



PARADISE VALLEY NATURE AREA

East Bradford Township

Natural Areas Stewardship Report

JANUARY 2013

East Bradford Township, Chester County
(Tax parcels 51-2-116-E, 55-2-110.1A-E)
40.67 acres



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General Property Description

The 40.67-acre Paradise Valley Nature Area (Nature Area) is located in East Bradford Township, Chester County between Valley Creek Road, which runs along the entire western border, and Brandywine Road. In addition to being owned by East Bradford Township, the Nature Area is also protected by conservation easements held by North American Land Trust. Many of the properties surrounding the Nature Area are protected through conservation easements. The remaining surrounding properties consist of large residential lots.

Paradise Valley Nature Area is accessible from a small parking lot on Valley Creek Road, pull-off parking along Ravine Road, and by its trail system, which connects through adjoining properties to Briarwood Court, Brandywine Road, and Ravine Road. The trail system within the Nature Area allows visitors to view many natural resources of the property.

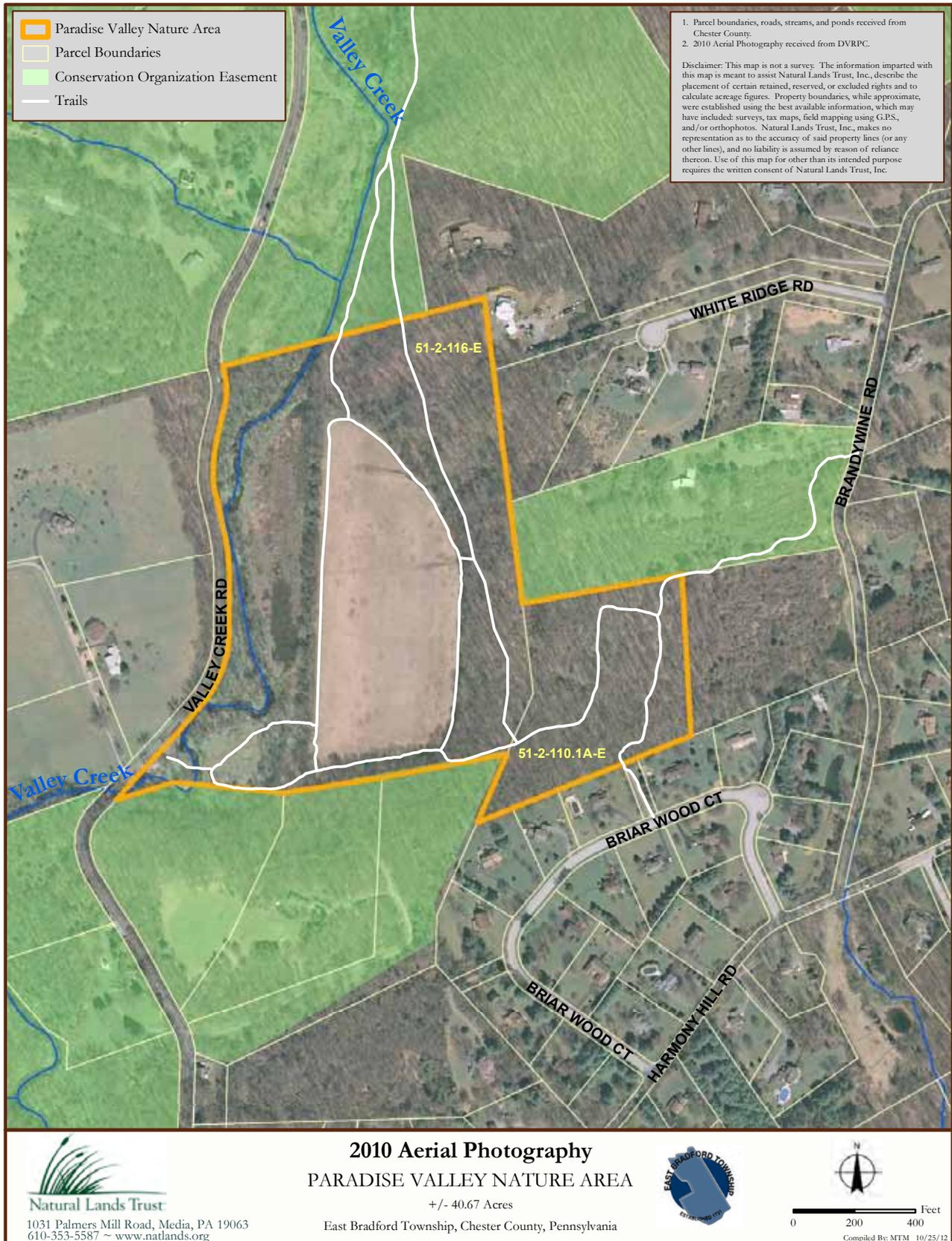
Natural Lands Trust staff accompanied by Mandie Cantlin, Assistant Township Manager, conducted a field inspection of the property on October 23, 2012. The natural resources within the Nature Area were assessed and documented during these field inspections by field notes and photographs.

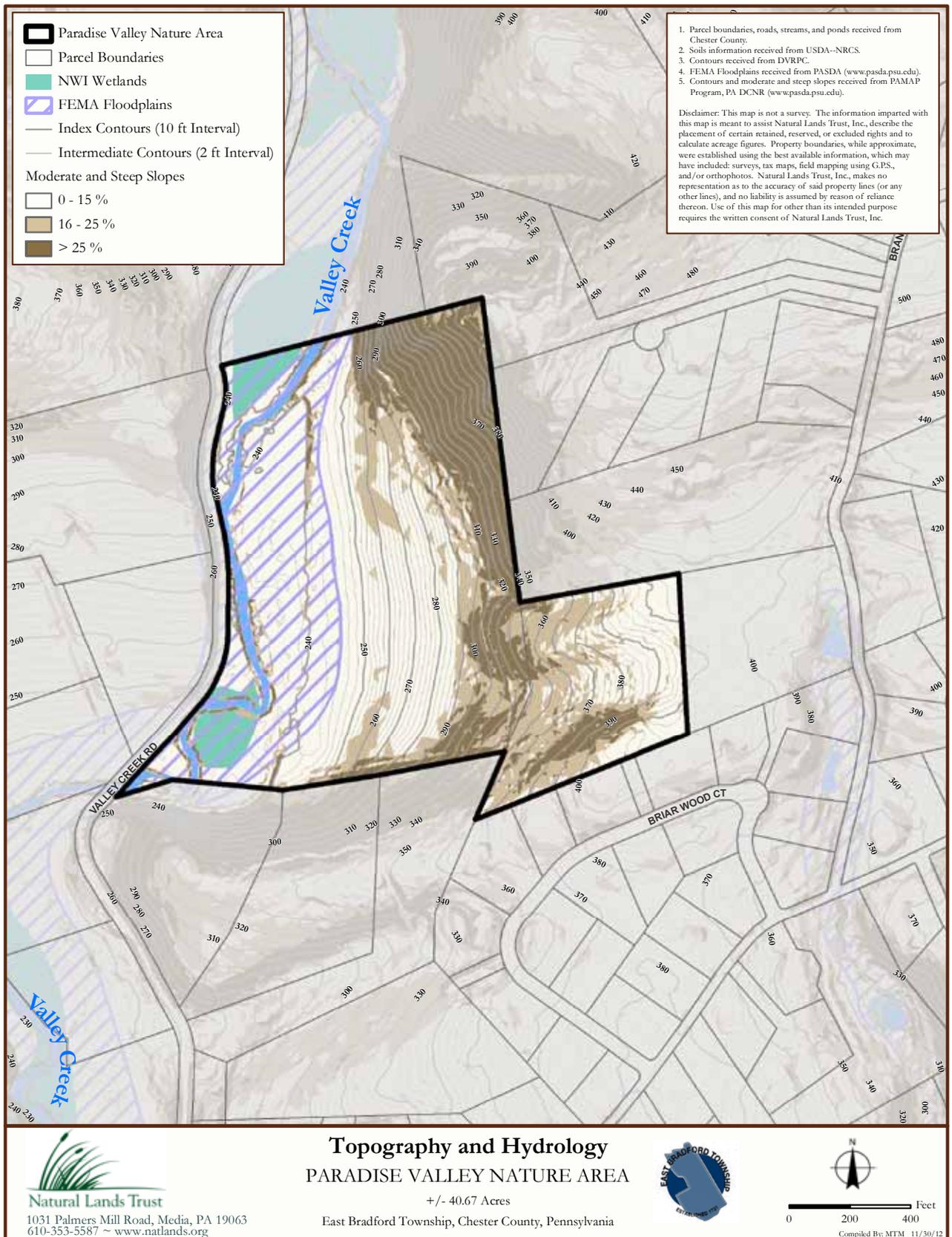


View from the parking lot



Entrance to Paradise Valley Nature Area





Topography

The topography of the property ranges from approximately 234 to 432 feet above mean sea level (see **Topography and Hydrology** map). The higher elevations are found in the eastern portion of the property with the highest point in the northeastern corner. From this point, the terrain slopes downward in a westerly direction toward Valley Creek. The lowest elevation is located where Valley Creek exits the Nature Area along Valley Creek Road near the southwestern corner.

Steep slopes, 16% to 25% and greater than 25%, are located in the eastern portion of the property. The steepest slopes, greater than 25%, begin in the northeastern corner and continue in a southerly direction. Slopes ranging from 16% to 25% primarily exist between the steepest slopes.

Water Resources

The Nature Area is located within the Valley Creek watershed. Valley Creek is a tributary to the East Branch Brandywine Creek, which merges with the main stem Brandywine Creek, flows into the Christina River, and continues into the Delaware River. Approximately 2,180 feet of Valley Creek flows along the western side of the property from north to south. Multiple seeps are present along the slopes within the mature upland forest. The headwater streams from these seeps can be seen on the 2010 aerial photograph as darker areas within the terrestrial meadow. In addition, a constructed wetland was established by PennDOT along the eastern side of Valley Creek which is now part of the early succession floodplain forest.

Plant Resources

Historically, the floodplain and lower slopes of the Nature Area were cleared and maintained open for agriculture with forest cover on the steep slopes (see **Historical Aerial Imagery 1937 and 1971**). The property currently contains six general plant communities as described below with invasive species highlighted in bold type. They include terrestrial forest, floodplain forest, old field/early successional forest, wet meadow/marsh, terrestrial meadow, and hedgerow.



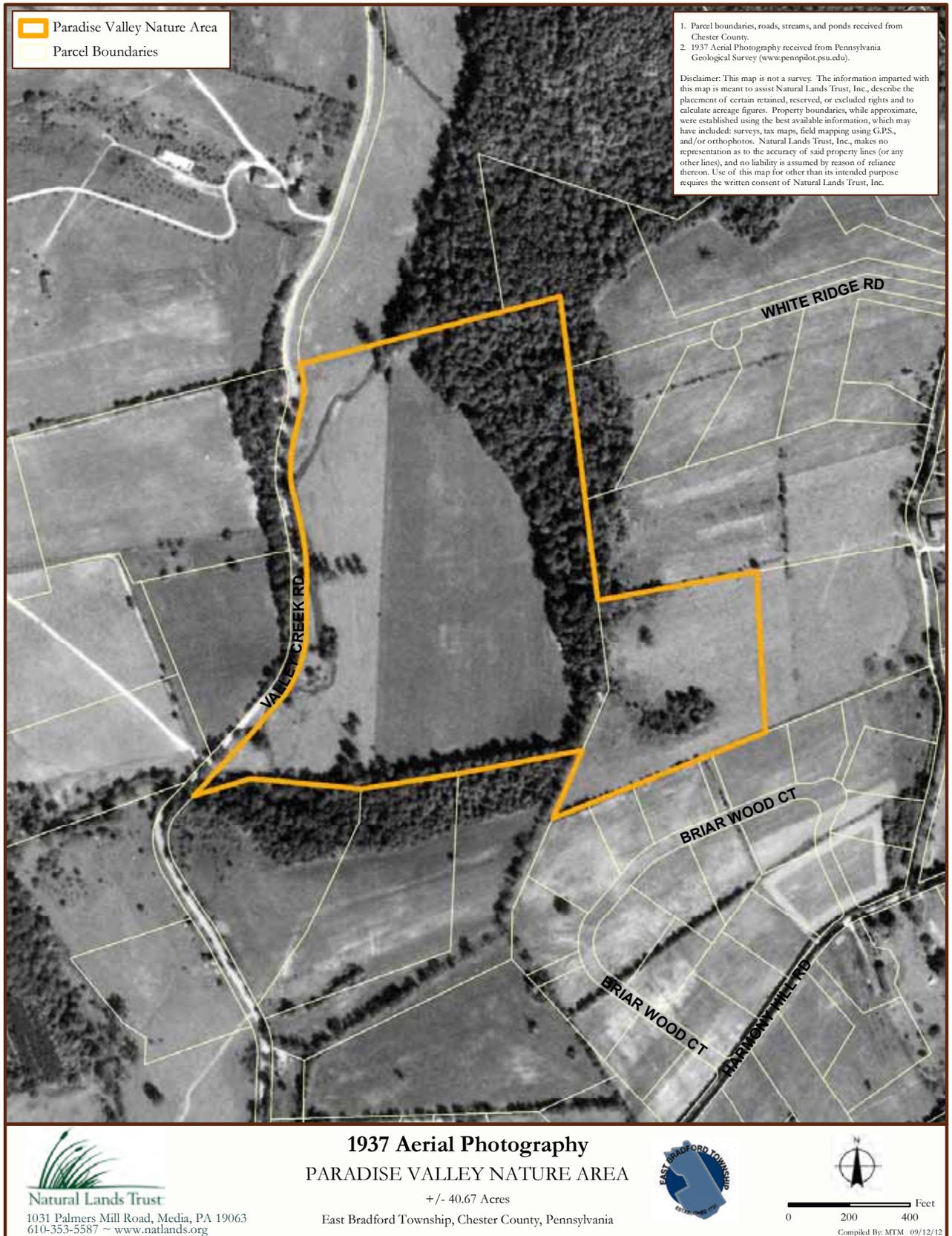
Valley Creek



Seep



Headwater stream





Red oak-mixed hardwood/tuliptree-beech-maple forest

A maturing to mature terrestrial forest (> 60% canopy cover) community, best described as a blend of red oak-mixed hardwood and tuliptree-beech-maple forest covers the steeper slopes on the eastern portion of the property. The oldest part of the forest is located on the steep slopes of the eastern part of the property as seen on the 1937 aerial photograph. The 1971 aerial photograph shows the forest beginning to be established in the area it covers today.

Tuliptree (*Liriodendron tulipifera*), beech (*Fagus grandifolia*), red oak (*Quercus rubra*), white oak (*Q. alba*), chestnut oak (*Q. montana*) are the dominant canopy trees. Other canopy elements include red maple (*Acer rubrum*), red ash (*Fraxinus pennsylvanica*), hickories (*Carya spp.*), Norway maple (*A. platanoides*), and amur corktree (*Phellodendron amurense*). Understory trees, shrubs, and vines include Norway maple, hickories, American holly (*Ilex opaca*), flowering dogwood (*Cornus florida*), black-haw (*Viburnum prunifolium*), spicebush (*Lindera benzoin*), witch hazel (*Hamamelis virginiana*), privet (*Ligustrum sp.*), multiflora rose (*Rosa multiflora*), winged euonymus (*Euonymus alatus*), autumn-olive (*Elaeagnus alatus*), Japanese barberry (*Berberis thunbergii*), Japanese honeysuckle (*Lonicera japonica*), and shrub honeysuckle (*Lonicera sp.*). The herbaceous layer is primarily comprised of garlic mustard (*Alliaria petiolata*), Christmas fern (*Polystichum acrostichoides*), sedges (*Carex spp.*), and wineberry (*Rubus phoenicolasius*). Also, jack-in-the-pulpit (*Arisaema triphyllum*) was noted in the seeps within the community.



Tuliptree dominated red oak-mixed hardwood/tuliptree-beech-maple forest



Oak dominated red oak-mixed hardwood/tuliptree-beech-maple forest



Garlic mustard and Japanese honeysuckle



Winged euonymus and privet



Amur corktree



Vines in canopy trees



Norway maple



Jack-in-the-pulpit



Floodplain forest

Floodplain forest

A maturing floodplain forest is present along Valley Creek between Valley Creek Road and the terrestrial meadow. This area includes an early successional expression of the floodplain forest where a wetland mitigation project was previously installed. Both the 1937 and 1971 aerial photographs show this area in agriculture with a few trees beginning to appear in the 1971 photo.

American sycamore (*Platanus occidentalis*), box-elder (*A. negundo*), red ash, river birch (*Betula nigra*), silver maple (*A. saccharinum*), and willow (*Salix* sp.) are the dominant canopy trees. Understory trees, shrubs, and vines include blackhaw viburnum, spicebush, black raspberry (*Rubus occidentalis*), grape species (*Vitis spp.*), Japanese honeysuckle, and oriental bittersweet (*Celastrus orbiculatus*). Within the early successional expression a colony of phragmites/common reed (*Phragmites australis*) is established.



Seasonal pool in floodplain

Old field/early successional forest

Located within the floodplain forest on the east side of the creek is an old field/early successional forest. The trees and shrubs beginning to populate the area include red ash, sycamore, privet, shrub honeysuckle, autumn-olive, and multiflora rose. Common teasel (*Dipsacus fullonum*) is present in the herbaceous layer.



Phragmites



Old field early successional forest

Wet meadow/marsh

A wet meadow/marsh lies within the early successional expression of the floodplain forest. It can be seen on the 2010 aerial as a darker area in the southern extent of this expression. It is dominated by common cat-tail (*Typha latifolia*) and sedges (*Carex spp.*).



Wet meadow/marsh

Terrestrial meadow

A terrestrial meadow is located generally in the center of the property and lies between the low-lying floodplain forest and upland terrestrial forest. The meadow has previously been managed by controlled burning and more recently by an annual mowing. However, the meadow has not been managed with either of these methods for a few years. A few woody plants are beginning to colonize the meadow including autumn-olive and brambles (*Rubus spp.*). Herbaceous species include native goldenrods (*Solidago spp.*), swamp milkweed (*Asclepias incarnata*), **Japanese stiltgrass (*Microstegium vimineum*)**, **garlic mustard**, **teasel**, asters (*Symphytotrichum spp.*), Indian-grass (*Sorghastrum nutans*) and other grasses.



Terrestrial meadow

Mixed hardwood hedgerow

A mixed hardwood hedgerow occurs along the border of the terrestrial meadow and the early successional floodplain forest. A couple of trees existed in 1937 and by 1971 a line of trees can be seen where the hedgerow is currently located. The hedgerow is severely degraded with invasive shrubs and vines. The trees, shrubs, and vines in the hedgerow include red maple, black cherry (*Prunus serotina*), **tree-of-heaven (*Ailanthus altissima*)**, **privet**, **multiflora rose**, **winged euonymus**, **Japanese honeysuckle**, **oriental bittersweet**, and **grape** species.



Degraded mixed hardwood hedgerow

Current Use

The Nature Area is used for passive recreation. A trail system allows for exploration of the water resources and plant communities. The major obstacle to public use is that Valley Creek separates the parking lot from almost the entire site. Crossing the

creek is the only way to access the property with the exception of entering on foot from the adjoining trails. This also complicates management of the property because it limits equipment access.

Stewardship Issues, Opportunities, and Recommendations

The following stewardship issues and opportunities were observed during the site visit to the Nature Area on October 23, 2012. They are described in the context of two overall stewardship goals for the natural areas on the property: (1) to provide a safe and enjoyable environment for passive recreation and educational opportunities; and (2) to protect and enhance plant communities that support resident and migratory wildlife. We have provided a summary of issues and opportunities for the stewardship of the property that are followed by general recommendations to address the issue or fulfill the opportunity.

Invasive Plants

A ubiquitous problem encountered in the stewardship of natural lands in southeastern Pennsylvania – and increasingly recognized as a threat worldwide – is the presence of invasive plant species. An invasive species is one that rapidly spreads and outcompetes multiple native species, chiefly because of the absence of predators, pathogens, and herbivores that keep it in check in its native range. Most invasive plants are particularly well adapted to colonize disturbed areas. In southeastern Pennsylvania, disturbance from human activities, particularly sprawl, coupled with the rich horticultural history of the southeastern counties, has afforded numerous invasive species the opportunity to become well established throughout the region. Even though the occasional immigration of new species into plant communities is a normal process, the current high rate of introduction – fueled by the planting of exotic (non-native) species for horticulture, wildlife management, and erosion control – is threatening the integrity of native plant communities and lowering native biodiversity. Not only do invasive plants alter the makeup of the plant communities on a site, but they also may affect soil

chemistry and hydrology and are usually less beneficial to wildlife than the native plants they replace, contributing further to the loss of biodiversity.

Meadows, forest edges and gaps, and hedgerows are most impacted by invasive plants because of the higher availability of light. Vines such as **oriental bittersweet** and **grape** are commonly seen climbing into canopy and understory trees in these areas. Aggressive vines can greatly raise a tree's vulnerability to blowdown through the increased weight (that elevates the tree's center of gravity) and by the vast increase in surface area (that acts to collect wind, ice, and snow). Vines can also smother tree seedlings and prevent them from reaching the canopy to replace trees felled by old age, windthrow, or pathogens.

Within the Nature Area, the mature and maturing terrestrial and floodplain forests are slightly to moderately impacted by invasive plants in general. The old field/early successional forest, terrestrial meadow, and wet meadow/marsh are moderately to severely impacted and the hedgerow is severely impacted by invasive plants.

RECOMMENDATIONS

Since the diversity of native species in a system is vital to providing suitable habitat for resident and migratory wildlife, as well as providing an enjoyable environment for community residents, we suggest the following measures to control invasive plant species at Paradise Valley Nature Area. In general, it is best to address invasive plant control with a *top-down* (starting in the canopy and working down through understory, shrub, and groundcover layers), *least-first strategy* (starting in the least impacted areas).

When considering invasive plant control, it is important to keep in mind that effective control of invasive plants, especially in the understory, shrub, and groundcover layers of the forest, will only be possible if implemented in conjunction with a deer management program (see "Forest Sustainability" section below). It is also important to note that the extensive edge area and seed sources in the region and the prolific nature of these plants guarantee that even with complete eradication on the property, invasive species can quickly reestablish themselves as a serious stewardship problem if not monitored and

addressed on a regular basis.

The following invasive management recommendations for the Nature Area are listed in general order of priority. The “Invasive Vegetation Management” section of Natural Lands Trust’s *Stewardship Handbook for Natural Lands in Southeastern Pennsylvania* (2008) also provides guidelines for monitoring and controlling invasive plants typical of the southeastern Pennsylvania landscape.

Any volunteer or contractor used for invasive plant control should be able to distinguish native species from invasive species (e.g., **Norway maple** from native maples). In or near sensitive wetland areas (Valley Creek, the headwater stream, seeps, pool), only herbicides approved for aquatic use (e.g., Rodeo) should be applied.

- Cut vines that are climbing into canopy trees, starting in the interior more intact area of the forest and moving to the forest edges. All **oriental bittersweet** vines should be cut and the cut stump treated with a systemic herbicide, if possible. Because the native grape vine is beneficial for native wildlife, only cut grape vines that are climbing into the canopy of the forests and compromising the structural integrity of native trees. Cut stumps of grape vines can be left to resprout. Care should be taken not to cut any Virginia creeper or poison ivy vines (unless the poison ivy impacts areas of high public use). These are native species that benefit wildlife and rarely become large enough to compromise canopy trees.
- Manage **Norway maple**, **amur corktree**, and **tree-of-heaven** with a basal bark application of triclopyr ester (e.g., Garlon 4) herbicide and basal oil. We recommend using a 20–30% mix of triclopyr in basal oil applied in a band around the base of the trunk, avoiding runoff. Depending on the season, it may take time for this treatment to work; for example, a winter application may result in leaf out in spring, followed by defoliation. Once the trees are dead, they can be cut down (if they create a potential hazard for visitors) without stimulating suckering or left as snags for wildlife habitat. Young tree-of-heaven (up to 1–2 feet) can be pulled by hand, as long as roots are not broken.

- Manage the small population of **common reed** (*Phragmites australis*) in the early succession portion of the floodplain forest. Plants can be managed by (a) cutting in the fall for at least two sequential years then removing cut materials from the site; and/or (b) cutting and injecting individual culms (stems) with a glyphosate herbicide suitable for wetland areas (e.g., Rodeo).
- Control **garlic mustard** in the mature forest. This is best done in early spring when the plant is in flower. Plants should be pulled, bagged, and removed from the site. This is a great activity for volunteers of all ages.
- Manage **privet**, **shrub honeysuckle**, **autumn-olive**, and **winged euonymus** by cutting to the stump and applying a glyphosate herbicide to the cut stump. Alternatively, after cutting, the shrub can be left to resprout and the young foliage treated with a glyphosate herbicide. In areas near water resources, a glyphosate herbicide (e.g., Rodeo) suitable for wetland habitats should be used.

The management of **multiflora rose** throughout the property can be a lower priority because this species will likely be weakened by the rose rosette disease, which is spreading throughout the region.

- In gaps where invasive shrubs have been removed, replant with native species to improve wildlife value and protect exposed slopes from erosion. Development of a forest management strategy that identifies phases for the removal of tree and shrub invasives over several years will help to spread out costs and to maintain nesting sites for resident and migratory birds until native replacements are established. The “Native Plant Materials” section of Natural Lands Trust’s *Stewardship Handbook for Natural Lands in Southeastern Pennsylvania* (2008) also provides a list of native species that are appropriate for the natural areas in the preserve.

New plantings should be monitored for deer browsing. If needed, protect newly planted trees from deer browse using tree shelters for plants less than 6 feet in height. For trees over 6 feet in height, tree wraps limit damage from buck rubbing. Newly planted shrubs should be protected with wire fencing.

Native Meadow Management

Native meadows are characterized by a diverse structure and composition of short and tall grasses and native wildflowers that provide feeding and nesting habitat for declining grassland birds (e.g., Eastern Meadowlark, Bobolink) and small mammals, as well as nectar sources for numerous butterflies and other insects. Native meadow species are naturally adapted to the soils and climate of our region and can, if necessary, survive on very little rain (and no irrigation). Once established, native meadows usually require just one mowing each year to limit encroachment by trees and shrubs.

The large meadow increases the diversity of habitat within the Nature Area, increasing its ecological, aesthetic, and educational benefits. However, it is difficult to manage given the access issues for equipment. If this issue can be resolved by a stream crossing or improved access from a neighboring property, maintaining the meadow would involve the least resources and allow the township to address larger issues (invasive plants, deer) throughout the property. Without equipment access, more intensive management will be required to address invasive plants and to help speed succession to forest.

The northern section of the meadow receives water from the headwater streams flowing from the adjacent forest. One management option for the meadow there is to construct a small seasonal wetland to benefit amphibians and waterfowl by capturing the water behind a small berm.

RECOMMENDATIONS

- Resolve access issue.
- With equipment access, mow the meadow annually in March. Mowing will reduce woody vegetation encroachment and promote native species diversity in these habitats. Competition for native grasses and forbs in the old field will be reduced. Mowing at this time of year minimizes impact on the nesting and foraging activities of native wildlife (birds, small mammals, butterflies) and often allows for easy equipment access if the ground is still frozen. For more information about establishing and managing native meadows, see the “Meadow Management” section of Natural

Lands Trust’s *Stewardship Handbook for Natural Lands in Southeastern Pennsylvania* (2008).

- Monitor for invasives and spot treat with herbicide as necessary.
- If access remains problematic, consider the option of reforesting the meadow.
- Consider creating a wetlands in the northern section by capturing the headwater streams emanating from the hillside seeps. Funding may be available through the US Fish & Wildlife Service Partners for Fish and Wildlife Program.

Forest Sustainability

Deer overabundance is a problem that affects most natural areas in our region. The habitat value of forests is greatest where there is an extensive unbroken canopy of mature trees with a diversity of native understory species that includes tree, shrubs, and herbaceous plants. Deer impact forest health by consuming seeds (particularly acorns) and browsing on seedlings, shrubs, and herbaceous plants. As deer population density increases, this activity can adversely affect populations of other wildlife species, especially songbirds, through a decrease in plant species and structural diversity within the forest. High deer populations are not only a threat to forest sustainability, but also to human health. Deer are a host to black-legged ticks, the primary vector of Lyme Disease and their movement at night frequently results in collisions with vehicles.

The recommended deer density to allow for adequate tree regeneration is 20 deer per forested square mile (one deer per 32 acres). However, to perpetuate a healthy native forest with a diversity of native shrubs and wildflowers, the recommended deer density is 10 deer per forested square mile (one deer per 64 acres). With approximately 20–30 acres of forest cover, the Nature Area can only sustainably support one deer part of the year.

Another method for determining the level of deer impact that is gaining favor with natural resource professionals (gathering accurate, useful deer density information is often complicated and expensive) is the condition of forest vegetation. A healthy mature

forest has structural diversity with well developed herb, shrub, understory, and canopy layers that create a dense curtain of foliage during the growing season. There should be abundant natural regeneration (seedlings and saplings), particularly in forest gaps.

The mature forest within the Nature Area shows fair structural and species diversity at this time. Currently, deer overbrowsing is having a moderate impact on regeneration in the forested areas, with the shrub and groundcover layer moderately browsed. Gaps in the forest lack any advance regeneration.

RECOMMENDATIONS

Our recommendations for addressing the impact of deer overbrowsing are provided below. Additional information about Natural Lands Trust's deer management program and deer management opportunities are included in the "Deer Management Options" section of Natural Lands Trust's *Stewardship Handbook for Natural Lands in Southeastern Pennsylvania* (2008).

- Continue the deer management program at the Nature Area.
- Monitoring the effects of deer browsing and educating the public about the effects of overabundant deer will be critical to the success of any future deer management program in the Township. One option to visually demonstrate and monitor the impact of deer browsing is the installation of small (10 meters square) exclosures. The growth of vegetation within these exclosures is often dramatically different than in surrounding areas with unrestricted access by deer. Ideally, exclosures (with accompanying interpretive signage to educate the public about the importance of reducing the deer population to maintain forest health) should be erected in forested areas on relatively flat ground and near public trails. The setup and monitoring of deer exclosures is a valuable educational exercise that could be undertaken by local schools and colleges.

Water Quality and Ecology

Valley Creek and the seep-fed headwater streams are generally protected by a riparian buffer of trees, shrubs, and meadow vegetation. Riparian buffers help to safeguard water quality, stabilize stream channels, and maximize infiltration and groundwater recharge that feed the stream. The riparian vegetation also benefits the aquatic ecology by shading the stream and adding organic matter (leaves, branches) that provide structure and nutrients for aquatic organisms. Preserving this cover by addressing the issues above will maintain these benefits.

The main impact on the water quality is soil erosion from trails and gravel from the parking lot entering Valley Creek. The parking lot surface has a gravel surface which enters Valley Creek during flooding events. This gravel is transported and deposited downstream. With the gravel in place along the creek bed, additional materials can collect and cause flooding along with change in velocity and course of the creek at that location.

Sections of the current trail system are located on very steep slopes. Due to foot traffic and stormwater runoff, soil erosion is occurring along these sections of the trail system. In addition, the trail system runs through the area where multiple seeps and headwater streams are located. These are sensitive areas where normal trail use can also cause soil erosion. With the development of a trail on steep slopes and wet areas, the natural surface drainage patterns are interrupted



Trail erosion

which then intercept more surface water, further accelerating soil erosion. Not only does the trail itself endure irreversible changes, the soil transported off of the trails can cause problems elsewhere as it may smother vegetation, provide a place for invasive plants to thrive, or be washed into waterways where it can change the drainage patterns of the streams and harm aquatic organisms and vegetation. Once erosion begins, efforts to correct the cause need to be undertaken quickly.

Another impact may come from increased use of the Nature Area from the parking lot. Currently there are no structures in place for crossing Valley Creek by foot or for maintenance vehicles. As more through-creek crossings occur, soils and sediments from the creek bed will be dislodged and transported downstream and may cause a deepening of the creek bed. As this occurs, the location of the crossing will change and the process will be replicated again and again.

RECOMMENDATIONS

The property should be carefully managed to protect and enhance the water quality of on-site and downstream water resources associated with Valley Creek, including headwater seeps, and to realize the many wildlife benefits and ecosystem services these resources provide.

- Consider paving options for the parking lot to keep gravel from entering Valley Creek.
- Re-route existing trails where needed, using cross-slope routes and switchbacks to minimize stormwater surface flows.
- Re-locate hillside trail to an area above the headwater seeps.
- Consider options for crossing Valley Creek from the parking lot to access the trail system and meadow for maintenance. Some options may include:
 - Installing a ford for maintenance vehicles and allowing visitors to cross with wet feet.
 - Installing concrete stepping stones for foot traffic; may be in conjunction with a ford.

- Building a bridge for both maintenance vehicles and foot traffic.

Wildlife Enhancement

Additional opportunities for enhancing wildlife habitat on the property are described below:

RECOMMENDATIONS

- Leave dead down wood within the forests as it serves as the base of the forest food web and a nutrient reservoir for living trees. Dead standing trees (snags) should also be left if they are located in areas that are not heavily used by the public. Snags benefit wildlife by providing cavities and loose bark for nesting and shelter, perching sites, and decaying wood for numerous insects that provide food for woodpeckers and nuthatches. See attached article “Critter Condos-Managing Dead Wood for Wildlife” for more information about these wildlife enhancements.
- Consider installing nest boxes for Wood Ducks along Brandywine Creek. See attached article published by the Natural Resources Conservation Service and the Wildlife Habitat Council.
- Consider installing nesting boxes for Eastern Bluebirds and American Kestrels along the forest edge. Bluebirds and American Kestrels nest in tree cavities, but in the absence of these natural niches, these species readily adopt nest boxes to raise their young and reduce competition for cavities with other birds. See two attached articles for more information: (1) “Artificial Nesting Structures” published by the Natural Resources Conservation Service Wildlife Habitat Management Institute and the Wildlife Habitat Council, and (2) “Managing Habitat for American Kestrels” Pennsylvania Wildlife Fact Sheet No. 13.

Hazards and Debris

There is a potential for hazard trees along roadways, trails, and other locations where the public might pause for any extended time – such as a sign, bench, or picnic table. As a landowner, East Bradford Township is responsible for preventing trees and

branches from falling into the adjacent right-of-way on the bordering roads through the monitoring and removal of hazard trees (trees that due to structural defects could fall in part or whole on a “target” such as a road, residence, or person).

Various types of debris and streamside trash were seen on the property. Barbed wire remnants were also seen attached to trees in the mature forest. Additionally, an accessible well head is located in the vicinity of the wet meadow/marsh.

RECOMMENDATIONS

- Secure or retire well head to prevent groundwater contamination.
- Monitor potential hazard tree areas along public roads and trails (places such as benches, picnic tables, or interpretive signs where people may linger) by foot once each year and following severe storms and address potential hazard trees (pruned or removed) as needed. Ideally, a certified arborist should be hired to complete this task and address any identified hazards through pruning or removal. See the “Hazard Tree Monitoring Program” section of the Natural Lands Trust’s *Stewardship Handbook for Natural Lands in Southeastern Pennsylvania* (2008) for information about procedures for hazard tree monitoring. In addition, Morris Arboretum in Philadelphia offers courses on identifying hazard trees.
- Cut notches in any downed trees to allow passage through if they lie in the trailway or present a hazardous situation.
- Remove scattered debris, streamside trash, and barbed wire.

Boundary Encroachment

Proper maintenance of property boundaries is an important stewardship priority on open space parcels. These undeveloped properties are often subject to unwarranted (and frequently unintentional) use by neighbors (e.g., dumping of yard waste) due to poorly marked boundaries.

RECOMMENDATION

- Where needed, survey and post the boundaries of the Nature Area to assist in preventing encroachment issues and to inform passing motorists about the location of the public open space. Signs could be small (3 ¾" x 3 ¾", 0.12 gauge aluminum diamond shape signs) and should indicate East Bradford Township ownership. Posting every 50–100 feet is adequate and particularly important where the property abuts private land.

Environmental Education and Volunteers

The natural communities, scenic landscape, and trail system through the Nature Area provide good opportunities to connect the community to their natural surroundings and provide meaningful volunteer and educational experiences. The following suggestions could enhance community educational opportunities on the property.

RECOMMENDATIONS

- Consider installing a kiosk at the parking area to display a trail map, photos of wildlife, and upcoming events as well as volunteer events.
- Install interpretive signs in key areas along the trail system that describe the natural resources (e.g., vegetation communities, wildlife habitat, floodplains, water quality) or stewardship initiatives (e.g., deer management, invasive plant management, meadow mowing, trail re-alignment).
- Label healthy examples of native trees along the trail system with scientific and common names in a manner that will not harm the trees.
- Invite Township residents to participate in natural areas stewardship projects. Schedule “workdays” on environmentally friendly days such as Earth Day or Arbor Day. Volunteers, including local scout troops, hiking clubs, birding groups, schools, and businesses could be recruited to assist with projects recommended in this report, including:
 - o Cutting vines from trees



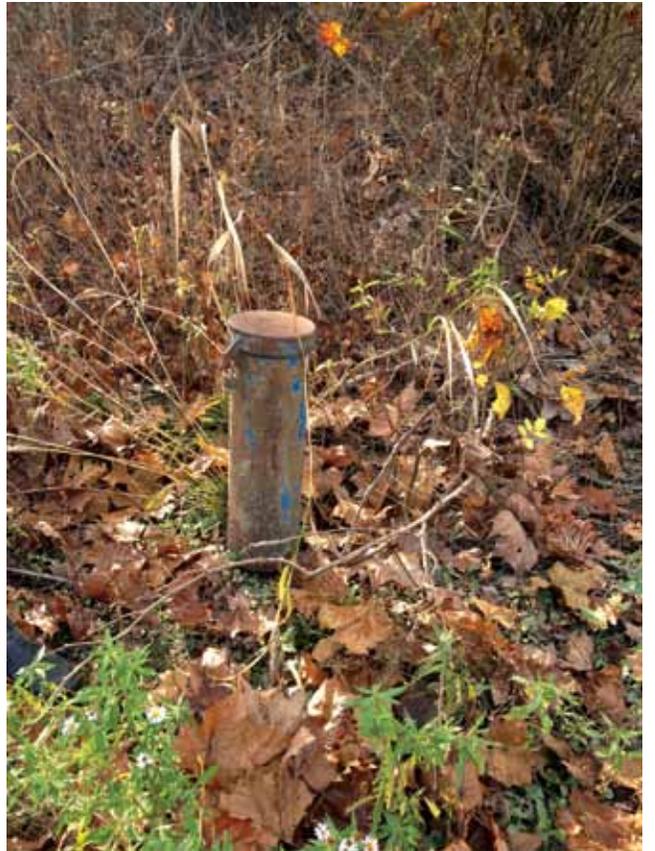
Debris in forest



Streamside trash



Barbed wire in oak



Well head

- o Pulling **garlic mustard**
 - o Planting forest gaps with native species
 - o Building, installing, and maintaining a kiosk
 - o Building and installing nesting boxes
 - o Maintaining trails
 - o Removing debris and streamside trash
- Encourage local schools, environmental groups, and birding groups to schedule educational walks on the property including water studies (chemistry, aquatic invertebrates), native plant and tree identification, and bird identification.

Potential Funding Sources for Stewardship Projects in East Bradford Township

POTENTIAL FUNDER	PROGRAM
PA Department of Conservation and Natural Resources (DCNR) <i>Contacts:</i> Carolyn Wallis 215-560-1182 Drew Gilchrist 215-560-1183	<i>Community Conservation Partnership Program</i>
	<i>PA Recreational Trails Program</i>
PA Department of Environmental Protection (DEP)	<i>Environmental Education Grants Program</i>
	<i>Growing Greener Watershed Grants</i>
	<i>Nonpoint Source Implementation Program (Section 319)</i>
PECO <i>Contact:</i> Holly Harper, Administrator 610-353-5587	<i>Green Region Open Space Program</i>
Local Corporations	<i>Corporate Charitable Giving Programs</i>
	<i>Employee Volunteer Programs</i>

Stewardship Priorities and Implementation Schedule

PRIORITY ¹	STEWARDSHIP RECOMMENDATIONS	SEASON	WHO COULD IMPLEMENT?
<i>Invasive Plants</i>			
1	Cut vines on canopy trees starting in forest interior	Anytime	Volunteers
1	Manage Norway maple, amur corktree, and tree-of-heaven	Fall	Municipal staff ² or contractor
1	Manage common reed	Fall	Municipal staff ² or contractor
1	Manage garlic mustard	Early Spring	Volunteers
1	Manage invasive shrubs in forest	Fall	Volunteers
2	Replant gaps in forest with native shrubs and trees	Spring or Fall	Volunteers
<i>Native Meadow Management</i>			
1	Resolve access issue	Anytime	Municipal staff
1	Mow the meadow annually	Early Sprng (March)	Municipal staff or volunteers
1	Monitor for invasive vegetation and spot treat	Anytime	Municipal staff ² or contractor
2	Consider creation of wetland	Anytime	Municipal staff
<i>Forest Sustainability</i>			
1	Continue Deer Management Program	Winter	Permitted hunters
2	Public education about the effects of overabundant deer	Anytime	Municipal staff, contractor, or volunteers
<i>Water Quality and Ecology</i>			
2	Consider paving options for parking lot	Anytime	Municipal staff
1	Re-route and re-locate trails	Summer, Winter	Municipal staff or volunteers
1	Consider options for crossing Valley Creek	Anytime	Municipal staff or contractor

Stewardship Priorities and Implementation Schedule (Continued)

PRIORITY ¹	STEWARDSHIP RECOMMENDATIONS	SEASON	WHO COULD IMPLEMENT?
Wildlife Enhancement			
2	Enhance old growth forest features by leaving down wood and snags	Anytime	Municipal staff
1	Install nesting boxes for Bluebirds, Kestrels, and Wood Ducks	Late Winter	Volunteers
Hazards			
1	Close well head	Anytime	Municipal staff
1	Monitor roadside boundaries and high use areas for hazard trees	Late Winter–Early Spring	Municipal staff
1	Remove scattered debris, streamside trash, and old barbed wire	Anytime	Municipal staff and volunteers
2	Cut notches in downed trees within trailways to allow passage	Anytime	Municipal staff
Boundaries			
1	Post boundaries to assist in preventing encroachment	Anytime	Municipal staff
Public Access and Environmental Education			
2	Install kiosk at parking area	Spring	Municipal staff and volunteers
3	Install interpretive signs in key areas along loop trail	Spring–Fall	Municipal staff
3	Label healthy examples of native trees	Spring–Fall	Municipal staff and volunteers
2	Invite residents to participate in stewardship projects	Spring–Fall	Municipal staff (oversees)
2	Encourage local groups to schedule nature walks	Spring–Fall	Municipal staff (oversees)

¹ 1 = high priority (implemented within 1-3 years); 2 = mid-priority (implemented within 3-5 years);
3 = low priority (implemented within 5-10 years)

² Must have PA Pesticide Applicator Certification to apply herbicides on public property



Natural Lands Trust

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