HELLAM HILLS CONSERVATION AREA ECOLOGICAL REPORT

August 2021

ABSTRACT

After one full growing season (2021), we have prepared a rapid ecological assessment of the Hellam Hills Conservation Area (Hellam Hills Nature Preserve and Wizard Ranch combined). This report details observed biodiversity, identifies ecological stressors, and offers a suite of restoration and stewardship recommendations to promote increased diversity and abundance of native plants and animals in this amazing space.

Resource Environmental Solutions

On behalf of Simone Collins and The Lancaster Conservancy

Contents

Executive Summary

The Lancaster Conservancy (LC) recently acquired two new parcels referred to as Hellam Hills and Wizard Ranch, collectively referred to as the Hellam Hills Conservation Area. Both sites are located near the Susquehanna River in eastern York County, Pennsylvania. These exciting additions to their portfolio have an interesting land use history and require adequate analysis of their biotic and abiotic components to make informed decisions about management of flora and fauna, stewardship, and public access. In support of this, LC has hired a team of professionals led by Simone Collins (SC) to develop site master plans. As the team ecologists, Resource Environmental Solutions (RES) conducted a series of rapid assessments and natural resource inventories to provide direct guidance to the SC designers. In addition, these data can also be used for educational and interpretive elements, future research initiatives, and serve as a baseline for future plant and animal inventories to denote changes in ecological function and diversity as the Plan is implemented over time.

The area has two unique sites that will be addressed individually: Hellam Hills Nature Preserve (725 acres) and Wizard Ranch (247 acres). Intact forest ecosystems include chestnut oak dry ridge forest, rich mesic mixed hardwood forest, and ash-maple-black willow swamp. Emergent wetlands are limited but present in small springs, seeps, and within floodplains along stream reaches. Evidence of logging and agriculture persist in the current plant communities and landforms/topography. Hellam Hills Nature Preserve is supporting robust interior forest breeding songbird populations. The hay fields at Wizard Ranch currently do not support any breeding grassland obligates. Invasive plant species and over-grazing by white-tailed deer are the largest threats to biodiversity at both locations. Despite these issues, both sites are supporting relict intact plant communities, iconic bird, mammal, and reptile species, and have the potential to support myriad additional native plants and wildlife by implementing targeted stewardship actions. This report details biodiversity observed over the past 8 months and provides guidance for improving diversity and enhancing the visitor experience from a natural history perspective.

Introduction

An ecological assessment was conducted on LC's 970-acre Hellam Hills Conservation Area to inform a Master Site Plan. The Conservation Area contains two distinct sites, Hellam Hills and Wizard

Ranch which will be discussed by site and in how they relate to one another. For ease of assessment and to account for variability, the sites have been categorized into management units that are described further along in this report. The properties were acquired by the conservancy between 2017 and 2019. The area sits in York County, PA within the Susquehanna Watershed and the Pennsylvania Department of Conservation and Natural Resources (DCNR) designated Susquehanna Riverlands Conservation Landscape (SRCL). The Preserve is also nested within the Captain John Smith Chesapeake National Historic Trail corridor, a National Park Service designated National Water Trail that encompasses the entirety of Susquehanna River and Chesapeake Bay. Furthermore, the area is also embedded within the Susquehanna National Heritage Area, the nation's 55th National Heritage Area.

Hellam Hills Nature Preserve is comprised of 724 acres of contiguous forested land that has historically been used by the public for outdoor recreation although never a formal park in the past. A large portion of the property was owned by the Marietta Gravity Water Company that was informally used by hunters and hikers. Some of the land was previously held by individual landowners. In 2018, the Conservancy and a local chapter of the Mason-Dixon Trail System rerouted a 2.5-mile section of the trail off a public roadway and across the Hellam Hills Nature Preserve.

Wizard Ranch Nature Preserve is 248 acres of natural land acquired by the conservancy in 2019 from the Boy Scouts of America New Birth of Freedom Council. The land has been used by the Boy Scouts for scouting activities and safaris since 1960 and will continue to do so under the new ownership and land protection. The site comprised of a dynamic mix of forest, wetlands, and hay fields.

To facilitate this Master Plan following sound ecological principles and following the mission of the Conservancy, "Providing wild and forested lands and clean waterways for our community. Forever.", RES followed established, peer-reviewed methodology to perform a rapid ecological assessment of the area to quantify what currently exists, characterize habitat, and provide recommendations for ecological uplift and conservation. In concert with other project team members and key project stakeholders, RES has developed a custom study of this area to establish a baseline data set of wildlife, plants, water and wetland resources, upland habitat types, and other important variables. These data constitute a snapshot of the site. Data collection was aligned with budget, timeline, and maximizing the seasonal probability of detection for a wide range of biota. None of the data sets are comprehensive as this would require additional taxa-specific experts, more survey methods, and significantly more time. Rather, these data allow for well-informed decision making regarding the existing site conditions, its wild inhabitants, and how to improve and steward these communities moving forward. The following report details our selected methods, results, and a set of ecological recommendations for thoughtful management of wildlife populations, botanical diversity, and the creation, stewardship, and protection of a mosaic of habitat types to support these biotic elements at Hellam Hills Conservation Area.

Methodology

Secondary Data

The site has been the focus of a variety of interested parties over the past few years which has resulted in the collection of a variety of data sets that can support this ecological assessment. Various natural history data have been collected prior to our assessment that can aid in understanding the site and save time when analyzing the site. These data sets are referred to as secondary data (pre-existing information). Our collected data in support of this project is referred to as primary data. Secondary data

sets include e-Bird records, plant lists, and other previously collected data sets. We would like to thank all contributors and compilers of pre-existing data in support of this project (see acknowledgments section). Primary data include the following onsite methodologies.

Rapid Ecological Assessment

A team of RES ecologists visited the site in the spring and summer months to walk the site in its entirety in search of indication of various ecological stressors and examples of intact habitat types. ArcCollector was used to spatially align observations throughout the site for aid in mapping and location-specific recommendations. Some of the primary goals of this rapid assessment included:

- Searching for combinations of abiotic and biotic features that might serve as critical habitat for rare, threatened and/or endangered species known to the region
- Locating any intact habitat locations that are free of invasive plant and/or animal pressure
- Locating any representation of forest ecosystems that have all strata present (canopy, understory, and groundstory) and evidence of forest regeneration
- Finding locations that show physical evidence of erosion within the drainage systems on site
- Finding locations of any impediments to drainage/flow or faunal migration within the stream systems
- Identifying sections of forested landscape with need for thinning, clearing, or other timber management needs/opportunities for ecological enhancement
- Documenting invasive plant species populations for development of an invasive species management plan

For succinct alignment of various data sets and recommendations, the site has been separated into distinct Management Units (MUs).

Plants

Timed meanders were the primary method used for botanical data collection within each of the identified MUs on site. This involved setting a fixed time and walking through each polygon collecting notes of species presence and relative abundance per species.

Primary goals for plant surveys were to characterize vegetation communities, locate any rare plants/rare plant habitats, and to document invasive species throughout the preserve.

Birds

RES conducted point counts at 15 locations at Hellam Hills and 11 locations at Wizard Ranch to systematically collect avifaunal data using Unlimited Distance, Single-Observer Point Counts. Point count locations are were selected to represent all onsite habitat types. Since birds are well-documented as indicators of ecosystem condition in all biomes, we have documented bird diversity, abundance, and behaviors within the various onsite habitat types as a method for learning a lot about the site in a streamlined manner.

Ecological Assessment Points

The avifaunal points also served as more intensive botanical inventory plots where species within a 10-meter radius of the point were noted. These observations included to which strata the species belonged (tree, shrub, herbaceous etc.), dominance, abundance, and conservation status. By combining point specific bird and flora observations, habitat health indicators become more robust and can be extrapolated to similar habitats throughout the area.

Herpetofauna

A robust survey for documenting reptiles and amphibians (collectively, herpetofauna) often requires multiple survey methods and significant effort through spring, summer, and fall months. These faunal assemblages have very low detection probabilities and, as ectotherms, are heavily reliant on external variables for metabolic function and life history activities. For this reason, a variety of systematic trapping is often required to confirm presence/absence. While this level of detail is not required for supporting this design, understanding the herpetofaunal community at Hellam Hills Conservation Area as best possible allows us to minimize impacts to existing populations and maximize the integration of critical habitats and safe mobility between these critical habitats by frogs, toads, salamanders, snakes, turtles, and lizards on site. RES has enacted two survey methods on site that do not require scientific collection permits, labor-intensive survey methods, or trapping and tracking infrastructure (ex. pitfall traps, hoop nets, radiotelemetry, etc.). The combination of these survey methods has proven to result in a near-comprehensive (~75% of all species detected) inventory of herpetofaunal assemblage in the region. These methods are described below.

Time (and Area) Constrained Searches (TCS)

TCS involves visiting the site at the proper times of day in spring, summer, and fall months when weather conditions are suitable for reptiles and amphibians to be surface active or concealed on the surface (rather than being underwater, buried in soil, or in burrows). Areas are delineated by the Management Units (and sub-units). Optimal conditions usually involve temperatures between 60- and 85-degrees Fahrenheit with some cloud cover and low to no wind. Precipitation (or recent rain) can be a valuable factor for certain species, with recent rain being ideal. These searches include using binoculars and spotting telescopes to search for basking turtles and snakes in water bodies, carefully searching under cover objects (logs, stones, and debris piles) for concealed snakes, salamanders, and anurans, and carefully searching for active/moving reptiles and amphibians in various habitats. Strict conservation etiquette is enacted when searching, making sure to replace logs and stones as found and carefully removing any found animals prior to replacing these objects to prevent injury of the animals. All found animals are released unharmed at the location where found.

Random Opportunistic Sampling

While on site conducting other data gathering exercises, our lead field biologist would pause to search locations for herpetofauna when conditions (weather, time of day, season, etc.) were appropriate. This involves similar search methods to the TCS methodology but in an opportunistic nature.

Mammals

With a diverse mosaic of habitat types, geology, soils, and other environmental factors, the site has potential to support a wide array of mammal species. Similar to the herpetofaunal approach, we've enacted low-cost and efficient methods to develop a general understanding of the mammal

communities on site without completing a comprehensive assessment using random opportunistic sampling and scat and track analysis.

Scat and Track Analysis

RES biologists and ecologists targeted stream margins, wet soil on trails, and other suitable locations on site to review tracks left by mammals traversing the site. Additionally, any encountered scat, hair, bones, or evidence in the landscape (buck rub, burrows, nests, cavities, etc.) were documented as evidence of mammal presence and, whenever possible, identified to the species level.

Management Units

Following a desktop review of aerial imagery and subsequent ground-truthing, our team has developed management units (Mus) for interpretation and management purposes. Each unit is described by dominant vegetation communities and any prominent natural features, such as rocky outcrops, streams, etc. Ecological restoration recommendations are also organized by each determined MU.

Hellam Hills Nature Preserve

Figure 1 Hellam Hills Nature Preserve Management Units

HMU 1 Dugan Run Floodplain – Dugan's Run begins via springs and ephemeral stormwater drainageways up-watershed to the southwest. The floodplain has been disconnected from the stream due to undercutting/elevation drop in the Run itself. Dewatering of the floodplain has been further impacted by subsequent colonization by invasive shrubs. Few sections of the stream or associated forested floodplain are in structural or vegetative balance. Numerous seeps and springs occur along the reach and provide quality habitat for wetland forbs and stream-associated salamander species.

HMU 2 Norway Spruce Forest – Plantations of spruce surround the upper portions of Dugan's Run. These are overstocked and non-native, resulting in a paucity of native grasses, wildflowers, shrubs, and trees. Areas where blowdowns have occurred are colonized with aggressive and invasive vines and shrubs.

HMU 3 Mesic Forest – This northeast-facing hardwood forest is dominated by tulip trees, maples, oaks, and hickories. Numerous headwater streams and small wetlands are present underneath mature second-growth trees. Most understory shrubs are invasive and few native canopy trees are regenerating due to deer over-grazing. A powerline ROW courses through the northwestern section of the tract and adds both diversity in plant communities as well as a vector for invasive species colonization.

HMU4 Dry-Mesic Mixed Hardwood Forest – Comprised of mainly oaks, hickories, and tulip trees, this second growth forest has a logging history evident in a maze of logging roads. Exposed boulders give way to a dry ridgetop forest community (HMU4A). Monocultures of paw-paw under a chestnut oak canopy indicate deer pressure. There is good habitat for nesting raptors and locally present snake species along this ridge.

HMU 5 Wildcat Run Floodplain – Similar to Dugan Run, this tributary stream is impaired by erosion and man-made manipulations. A previously present dam has been removed which benefits aquatic fauna and will aid in proper stream restoration in coming years. This watershed is supporting a large diversity of amphibians in portions of the stream itself and relict intact seepage wetlands throughout.

Wizard Ranch Nature Preserve

Figure 2 Wizard Ranch Nature Preserve Management Units

WMU1 Accomac Tributary Floodplain- The Accomac Tributary floodplain encompasses the mapped stream and its floodplain as well as a few additional small stream branches that were not included in the

original mapping. The stream is fairly degraded in some sections with erosion caused by scour from the runoff from the fields and other fast-moving rills and human disturbances. As with many areas of Wizard Ranch, the riparian areas around the stream are suffering from an influx of invasive plants.

WMU2 Northwest Forest- The Northwest Forest occurs at the northern property line of Wizard Ranch Nature Preserve. The forest is sloping throughout and steeper in some areas. 2A is a dry mesic hardwood forest that transitions into forested new growth where timber has been harvested more recently.

WMU3 Western Forest- The Western Forest starts with less slope and elevation in 3A to the west of the field however starts sloping toward the stream. As the slope increases. The communities edging the field and the stream represent different communities as can be seen by the subsections on the map (*Figure 2*).

WMU4 Southeast Forest- This management unit contains 4A, a north facing mesic forest that slopes from the fields abutting Accomac Road down to the stream. 4B encompasses the hedgerows that separate the road from the fields.

WMU5 Northeast Forest- This forest represents the most northern end of the site where there is a ridge and then a steep descent towards the Susquehanna River. The stream and floodplain abut 5C while 5A and 5D adjoin fields.

Fields- These fields provide a staging area for the Boy Scouts to camp and gather during their safaris. Some of them are hayed regularly as per agreement with local farmers. They are still the most manipulated areas of the nature preserve.

Results

A total of five separate site visits were conducted to develop the data sets in this report. Each site visit constitutes multiple field days and visited both sites.

Table 1 Survey Dates

Survey Event	Dates
1	October 26, 2020
2	March 17, 2021
3	May 13-14, 2021
4	June 28, 2021
5	July 15, 2021

Hellam Hills

Plants

A total of 148 plant species have been observed over 5 site visits (see Table 1). While just 30 of the species are considered invasive- many of these are dominants (most dense within communities as well as most widely distributed in some instances). Some consistently pervasive invasives throughout the site include Japanese stilt-grass (*Microstegium vimineum*) and Tree of Heaven (*Ailanthus altissima*). Please

see management unit descriptions for more on plant communities. A full species list can be found in Appendix I.

Hellam Hills Vegetation			
	Native	**Invasive**	**N/I**
Tree	25	6	0
Shrub	11	5	0
Forb	58	13	7
Graminoid	11	2	2
Vine	4	4	0
Sub-Total	*109*	*30*	*9*
TOTAL	**148**		

Birds

A total of 144 bird species were observed via point count on site (see Appendix II for the full species list) out of 318 individual birds observed. These observations were made during fall migration, spring migration, and breeding season. Of the species observed, 65 were confirmed or probable breeders per the PA Breeding Bird Survey behavior codes. The most frequently observed birds were red-eyed vireo, ovenbird, eastern towhee, scarlet tanager, and wood thrush. The site is supporting a relatively robust interior forest breeding bird community. Worm-eating warblers are maintaining territories along the ridge lines and steep slopes. Kentucky warblers and hooded warblers are occupying bottomlands and lower elevation shrub thickets in impressive densities for the region. Acadian flycatchers are breeding in the forested sections of Dugan Run. Edge habitat associated with the powerline ROW and roads on site are also providing critical nesting habitat for indigo buntings, great-crested flycatchers, brown thrashers, common yellowthroats, and blue-winged warblers (in addition to hooded and Kentucky warblers).

Herpetofauna

The site is mostly forested with significant coarse woody debris, leaf litter, and small canopy breaks/disturbances. There are two streams that are both supported by seepage wetlands. A rocky outcrop runs the primary ridge on the site as well. These are all critical habitat features for regional herpetofauna. To date, our team has observed a total of 7 reptiles and 12 amphibians at Hellam Hills (Table 2). We suspect the actual diversity to be greater despite observed impacts to onsite critical habitat (i.e. logging roads, erosion, invasive plants, damming in streams, shading of exposed rock outcrops by paw-paw and tree-of-heaven, and population imbalances of keystone species).

Table 2. Herpetofauna Observed at Hellam Hills During Ecological Assessment

Animal Group	Common Name	Scientific Name
Salamander	eastern redback salamander	*Plethodon cinereus*
Salamander	northern two-lined salamander	*Eurycea bislineata*
Salamander	northern dusky salamander	*Desmognathus fuscus*
Salamander	northern slimy salamander	*Plethodon glutinosus*
Salamander	spotted salamander	*Ambystoma maculatum*
Salamander	eastern newt	*Notophthalmus viridescens*
Anuran	American toad	*Anaxyrus americanus*

Anuran	northern spring peeper	*Pseudacris crucifer crucifer*
Anuran	northern gray treefrog	*Hyla versicolor*
Anuran	pickerel frog	*Lithobates palustris*
Anuran	wood frog	*Lithobates sylvaticus*
Anuran	northern green frog	*Lithobates clamitans melanota*
Turtle	eastern box turtle	*Terrapene carolina carolina*
Lizard	northern five-lined skink	*Plestiodon fasciatus*
Snake	northern brown snake	*Storeria dekayi*
Snake	northern ringneck snake	*Diadophis punctatus edwardsii*
Snake	eastern garter snake	*Thamnophis sirtalis sirtalis*
Snake	northern black racer	*Coluber constrictor constrictor*
Snake	eastern ratsnake	*Pantherophis alleghaniensis*

Rocky outcrops on site could be critical denning and gestation sites for regionally present venomous species (northern copperhead and timber rattlesnake). Neither species were observed but a targeted survey for these species may reveal an extant population. Both species are in decline in our region and require habitat types that are iconic to the river bluff and forested communities native to the area. Timber rattlesnakes are on the edge of their range here which elevates the conservation need. We recommend assuming these species as present in order to enact some habitat restoration that would benefit these species as well as have other benefits to the ecosystem and viewsheds on the site (ex. removing colonies of paw-paw and canopy trees that are currently shading these boulder fields and outcrops).

Mammals

Some mammals can prove difficult to locate due to nocturnal/crepuscular activity periods, secretive movements, and other factors. Therefore, we rely on a variety of methods to locate evidence of mammals, such as dens, tracks, scat, and hair. A total of 13 mammal species have been observed on the site during this effort (Table 3). Evidence of an overpopulation of white-tailed deer (*Odocoileus virginianus*) is evident throughout the site. It is very likely that other species, including bobcat (*Lynx rufus*), fisher (*Pekania pennanti*), and gray fox (*Urocyon cineroargenteus*), may currently occupy the site as well as additional small mammals.

Table 3. Mammals Observed at Hellam Hills During Ecological Assessment

Size	Common Name	Scientific Name	Notes
Small	deer mouse	*Peromyscus sp.*	under natural cover
Small	short-tailed shrew	*Blarina brevicauda*	found along trail
Small	eastern chipmunk	*Tamias striatus*	common
Small	eastern red squirrel	*Tamisciurus hudsonicus*	in spruce areas
Small	eastern gray squirrel	*Sciurus carolinensis*	common
Medium	Groundhog	*Marmota monax*	open edges
Medium	Virginia opossum	*Didelphis virginianus*	common
Medium	Raccoon	*Procyon lotor*	common
Medium	eastern striped skunk	*Mephitis mephitis*	2 individuals observed
Medium	red fox	*Vulpes vulpes*	scat, tracks, and 2 individuals observed
Large	eastern coyote	*Canis latrans*	scat and tracks
Large	white-tailed deer	*Odocoileus virginianus*	dense population
Large	black bear	*Ursus americanus*	scat

Hellam Hills Ecological Descriptions and Recommendations by Management Unit

Basic descriptions of each management unit are provided below. Following each description are ecological management recommendations specific to the MU. These may be for the purpose of overall ecological health, restoration of historically present conditions, in direct support of specific animal groups or targeted species, or for other reasons.

Universal recommendations that apply to all units include:

- Invasive species management
    - Control Microstegium on logging roads and trails
    - Cut and stump treat invasive shrubs in the winter
- Leave downed woody debris in the forest
- Promote tree-roosting bat habitat
    - Leave dead snags
    - Plant shagbark hickory
    - Seed open areas with native wildflower/grass mix to increase foraging habitat quality
- Obtain and store native seed mixes for all onsite habitat types as well as native annual cover crop (ex. *Elymus virginicus* for uplands, *Elymus riparius* for floodplains and bottomlands) for seeding into all areas after invasive species removal
- Protect all planted woody material with individual protection (tree cages) or plant in clusters with larger fencing around these areas

HHMU1A Dugan Run Floodplain-

This tributary stream flows west to east across the southern part of the site before emptying into the Susquehanna River. Stream channel morphology is evident in multiple small reaches within the planted Norway Spruce parcel in the southwest (MU2) that converge prior just crossing under Furnace Road. At this stage there is already stream bank instability and channel incising occurring. Upon emptying from under the road the stream is met by another seepage wetland before coursing deeply into the floodplain with evidence of massive erosion. The stream bed is full of road debris for at least 150 meters downgrade from Furnace Road. The stream flattens out and runs through a somewhat intact riparian forest where Acadian flycatchers and Louisiana waterthrush are breeding.

Recommendations for HHMU1A

- Develop a stream-wide restoration plan
    - To include streambank stabilization, streambed elevation (where appropriate), grade-control structures (ex. cross vanes and beaver dam analogs), invasive species management, etc.
    - Apply for grant support and bring in relevant partners
- Coordinate with municipality for MS4 credit for lbs of sediment removed
- Improve hydrology in stream-associated wetlands – monitor changes in plant community

HMU 1B North-facing Seepage Wetlands

A combination of stormwater surface flow over 2B and groundwater seeping out at the tow of the slope is producing small wetlands and channelized conveyance at the margins of 1A. Some areas of floodplain between the toe-of-slope wetlands and the primary channel are supporting muck soils (shallow to mineral soil). While some native plants are present such as Caltha palustris and various cress species, privet (*Ligustrum vulgare*), winged euonymus (*Euonymus alatus*), and buttercup (*Ficaria verna*).

Numerous amphibians were observed in this area, mostly northern green frog (*Lithobates clamitans melanota*) and American toad (*Anaxyrus americanus*).

Recommendations for HHMU1B

- Control invasive shrubs. Seed/plant OBL shrubs to aid in preventing recolonization
- Monitor hydrological changes from floodplain reconnection
- See HHMU2B for surrounding upland buffering

HHMU2A, 2B, and 2C Norway Spruce Forest Area

The area has been planted with Norway spruce and other conifers but is aging out and overcrowded. Canopy gaps are typically populated by colonizing invasive plants, such as multiflora rose (*Rosa multiflora*), oriental bittersweet (*Celastrus orbiculatus*), grape vines (Vitis spp.), and an occasional native like red maple (*Acer rubrum*). Pockets of headwater wetlands are present and dominated by invasive grasses. Deer herbivory is evident in the simplified groundstory and lack of native woody regeneration. Conifer areas can be valuable for turkey and deer in the winter months. Winter flocks of finches and juncos were found in this area. Stands should be thinned to control invasives and open the canopy to allow light penetration in overstocked areas.

Recommendations for HHMU2

- Continue white-tailed deer hunting in this area and consider extending hunting across Furnace Road
- Selectively thin spruce trees OR remove in full sections followed immediately by planting white pines, oaks, birch, and hemlock as well as dogwoods, viburnums, and laurels
    - Start in areas of MU2B nearest the wetland seeps to stabilize soil and allow for emergent wetland plants to get more light exposure and buffer margins to HHMU1A with increases in groundstory and shrub species
- Remove all invasives
    - Winter brush understory trees/shrubs (cut and stump treat)
    - Spot spray herbaceous invasives, overseed with native mix
    - Design space to provide forage for deer as well as other wildlife species

HHMU3 Wet Mesic Mixed Hardwood Forest

This section of woods consists of a mosaic of wet woods and upland sloped hardwood forest types. Contributing Wildcat Run headwater tributaries derive from this MU (HHMU3B). Evidence of attempts to drain the wetland in previous years is evident in the channelized nature of some of these high-order streams. Tree species are diverse in this unit, with sugar maple (*Acer saccharum*), red maple (*Acer rubrum*), green ash (*Fraxinus americanus*), tulip poplar (*Liriodendron tulipifera*), black cherry (*Prunus serotina*), red elm (*Ulmus rubra*), various hickories (*Carya* spp.), oaks (*Quercus* spp.), and hop hornbeam (*Ostrya virginica*) all being observable. The shrub layer is mostly bush honeysuckle (*Lonicera mackii*), Japanese barberry (*Berberis thunbergii*), and multiflora rose (Rosa multiflora) and will require a concerted effort to remove. Despite a paucity of native shrubs, this area is supporting a healthy population of Kentucky and hooded warblers. Any efforts to eradicate shrubs in this section should take into consideration these nesting migrants. Most ash trees are dead. This has caused open sunny areas within the mosaic. The upper and western sections of this unit have a powerline right-of-way running through them. Planting efforts (trees, shrubs, and native seed) have been conducted along this ROW. Some areas are heavily invaded by Japanese stilt grass (*Microstegium vimineum*) and wineberry (*Rubus phonesicolasius*). A small opening along the access road is currently supporting nesting blue-winged warblers, indigo buntings, and brown thrashers.

Recommendations for HHMU3

- Winter brush (cut and stump treat) invasive vines following a phased approach
- Enhance ROW plantings to better promote successional breeding birds and pollinating insects

- Install low-tech grade control elements such as BDAs (Beaver Dam Analogs)
- Discuss with ROW company re-seeding in certain areas to increase pollinators and promote diversity
- Expand meadow/opening area and transition to successional forest and mature second growth in a mosaic

HHMU4 Dry-Mesic Mixed Hardwood Forest

This forested unit runs like a spine through the site, with sloped forest angling south and north and a ridgetop community found in between. This management unit also includes the small but unique river bluff forest and river scour grassland communities located in the northernmost parts of the site. Chestnut oak (*Quercus montana*) dominates the canopy alongside red maple (*Acer rubrum*), red oak (*Quercus rubra*). The north-facing slopes (4C) are holding more moisture and get more shade, resulting in more rich species like sugar maple, basswood, maples, and some oaks. The south facing slope (4B) is surprisingly mesic as well and has a moderately dense shrub understory. There are hooded warblers, Kentucky warblers, and worm-eating warblers nesting on this slope. Numerous trails occur in this section on the old logging roads that are present. A small section of planted conifers is present. Numerous snakes, including black rat snake, northern black racer, eastern milksnake, and eastern garter snake were found in this section. The exposed outcrops may provide critical habitat for northern copperhead and/or timber rattlesnake as well.

Recommendations for HHMU4

- Invasives control
- Reduce/retire trails to promote one fixed trail route

- Clear all tree-of-heaven (Ailanthus altissima) from the woods, especially near Buzzard's Roost to increase aesthetics
- Conduct taxa-specific plant and wildlife studies along river bluff and dry ridge forest communities (targeting RTE species)
    - Potential for rare lithophilic plants and rare snakes

HHMU5 Wildcat Run Floodplain

This MU encompasses all channelized drainage tributaries, wetland seeps, and the primary channel for the Wildcat Run. There are significant blowouts and eroded banks with invasive shrub colonies on them juxtaposed with lush and intact older forest communities nearby. Rich and diverse terrestrial and palustrine habitat types are present alongside significant invasive species. Significant sediment loss has already occurred here and may require raising the stream bank elevation to support extant amphibians.

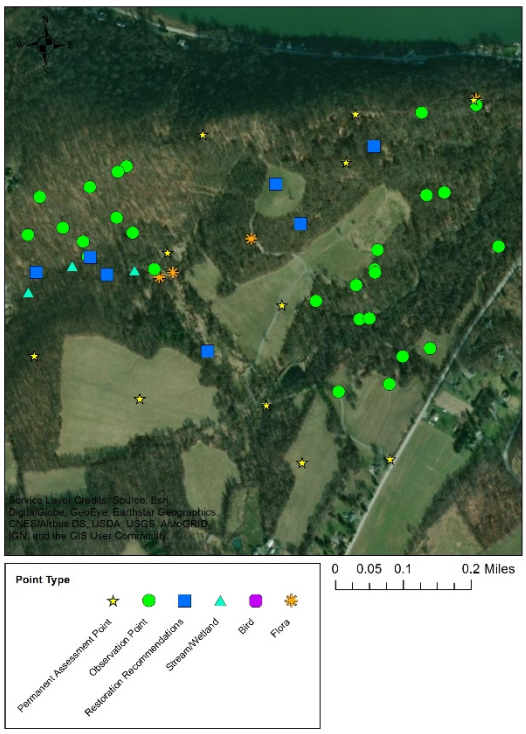
Vernal pool obligate species such as spotted salamander (*Ambystoma maculatum*) and wood frog *(Lithobates sylvaticus*) are found in both stream-adjacent pools and scour pools within Wildcat Run.

Recommendations for HHMU5

- Same a Dugan Run - Establish a reach-wide stream restoration plan
    - Include low-cost/hgh-return interventions such as beaver dam analogs and other innovative grade-control structures as well as considering removal of depositional soils for floodplain reconnection where applicable
- Enroll project in MS4 program or compensatory stream bank mitigation program
- Apply for grant support to fund design/permit/construction
- Develop/fortify strategic partnerships

Wizard Ranch

Wizard Ranch ArcCollector Map



Plants

A total of 182 plant species (*Table 3*) have been observed over 5 site visits (*Table 1*). 49 of the species are considered invasive- but many of these are dominants (most dense within communities as well as most widely distributed in some instances). Because of the large open fields there were many planted graminoids that are common crops (like corn) but are not considered native. The fields and roads that have been consistently used by the Boy Scouts show evidence of their anthropogenic use in having a higher invasive count and coverage than Hellam Hills. Like Hellam Hills though, Japanese stilt-grass (*Microstegium vimineum*) was pervasive. Many of the slopes had little no groundcover and just a shrub layer of pawpaw *(Asimina triloba*). Please see management unit descriptions for more on plant communities. A full species list can be found in Appendix I.

Table 2 Wizard Ranch Nature Preserve Vegetation

Wizard Ranch Vegetation			
	Native	**Invasive**	**N/I**
Tree	32	6	0
Shrub	9	5	1
Forb	62	25	6
Graminoid	16	7	3
Vine	4	6	0
Sub-Total	*123*	*49*	*10*
TOTAL	**182**		

Birds

97 bird species were observed via point count on site (see Appendix II for the full species list) out of 388 individual birds observed. These observations were made during fall migration, spring migration, and breeding season. Of the species observed, 45 were confirmed or probable breeders per the PA Breeding Bird Survey behavior codes. The most frequently observed birds were indigo bunting (*Passerina cyanea)*, northern cardinal (*Cardinalis cardinalis)*, red-bellied woodpecker (*Melanerpes carolinianus)*, red-eyed vireo (*Vireo olivaceus*), and American goldfinch (*Carduelis tristis)*.

Herpetofauna

A relatively rich diversity of herpetofauna are present in the stream corridor and certain upland areas at Wizard Ranch NP. A total of 12 species (2 turtles, 5 anurans, 3 salamanders, and 2 snakes) were confirmed present. In addition, degraded, but suitable habitat for spotted turtle is present on site.

Mammals

Similar to Hellam Hills, many white-tailed deer (*Odocoileus virginianus*) were observed, and their presence was very notable in herbivory and scat. The fields adjacent to forested areas provided a large amount of edge habitat that deer were using. Other mammals observed include northern gray squirrel, raccoon, groundhog, opossum, and there was evidence of both fox and coyote.

Results by Management Unit

MU1 - Accomac Tributary Floodplain- The onsite (unnamed) tributary to Accomac Stream courses through the site from west to east and is comprised of two reaches that converge in approximately the center of the site. Both are experiencing deleterious effects from bank erosion and stream bed undercutting, thus channelizing and deepening the stream as it moves through the site. This has lowered the water table and prevents the adjacent floodplain from providing critical stormwater management (via energy dissipation, resultant sediment and TSS removal, and volume control). There was evidence of rills funneling from the fields into the stream that are contributing to this issue as well. Despite this cascading negative ecological effect, higher quality areas are present but are in threat of negative impacts such as invasive species colonization, continued hydrologic manipulation, and simplification of native plant and animal diversity. After the convergence the stream approaches and then flows over shallow and exposed bedrock. Here the classic pool-riffle-run sequence and stable stream banks is observable. The only fish observed using the stream were blacknose dace (*Rhinichthys atratulus*) although there are likely others. No evidence of freshwater mussels was found which indicates either water quality issues or physical impediments like dams, flashiness, or lack of appropriate substrate.

Black willow (*Salix nigra*), sweet birch (*Betula lenta*), and black tupelo (*Nyssa sylvatica*) are present within the hydrologically impaired floodplain. Common native wetland plants growing along the stream like jewelweed (*Impatiens capensis*), joe-pye weed (*Eutrochium purpureum*), and skunk cabbage (*Symplocarpus foetida*) are locally observed alongside ironweed (*Vernonia noveboracensis*), giant goldenrod (*Solidago gigantea*), and other hearty species. However, there were also invasives compromising the edges like Japanese stilt-grass, Japanese hops (*Humulus japonicus*), Japanese honeysuckle (*Lonicera japonica*), and mile-a-minute (*Persicaria persicaria*).

32 bird species were seen in this management unit including 8 warbler species: yellow-rumped warbler (*Setophaga coronata)*, common yellowthroat (*Geothlypis trichas*), American redstart (*Setophaga ruticilla*), northern parula (*Setophaga americana*), mourning warbler (*Geothlypis philadelphia)*, chestnut-sided warbler (*Setophaga pensylvanica)*, black-throated blue warbler (*Setophaga caerulescens)*, and blue-winged warbler (*Vermivora cyanoptera)*. Commonly observed songbirds include blue-gray gnatcatcher (*Polioptila caerulea*), indigo bunting (*Passerina cyanea*), and gray catbird (*Dumetella carolinensis*).

MU2 – Northwest Woods - The South Facing Forest was very sloped in most parts and had a very steep eroded transition where it meets the meadow and old logging road. Most of the forest did not contain groundcover except for patches of Japanese stilt-grass and garlic mustard (*Alliaria petiolata*). There were many stands of shrubby pawpaw (*Asimina triloba*). The canopy layer consisted primarily of tulip poplar (*Liriodendron tulipifera*) but there were some black cherry (*Prunus serotina*), oak species (*Quercus spp*), and slippery elm (*Ulmus rubra*) interspersed. Wild geranium (*Geranium maculatum*), Solomon seal (*Polygonatum biflorum*) and spicebush (*Lindera benzoin*) were some good species found although they were again interspersed with multiflora rose (*Rosa multiflora*) and natives like greenbrier (*Smilax rotundifolia*) and poison ivy (*Toxicodendron radicans*).

In this area, 24 bird species were observed, the most common being Carolina chickadee (*Poecile carolinensis*), cedar waxwing (*Bombycilla cedrorum)*, red-eyed vireo, and scarlet tanager. Additional warblers were seen here, worm-eating warbler (*Helmitheros vermivorum*), black-and-white warbler (*Mniotilta varia*), Cape May Warbler (*Setophaga tigrina*), black-throated blue warbler (*Setophaga caerulescens*), and blue-winged warbler (*Vermivora cyanoptera*).

The lack of groundcover and evidence of heavy browse suggested a large population of white-tailed deer. Pellets and deer paths were seen throughout.

MU3 – West Woods - This unit encompassed multiple elevation levels from a dry ridge forest to a mesic forested slope, to a mesic hardwood forest. A large field was carved into the center of this forested area creating a significant amount of edge habitat. These habitats are similar enough to be grouped together but vary based on proximity to field and stream.

Again, there was a lot of pawpaw and tulip poplar. Oak, black cherry, green ash (*Fraxinus pensylvanica*), red maple (*Acer rubrum*) and American sycamore (*Platanus occidentalis*) appeared sporadically as well as some tree of heaven and black walnut. The groundcover again was sparse in herbaceous cover but there was a significant amount of vines like honeysuckle, oriental bittersweet, mile-a-minute, and greenbrier as well as multiflora rose and wineberry (*Rubus phoenicolasius*) bushes.

22 bird species were observed in this management unit with the most common being indigo bunting, red-bellied woodpecker, and red-eyed vireo. Worm-eating warbler was observed breeding in this unit.

MU4 Southeast Woods- This forested area had a lot of edge with the fields, stream, and road and very little interior habitat. The canopy consists mainly of tulip poplar, red maple, tree of heaven, and black locust. Some basswood (*Tilia americana*) was also observed and many pawpaws. The herbaceous layer was comprised of invasives like garlic mustard, sticky willy (*Gallium aparine*), narrowleaf bittercress (*Cardamine impatiens*), and red clover (*Trifolium pratense*) and common natives like poison ivy and Philadelphia fleabane (*Erigeron philadelphicus*). Invasive shrubs like multiflora rose and privet (*Ligustrum vulgaris*) also populated this unit.

30 bird species were observed in this area, the most common being chipping sparrow (*Spizella passerina*), northern cardinal, eastern phoebe (*Sayornis phoebe)*, eastern bluebird (*Sialia sialis)*, indigo bunting, and Carolina chickadee.

MU5 Northeast Woods- These woods have been heavily impacted by logging activity and in some areas were observed to be highly degraded. Native trees are present (approximately 60-80yo) apart from the un-logged specimens on the steepest slopes) but invasive vines and shrubs dominate many areas. In 5C we recommend using a brush hog and herbicide on the entire slope and only retaining the largest tulip poplars and any oaks found. This can then be seeded in with dry-mesic native seed mix and oaks and shrubs can be planted in fenced clusters to restore to an oak savanna. The old logging road that runs through 5A was completely edged with invasives like Japanese stiltgrass, mile-a-minute, privet, multiflora rose, wineberry, honeysuckle, and knotweed (*Fallonia japonica*) among others.

43 bird species were observed in this management unit. Red-eyed vireo were the most dominant but other common observations were northern parula (*Setophaga americana)*, red-bellied woodpecker, pileated woodpecker (*Dryocopus pileatus)*, and northern cardinal.

Fields- Some of these fields were mowed and/or hayed frequently. The grasses tended to be non-native like orchard grass and stiltgrass, but a few natives were observed including little bluestem (*Schizachyrium scoparium*), deer-tongue grass (*Dicanthelium clandestinum*), and switchgrass (*Panicum virgatum*). The colonizing forbs were also primarily invasives like red clover, plantain (*Plantago asiatica*), mugwort (*Artemisia vulgaris*), and sticky willy. Some natives popped up like white snakeroot (*Ageratina altissima*) and multiple goldenrod species.

In these fields, 55 species of birds were observed. American goldfinch, Baltimore oriole (*Icterus galbula*), brown headed cowbird (*Molothrus ater)*, brown thrasher (*Toxostoma rufum)*, wood thrush (*Hylocichla mustelina*), northern cardinal, and indigo bunting were very common.

Discussion

The site is comprised of two very different locations and their management will require very different approaches. Hellam Hills Nature Preserve, despite many years of impacts from logging and water utility management, sustains a gorgeous mature canopy of native trees. It needs help to ensure that this forested landscape can remain so for centuries to come. This will largely involve management of deer and invasive species. Until the deer reduced to pre-European settlement densities, it will require planting and herbivory protection of slow-growing native species, such as oaks, hickories, elms. Conversion of the spruce planting area into a mosaic of field, shrubland, and emerging hardwood and mixed forest types will be the largest terrestrial impact to the site and has the potential to drastically increase overall biodiversity at the site. The breeding bird community is already impressive, but adding

successional habitat at this scale will greatly increase the odds of attracting locally declining species such as yellow-breasted chat, blue grosbeak, and golden-winged warbler to the site. The stream reaches are both in dire need of a full restoration plan. While many locations along the reaches may only need simple interventions such as BDAs (beaver dam analogs) other portions require streambank stabilization, more rigorous grade control structures, and stream bed elevation corrections. These will be costly but extremely valuable endeavors, with a high probability of being awarded grant support for design/build approaches.

Wizard Ranch has a very different layout and history. Here, this working land can be "restored" in a manner that celebrates early succession habitats (ex. wildflower meadows), provide interactive food forest components, and continue to serve humans to some extent beyond passive recreation. It is highly encouraged to modify the existing haying arrangement of the fields on site. Conversion from the existing simple hay mix to a more robust warm season grassland meadow and modifying the harvest/mow schedule to be amenable to breeding grassland birds is a relatively simple and inexpensive way to greatly increase the beauty/aesthetics and ecological function of the site. Softening of field edges is also encouraged by virtue of invasive species removal and planting of young trees and shrubs in non-linear arrangements at the current forest/field edge. Re-routing the road outside of the historically complex and dynamic stream convergence black willow wetland and restoring hydrology will have great benefit to plants, insects, reptiles, amphibians, and tree-roosting bats in summer months. The entire stream reach should be approached just like those of Hellam Hills NP. Raising the streambed elevation to reconnect to the structurally intact (but vegetatively and hydrologically altered) floodplain will have great benefit and may require little vegetation management if the hydrology is restored properly. Degraded second growth woodlands between the fields should be completely removed and "started over". This is a big project that will involve heavy machinery and winter clearing, followed by seeding, mulching, and planting to start anew. This provides flexibility in ecological planning as well. If grassland connectivity became a priority then leaving this cleared area in early succession meadow (via fire, animal grazing, or mowing) would increase the field size significantly and possibly attract more denizens of the grassland. If successional birds, such as chats, and orchard orioles, and chestnut-sided warblers were a priority, the newly established meadow area could be planted with clusters of trees and shrubs to promote 30-40 years of successional woodlands which would over time develop into a mature hardwood forest.

In all, these two properties are stunning contributions to the LCs land portfolio. Under the diligent stewardship of LC these will no doubt become regionally recognized as premier destinations for passive recreation. We strongly recommend repeating/continuing montoring of natural areas to compare areas over time as you enact restoration on site.

Appendix I

Hellam Hills Nature Preserve Plant List

Common Name	***Scientific Name***	**Class**	**Native/Invasive**
Red maple	*Acer rubrum*	T	N
White snakeroot	*Ageratina altissima*	F	N
Tree of Heaven	*Ailanthus altissima*	T	I
Garlic mustard	*Alliaria petiolata*	F	I
Wild garlic	*Allium vineale*	F	I
Shadblow serviceberry	*Amelanchier canadensis*	T	N
Japanese angelica tree	*Aralia elata*	T	I
Wild sarsaparilla	*Aralia nudicaulis*	F	N
Burdock species	*Arctium species*	F	N/I
Jack-in-the-pulpit	*Arisaema triphyllum*	F	N
Common milkweed	*Asclepias syriaca*	F	N
Pawpaw	*Asimina triloba*	T	N
Yellow rocket	*Barbarea vulgaris*	F	I
Japanese barberry	*Berberis thunbergii*	S	I
Sweet birch	*Betula lenta*	T	N
Paper birch	*Betula papyfera*	T	N
Devil's beggarticks	*Bidens frondosa*	F	N
Moss species	*Bryophyte species*	B	N
Bitternut hickory	*Carya cordiformis*	T	N
Bittercress species	*Cardamine species*	F	N/I
Shagbark hickory	*Carya ovata*	T	N
Mockernut hickory	*Carya tomentosa*	T	N
Oriental bittersweet	*Celastrus orbiculatus*	V	I
Eastern redbud	*Cercis canadensis*	T	N
Creeping thistle	*Cirsium arvense*	F	I
Thistle species	*Cirsium species*	F	N/I
Spring beauty	*Claytonia virginiana*	F	N
Richweed	*Collinsonia canadensis*	F	N
Beaked hazel	*Corylus cornuta*	S	N
Corydalis species	*Corydalis species*	F	N/I
Common woodland sedge	*Carex blanda*	G	N
Slender sedge	*Carex gracilior*	G	I
Pennsylvania sedge	*Carex pensylvanica*	G	N
Plantainleaf sedge	*Carex plantaginea*	G	N
Sedge species	*Carex species*	G	N/I
Awlfruit sedge	*Carex stipata*	G	N
Tussock sedge	*Carex stricta*	G	N
American fox sedge	*Carex vulpinoidea*	G	N
Wild carrot	*Daucus carota*	F	I
Hay-scented fern	*Dennstaedtia punctilobula*	F	N
showy tick trefoil	*Desmodium canadense*	F	N
Deer-tongue grass	*Dicanthelium clandestinum*	G	N
Marginal woodfern	*Dryopteris marginalis*	F	N
Horsetail species	*Equisetum species*	F	N

Eastern daisy fleabane	*Erigeron annuus*	F	N
Philadelphia fleabane	*Erigeron philadelphicus*	F	N
Boneset	*Eupatorium perfoliatum*	F	N
Joe-pye weed	*Eutrochium purpureum*	F	N
Late boneset	*Eupatorium serotinum*	F	N
Grass-leaved goldenrod	*Euthamia graminifolia*	F	N
American beech	*Fagus grandifolia*	T	N
Ash species	*Fraxinus species*	T	N
Virginia strawberry	*Fragaria virginiana*	F	N
Sticky Willy	*Gallium aparine*	F	I
Blue huckleberry	*Gaylussacia frondosa*	S	N
Wild geranium	*Geranium maculatum*	F	N
White avens	*Geum canadense*	F	N
Ground ivy	*Glechoma hederacea*	V	I
American witch-hazel	*Hamamelis virginiana*	T	N
Bluet species	*Houstonia species*	F	N
Stonecrop species	*Hylotelephium species*	F	N
St. John's wort species	*Hypericum species*	F	N
American holly	*Ilex opaca*	T	N
Jewelweed	*Impatiens capensis*	F	N
Soft rush	*Juncus effusus*	G	N
Canadian woodnettle	*Laportea canadensis*	F	N
Privet	*Ligustrum vulgare*	S	I
Lily species	*Lilium species*	F	N
Spicebush	*Lindera benzoin*	S	N
Tulip poplar	*Liriodendron tulipifera*	T	N
Japanese honeysuckle	*Lonicera japonica*	V	I
Amur honeysuckle	*Lonicera maackii*	S	I
Bird's foot trefoil	*Lotus corniculatus*	F	I
Whorled loosestrife	*Lysimachia quadrifolia*	F	N
Purple loosestrife	*Lythrum salicaria*	F	I
Canada mayflower	*Maianthemum canadense*	F	N
Ostrich fern	*Matteuccia struthiopteris*	F	N
Cucumber species	*Medeola species*	F	N
Japanese stilt-grass	*Microstegium vimineum*	G	I
Sweet cicely	*Myrrhis odorata*	F	N
Black tupelo	*Nyssa sylvatica*	T	N
Sensitive fern	*Onoclea sensibilis*	F	N
Cinnamon fern	*Osmunda cinnamomea*	F	N
Royal fern	*Osmunda regalis*	F	N
Yellow woodsorrel	*Oxalis stricta*	F	N
Switchgrass	*Panicum virgatum*	G	N
Virginia creeper	*Parthenocissus quinquefolia*	F	N
Halberd-leaved tearthumb	*Persicaria arifolia*	V	N
Mile-a-minute	*Persicaria perfoliata*	V	I
Beech fern	*Phegopteris hexagonoptera*	F	N
Pokeweed	*Phytolacca americana*	S	N
Norway spruce	*Picea abies*	T	I
Virginia mountain mint	*Pycnanthemum virginianum*	F	N

Eastern white pine	*Pinus strobus*	T	N
Ribwort plantain	*Plantago lanceolata*	F	I
Broadleaf plantain	*Plantago major*	F	I
Annual bluegrass	*Poa annua*	G	N
Grass species	*Poa species*	G	N/I
Mayapple	*Podophyllum peltatum*	F	N
Christmas fern	*Polystichum acrostichoides*	F	N
Solomon's seal	*Polygonatum biflorum*	F	N
Jumpseed	*Polygonum virginianum*	F	N
Common cinquefoil	*Potentilla simplex*	F	N
Cinquefoil species	*Potentilla species*	F	N/I
Sweet cherry	*Prunus avium*	T	I
Black cherry	*Prunus serotina*	T	N
Callery pear	*Pyrus calleryana*	T	I
White oak	*Quercus alba*	T	N
Pin oak	*Quercus palustris*	T	N
Chestnut oak	*Quercus prinus*	T	N
Red oak	*Quercus rubra*	T	N
Black oak	*Quercus velutina*	T	N
Buttercup species	*Ranunculus species*	F	N/I
Black locust	*Robinia pseudoaccacia*	T	I
Multiflora rose	*Rosa multiflora*	S	I
Swamp dewberry	*Rubus hispida*	F	N
Pennsylvania blackberry	*Rubus pennsylvanicus*	S	N
Wineberry	*Rubus phonesicolasius*	S	I
Curly dock	*Rumex crispus*	F	I
Sassafras	*Sassafras albidum*	T	N
Common greenbrier	*Smilax rotundifolia*	V	N
Canada goldenrod	*Solidago canadensis*	F	N
Gray goldenrod	*Solidago nemoralis*	F	N
Wrinkleleaf goldenrod	*Solidago rugosa*	F	N
Goldenrod species	*Solidago species*	F	N
Chickweed	*Stellaria media*	F	N
Skunk cabbage	*Symplocarpus foetidus*	F	N
Panicled aster	*Symphyotrichum lanceolatum*	F	N
Aster species	*Symphyotrichum species*	F	N
Dandelion	*Taraxacum officinale*	F	N
Rue anemone	*Thalictrum thalictroides*	F	N
Basswood	*Tilia americana*	T	N
Poison ivy	*Toxicodendron radicans*	V	N
Starflower	*Trientalis borealis*	F	N
Red clover	*Trifolium pratense*	F	I
Broadleaf cattail	*Typha latifolia*	G	N
American elm	*Ulmus americana*	T	N
Stinging nettle	*Urtica dioica*	F	N
High bush blueberry	*Vaccinium corymbosum*	S	N
Common mullein	*Verbascum thapsus*	F	I
False hellebore	*Veratrum viride*	F	N
Mapleleaf arrowwood	*Viburnum acerifolium*	S	N

Arrowwood viburnum	*Viburnum dentatum*	S	N
Linden viburnum	*Viburnum dilatatum*	S	N
Blackhaw	*Viburnum prunifolium*	S	N
Viburnum species	*Viburnum species*	S	N
Common blue violet	*Viola sororia*	F	N
Viola species	*Viola species*	F	N/I
Grape species	*Vitis species*	V	N

Wizard Ranch Plant List

Common Name	***Scientific Name***	**Class**	**Native/Invasive**
Boxelder	*Acer negundo*	T	N
Red maple	*Acer rubrum*	T	N
Common yarrow	*Achillea millefolium*	F	N
Sweet flag	*Acorus calamus*	F	N
White snakeroot	*Ageratina altissima*	F	N
Tall-hairy agrimony	*Agrimonia gryposepala*	F	N
Upland bentgrass	*Agrostis perennans*	G	N
Tree of Heaven	*Ailanthus altissima*	T	I
Garlic mustard	*Alliaria petiolata*	F	I
Wild garlic	*Allium vineale*	F	I
Hog peanut	*Amphicarpaea bracteata*	F	N
Japanese angelica tree	*Aralia elata*	T	I
Wild sarsaparilla	*Aralia nudicaulis*	F	N
Burdock species	*Arctium species*	F	N/I
Jack-in-the-pulpit	*Arisaema triphyllum*	F	N
Mugwort	*Artemisia vulgaris*	F	I
Common milkweed	*Asclepias syriaca*	F	N
Pawpaw	*Asimina triloba*	T	N
Ebony spleenwort	*Asplenium platyneuron*	F	N
Yellow rocket	*Barbarea vulgaris*	F	I
Japanese barberry	*Berberis thunbergii*	S	I
Sweet birch	*Betula lenta*	T	N
musclewood	*Carpinus carolina*	S	N
Cut-leaved toothwort	*Cardamine concatenata*	F	N
Narrowleaf bittercress	*Cardamine impatiens*	F	I
Shagbark hickory	*Carya ovata*	T	N
Mockernut hickory	*Carya tomentosa*	T	N
Oriental bittersweet	*Celastrus orbiculatus*	V	I
Pennywort species	*Centella species*	F	N/I
Striped prince's pine	*Chimaphila maculata*	F	N
Common chickory	*Cichorium intybus*	F	N
Wood reed grass	*Cinna arundinacea*	G	N
Creeping thistle	*Cirsium arvense*	F	I
bull thistle	*Cirsium vulgare*	F	I
Richweed	*Collinsonia canadensis*	F	N

Chinese hemlock parsley	*Conioselinum chinense*	F	I
Common woodland sedge	*Carex blanda*	G	N
Slender sedge	*Carex gracilior*	G	I
Blunt sedge	*Carex obtusata*	G	N
Pennsylvania sedge	*Carex pensylvanica*	G	N
Plantainleaf sedge	*Carex plantaginea*	G	N
Rosy sedge	*Carex rosea*	G	N
Sedge species	*Carex species*	G	N/I
Awlfruit sedge	*Carex stipata*	G	N
American fox sedge	*Carex vulpinoidea*	G	N
Orchardgrass	*Dactylis glomerata*	G	I
Wild carrot	*Daucus carota*	F	I
Hay-scented fern	*Dennstaedtia punctilobula*	F	N
Deer-tongue grass	*Dicanthelium clandestinum*	G	N
Intermediate wood fern	*Dryopteris intermedia*	F	N
Fern species	*Dryoptera species*	F	N
Horsetail species	*Equisetum species*	F	N
Eastern daisy fleabane	*Erigeron annuus*	F	N
Yellow yarrow	*Eriophyllum confertiflorum*	F	I
Philadelphia fleabane	*Erigeron philadelphicus*	F	N
amethyst sea holly	*Eryngium amethystinum*	F	I
Spotted joe-pye weed	*Eupatorium maculatum*	F	N
Eupatorium species	*Eupatorium species*	F	N
White wood aster	*Eurybia divaricata*	F	N
Grass-leaved goldenrod	*Euthamia graminifolia*	F	N
American beech	*Fagus grandifolia*	T	N
Japanese knotweed	*Fallonia japonica*	F	I
Fern species	*Fern species*	F	N
Green ash	*Fraxinus pensylvanica*	T	N
Ash species	*Fraxinus species*	T	N
Virginia strawberry	*Fragaria virginiana*	F	N
Ash species	*Fraxinus species*	T	N
Sticky Willy	*Gallium aparine*	F	I
Gallium species	*Gallium species*	F	N/I
black huckleberry	*Gaylussacia baccata*	S	N
Longstalk cranebill	*Geranium columbinum*	F	N
Wild geranium	*Geranium maculatum*	F	N
White avens	*Geum canadense*	F	N
Ground ivy	*Glechoma hederacea*	V	I
American witch-hazel	*Hamamelis virginiana*	T	N
English Ivy	*Hedera helix*	V	I
Smooth oxeye	*Heliopsis gracilis*	F	I
oxeye sunflower	*Heliopsis helianthoides*	F	N
Japanese hops	*Humulus japonicus*	V	I
American holly	*Ilex opaca*	T	N
Jewelweed	*Impatiens capensis*	F	N
purple rocket	*Iodanthus pinnatifidus*	F	N
Iris species	*Iris species*	F	N

Black walnut	*Juglans nigra*	T	N
Dwarf rush	*Juncus capitatus*	G	I
Soft rush	*Juncus effusus*	G	N
Eastern red cedar	*Juniperus virginianus*	T	N
mountain laurel	*Kalmia latifolia*	S	N
Mint species	*Lamiaceae species*	F	N/I
Canadian woodnettle	*Laportea canadensis*	F	N
Privet	*Ligustrum vulgare*	S	I
Spicebush	*Lindera benzoin*	S	N
purple toadflax	*Linaria purpurea*	F	I
Tulip poplar	*Liriodendron tulipifera*	T	N
Japanese honeysuckle	*Lonicera japonica*	V	I
Amur honeysuckle	*Lonicera maackii*	S	I
Whorled loosestrife	*Lysimachia quadrifolia*	F	N
Purple loosestrife	*Lythrum salicaria*	F	I
Sweetbay magnolia	*Magnolia virginiana*	T	N
False Solomon seal	*Maianthemum racemosum*	G	N
Japanese stilt-grass	*Microstegium vimineum*	G	I
Sweet cicely	*Myrrhis odorata*	F	N
Watercress	*Nasturtium officinale*	F	I
Black tupelo	*Nyssa sylvatica*	T	N
Common evening-primrose	*Oenothera biennis*	F	N
Sensitive fern	*Onoclea sensibilis*	F	N
American hophornbeam	*Ostrya virginica*	T	N
Yellow woodsorrel	*Oxalis stricta*	F	N
Witchgrass	*Panicum capillare*	G	N
Grass species	*Panicum species*	G	N/I
Switchgrass	*Panicum virgatum*	G	N
Virginia creeper	*Parthenocissus quinquefolia*	F	N
Empress tree	*Paulownia tomentosa*	T	I
Halberd-leaved tearthumb	*Persicaria arifolia*	V	N
Mile-a-minute	*Persicaria perfoliata*	V	I
Amur cork	*Phellodendron amurense*	T	I
Beech fern	*Phegopteris hexagonoptera*	F	N
Australian common reed	*Phragmites australis*	G	I
Canadian clearweed	*Pilea pumila*	F	N
Eastern white pine	*Pinus strobus*	T	N
Ribwort plantain	*Plantago lanceolata*	F	I
American sycamore	*Platanus occidentalis*	T	N
Grass species	*Poa species*	G	N/I
Mayapple	*Podophyllum peltatum*	F	N
Christmas fern	*Polystichum acrostichoides*	F	N
Solomon's seal	*Polygonatum biflorum*	F	N
spotted smartweed	*Polygonum punctatum*	F	N
Polygonum species	*Polygonum species*	F	N/I
Jumpseed	*Polygonum virginianum*	F	N
Common polypody	*Polypodium virginianum*	F	N
Mock strawberry	*Potentilla indica*	F	I

Sweet cherry	*Prunus avium*	T	I
Black cherry	*Prunus serotina*	T	N
Pulsatilla species	*Pulsatilla species*	F	I
White oak	*Quercus alba*	T	N
Spanish oak	*Quercus falcata*	T	N
Chestnut oak	*Quercus montana*	T	N
Chestnut oak	*Quercus prinus*	T	N
Oak species	*Quercus species*	T	N
Black oak	*Quercus velutina*	T	N
Common buttercup	*Ranunculus acris*	F	I
Buttercup species	*Ranunculus species*	F	N/I
Black locust	*Robinia pseudoacacia*	T	I
Multiflora rose	*Rosa multiflora*	S	I
Allegheny blackberry	*Rubus allegheniensis*	S	N
Pennsylvania blackberry	*Rubus pennsylvanicus*	S	N
Wineberry	*Rubus phonesicolasius*	S	I
Rubus species	*Rubus species*	S	N/I
cutleaf coneflower	*Rudbeckia laciniata*	F	N
Curly dock	*Rumex crispus*	F	I
Black willow	*Salix nigra*	T	N
Elderberry	*Sambucus canadensis*	S	N
Sassafras	*Sassafras albidum*	T	N
Little bluestem	*Schizachyrium scoparium*	G	N
Chinese foxtail	*Setaria faberi*	G	I
Common greenbrier	*Smilax rotundifolia*	V	N
Canada goldenrod	*Solidago canadensis*	F	N
Giant goldenrod	*Solidago gigantea*	F	N
Early goldenrod	*Solidago juncea*	F	N
Gray goldenrod	*Solidago nemoralis*	F	N
Wrinkleleaf goldenrod	*Solidago rugosa*	F	N
nightshade species	*Solanum species*	F	N/I
Chickweed	*Stellaria media*	F	N
Skunk cabbage	*Symplocarpus foetidus*	F	N
Panicled aster	*Symphyotrichum lanceolatum*	F	N
Dandelion	*Taraxacum officinale*	F	N
Basswood	*Tilia americana*	T	N
Poison ivy	*Toxicodendron radicans*	V	N
Starflower	*Trientalis borealis*	F	N
Red clover	*Trifolium pratense*	F	I
Thyme species	*Tymus spp*	F	N/I
Broadleaf cattail	*Typha latifolia*	G	N
American elm	*Ulmus americana*	T	N
Slippery elm	*Ulmus rubra*	T	N
Stinging nettle	*Urtica dioica*	F	N
lowbush blueberry	*Vaccinium angustifolium*	S	N
High bush blueberry	*Vaccinium corymbosum*	S	N
wingstem	*Verbesina alternifolia*	F	N
New York ironweed	*Vernonia noveboracensis*	F	N
Thymeleaf speedwell	*Veronica serpyllifolia*	F	I

Common mullein	*Verbascum thapsus*	F	I
Common blue violet	*Viola sororia*	F	N
Viola species	*Viola species*	F	N/I
Grape species	*Vitis species*	V	N
domestic corn	*Zea mays*	G	I

Appendix II

Hellam Hills Nature Preserve Bird List

Acadian flycatcher	*Empidonax virescens*
American crow	*Corvus brachyrhynchos*
American goldfinch	*Carduelis tristis*
American redstart	*Setophaga ruticilla*
American robin	*Turdus migratorius*
Baltimore oriole	*Icterus galbula*
black-and-white warbler	*Mniotilta varia*
bay-breasted warbler	*Setophaga castanea*
belted kingfisher	*Megaceryle alcyon*
blue-gray gnatcatcher	*Polioptila caerulea*
brown-headed cowbird	*Molothrus ater*
blue-headed vireo	*Vireo solitarius*
blue jay	*Cyanocitta cristada*
brown thrasher	*Toxostoma rufum*
black-throated blue warbler	*Setophaga caerulescens*
black-throated green warbler	*Setophaga virens*
broad-winged hawk	*Buteo platypterus*
blue-winged warbler	*Vermivora cyanoptera*
Carolina chickadee	*Poecile carolinensis*
Carolina wren	*Thytothorus ludovicianus*
Canada warbler	*Cardellina canadensis*
cedar waxwing	*Bombycilla cedrorum*
chipping sparrow	*Spiza passerina*
Cape May Warbler	*Setophaga tigrina*
common grackle	*Quiscalus quiscula*
common raven	*Corvus corvus*
common yellowthroat	*Geothlypis trichas*
chestnut-sided warbler	*Setophaga pensylvanica*
downy woodpecker	*Dryobates pubescens*
eastern towhee	*Pipilo erythropthalmus*
eastern wood-pewee	*Contopus virens*
great crested flycatcher	*Myiarchus crinitus*
gray catbird	*Dumetella carolinensis*
hairy woodpecker	*Dryobates villosus*
hooded warbler	*Setophaga citrina*
indigo bunting	*Passerina cyanea*
Kentucky warbler	*Geothlypis formosa*
Louisiana waterthrush	*Parkesia motacilla*
magnolia warbler	*Setophaga magnolia*

mourning dove	*Zenaida macroura*
Nashville warbler	*Oreothlypis ruficapilla*
northern cardinal	*Cardinalis cardinalis*
northern flicker	*Colaptes auritus*
northern parula	*Setophaga americana*
ovenbird	*Seiurus aurocapilla*
pine warbler	*Setophaga pinus*
pileated woodpecker	*Dryocopus pileatus*
rose-breasted grosbeak	*Pheucticus ludovicianus*
red-bellied woodpecker	*Melanerpes carolinianus*
red-eyed vireo	*Vireo olivaceus*
red-headed woodpecker	*Melanerpes erythrocephalus*
red-winged blackbird	*Agelaius phoeniceus*
scarlet tanager	*Piranga olivacea*
song sparrow	*Melospiza melodia*
Tennessee warbler	*Leiothlypis peregrina*
tree swallow	*Tachycineta bicolor*
tufted titmouse	*Baeolophus bicolor*
warbling vireo	*Vireo gilvus*
white-breasted nuthatch	*Sitta carolina*
white-eyed vireo	*Vireo griseus*
worm-eating warbler	*Helmitheros vermivorum*
wild turkey	*Meleagris gallopavo*
Wilson's warbler	*Cardellina pusilla*
winter wren	*Troglodytes hiemalis*
wood thrush	*Hylocichla mustelina*
white-throated sparrow	*Zonotrichia albicollis*
yellow-rumped warbler	*Setophaga coronata*
yellow-throated vireo	*Vireo flavifrons*

Wizard Ranch Nature Preserve Bird List

Acadian flycatcher	*Empidonax virescens*
American crow	*Corvus brachyrhynchos*
American goldfinch	*Carduelis tristis*
American kestrel	*Falco sparverius*
American redstart	*Setophaga ruticilla*
American robin	*Turdus migratorius*
American woodcock	*Scolopax minor*
bald eagle	*Haliaeetus leucocephalus*
Baltimore oriole	*Icterus galbula*
black-and-white warbler	*Mniotilta varia*
bay-breasted warbler	*Setophaga castanea*
blue-gray gnatcatcher	*Polioptila caerulea*
brown-headed cowbird	*Molothrus ater*
blue jay	*Cyanocitta cristada*
blackpoll warbler	*Setophaga striata*

brown thrasher	*Toxostoma rufum*
black-throated blue warbler	*Setophaga caerulescens*
black-throated green warbler	*Setophaga virens*
broad-winged hawk	*Buteo platypterus*
blue-winged warbler	*Vermivora cyanoptera*
Carolina chickadee	*Poecile carolinensis*
Carolina wren	*Thytothorus ludovicianus*
Canada warbler	*Cardellina canadensis*
cedar waxwing	*Bombycilla cedrorum*
cerulean warbler	*Setophaga cerulea*
chipping sparrow	*Spiza passerina*
chimney swift	*Chaetura pelagica*
Cape May Warbler	*Setophaga tigrina*
common grackle	*Quiscalus quiscula*
Coopers hawk	*Accipiter cooperii*
common yellowthroat	*Geothlypis trichas*
chestnut-sided warbler	*Setophaga pensylvanica*
downy woodpecker	*Dryobates pubescens*
eastern bluebird	*Sialis sialia*
eastern kingbird	*Tyrannus tyrannus*
eastern phoebe	*Sayornis phoebe*
eastern towhee	*Pipilo erythropthalmus*
eastern wood-pewee	*Contopus virens*
European starling	*Sturnus vulgaris*
fish crow	*Corvus ossifragus*
great crested flycatcher	*Myiarchus crinitus*
golden crowned kinglet	*Regulus satrapa*
gray catbird	*Dumetella carolinensis*
grasshopper sparrow	*Ammodramus savannarum*
hairy woodpecker	*Dryobates villosus*
house finch	*Carpodacus mexicanus*
hooded warbler	*Setophaga citrina*
house wren	*Troglodytes aedon*
indigo bunting	*Passerina cyanea*
Kentucky warbler	*Geothlypis formosa*
magnolia warbler	*Setophaga magnolia*
mourning dove	*Zenaida macroura*
mourning warbler	*Geothlypis philadelphia*
Nashville warbler	*Oreothlypis ruficapilla*
northern cardinal	*Cardinalis cardinalis*
northern flicker	*Colaptes auritus*
northern mockingbird	*Mimus polyglottos*
northern parula	*Setophaga americana*
orchard oriole	*Icterus spurius*
ovenbird	*Seiurus aurocapilla*
pine siskin	*Spinus pinus*
pileated woodpecker	*Dryocopus pileatus*
red-bellied woodpecker	*Melanerpes carolinianus*

red-eyed vireo	*Vireo olivaceus*
red-tailed hawk	*Buteo jamaicensis*
red-winged blackbird	*Agelaius phoeniceus*
scarlet tanager	*Piranga olivacea*
song sparrow	*Melospiza melodia*
tufted titmouse	*Baeolophus bicolor*
turkey vulture	*Cathartes aura*
warbling vireo	*Vireo gilvus*
white-breasted nuthatch	*Sitta carolina*
white-eyed vireo	*Vireo griseus*
worm-eating warbler	*Helmitheros vermivorum*
wild turkey	*Meleagris gallopavo*
winter wren	*Troglodytes hiemalis*
wood thrush	*Hylocichla mustelina*
white-throated sparrow	*Zonotrichia albicollis*
yellow-billed cuckoo	*Coccyzus americana*
yellow-rumped warbler	*Setophaga coronata*