwood Acres Park with more mineral rich soil have been heavily invaded by exotic species.

WPC highlighted the areas with the greatest ecological integrity by mapping areas as "best", "good", "ok" and "poor" quality natural communities.

- **"Best quality"** – these areas have mature plant communities with native herbaceous and shrub layers, including a few more "conservative" species that require intact forest habitat and do not re-establish quickly after disturbance. These species have special conservation value, because they are difficult to re-establish once lost. They can also provide seed and propagule (a vegetative structure that can become detached from a plant and give rise to a new plant, e.g., a bud, sucker, or spore) stock for restoration efforts elsewhere in the park, if they are managed to develop healthy populations and sustainably harvested; however, currently most of these species have extremely low populations in Hartwood Acres Park. These areas also currently have low presence of invasive species, and should be monitored and managed to prevent the establishment and spread of invasives.

- **"Good quality"** – these are areas that have medium-aged to mature plant communities, with species diversity that is lower than expected for a reference example of the community type. "Conservative" species are less common or absent in these areas. Exotic species may be present but native species are dominant. Restoration of greater species diversity should be considered through movement of seed propagules from "best quality" examples of similar community types in the park. Invasive species management may also be needed in these areas.

- **"Poor quality"** – these are areas that have early successional plant communities with low diversity of native plants; species tend to be non-conservative, i.e., those that can colonize disturbed habitats easily, and exotic invasive plants are common. These areas will require intensive management to restore ecological quality and allow them to proceed on a natural successional path to develop a mature native plant community. The primary difficulty is the need to manage invasive species so that natives can establish and mature; propagule introduction may also eventually be needed to restore more conservative species.


Ecological Integrity at
Hartwood Acres Park
poor
ok
good
best
Park Boundary
N


Hartwood Acres Park Management
Zones and Ecological Units
Western Pennsylvania Conservancy
Zone 1
Zone 2
Zone 3
Zone 4
Zone 5
N
Management Zones
Ecological Units
0 500 1,000 2,000 Feet

Management Recommendations for Ecologically intact Areas

- Manage deer populations in the park to reduce browsing pressure. Immediate deer fencing around especially sensitive areas may be a good way to stop further loss of plant diversity, as long-term deer management plans are developed.
- More intact forest areas should be the highest priority for invasive species management to preserve these ecosystems while they are still in reasonably good condition. Monitoring and treatment efforts should be designed for early detection and prompt removal of invasive species before they become well-established or widespread within high-quality areas. Early detection and treatment not only improves the chances of success, but saves greatly on expense and labor compared to what is required to control well-established populations.
- If canopy gaps or other disturbances develop within high-quality forest areas, these should be 1) given particular attention when monitoring and treating pioneer invasives, and 2) evaluated to determine if forest restoration efforts are needed to repair the opening. Openings facilitate the establishment of invasive species, as increased light and soil disturbance provide favorable conditions for many of these species, while closed canopy provides less favorable conditions.
- Trail development should be limited in the mature forest areas, to minimize both direct impacts and the spread of invasive species. If mountain biking cannot be contained to trails, trails should be restricted to foot traffic.
- Interpretive signage regarding the biodiversity value of the ecologically intact areas, including requests not to pick flowers or other native vegetation and to refrain from damaging recreational activities, may help with public cooperation in conservation-oriented management of these areas.
- Some conservative plant species should receive individual monitoring and stewardship to improve their populations, or they may be at risk of being lost from the park.

Best Quality Management Zones and Ecological Unit Area Descriptions

Five distinct management zones broken into 55 ecological units (EU) are depicted on the preceding map. The following section will describe each of the “Best Quality” ecological units when looking at the ecological integrity of Hartwood Acres Park. Named sections will coincide with their ecological unit number shown on the previous map.

2.6.1 ECOLOGICAL UNIT 54

Ecological Unit 54 includes a moderately steep mid-slope area with Allegheny Plateau oak forest community, and a steep headwaters ravine with a small stream channel and some associated seepage areas. The Allegheny Plateau oak forest has a canopy of large red oak (*Quercus rubra*) and black oak (*Quercus velutina*), smaller red maple (*Acer rubrum*), black birch (*Betula lenta*), black cherry (*Prunus serotina*), American beech (*Fagus grandolia*), and flowering dogwood (*Cornus florida*). The flora is not very diverse but does contain a few conservative species. The herb layer includes mayapple (*Podophyllum peltatum*), maple leaved viburnum (*Viburnum acerifolium* - 6), sedges (*Carex digitalis* – 6, *Carex pensylvanica* - 5, *Carex rosea* - 5), ash seedlings, Solomon's seal (*Polygonatum biflorum* - 7), lowbush blueberry (*Vaccinium pallidum* - 6), canada cinquefoil (*Potentilla canadensis*), wild licorice (*Galium lanceolatum* - 8), and jumpseed (*Polygonum virginianum*).

The forest in the ravine has a more mesic character. There are also some patches where invasive exotic species have established; this is a priority area to combat the invasive species due to the quality of the surrounding community. At the upper end there is a mesic tuliptree forest; midway down the ravine there is a large canopy gap where invasive species have established (multifora rose, Japanese barberry, Japanese stiltgrass, and Oriental bittersweet). Below this gap native cover resumes, including several seepage areas with interrupted fern (*Osmunda claytoniana*) and jewelweed (*Impatiens capensis*).

Succesional Forest within Ecological Unit 54

The mesic ravine forest has a canopy of tall tuliptree (*Liriodendron tulipifera*), with American elm (*Ulmus americana*) and red maple (*Acer rubrum*) in the subcanopy, spicebush (*Lindera benzoin*) and witch hazel (*Hamamelis virginiana*) in the shrub layer. The herb layer is relatively diverse for the park, although low diversity compared to the potential of this community type. It includes moderately conservative species with a few more conservative elements. Herbaceous species: jumpseed (*Polygonum virginianum*), horse nettle (*Collinsonia canadensis* - 5), downy yellow violet (*Viola pubescens* - 7), intermediate wood fern (*Dryopteris intermedia* -5), enchanter's nightshade (*Circaea lutetiana*), christmas fern (*Polystichum acrostichoides* - 5), jack-in-the-pulpit (*Arisaema triphyllum* - 5), stonecrop (*Sedum ternatum* - 6), New York fern (*Thelypteris noveboracensis* - 5), and wild geranium (*Geranium maculatum* - 5). The invasive exotic species garlic mustard (*Alliaria petiolata*) and Japanese stiltgrass (*Microstegium vimineum*) are common; multiflora rose (*Rosa multiflora*) and Japanese barberry (*Berberis thunbergii*) are also present.

Downy yellow violet (*Viola pubescens)*

2.6.2 ECOLOGICAL UNIT 37 AND 43

EU #37 is a west-facing slope and hilltop knob with one of the best examples of Allegheny oak forest in the park. The canopy is dominated by chestnut oak (Quercus prinus), white oak (*Quercus alba*) and heaths at top of the knob; midslope, red and black oaks (*Quercus rubra, Quercus velutina*) are dominant, while tuliptree and red maple are present near the bottom of the slope where it meets a stream channel. Some very large trees are present in the Allegheny oak forest area. The area is remarkably free of invasive species. Several American chestnuts (*Castanea dentata*) are present here, in varying states of health. Subcanopy species include flowering dogwood (*Cornus florida*), Black cherry (*Prunus serotina*), red maple (*Acer rubrum*), and mockernut hickory (*Carya tomentosa*). The shrub layer is very sparse but includes some lowbush blueberry; herb layer is also sparse but includes a couple of highly conservative

species typical of this community – teaberry (*Gaultheria procumbens*) and rattlesnake weed (*Hieracium venosum*), as well as oak seedlings. Patches of mosses are also common, a typical feature of the dry oak health community.

The slope east of this area is more mesic and much more heavily invaded; invasive control efforts to maintain the high-quality area might include monitoring and treating around this boundary. Japanese stiltgrass is spreading up from the bottom of the ravine.

EU #43 is an additional small patch of Allegheny Plateau oak forest at a slope summit. It is almost free of invasives. High-quality forest continues off the park property to the east, but to the west and south, the forest is younger and more heavily invaded.

Allegheny Plateau Oak Forest - Ecological Unit 43

2.6.3 ECOLOGICAL UNITS 21, 24 & 25

This area includes a west-facing slope of a small narrow ridge, and the adjacent valley bottom to the east, which includes a small stream and wetland area (EU #25). The upslope area has a dry oak – mixed hardwood forest community (EU #21), with some mesic elements. It is largely free of invasive species except along edges and trails, as well as scattered small shrubs. The canopy is mostly large white, red, and black oak, with scattered tuliptree and black gum (some very large); there is also smaller chestnut oak, red maple, sugar maple (uncommon), black cherry, sassafras, red hickory. The shrub layer is fairly sparse, with occasional witch hazel (*Hamamelis virginiana* – 5), deerberry (*Vaccinium stamineum* – 6), azalea (*Rhododendron sp.*) and lowbush blueberry (*Vaccinium pallidum* – 6). The herb layer is also sparse, with hay scented fern (Dennstaedtia punctilobula) and mayapple (*Podophyllum peltatum*) the dominant species, but a few more conservative species are scattered infrequently, including teaberry (*Gaultheria procumbens* – 8), Bluestem goldenrod (*Solidago caesia* – 6), and club-rush (*Trichophorum planifolium* – 8). The club-rush is a species that is quite uncommon in western Pennsylvania, although more common to the east. This forest community may transition to a more mesic community in the future, as saplings and young trees are mainly red maple and ash with very little young oak. The invasives documented in this area were scattered stiltgrass, garlic mustard, and barberry especially on edges and trails.

Shrub Layer - Ecological Unit 25

In the lower half of the slope the forest composition is more mesic (EU #24), with less oak and more American beech (*Fagus grandifolia*), black maple (*Acer nigrum*), shagbark hickory (*Carya ovata*) and American hop-hornbeam (*Ostrya virginiana*). There is a floodplain wetland area in the valley bottom (EU #25) with a moderate diversity of typical native species, including Skunk cabbage (*Symplocarpus foetidus*), drooping sedge (*Carex prasina* – 8), sensitive fern (*Onoclea sensibilis*), fowl mannagrass (*Glyceria striata* - 5), hooked crowfoot (*Ranunculus recurvatus*), jewelweed (*Impatiens sp.*), heart-leaved tear-thumb (*Polygonum sagittatum*), sedges (*Carex lurida, Carex brunnescens*), soft rush (*Juncus effusus*), jumpseed (*Polygonum virginianum*), and jack-in-the-pulpit (*Arisaema triphyllum*). Spicebush, a common shrub, is present and the tree canopy includes black willow (*Salix nigra*) and black walnut (*Juglans nigra*), two native species typical of floodplains, and also a stand of the exotic Norway spruce (*Picea abies*). Invasive exotic species pose a significant threat to this wetland; further upstream the ravine is overwhelmingly dominated by Japanese stiltgrass (*Microstegium vimineum*), while reed canarygrass (*Phalaris arundinacea*), a grass that commonly forms dense stands in wetlands and outcompetes native species, is present but not dominant. Other exotic species present that have invasive potential include white bedstraw (*Galium mollugo*), Canada thistle (*Cirsium arvense*), burning bush (*Euonymus alata*), and gill-over-the-ground (*Glechoma hederacea*).

2.6.4 ECOLOGICAL UNITS 14 & 15

This area is a broad west-facing slope above Little Pine Creek; the forest is higher quality on this slope than surrounding areas. The upper portion of the slope is Allegheny Plateau Oak Forest, with large black, red, white, and chestnut oaks (*Quercus velutina, Q. rubra, Q. alba, Q. prinus*) in the canopy. The understory and shrub layer includes black cherry (*Prunus serotina*), black gum (*Nyssa sylvatica*), black birch (*Betula lenta*), flowering dogwood (*Cornus florida*) and red maple (*Acer rubrum*). The herb layer is sparse, mainly moderately conservative species such as mayapple (*Podophyllum peltatum*- 5), intermediate wood fern (*Dryopteris intermedia*- 5), (*Potentilla simplex*-3), cutleaf toothwort (*Cardamine concatenata*- 5), and Pennsylvania sedge (*Carex pensylvanica*- 5), with a few more conservative species (*Carex woodii* – 8, *Carex digitalis* – 6) scattered. The exotic species Norway maple (*Acer platanoides*) and Japanese barberry (*Berberis thunbergii*) are scattered here and could easily be removed now before infestation spreads further. Japanese stiltgrass (*Microstegium vimineum*) is also scattered; it may be containable at this point, but control efforts should be careful not to damage native species.

Lower on the slope the forest becomes more mesic, transitioning to a Red oak – mixed hardwood community. The canopy contains large red oaks along with red maple, black cherry, American elm (*Ulmus americana*), bird cherry (*Prunus avium*); black gum, black oak, sugar maple, and shagbark hickory (*Carya ovata*)

are occasional. Spicebush (*Lindera benzoin*) is a common shrub here, with witch hazel (*Hamamelis virginiana*) also scattered. While the herb layer is low diversity compared to the potential of this community type, it does have some typical native spring wildflowers. Species include mayapple (*Podophyllum peltatum*), cutleaf toothwort (*Cardamine concatenata*), Christmas fern (*Polystichum acrostichoides*), broad beech fern (*Phegopteris hexagonoptera*), early meadow rue (*Thalictrum thalictroides*), hay scented fern (*Dennstaedtia punctilobula*), and bedstraw (*Galium aparine*). The invasive exotic species garlic mustard (*Alliaria petiolata*) is also present here, with a dense concentration on the lower slope by the stream.

2.6.5 ECOLOGICAL UNIT 11

This is a small area of mature Allegheny Plateau oak forest at the summit of a hill. It is primarily notable for its canopy of mature oaks; the shrub and herb layer are not in as good condition. The canopy is composed of red, black, and chestnut oak *(Quercus rubra, Q. velutina, and Q. prinus*), including many large diameter trees. There is also some black cherry and red maple. The understory is depauperate with some Japanese barberry, garlic mustard (*Alliaria petiolata*) and black cherry saplings. The canopy cover is 50-70% with some gaps. The forested slope adjacent to the east has high invasive species cover, and these species may spread into this more intact community without control efforts.

A large Chestnut Oak in Ecological Unit 11 - Hartwood Acres Park

2.7 BOTANICAL CONSERVATION TARGETS AT HARTWOOD ACRES PARK

No species of regional conservation concern were documented in the park. Plant conservation efforts should focus on the more conservative species present in the park with low population numbers present currently. See previous recommendations for managing the ecologically intact areas of the park, and the list of conservative plant species below.

2.8 CONSERVATIVE PLANT SPECIES OF HARTWOOD ACRES PARK

The following table lists plant species found in Hartwood Acres Park that require intact natural habitats with little disturbance. The "Coefficient of Conservatism" is a rating developed to estimate how strongly a plant requires such a habitat; a species rated "10" will almost never be found outside of a very intact natural habitat, while a species rated "1" can easily colonize disturbed areas . The presence of species rated "5" or above can serve as a guide to indicate good quality natural habitats (Swink and Wilhelm 1994). They are also important conservation targets because many of the species rated "6" or above generally re-establish extremely slowly once lost (this is especially true for herbaceous species, less so for woody species).

Some natural habitats depend on natural disturbances, such as floodplains or fire. Although species that inhabit these ecosystems generally have low coefficients of conservatism, this does not diminish their ecological importance.

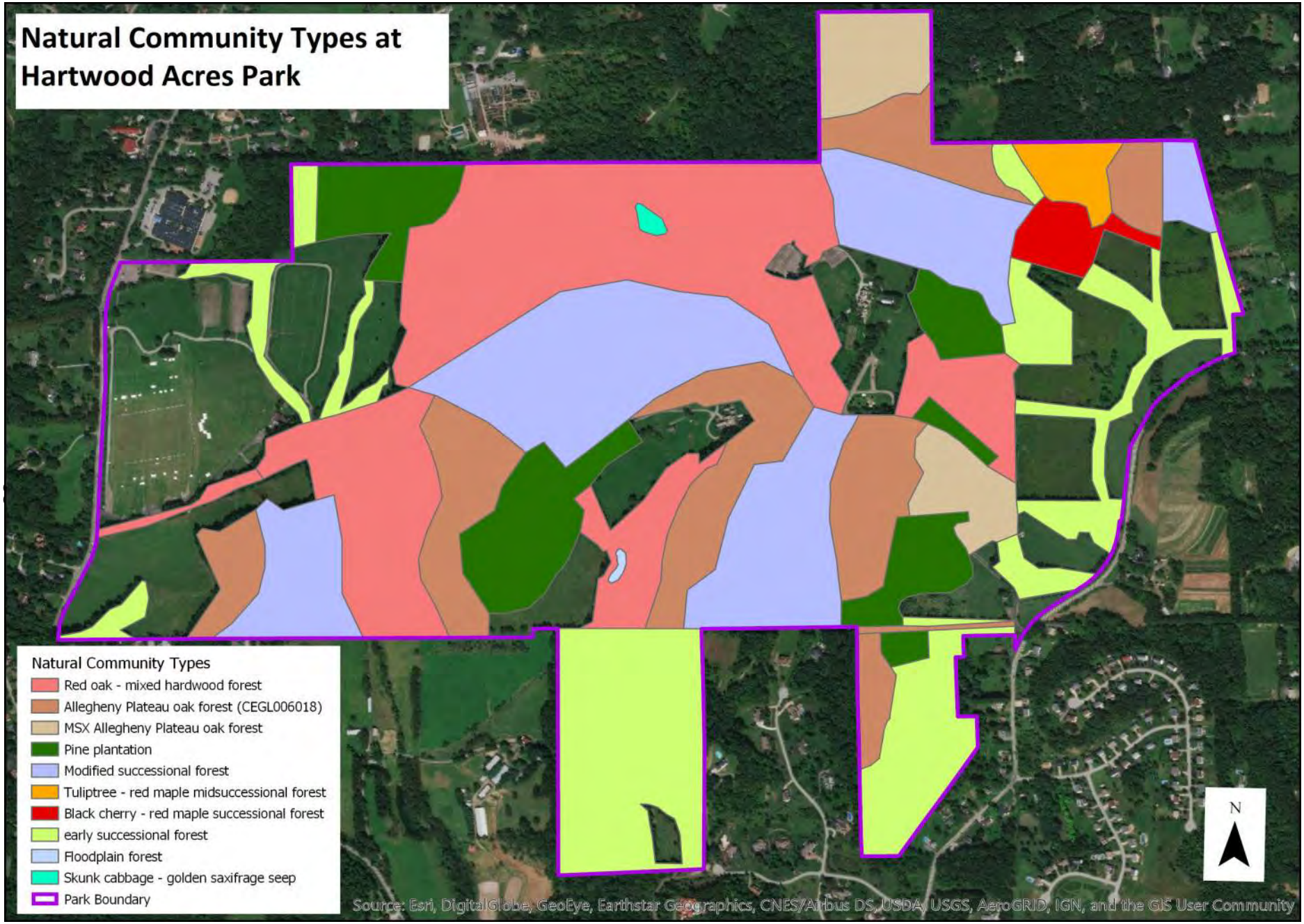
Hartwood Acres Park has a relatively low number of conservative species present in the park, and many of them are woody species, which are longer-lived and can survive disturbances to which herbaceous species can be more vulnerable.

Scientific Name	**Common Name**	**Coefficient of Conservatism***
Carex woodii	Sedge	8
Circaea alpine	Enchanter's-nightshade	8
Trichophorum planifolium	Club-rush	8
Gaultheria procumbens	Teaberry	8
Carex prasina	Sedge	8
Carex brunnescens	Sedge	8
Magnolia acuminate	Cucumber-tree	8

Scientific Name	**Common Name**	**Coefficient of Conservatism**
Galium lanceolatum	Wild licorice	8
Quercus prinus	Chestnut oak	7
Carex laxiculmis	Sedge	7
Phegopteris hexagonoptera	Broad beech fern	7
Ostrya virginiana	Hop-hornbeam	7
Acer nigrum	Black maple	7
Viola pubescens	Downy yellow violet	7
Carex communis	Red sedge	7
Hieracium venosum	Rattlesnake-weed	7
Polygonatum biflorum	Solomon's-seal	7
Carex laxiculmis var. copulata	Sedge	7
Quercus rubra	Northern red oak	6
Nyssa sylvatica	Blackgum	6
Carex digitalis	Sedge	6
Quercus alba	White oak	6
Quercus velutina	Black oak	6
Carya glabra	Pignut hickory	6
Thalictrum thalictroides	Rue-anemone	6
Carpinus caroliniana	Hornbeam	6
Acer saccharum	Sugar maple	6
Amelanchier arborea	Shadbush	6
Galium circaezans	Wild licorice	6
Fagus grandifolia	American beech	6
Osmunda claytoniana	Interrupted fern	6
Viburnum acerifolium	Maple-leaved viburnum	6
Carya ovalis	Sweet pignut hickory	6
Vaccinium pallidum	Lowbush blueberry	6
Solidago caesia	Bluestem goldenrod	6
Vaccinium stamineum	Deerberry	6
Carya ovata	Shagbark hickory	6
Carex virescens	Sedge	6
Carex gracillima	Sedge	6
Rhododendron periclymenoides	Pinxter-flower	6

Scientific Name	**Common Name**	**Coefficient of Conservatism**
Rosa virginiana	Virginia rose	6
Cardamine concatenate	Cutleaf toothwort	5
Podophyllum peltatum	Mayapple	5
Dryopteris intermedia	Intermediate wood fern	5
Ulmus americana	American elm	5
Claytonia virginica	Virginia spring-beauty	5
Betula lenta	Black birch	5
Carex pensylvanica	Sedge	5
Lindera benzoin	Spicebush	5
Arisaema triphyllum	Jack-in-the-pulpit	5
Polystichum acrostichoides	Christmas fern	5
Liriodendron tulipifera	Tuliptree	5
Hamamelis virginiana	Witch-hazel	5
Symplocarpus foetidus	Skunk-cabbage	5
Geranium maculatum	Wild geranium	5
Thelypteris noveboracensis	New York fern	5
Eupatorium purpureum	Sweet-scented Joe-Pye-weed	5
Carex rosea	Sedge	5
Glyceria striata	Fowl mannagrass	5
Eurybia divaricate	White wood aster	5
Luzula multiflora	Field woodrush	5
Viburnum prunifolium	Black-haw	5
Castanea dentata	American chestnut	5
Dioscorea quaternata	Wild yam	5

* The values used in this report are Pennsylvania-specific and for the Appalachian Plateau ecoregion (Chamberlain and Ingram 2012).


Natural Community Types at Hartwood Acres Park
Natural Community Types
Red oak - mixed hardwood forest
Allegheny Plateau oak forest (CEGL006018)
MSX Allegheny Plateau oak forest
Pine plantation
Modified successional forest
Tuliptree - red maple midsuccessional forest
Black cherry - red maple successional forest
early successional forest
Floodplain forest
Skunk cabbage - golden saxifrage seep
Park Boundary
N
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

2.9 PLANT COMMUNITY TYPES OF HARTWOOD ACRES PARK

Community types are assigned using the Pennsylvania Natural Heritage Program's plant community classification system (PNHP 2018) and the U.S. National Vegetation Classification (USNVC 2018). There are two mature forest community types found in the park. These host many of the highly conservative species of the park (see table above); herbaceous species that are unique to mature forests because they re-establish very slowly after disturbance. These species are not found in other areas of the park. Several park-specific mid-successional types are delineated in the park.

Early successional forest in the park is all combined into a single type, as early successional forest is extremely variable, and generally does not form distinct repeated and recognizable types. These forests have established more recently than the mature forests and also may have experienced more disturbance.

They are dominated by early-successional, disturbance tolerant species, a high proportion of which are often exotic. There are two wetland community types identified in the park; although some small additional areas of floodplain may also qualify as wetland, these had experienced more disturbance and did not resemble described natural community types.

2.9.1 MATURE FOREST TYPES - Allegheny Plateau Oak Forest

This type is described in the National Vegetation Classification system (CEGL006018). It occurs on sandy or rocky soil on dry upper slopes and terraces of sandstone, shale, granite, gneiss, and other acidic parent materials. The tree canopy is dominated by a mixture of black oak *(Quercus velutina)*, white oak (*Quercus alba*), red oak (*Quercus rubra*), scarlet oak (*Quercus coccinea*), red maple (*Acer rubrum*), and chestnut oak (*Quercus prinus*). Associates include pignut hickory (*Carya glabra*), shagbark hickory (*Carya ovata*), black gum (*Nyssa sylvatica*), sassafras (*Sassafras albidum*), black birch (*Betula lenta*), and black cherry (*Prunus serotina*). American chestnut (*Castanea dentata*) was formerly common in this forest. The understory is characterized by black gum (*Nyssa sylvatica*). The low-shrub layer is characterized by ericaceous shrubs such as lowbush blueberries (*Vaccinium pallidum, Vaccinium angustifolium*), deerberry (*Vaccinium stamineum*), huckleberry (*Gaylussacia baccata*), mountain laurel (*Kalmia latifolia*), and pinxterflower (*Rhododendron periclymenoides*), as well as maple-leaf viburnum (*Viburnum acerifolium*). Typical species of the herbaceous layer include bracken fern (*Pteridium aquilinum*), pennsylvania sedge (*Carex pensylvanica*), spreading ricegrass (*Oryzopsis asperifolia*), teaberry (*Gaultheria procumbens*), rattlesnake weed (*Hieracium venosum*), pink lady's slipper (*Cypripedium acaule*), dwarf dandelion (*Krigia biflora*), gaywings (*Polygala*

paucifolia), starflower (*Trientalis borealis*), and barren-strawberry (*Waldsteinia fragarioides*). Disturbance such as windthrow and logging favor black oak and black birch.

At Hartwood Acres Park, this is the second most common mature forest type, with 19% of the portion of the park with natural vegetation. The canopy composition is a very good match for this community type. In upper slope positions on west-facing slopes, it is dominated by red, white, and black oaks, while on summits and knobs chestnut oak is more prominent, and bryophyte cover is also higher. The herbaceous and shrub layers have some of the species listed above, but diversity in the park is lower than typical for a reference example of this type.

In the Pennsylvania community classification system, this type crosswalks to dry oak – heath forest in summit positions and to dry oak – mixed hardwoods forest in upper slope positions; the Allegheny Plateau oak type was used here because it is specific to our local ecoregion and better matches the species composition on the ground.

Red Oak - Mixed Hardwood Forest

This is the most common mature forest type in the park, occupying about 33% of the portion of the park with natural vegetation. It is found on mid- and lower- slopes, on well-drained soils, with a broad range of pH values. red oak is a canopy dominant, often accompanied by white oak (*Quercus alba*), with smaller components of sugar maple (*Acer saccharum*), red maple (*Acer rubrum*), black cherry (*Prunus serotina*), bitternut hickory (*Carya cordiformis*), American beech (*Fagus grandifolia*), slippery elm (*Ulmus rubra*), and (less frequently) American elm (Ulmus americana). Tuliptree (*Liriodendron tulipifera*) and black maple (*Acer nigrum*) are also sporadically present. White ash (Fraxinus americana) was previously a minor component, but most have died due to emerald ash borer infestation. The shrub layer may include spicebush (*Lindera benzoin*), witch hazel (*Hamamelis virginiana*), and a variety of exotic species such as bush honeysuckles or Japanese barberry (*Berberis thunbergii*). The herbaceous layer typically has a somewhat lower diversity of native species than would be expected for highly intact examples of this community; this may reflect overbrowsing by white-tailed deer, as well as the impacts of past land use and forest fragmentation. Species such as mayapple (*Podophyllum peltatum*), hay-scented fern (*Dennstaedtia punctilobula*) and violets (*Viola spp.*) were typical, while more conservative species such as broad beech fern (*Phegopteris hexagonoptera*), wood anemone (*Thalictrum thalictroides*), and wild geranium (*Geranium maculatum*) were scattered with one or a few populations in the park.

2.9.2 SUCCESSIONAL FOREST TYPES - Modified Successional Forest

This type is applied for mid-successional aged forests that show some evidence of disturbance and have not matured into a recognizable natural community type. There is usually also a high fraction of cover of exotic invasive species in the shrub and herb layers.

MSX - Allegheny Oak-Forest

One ecological unit had a younger stand of forest with some disturbance present (consistent with modified successional forest) but the species composition recognizably tended towards Allegheny Plateau oak forest type.

Tuliptree - Red Maple Mid-Successional Forest

One ecological unit had a midsuccessional stand of forest in a bottomland situation with a canopy dominated by large tuliptree (*Liriodendron tulipifera*) and red maple (*Acer rubrum*). A park-specific type was applied here because it did not show the disturbance levels typical of modified successional forest, but also did not fit any existing natural community types particularly well, in part due to a lower diversity probably related to its early successional stage and disturbance history.

Black Cherry - Red Maple Successional Forest

This forest was moderately mature and had a canopy dominated by black cherry (*Prunus serotina*) and red maple (*Acer rubrum*).

Early Successional Forest

These areas have young forest cover dominated by early successional species. Black cherry (*Prunus serotina*) is the most ubiquitous and the most abundant. Other common species are: tuliptree (*Liriodendron tulipifera*), sassafrass (*Sassafrass albidum*), black walnut (*Juglans nigra*), elms (*Ulmus americana, Ulmus rubra*), and bitternut hickory (*Carya cordiformis*). Ash trees (*Fraxinus americana, Fraxinus pennsylvania*) were formerly an important part of the canopy in these forests, but have recently died due to infestation with the Emerald ash borer. Exotic invasive shrubs, and grapevine tangles, are common. The shrub layer is typically dominated by multiflora rose (*Rosa multiflora*) and spicebush (*Lindera benzoin*). The herbaceous layer is often somewhat limited by the dense shrub layer. Early successional, disturbance adapted native and exotic species are common, and conservative forest species are almost absent. Wingstem (*Verbesina alternifolia*) is often a herbaceous dominant; jumpseed (*Persicaria virginiana*) and white snakeroot (*Ageratina altissima*) are common native species.

2.9.3 WETLANDS Skunk Cabbage - Golden Saxifrage Forest Seep

This type is a closed-canopy wetland that occurs where seepage emerges in a forest. It may have a great diversity of wetland species present. At Hartwood Acres Park there are two such seepage communities present; they are dominated primarily by native species, although the diversity is lower than a reference example of the type. Skunk cabbage (Symplocarpus foetidus) is the dominant species, with interrupted fern *(Osmunda claytoniana)*, jewelweed, (Impatiens sp.), a buttercup species (Ranunculus), dwarf enchanters nightshade *(Circaea alpina)*, sensitive fern *(Onoclea sensibilis)*, and jack-in-the-pulpit (Arisaema triphyllum) also present. The exotic invasive species narrowleaf bittercress (Cardamine impatiens) has established in small numbers, and should be removed while still feasible.

Floodplain Wetland

There is one area classified as a floodplain wetland community in Hartwood Acres Park. It is dominated by native species but does not fit a recognizable community type. See the description under ecological unit #25 of the higher ecological integrity areas. This habitat can be important for amphibian breeding.

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Hartwood Acres Park Management
Zones and Ecological Units
Western Pennsylvania Conservancy
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Zone 5
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Management Zones
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2.10 HARTWOOD ACRES PARK MANAGEMENT ZONE SUMMARIES & POTENTIAL PRIORITY PROJECTS

Based on community usage and community practice, some of the small segments have been clustered to provide clear management zones toward which recommendations can be focused. Five distinct management zones broken into 61 ecological units (EU) are depicted on the map on page 42.

2.10.1 - MANAGMENT ZONE 1

Management Zone 1 is located in the far western portion of the park and is comprised mostly of large open areas used for park event and parking lots (EU 1-4, 6) a dog park (EU 7) and a large open field (EU 9). Unit 5 includes two narrow gallery forests that follow Little Pine Creek near the dog park and an unnamed drainage further west between the open event areas. The wetland along Little Pine Creek is heavily invaded in spots, but it also has several components of a healthier wetland community (black willow, ninebark, hazel alder, hawthorn, white snakeroot, and a healthy population of frogs who could be heard escaping into the stream as WPC staff approached).

A large scour from significant stormwater runoff was observed along the park service road along the border of EU 5 and 13 (also the border between management zones 1 and 2). Water runs along the service road to the west, eventually exiting the road on the south side and eroding a trail that slopes down to the banks of Little Pine Creek (northern boundary of EU 13 in Management Zone 2.

Erosion from Runoff from Access Road into Little Pink Creek - Across from Dog Park

The forested drainage further west is more heavily invaded and contains large pockets of privet, stiltgrass, multiflora rose, and Oriental bittersweet. A few Norway maples were found in both wetlands. Littering from the nearby event areas is of special concern in this location. Trash and exotic understory plants increase in coverage further north toward the parking lots and a large hedge row of privet is found on the forest edge as it curves westward. Multiple Norway maples and naturalized hedge maples were found along the parking lot off of Middle Road.

A large mowed field is located south of the park access road (EU 9). Significant erosion from stormwater runoff was observed which originated from the crest of the hill and transcended into multiple eroded fissures within the field along Middle Road. It appeared that storm drains within in the roadway were strategically placed specifically to capture runoff from these scours. The quantity of runoff could be significantly reduced by altering mowing practices and increasing vegetation or installing an engineered green infrastructure project.

A narrow strip of the field extends eastward above EU 11 and 12. Routine mowing stops only partway towards the forest edge and a more natural wet meadow-like composition. Native sedges, ferns, milkweed, and dogbane were present here, along with several invasive plant species. Restoration of this area could endeavor to include removal of exotic plants and an increase of native species.

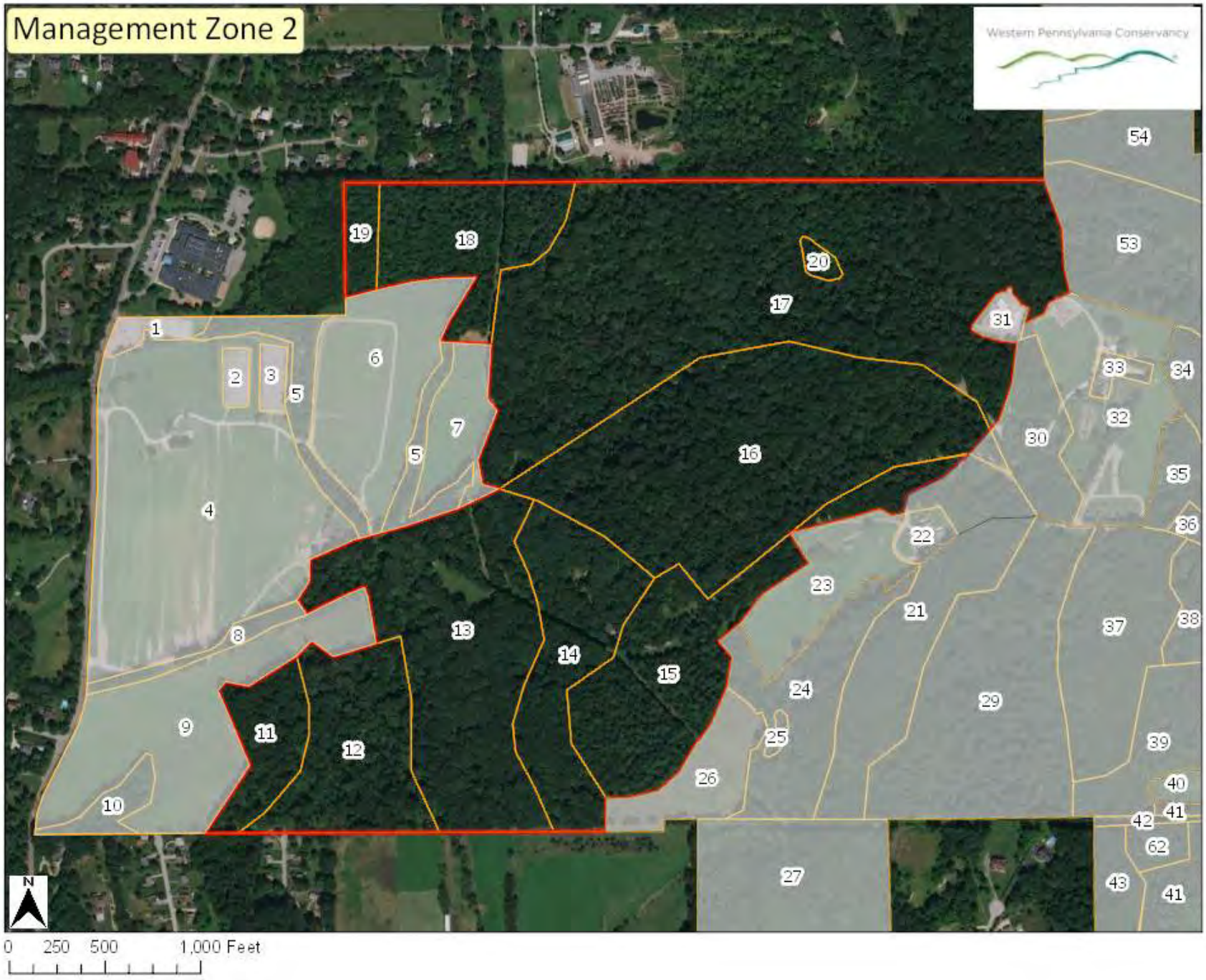
Priority Projects for Management Zone 1

1. Increase the buffer widths along the streams in EU 5, especially the higher quality Little Pine Creek. This objective can be achieved by reducing mowing and planting additional forest and/or meadow plant species. Invasive plant species should also be treated in and around the drainages. This is especially important when establishing new areas intended to be naturally vegetated, to ensure that invasive species do not colonize in place of natives.

2. Remove pockets of Norway maple and hedge maple that are naturalizing along the forest edges around the parking lot on Middle Road.

3. Conduct a meadow restoration project in the eastern section of EU 9 and a stormwater mitigation project towards Middle Road.

4. Install a green infrastructure project along the park service road to mitigate trail erosion and stormwater runoff from the road into Little Pine Creek.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2.10.2 - MANAGMENT ZONE 2

Management Zone 2 is entirely forested and does not contain any developed park areas. Two higher quality oak forests are located in the southwestern portion of this zone and they both border the southern park boundary. See the descriptions under “ecologically intact areas” for further description of these high quality forests. EU 11 is primarily present on a southwest-facing slope and thus has a drier, more acidic Allegheny Plateau oak-heath forest composition. Several large red, black and chestnut oaks were observed here, including chestnut oaks over 30 inches in diameter. The overstory canopy was mostly intact with only a few gaps populated by invasive barberry and garlic mustard.

High Quality Alegheny Plateau Forest located in Ecological Unit 14 - Management Zone 2

To the east, EUs 13 & 14 are also considered high-quality forest. EU 13 contains a red oak-mixed hardwood forest around the drainage of Little Pine Creek and stretching upslope to the east. The forest immediately within the narrow floodplain is much more open compared to the remainder of this unit. Witch hazel, skunk cabbage, spicebush, bedstraw, and a few large diameter tuliptrees dominate the vegetation here, along with a heavy population of exotic invasive plants, including Japanese stiltgrass, multiflora rose, and garlic mustard. As the forest progresses upslope to the east and away from the floodplain, the canopy becomes much more intact and the species composition is more characteristic of a red oak-mixed hardwood forest. The understory becomes less dense and is populated primarily by spicebush, with a lower concentration of invasives.

East of EU 13, the upper portion of the west-facing slope is steeper and the forest transitions back to the drier Allegheny Plateau oak forest (EU 14). While the canopy is mostly intact and contains many large diameter oak species,

Japanese stiltgrass and Norway maple saplings were observed to be invading portions of the understory. A park service road bisects the northern part of this EU, with Oriental bittersweet and grapevine overtaking native vegetation (primarily witch-hazel) on the road's edges.

Nestled along the east-facing slope between EU's 11 and 13 is a modified successional forest comprised of mature trees and a patchwork of large canopy gaps (EU 12). The majority of the herbaceous layer is invaded by a contiguous carpet of garlic mustard and Japanese stiltgrass along with a notable increase of barberry, multiflora rose and grapevine within the canopy gaps. Large diameter white oak and tuliptree were scattered throughout the unit along with a sub-canopy of smaller red maple, black cherry, and walnut. This highly invaded EU borders the primarily native and intact oak forests to the east and west.

A successional white pine plantation dominated by large white pines and a few large black oaks was observed on and around the ridgetop in EU 15. The white pine is not regenerating in any significant quantity and is instead succeeding into a mixed hardwood forest, as evidenced by a sub-canopy of cherry, birch, oak, and maple seedlings. Grapevine and privet invasions are widespread and Oriental bittersweet is especially severe on the eastern forest edge that borders EU 26 in Management Unit 4. A stand of sassafras trees infected with the Nectria canker was observed at the southern edge of the ridge top.

The park service road is bounded by large swaths of a modified successional forest that is tending towards a red oak-mixed hardwood forest (EU 16 and 17). There is a unique forest structure in this region, possibly the result of past agriculture and livestock grazing. The overstory canopy of EU 16 and portions of EU 17 is semi-open with mature trees that have large and gnarled branching patterns consistent with having been grown in a more open forest environment. Almost no trees of medium size classes were observed but there was a consistent sub-canopy of young hardwood saplings. The understory was highly invaded with a contiguous carpet of stiltgrass and garlic mustard and little to no native vegetation.

Historic aerial imagery shows that these EU's were forested to at least 1939. Horses may have been permitted to graze here, resulting in the current lack of native seed sources. Some trees were retained to provide shade and cover for the horses, while other trees were removed to create space for livestock to graze. The trees that were retained grew for decades within this semi-open woodland creating the broader branching structures observed today. A prolonged management strategy of removing other trees to maintain grazing and herding space prevented the introduction of smaller size classes. At some point, the land was no longer used for this purpose and management stopped. This allowed new trees to begin growing within the spaces, creating

the structure observed today with a dramatic difference in size classes. These observations were especially apparent in unit 16, which is very close to the old stables.

The forest structure of EU 17 is less dramatically two-tiered than EU 16, but larger open-grown trees and a primarily exotic shrub and herbaceous layer were observed close to the service road. A more mature red oak-mixed hardwood forest lies further within the EU. It becomes quite mesic in the northwestern corner along the floodplain at the headwaters of Little Pine Creek. The predominantly white oak canopy becomes more open and introduces a mix of red elm and blackgum with clumps of witch hazel. The understory is mostly exotic with significant stiltgrass, barberry, privet, and euonymus.

Along the service road, just east of the dog park, is an area with a history of oak wilt. At the time of this assessment, only one tree displayed visible symptoms that can be indicators of the disease. This area should be monitored closely. Just north of this area, a few small diameter Amercian chestnuts were

Skunk Cabbage Seep - Ecological Unit 20, Management Zone 2

observed in close proximity to a stand of Norway spruce.

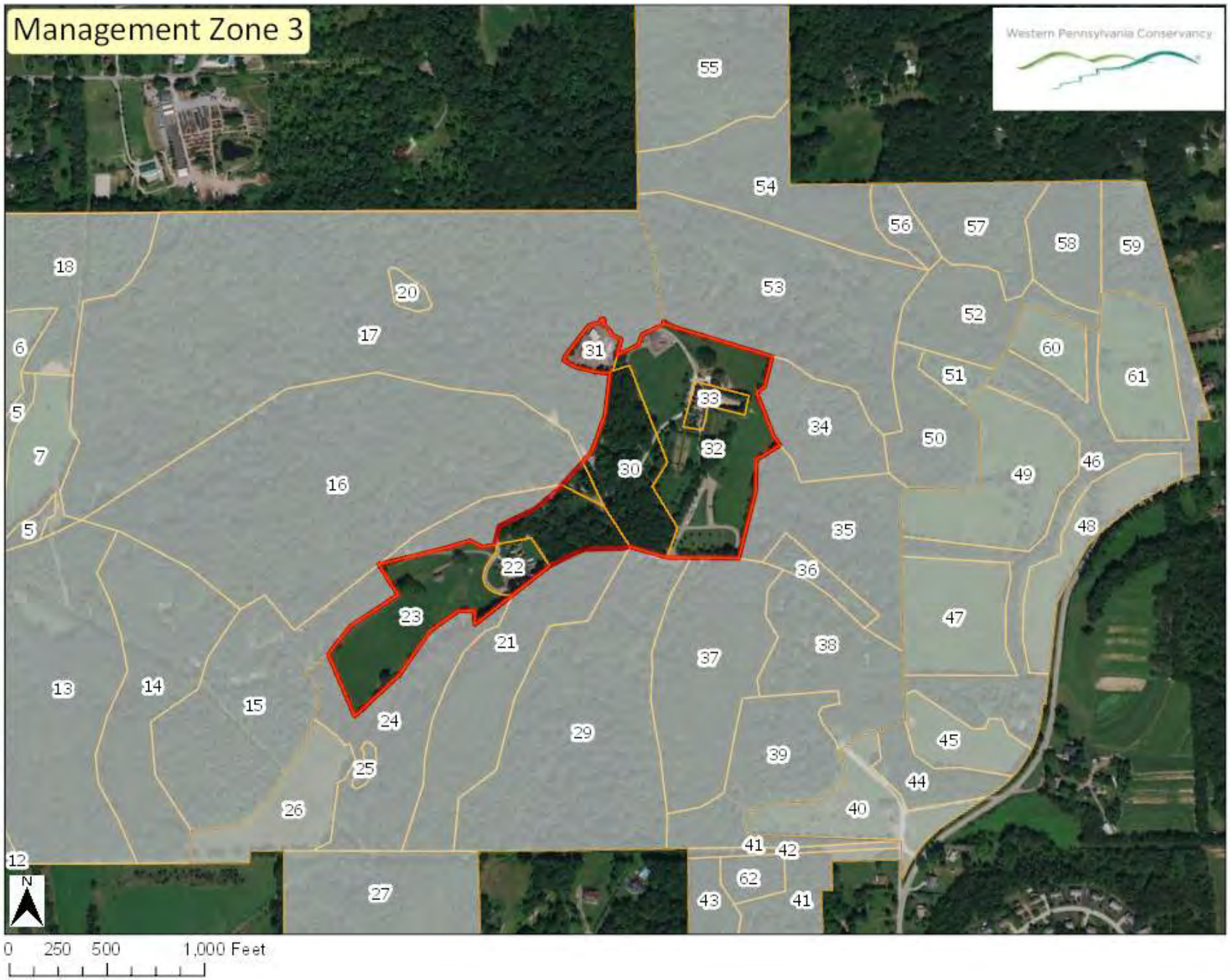
Within EU 17, a localized wetland consisting of two linear forested seepages was observed (EU 20). The wetland included a broad and diffuse skunk cabbage seep and a more narrow spring channel. The vegetation was predominantly skunk cabbage and native fer ns, but invasive Oriental bittersweet, garlic mustard, stiltgrass, and narrowleaf bittercress were scattered throughout.

The far northwestern corner of Management Zone 2 contains a successional white pine plantation (EU 18) that is dominated by large white pines with a sub-canopy of mixed hardwoods. The shrub layer is depauperate, lacking species diversity throughout and is comprised of spicebush, volunteer holly bushes and invasive barberry, and privet. Japanese stiltgrass is the dominant herb species. A right-of-way (ROW) with an underground utility bisects this zone from the north to south and is full of many common invasive plants. A smaller remnant plantation of red pine exists on the park boundary near the ROW. The western most region (EU 19) does not contain any pine and is an early successional forest of mostly black cherry and red maple, a sparse shrub layer, and a significant layer of stiltgrass. A small monoculture of blackgum trees was observed on the northwestern park boundary.

Blackgum Monoculture - Ecological Unit 19, Management Zone 2

Priority Projects for Managment Zone 2

1. Preserve the integrity of the higher quality units (EUs 11, 13, and 14) by conducting routine monitoring and treatment of invasive plants on the border with lesser quality forest communities (EU 12 and western EU 15).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2.10.3 - MANAGEMENT ZONE 3

The majority of Management Zone 3 consists of the developed land around the mansion and stables. Significant stormwater runoff accumulates in the lawns of the stable and park residences. The water originates from the slopes at the mansion and quickly washes downslope due to the abundance of impermeable parking lots and roads. Green infrastructure projects could be implemented here to reduce the quantity of flow and redirect it away from park facilities.

A small area of forest separates the mansion and stable areas, which is separated into two EU's because of fragmenting roads. Between the mansion lawn and the main park road, bisected by the access road to the mansion, EU 30 is a small area of red oak – mixed hardwood community. Some very attractive, mature chestnut oaks were observed on the mansion-side of the main park road in this unit. They were accompanied by sassafras, white and black oak, rhododendron, mountain laurel, and hemlock infested with the woolly adelgid.

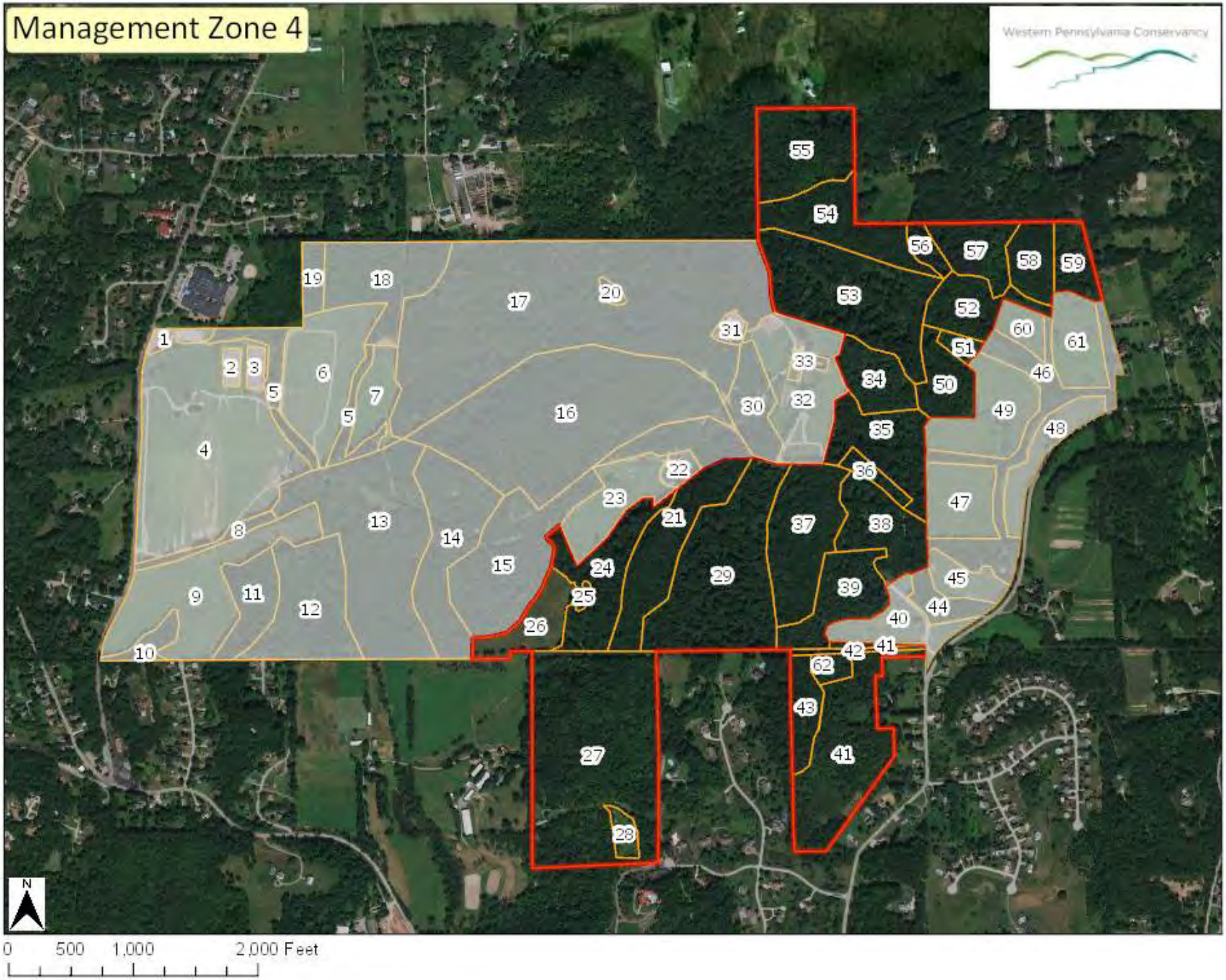

Erosion at the Stables - Management Zone 3

West of the road in the northern end of EU 21 is a local power line leading to the stable residences that is invaded with several shrub invasives, especially Japanese barberry. A small clump of a Miscanthus grass was observed here and should be removed before it spreads within the park. The surrounding forest is classified as Allegheny Plateau oak forest; it is rather intact and minimally invaded with an herbaceous layer that was predominantly hay scented fern and mayapple.

Priority Projects for Management Zone 3

1. Install a green infrastructure project to manage stormwater runoff from the hillsides and developed areas around the mansion.

2. Manage invasive plant species within the small ROW in EU 21 to protect the integrity of the intact surrounding forest.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2.10.4 - MANAGEMENT ZONE 4

Management Zone 4 stretches from the northernmost point of the park (EU 55) to the southernmost points (EU 27 and 41). It is made up of a patchwork of highly variable forest communities with stark differences in overall quality and in the densities of invasive plant populations.

In the southern section of this zone, higher quality Allegheny Plateau oak forests are found in EU's 21, 37, and 43. Each EU is located on a drier, acidic south or southwest-facing slope of a nearby ridge. They have a mature and intact overstory canopy that is dominated by chestnut, red and black oak and accompanied by lesser quantities of other mixed hardwoods. The understories are minimally invaded and contain very little shrub vegetation. Lowbush blueberry, teaberry, and chestnut oak seedlings are common on the forest floor. EU 37 is remarkably uninvaded and contains copious amounts of chestnut oak regeneration on the forest floor. This ecological unit is perhaps the highest quality and least disturbed section within the entire park. A few small diameter American chestnut trees showing symptoms of the chestnut blight were observed just off of the main service road.

These three units are also similar in that they are all surrounded by lesser quality forests containing moderate to high levels of invasive plants. To the west of EU 21 is a moderately invaded red oak-mixed hardwood forest (EU 24). Some areas have a rather intact mature canopy, but many common invasive plants have heavily invaded canopy gaps and the forest floor surrounding a floodplain at the bottom of the slope. Japanese stiltgrass blankets the floodplain and Oriental bittersweet has overtaken much of the forest edge with a mowed field in EU 26. An open wetland (EU 25) is enclaved entirely by this unit and is similarly invaded.

Significant ash mortality is present throughout these units, especially EU 27 to the south. Oriental bittersweet and many other invasive species have rapidly colonized the disturbed regions. Additionally, multiple stands of sassafras trees were observed with the Nectria canker which will lead to additional tree mortality. A field of orchard grass and Canada thistle (EU 28) could be restored with a meadow restoration project and a similar initiative could also be conducted in the fields of EU 26. The forest in and around EU 28 contained multiple specimens of tree-of-heaven.

Located between EU's 21 and 37 is a modified successional forest (EU 29) that contains a two-tiered canopy of scattered mature trees with frequent canopy gaps heavily invaded by exotic plants. If intact, the forest would likely tend toward a red oak-mixed hardwood forest. Scattered specimens of tree-of-heaven and winged euonymus are present, pioneer populations that could at

this point still be managed relatively easily. WPC staff also noted some minor trail erosion near the border with unit 21.

With the exception of EU 43, the eastern finger of the park south of the ROW is low quality, early successional forest. It contains a highly invaded early successional forest dominated by black cherry and hawthorn (EU 41) and a small successional white pine and Norway spruce plantation (EU 62). The ROW (EU 42) does contain some populations of invasive plants, but it is surprisingly dominated by native plants such as deer tongue grass and oatgrass.

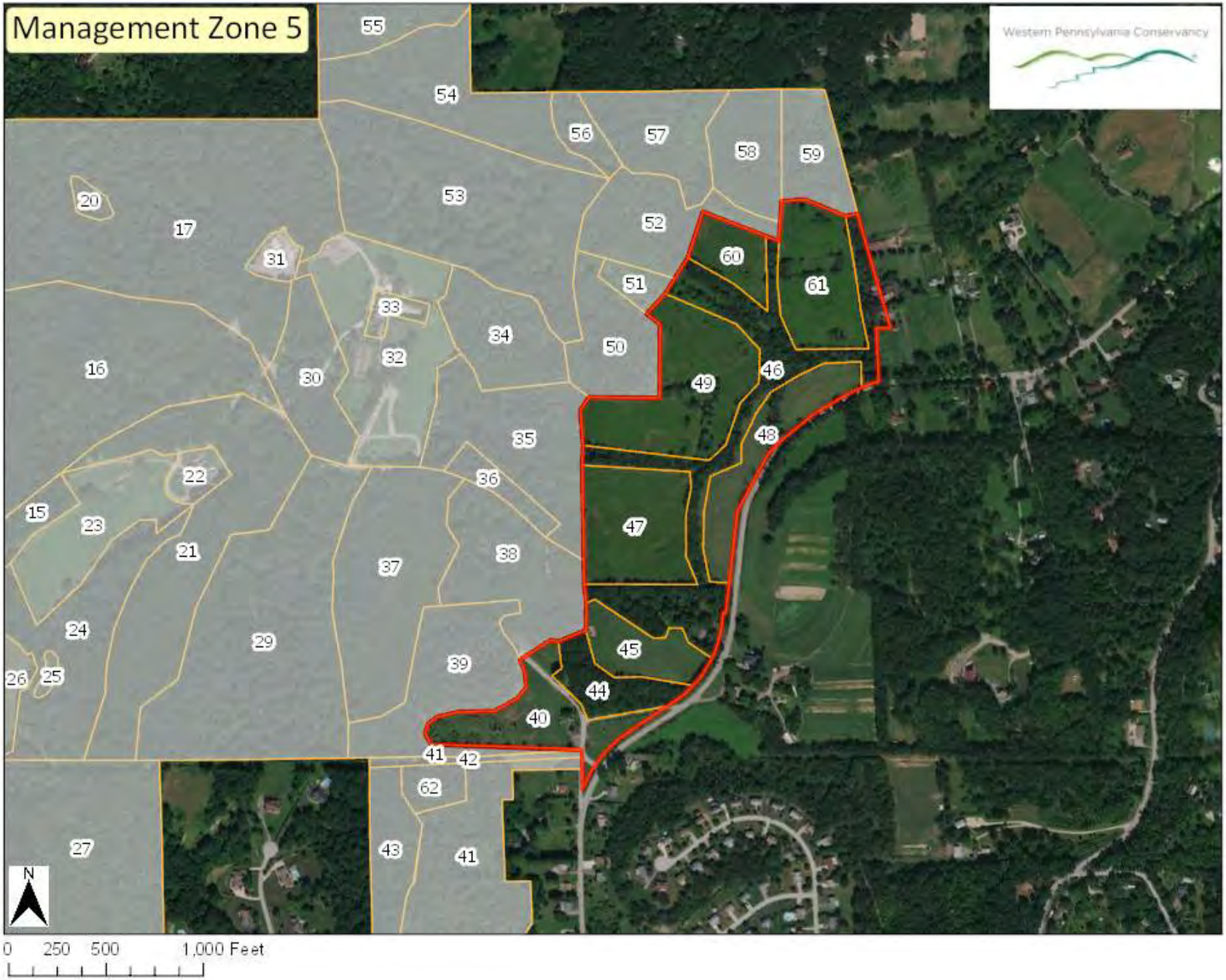
In the northern portion of this management zone, the highest quality forest is found in EU 54, Allegheny Plateau oak forest on a mid-slope region. The small headwaters ravine just south of EU 54 is also of interest (see ecologically intact area description). EUs 57 and 58, further east, are also fairly uninvaded, but the canopy trees are smaller and less mature than in EU 54. EU 57 is a mesic mid-successional stand on a lower slope, dominated by tuliptree and red maple, while EU 58 is an early or mid-successional version of Allegheny oak forest, with an extremely sparse herbaceous and shrub layer. These units are also surrounded by lesser quality forests in EUs 52, 53, 55, and 56. EU 53 contains some mature canopy but also has frequent canopy gaps, which are typically heavily invaded by exotic species and/or grapevine. EU 56, adjacent to the higher-quality unit 54, is a similar community type but with much younger trees; much of the unit is fairly uninvaded, although stiltgrass has established along trails, and the northern edge has Japanese barberry and Oriental bittersweet. Stiltgrass may still be controllable in this area. EU 56 is a ravine that is entirely composed of a highly invaded canopy gap. EU 52 is early successional forest that has fairly high density of invasive species. Unit 59 is furthest to the northeast and contains a highly disturbed and invaded early successional forest. A proposed powerline may cut through this section of the park. If constructed, it will impact a stand of smaller hardwoods surrounded by mostly exotic shrub and herbaceous species.

Priority Projects for Management Zone 4

1. Preserve the integrity of the higher quality units (21, 37, 43, 54, 57, and 58) by conducting routine monitoring and treatment of invasive plants on the border with lesser quality forest communities.

2. Minimize human impacts to the especially intact forests of unit 37 by practicing sustainable trail best management practices and installing interpretive signage to encourage trail users to stay on posted trails.

3. Conduct meadow and/or forest restoration projects within the open fields (EU 26 and 28) to manage invasions of exotic plants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2.10.5 - MANAGEMENT ZONE 5

Management Zone 5 is located on the eastern edge of the park and is comprised mostly of open fields separated by narrow swaths of successional woodland. Open fields (EU 40, 45, 47, 48, 49, 60, 61) present unique opportunities for varying types of meadow and/or forest restoration. A drainage and erosion concern was observed in the mowed area of unit 40 northwest of the park entrance on Saxonburg Blvd. Green infrastructure projects could be implemented here to reduce the quantity of flow and redirect it away from park facilities at the base of the hill.

Meadow in Management Zone 5

Plans are in development to install an engineered wetland in EU 49 and EU 46. Additionally, a future powerline ROW may cut through the park immediately along the eastern park boundary.

Priority Projects for Management Zone 5

1. Install a green infrastructure project to manage stormwater runoff from the hillsides above the park entrance.

2. Conduct meadow and/or forest restoration projects within the open fields to manage against invasions of exotic plants.

3. Minimize new trail and road construction as part of the maintenance facility and wetland projects that would further fragment the eastern region of the park and facilitate the spread of invasive plants. Furthermore, use clean construction equipment and plant species consistent with the existing forest community and soil properties.

Allegheny County Parks and Western Pennsylvania Conservancy staff and volunteers plant landscape trees at Boyce Park.

SECTION III - OBJECTIVES, ISSUES & OPPORTUNITIES:

3.1 Objective: Maintain and Improve Ecological Function of Natural Areas in the Park, building out from "Best" and "Good Ecological Integrity Areas to Expand their Size and Connectivity.

In approaching ecological management of Hartwood Acres Park's natural lands, the focal point for conservation planning should be the areas with the highest ecological integrity, as the cornerstones to build outwards from and improve the overall ecological health of the park. The first priority should be to maintain the existing high quality areas, and the second priority is to connect these small patches into larger areas of high integrity through restoration in the landscapes in between.

A high proportion of Hartwood Acres Park is forested, but the quality of these forest ecosystems is very patchy, with many areas experiencing diminished ecological integrity from deer overbrowse, invasive species, and forest canopy gaps. These intertwined problems tend to expand, as invasive species colonize the high-light environment in the canopy gap, deer browse out natives that try to establish, and then dense vine growth pulls down more tree canopy surrounding the gap. They can also prevent native forest regeneration, setting the forests on a course to transform over time from native-dominated to invasive dominated, as the existing native tree canopy dies out. The invasive species Japanese stiltgrass is a particular threat in this respect because it can colonize shaded areas, it prevents regeneration of native tree species, and it is rapidly expanding within the park.

The existing high-quality ecological areas in Hartwood Acres are mapped and described in section 2.6 "Ecological Integrity Mapping."

Most of these areas are forests, although some wetland areas are included too. Many of them were never tilled or fully cleared, although they may have been logged. These areas are reservoirs of ecological integrity, with a mature native tree canopy and some presence of native herb and shrub species, and they are difficult to restore if lost. Furthermore, because higher ecological integrity areas have more resilience against stressors, efforts to steward the overall ecological health of the park will be most successful if they build on the areas that are most stable. Protecting and even improving the ecological integrity of the park's forests provides benefit to park users, as these areas are some of the most aesthetically beautiful forests, and intact forests are much easier to traverse for recreational use than tangles of invasive vine and shrub. Hartwood Acres Park also has ecological value as an intact natural area in a landscape that is highly fragmented with suburban development. Efforts to maintain the remaining areas with good ecological integrity will continue to provide myriad of benefits to the natural landscape and humans alike.

Issues:

- Invasive plants
  - The most severe and widespread ecological issue facing the native plant communities of Hartwood Acres Park is infestation by invasive weeds. In general, the "best" ecological integrity areas have pioneer populations only, the "good" areas have pioneer to moderate populations, and all other areas have moderate to severe infestations of invasive plant species. In Hartwood Acres, there is a strong correlation between aspect, plant community, and invasive presence. The west-facing slopes and high knobs are much more intact than the east-facing slopes and mesic valleys. Furthermore, younger forest areas almost all have a very high presence of invasive species, as they regenerated in the last few decades, when non-native invasive seed source had become pervasive.

- Canopy gaps in Mature Forests
  - When forest canopy gaps form in mature forests with good ecological integrity, they can serve as entry points for invasive species. Furthermore, aggressive vines can cause canopy gaps to expand by pulling down adjacent trees. Canopy gaps are a major problem at Hartwood Acres Park, degrading the condition of a fairly substantial acreage of mature forest that would otherwise be high quality.

Invasive Japanese Barberry

- Deer Over-Browse
    - This is a severe problem at Hartwood Acres Park that appears to have gone on for many years and has significantly reduced the overall plant diversity in the park. It may have also compromised native forest regeneration. WPC recommends that existing deer control programs should continue, and any additional herd reduction measures would be beneficial. All restoration plantings should be temporarily fenced to prevent deer access.

- Balancing Recreational use with Conservation
    - More intense recreational uses like mountain biking and horseback riding can severely damage sensitive ecological areas, especially when trails through such areas are not adequately designed and regulated. More intensive use also brings greater problems with the transportation of invasive species. Japanese stiltgrass appears to be spreading along trails and roads. Hartwood Acres is an intensively used park with many trails to maintain and regulate.

Utility ROW running through Hartwood Acres Park

- Forest Pests and Pathogens
    - The ecological assessment noted several forest pest and pathogen issues in Hartwood Acres Park. The most visually and ecologically significant impact is the park-wide loss of ash trees as a component of the forest and recreational areas resulting from emerald ash borer infestation. In some cases, the loss of these trees has created canopy gaps that facilitate the establishment of invasive species within areas with otherwise good ecological integrity. While no serious pest or pathogen issues are currently causing tree mortality in the mature forests, it is important to be prepared for rapid response to any new forest pest or pathogen.

- Public Appreciation and Support
    - Hartwood Acres is a popular and well-used park. Public support for conservation management efforts in forested areas will be important for the ongoing success of these efforts.

Opportunities: Invasive Species Management Guidlines

- The top priority is to maintain the quality of existing areas with high ecological integrity through early detection and removal of invasive species before they become problematic. Restoration is much more difficult, time-consuming, and expensive if invasive species become pervasive in an area. Japanese stiltgrass is currently spreading rapidly through the park and expanding into high-quality areas, where it often

Forest Pest - Hickory Gall phylloxera

first appears along trail edges. Eradicating these populations while they are small should be a top priority. Even though new introductions will continue to appear and require ongoing management, it may be possible to prevent the understory from becoming a carpet of stiltgrass throughout the park.

- Develop capacity among park rangers, maintenance staff, or other personnel who traverse park trails regularly to recognize invasive species, and take simple efforts to remove pioneer infestations. Focus efforts on high-quality areas, and on pioneer populations of invasive species that are new to the park or region. Trail edges and forest edges are particularly likely to experience seed introductions and may need special focus within high-quality areas.

- Pioneer populations of new invasive species within the park (even if they are present elsewhere in the region) should also be prioritized for treatment. Jetbead (*Rhodotypos scandens*) is one such species that still has a fairly small population within the park.

- Volunteer groups interested in conservation may also be a source of capacity for invasive species management, with appropriate training

- In areas of lower ecological integrity where invasive species have already become well established, management efforts should be prioritized when invasive species interfere with local uses (such as tangles of Oriental bittersweet closing trail access), and when proximity to areas of high ecological integrity threatens those areas.

- Do not allow mountain biking, horseback riding, or ATV use in the most sensitive ecological areas, as these activities increase the rate of introduction of invasive plant seeds.

- Use best management practices for cleaning equipment used in the park to prevent introduction of invasive plant seeds or materials through tire treads, front end loaders, etc

- Be cautious in sourcing any fill, leaf compost, or topsoil used in the park, to prevent introduction of invasive propagules.

- Because invasive plants will continue to be a reality, this will be an ongoing management concern that will require regular attention indefinitely.

Canopy Gap Forest Restoration in "Good" and 'Best" Ecological Integrity Areas

- Forest restoration efforts in small-scale canopy gaps within mature forests of otherwise good quality can help to steer regeneration back towards native species, rather than allowing the gap to destabilize and degrade the surrounding natural community. See recommendations in section 4.1 for more information.

Continue existing deer management program in the park and partnering with surrounding landowners and communities on deer management, and expand efforts for deer reduction if possible.

- The populations of some conservative plant species (see list on page 34) have been reduced to dangerously low levels within the park. These may need restoration efforts to regain viability. All restoration efforts should use locally sourced plant materials, ideally propagated from existing plants within the park or nearby areas.

- Installing deer fencing around especially sensitive areas may be a good way to stop further loss of plant diversity in combination with existing deer management program.

Protected Meadow Area in Schenley Park, Pittsburgh.

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Protected Meadow Area in Schenley Park, Pittsburgh.

Tree Management in High Quality Ecological Areas

- In general, less trail development is better in areas of high ecological integrity.

- If possible, limiting trail use to foot traffic is a best practice for high integrity areas. Mountain bikes, horses, and ATVs all spread invasive species propagules at a faster rate than foot traffic alone.

- Close problematic and/or redundant trails in mature forest patches.

- Prioritizing implementation of best management practices on existing trails through areas of high ecological integrity.

Monitor and treat forest pests and pathogens when possible, particularly those that could create wide-scale impacts if not treated early (oak wilt, Asian long-horned beetle, etc.), and those that impact any rare or sensitive tree species.

Public Outreach Recommendations

- Install interpretive signage about the natural history of the high ecological integrity areas – such as requests not to pick flowers or other native vegetation and to refrain from damaging recreational activities – may help with public cooperation in conservation-oriented management.

- Increase outreach and education programming to the local community and to educational institutions about the history, ecology, and biodiversity of Hartwood Acres Park.

Interprative Signage at the Boyce Park Meadow

3.2 Objective: Ecological Management of Utility Rights-of-Way

Utility rights-of-way exist in most Allegheny County Parks. Optimal ecological management aims to keep these corridors as compatible as possible with the native ecological character of the surrounding landscapes, and to minimize the potential for these corridors to cause ecological problems such as the introduction of invasive plant species and forest pathogens, soil erosion, and loss of native habitat.

Issues and Challenges:

- Utility rights-of-way typically require the clearance of woody vegetation, creating a linear fragmenting feature within forested landscapes.

- Rights-of-way can be corridors for invasive species, both because they are high-light, disturbed habitats that many of these species thrive in, and because maintenance equipment can introduce invasive plant propagules. Sometimes non-native seed mixes are used that even include aggressive or invasive species. Hartwood Acres Park's' ROWs

Utility ROW through Hartwood Acres Park

are currently dominated by native species, but Canada thistle (*Cirsium arvense*), Oriental bittersweet (*Celastrus orbiculatus*), Japanese stiltgrass (*Microstegium vimineum*), and Japanese honeysuckle (*Lonicera japonica*) were noted at specific locations.

- Rights-of-way are often planted with non-native species that provide little habitat value for native wildlife.

- Equipment used to prune trees in rights-of-way is often moved between many jobs over a large geographic area without sterilization between sites, and can introduce forest pathogens.

- Soil exposure and erosion can occur on steep slopes if vegetation is not properly managed.

Opportunities: Utility Right-of-Way Best Management Practices

- Engage proactively with utility companies, regulators, and others planning for new and existing utility corridors, to minimize ecological impacts on park lands.

- If new ROW corridors are considered, prioritize avoidance of "best" and "good" ecological integrity areas.

- For existing ROW corridors, best management practices should be employed in the following areas:

    - Clean equipment between sites to avoid transport of invasive species seed/materials.

    - Prevent soil exposure and erosion with management to minimize vegetation removal, and ensure and maintain vegetation establishment, especially on steep slopes.

    - Prune trees during dormant season (November through mid-April) rather than growing season to reduce transport of fungal diseases such as oak wilt (PSU Extension).

    - In cases where vegetation will be planted, species should be native to Allegheny County or adjacent counties. The Pennsylvania Bureau of Forestry (BOF) has found that while native warm-season grasses are excellent at erosion prevention due to their dense root systems, it is difficult to get utility companies to use practices that can ensure their establishment on steep slopes. The BOF has developed an alternative species mix including native and non-aggressive non-native species for these sites which should be considered.

- Monitor ROWs for the establishment of pioneer populations of invasive species; detect and treat early to prevent general infestation of the park.

- If herbicides are used, ensure that they are not environmentally persistent or detrimental to surrounding native vegetation.

- More information can be found in the following resource documents:
  - PA Bureau of Forestry Native Seed Mix for Rights-of-Way
  - PA Bureau of Forestry Seed Mix for Rights-ofWay >15% Slope
  - PA Bureau of Forestry Planting and Seeding Guidelines: http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/dcnr_20031083.pdf
  - Guidelines for Administering Oil and Gas Activity on State Forest Lands: http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/dcnr_20031083.pdf

Utility ROW in Hartwood Acres

3.3 Objective: Enhance User Experience in Undeveloped Areas of the Park such as Forests and Meadows

Hartwood Acres Park currently has a large network of well-used trails. There are some informal trails that have developed as cut-throughs between formal trails. There are some areas where erosion and trail expansion has developed, although problems are not pervasive. The network could benefit from a comprehensive assessment to determine which trails may be redundant or poorly sited for long-term maintenance. There is currently little in the way of interpretive materials for the natural landscape, and many opportunities exist for such outreach to enhance the user experience and communicate conservation values to the community.

Issues:

- Lack of a central "trail head" where visitors can arrive and get information on trail use.
- Existence of some informal trails causing confusion with formal trails.
- Design, redundancy and maintenance issues with formal trails.

Opportunities:

- Conduct a comprehensive evaluation and assessment of the trail system to identify needed improvements for the entire trail system and for individual trails.
- Establish one or more "trail head" areas that provide convenient access to the entire trail system and where visitors can obtain trail information, rules, maps, etc.
- Retire and close problematic, and/or redundant trails.
- Install interpretive signage to help raise awareness about the park's natural features and efforts to maintain/improve them, such as forest communities, the existing restoration forest planting, invasive species, oak wilt, and any new meadows that are established.
- Collaboration between park staff and active community volunteers and user groups to improve and maintain the trails in a comprehensive manner.

3.4 Objective: Enhancing the Ecological Value and Visual Appeal of Currently Mowed Areas

Reducing or eliminating mowing and establishing meadows or reforestation is relatively simple highly effective way to enhance the park landscape's ability to provide ecosystem services, and can have high visual appeal if done properly. Meadows provide year-long food resources and shelter for small mammals, and birds. Wildflowers also attract hummingbirds, butterflies, and other beneficial insects.

Meadows can serve a highly important ecosystem service by providing sources of food and breeding habitat for native pollinating insects, especially in a suburban setting where mowed lawns and ornamental landscaping can lack this function. Scientists across the globe are raising alarms about collapsing populations of native pollinator insects. While this is a global issue that will require global solutions, much can be done on the local level by restoring manicured, highly simplified suburban landscapes into more diverse native plant communities.

The completed Boyce Park Meadow at Indian Hill

Perennial meadows are a useful and beautiful alternative to the mowed lawn. A landscape of perennial grasses and wildflowers provides a myriad of ecological benefits with very little maintenance required once established. After the plants are established, watering is virtually unnecessary, and mowing requirements are reduced to once per year at most.

Besides benefits to wildlife, the root system within a meadow slows down and infiltrates stormwater much more effectively than mowed lawn, allowing it to seep into the ground rather than gush into storm drains as a pulse of runoff. And since they require no fertilizers or insecticides, meadows cut down on the amount of excess nutrients that pollute the ecosystem.

Perennial meadows can also be more visually rewarding. In stark contrast to a static lawn, meadows constantly change throughout the seasons. Blades of tall warm-season grasses catch the sunlight as they rhythmically dance in the breeze, while colorful wildflowers produce eye-pleasing colors and textures. This landscape amenity can reduce stress and serve as topic for community environmental learning.

In addition to the ecological, visual and education benefits to establishing meadows, significant cost savings and environmental benefits can be realized through reducing or eliminating mowing. Reducing mowing will lead to savings on mower maintenance and replacement costs, fuel costs, staff costs spent on mowing, fertilizer and chemical costs and more. Reducing mowing could also significantly reduce emissions and the overall carbon footprint of park management activities.

Issues and Challenges:

- Public perception of meadow areas:
  - The public reception to the Indian Hill Meadow at Boyce Park (planted in 2017) was a resounding success. Thousands of people enthusiastically enjoyed it by visiting in person or through social media. ACPF and Allegheny County Parks are planning to plant meadows in all nine parks buoyed by this reaction.

  - Conversely, many citizens, park users, and even park staff may have negative perceptions of discontinuing regular mowing of areas that are traditionally mowed lawn. While some efforts have been well received, there have been several small controversies over some of the "field restoration" efforts across the county park system where mowing was discontinued in particular.

- Mowing ingrained in park workflow
  - Hartwood Acres Park contains acres of lawn that receives regular mowing during the growing season. Because of the volume of work involved in regular mowing of these areas, mowing is an ingrained and primary component of the seasonal flow of work within the park. Establishing meadows over time will gradually reduce the amount of staff time needed for mowing that could then be re-allocated to other maintenance activities.

Opportunities:

- Reducing frequency of mowing and re-seeding mowed areas with native meadow mix, especially emphasizing pollinator-friendly species and visual appeal.

- Expanding and amplifying educational and interpretive efforts by park

rangers and naturalists regarding meadow habitat, especially as it relates to pollinators and other wildlife.

- Measure cost and carbon emissions savings realized from reduced mowing, share results widely.

- Maintain seasonal mowing and train park staff on herbicide treatment and other control strategies to prevent invasive plant infestations.

3.5 Objective: Reducing erosion, flooding and other downstream environmental impacts resulting from stormwater runoff within Hartwood Acres Park.

Issues:

- High-energy runoff during rain events from impervious surfaces such as parking lots, sidewalks, roads, rooftops, ball fields, mowed areas (to a degree).

- Un-maintained or inadequately designed stormwater infrastructure (Roads, ditches, culverts, storm drains, trails, etc.).


Erosion in Field into Middle Road - MGMT Zone 1

Opportunities:

- Convert paved areas to more permeable surfaces, right-size parking lots, add stormwater capture components to all buildings to capture rooftop runoff (green roofs, rain gardens, soakage trenches, etc.).

- Conduct a broad-scale tree planting program across the park to increase canopy cover and enhance stormwater mitigation potential.

- Upgrade drainage infrastructure culvert erosion issues. Incorporate green infrastructure components to slow, store, and filter stormwater if feasible.

WPC staff and Barrett Elementary students plant new trees in new tree pits meant to capture and retain stormwater in front of the school in Homestead.

SECTION IV - RECOMMENDATIONS:

4.1 RESTORE FORESTS

WPC recommends several sites for reforestation as indicated in the map on the following page.

Methodology

Several opportunities for forest restoration projects in Hartwood Acres Park were identified during this assessment. The existing forest restoration site near the entrance of the park can benefit from a new round of planting to coincide with the transition away from management through regular mowing. Canopy gaps also exist in mature forests in many areas of the park; we have provided a map with several levels of priority for canopy gap restoration sites.

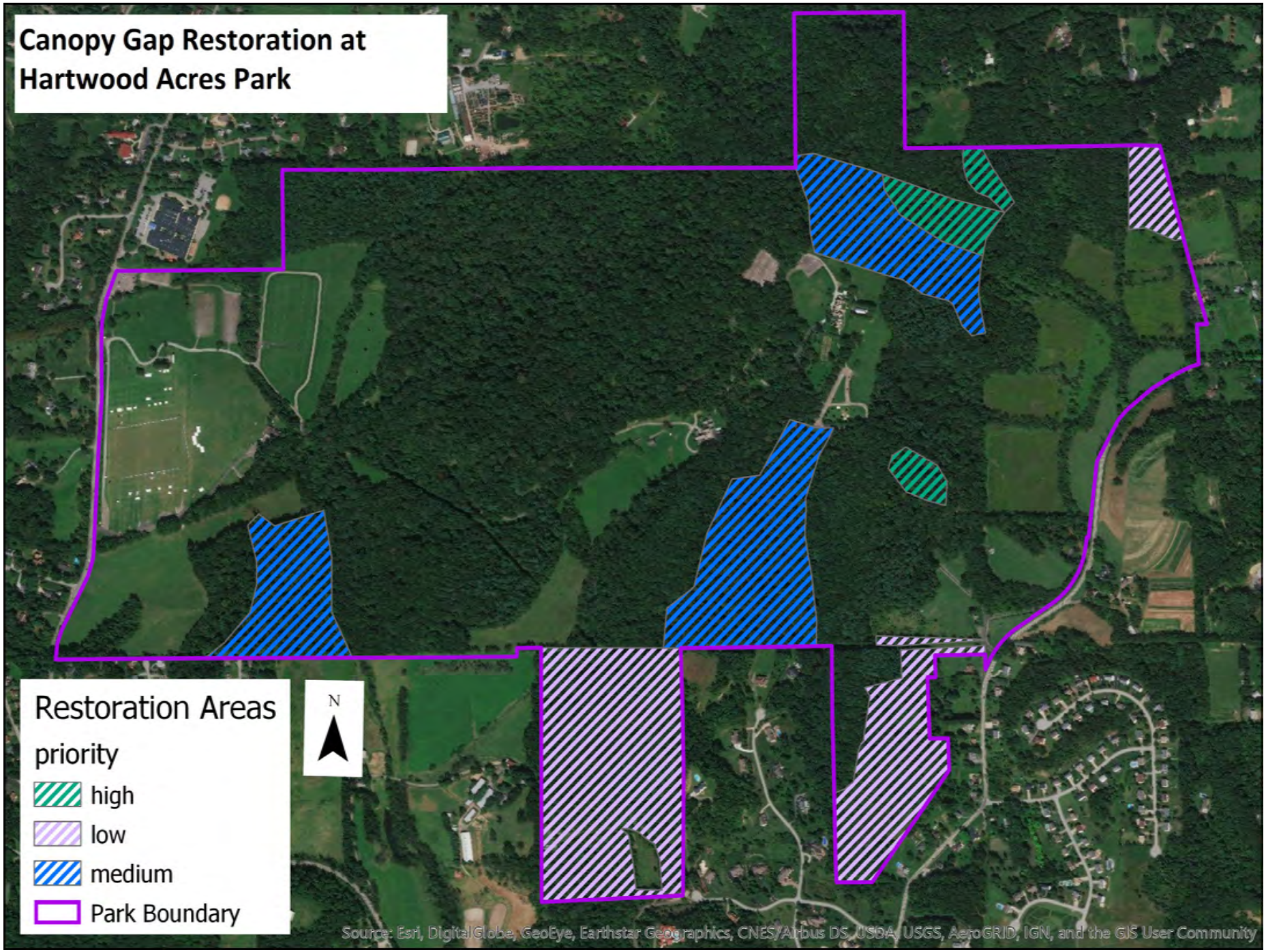
4.1.1 CANOPY GAP RESTORATION

The goal of the canopy gap restoration tree plantings is to reforest relatively small areas where gaps have formed in native forest communities, to create a trajectory for re-establishment of native forest and improved forest integrity. If left unmanaged, canopy gaps can become establishment sites for invasive exotic species that then expand outwards into adjacent forests, often causing further canopy loss and ecosystem destabilization.

The strategy is to first eradicate any existing invasive plant populations, then plant a suite of native trees, shrubs, and herbs that match the existing natural forest community, and will over time out-compete invasive plant species that could seed in, to restore a contiguous forest community. See section 2.9 for a map and descriptions of natural community types found in Hartwood Acres Park.

Ongoing management will be needed at such sites to water new plantings, protect them from deer and small mammal herbivory, and to spot-treat any invasive plants that appear. Plantings may be designed in multiple phases. At first, establishing density and shade are most important; species that grow fast in gaps but do not persist long-term in shade may be used in this phase, possibly interspersed with slower-growing species. A second planting may be designed for a few years later once shade has been established, to introduce native forest species that are shade-tolerant, slower growing, and typical of the target forest community but unlikely to re-establish on their own

The New York City Park System's **"Guidelines for Urban Forest Restoration"** includes more detail about many aspects of restoration plantings, including how to control invasive plants, sizing and density of tree plantings, and examples of planting plans.


Canopy Gap Restoration at Hartwood Acres Park
Restoration Areas
priority
high
low
medium
Park Boundary
N
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Timeline and Cost Estimates

Project Phase	Cost Item	Timeframe
Site Preperation	Invasive Species Treatment	Year 1-2
First-Stage Planting	Faster-growing trees & shrubs	Year 2-3 (if site requires invasive removal prior to planting
	Herbivory protection (Fencing, Tubes)	Planting Years
Maintenance Costs	Watering	Years 1 - ?
	Invasive Monitoring & Treatment	Years 2+
	Replanting any failures	Year following any planting
Second Stage Planting	Shade tolerant trees, shrubs, herbs	Years 7-10 depending on first stage growth
	(potential cost offest if local site materials are propogated in-house in time interval between stage 1-2)	
	Herbivory protection	Planting years

*****Project Costs will ultimately depend on contracted services provided through competitive bids and components that can be completed in-house or via in-kind services.

The Canopy Gap Restoration map (previous page) shows the recommended forest restoration areas within Hartwood Acres Park.

The highest priority areas for canopy gap restoration are two areas that are adjacent to high-quality forests and would expand an unusual habitat type within the park.

- **Area 1** is adjacent to a high quality oak-heath forest and contains mature trees interrupted by several gaps. Pioneer populations of the invasive species tree of heaven (Ailanthus altissima) and jetbead (Rhodotypus scandens) have established in these gaps, so restoration work would have the double benefit of eradicating these before they spread. This site is very near the main park road and trails access is good as well.

- **Area 2** is a cluster of canopy gaps along a mesic ravine in the northern part of the park. The ravine is in good condition outside of the canopy gap, and it is an unusual habitat type within the park that hosts a different suite of species. The adjacent forest areas are also currently in good condition and could be merged together to form a block of high-quality habitat.

- **Area 3** is a small ravine that has entirely become a canopy gap, within the same cluster of higher-quality habitats as Area 2. Repairing this canopy gap could enhance the viability of the surrounding forest areas

Second level priority is given to several east-facing slopes where canopy gaps and invasive species are extensive. These are adjacent to high-quality forests, but they will be very extensive undertakings to restore because of the number of gaps that exist and the degree to which invasive species have already established.

Third-level priority is given to the early successional areas of the park, many of which are currently open and vulnerable to establishment of invasive species instead of a native forest community. However, while it would be beneficial to divert this trajectory, these areas are mainly surrounded by lower-quality successional forest that already has a high presence of invasive species, so the overall benefit to park communities will be lower for restoration work in these areas. It is also less likely to be successful than projects embedded within or adjacent to higher-quality forests.

A Potential Site for a Canopy Gap Restoration Project in Area 1

4.1.2 EXISTING FOREST RESTORATION SITE ENHANCEMENT

The existing forest restoration site near the entrance of Hartwood Acres Park has matured to a point where it is no longer practical to continue mowing between the trees. At this point, it can benefit from a second round of plantings designed to enhance the development of a forest community. The goal is to fill in gaps in the first planting and to add native shrub and herb species. The forest restoration area could also potentially be expanded down towards the road, concurrently organized with meadow planting in that area (see section 4.2).

Some species in the initial forest restoration planting have flourished and grown rapidly, while others have grown at a slower rate. Scattered gaps indicate that some individuals may have died. Currently there are almost no shrubs, while the herb layer is predominantly Japanese stiltgrass. The surrounding forest areas are unlikely to supply propagules for native species to seed in naturally, because shrubs and herbs are very sparse in these areas due to long-term deer browse pressure.

Herbivory protection will be very important to include in the second round of plantings. Deer-resistant species should also be prioritized, given the ongoing problem of browse pressure in the park. Because the site grades from fairly wet at the base of the slope to somewhat dry at the top of the slope, species across a spectrum of moisture tolerances should be included and sited appropriately. A mix of highly competitive open-site herbs and slower-growing, shade tolerant herbs should be planted, all with some potential to outcompete Japanese stiltgrass. The species list included below shows a sample range of such species. On the lower slope, the forest community can include wet-mesic floodplain forest species such as walnut, swamp white oak, red maple, American sycamore. The upper slope should grade into the surrounding oak forest communities, with species such as white oak, white pine, sassafras, and red maple.

It will be very difficult to completely eradicate Japanese stiltgrass before installing new plantings, due to the size of the current population on site and the long-term persistence of this species in the seed bank. One possible strategy is to treat Japanese stiltgrass locally where new plantings will be sited, to allow them to establish, and continue to treat until the new plantings reach a competitive size. At this time, plantings should be observed to see whether any native species demonstrate success in competing with the stiltgrass, and those species should be encouraged and expanded at the site.

Cost Estimate (Existing Forest Restoration Phase II Planting)

Project Phase	Cost Item	Timeframe
Site Preperation	Invasive species treatment	Year 1-2
Second Stage Planting	Trees, shrubs & herbs	Year 1-2
	Herbivory Protection (fencing, tubes)	Planting Years
Maintenance Costs	Watering	Years 1-?
	Invasive monitoring and treatment	Years 2+
	Replanting any failures	Year following any plantings

*****Project Costs will ultimately depend on contracted services provided through competitive bids and components that can be completed in-house or via in-kind services.

Hartwood Acres Park Species List for Exisiting Forest Restoration Site

Common	Scientific	Growth Form	Wetland Tolerance	Growth	Shade Tolerance
Red maple	*Acer rubrum**	tree	flood tolerant	moderate	high
American sycamore	*Plantanus occidentalis**	tree	flood-tolerant	fast	low
Black walnut	*Juglans nigra**	tree	flood-tolerant	fast	low
Swamp white oak	*Quercus bicolor**	tree	flood-tolerant	moderate	low
White pine	*Pinus strobus**	tree	upland	fast	low
White oak	*Quercus alba*	tree	upland	moderate	moderate
American hornbeam	*Carpinus caroliniana*	small tree	mesic upland	slow	high
Spicebush	*Lindera benzoin*	shrub	mesic upland	slow	high
Alternate-leaved dogwood	*Cornus alternifolia*	shrub	upland	moderate	moderate
Sassafras	*Sassafras albidum*	tree	upland	moderate	low
Calico aster	*Symphyotrichum pilosum*	herb	broadly tolerant	N/A	moderate
New york aster	*Symphyotrichum novae-angliae*	herb	wetland	N/A	moderate

Common	Scientific	Growth Form	Wetland Tolerance	Growth	Shade Tolerance
boneset	*Eupatorium perfoliatum*	herb	wetland	N/A	low
jewelweed	*Impatiens capensis*	herb	wetland	N/A	moderate
golden ragwort	*Packera aurea*	herb	wetland-mesic forest	N/A	high
intermediate wood fern	*Dryopteris intermedia*	herb	mesic forest-upland	slow	high
Ostrich fern	*Matteucia struthopteris*	herb	wetland-mesic forest	N/A	high
Jumpseed	*Persicaria virginiana*	herb	wetland-mesic forest	N/A	moderate
Witch hazel	*Hamemalis virginiana*	shrub	mesic upland	moderate	high
Purplestem aster	*Symphyotrichum puniceum*	herb	Wetland-mesic upland	N/A	moderate
Zig-zag aster	*Symphyotrichum prenanthoides*	herb		N/A	Moderate
Canada goldenrod	*Solidago canadensis*	herb	Wetland-mesic upland	N/A	Low
Rough-leaved goldenrod	*Solidago rugosa*	herb	wetland	N/A	Moderate
Purple-leaved willow herb	*Epilobium coloratum*	herb	wetland	N/A	Low
Bee balm	*Monarda fistulosa*	erb	Wetland-mesic upland	N/A	Moderate
Wingstem (species can be very aggressive)	*Verbesina alternifolia*	herb	wetland-mesic forest	fast	moderate

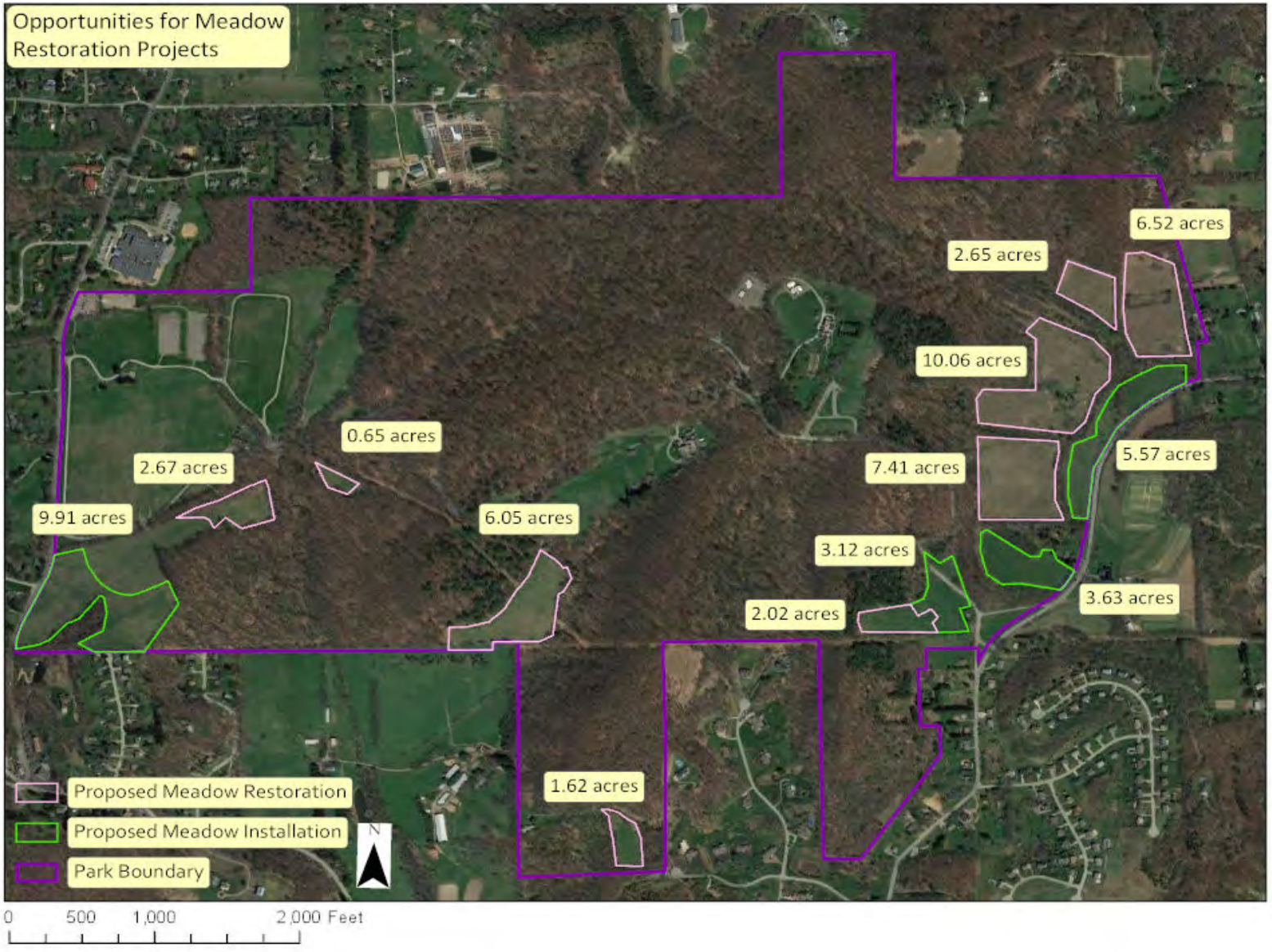
4.2 ESTABLISH MEADOWS

This assessment located two areas of regularly mowed lawn in Hartwood Acres which are suitable for establishing meadows of native grasses and wildflowers that will have high ecological value, will be visually appealing and will require minimal maintenance relative to maintaining a mowed lawn. They are both located near major entrances to the park and they are negatively impacted by stormwater runoff and erosion. Furthermore, the assessment identified an additional 13 acres of existing meadow-like areas that could be improved.

It is recommended that a demonstration project area be selected and converted from lawn to meadow as soon as possible. If successful, it will provide an ideal outreach and education opportunity that will be important for building support for more wide-scale establishment of meadows on mowed areas. Once a site is selected, several site preparation steps should be taken to ensure the area can be enjoyed by the public and that vigorous establishment of native meadow plants occurs and is sustained.

Following the protocol that the County is using at the Indian Hill Demonstration Meadow at Boyce Park, site preparation and seeding will be conducted by Allegheny County Park staff using a newly acquired Truax no-till native seed drill.

Completed Demonstration Meadow at Boyce Park


Opportunities for Meadow Restoration Projects
6.52 acres
2.65 acres
10.06 acres
5.57 acres
7.41 acres
0.65 acres
2.67 acres
9.91 acres
6.05 acres
3.12 acres
3.63 acres
2.02 acres
1.62 acres
Proposed Meadow Restoration
Proposed Meadow Installation
Park Boundary
N
0
500
1,000
2,000 Feet

A nearly 10 acre section of a large mowed field and hillside in the southwestern most corner of the park contains significant soil erosion from the effects of stormwater runoff. During periods of heavy rainfall, runoff begins at the crest of the hill and flows downslope towards the event parking area. Prior to reaching the parking area, the runoff bends west towards Middle Road. Repeated runoff has created three large fissures that empty directly onto the roadway. The crevices are so pronounced that they are visible from aerial photography in the map on the previous page.

It is recommended that regular mowing at the top of the hill and in the western section of the field along Middle Road cease immediately. The installation of a meadow with species specifically chosen for wet areas and soil retention will mitigate the level of runoff that drains into the roadway. The planting plan could incorporate some larger shrubs, or even trees, immediately along the eroded fissures within the field. The visibility of this area from major park events and Middle Road make this an excellent location for a demonstration meadow.

Meadow opportunity at the 9.91 acre section along Middle Road. The largest eroded fissure can be seen in the middle of the photo, flowing from the right and curving toward the road.

A second meadow opportunity exists as a 3.12 acre mowed field at the park's main entrance from Saxonburg Blvd. Stormwater runoff and a seep from underground, combine to form an eroded drainage that begins mid-slope and flows towards the private residence. It is recommended that regular mowing on this slope cease immediately. The installation of a meadow with species specifically chosen for wet areas and soil retention will mitigate the level of runoff that drains towards the residence. The planting plan could incorporate some larger shrubs, or even trees, immediately along the eroded fissure within the field.

Meadow opportunity at the 3.12 acre mowed field at the entrance off Saxonburg Blvd.

The project area could envelop the mowed drainage on the east side of the park entrance road. This drainage could also benefit from stormwater mitigation, and attractive meadow wildflowers could greet park visitors from both sides of the road.

Furthermore, a restoration project could spread west into the area planted with trees. The trees were planted years ago, but there is a lack of native shrub and herbaceous species. The introduction of native species along the forest floor would aid in preventing the invasion of Japanese stiltgrass and other nearby exotic plants.


Recommended Area for Meadow Installation and Restoration
Western Pennsylvania Conservancy
Proposed Meadow Restoration
Proposed Meadow Installation
N
erosion
2.02 acres
3.12 acres
0
50
100
200 Feet

Equipment needed for meadow establishment projects include the following:

Tractor or ATV mounted herbicide sprayer

Disc tiller on trailer

Cultipacker

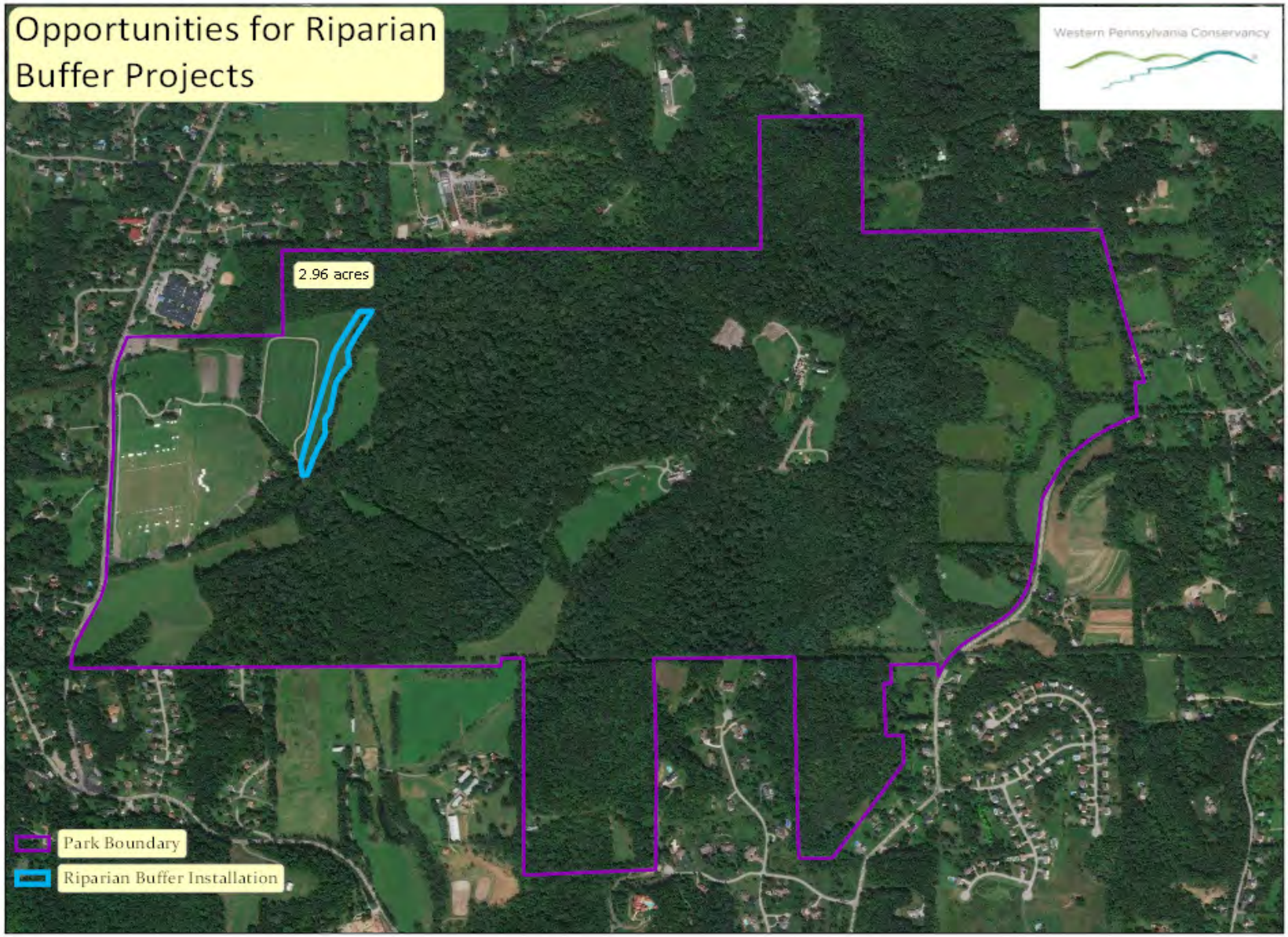
Grain drill

A demonstration project can begin during 2019. The steps in establishing a meadow on the selected site include the following:

1. Summer/Fall: Mark off areas where mowed lawn will be retained (i.e. trails, picnic groves, etc.)
2. Fall: Spray grass area to be re-seeded with a systemic herbicide. Repeat again in early spring if total kill not achieved
3. Spring: No-till drill meadow with seed mix

If work is not conducted by park staff, the estimated total cost for hiring custom equipment operators to establish meadows is approximately $1,000 per acre broken down as follows:

Herbicide Treatment:	$20-$35 per acre
Grain Drill:	$27-$35 per acre
Meadow Seed Mixes:	$20-$45 per pound
Seeding Rate:	10-20 pounds per acre


Opportunities for Riparian Buffer Projects
Western Pennsylvania Conservancy
2.96 acres
Park Boundary
Riparian Buffer Installation

4.3 ESTABLISH RIPARIAN BUFFERS

This assessment located one area of regularly mowed lawn in Hartwood Acres immediately next to a stream that would benefit significantly from the installation of a riparian buffer. It is located along Little Pine Creek, in the northern section of Management Zone 1. Increasing the vegetation on the west side of the creek would substantially increase the ecological value and water quality, be visually appealing and require minimal maintenance compared to maintaining a mowed lawn.

In the fall of 2018, the County Parks Foundation, in partnership with Allegheny County, the Allegheny County Conservation District and the Western Pennsylvania Conservancy, restored a riparian buffer along Catfish Run in South Park. The project incorporated a wide variety of plant material, including live stakes, one-gallon container wetland perennials, two-gallon container trees, and two inch caliper balled and burlapped landscape trees. Several groups of middle school students participated in the planting events.

The goals of the project are to reduce stormwater runoff along Corrigan Drive and the South Park Ice Skating Rink, stabilize the streambanks along Catfish Run, and increase habitat for wildlife.

Riparian buffer tree planting along Catfish Run in South Park


Recommended Area for
Riparian Buffer Installation
Western Pennsylvania Conservancy
2.96 acres
Park Boundary
Riparian Buffer Installation
N

Mowing in the field on the west side of Little Pine Creek.

Mowing right up to the west bank of Little Pine Creek

It is recommended that regular mowing cease immediately along the west side of Little Pine Creek. The installation of a riparian buffer with species specifically chosen for wet areas and soil retention will mitigate the level of runoff that drains into the stream. A restoration project should follow the same protocol as the Catfish Run project in South Park. The planting plan should incorporate multiple types of plant material and be comprised of species native to a floodplain forest and wet meadow. The visibility of this area from major park events would make this an excellent location for a demonstration buffer.

Riparian buffer opportunity in Hartwood Acres Park within a nearly three-acre section of mowed field on the west side of Little Pine Creek

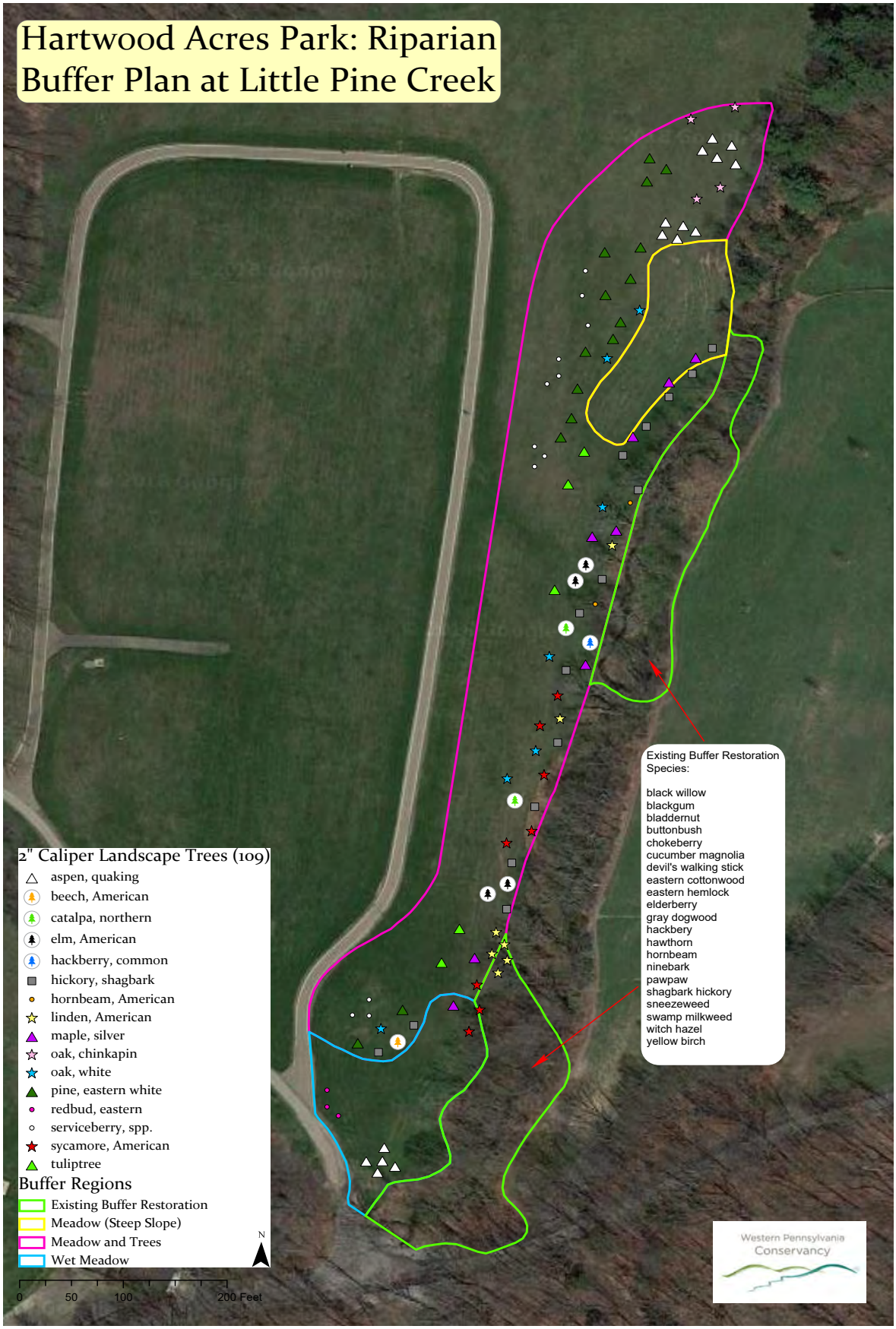
A riparian buffer project can begin during 2019. A proposed planting day map can be seen on the following page. The steps in establishing a buffer on the selected site include the following:

1. Summer/Fall 2019: Mark off areas where mowed lawn will be retained (i.e. trails, picnic groves, etc.); remove invasive plants from the streambank
2. Fall 2019/Spring 2020: Install plant material with groups of volunteers

Cost Estimates:

Material	Unit Cost	Quantity	Total Cost
2" Caliper Landscape Tree	$200.00	109	$21,800.00
Landscape Tree - Open Site	$250.00	109	$27,250.00
Landscape Tree Stake	$4.00	218	$872.00
Bark Guard	$5.00	80	$400.00
2gal Restoration Tree/Shrub	$20.00	250	$5,000.00
Restoration Tree Stake	$1.25	180	$225.00
1gal Wetland Perennial	$12.00	250	$3,000.00
100ft Roll of Caging	$100.00	30	$3,000.00
Mesic Pollinator Native Seed Mix (Lbs)	$35.00	60	$2,100.00
Wet Meadow Native Seed Mix (Lbs)	$60.00	10	$600.00
Mulch (Yds)	$35.00	10	$350.00
Container Tree Delivery	$300.00	1	$300.00
Container Perennial Delivery	$50.00	1	$50.00
Educational Signage	$3,500.00	1	$3,500.00
Sod Removal (In House Cost)	-	-	-
TOTAL			**$68,447.00**

**These costs were calculated using WPC sourced material during December of 2018. Prices subject to change. Does not include professional services project management.*

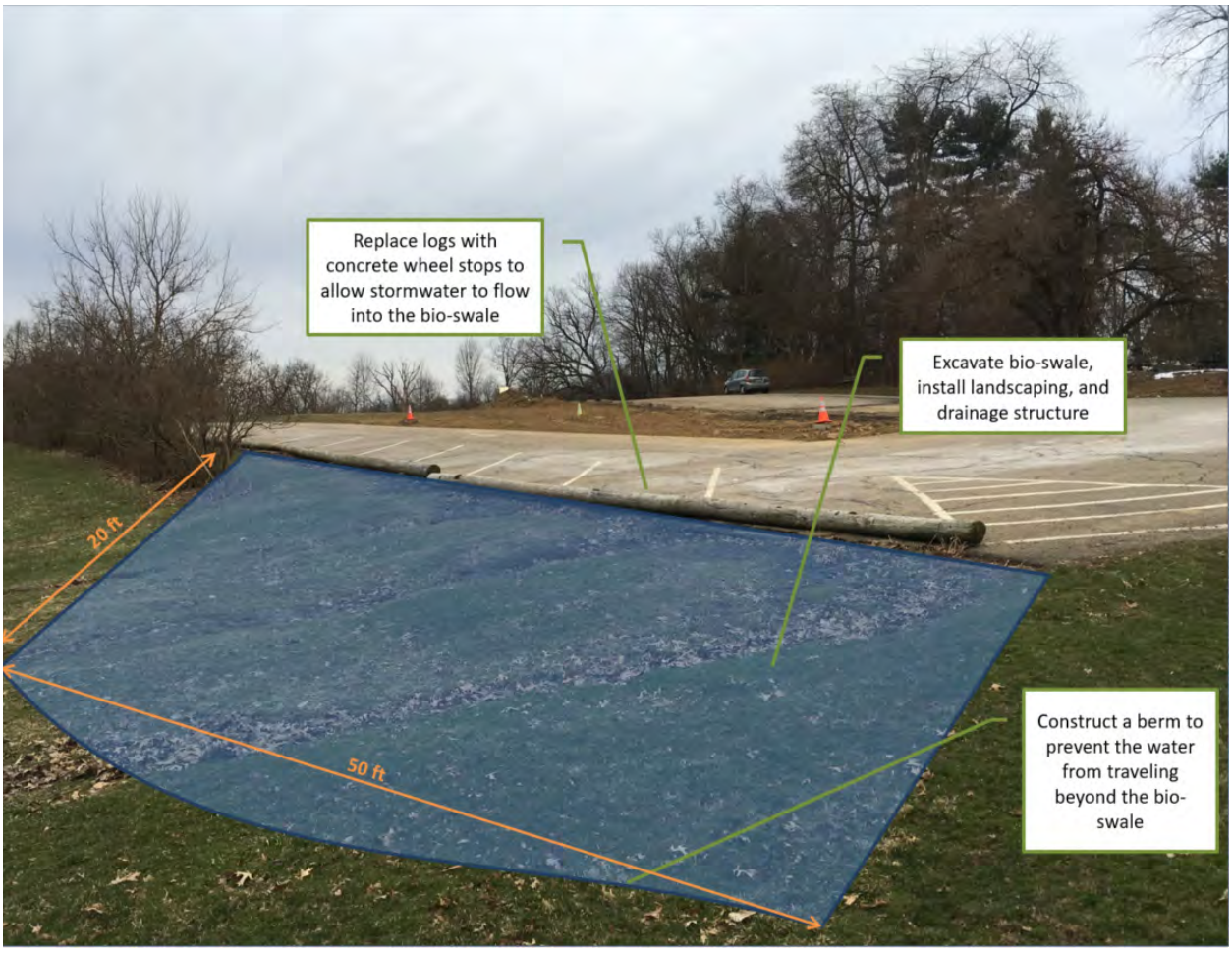

Hartwood Acres Park: Riparian Buffer Plan at Little Pine Creek
Existing Buffer Restoration Species:
black willow
blackgum
bladdernut
buttonbush
chokeberry
cucumber magnolia
devil's walking stick
eastern cottonwood
eastern hemlock
elderberry
gray dogwood
hackbery
hawthorn
hornbeam
ninebark
pawpaw
shagbark hickory
sneezeweed
swamp milkweed
witch hazel
yellow birch
2" Caliper Landscape Trees (109)
aspen, quaking
beech, American
catalpa, northern
elm, American
hackberry, common
hickory, shagbark
hornbeam, American
linden, American
maple, silver
oak, chinkapin
oak, white
pine, eastern white
redbud, eastern
serviceberry, spp.
sycamore, American
tuliptree
Buffer Regions
Existing Buffer Restoration
Meadow (Steep Slope)
Meadow and Trees
Wet Meadow
N
0
50
100
200 Feet
Western Pennsylvania Conservancy

4.4 GREEN INFRASTRUCTURE

Green infrastructure is increasingly recognized in our region as an affordable and effective strategy for managing stormwater runoff while improving water quality. Green infrastructure, such as bioswales, capture stormwater runoff from parking lots and roads and facilitates the infiltration and filtration of runoff through engineered structures that usually include hardscaping and plants.

Methodology

WPC has identified several potential locations for bioswales in Hartwood Acres, with a focus on the Mansion parking lots. This large asphalt covered area slopes downhill from the Hartwood Acres Mansion to the forested area below (EU 35). Initial investigation by WPC staff shows this particular site, below the Mansion, suffers from frequent runoff during rain events. This water could be contained by installing a bioswale along the parking lot edge that will capture, slow, and filter stormwater before continuing on to the mid-successional forest to the east.




Create channel for water to enter the bio-swale
Excavate bio-swale, install landscaping, and drainage structure


Excavate bio-swale, install landscaping, and drainage structure

In addition, another substantial bioswale could be installed where water currently ponds by the park stables (EU 22). This would create an attractive corridor into the stable area, in addition to providing shading and capacity for significant stormwater capture.

Finally, there is great opportunity in EU 19, below the elementary school outside park boundaries. There is a significant amount of runoff from the school parking lots that could be slowed and controlled on park property using a series of weirs and drainage structures.

The process to install bioswales would begin with engineering analyses of the sites to calculate the drainage areas and stormwater capture goals. Implementation can be credited toward Municipal Separate Storm Sewer (MS4) program requirements. (Refer to the Department of Environmental Protection MS4 manual for more information http://www.dep.pa.gov/Business/Water/CleanWater/StormwaterMgmt/Stormwater/Pages). Hampton and Indiana Township could possibly receive credit for green infrastructure installations.

Another necessary measure would include conducting infiltration tests that indicate the infiltration potential of the soils and substrate. Once these technical components are complete, design of the facility can begin. Design features can vary based on site conditions, desired stormwater capture goals, and aesthetics. The design will indicate where the runoff will enter the bioswale and what materials will be used in construction. Materials typically include a combination of rock, soil, and plants and usually feature constructed components such as concrete weirs.

The success and sustainability of any green infrastructure comes in large part from the community engagement component, wherein residents, staff, and officials understand the value of this work and develop the capacity to plan, implement, and maintain these types of projects themselves over the long term.

Cost Estimates

Project Management Financial Management Bidding and Contracts Coordination among Partners and Contractors Contractor Oversight	$3,750
Survey Design & Engineering Landscape Design Hydraulic and Hydrologic Analysis	$4,500
Construction & Materials Native Plants Trees Bioswale (1000 sq. ft.) Amended Soil	$19,300
Total to Control 1" of Stormwater Runoff over the 0.67 acre Parking Lot	**$27,550**

These numbers are estimates to complete the bioswale off of the Mansion parking lot (photo on page 96). Project costs will ultimately depend on contracted services provided through competitive bids and components that can be completed in house or via in-kind services.

4.5 MANAGEMENT/PLANNING

4.5.1 PARK STAFF TRAINING

Invasive Species Management

In the spring of 2019, the Allegheny County Park Rangers are expected to launch the Allegheny County Park Steward Program with a pilot program in North Park. Park Stewards will adopt plots of land in the Allegheny County Parks, remove invasive species and monitor the plots' progress.

Tree Planting and Care (Tree Tender Training)

WPC has been working with the non-profit Tree Pittsburgh since 2008 through the TreeVitalize Pittsburgh project. An important component of the success of that project has been the training of volunteers through Tree Pittsburgh's "Tree Tender" program. Tree Pittsburgh has trained over 1,400 Tree Tenders in Allegheny County through an eight hour workshop that covers everything from the benefits of trees to communities to the planting and care of trees over the long term. In the Boyce Ecological Assessment and Action Plan (2016), WPC recommended that the Allegheny County Parks Maintenance staff undergo Tree Tender Training. The County Parks Director agreed that this was a high priority, and the PNC Foundation provided a grant to ACPF to cover the cost of two training sessions. The first was held in April 2016, and a second training

Volunteers and staff plant and protect restoration trees during a planting along a river trail in Pittsburgh's South Side.

session to complete the "Tree Tender" certification will be held in early 2017. Trained Parks staff will help to care for and enhance the longevity of newly planted trees.

4.5.2 REDUCE MOWING, PRIORITIZE ECOLOGICAL MANAGEMENT AND MAINTENANCE OF CAPITAL PROJECTS

As discussed in the previous section, making reductions to the acreage and frequency of mowing in Hartwood Acres Park will result in significant ecological, visual, education and cost savings benefits.

As staff time availability increases with reduced mowing obligations, staff capacity should be re-allocated more heavily toward ongoing maintenance and management of the capital projects mentioned above.

- Invasive Weed Management
  - As described in previous sections of this report, managing invasive weed infestations impacting mature forest areas of Hartwood Acres Park is a priority management concern, and will continue to be into the future. Investments in tools and staff training are priority recommendations also mentioned in this section.

- Trail System Maintenance

- Green Infrastructure Maintenance

- Meadows and Reforested Areas Maintenance

4.5.3 PROCURE TOOLS AND EQUIPMENT

For invasive weed management, trail maintenance, meadow management, tree planting, fence building and maintenance. Procuring an adequate supply of the tools listed below will cost approximately $20,000 total, although the tools could be acquired as needed over the course of several months/years.

Hand Tools:

Hedge shears:	$20-$75 each (depending on size)
Hand pruners:	$15-$45 each
Loppers:	$20-$80 each (depending on size)
Bow saws:	$15-$30 each
Long reach pruners:	$75-$150 each
Picks mattock:	$15-$40 each

Specialty Tools:

Tree and root puller (Pullerbear):	$200
Root Talon:	$70
Root Buster:	$45
Tree planting dibble bar:	$35-$45 each

Power Tools:

Professional-grade chain saws:	$350-$600 each (depending on size and brand)
Professional-grade Pole saws:	$400-$700 each (depending on size)
Walk-behind brush cutter:	$1,500 - $3,000
Brush hog tractor attachment:	$2,000 - $4,000
Tree hole auger:	
Attachment for tractor with 3-point hitch:	$450-$1,000
Hand-held:	$200-$400

Goat herd:

- Use of goat herds to graze on invasive weeds has emerged locally as a potentially high impact, low cost strategy to be used in combination with other treatment methods, either chemical or mechanical. For example, spraying a systemic herbicide (i.e. tryclopyr or glyphosate) immediately following grazing by goats can create good conditions for herbicide absorb into the plants' vascular system, increasing the chances of a total kill of the unwanted vegetation.

- There is one location non-profit organization that uses goats as a way to manage invasive and unwanted plant species - Alegheny GoatScape - that used to to business as Steel City Grazers. WPC engaged Steel City Grazers on one project to control a small patch of Japanese knotweed and other invasives in the City of Pittsburgh that proved to be highly effective. The fee for that project was based on a $500 base fee plus $100 per day for a 10-goat herd with an expectation that it could take two to three weeks per acre to be cleared. Those fees included transportation of the goats, temporary electric fencing to contain the goats to the area being managed, a donkey whose role was to protect the goats from predators such as coyotes and feral dogs and daily care of the animals.

- Interest was also raised by County Park staff and others during the meetings conducted in conjunction with this project about the possibility of acquiring a permanent goat herd (or herds) to manage invasive weeds across the County Parks system. Because of recent notoriety, demand is quite high for privately owned goat herds. Acquiring a goat herd would help to ensure goats are always available for weed management.

Steel City Grazers goat herd eats invasive plants along Bates Street in the Oakland neighborhood of Pittsburgh, Sept. 2015.

- Goats themselves are relatively inexpensive to buy (sometimes even free). However, they do require good fencing, food and shelter during winter and inclement weather, transportation to and from weed management projects, protection from predators, and a knowledgeable caretaker.

4.5.4 DEVELOP A SUSTAINABLE TRAIL MANAGEMENT PLAN

In conjunction with training Parks staff on trail management and maintenance, developing a sustainable trail management plan that provides a comprehensive vision and management framework for all trails in Hartwood Acres Park is a top priority. Such a plan should include broad stakeholder and public input, as well as engagement of trail design, construction and maintenance professionals.

The scope of the plan should include the following:

- Survey and evaluation of current and future trail usage.
- A comprehensive assessment and evaluation of the existing trail system by trail consultants.
- Identifying most appropriate trails for each permitted use.
- Identifying locations for development of new trailheads.
- A plan for interpretive signage and other outreach and educational ssets.
- Prioritizing trails/trail sections will be the focus of future maintenance efforts and developing detailed work logs.
- Garner broad stakeholder and public input.
- Training and project oversight for County Parks staff on trail construction and maintenance BMPs.
- Identifying trails to close/eliminate due to redundancy, illegal vehicle use or other problems.
- Plan for accessibility in compliance with the ADA.

A more detailed budget estimate should be developed based on soliciting proposals from outside consultants, but the total cost to develop the plan is likely to cost fanywhere from $25,000 to $120,000 depending on the contractor. The planning process would likely take at least two years to complete. For fundraising purposes, developing the Sustainable Trail Management Plan could be packaged with other recommended initiatives to develop an interpretive plan for Hartwood Acres Park and to train County Parks' staff on trail management and maintenance.

Based on discussions held in conjunction with this project, it was also mentioned that the plan could be done in conjunction with a broader County Parks system wide trail planning effort that leverages the skill and expertise of the Allegheny County Park Rangers and Trail Pittsburgh, an organization that conducts extensive volunteer activities to protect and enhance trails for all park user groups.

4.6 THE POWER OF GREEN

Hartwood Acres Park is in a great position to use the power of green to enhance its immediate present and support its future. With the engagement and leadership of the Allegheny County Parks Foundation and the Allegheny County Parks, it has many of the elements that are necessary for successful greening projects. Strategic greening has the potential to be a rallying point for community improvement that can involve citizens from school children to seniors, from business owners to cultural institutions, from novices to skilled members of the community. The power of green is found in the multifaceted benefits and the profoundly satisfying experience of improving the living landscape of the community. Hartwood Acres Park has the elements in place to harness this power for all its constituents, employees and its landscape.