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Natural Lands Management and Stewardship Plan for Harriet Wetherill Park in Plymouth Meeting, Pennsylvania

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An independent study project report by The Martha S. Miller Endowed Urban Forestry Intern (2012-2013)

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Natural Lands Management and Stewardship Plan for Harriet Wetherill Park in Plymouth Meeting, Pennsylvania

Abstract

The Plymouth Township Parks and Recreation Department recently created Harriet Wetherill Park, a 66 ½ acre park encompassing agricultural lands, wooded areas, streams, fields, and a farmstead. Caring for the natural areas of the park presents a new challenge to the township; the other parks maintained by the parks and recreation department are designed for active recreation. The purpose of Harriet Wetherill Park is passive recreation and nature education.

To help them achieve their goals for the park, Plymouth Township contracted with Land Concepts Group, LLC in 2011 to develop a conservation and management plan for Harriet Wetherill Park. The Morris Arboretum Urban Forestry Consultants (MA-UFC) were brought on by Land Concepts to write the natural lands management and stewardship portion of the plan. This plan builds on work already undertaken by the Natural Lands Trust (NLT) at the park; it also follows the format for a stewardship plan recommended in NLT's Stewardship Handbook (Steckel and others 2008).

The challenges for the natural areas of the park are the limited diversity of vegetation due to both deer browse and the prevalence of invasive plant species on site; the fragmentation of the wooded areas; and the lack of a riparian buffer zone in parts of the park. Erosion is also a concern in several areas. This stewardship plan outlines the steps to take to meet these challenges, prioritizes management activities, and provides a management calendar for the park. A stewardship manual will be provided to Plymouth Township Parks and Recreation in May 2013.

Disciplines

Forest Management

Comments

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Date: May 9, 2013

ABSTRACT:

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CONTENTS

GENERAL AND BACKGROUND INFORMATION.....	3
Regional context.....	3
Goals for Harriet Wetherill Park.....	4
NATURAL RESOURCES INVENTORY AND ANALYSIS.....	4
Species and communities of special concern.....	9
STEWARDSHIP ISSUES.....	9
Deer browse.....	9
Invasive plant species.....	10
Edge effects.....	12
Lack of riparian buffers.....	12
Erosion.....	13
LAND MANAGEMENT.....	13
Stewardship units.....	13
Stewardship goals.....	13
Stewardship strategies and tasks.....	13
Protecting and enhancing existing natural resources.....	13
Routine tasks.....	16
Monitoring.....	17
REFERENCES.....	18
NOTES.....	20
Appendix A: Management Tasks for HWP by Stewardship Unit.....	21

GENERAL AND BACKGROUND INFORMATION

Harriet Wetherill Park, located in Plymouth Township, Montgomery County, PA is a 66 ½ acre park comprised of agricultural lands, wooded areas, streams, fields, and the former farmstead of Mr. and Mrs. Elkins Wetherill. Approximately 40 acres of the park was acquired by Plymouth Township in 1996 and the remaining acreage in 2006. The park is in the Reading quadrangle (USGS) with coordinates of 40.117222° N and 75.268889° W at its approximate center.

Harriet Wetherill Park (HWP) is located about one mile from Plymouth Meeting Mall, with the main entrance from Narcissa Road and a second entrance, leading to the main house, from Butler Pike. A new main entrance is planned off of Butler Pike. Both current entrances are accessible by vehicle; there are no designated trails leading into the park and the adjacent roads are not easily used by either pedestrians or cyclists. The nearest public transportation is the L bus that stops at Plymouth Meeting Mall.

Regional context

Harriet Wetherill Park is the only parkland in Plymouth Township with considerable wooded and natural areas. Parts of the land have been in agriculture for many decades and, with the decline of farming elsewhere in the community, now showcase the region's agriculture heritage. The park is surrounded by



Map 1 Aerial photograph of Harriet Wetherill Park showing park boundary.

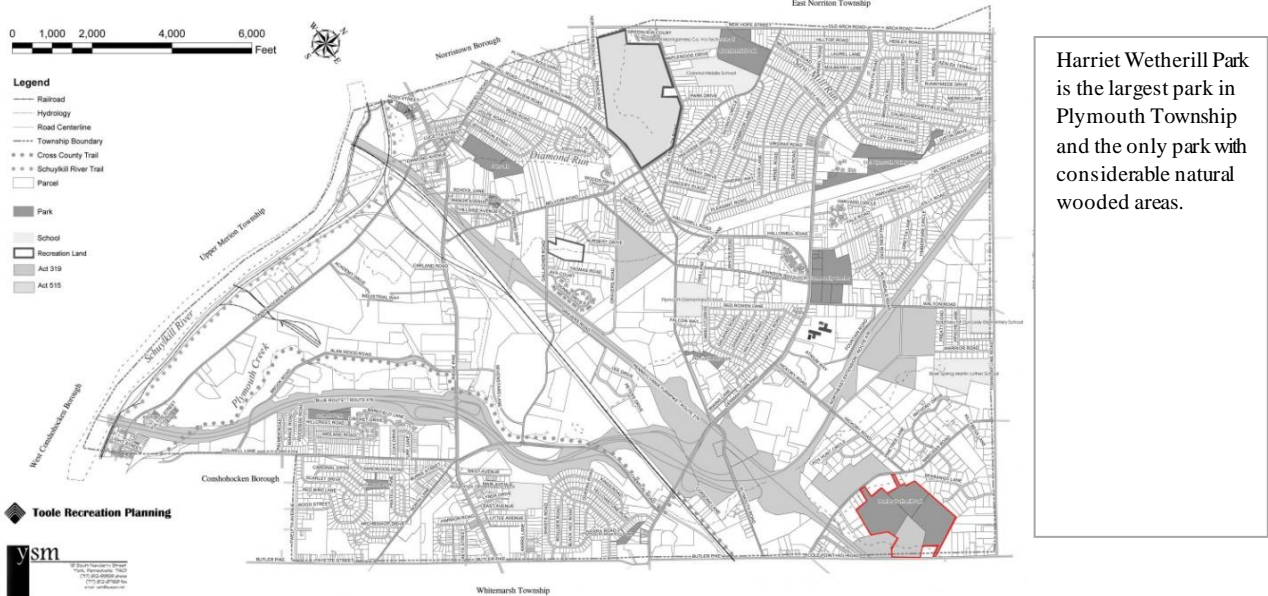
suburban-sized individual home lots on most of its edges. South of the park, the adjacent parcel of land is protected under Act 319 as Clean and Green Land, i.e. land that the owner agrees to keep as woodland, farm, or pasture (YSM 2007).

HWP is connected to the larger community through its waterways: Plymouth Creek and its tributaries flow through the park and eventually into the Schuylkill River and the park provides a large, non-paved area for stormwater infiltration.

Agricultural crops grown in the park by Maple

Acres Farm are sold to residents of Plymouth Township and the surrounding area, meaning that some community members are connected to HWP in a very physical way: they eat food grown there.

Plymouth Township Recreation Plan



Harriet Wetherill Park is the largest park in Plymouth Township and the only park with considerable natural wooded areas.

Map 2 Harriet Wetherill Park shown in relation to other park land in Plymouth Township.

Goals for Harriet Wetherill Park

In accordance with Mr. Wetherill’s wishes, Plymouth Township intends that the land be used to protect open space, preserve the natural resources currently onsite, and maintain the cultural context of the farm property in the midst of a suburban area. Goals for the park include:

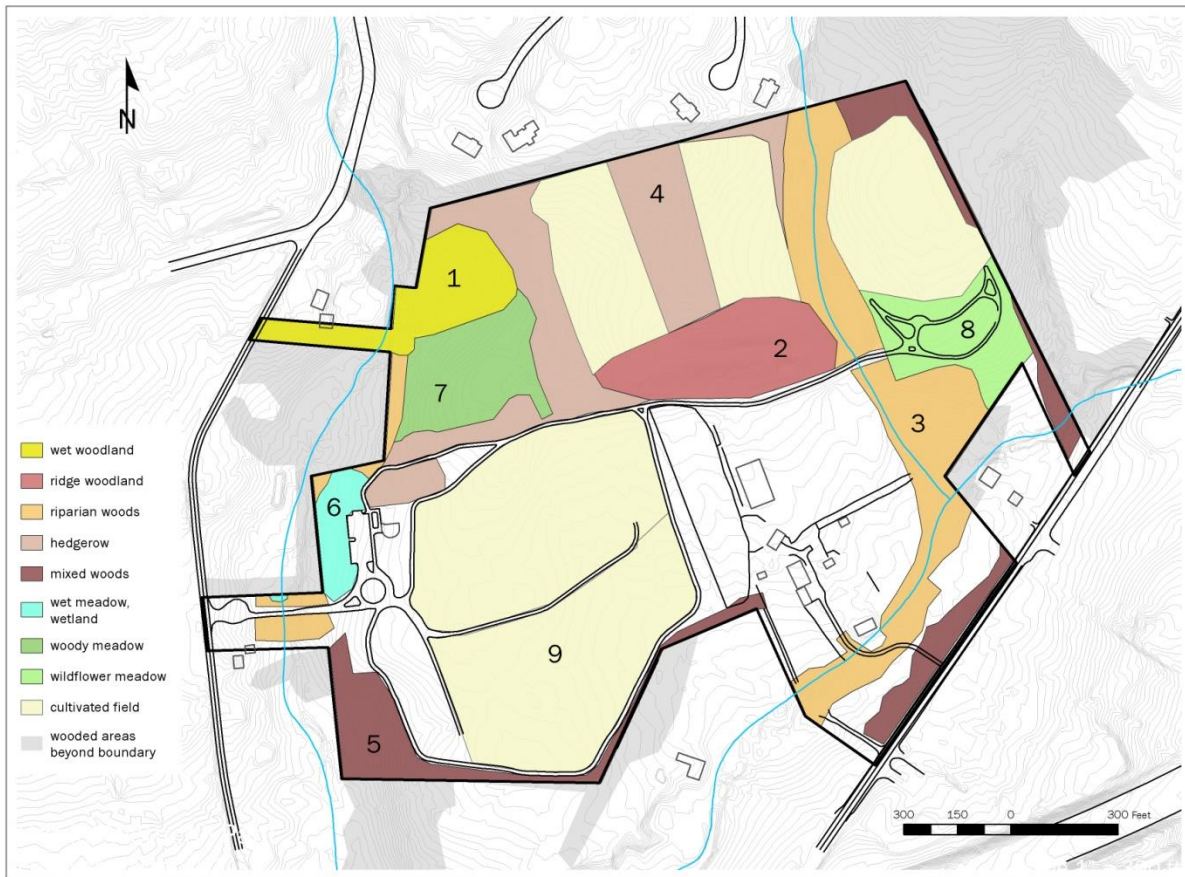
- Passive recreation opportunities
- Environmental education
- Enjoyment of the outdoors
- Reconnection with the agrarian and equestrian heritage of the region
- That it be revenue-neutral.

NATURAL RESOURCES INVENTORY AND ANALYSIS

Before making stewardship recommendations for the improvement and continued care of the park, an inventory of the natural resources at HWP was needed. The following sections detail these natural resources.

MA-UFC identified 9 cover types at HWP, 5 wooded and 4 more open cover types. These types reflect the topography and soils that underlie them as well as the kind and frequency of disturbance they have been subject to. Most of the disturbance has been due to site management activities undertaken intentionally. Different portions of the park have been variously maintained through agricultural practices (like tilling and sowing), mowing, garden planting, and tree planting. Some areas were left to grow with minimal disturbance.

At the end of each section we have also provided the term used by the Natural Lands Trust in their 2011 report for HWP, for continuity.



Map 3 Vegetation cover types at Harriet Wetherill Park.

1. Wet woodland

The wet woodland canopy layer contains red maple (*Acer rubrum*), silver maple (*Acer saccharinum*), and white ash (*Fraxinus americana*). Elms (*Ulmus rubra*, *U. americana*) and sycamore (*Platanus occidentalis*) were also observed, as well as pin oak (*Quercus palustris*). Walnuts (*Juglans nigra*) increase upslope from the creek tributary.

The canopy is thin and not much seedling recruitment was in evidence. The ash trees are in decline; the dieback is not due to emerald ash borer (*Agilus planipennis*) damage since the exit holes in the trunks were round, not D-shaped; D-shaped exit holes are diagnostic for emerald ash borer (EAB). Additionally, EAB has not yet been documented in this part of Pennsylvania. Similar decline in ashes in other areas of Pennsylvania and New Jersey has been observed and ascribed to ash yellows; Jason Lubar (MA-UFC) thinks that this is not the case here. It is unclear what is causing ash decline at Harriet Wetherill Park.

The wet woodland understory is largely privet (*Ligustrum obtusifolium*), crabapple (*Malus sp.*), and multiflora rose (*Rosa multiflora*), with buckthorn (*Rhamnus cathartica*) present along the edges of the woods. Much of the multiflora rose has rose rosette disease. Arrowwood viburnum (*Viburnum dentatum*) and spicebush (*Lindera benzoin*), both native understory plants, were observed upslope from the wettest areas.

The herbaceous layer supports sensitive fern (*Onoclea sensibilis*) and agrimony (*Agrimonia* sp.), plants that need some sun and wet conditions. Stiltgrass (*Microstigium vimineum*) covers the ground in the sunniest areas. Sedges (*Carex* sp.), rushes (*Juncus* sp.), and deer tongue grass (*Dichanthelium clandestinum*) are also present.

NLT designation: red maple palustrine forest

2. Ridge woodland

The wooded ridge in the middle of the park has some of the oldest and largest trees at Harriet Wetherill – some trees appear to be over 120 years old (informal tree ring count by Jason Lubar, MA-UFC). Red oak (*Quercus rubra*), white oak (*Quercus alba*), and shagbark hickory (*Carya ovata*) compose the canopy layer; ash, hackberry (*Celtis occidentalis*), and Norway maple (*Acer platanoides*) are also present. There is visible regeneration of ash and hickory.

The ridge woodland supports late-successional tree species and serves as a seed source of these species for the adjacent hedgerows. In the nearest hedgerow, more oaks were observed in the portion closest to the ridge woodland.

There is a gap in the canopy at the top of the ridge and the sunny area is covered in stiltgrass and garlic mustard (*Alliaria petiolata*). This area has exposed rock in some areas and shallow soil in others, which might not support shrubs and trees. Bush honeysuckles (*Lonicera* sp.) are present lower on the ridge, especially on the west and south sides. Garlic mustard is rampant on the southwestern slope of the ridge. In March 2013, the first-year rosettes were forming. Garlic mustard is a biennial plant, forming a rosette in year 1 and becoming a tall plant in year 2 before setting seed and dying.

Spring ephemeral plants found on the ridge include spring-beauty (*Claytonia virginica*), yellow trout-lily (*Erythronium americanum*), and bloodroot (*Sanguinaria canadensis*). These plants emerge in the early spring before the tree canopy leafs out and they flower and set seed before the canopy closes in May. For the rest of the year, spring ephemeral plants die back to their underground parts and re-emerge the following spring.

Lesser celandine (*Ranunculus ficaria*), found in some parts of the ridge woodland, is also a spring ephemeral but is not native to the area and is considered invasive by the USDA. It forms a dense carpet and can impede native spring ephemerals. Other spring-blooming plants of interest in the ridge woodland are hairy Solomon's seal (*Polygonatum pubescens*), false Solomon's seal (*Maianthemum racemosum*), and Jack-in-the-pulpit (*Arisaema triphyllum* ssp. *triphyllum*).

NLT designation: red oak – mixed hardwood forest

3. Riparian woodland

The woods along tributary no. 5 of Plymouth Creek have been the site of recent tree plantings: maples, birch, and cryptomeria (*Cryptomeria japonica*) were observed in late summer 2012. Several of these had died by the spring of 2013.

Ashes and maples compose an increasing percentage of the canopy moving further along the creek, away from the ridge woodland. Some canopy dieback is in evidence along the stream, especially among the ashes.

Privet and grape (*Vitis* sp.) are found in the shrub layer, with more bush honeysuckle approaching the park boundary. Bottlebrush grass (*Elymus hystrix*) grows near the end of the ridge heading towards the creek. Several skunk cabbages (*Symplocarpus foetidus*) were up in March, surrounded by lesser celandine.

NLT designation: red maple palustrine forest

4. *Hedgerows*

The canopy in the hedgerows is mostly ash and walnut; as elsewhere at HWP, the ash trees are showing signs of decline. Closer to the ridge area, oak species, cherries (*Prunus* sp.), and hawthorns (*Crataegus* sp.) are in evidence.

The understory is a riot of shrubs and vines: grape grows over shrub honeysuckle and multiflora rose, with buckthorn along the borders. More berries and lush vegetation were observed on the sunny sides of the hedgerows (the southwest sides) than on the shadier sides.

In wetter hedgerow areas, New York ironweed (*Vernonia noveboracensis*) was in bloom during the August 2012 site visit.

NLT designation: mixed hardwood forest.

5. *Mixed woods*

Other areas of Harriet Wetherill Park with some canopy cover were designated as mixed woods by MA-UFC. In some places there is only light cover – a strip of wooded area a few trees wide that serves as a buffer between the park and neighboring properties or Butler Pike, e.g. Other mixed woods areas are the edges of small woodlands that extend off-site.

NLT designation: mixed hardwood forest.

6. *Wet meadow and wetland*

The constructed rain garden that detains runoff from the parking lot is now primarily cattails (*Typha latifolia*). According to a DCNR report, this area was planted with native meadow grasses and wildflowers when it was installed but few of these appear to have survived in the basin itself (PA DCNR 2011). The wet meadow area adjacent to it does have a mix of wildflower and meadow species adapted to wet areas. The rain garden vegetation is not terribly diverse, but cattails are native, functional, and require little to no maintenance.

Harriet Wetherill Park also has 0.231 acres of delineated wetland that sits just beyond the Narcissa Road entrance. Like the area below the parking lot, the wetland is mostly cattails. Any disturbance in the delineated wetland would be subject to regulation by the U.S. Army Corps of Engineers and the Pennsylvania Department of Environmental Protection.

7. *Woody meadow*

Woody clumps and hedgerows support fast-growing trees: black walnut, cherry, and silver maple. The understory of the clumps is composed of invasive shrubs also found elsewhere on site: buckthorn and multiflora rose, with Japanese honeysuckle growing over the tops. Some of the clumps of trees in the woody meadow have formed around evergreens: Eastern white pine (*Pinus strobus*) and Eastern redcedar (*Juniperus virginiana*).

The open areas of this meadow support generalist herbaceous species, including a number of grasses documented by Mr. Wetherill. Chinese silver grass (*Miscanthus sinensis*), which is considered invasive, can be seen spreading along the edges of the hedgerows. Poison ivy (*Toxicodendron radicans*) grows in patches in the open areas.

The hedgerows are encroaching on the woody meadow in the northwest of the park; the vegetation today extends much further than shown on the 1942 map, and subsequent maps show a few feet of encroachment approximately every 10 years.

NLT designation: terrestrial meadow

8. *Wildflower meadow and butterfly garden*

The butterfly garden was an early action item from the HWP Master Plan completed in 2007. The garden has been the focus of several volunteer days, where neighbors and members of local businesses and organizations undertake weeding, path maintenance, and planting. The butterfly garden paths were re-paved in February 2013 by the parks and recreation department.

Below the walkways in the garden is a wildflower meadow, some of which was also planted.

On the March 2013 site visit, it appeared that there were three butterfly bushes (*Buddleja* sp.) that had been planted near one of the stone retaining walls. The most popular species of butterfly bush, *Buddleja davidii*, is an invasive species and should not be planted. MA-UFC was not able to determine which species were used in the butterfly garden, but only seed-sterile cultivars of butterfly bush should be planted.

NLT designation: terrestrial meadow.

9. *Cultivated fields*

The largest cultivated area at HWP, in the southwest corner, is currently farmed by Maple Acres Farm. The two areas to the north are to be leased for farming also, although maybe not to the same operation. These areas will be planted and cared for by tenants.

The area in the northeast corner, north of the butterfly garden, is currently similar to other open, uncultivated areas on site. It is mown regularly, preventing the establishment of woody species. Its future use, and hence cover type, is yet to be determined, but it has been discussed as an area for pasture or a warm season grass meadow and is suitable for both uses.

As stated in the hydrology section, the fields all drain to either Plymouth Creek or its tributaries. Drainage patterns need to be taken into account if these fields are ploughed or re-graded for any purpose or if amendments are used on fields.

NLT designation: agricultural fields.

Species and communities of special concern

The oldest trees on site are found in the ridge woodland, as are many of the spring ephemeral plants. As the least-disturbed area, the ridge is a priority for protection. The wet woodland also supports a diversity of plant species and is only moderately invaded. Finally, protecting and enhancing the riparian corridors is a high priority because they form part of a network extending beyond the park's boundaries and provide many ecosystem services.

Species of concern include the invasive woody shrubs, vines, and herbaceous plants colonizing the site. Management activities detailed below will address these species. There are a number of species of deciduous shrubs and woody vines that are considered invasive; invasive species make up nearly half of the diversity of deciduous shrub and woody vine species on site.

STEWARDSHIP ISSUES

Deer browse

Deer are the greatest threat to biodiversity and ecosystem functions on site. White-tailed deer populations on the East Coast have reached levels not seen in the previous two hundred years and are highest in areas with mixed forest and agricultural fields, where there may be 60 deer/km² (Horsley and others 2003).

The overabundance of deer affects the development and species composition of vegetation – plants that deer prefer disappear quickly and unpalatable plants come to dominate. For example, deer prefer not to eat ferns, so in areas with heavy deer activity, ferns may be the primary plant in the herbaceous layer. When hardwood seedlings do manage to grow through the mat of ferns, they are then eaten by deer (Horsley and others 2003). Deer inhibit regeneration of many tree species, leading to a forest with older native trees in the canopy but few younger native trees growing up to replace the older ones.

At HWP, the pressure of deer browse is evident across the site. The active agricultural fields are fenced to protect the crops inside. Outside the fences, unpalatable and/or non-native shrubs are the primary vegetation in the hedgerows and ferns and sedges are a large part of the herbaceous layer in the wet woodland.

A deer enclosure – an area of woodland fenced off to exclude deer – could increase the diversity of native plants at HWP and be a useful educational demonstration. Seeds of species that are heavily browsed by deer – viburnum or Eastern hemlock, e.g. – may be present in the seed bank and may regenerate once the deer are excluded. An enclosure would give park users a chance to see a greater variety of native vegetation and learn about the impact of white-tailed deer on the East Coast. Enclosure fencing would require regular maintenance and occasional repair.

If fencing a larger area is not an option for aesthetic or maintenance reasons, a deer repellent could be applied to new plantings, especially young trees and shrubs. The Philadelphia Parks and Recreation Department is currently using a spray-on deer repellent (PlantSkydd®; similar products could also be used) with an odor that triggers a fear response in deer to protect new plantings in restoration areas (Luke Rhodes, Philadelphia Parks and Recreation, personal communication). Some deer repellents are listed as organic by the Organic Materials Review Institute (OMRI) and could be applied by anyone, park staff or volunteer, without a pesticide applicator's license.

Fencing on individual trees can also be used. A thick plastic mesh is preferable to other types of tree fencing because it allows air to flow easily around the trunk, preventing dampness and rot. This can also help prevent bucks from rubbing young trees to death, although in some instances they are able to hike up the fencing and get to the tree trunk regardless of the fence type used.

Planting larger trees with most of their foliage above the browse line (the height deer can reach) may be another option, although large trees are much more expensive. Moving and planting large trees also disturbs more soil, and the equipment used can cause soil compaction.

In short, most if not all new plantings will need to be protected from deer. Even shrubs that are not usually eaten by deer will be browsed if the deer population is high in an area, and any woody plant is susceptible to rubbing by bucks.

Invasive plant species

Invasive plant species at Harriet Wetherill Park also threaten plant diversity. As defined by Federal Executive Order 13112, invasive species are species that are foreign to the ecosystem under consideration and whose introduction causes or is likely to cause harm, either to the environment, to economic interests, or to human health (qtd in PA DCNR 2011 p. 3). Invasive species may be very successful at reproducing, photosynthesize for a longer period of time than other plants, or benefit from a lack of competitors and predators and therefore come to dominate the area in which they establish.

Invasive plant species and species that are overly aggressive to the detriment of other vegetation found at Harriet Wetherill include

Herbaceous layer: Garlic mustard; stiltgrass; bull thistle (*Cirsium vulgare*); Chinese silver grass

Shrub layer: bush honeysuckles (*Lonicera maackii*, *L. morrowii*, and *L. standishii*); multiflora rose; buckthorn; wineberry (*Rubus phoenicolasius*); autumn-olive (*Elaeagnus umbellata*); privet

Woody vines: Japanese honeysuckle (*Lonicera japonica*); wisteria; oriental bittersweet (*Celastrus orbiculatus*); English ivy (*Hedera helix*)

Canopy: Norway maple (*Acer platanoides*); tree-of-heaven (*Ailanthus altissima*)

Of these, the most important to address are the woody vines, as these can smother desirable trees and shrubs, and the invasive shrubs.

Woody vines can generally be managed by pulling up small ones and cutting large ones, then painting the cut surface with glyphosate while the cut is still fresh. Fragments of roots left in the soil will re-sprout, so it is necessary to do this through multiple seasons. Some, like Japanese honeysuckle, keep their leaves later into the fall and can be sprayed with glyphosate when other plants are dormant (Kaufman 2007 p. 193). Any vines growing up into trees should be cut to prevent them from girdling the tree, limiting its available light and making it top-heavy and susceptible to wind throw.

Most invasive shrubs are best managed by cutting and then painting the cut stump with herbicide. They are generally too large to be pulled out and digging them out disturbs so much soil that it is often more detrimental than helpful. It may be necessary to cut and paint several times; at least one of these times should be in late summer when the plant is low on resources. Juvenile shrubs can be pulled out mechanically using a WeedWrench™ or similar puller.

The shrub honeysuckles leaf out earlier in the spring than other plants and keep their leaves later in the season, making early spring and fall good times to distinguish them from native vegetation. Their dense growth inhibits tree seedlings and herbaceous plants (Kaufman 2007 p.169). The shrubs do provide nesting habitat and a food source for birds in the winter, so once control has been established over the invasive shrub honeysuckles, native shrubs with winter fruits like winterberry holly (*Ilex verticillata*) and possumhaw viburnum (*Viburnum nudum*) should be planted and protected from deer.

The multiflora rose at HWP has rose rosette disease, which often kills host plants within a few years. Since multiflora rose is an invasive shrub, controlling it biologically through rose rosette disease is desirable. However, rose rosette disease also infects ornamental roses, which may be growing in some of the homes near the park. The Virginia Cooperative Extension does recommend removing multiflora rose within 100 m of areas where there are cultivated roses (Hong and others 2012). Plymouth Parks and Recreation could decide to let rose rosette disease take care of the multiflora rose in the wet woodland if there are no nearby cultivated rose populations.

In addition to limiting the spread of existing invasive plants, park stewards at HWP should take care not to introduce more invasive species. The proposed construction of the nature center has a chance of introducing more seeds of invasive species through soil brought in. The Pennsylvania Department of Conservation and Natural Resources (PA DCNR) recommends requiring contractors to share responsibility for preventing the introduction of invasive species on machinery or through fill. One way of doing this is by making them responsible for cleaning up any outbreak at a job site for a set amount of time after completion (PA DCNR 2011 p. 18).

Edge effects

An edge is where two habitat types meet each other – where grasses abut woodland, for example. Harriet Wetherill Park consists of primarily edges. In many areas of the park, an agricultural field, a cover type that is structurally simple and has relatively low plant species diversity, adjoins a wooded area. As they are currently managed, some of these are hard transitions – straight mown lines. Soft, wavy edges and gradual transitions (mown grass to tall grass to shrubs to trees) are preferable because they check the effectiveness of predators like hawks and give shelter to small mammals. The township parks & recreation department has begun creating these types of planted transition zones between the farmstead and main agricultural field and as a buffer between the park and adjacent properties, where trees and shrubs are planted into unmown areas rather than turf grass.

Edges are prime browsing grounds because of the abundance of leafy vegetation. The availability of sunlight leads to greater flowering and fruiting too, so edges offer many nectar and fruit sources for wildlife. This makes edges excellent hunting areas for predators as well – they go where the herbivorous animals are.

In addition to increased sunlight penetration, especially on southern edges, wind and dust deposition are greater along woodland edges. How far edge effects penetrate into a wooded area varies, but in a survey of edge effect studies, effects were frequently measured up to 40m within the woodland (Murcia 1995). Taking 40m (around 130 feet) as a rough estimate of how far edge effects extend, HWP is almost all edge; see map 5 below. The wet woodland area is large enough to have an interior reasonably protected from edge effects; other potential interior wooded areas are located offsite but could be strengthened by expanding the adjoining wooded areas within HWP.

Lack of riparian buffers

DCNR recommends a 100 foot buffer along streams and creeks in Pennsylvania. Forested buffers remove more pesticides and nitrogen than grass buffers, help prevent stream erosion and increased sediment loads in the stream, and keep the water temperature cooler in summer (TreeVitalize 2013). While a wooded buffer is not possible everywhere at HWP, it is a good goal to keep in mind.

TreeVitalize enabled the planting of some trees in the riparian zone along tributary no. 5 of Plymouth Creek; more planting needs to take place here. The ash trees in this area are in decline and will need to be supplanted with other species; these should be planted soon so that they grow large enough to take the place of the ashes once they die. Appropriate species for planting here include pin oak (*Quercus palustris*), native maples, and river birch (*Betula nigra*).

The portion of Plymouth Creek that runs between the farmstead and Butler Pike is not well buffered – understandably so, since views into the park and from the homestead are important, as is access. But there is high potential for erosion if pasture area for the TBD-tenant of the farmstead is extended to the creek. Some planned views could be preserved and the tree cover increased in other areas. In addition to the ecological benefits of a wooded stream buffer, if the trail system runs along this portion of the creek, going in and out of sunlight and through shady areas would be a pleasant experience.

An increased wooded buffer along the creek would keep the sight and sound of Butler Pike from intruding into the park in the future. In some years' time, this portion of the trail between the creek and the pike could be wooded and shady, cooling for both the life in the creek and the park visitors. One or two gaps in the buffer could be kept to provide a glimpse of the farm house from the pike.

Erosion

Rogue trails and deer paths that become informal trails should be closed. The most effective way to close a trail is to make it very difficult to walk on – hummocky and grown-over in appearance (McCarthy 2013). This can be done by placing logs and brush on the trail or with berms or rock piles, depending on the materials available nearby.

New trails should follow contour lines wherever possible to minimize erosion. Trails that do cross contour lines can be constructed with cribbing – logs placed like stair risers along the contours of a slope – to divert water from the trail and prevent it from slowing downslope quickly (Jones Sauer 1998 p. 255).

LAND MANAGEMENT

Stewardship units

Stewardship units were mapped according to cover type, which reflects the topography, soils, moisture levels, and past management practices on site; see map 5 above. All wooded areas and the woody meadow, wet meadow, wetland, and butterfly garden (areas 1 – 8) are to be managed by Plymouth Township Parks and Recreation. The pasture and agricultural fields will be managed by the lessees; their management is outside the scope of this report.

Stewardship goals

The primary goal for stewards of the natural areas of HWP is to increase the quality of habitat through a greater diversity of native vegetation: more species and better-developed layers. Secondary goals include allowing for environmental education and recreational access and enhancing the riparian buffer around Plymouth Creek and its tributaries.

Stewardship strategies and tasks

These include work that protects natural resources already existing at HWP, routine and periodic tasks, work that increases public use and access at the park, and monitoring tasks.

Protecting and enhancing existing natural resources

1. Wet woodland

The most important tasks in the wet woodland are closing off rogue trails to prevent erosion and fragmentation and stabilizing the existing trails on the woodland edge. As of April 2013, there are no trails proposed through the main part of the wet woodland. Discouraging access to the woodland interior will protect vegetation from trampling.

In the near future (<5 years), new trees should be planted, since there is little sign of natural regeneration of canopy trees. Ash trees form a large percentage of the canopy in the wet woodland. Ash trees at the park are showing signs of decline and many have died already; MA-UFC inventoried 57 dead ash trees in the park in 2012; ash species were 80% of the total dead trees inventoried. As the ashes die, larger gaps in the tree canopy will open up. To preserve the

dappled light present in the wet woodland, additional trees need to be planted to replace the dying ash. These new trees should be protected from deer browse and rub, either by fencing or by a deer repellent.

If HWP wants to introduce additional native grasses and sedges, the wet woodland area would be a good place to plant shade-tolerant, wet-loving species. Appropriate species for planting can be found in the *Stewardship Handbook for Natural Lands in Southeastern Pennsylvania* (Steckel DB and others 2008 pg. 108).

2. *Ridge woodland*

The garlic mustard and stiltgrass on the top of the ridge woodland and throughout the southwestern slope should be addressed immediately, as they form a manageable patch of invasive plants in woods that are otherwise in fair condition. Garlic mustard is a biennial plant that forms basal rosettes in the first year and then stalks, flowers, and seeds in its second year. The rosettes emerge in the early spring, in March, and are green before many native plants. They are easy to pull when they are young; this would be a good volunteer activity. If it is removed before setting seed, fewer plants come up the following year and pulling can continue until there are very few plants present (Tracy Beerley, Morris Arboretum, personal communication). Stiltgrass can also be hand-pulled since its roots are shallow. Pulling should be done before it flowers and sets seed; flowering usually begins in August.

Japanese honeysuckle vines can be hand-pulled or cut at the base and the cut area painted with glyphosate. Since HWP is park land, glyphosate can only be applied by someone with a pesticide applicator's license – either park staff or a contractor. It's best to do this work in late summer or early fall (July to October) when the plant is heat-stressed and its resources have been depleted. When weighing pulling vs. cutting and painting, consider the amount of soil that would be disturbed by pulling. Freshly upturned soil will probably be colonized by an invasive plant species if it is not planted immediately by park staff.

Disturbing the soil in areas of the ridge woodland could also uproot spring ephemeral plants, especially if the disturbance happens when these plants are dormant and cannot be seen aboveground. Spring ephemeral plants should be flagged so that they can be protected during invasive removal or trail-building activities. These plants are only visible in the spring, emerging before the canopy leafs out and disappearing once the canopy closes in mid-May.

If the township decides to install deer fencing beyond what agriculture at the park requires, the ridge woodland would be the best candidate for fencing or other form of protection from deer browse. It is an easy area to isolate and contains some of the oldest trees in the park.

3. *Riparian woodland*

As in the wet woodland, one of the most important tasks in the riparian corridor is to limit erosion. There are trails/deer paths along the creek presently – these should be formalized as trails and maintained or else closed.

Some tree planting has already been done and more could be done to help close canopy gaps and shade the creek. The riparian buffer should be wide (100' is encouraged) and dense where possible.

4. *Hedgerows*

The hedgerows are currently an immense seed bank of invasive exotic seeds and have less native vegetation in them and fewer native plant species than other parts of HWP. This makes them a good place to direct efforts initially, when testing out control methods. In general, invasive shrubs should be cut and their stems painted with glyphosate, since they are difficult to uproot once established. Woody vines growing up into trees should be cut.

Since there is extensive invasive plant removal work that could be done, it is best to start small and focus on a single area. This will let park staff and volunteers see results more quickly and reduce volunteer fatigue. MA-UFC recommends starting work in 1) the ridge woodland and 2) the area of hedgerow nearest to the ridge woodland. Starting here will lessen the threat to the ridge woodland itself from invasive species and provide an area in one of the hedgerows for native species present along the ridge to eventually spread into.

If any invasive removal is done by contractors, Plymouth Township should specify that equipment be cleaned prior to coming onto the site and all plant material should be properly disposed of offsite. Equipment with soil on it from other projects can introduce new invasive species into the park.

The soil in the hedgerow areas may not be ready for new tree planting for several years; MA-UFC recommends that park stewards concentrate on invasive plant removal and improving soil quality for the first 2 – 3 years. This will also give staff a chance to observe the vegetation already in the park before introducing more. Thinking in terms of forest succession, the hedgerows are in a mid-successional state and therefore early or mid-successional species native to the northeastern U.S. are appropriate for planting (Sarah Low, US Forest Service – Philadelphia Field Station, personal communication). Early successional species typically germinate near the surface and require high amounts of light and greater temperature fluctuations than later-successional, close-canopy species (Bazzaz 1979). These are the conditions that will be present in the hedgerows, especially as shrub removal occurs.

5. *Mixed woods*

Areas of mixed woods that act as buffers for neighbors and limit visibility into and out of the park should be strengthened with additional plantings. Adding plants will also help clarify the park boundaries.

A few instances of dumping yard waste were observed; these areas should be cleaned up and signs should be posted discouraging dumping.

6. *Wet meadow and wetland*

While not diverse, the cattails do not present a problem in the wet areas. Cattails respond to rich soils – which might be expected due to runoff from nearby cultivated fields – by putting on biomass and out-competing other vegetation. They are native and are confined to the very wet areas; they have little impact on other plants on drier portions of the site. MA-UFC recommends focusing on other areas of the park and letting the wet, low places remain cattails.

7. *Woody meadow*

The woody meadow has a number of attractive herbaceous species and woody clumps of trees. Vines growing up into the canopy in the clumps should be cut and painted. These vines are a manageable size and since the clumps are isolated, this makes a good and manageable initial project.

Poison ivy, although a native plant with good wildlife benefit and fall color, it is undesirable along trails and should be removed.

8. *Wildflower meadow and butterfly garden* and 9. *Cultivated fields*

These areas are intensively managed landscapes and fall outside of the ‘natural areas’ scope of MA-UFC’s work.

Routine tasks

Wooded areas should be monitored periodically for hazardous trees, especially along trails and roads. This should be done by a certified arborist trained in tree risk assessment. Yearly monitoring along heavily-used areas would be appropriate; in areas of the park with less use, every 3 years would be acceptable. The wooded areas along paths should also be inspected after heavy storms.

Trails should be cleared of debris and encroaching vegetation. This is most important in late summer when vegetation is at its height but can be done any time.

HWP is designed to be a carry-in, carry-out park. At the edges of the park, there are some organic dump sites where yard waste and grass clippings have been deposited. This material should be removed and the areas should be monitored for future dumping. Signs can be posted in the area to discourage dumping – either warning signs or simply signs stating that the area is part of Harriet Wetherill Park. If dumping is a continued problem, Plymouth Township may need to reach out to the park’s neighbors, either through mailers (maybe informational mailers letting them know that they have an excellent natural resource next door and outlining some things they can do to be good stewards of it – including not dumping yard waste) or personal communication. The boundaries of HWP also need to be clearly delineated. These activities can be done any time but may be good winter activities when other park work slows.

Mulching in the most-maintained areas of HWP (currently the butterfly garden) will need to be done twice annually, and weeding in these areas needs to be done several times per year. It is best to mulch in the spring after the soil warms up (mulching cold soil can keep it cold longer and delay plant growth) and

again the late fall after the soil freezes. Plymouth Township Parks and Recreation currently schedules monthly butterfly garden volunteer days during the spring and summer months; this is a great idea and should continue.

Monitoring

Monitoring how the township is doing in meeting its primary stewardship goal for the natural areas, increasing the diversity of native vegetation at Harriet Wetherill Park, is important. There are a number of potential methods for stewardship tasks like invasive removal. Without monitoring, the township will not know which methods are worth continuing and which are not.

Monitoring also takes time, planning, and good communication among staff. Fortunately, HWP does not need scientifically rigorous monitoring (of the sort that the U.S. Forest Service does, for example) to get a general understanding of how the park is faring. A simple way to monitor the effectiveness of stewardship efforts would be through photographs and written descriptions plus a record of what was done, when it was done, and where it was done (Jones Sauer 1998).

To monitor vegetation changes over time, first Plymouth Township needs to establish a baseline – an inventory for the site as it is now, prior to beginning new management tasks. This report provides much of the baseline information necessary, including a species inventory, verbal descriptions, and photographs of the park.

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NOTES

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Beerley, T. Natural Areas Horticulturist, the Morris Arboretum of the University of Pennsylvania. Tracy provided feedback on the management tasks and schedule for HWP.

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Low, S. Biological Scientist, Philadelphia Field Station, U.S. Forest Service. Sarah advised on which tasks at HWP to undertake first and on strategies for organizing groups of volunteers. She also provided recommendations on invasive removal techniques and use of cover crops after disturbing the soil through mechanical removal.

Marrocco, V. Chief Horticulturist, the Morris Arboretum of the University of Pennsylvania. Vince informed me of the regulations and licensing requirements for applying pesticides to public land.

Rhodes, L. Restoration Field Supervisor, Urban Forestry and Ecosystem Management, Philadelphia Parks & Recreation. Luke discussed methods that Philadelphia Parks and Recreation uses to protect new plantings from deer browse.

Appendix A: Management Tasks for HWP by Stewardship Unit

ACTIVITIES	STEWARDSHIP UNITS							Who will do this?
	Ridge Woodland	Wet Woodland	Riparian Woods	Hedgerows	Wet Meadow	Woody Meadow	Butterfly Garden	
Removing Plants								
Remove invasive/exotic shrubs				X		X		Volunteers
Control poison ivy along trails						X		Park staff
Remove garlic mustard and stiltgrass	X							Park staff
Cut vines in trees				X				Volunteers
Remove invasive ornamentals						X	X	Volunteers
Remove Japanese honeysuckle vines	X					X		Volunteers
General weeding							X	Volunteers
Improving Soil								
Close off 'rogue' footpaths		X	X		X			Volunteers
Add leaf litter and woody debris				X				Volunteers
Plant bottlebrush grass to protect soil in disturbed areas	X			X				Volunteers
Remove 'rogue' organic dump sites				X				Volunteers
Mitigate trail erosion		X						Volunteers
Mulching							X	Volunteers
Protecting People								
Monitor for hazardous trees along trails	X	X	X	X				Certified arborist
Keep trails clear of debris and encroaching vegetation	X	X	X	X		X		Volunteers
Protecting Plants								
Flag spring ephemeral plants	X							Botanist or knowledgeable plantsman
Install deer fencing and inspect regularly	X	X						Park staff
Use deer repellent or fencing to protect new trees		X	X					Park staff
Adding Plants								
Plant deciduous trees (early successional)			X	X				Volunteers or contractors
Plant edge buffers				X				Volunteers or contractors
Plant evergreens						X		Volunteers or contractors
Plant sedges		X			X			Volunteers
Plant shrubs				X				Volunteers
<p>Note 1: all activities labeled 'Volunteers' could also be done by park staff if desired</p> <p>Note 2: all activities labeled 'Volunteers' need a coordinator to schedule, instruct, direct, provide tools, etc.</p> <p>X = highest priorities</p> <p>X = according to resources</p>								