

Introduction

The Unami Creek Valleys landscape system is approximately 10,000 acres (15.8 square mile) of mostly unprotected contiguous woodlands that includes the majority of the lower Unami Creek and Ridge Valley Creek watersheds east of the Northeast Extension of the Pennsylvania Turnpike and several contiguous forest areas. *The Unami Creek Valleys stands as one of the largest remaining forested landscapes in southeastern Pennsylvania, supporting a vast, interconnected mosaic of relatively natural habitat, with at least 30 patches of forest-interior habitat (30 acres or greater), a series of uncommon diabase woodlands, and over 24 miles of perennial streams, most of which are well buffered by forest.* The area is distinguished from the gently rolling red shale landscape by its unusually broad forest cover, prominent, diabase ridges and sharply defined valleys. The ecological integrity inherent in this landscape has resulted in an extraordinary combination of unique forest and meadow plant communities, forest-nesting bird species, and high quality streams.

This unique combination of ecological factors, and the threat to the Unami Creek Valleys posed by rapidly encroaching suburban development has motivated Natural Lands Trust (NLT) to include this landscape in its list of priority conservation focus areas for southeastern Pennsylvania. The centerpiece of NLT's involvement in the area is its 108-acre Fulshaw Craeg Preserve, which protects a combination of maturing diabase woodland and rare meadow plant communities along the Ridge Valley Creek. To expand its protection efforts in a focused manner, NLT has prepared this Unami Creek Valleys Landscape Conservation Plan (LCP).

The LCP provides a summary of the key natural features of the Unami Creek Valleys, the landscape ecology that supports local and regional biodiversity, cultural and historic resources, and current and projected land use and land ownership patterns affecting the area. This information has been compiled using NLT's Geographic Information System (GIS) database, field visits, and dialogue with local residents and government officials, and the associated text and series of maps are presented in this report. An assessment of threats and stresses facing the area has also been prepared, with a series of strategies outlined to abate some or all of the threats and/or stresses. Finally, a GIS-based analysis of this information has generated a detailed listing of Landscape Conservation Priorities, including parcel-specific identification of critical areas for short-term conservation and longer-term restoration.

It is NLT's intent to utilize the final recommendations of the Unami Creek Valleys LCP as a road map for working with landowners, local governments, County and State agencies, and non-profit conservation groups to create a viable network of protected and restored natural areas that sustain the ecological integrity of this landscape, and contribute to biodiversity conservation in southeast Pennsylvania.

Natural Features

Physiographic Setting

The Unami Creek Valleys is situated in the Upper Perkiomen Creek valley portion of the Perkiomen Creek watershed, a 362-square mile section of the Schuylkill River watershed and the Delaware River basin. These streams drain much of the southeastern Pennsylvania portion of the Northern Piedmont. The Northern Piedmont extends from northern Virginia to southwestern Maine (The Nature Conservancy, 1996), and represents a gently rolling landscape of temperate deciduous forest underlain by crystalline bedrock and clayey soils on the eastern foothills of the Appalachian Mountains reaching eastward to the Atlantic Coastal Plain. The Unami Creek Valleys is a fine representative example of the pre-settlement Northern Piedmont landscape within the Delaware River drainage.

The limits of the project study area are defined partly by watershed boundaries and areas of contiguous woodland, and partly by road boundaries. These include the Northeast Extension of the Pennsylvania Turnpike to the east, the limit of the Ridge Valley Creek watershed to the south contiguous woodlands surrounding Green Lane Borough to the east, and Hoppenville Road, Gerryville Pike and Brickman Road to the north.

Geology

The Unami Creek Valleys is situated within the Newark Basin portion of Triassic Lowland Province, a broad basin within the Northern Piedmont defined by its fairly young (150 million to 180 million year old) sedimentary shale bedrock geology. The project study area encompasses part of a broad circle of igneous Diabase bedrock intrusions, perhaps the most dramatic landform within the Triassic Lowlands.

The Unami Creek Valleys is almost entirely underlain by Diabase bedrock, with small areas of Brunswick shale interspersed. This Diabase formation was intruded into the 150 to 180 million-year-old Brunswick shale as molten lava some during that time period. This igneous (molten lava) bedrock heated the adjacent Brunswick shale to form a more dense, crystalline, metamorphic rock type known as “hornfels”. The pattern of Diabase and associated hornfels in the Perkiomen Valley forms an unusual, broad circle of ridges with the boroughs of Pennsburg and Red Hill at its Center. The Unami Creek Valleys is situated along the broad eastern portion of that Diabase formation. The stream valleys within the study area are generally underlain by softer the hornfels and red shale.

Diabase

Diabase is the primary rock type underlying the Unami Creek Valleys, and defines much of its prominent wooded ridges, steep slopes, boulder-strewn hillsides and narrow stream valleys. Some of the broadest diabase outcrops in the region occur in the Unami area, with sections along Upper Ridge Road and Hill Road reaching one-half mile or more in width.

The igneous nature of diabase explains its physical characteristics as a dense, crystalline, erosion-resistant outcrops that weather to form large boulders, occasionally in broad fields of “Ringing

Rocks.” Boulder fields such as the one along the east side of King Road at the Fulshaw Craeg Preserve are examples of natural features that have become local cultural landmarks. Many generations of local residents have come to climb on the rocks and strike them together to make the ringing sound associated with sound waves traveling through dense crystalline interior and the almost metallic weathered surface.

Groupings of large diabase boulders along steep slopes form small “caves” in some areas of the valley. These caves may support nesting habitat for bird species such as Turkey Vulture and Black Vulture, but have not been documented as roosting habitat for bat species in the area. Some of these caves have been documented as the Unami Creek Rock Shelters used by the native Lenai Lenape people up to the 18th century.

In the 19th and early 20th century, diabase in the area was quarried to form “Belgian blocks” that lined major Philadelphia streets such as Broad Street. Drill marks for dynamite can still be seen in boulders on the Fulshaw Craeg Preserve and surrounding areas. Diabase, also known as “black granite” or “trap rock”, has been used for headstones and support stones for large engineering projects, but was generally considered too dark to be used as building stone.

Hornfels

The igneous diabase intrusions in the Brunswick formation of the Perkiomen Creek watershed are so pronounced that it is likely that nearly all of the adjacent shale was heated and compressed to form metamorphic hornfels. Therefore, the reddish-brown Lehigh, Brecknock and Croton soils at the northern and southern limits of the Unami Creek Valleys program area are more likely to be hornfels-based rather than formed from unmorphosed sedimentary Brunswick shale.

Brunswick Formation

The rock types associated with the Brunswick formation are generally reddish brown shales, mudstone and siltstone. These shales are moderately resistant to erosion and weathering. Many of the historic structures in northern Montgomery County were made with the reddish-brown stone quarried in the area. Weathering parent material from the Brunswick geology also directly forms the reddish-brown soils of the Lehigh-Brecknock-Croton series. Based on geologic mapping and the predominance of diabase and hornfels in the area, the presence of Brunswick formation geology in the Unami Creek Valleys is probably very limited.

Planning Implications

The strong influence of the underlying Diabase bedrock on the topography and vegetation of the Unami Creek Valleys also provides natural limitations for agriculture and land development. In particular, the steep, rocky nature of the land has historically limited the use of the area for cultivation. Numerous stone walls and stone house ruins in the woodland indicate that small-scale sheep farming probably represented the pinnacle of agricultural use in the area over 100 years ago. The floodplains in the area were never broad enough or extensive enough to support the larger scale cultivation and pasturing found in more gently rolling portions of the Perkiomen Creek watershed. These same steep slopes and rocky soils present natural limitations today to large-scale development, road construction, and septic systems and private wells in the Unami Creek Valleys.

Diabase is considered a poor source of groundwater, with most groundwater only available within the weathered zone to 30 feet deep, and median yields of 5 gallons per minute (gpm) reported (Cahill, 1994). Most of the underlying geology is too dense, and the fractures and fissures too narrow, to provide reliable well water on a large scale. The shallow depth to bedrock through much of the Unami program area presents difficulties for excavation of on-site septic systems,

and sand mound systems are commonly used as a way of defeating this natural constraint. Extension sewer lines from municipal or community sewage treatment plants in the vicinity of Green Lane or Sumneytown could mean that geology is taken out of the equation as a limiting factor for wastewater treatment in the area.

Topography and Landforms

The upheaval and gradual weathering and erosion of the diabase geology over the last 150 to 180 million years largely shape the topography of the Unami Creek Valleys study area. These events have produced a landscape with two narrow stream valleys draining from northeast to southwest, divided between three ridges trending in the same northeast-southwest direction. The orientation of these landforms is due in part to their location in the southwest section of a broad circle of diabase bedrock, approximately 8 miles across in the upper Perkiomen Creek watershed. This circle may have resulted from the intrusion of the igneous diabase as molten lava in the form of a “caldora”, or volcanic formation.

The highest points in the Unami Creek Valleys occur along the ridge between Hill Road and the Ridge Valley Creek. The radio tower along Hill Road sits atop a knoll that is approximately 620 feet in elevation above sea level, one of the highest points in Montgomery County. The study area reaches its lowest point at 200 feet above sea level along the Unami Creek floodplain just below Sumneytown, a drop of over 400 feet in approximately 1.5 miles.

The sides of the diabase ridges feature numerous areas of steep slopes ranging from 15 to 25%, and 25% or greater. The most dramatic example of this steep topography (often in excess of 25% in grade) can be found along the Ridge Valley Creek and the Unami Creek, which experience drops of 300 feet over distances of less than 1,000 feet, from ridgetops to stream channels.

The floodplain of Ridge Valley Creek along both sides of the Northeast Extension of the Pennsylvania Turnpike becomes uncharacteristically broad with a wide gap between diabase ridges. The alluvial sediment deposits in this area form extensive floodplain forest and marsh conditions.

Planning implications

The underlying geology and topography has determined much of the land use in the Unami Creek Valleys, and will continue to play an important role in the future. While the area has a long history of limited use for small grist and sawmills and scattered sheep farms, the ridges, slopes and narrow valleys of the area today are left wooded with scattered residential development in less steep or wet areas. Road networks in the area are local, indirect and winding, and are often unpaved. Only the ridge top roads at the northern and southern boundaries provide through access to other destinations. The topography of the Unami Creek Valleys is not conducive to high-density residential development, modern industrial or commercial development or agricultural use. The diabase topography reinforces the sense of this land use division by the limitation it places on the use of on-site septic systems, water supply and the construction of new access roads.

To best protect the steep slopes in the Unami Creek Valleys area, the local municipalities should enact updated ordinances to restrict development on inappropriate topographic areas. Steep slope ordinances limit, and sometimes prohibit, development on slopes considered too steep to be built upon without danger to public health and safety. Steep slopes erode rapidly if exposed, which can cause silting of streams. It is also difficult to build safe driveways and roads on steep slopes

without excessive grading, disturbance to vegetation, erosion of soils and sediment, and salt impacts to streams in winter. Generally two categories of steep slope are defined:

- slopes that fall one foot for every 6.67 linear feet (15%) to one foot for every four linear feet (25%),
- slopes greater than 25%.

Restrictions on the second category are greater, concomitant with their greater sensitivity. These are overlay zoning districts, like the floodplain districts.

In the greater than 25% slope areas (often called “Very Steep Slopes”), structures and septic fields are usually prohibited. In the 15-25% category (“Steep Slopes”) buildings and septic systems are often allowed as conditional uses requiring Zoning Hearing Board approval. In other cases a maximum percentage of each slope type may be disturbed (e.g., Upper Providence). Marlborough Township’s Zoning Ordinance includes a Steep Slope Overlay District and maps that show the greatest concentration of slopes over 15% along both sides of the Unami Creek. Development on slopes of 15% or greater is limited to state- and county-permitted on-site sewage disposal systems. Public wells, stormwater facilities, underground utility lines, roads and driveways, and construction of structures on slopes of 15% or greater are permitted, but only as a Special Exception when the applicant has demonstrated to the Zoning Hearing Board that no alternative exists and that health, safety and welfare of the community are protected. *All such ordinances should include standards greatly limiting development and protecting vegetation, particularly on slopes adjacent to the floodplain and small tributaries.*

Soils

Neshaminy, Mount Lucas and Watchung soils make up the large portion of the Unami Creek Valleys soils overlying the diabase formation. These soils are mostly deep, well-drained to poorly-drained silt loams on diabase hills and ridges. The Lehigh, Brecknock and Croton soils are limited to Brunswick shale areas at the perimeter of the program area.

Neshaminy (NsD, NsB, NeB)

Neshaminy soils are by far the most common soil type in the program area, with Neshaminy (NsD) very stony silt loam, 8 to 25 percent slopes most common along the slopes above the Unami Creek and Ridge Valley Creek. Some areas of this soil are more sandy and shallow over bedrock, and small areas are extremely stony. The less steeply sloping NsB soils have a top layer of woodland leaf litter and humus. The diabase boulders beneath the subsoil are from 1 foot to more than 12 feet in diameter. The hilltops and ridges in the area are dominated by Neshaminy (NeB) extremely stony silt loam, 0 to 8 percent slopes. These are the soils of rock outcrops and shallow depth to bedrock areas.

Mount Lucas (MoB2, MoC2, MuB, MuD)

Mount Lucas soils are silt loams commonly found throughout the hilltops, ridges and lower slopes adjacent to the Neshaminy soils and the Watchung. Mount Lucas soils in particular have moderately slow permeability in the subsoil, and are rated as hydric soils with a depth to seasonal high water table averaging 1 to 2.5 feet. These soils also feature large, round diabase boulders from 1 foot to 12 feet in diameter. Hard bedrock is usually 5 to 10 feet beneath the surface, with numerous boulders interspersed in the soil above that level. Mount Lucas soils are also slightly acid to neutral. Some areas of Mount Lucas soil (MoB2) have slow permeability and form wet depressions and seeps at the bases of slopes from spring through early summer. The Mount

Lucas very stony silt loams on 0 to 8 percent slopes (MuB) occur along ridgetops in the area, and those on 8 to 25 percent slopes (MuD) occur on lower slopes.

Lehigh, Brecknock and Croton

Lehigh, Brecknock and Croton are the common soils overlying the Brunswick formation geology at the northern and southern limits of the program area. These soils are moderately deep, poorly drained to well-drained soils of uplands underlain by metamorphosed shale. These soil types include small areas of prime agricultural soils. Soil survey information cannot be relied upon for site-specific determinations without on-site investigations.

Planning Implications

Poor drainage, high water table, shallow depth to bedrock, and rocky ridges, outcrops and slopes characterize the majority of the soils that constitute the land mass of the Unami Creek Valleys program study area. These qualities demonstrate that the gradual erosion of the underlying diabase geology has created a landscape where water and rock are common factors affecting the uses of the land and soil.

Natural constraints to development are most frequently due to poor recharge qualities, high groundwater table, or shallow depth to bedrock. These qualities are typical of the most common soil types in the area, and they point to the fact that the area cannot handle significant increases in on-lot disposal of sewage effluent (with or without sand mounds) without seriously threatening the carrying capacity of the land to supply clean groundwater for the private wells used by most residents.

Neshaminy and Mount Lucas soils are commonly found over diabase. The Neshaminy soils tend to be fairly well drained, with a depth to seasonal high water table averaging 3 feet below the surface. Most of the Neshaminy soils are rated as having moderate to severe limitations for on-site septic systems. All of the Mount Lucas soils are rated as having severe limitations if used as disposal fields for septic effluent. Water supply in these soils is generally poor due to the relatively shallow depth to bedrock and low well yields from tight fractures in diabase bedrock.

These limitations are serious enough to warrant careful consideration of the groundwater impacts that may result with each new proposed land development plan in the area. Where construction of new septic systems is permitted, protection of existing wells and ground water quality in the area should be guaranteed with accurate hydrologic documentation and escrow funds to cover the cost of replacing failed wells.

The attached GIS maps show areas of hydric and alluvial soils in the project area. These are the soils of most concern and interest for conservation planning, indicating preservation opportunities. While a small amount of hydric soils have been recorded and mapped by the USDA-NRCS Soil Survey for Montgomery County, there are quite extensive areas that are candidates for hydric inclusions where seeps, springs and rivulets emerge along the bases of slopes in the area.

Only a small percentage of the project area supports important agricultural soils, with the greatest concentrations found along the shale and sandstone based Lehigh-Brecknock soils around the perimeter of the study area. Properties over 50 acres in size along Upper Ridge Road and Geryville Pike, Ridge Road and along the lower Unami Creek west of Sumneytown Pike are candidates for agricultural preservation through the Pennsylvania's Agricultural Easement program, as administered locally by Montgomery County and, in some cases, with the assistance of municipal open space funding. The critical mass areas (several hundred acres) of contiguous

Class 1, 2 or 3 soils that occur in the study area should be closely evaluated as potential agricultural preservation areas.

Hydrology

Surface water

The project area for the Unami Creek Valleys Landscape Conservation Plan includes major sections of two main tributaries of the Perkiomen Creek, the Unami Creek and its major tributary, the Ridge Valley Creek. A total of over 26 stream miles are included in the study area, with nearly 14 miles of frontage on the Unami Creek and its tributaries and over 8 miles along Ridge Valley and its tributaries. Several First Order tributaries of the Macoby Creek totaling 4 miles in length are also included in the western portion of the study area along Geryville Road.

These streams are generally characterized by the influence of natural conditions such as the underlying diabase geology and the topography of dramatic ridges and steep ravines, combined with the long history of human influence – with the initial forest clearing, limited agricultural use as small livestock farms, construction of mills, dams and ponds, road and building construction, and modern development, conservation and restoration. The physical characteristics of the stream channel, the quality of the water (both chemical, biological and physical), and the quantity of water during periods of average flow, draught and flooding are all influenced by the interaction of these natural and cultural forces.

As land in the watersheds continues to face increasing pressure for subdivision and land development, the need to maintain and restore the quality and quantity of the streams of the Unami Creek Valleys program area must be central to the decision-making process. Conservation and restoration of land along streams are perhaps the most important steps that can be taken to balance the impacts of future development.

Unami Creek and Ridge Valley Creek

The Unami Creek, at the heart of the study area, drains a watershed area of 4,769 acres with approximately 73,856 linear feet of stream system within the study area. This represents roughly the lower half of the entire watershed. The system includes at least eight First Order tributaries draining the uplands in most of the central core of the study area, flowing in a southwesterly direction before converging with Ridge Valley Creek at Sumneytown. Swamp Creek Road parallels the stream for most of its length. The Unami Creek is a Fourth Order stream that rises in a broad, rural headwaters area to the northwest of Quakertown and , indicating that it drains a relatively small area with few major tributaries.

Ridge Valley Creek is somewhat smaller tributary of the Unami, originating just north of Camp Skymont Park along the PA Turnpike. This Second Order stream flows entirely through diabase, and drains an area of approximately 3,141 acres with 42,498 linear feet of stream system within the study area. This represents roughly the lower 2/3rds of the watershed. At least six main First Order tributaries drain the uplands in the eastern third of the study area.

Although the Pennsylvania Department of Environmental Protection has rated the Unami Creek and Ridge Valley Creek as a Cold Water Fishery (CWF), they are potential candidates for upgrading to High Quality or Exceptional Value due to the relatively undeveloped agricultural and natural landscapes that form their drainage area. Still, the streams suffer from non-point source pollution such as runoff and sedimentation from inadequately protected construction sites,

effluent from failed on-lot septic systems, and runoff from agricultural lands lacking Best Management Practices (BMP's). These problems are more concentrated in the Unami due to its broader headwaters area.

The stream channels of both creeks are relatively shallow but wide, with a pool-and-riffle pattern formed between large diabase boulders and smaller deposits and islands of alluvial silts, sediments, sands and gravels. Several dams maintained for recreational purposes impede both streams. A dam on the Musser Boy Scout Camp property alters the natural flow of the Unami. Dams at Camp Skymont and Whites Mill Park are the main impoundments on the Ridge Valley. The benefits of these sites as historic resources, recreational areas and unique open water habitats should be carefully weighed with the effects they have on the overall health and viability of the stream ecosystems.

In general, the portions of the Unami and Ridge Valley flowing through the study area do not suffer from severe erosion and cutting of stream banks due to the prevalence of diabase boulders, which form a natural rip-rap in some areas. The gradual drop of the streams over these boulders forms small waterfalls that serve as a natural aeration for the water, increasing levels of dissolved oxygen that are vital to aquatic life. The steeply sloping topography and narrow floodplain along most of the Unami and Ridge Valley provides a natural constraint to degrading uses such as large-scale development or agriculture. Almost the entire length of the lowland corridors along both streams in the study area is mapped as floodplains, although these areas are quite narrow.

Planning Implications

The streams in the area are vulnerable to ongoing non-point source pollution impacts and erosion and flooding problems. On the quality side, pollutants such as road salt, hydrocarbons and sediments carried by runoff channels along the ditches of paved and dirt roads drain directly into these streams through culverts, swales and sheet flow. Runoff from farm fields and lawns in the upper Unami Creek watershed carry nutrients, pesticides and sediments. Where the stream is buffered by a wooded strip of 50 feet or more, these pollutants are less likely to reach the stream as sheet flow is intercepted by natural vegetation and pollutant-laden sediments settle out and are filtered by plants and soils.

The greatest concerns for water quality in the study area are pollutants and sediments carried by runoff from roadside ditches along public and private roads and driveways, the prevalence of failed or poorly functioning septic systems, and increased clearing of woodlands, construction of impervious rooftops and driveways, and resulting erosion along steep slopes. As development continues to increase the scope and severity of these impacts, the need for protected open space, clearing and grading standards, and innovative stormwater management approaches will become increasingly important to the health and viability of local streams. Two of the most important strategies to protect streams include the preservation and restoration of sizeable natural open space networks along streams, and the use of stormwater management systems that maximize filtration and recharge of stormwater runoff. To maintain stream water quality and quantity in the Unami Creek Valleys area, stream-discharge of treated sewage effluent should be prohibited, as should export of groundwater (via wells) to sewage treatment systems discharging out of the local watersheds. Consideration should also be given to the feasibility and benefits of removing or partially breaching certain dams in the area.

In light of the diabase geology and concerns about contamination and pollution, water quality should be periodically sampled in the Unami Creek Valleys, and records kept indicating trends. Voluntary submission of residential well testing results to a centralized database maintained by the local townships would also provide for tracking and trend analysis of water quality, as well as

water quantity provided by the underlying aquifer. The Schuylkill Riverkeeper can be consulted for protocols and training of volunteers for stream water quality sampling. In addition, an annual stream walk along Ridge Valley Creek and Unami Creek would serve to both visually check stream condition and also provide the opportunity for community residents to remove trash and check for evidence of new point-source or non-point-source pollution impacts.

Goals should be set for restoration of both streams, with the goal of improving the stream designations to “Exceptional Value”.

Wetlands and Vernal Pools

Wetlands are not a particularly significant natural feature of the Unami Creek Valleys study area. They are probably an underrepresented habitat type compared to the historic condition of the site, with some of the broader floodplain areas along the Unami Creek and Ridge Valley Creek now supporting man-made ponds and lakes. Most of the natural wetlands in the study area are associated with the stream corridors or seeps and springs in headwaters areas. The greatest concentration of mapped wetlands on the National Wetlands Inventory can be found along the Ridge Valley Creek in the vicinity of Camp Skymont Park and Whites Mill Park. Perhaps the most significant unmapped wetlands include the extensive amount of small seeps and springs that emerge from diabase slopes and feed small rivulets and tributary streams. Some of the hydric soils, which have high seasonal water tables –typically those in the ‘severe’ category with season water table fluctuations in the 0-1.5’ below surface depth, may also be considered wetlands. All wetlands need field verification. It is likely that any wetlands that have not yet been mapped in the area by the National Wetlands Inventory (which on average only represents about 50% of actual wetlands in Pennsylvania¹), would be of a riverine nature and fairly small features.

Vernal Pools are important conservation features at a local level, since they are the focus of most amphibian and some reptile reproductive viability. These ephemeral pools that appear as the spring high water table and spring rains saturate the soils, may only be present for a few months of the year. Vernal Pools most commonly occur along forested floodplains in the area where floodwaters deposit sediments that form natural “levees” along the tops of stream banks, thereby impeding direct runoff to streams.² Certain poorly drained upland soils along fairly level, forested diabase ridgetops also exhibit ponding effects that may serve to support Vernal Pools. They are usually so small that they are easily overlooked. None of the GIS mapping completed for this project is detailed enough to capture the locations, if any, of these critical conservation features. If they are locally known of, every effort should be made to protect them, and their immediate upstream watershed and buffer areas.

Planning Implications

Wetlands are important habitats for native plants and wildlife, and also act as the valve, sponge and filter of the hydrological system, holding floodwaters after a storm, cleaning them naturally through biofiltration, and then letting the water out slowly.

In the Unami Creek Valleys study area, more natural wetlands may have existed in the area before local streams were dammed for mills and recreational purposes. The hydric soils, particularly along small tributaries and the bases of slopes, however, may be the most extensive network of important, unmapped wetlands. Although no site-specific investigations have been

¹ Personal Communication, Art Spingarn, EPA Region 3.

² Godfrey, 1980.

completed under this study, there could be opportunities to identify, protect, and restore wetland habitats and vernal pools on mapped hydric soils and in areas altered by dams and ponds in the Unami Creek Valleys area.

Planning Implications

Wetlands are important habitats, and also act as the valve, sponge and filter of the hydrological system, holding floodwaters after a storm, cleaning them naturally through biofiltration, and then letting the water out slowly.

In the Unami Creek Valleys study area, more natural wetlands may have existed in the area before dams and ponds were constructed and wider floodplain areas were converted to limited agricultural or residential use. Although visual expressions of wetlands along open floodplains are limited where large ponds and fields exist, the soils in these areas may still exhibit the hydric characteristics of wetlands. Although no site-specific investigations have been completed under this study, there could be opportunities to recreate and/or restore wetland habitats on mapped hydric soils in the Unami Creek Valleys area.

Groundwater

Fractures and solution channels in diabase areas and seasonal high water table in many parts of the study area provide for a direct connection between land surfaces and groundwater, thus greatly increasing the potential for groundwater contamination, aggravated by the potential for direct interchange between surface and groundwater as groundwater seeps and springs feed the local stream network.

Both Unami Creek and Ridge Valley Creek flow over the diabase aquifer that many residents used as their prime source of drinking water. This may be very difficult to replace if it becomes contaminated. Groundwater resources are considered limited in diabase geology, and water availability may be an important limiting factor on future growth in the area. And while still considered relatively clean in the region, concerns about water quality and quantity are likely to mount as threats of sprawl and intensified uses of the land build momentum in the area.

Planning Implications

Where public water supply and wastewater treatment are not used, the dense crystalline nature of diabase geology should place a limit on the development potential of the land. The prospect of large-scale community wells or sewage treatment systems is not likely in the immediate study area, however, nearby shale and sandstone-based areas, and the close proximity to Green Lane Reservoir, represent potential sources for public water and sewer systems that could be used to undermine the natural carrying capacity of the Unami Creek Valleys to provide sustainable water supply for its residents.

Most groundwater recharge in the area results from precipitation. A good five-feet of permeable soil overburden is recommended to cleanse most ordinary suspended and dissolved contaminants – i.e., there should be at least 5-feet of soil between the *bottom* of a septic system and the *top* of the water table. In the Unami Creek Valleys area, where soils are often thin and poorly drained, the use of sand mound systems is increasingly common. Sand mounds should not be seen as a solution to the looming problem of groundwater contamination. In areas along the Unami and Ridge Valley Creeks where the water table is high, contaminants may not have a chance to be

ameliorated by the soil before entering the water supply, with or without sand mounds. Shallow wells in these areas are likely to become contaminated by septic effluent more easily than deep wells. To provide reasonable assurances that septic leachate does not contaminate domestic water supply wells where local sewer and public water are not supplied, residential densities should not exceed one residence in 5 acres.

Riparian Buffers

Riparian buffers are defined in this Plan as wooded corridors paralleling streams and extending outward at least 100 feet from the tops of both banks of a stream. They provide numerous community benefits, and are often the first line of defense for non-point source surface water quality concerns such as sediment, erosion, nutrients and other pollutants. The roots of trees, shrubs and herbaceous vegetation help to anchor streamside soils and reduce flooding. The leaves, twigs, branches and logs of trees provide food and habitat on which the entire food web of a healthy stream ecosystem is based, and tree canopies provide shade to maintain cooler water temperatures necessary for many native aquatic organisms, including native brook trout.

Since the vast majority of the streams in the Unami Creek Valleys are bordered by forest, this Plan does not emphasize a detailed analysis of riparian buffer corridors and gaps. However, since a minimum of 75 feet of forest cover on each side of a stream is recommended for most of southeastern Pennsylvania, the Unami area has the potential to protect significantly wider buffers to benefit the health of the stream ecosystem. Areas with full riparian buffers are good candidates for voluntary protection agreements such as conservation easements. Partial buffers can be expanded with tree planting efforts and by fencing streams in areas where floodplain meadows or fields exist, extending the width of existing riparian buffers to, ideally, at least 100-feet on either side of the stream. Missing buffers, areas where streams flow unprotected through fields or lawns, are “opportunities” for reforestation. The only exceptions to this recommendation apply in areas where native herbaceous wetlands (i.e. sedge marshes and wet meadows) provide important habitats for native plants and wildlife.

Planning Implications

Creative and innovative ways should be pursued to encourage landowners to maintain and restore sizeable riparian buffers. In many cases, the use of conservation easements or “riparian buffer easements” is the most effective approach. These voluntary agreements help to ensure that stream corridors remain natural without future clearing or construction of improvements. The Township may want to consider financial incentives, such as property tax rebates, for landowners who are willing to install and maintain high quality riparian buffers on their property. Riparian buffer ordinances are used in many municipalities to ensure that future development does not unnecessarily intrude on these valuable natural areas. A program should be developed and goals set – such as achieving 100% stream bank fencing and riparian buffers along all surface water streams and wetlands in ten years.

Stormwater

Many conservation concerns arise from poor stormwater management. Surface water non-point pollution (particularly sedimentation), erosion and lack of groundwater recharge are perhaps the biggest concerns. Although no site-specific analysis of stormwater conditions have been conducted for this report, some general guidelines can be recommended.

Planning Implications

Excellent recommendations for stormwater and impervious surface ordinances and sustainable taxation schemes suitable for implementation throughout the region have been provided in the Wissahickon River Conservation Plan, page V-10 through V-23 (Delta Group et al 1999). The following is a brief summary of the highlights. However, it is highly recommended that the entire section referenced above be read and implemented in Williams Township.

Stormwater management ordinances should be consistent with approaches presented in *Pennsylvania Handbook of Best Management Practices for Developing Areas* (1998). By and large, the uncontrolled small storms cause most stormwater problems in the region, while modifying standard BMP's to account for the special considerations of the karst topography.

Comprehensive ordinances should provide:

- Performance standards
- Appropriate storm designs (e.g. detention of the 1 and 2-yr storms)
- Improvement in groundwater recharge, including:
 - Retain first ¾ inch of rainfall on-site (rain barrels)
 - Preserve the same volume of infiltrated rainfall as in pre-development condition (based on annual rainfall)
- Lists of recommended BMPs

Also, the following are encouraged:

- Reassessment of stormwater management objectives by municipalities
- Retrofitting grandfathered properties with up to date stormwater management levels as they are redeveloped
- Requirements for the management of roof runoff

- Requirements for agricultural lands

Municipalities should have policies and ordinances that incorporate provisions to reward developers and homeowners (like relaxing some permitting requirements or shortening review cycles), for using low-impact site design principles.

Finally, tangible financial incentives are justified where voluntary measures will substantially reduce the costs that would otherwise be incurred by municipalities for water treatment, maintenance, repairs or improvements to publicly owned facilities. *This could include financial payments to local landowners - compensating them if they agree to set-aside ideally 100-foot riparian buffers on each side of a stream, as well as hydric soils for riparian buffer and wetland restoration.*

At the same time, Stormwater Utilities (SWU) (a mechanism to fund stormwater facilities and services) are being implemented with greater frequency in the United States. Tax payments can be made to the municipality on the basis on some index of stormwater impact created by the property – such as total impervious area or contiguous impervious area. The revenues from these taxes should be used to fund watershed studies, GIS databases, direct subsidies to landowners who install BMPs, and where appropriate, upgrades to public works projects (e.g. tertiary treatment sewage treatment plants).

Vegetative Communities

Plant communities do not generally occur at random across the landscape, but form patterns based on environmental conditions. The division of plant communities into discrete communities is an artificial process, but is conducted by simplifying the complexity of nature to convey the character of a site. There are no hard divisions between plant community types – boundaries dissolve slowly as rich mosaics of plant associations and community patches respond to changing environmental conditions – from dry to moist to wet, and by aspect, topography, depth of soil and elevation.

The forests at the project site are generally in reasonable condition. Deer browse does not seem to be over-abundant (helped no doubt by the prevalence of boulder-strewn hillsides - deer prefer to avoid landscapes where brush and rocks hamper their legs). No significant signs of infestations or diseases (like gypsy moth or beech blight) are evident. Undoubtedly the forests have lost the American chestnut and elms that our grandfathers would have expected to see, but otherwise they are good quality representations of medium-aged common plant communities.

The woodlands in the Unami Creek Valleys program area support the distinctive plant communities of the diabase region and contain over a dozen canopy tree species including sugar maple, black birch, white ash and tulip poplar. According to the classification system presented in *Terrestrial and Palustrine Plant Communities of Pennsylvania*, by Jean Fike of the Pennsylvania Natural Diversity Inventory, the program area supports as many as eight different forest types, two shrub wetland communities and two herbaceous wetland communities. These include:

Tuliptree-Beech-Maple Forest

Sugar Maple-Basswood Forest

The slopes and other well-drained areas in the diabase region along Unami and Ridge Valley Creeks and the north- and east-facing slopes above waterways in the Triassic shale region at the perimeter of the study area support these two similar forest types. Dominant species include:

| | |
|----------------|--------------------------------|
| American beech | <i>Fagus grandifolia</i> |
| Basswood | <i>Tilia americana</i> |
| Red Oak | <i>Quercus rubra</i> |
| Sugar maple | <i>Acer saccharum</i> |
| Tuliptree | <i>Liriodendron tulipifera</i> |
| White ash | <i>Fraxinus americana</i> |
| White oak | <i>Quercus alba</i> |

Red Oak-Mixed Hardwood Forest

The more level uplands on Triassic shale tend to support this forest type, often maturing from an early successional stage of nearly solid thickets of Eastern redcedar (*Juniperus virginiana*).

Woodlands with these characteristics are concentrated along Upper Ridge Road and Ridge Road.

Dominant species include:

| | |
|-------------------|--------------------------------|
| Mockernut hickory | <i>Carya tomentosa</i> |
| Red oak | <i>Quercus rubra</i> |
| Shagbark hickory | <i>Carya ovata</i> |
| Tuliptree | <i>Liriodendron tulipifera</i> |
| White oak | <i>Quercus alba</i> |

Successional Red Maple Forest

This forest type is typically found in low-lying areas along streams, floodplains and headwaters areas with hydric soils, particularly those that have been logged or abandoned from farming within the last 20 to 30 years. Dominant species include:

| | |
|------------------|--------------------------------|
| Eastern redcedar | <i>Juniperus virginiana</i> |
| Red maple | <i>Acer rubrum</i> |
| Tuliptree | <i>Liriodendron tulipifera</i> |
| White ash | <i>Fraxinus Americana</i> |

Bottomland Oak-Hardwood Palustrine Forest

Forested areas along broader floodplains bordering the Unami and Ridge Valley Creeks mature to this forest type. Dominant species include:

| | |
|------------------|------------------------------|
| Black walnut | <i>Juglans nigra</i> |
| Box elder | <i>Acer negundo</i> |
| Hop hornbeam | <i>Ostrya virginiana</i> |
| Pin oak | <i>Quercus palustris</i> |
| River birch | <i>Betula nigra</i> |
| Shagbark hickory | <i>Carya ovata</i> |
| Silver maple | <i>Acer saccharinum</i> |
| Sycamore | <i>Platanus occidentalis</i> |

Silver Maple Flood Plain Forest

Sycamore-River Birch-Box Elder Flood Plain Forest

Flood plains may also support a forest type with greater representation of silver maple or sycamore and river birch.

Conifer Plantations

Planted stands of evergreen species such as Norway spruce (*Picea abies*) and white pine (*Pinus strobes*) can be found in certain parts of the program area. These plantations are not a native forest type, but often date back 50 to 75 years when seedlings were widely distributed.

Buttonbush Wetland

Alder-Ninebark Wetland

Shrubby wetland communities in the study area are known to support the following species:

| | |
|-------------------|----------------------------------|
| Alder | <i>Alnus spp.</i> |
| Arrowwood | <i>Viburnum dentatum</i> |
| Buttonbush | <i>Cephalanthus occidentalis</i> |
| Elderberry | <i>Sambucus canadensis</i> |
| Red-osier dogwood | <i>Cornus amomum</i> |
| Silky dogwood | <i>Cornus racemosa</i> |
| Spicebush | <i>Lindera benzoin</i> |
| Swamp Rose | <i>Rosa palustris</i> |
| Willow | <i>Salix spp.</i> |
| Winterberry holly | <i>Ilex verticillata</i> |

Tussock Sedge Marsh

Mixed forb Marsh

Openings in shrubby wetlands, and broader wet meadow areas support these communities, including species such as tussock sedge, sweet flag iris, sensitive fern and skunk cabbage.

Planning Implications

As mentioned earlier, the US Forest Service urged protection of large contiguous forests (defined as areas of more than 5,000 acres) as part of the New York – New Jersey Highlands Regional Study in 1990. If the Highlands province is extended into Pennsylvania, additional funds for voluntary protection of forestlands may be available from a special set aside from Pennsylvania’s Land and Water Conservation Fund. Pennsylvania may also consider the Highlands province as a Forest Legacy project site, which would again mean that funding would be available for forested tracts of land to be protected.

The US Forest Service Highlands study also addresses the issue of timber management and production, noting that the timber resources of the region may be underutilized. The Forest Legacy Program also endorses sustainable forestry, promoting selective cutting with good environmental best management practices. Selective harvesting can occur without causing too much harm to forest and aquatic systems; however, local controls need to ensure that over-harvesting and clear-cuts are avoided, especially within riparian zones and on the steepest slopes, which have the most erodable soils.

At the end of the last ice age (Pleistocene), the area forests probably consisted primarily of spruce, pine, birch and alder, which gave way to chestnut-oak forests as the climate warmed. Indians likely burned the forest periodically, while subsequently Eurocolonials cleared and plowed many forests and introduced new species, both intentionally (e.g. Norway maples) and unintentionally (e.g. chestnut blight). While chestnut, elm and hemlock have declined locally due to disease, and oaks, beech and hickories are now probably *underrepresented* due to high-grade lumbering, ash, maple, sycamore and tulip poplar are probably more common than they once were in the landscape.

Any future restoration activities involving forests and/or riparian buffers should consider *emphasizing* the underrepresented native species to reinstate biological balance. This will also ensure that appropriate seed-sources are reintroduced to the region, which will in turn provide for long-term viability and balance of the common plant communities.

A final note about *local provenance* is applicable at this point: Efforts should be made to ensure that, where possible, any plants used for restoration (or even for horticultural use – at least by the Township institutions if not by residences) should be obtained from local growers. Much discussion in the ecological and native plant communities in recent years has promoted the concept of purchasing plants grown within, ideally, less than 50 miles of the planting site – and certainly no more than 100 miles.

Invasive Exotic Plant Species

The combination of thin, low-nutrient diabase soils, extensive forest cover and lack of soils disturbance, and the prevalence of north-facing slopes in the Unami Creek Valleys has greatly limited the spread of invasive exotic vegetation so commonly found throughout southeastern Pennsylvania. In disturbed areas, such as successional goldfields, along woodland edges, forest gaps or clear-cuts, a slate of invasive exotic plants may be evident, intermixed with ruderal (i.e. opportunistic) natives such as cherry, red cedar, dogwood, crab apple, maple and tulip poplar. Invasive exotic plant species of particular concern in the area typically include, but are not limited to:

Multiflora rose; blackberry; wineberry
Japanese honeysuckle; knotweed; hops; stilt grass; barberry; shrub honeysuckles; Russian olive;
Japanese barberry; winged euonymus (a.k.a. burning bush);
Norway & sycamore maples
Asiatic bittersweet; akebia vine; porcelain-berry vine; mile-a-minute vine
Garlic mustard, lesser celandine, dame's rocket, purple loostrike
Miscanthus; pennisetum; and reed canary grasses

This list represents only some of the most infamous species. More extensive lists are available³, which also consider potentially harmful species that are still being evaluated locally for detrimental impacts.

At the same time, there is also a general overabundance of native ruderal species that prefer 'edge' or disturbed environments in the region. Human impacts in the past few centuries have created many more of these habitat types than there were in pre-colonial times through fragmentation. This imbalance can be address through public awareness and discouraging over-abundant, aggressive native species in favor of underrepresented native species. For example, fox grape is an over-abundant native species in the area that thrives in disturbed edge habitat conditions. Although it provides good wildlife food, its extent should be monitored carefully. If it becomes overabundant, it should be carefully controlled - but not necessarily eradicated. If there are local concerns about loss of wildlife food sources, encouraging natural regeneration or planting native shrubs that produce high-lipid berries and nuts (e.g. viburnums, hazel) – is a good alternative.

³ Pennsylvania Department of Conservation and Natural Resources has recently published [4/00] an excellent pamphlet called 'Invasive Plants in Pennsylvania' [#8100-pa-dcnr3077]explaining this problem and listing plant species in the region which are considered current threats.

Planning Implications

While the health of the local forests in the Unami Creek Valleys is relatively good, local conservationists must be vigilant. Invasive exotic plant species spread typically by bird droppings (for berry-or seed reproducing species) or wind. Since most invasives were introduced by man, either by accident or purposefully, their distribution is typically highest around urban areas, with concentric rings of decreasing density moving into the countryside. In this area, if the seed-source for many of these species is not yet evident – they will probably be arriving soon.

It is no longer sufficient to conveniently assume that nature is maintaining a self-perpetuating balance. With the invasion of aggressive non-native species, many native plant populations can be severely impacted. Highly disturbed forests can lose their naturally high biodiversity in the face of these alien invasions – and surprisingly quickly.

It is recommended that local conservation groups undertake annual monitoring of the natural habitats throughout the Unami Creek Valleys, particularly those that house rare plant species and in protected parks and nature preserves. At the first signs of invasion by exotics, volunteers should be solicited to manually remove the invasive plants, paying particular attention to removing all roots and seed-heads to avoid resprouting or new germination. If necessary, a skilled, qualified and certified professional can be hired to spot-spray herbicide (typically in the late summer with Roundup,) to control patches of invasive exotic plants that don't respond to manual removal. A public education campaign should be initiated to inform local landowners of the issue and concerns. Natural Lands Trust's Fulshaw Craeg Preserve provides a valuable local demonstration site to learn techniques for management of invasive species.

As a compliment to the native plant species local provenance ordinance proposed above (under the Vegetation Communities section), the local townships should also consider implementing an Invasive Exotic Plant ordinance to ensure that future plantings do not use known invasive species. Again, institutions and corporations could be *required* to adhere to the guidelines, while residential landowners might be *encouraged*, perhaps through property tax rebate incentives, to follow the recommendations. Numerous counties and municipalities in southeast Pennsylvania have such ordinances that could serve as models.

Wildlife

The Unami Creek Valleys includes a broad network of forest-interior habitat, forested stream corridors and wetlands, and herbaceous and shrub wetlands and meadows that supports a relatively high diversity of native wildlife species. Owing to the relative lack of forest fragmentation and habitat disturbance in the valley, a number of wildlife species are present that are not commonly found in the more heavily agricultural or developed landscapes of southeast Pennsylvania. Mammal species such as gray fox, forest-nesting birds including scarlet tanager and pileated woodpecker, and reptiles such as Northern Copperhead are all indicative of the ecological integrity of the Unami area.

The Unami study area includes a broad network of forest-interior habitat, forested stream corridors and wetlands, with some upland meadows and old fields, and herbaceous and shrub wetlands that supports a relatively high diversity of native wildlife species. Owing to the relative lack of forest fragmentation and habitat disturbance in this area, and the presence of the two large stream corridors, a number of wildlife species are present that are not commonly found in the more heavily agricultural or developed landscapes of southeast Pennsylvania. Mammal species

such as mink, forest-nesting birds including scarlet tanager and pileated woodpecker and amphibians such as wood frog and spotted salamander are all indicative of the ecological integrity of the Unami area.

The distinction between wildlife species that are *habitat specialists* and those that are *habitat generalists* is important to consider in prioritizing natural areas for protection. *Habitat specialists* depend on specific habitat types (e.g. grasslands, forest-interior, cold-water streams), whereas *habitat generalists* are more adaptable to a variety of human-influenced environments. *Habitat generalists* such as gray squirrels, white-tailed deer and blue jays are more often likely to be commonly found in the suburban landscapes of residential areas, woodland edges and woodlots, and small fields that are becoming more ubiquitous throughout the region. *Habitat specialists* such as bald eagles, wood frogs and luna moths rely on larger, undisturbed blocks of interconnected natural areas – the very kind of networks that are being replaced by suburban landscapes favoring *habitat generalists*.

This Plan includes a series of Potential Habitat Maps that demonstrate the suitability of the habitat networks in the study area for supporting biodiversity for each of the major taxa groups: plants; aquatic species (invertebrates and vertebrates); birds; mammals; herpetofauna (reptiles and amphibians); and invertebrates (terrestrial). The map titled Summary Taxa Habitat Value consolidates these individual suitability maps into one comprehensive overview of the Paunacussing area that rates blocks of land based on their potential for supporting biodiversity. This map reveals that, as can be expected, the largest blocks land containing the broadest networks of forest, wetland and stream habitat are those with the greatest potential habitat value for biodiversity conservation. The deep woods and wooded corridors along the Unami Creek and Ridge Valley Creek are all rated as the Most Important tracts of land for supporting biodiversity spread across the greatest number of taxa groups. Outlying areas at the perimeter of the study area are somewhat less important due to larger agricultural and developed areas.

Aquatic Species (fish, invertebrates)

The major streams, tributary streams, wetlands and ponds that constitute the aquatic ecosystems of the Unami area provide food and habitat conditions suitable for a rich diversity of aquatic life. These include an array of benthic macroinvertebrates (insects and larvae found in stream beds) such as caddisfly nymphs, stonefly nymphs, and mayfly nymphs. Freshwater mussels, snails and crayfish also fall into this category. These species form the base of the food web in stream ecosystems, and are important indicators of stream health or degradation. The diversity of aquatic life includes fish such as dace, darters, minnows, suckers, brown trout and native brook trout.

The Potential Aquatics Habitat Value map reveals that the best habitats for supporting these species are (obviously) streams, ponds and wetlands, but also associated forest areas which provide important filtration and recharge benefits to maintain the critically important quality and quantity of water on which aquatic organisms depend. Freshwater stream ecosystems evolved in a forested condition, and their richness and viability are inherently connected to the presence of healthy streamside and upland woodland networks. Residential and agricultural land areas are less important for these species.

Bird Species

Given the size, diversity and quality of habitats in the area, and the situation along the upper Perkiomen Creek valley, the total number of overwintering, migratory and breeding bird species utilizing the area is expected to be high, particularly with forest dwelling species. The deep woods habitats and wooded riparian corridors of the Unami area attract numerous species of woodland warblers and other habitat specialists such as woodpeckers, owls and small hawks and wood ducks. Even shrubbier successional old field habitats attract less-common edge species such as American woodcock, yellow-breasted chat, and indigo bunting.

The Potential Birds Habitat Value map confirms that these woodland/stream/wetland/river habitat networks are critical for supporting bird species diversity in the Unami area. Lower density residential areas are rated as having moderate value, but agricultural lands and more intensive residential developments (such as in nearby villages) rate as Least Important for most bird species, owing to the lack of food and cover opportunities for many of the habitat specialists that make up the list for the area.

Herpetofauna (Reptiles and Amphibians)

The same habitat networks that support aquatic and bird species diversity are also critical for the reptiles and amphibians of the Unami area – but riparian and wetland habitats are most important. Amphibians such as frogs (at least 7 species), toads and salamanders (at least 5 species) are perfect examples of habitat specialists, often reproducing in small vernal pools and shallow wetlands during the spring breeding season, then dispersing to streamside and upland woodlands and wet meadow areas. Reptiles including turtles (at least 5 species) and snakes (6 species) are also found more commonly in natural areas rather than residential or agricultural landscapes. The Potential Herpetofauna Habitat and Value map reveals that the stream, pond, wetland and river habitats are Most Important for these species, with the majority of woodlands in the area ranking as moderately important. Agricultural and residential landscapes are less important habitats for reptiles and amphibians.

Invertebrates (Terrestrial)

Invertebrates are perhaps the most diverse yet least understood and appreciated of the wildlife taxa groups. The myriad of ants, beetles, worms, and larvae that live in the forest leaf litter and upper soil layers in the region are the “decomposers” that play a crucial role in maintaining healthy ecosystems and stream quality. The more charismatic butterflies, moths, dragonflies, damselflies, and the less popular bees, wasps, flies and mosquitos play crucial roles as pollinators and/or decomposers, and are often *plant specific* in their habitat requirements, in addition to being habitat specific. The Potential Invertebrates Habitat and Value map, in general, confirms that these species are most dependent on forested habitats for their survival, due to the combination of high plant diversity and accumulation of organic matter they provide. Agricultural and residential landscapes are less beneficial.

Mammals

The habitat networks of the Unami area may support as many as 50 different species of mammals. Some of these are more common habitat generalists or woodland edge species found in many backyards. Species such as white-tailed deer, gray squirrel, groundhog, white-footed mouse, raccoon, opossum, moles, shrews, and eastern cottontail rabbit fall into this category. The potential list of less common and more habitat specific species in the area includes several types of weasels (including mink), gray fox, up to 10 species of bats, eastern coyote and red squirrel. Several larger mammal species that are indicators of large, healthy habitat networks may pass

through the area, or could be attracted in the future. These include bobcat, black bear, beaver and Eastern wood rat -- an important, declining native rodent that may be present in this area. The Potential Mammals Habitat Value map includes the important woodland/stream/wetland/river networks as Most Important, but also includes agricultural and residential landscapes as having secondary value for mammals. The buffering and linking value of farmland adjoining woodlands is certainly an important factor in maintaining the diversity of mammals in the Paunacussing area.

Planning Implications

Habitat destruction, fragmentation and disturbance are the primary causes of loss of flora and fauna diversity across the region, and in the Unami Creek Valleys landscape. However, studies show that the introduction or invasion of exotic species now has the second largest impact in reducing species diversity across the nation. Deer browse is also a concern for plant species diversity and the wildlife diversity that depends on native vegetation. Locally, gypsy moth invasions are a good invasive exotic wildlife example, but there are many others – the newest of which are the growing concerns about Asian longhorn beetle and Asian and European earthworm impacts in natural woodlands, although no sustainable solutions to these problems have yet been developed.⁴

As with many other areas in the region, some wildlife species are bouncing back from human impacts – such as white-tailed deer, wild turkey and red fox – while others continue to decline. Typically invertebrates, amphibians and reptiles continue to be disproportionately impacted by our modern world, while other vertebrates, and mammals in particular, seem better able to adapt. Species of all taxon groups that have difficulty adapting to disturbance, or those that *require* specific disturbance regimes or that are area-sensitive and affected by habitat fragmentation, continue to decline in the region. Many bird species – neotropical migrants and grassland species in particular, are showing marked population declines on the east-coast. Many amphibians and reptiles suffer as wetlands, vernal pools and other surface waters are ‘improved’ for higher-value land use or compromised by pollution. While water habitats may be essential for breeding, there is a growing realization that many of these species also need an undisturbed upland habitat buffer adjacent to their breeding habitats for foraging and hibernation in non-breeding season.

It is, of course, very difficult to obtain accurate wildlife survey information - and even when we do obtain it, we must acknowledge that it is always over-representative of charismatic megafauna and under-representative of the lower orders of faunal life forms.

Unlike flora, it is difficult to know where wildlife is located at any given time – since it moves around over both the short and long term. Seasonal migrations are particularly difficult to provide for in conservation planning, especially when the migrations are of large geographic extent, particularly international. Neotropical migratory birds are perhaps the best example of this scale. The Delaware River valley its adjacent woodlands are critical stopover points for migratory birds along the Atlantic Flyway, the major migratory corridor for birds in eastern North America. *Successful land preservation efforts to support viable wildlife therefore needs to focus more on providing a suitable regional habitat network, rather than just focusing on site-specific parcels where species have been seen and are presumed to reside. Local land use ordinances must also consider the importance of wildlife habitats in guiding development. In addition, more detailed surveys of local fauna are needed to better assess the health or crises facing wildlife communities in the area.*

⁴ Contact Natural Lands Trust for more information on this developing issue.

Faunal Studies

While the Unami Creek Valleys Landscape Conservation Plan has identified numerous Habitat Conservation Networks as part of the prioritization process for Critical Conservation and Critical Restoration Areas, very little is known about the rich diversity of native wildlife species that are sustained by those habitat networks. To do a better job of protecting the most ecologically valuable natural areas, we need a better understanding of how wildlife are using those areas. Where do we find the greatest concentrations of amphibians such as frogs and salamanders -- are they found around the vernal pools and the seeps and springs along small rivulets in the area? Are top-predator mammals such as coyote or bobcat found in the area? Do mink utilize the stream corridors? Where are the greatest concentrations of forest-nesting warblers and bats in the area? These are extremely important questions for honing-in on the “hotspots” of biodiversity in the Unami Creek Valleys. So far, they have only been addressed based on educated assumptions, and the limited surveys of the Montgomery County Natural Areas Inventory. The best way to answer questions about patterns of wildlife occurrence and diversity is to enlist the assistance of ornithologists, zoologists, herpetologists, etymologists and other wildlife experts in conducting field surveys of the area. Local bird clubs and local sportsmen’s clubs are also good sources of information regarding wildlife and local habitats. Natural Lands Trust should develop a wildlife inventory initiative for the Unami Creek Valleys to establish baseline data on species diversity and habitat use.

Montgomery County Natural Areas Inventory

The Montgomery County Natural Areas Inventory of 1995, prepared by the Pennsylvania Science Office of The Nature Conservancy, lists an unusually rich array of five (5) Priority 1 Sites of Statewide Significance and one (1) Priority 2 Site of Local Significance within the Unami Creek Valleys as priorities for biodiversity conservation. The Unami Creek Valleys supports one of the highest concentrations of Natural Areas Inventory priority sites in all of Montgomery County. These include:

Priority 1 Sites:

The Ridge Valley Site: this site includes the meadows at NLT’s Fulshaw Craeg Preserve and some adjacent meadows on the PECO Energy property. Two plant species of special concern (SP556 and SP562) and a diversity of meadow wildflowers and grasses are noted for the site. Succession and invasion of exotic plant species were noted as potential threats to this plant community. The “Potato Patch” boulder field is also included as a locally-significant geologic feature.

The Sumneytown South Slopes: this site includes wooded slopes of sugar maple, oak and hop-hornbeam along Unami Creek, in which a rare plant is found. The forested buffer along the creek and lack of disturbance are noted. Exotic invasive vegetation such as garlic mustard and stilt grass are present. These, along with potential gaps in the forest canopy, are noted as potential threats to the rare plant population, pointing to the need for management.

Upper Ridge Road: this site includes two subpopulations of a wildflower species of special concern growing in open meadow areas. “A management plan defining an annual mowing regime could help to secure the long-term viability of this species here. Herbicides would be detrimental to the plants.” The site is partially on property of the Hart Boy Scout Camp.

Unami Creek Site: this site includes a sedge of special concern and a threatened species of rush along Unami Creek, partially within the Hart Boy Scout Camp. The boulders along Unami Creek are also noted as a locally-significant geologic feature.

Boucher Road Site: this site includes wet meadows and shrubland along a PECO Energy corridor, and supports two species of special concern. Herbicide use and succession are noted as concerns.

Priority 2 Sites:

Whites Mill Swamp: this site is a forested wetland and shrub swamp along Ridge Valley Creek near the intersection of Whites Mill and Reller Roads. It is considered “one of the largest areas of this type in the county” and contains several shallow man-made or enlarged ponds with abundant aquatic vegetation. Birds, dragonflies, and damselfly communities are all rich at this site.

Landscape Ecology

The Unami Creek Valleys program area includes ecologically-significant networks of habitat interspersed through the broader areas of farmland and residential development. These networks of both remnant and regenerating woodlands, wetlands, streams, ponds and successional areas (i.e. meadows, old fields and thickets) are the main sources of habitat for the native vegetation and wildlife that constitute the natural diversity (or biodiversity) of the area. As of the year 2001, approximately 80 % of the program area can be considered as habitat networks.

Conservation and restoration activists focusing in the Unami Creek Valleys program area can work to sustain and enhance local and regional biodiversity by sustaining and enhancing several important characteristics of these habitat networks:

- 1) relatively large habitats representing the full diversity of habitat types that are typical of the region, particularly large, contiguous woodlands;
- 2) habitats that are linked by undeveloped corridors such as streams, hedgerows, utility lines, and other open space linkages;
- 3) higher quality habitats that retain their ecological integrity and are not seriously degraded by disturbances such as exotic invasive vegetation, intensive logging, erosion, sedimentation, soil compaction, grazing, dumping, etc.
- 4) habitats that protect or feature plant or animal species or unique habitats listed in the Pennsylvania Natural Diversity Inventory or the Natural Areas Inventories for Montgomery County and Bucks County.
- 5) include habitats with existing open space buffers and potential for expansion through active restoration or natural succession.

This Plan evaluates the condition and interconnections between habitat networks in the Unami Creek Valleys landscape, and identifies those networks which best meet these characteristics as “Habitat Conservation Networks” which are of the highest priority for conservation. In addition, areas of open space that are contiguous with these Habitat Conservation Networks are identified as having Habitat Restoration Potential or Habitat Management Potential. Finally, the Landscape Conservation Priorities section further evaluates these Habitat Conservation Networks and areas of Habitat Restoration or Management Potential in terms of their pattern of ownership and prioritizes specific parcels for conservation and restoration.

Habitat Conservation Networks

A total of over 30 Habitat Conservation Networks are identified in the Unami Creek Valleys area. These networks were identified, analyzed and prioritized according to the following criteria:

Habitat Size:

The areas of contiguous habitat blocks were identified and ranked in descending order of size. Habitat blocks are areas not separated by roads, utility lines, or clearings for driveways or structures. The largest blocks are primarily contiguous woodlands of 250 to 500 acres in size. This pattern is unique to most of southeastern Pennsylvania at this point in time.

Habitat Shape:

These habitat blocks were assessed and ranked in terms of their shape, as calculated by comparing the perimeter of each block to the area within each block. The most rounded or square

shaped blocks have a relatively close ratio of edge-to-area, while the more irregular or elongated blocks have greater amounts of edge relative to area. This is an ecologically important criteria for supporting a diversity of forest-nesting birds and forest plants, since forest edge conditions generally support less-sensitive plant and wildlife species. Perhaps the most unique quality of the Unami Creek Valleys landscape is its ability to provide large, well-rounded blocks of forest habitat to support forest-interior species.

Forest-Interior Habitat Area:

To further refine the assessment of size and shape, the calculation of forest-interior habitat area was generated for each habitat block. This assumes that the forest-edge conditions (warmer, drier soils, predatory wildlife, invasive exotic plants) extend roughly 300 feet into the interior, based on numerous landscape ecology studies for the Piedmont region⁵. Woodlands beyond that distance can be considered as potential forest-interior habitat that have a greater critical mass for supporting less-common flora and fauna.

Habitat Connectivity:

The final criteria used to identify Habitat Conservation Networks are a measurement of habitat connectivity – in this case the length of stream frontage in each woodland. The Unami Creek Valleys landscape is so heavily dominated by large contiguous woodlands that it does not share the true “corridors” or greenways that the vital linkages in typical agricultural or developed landscapes throughout the region. Therefore, rather than measure distinct corridors linking distinct woodlands, the habitat connectivity criteria measures the amount of stream frontage found in each habitat block. It assumes that streams are the major natural corridors for connecting large woodlands, and that greater amounts of frontage along a stream means a healthier, more diverse stream and forest habitat with greater overall connectivity to other habitats in the landscape.

Habitat Conservation Network Analysis:

The final GIS analysis combines these criteria for ranking the most ecologically valuable Habitat Conservation Networks. Equal weight is assigned to each criteria. *The Habitat Conservation Network map reveals that the Most Important networks in the Unami Creek Valleys study area are the largest, most well-rounded or square blocks for woodland with the greatest area of forest-interior habitat and the most extensive amounts of stream frontage. Woodlands with these qualities are not only the most ecologically valuable habitats in the Unami Creek Valleys project area – given their context they are also among the most ecologically important habitats in southeastern Pennsylvania.*

Two additional criteria that have been factored-in (but not using GIS) are: the presence of PNDI-listed species or Natural Areas Inventory (NAI) priority sites; and the number of owners (fewer owners is more valuable for conservation potential).

The breakdown of the 10 most valuable Habitat Conservation Networks (HCN’s) is as follows, including 2 “Super Blocks” of approximately 1,500 acres of nearly-contiguous HCN’s:

“TOP 4 HCN’s”

1. Lower Unami -- East-facing Slopes.

This block of diabase woodland is by far the largest (520 acres), most square-shaped habitat with the greatest amount of forest-interior habitat and stream frontage. Most of

⁵ Forman and Godron, 1986.

the interior habitat is under single ownership (as part of the Musser Scout Camp), with roughly 7 perimeter owners. The tract also includes PNDI and NAI –listed species and habitats. This site is not an island on its own but, rather, forms the core of a “Super Block” of the top 4 ranking Habitat Conservation Networks in the Unami Creek Valleys, totaling almost 1,500 acres of nearly-contiguous woodlands, each over 250 acres in size. This combination of qualities puts it at the top of the list as the highest priority Habitat Conservation Network.

2. Lower Ridge Valley -- East-facing Slopes.

The contiguous diabase woodland along the north side of lower Ridge Valley Creek is notable for its size (275 acres), shape, interior habitat, and extensive stream frontage. This site includes part of the Priority 1 Ridge Valley Creek NAI site. It is also important as the southern limit the “Top 4 Super Block”. This site is owned in 8 parcels, and includes portions of Camp Green Lane and Copper Mine Run Park.

3. Lower Unami -- West-facing Slopes.

This large (363 acre) rectangle of diabase woodland and riparian habitat extends from the PECO Energy transmission line corridor at the northeast to the edge of Sumneytown at the southwestern limit. The wooded slopes on this site drain directly to the lower Unami Creek, which flows below the site for nearly 1.5 miles. The ownership of this tract is more fragmented and presents a challenge, with as many as 30 individual parcels, however many of these are undeveloped. This block forms part of the southern half of the Top 4 Super Block.

4. Upper Ridge Road Plateau

This woodland is different from the other Top 4 HCN’s due to its location along the red-shale based plateau following the north side of Upper Ridge Road. It includes a small amount of frontage on 2 headwaters tributaries of Macoby Creek, The relatively large (338 acre) size, square shape, high forest-interior rank, location at the northern limit of the Top 4 Super Block and relatively low number of owners (15) place it in this upper category. While the lack of Unami or Ridge Valley stream frontage may raise questions about the high rank of this HCN, it should be noted that the next 3 highest-ranking HCN’s are roughly 1 mile upstream from the Top 4 Super Block.

“SECOND-TIER HCN’S”

1. Upper Unami West-facing Slopes

This diabase woodland includes the ridge top and north-facing slopes between the Ridge Valley and Unami Creeks at the north end of the study area. It includes over 265 acres of contiguous diabase woodland with extensive frontage on Unami Creek. The land adjoins both Camp Skymont and the Musser Scout Reservation, and includes part of the Priority 1 NAI site for Ridge Valley Creek and a PNDI-listed plant site. The ownership of the tract is somewhat fragmented, with at least 15 key parcels. This site forms the part of the core of the 1,500 acre “Second-Tier Super Block”.

2. Scott Road West-facing Slopes

This site is a broad, unbroken 184 acre north-facing diabase woodland draining toward Unami Creek. It includes seeps and springs and a small tributary stream, and is owned as a single parcel within the Musser Scout Reservation. The site forms part of the core of the Second-Tier Super Block.

3. Upper Ridge Valley -- East-facing Slopes
This 285 acre diabase woodland block includes slopes and frontage on both sides of Ridge Valley Creek and includes most of the Whites Mill Park and Souderton-Harleysville Game, Fish and Forestry Association properties. The site includes portions of 2 Priority 1 NAI sites -- Whites Mill Swamp and Ridge Valley Creek. Ownership of the tract falls within 15 parcels, but only several key landowners. This site forms the lower portion of the Second-Tier Super Block.
4. Fulshaw Craeg Habitat Network
This 290 acre diabase woodland block includes slopes and frontage on both sides of Valley Creek and includes Fulshaw Craeg at its core. It falls within the NAI Priority 1 Ridge Valley Creek site, and includes several PNDI-listed plant species. This tract forms the most important linkage between the Top 4 Super Block and the Second-Tier Super Block by providing a nearly-continuous link of protected natural stream valley – a perfect example of a greenway. The linkage is only broken by the PECO Energy Transmission Line, Hausmann Road, and Dietz Mill Road. Approximately 10 unprotected parcels fall within this block.
5. Hill Road – Scott Road Habitat Network
The tract along the ridge between Hill Road and Scott Road provides an important 213 acre block of upland diabase woodland containing headwaters to two small tributaries of the Unami Creek. This tract benefits from its central location, and forms an important piece of the core of the Second Tier Super Block and a link between the Game and Fish club and the Musser Scout Reservation. Ownership is fairly fragmented, however, with at least 20 key owners.
6. Upper Unami – East-facing Slopes
The 321 acre tract of diabase woodland on the north side of Swamp Creek Road extends from the Musser Scout Reservation to the county line. This block includes frontage on a tributary of the Unami, and is owned as only 4 main parcels. It forms the northern limit of the Second-Tier Super Block.

At least 20 additional Habitat Conservation Networks were assessed and prioritized in the moderately important to least important. Many of these HCN's are valuable habitats in their own right and in terms of their proximity to higher-ranking blocks, but they did not score as highly due to their smaller size, more irregular shape, lack of stream frontage, or some combination of factors. Two examples of lower-scoring HCN's with critically important locations are the two blocks of forest immediately adjoining the northwest and southeast side of the Fulshaw Craeg Habitat Network. These areas provide buffers to the core HCN and link it to other smaller HCN's.

This analysis seeks to identify the most viable Habitat Conservation Networks based on general landscape ecological criteria. It should be noted that site-specific factors such as the quality of habitat, rarity of plants or animals, mature trees, or presence of microhabitats such as vernal pools or small rivulets and seeps can have important influences on this type of ranking system – if they are known. One of the ongoing goals of Natural Lands Trust and other partners should be to add a finer level of resolution to the knowledge base of native plants, wildlife, and habitats that are found in the Unami Creek Valleys.

For the past three years, Nichole Coulter, a Drexel University graduate student and staff scientist at The Academy of Natural Science's Patrick Center for Environmental Education, has been conducting research at the Fulshaw Craeg Preserve, supervised by the Trust's Conservation Biologist Dr. Stevens Heckscher. The results of the research initiative — which is designed to study and test a variety of techniques to better manage native wildflower meadows — will enable the Trust to develop a scientifically based management system for meadow stewardship. We expect Nichole to complete her research, as well as her thesis, in August of 2001.

Land Use and Ownership Patterns

“Central and western Montgomery County experienced a 242 percent increase in developed acres between 1965 and 1990...Even though our rate of population growth is slowing down, our rate of land consumption is increasing. Much more land is used for each new house than in previous decades. In 1965 there were 0.8 acres of developed land per household. Between 1965 and 1990, land was developed at a rate of 1.4 acres per household.” (Montgomery County Open Space Plan, 1996)

The Census 2000 findings of the Census Bureau document that the municipalities of the Unami Creek Valleys study area have seen slower growth (so far) than their surrounding municipalities over the last two decades.

The central municipalities in the study area, Marlborough Township and Salford Township, each experienced higher growth rates in the 1980's than in the 1990's, but grew a total of 9.51% and 18.45%, respectively, between 1980 and 2000. Marlborough's population grew from 2,849 to 3,120 between 1980 and 1990, an increase of 8.95%. Salford's population grew from 1,995 to 2,216 during that same period, increasing by 11.08%. From 1990 to 2000 the population of Marlborough reached 3,104 (a 51% increase) and Salford's population reached 2,363 (a 6.63% increase).

The slower growth rates surely result from a combination of factors: environmental constraints; access/roadway limitations; distance from growth centers; real estate market; zoning; however, *slower growth rates should not be mistaken as a relief from future growth pressure*. As surrounding municipalities experience rapid growth along Route 422 and Route 29, and the Lansdale exit of the Turnpike along Route 63, pressure will be expected to increase on the Unami Creek Valleys area as a desirable location for construction of custom homes on “large” wooded lots or small-scale subdivisions. Seasonal home construction is also a factor in the area.

The land use pattern in the wooded valleys of the Unami area is closely linked to the ownership pattern, the natural constraints of the land, demographic trends, local land use regulations, and the central Bucks County real estate market. The area can generally be described as a historic 2nd-growth forested landscape of wooded diabase ridges, steep wooded valleys with scattered 19th century mill sites, with the nearby villages of Green Lane and Sumneytown and the suburban residential development encroaching on all of these landscape types. There are no major industrial or commercial land uses present in the study area, other than an active quarry and small businesses. No large-scale recreational uses (i.e. golf courses, large ball fields) or community facilities are present. Public utilities are limited to the PECO Energy transmission lines and the AT and T fiber optic lines that pass through the area from west to east. The history of large camps in the area is symbolic of its presence in the region as a relatively remote, natural getaway.

Ownership Patterns

As can be seen on the Large Parcels map, a significant amount of the Unami Creek Valleys (nearly 50%) is owned as a series of roughly 50 parcels over 25 acres in size. The vast remainder are parcels of between 10 and 25 acres in size. Most of the largest parcels are situated along the streams and wooded slopes in the area, which the smaller parcels are more randomly located.

Numerous parcels below 10 acres in size can be found along nearly every road throughout the study area.

Largest Parcels (250 to 1,250)

The largest parcels tend to be 250 to 1,250 acres in size, and generally include large, wooded camp properties owned by non-profit institutions. At least 3 major holdings fall into this size category. The goal of the ongoing conservation efforts in the area is to secure these parcels with permanent protection from future development and to promote ecological land management. They represent true “anchors” of biodiversity in the region.

Second-Tier Parcels (100 to 250)

The next level of parcel sizes in the study area are those in the 100 to 250 acre range. These include properties such as parks, hunting clubs, nature preserves and several private holdings scattered throughout the area, but they are often contiguous with other parcels in this size class or the Largest Parcels. They often include significant woodlands, steep slopes, hydric soils and riparian corridors. These parcels, if not already protected, are generally listed as conservation priorities to secure conservation and sound land management.

Third-Tier Parcels (25 to 100)

The next level of open space parcels fall in the 25 to 100 acre range. These are scattered widely throughout the Unami area, often in contiguous blocks adjoining Second-Tier or Largest Parcels. Properties in this size category are important priorities for “infill” conservation between larger tracts.

Small Individual Parcels and Subdivisions

Parcels of 5 to 10 acres are shown on the Large Parcels map in light green, with smaller parcels in white. The Unami area is fortunate to not yet have experienced many large-scale subdivisions. Historically, the populations of local municipalities have been located in villages, in well-designed homes on small lots. In the mid- to late 20th century, many individual road-front lots and large lots were sold off for custom homes and cabins – a trend which continues today. An increasing number of large-lot subdivision (3 to 5 acres or more per lot) are being developed in the area.

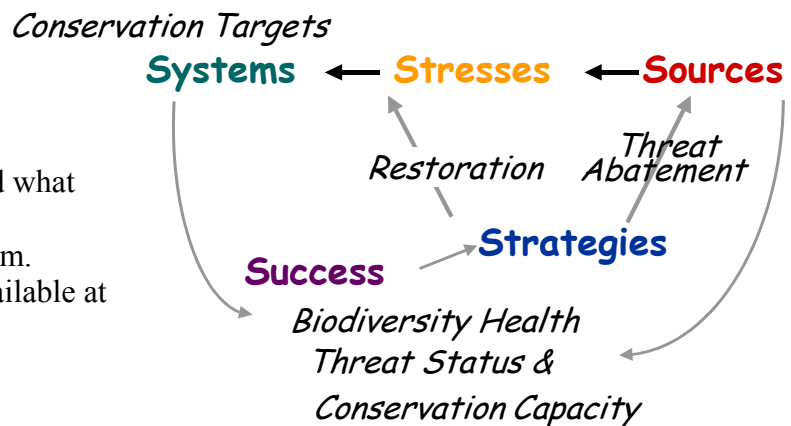
Planning Implications

The current land use pattern and growth trends are interrelated. The traditional pattern of woodlands, small farms, and historic mills and villages is still present, and can be maintained even as the area continues to grow, provided that conservation and planning approaches are utilized, as recommended in this plan. Water quality and quantity are clearly important “carrying capacity” issues for local municipalities to consider carefully as a means of guiding growth and managing overall density. The majority of critical open space parcels can be preserved with open space funding and possibly transfer of development rights (TDR) to areas that are better suited for more intensive development.

Conservation Targets, Threats, Stresses and Strategies

Conservation Targets and Threats

As part of its Site Conservation Planning process, The Nature Conservancy (TNC) has developed what they call the “5-S” approach – as illustrated in the adjacent diagram. (more information about this is available at their Conserve Online website - www.conserveonline.org)



To capture thinking about their 5-S approach, TNC has developed a new tool that they are making available for conservation partners to use -- their “Measures of Success’ threat assessment spreadsheet. This spreadsheet walks the user through the steps necessary to define and evaluate: systems (a.k.a. conservation targets); stresses; sources of stress; and then to determine and evaluate the necessary strategies needed to address the conservation issues at a site. Finally, since targets and strategies have been clearly defined, the model provides the parameters to measure future success as the project proceeds. TNC approaches these complex issues by trying to answer several critical questions:

For the conservation site in question now, and over the next ten years:

- What are the conservation targets at the site?
 - What quality are these targets and how viable are they?
- What stresses are acting on each conservation target?
 - How extensive and how serious are these threats?
- What sources cause the stresses?
- What strategies can be used to mitigate the sources of stress?
 - How hard will it be to implement the strategies?
 - How effective are the strategies likely to be?
 - How much will it cost to implement the strategies?

The assessment spreadsheet does not magically ‘reveal’ any previously unknown truths – but its rigorousness forces the user to apply their knowledge of a site through a very structured process. After completing the assessment, users generally find that they have been forced to document their understanding of a site at a level far more detailed than they may previously have thought possible.

Perhaps the greatest strength of TNC's assessment spreadsheet is that it *documents* current thinking about targets and threats, so the results can then be reviewed, modified and shared with other stakeholders. In turn, this inevitably starts a very focused dialogue between the stakeholders working to conserve the site as they critique and modify the spreadsheet results.

In the final analysis, there are no 'right' answers – the assessment technique is just a tool that can help focus attention and establish relative priorities for the conservation actions that can or should be taken.

For the Unami study area, NLT staff created an initial assessment as presented in the attached summary sheets, while the full assessment will be further refined in the future. The results are fairly self-evident, so extensive discussion is belabored here.

Landscape Conservation Priorities

A large number of properties have been identified in the Unami Creek Valleys project area as priorities for conservation. These are shown as Forest Preservation Priorities on the map titled Habitat Conservation Network with Critical Parcels. *These properties were identified as a result of the detailed GIS analysis, with an emphasis on protecting large parcels within Habitat Conservation Networks, and adjoining streams and existing or pending protected lands. The goal is to protect landscape-scale networks of forest interior habitat and forested riparian corridors.* The majority of the properties identified as Forest Preservation Priorities are at least 10 acres or greater in size. They are situated in Upper Salford, Salford, Marlborough, Milford and West Rockhill Townships, with the majority concentrated in Salford and Marlborough.

The Landscape Conservation Priorities are listed below as key open space parcels organized by municipality and watershed, with description of important features and potential conservation status where possible. These parcels are not listed in order of priority. Certain properties are listed as a series of contiguous parcels under single ownership. Others are listed as proposed for subdivision, with potential protection of key resources. Lands that are already protected are listed and mapped as such based on current information. *Given the conservation importance of the Unami Creek Valleys, all parcels over 10 acres in size may be considered as priorities providing significant conservation benefit.*

Top Four Habitat Conservation Networks

The following parcels are included in the Top Four Habitat Conservation Networks.

Lower Ridge Valley -- East-facing Slopes.

8.14 acre wooded parcel on the east side of Hausman Road and 2.35 acre parcel on the west side of the road, between Fulshaw Craeg Preserve and Camp Green Lane. Includes one house and 250 feet of forested frontage on Ridge Valley Creek with a broad floodplain area below a sharp bend in the road. Includes over 900 feet of wooded road frontage.

(#44-0029-011) 16.27 acre parcel along the east side of Hausman Road between Fulshaw Craeg Preserve and NLT's Harbine easement. Includes forested uplands, part of utility right-of-way, and nearly extensive wooded road frontage.

(#44-0029-014) 11 acre parcel along the east side of Hausman Road between Fulshaw Craeg Preserve and Camp Green Lane. Includes forested uplands, frontage on Ridge Valley Creek, part of utility right-of-way, and nearly extensive wooded road frontage.

(#44-0034-002 and 004) 6.7 acres and 3.8 of woodland adjoining east side of Copper Mine Run Park along Hausman Road.

Copper Mine Run Park 20.65 acre wooded upland park owned by Marlborough Township. Adjoins Camp Green Lane to the south and Harbine to the east. Management is currently as a natural area.

Camp Green Lane 100-plus acres (20.576 acres, 51.604 acres) owned as a private summer camp. Includes large pond along Ridge Valley Creek, over 1,500 feet of stream frontage, a

broad floodplain, and an extensive area of hydric soils at the eastern end of the property. The core of the property features extensive area of lawn, recreational facilities and cabins. Far north end adjoining Copper Mine Run Park and far south end of property are more natural diabase woodlands. Camp Green Lane provides an important anchor of semi-natural open space at the southern limit of the Unami Creek Valleys program area.

The following parcels form a buffer for Camp Green Lane/Copper Mine Run Park:
(#45-029-05). A 10.24 acre woodland tract on the ridge between Unami and Ridge Valley Creeks.

(#45-029-08). A 14.75 acre woodland tract on the ridge between Unami and Ridge Valley Creeks, adjoining 17.3 acre NLT easement property.

(#45-029-012). A 11.22 acre woodland tract on the ridge between Unami and Ridge Valley Creeks, adjoining 17.3 acre NLT easement property.

(#44-034-001) Protected. A 6.95 acre parcel with mature woodlands and diabase rocks on a south-facing slope located between Copper Mine Run Park and the Stahl easement at the southwest corner of Hill Road and Hausman Road. The property includes 1,320 feet of road frontage on Hill Road, and is within 400 feet of the Fulshaw Craeg Preserve. NLT is awaiting grant funding approval for a fee purchase.

(#44-034-011 and #44-035-001). 29.38 acre parcel adjoining northwest corner of Camp Green Lane. Includes over 1,000 feet of forested stream frontage on Ridge Valley Creek.

(#44-034-010). 22.66 acre parcel adjoining west boundary of Copper Mine Run Park. Includes over 500 feet of wooded frontage on a 1st Order tributary of Ridge Valley Creek. The slopes along this tributary appear to support evergreens, most likely hemlock.

(44-034-024). 20.65 acre parcel. Includes over 750 feet of forested stream frontage on Ridge Valley Creek, and over 1,200 feet of forested frontage on a 1st Order tributary. The forested slopes along the tributary include a patch of evergreens, most likely hemlock, that extends onto the Wilhelm property. The owners have maintained a house and a natural landscape design. Conservation easement to NLT pending as a codicil to will.

(#44-034-020). 28 acre parcel on the border of Salford and Upper Salford Township, includes frontage on Ridge Valley Creek.

(#44-036-002 and 003). 12.17 acre property with over 300 feet of forested stream frontage on Ridge Valley Creek.

(#44-036-002 and 004). 11.26 acre property with over 300 feet of forested stream frontage on a tributary to Ridge Valley Creek.

Lower Unami -- West-facing Slopes.

Upper Salford Township

19.5 acres with over 900 feet of frontage on Ridge Valley Creek, including 9 acres of wooded pasture and 10.5 acres of woodland. Its location near the confluence of the Ridge Valley and Unami Creeks makes it a logical “head” of NLT’s proposed greenway system in the Ridge Valley

Creek stream valley. Initially, public access would be limited to a trail at the upstream end of the property, but eventually will be permitted in the pasture area as well. Under a draft Agreement of Sale (in fee with reserved life estate) and is near closure.

Protected. Siemel easement. 27 acres of wooded slopes and pasture on the ridgeline between Unami Creek and Ridge Valley Creek. The property is located on Zepp Road, and contains an 18th century residence, barn and a newer residence. Protected by a conservation easement held by NLT (November 1999). A trail easement allows for public access, potentially linking future greenways along the Ridge Valley Creek and the Unami Creek.

15 acre V-shaped parcel (shown as part of 35.12 acre parcel). Includes over 2,000 feet of forested stream frontage on Ridge Valley Creek and a broad floodplain area just above confluence with Unami Creek. Partly in Core Preservation Area.

9.1 acre mostly wooded parcel adjoining west side of NLT's Siemel easement. Includes over 250 feet of frontage on Unami Creek and a broad floodplain area.

24.3 acre mostly wooded parcel to north of Siemel easement, includes over 1,500 feet of frontage on Unami Creek across from the park in Sumneytown. Gently sloping woodlands with diabase boulders provide a scenic natural backdrop for the park.

10 acre parcel, includes forested slopes and floodplains along over 900 feet of Unami Creek.

Salford Township

Protected. 17.3 acre woodland tract located on the ridgeline between Unami Creek and Ridge Valley Creek. The property is located on Hill Road near Copper Mine Run Park (Salford Township) and contains a residence in a small clearing close to the road. Protected by a conservation easement held by NLT (November 1999). A trail easement allows for public access, potentially linking future greenways along the Ridge Valley Creek and the Unami Creek.

Marlborough Township

The following parcels fall within the Marlborough Township portion of the Lower Unami – West facing Slopes Habitat Conservation Network. These parcels are mainly wooded diabase slopes above Unami Creek along Boucher/Knuckles Road and Zepp/Hill Road just south of the Musser Scout Reservation. Several tributary streams are present.

The following parcels border NLT's Stahl easement.

(#45-0029-004). 5 acres. (#45-0029-005). 10.25 acres. (#45-0029-008). 13 acres.
(#45-0029-010). 19.24 acres. (#45-0029-012). 11.22 acres. (#45-0034-016). 8 acres.

(#45-0034-023). 14.75 acres; (#45-0034-008). 9.4 acres; (#45-0034-015). 10.23 acres;
(#45-0034-026 and 006). 11.69 acres; (#45-0034-007). 9 acres;

The following parcels are adjacent to NLT's Siemel easement:

(#45-0039-0056, 0057 and 0058). 21 acres with adjoining land in Upper Salford Township. (#45-0039-045). 3.88 acres; (#45-0039-034). 25 acres; (#45-0039-033 and

035) 8.5 acres; (#45-0039-043 and 053). 5.5 acres; (#45-0039-044). 2.25 acres; (#45-0039-086). Assessed in Upper Salford.

Lower Unami -- East-facing Slopes.

The following 10 parcels border the southern end of the Musser Scout Reservation on Swamp Creek Road and Upper Ridge Road.

- (#45-0038-108) 38 acre wooded tract on Geryville Road.
- (#45-0032-003 and 004) 5.1 acres and 4.8 acre wooded tracts on Geryville Road.
- (#45-0033-002) 14.1 acres with frontage on Unami Creek and both sides of Swamp Creek Road.
- (#45-0033-003) 12.7 acres with frontage on Unami Creek and both sides of Swamp Creek Road.
- (#45-0033-005) 8.52 acres
- (#45-0033-008) 7.5 acres
- (#45-0033-010) 8.8 acres along Unami Creek and on both sides of Swamp Creek Road.
- (#45-0034-003) 13 acres
- (#45-0034-005) 7.5 acres
- (#45-0034-003) 13 acres
- (#45-0034-0027) 13.8 acres
- (#45-0034-004) 7.6 acres

- (#45-0022-011) 16.63 acres on Upper Ridge Road.
- (#45-0022-001, 002 and 003; and #45-0016-011) 20.01 acres on Upper Ridge Road.
- (#45-0016-003 and 014) 62.94 and 10.25 acres on Upper Ridge Road.

Bucks County – Milford Township -- Upper Unami Corridor

15 parcels along several thousand feet of mostly forested stream frontage on Unami Creek, following Swamp Creek Road, Upper Ridge Road, Carvers Hill Road and Nursery Road.

Includes part or all of:

- (#23-020-011); (#23-020-014); (#23-020-024); (#23-020-026);(#23-020-030-001); (#23-020-032); (#23-020-034); (#23-020-035); (#23-020-038); (#23-020-039);(#23-020-094); (#23-020-098);(#23-020-101-1);(#23-020-108);(#23-020-109);

Bucks County – Rockhill Township -- Upper Ridge Valley Corridor

Also included are 2 parcels on the north side of Camp Skymount Park.

Second-Tier Habitat Conservation Networks

Upper Unami West-facing Slopes Habitat Conservation Network

The following sites are mostly diabase woodlands within the *Upper Unami West-facing Slopes Habitat Conservation Network*, the top-ranking of the Second-Tier HCN's, and part of the "Second Tier Super Block".

Camp Skymont Park (#45-0005-001). 85 acres Protected. On Long Road on the county line. Mostly wooded, with frontage on Ridge Valley Creek, including a large pond. Owned by Marlborough Township.

(#45-0005-005; #45-0004-013) 33.42 acres and 9.58 acres, respectively, just west of Camp Skymont Park. Ridge and slopes above Unami Creek and Ridge Valley Creek.

(#45-0005-006) 10.8 acres just west of Camp Skymont Park. East-facing slopes above Ridge Valley Creek.

(#45-0005-024) 10.68 acres west of Camp Skymont Park.

(#45-0004-004) 55.58 acre ridge top between Unami and Ridge Valley Creeks. West of Camp Skymont Park. Adjoins east side of NLT easement.

(#45-0004-012 and 010). 24.23 acres along Swamp Creek Road with direct frontage on Whites Mill Road, just upslope from over 800 feet of Unami Creek. Just south of NLT easement.

(#45-0004-016). 15 acres on slopes above Unami Creek.

(#45-0004-020). 15.74 acres along Whites Mill Road, adjoining over 800 feet of Unami Creek.

(#45-0004-008). 13.32 acres along Swamp Creek Road, adjoining over 300 feet of Unami Creek.

(#45-0004-005). 17.63 acres along Swamp Creek Road, with slopes above Unami Creek.

(#45-0004-006). 14.36 acres along Swamp Creek Road, adjoining over 700 feet of Unami Creek.

Upper Unami – East-facing Slopes Habitat Conservation Network

The following parcels are located within the 321 acre *Upper Unami – East-facing Slopes Habitat Conservation Network* within the Second-Tier Superblock.

(#45-0003-00). 78.21 acres along Swamp Creek Road, with extensive wooded slopes above half a mile of Unami Creek.

(#45-0003-023). 17.07 acres along Swamp Creek Road, with extensive wooded slopes above over 700 feet of Unami Creek.

(#45-0008-008 and 009). 19.95 acres along Swamp Creek Road, with wooded slopes bordering over 600 feet of an unnamed tributary of Unami Creek.

(#45-0008-011). 11.8 acres along Swamp Creek Road, with over 400 feet of forested stream frontage on an unnamed tributary of Unami Creek.

(#45-0008-001; 45-0008-004; 45-0008-010). *Musser Scout Reservation. Pending Conservation Easement.* 114.67 acres along Swamp Creek Road, with over 1,200 feet of forested stream frontage on an unnamed tributary of Unami Creek. Includes sizeable forest-interior habitat.

Camp Skymont Park/Whites Mill Park Linkage Parcels:

(#44-0001-004). 39.82 acres on Reller Road, mostly wooded. Located along the eastern boundary of Camp Skymont and the south side of the NE Extension of the PA Turnpike. Includes a residence and small pond in a clearing. Over 1,500 feet of forested stream frontage. This forested tract includes extensive areas of hydric soils, Palustrine Forested and Palustrine Scrub/Shrub wetlands, and a floodplain over 300 feet in width along Ridge Valley Creek.

(#44-0001-015). 12.98 acres on Reller Road. Includes historic house and nearly 500 feet of forested stream frontage on Ridge Valley Creek. The site is almost entirely hydric soil, with areas of Palustrine Forested and Palustrine Scrub/Shrub wetlands and a floodplain of over 300 feet in width.

(#44-0001-005; #44-0001-016). Two parcels (18.67 acres and 10.18 acres, respectively) owned together, totaling 28.85 acres, along Reller Road. Used for a residence and landscaping business, with two ponds along the west side of Ridge Valley Creek. Broad cleared areas around ponds and around a second homestead on northwest boundary. Together, these parcels include over 1,000 feet of stream frontage in a partly cleared, partly wooded area. Soils on both sites are entirely mapped as hydric. National Wetlands Inventory indicates broad areas of Palustrine Forested wetland, Palustrine Scrub/Shrub wetland. Unfortunately, the landscaping business may have cleared much of the native wetland vegetation near the ponds. Mapped as part of the Ridge Valley Creek Priority 1 Site in the Bucks County Natural Areas Inventory.

(#44-0001-014). 10.14 acre partly wooded parcel with residence on Reller Road. Over 500 feet of forested stream frontage on Ridge Valley Creek with Palustrine Forested wetlands and hydric soils under most of the tract. Some old field succession areas at the western end of the property.

(#44-0001-010). 26.54 acre wooded property with residence on Reller Road, includes several parcels. Over 500 feet of forested stream frontage on Ridge Valley Creek with Palustrine Forested wetlands and hydric soils under the eastern half of the tract.

The following wooded parcels are located along a Ridge Valley Creek tributary on Schultz Road:

(#44-0014-007). 22.82 acres with over 300 feet of stream frontage.

(#44-0014-040). 22.9 acres with over 800 feet of stream frontage.

(#44-0014-004). 10.04 acres with over 600 feet of stream frontage.

Upper Ridge Valley Creek Tributary

A total of 4 parcels are included along a tributary of Ridge Valley Creek east of Whites Mill Park, along Whites Mill and Badman Roads. These are:

(#44-0007-008). 14.42 acres with 600 feet of forested stream frontage.

(#44-0008-019). 16.28 acres with over 600 feet of mostly forested stream frontage.

(#44-0008-002). 4.8 acres with wooded stream frontage.

(#44-0008-003 and 004). 2 acres and 3.06 acres with wooded stream frontage.

Whites Mill Park (#44-0007-007; #44-0013-011; and #44-0013-015). 96.47 acre park owned by Marlborough Township. Primarily wooded uplands, includes part of Whites Mill Swamp, listed as a Priority 2 Site in the Montgomery County Natural Areas Inventory. The dam forming the large pond has recently been reconstructed. Includes over 2,000 feet of Ridge Valley Creek with a broad floodplain and hydric soils.

The following two parcels are located between Whites Mill Park and the Gun Club property.
(#44-0013-013). 3.58 acres with 200 feet of stream frontage.
(#44-0013-014). 3.83 acres with 200 feet of stream frontage.

Several parcels along Clump Road are included, mostly wooded with some frontage on a tributary of Ridge Valley Creek:
(#44-0019-002). 13.28 acres with wooded stream frontage.
(#44-0019-007). 15.6 acres, partly wooded with 500 feet of frontage on two tributaries.
(#44-0013-007). 19.6 acres, mostly wooded at the northwest corner of Dietz Mill and Clump Road.

Souderton Harleysville Game, Fish and Forestry Association 128.13 acre, primarily wooded property owned in several parcels, owned by a local sportsmen's club. Includes a large lake and several smaller ponds and over 3,000 feet of stream frontage on the Ridge Valley Creek and an unnamed 1st Order tributary. The western end of the property includes extensive areas of steep slopes (>25%) on the south-facing ridge above the stream, and a broad area of hydric soils along the eastern half of the property. Ownership by the sportsmen's club can be considered a step toward conservation, but the property should be permanently protected due to its size, relatively natural character, and location. As a game club, land management may favor certain species (i.e. white-tailed deer, ruffed grouse, bass) over the biodiversity that would naturally occur in woodland and stream habitats on the property.

Hill Road – Scott Road Habitat Network

(#44-0018-007). 51.18 acres, mostly wooded ridge top on Hill Road west of the Gun Club, including 200 feet of frontage on a tributary of Ridge Valley Creek and 800 feet of frontage on an Unami Creek tributary.

(#44-0022-015). 37.01 acres on Dietz Mill Road, bordering Gun Club.

Fulshaw Craeg Habitat Network

Fulshaw Craeg Preserve . A 115+ acre preserve owned by Natural Lands Trust. Ridge Valley Creek bisects the preserve and several wildflower meadows blanket the stream valley. The Trust is implementing three critical strategies to improve long-term biological management and community stewardship that will ensure protection of the ecological health of Fulshaw Craeg preserve. The property includes extensive and diverse diabase woodlands, numerous seeps, springs and 1st Order tributary streams, over 2,000 feet of forested riparian frontage on Ridge Valley Creek, and extensive streamside meadows with an unusual diversity of native wildflowers. Species that flourish in these lush streamside meadows include Indian paintbrush, showy goldenrod, fringe gentian and New Jersey tea. The property is at the core of the Ridge Valley Creek site in the Montgomery County Natural Areas Inventory, and hosts several state-listed plant species. Both wooded slopes above the creek include broad areas of steep slope. The entire frontage along Ridge Valley Creek is mapped as floodplain underlain by hydric soil. In 1999, several key buffer properties were purchased and added to the Preserve. These include PECO lands along the southwest border of the Preserve, the Reppert property near Camp Green Lane, and the Stoudt and Groves parcels around “the Devil’s Potato Patch” at the east end.

As of November 1999, NLT has acquired 24.8 acres of woodland in 7 parcels that are portions of excess land along the transmission line that crosses the Ridge Valley creek valley. All of the parcels are in Salford Township, and connect portions of the Fulshaw Craeg property. The purchase includes a cross-access and management license over approximately 4 acres of the PECO right-of-way adjoining Fulshaw Craeg.

Groves is a 9.2 acre woodland tract recently added to the Fulshaw Craeg Preserve (June 1999). Identified on the Montgomery County Natural Areas Inventory as the “Ridge Valley Site”. Stout is a 10 acre woodland tract adjoining Groves, also recently added to the Fulshaw Craeg Preserve (June 1999), identified on the Montgomery County Natural Areas Inventory as the “Ridge Valley Site”. Includes a portion of the diabase boulder field known locally as the “Devil’s Potato Patch”, which is open to public access.

The Pennsylvania Department of Environmental Protection has committed over \$24,000 in Growing Greener funds for streambank restoration work at the Fulshaw Craeg Preserve, including erosion control and riparian buffer plantings.

Key parcels – Fulshaw Craeg Preserve Buffer: (Core Preservation Area)

5.52 acre parcel located as an out parcel at the center of the Fulshaw Craeg Preserve. The parcel contains mature woodlands on a south-facing slope that overlooks Ridge Valley Creek. Numerous large boulders dot the landscape. NLT intends to purchase the parcel to eliminate 2 potential house sites at the center of the Preserve. The second out parcel is subject to a Right of First Refusal. The project is awaiting additional funds due to a significant funding gap.

(#44-0022-010). 15.13 acre parcel bordering the northern edge of the Fulshaw Craeg Preserve off Hill Road. The parcel contains mature woodlands and diabase boulders along a north-facing slope, and adjoins a 22.5 acre parcel purchased by NLT from the same owner. A sales contract has been sent and awaits settlement.

(#44-0022-006). 15.96 acre parcel bordering the northern edge of the Fulshaw Craeg Preserve off Hill Road. The parcel contains mature woodlands and diabase boulders along a north-facing slope.

(#44-0022-007 and #44-0022-008). 4.55 acres and 6.137 acres, respectively, on Hill Road.

(#44-0022-009) 39 acre, mostly wooded parcel situated on Hill road adjoining north side of the Fulshaw Craeg Preserve. A small clearing surrounds the residence, but the majority of the property includes upland diabase woodlands that form a critical patch of forest-interior habitat with those on the Preserve.

(#44-0022-015 and #44-0018-023). 37.01 acre wooded property on both sides of Dietz Mill Road, adjoins east side of Fulshaw Craeg Preserve, and is next to the radio tower and the highest point (600 feet) in the Unami Creek Valleys project area. The property includes an important area of upland diabase woodlands that form a critical patch of forest-interior habitat with those on the Preserve.

(#44-0022-018; #44-0022-18 and #44-0022-024). 23.5 acre wooded property with several parcels located at the corner of King Road and Dietz Mill Road, and includes extensive (750 feet) forested stream frontage on Ridge Valley Creek less than ¼ mile upstream from the Preserve. The entire property is mapped as being underlain by hydric soils.

(#44-0022-016). Total of 19.8 acres in 2 parcels. 8.73 acre parcel on the north side of King Road bordering the southeast corner of the Fulshaw Craeg Preserve. Includes roughly 900 feet of forested stream frontage along Ridge Valley Creek. Nearly all of the property is mapped as hydric soils, with a small knoll of upland soils supporting a single family residence. In Includes adjoining 11.11 acre parcel (#22-16) on east side of King Road on the southeast side of Fulshaw Craeg Preserve and including part of Devil's Potato Patch diabase boulder field.

(#44-0030-005). 10.534 acre parcel and adjoining parcels at corner of Dietz Mill and Camp Green Lane Road, just south of Preserve.

(#44-0030-020 and #44-0030-023). 12.31 acres in two parcels on south side of Preserve.

(#44-0030-021) . 10.23 acres on south side of Preserve.

(#44-0030-022). 10.29 acres on south side of Preserve.

Salford Township

The former Reppert property is a landlocked, 18.5-acre wooded parcel containing two headwaters streams of the Ridge Valley Creek. It was purchased by NLT (February, 2001) and provides a near-link to the Heritage Conservancy preserve on King Road, separated by only one 10.8 acre wooded property.

Heritage Conservancy Preserve 16.6 acre wooded preserve with parcels on both sides of King Road. Includes broad area of hydric soils. This Preserve is separated from NLT's Reppert property by one 10.8 acre wooded parcel.

10.8 acre wooded parcel separating NLT's Reppert property and the Heritage Conservancy Preserve.

Fulshaw Craeg/Musser Scout Reservation Linkage

Hill Road/Knuckles Road Parcels

The following 22 small parcels are situated along Hill Road and Knuckles Road, and provide the most direct link between the Fulshaw Craeg Preserve and the Musser Scout Reservation:

(#44-0022-001). 6.8 acres; (#44-0022-002). 5.4 acres; (#44-0022-003). 3.6 acres; (#44-0022-021). 3.5 acres; (#44-0022-022). 3.5 acres; (#44-0022-029). 10 acres; (#44-0022-030). 7.8 acres; (#44-0024-007). 4.7 acres; (#44-0024-010). 2.11 acres; (#44-0022-003). 4.37 acres (#44-0022-001). 6.8 acres(#44-0024-004). 16.3 acres; (#44-0024-0014). 5 acres; (#44-0024-009). 10 acres; (#44-0024-006). 5 acres; (#44-0024-013). 5.9 acres

Musser Scout Reservation (also known as the "Hart Boy Scout Camp") – this tract of over 1,250 acres is bordered to the west by Upper Ridge Road, to the east by Scott Road and Butcher Road, Whites Mill Road to the north, and the Borough of Sumneytown to the south. Swamp Creek Road, Miller Road and Price Road wind through the property. The Reservation borders both sides of the Unami Creek for over 2 miles, and includes at least four First Order tributary streams. The property is over 80 % forested, and includes several of the largest blocks of forest-interior habitat in the study area. The Montgomery County Natural Areas Inventory notes at least three of its five Priority 1 sites as being on the "Hart Boy Scout Camp" property. The Upper Ridge Road site, with two subpopulations of a wildflower species of special concern growing in open meadow areas. The Unami Creek Site includes a sedge of special concern and a threatened species of rush along Unami Creek. The boulders along the creek are noted as a locally-significant geologic

feature. Finally, the Boucher Road site includes wet meadows and shrubland along the PECO Energy corridor with two species of special concern.

In collaboration with Montgomery County Lands Trust, Natural Lands Trust announced an agreement in the Fall of 2000 with the Boys Scouts of America to place a conservation easement on the roughly 1,250-acre Musser Scout Reservation in Montgomery County. The scout reservation is a half-mile north of the Fulshaw Craeg Preserve, on Unami Creek. Cultivation efforts facilitated the contacts necessary to initiate the agreement between the land trusts and the Boy Scout Council. This agreement marks the largest private conservation project in Montgomery County history. Future land preservation strategies will focus on building a greenway between Musser Scout Reservation and the Fulshaw Craeg preserve.

Over the course of the past three years — bolstered by grants from the Pennsylvania Department of Conservation and Natural Resources, The William Penn Foundation, and the Montgomery County Private Organization Challenge Grant Program — Natural Lands Trust has worked aggressively to acquire additional lands in the Unami Creek Valleys. Dolfinger-McMahon's support, matched with funding from the John Drew Betz Foundation, has been instrumental in facilitating the efforts of Drew Gilchrist, Assistant Director of Stewardship and Protection, in cultivating relationships with local landowners. Drew has successfully brokered several land deals in the Unami Creek Valleys contributing significantly to the growth and expansion of Fulshaw Craeg preserve and surrounding properties, such as the 1,250-acre Musser Scout Reservation.

Natural Lands Trust has nearly *tripled* the size of Fulshaw Craeg preserve over the past three years. In 1998, the preserve totaled 104 acres with an additional 30 acres under conservation easements. Natural Lands Trust staff worked with local landowners to add 61 acres to the Preserve and the preserve borders were protected with an additional 76 acres in conservation easements during the three-year grant period. Additionally, five real estate agreements are in the pipeline that should see completion in 2001, adding a total of 61 acres to the preserve using three types of protection strategies: direct acquisition (32 acres), conservation easements (10 acres) and life estates (19 acres). By the end of 2001, the Fulshaw Craeg preserve, will be 197 acres in size with 116 acres in easements and life estates, for a total of 313 acres.

A neighborhood open house was held in October 2000. About 50 neighbors of the Fulshaw Craeg Preserve attended the event to network with other local residents and raise awareness about community conservation issues. Guests discussed conservation accomplishments over the past three years and ideas for future preserve growth and management.

Montgomery County Open Space Plan (1996)

Approximately one-third of the funds used by NLT for acquisition of land or easements in the Unami Creek Valleys have been provided through the Montgomery County Open Space Preservation Program, a \$100 million initiative approved in 1993.

To focus its open space protection efforts and to guide the spending of these open space funds, the Montgomery County Open Space Plan (“Creating an Open Space Legacy”) was prepared by the Montgomery County Planning Commission (MCPC) and the Montgomery County Open Space Planning Board and adopted in 1996 by the County Commissioners. The Plan sets specific goals for open space protection, and highlights the Unami Creek Valleys as an area of special emphasis for biodiversity conservation. The Plan includes a map entitled Open Space System Recommendations that includes the Unami Creek Valleys as one of only a few areas of Contiguous Woodlands (>1,000 acres) and shows the Unami Creek corridor and a broad corridor

along Ridge Valley Creek as Areas of Concentrated Natural Features. The Significant Natural Areas map also shows the Unami Creek Valleys as part of the Terrestrial Features network that follows contiguous woodlands along diabase outcrops and ridges, and shows the stream corridors as Areas of Hydrological and Terrestrial Convergence. “The composite maps show that most large areas of vulnerable natural resources (both hydrological and terrestrial) are west of the Perkiomen Creek and around the Unami and Ridge Valley Creeks. Areas of large woodlands, diabase geology, steep slopes (all of which are highly related), and sensitive soils (alluvial and wet) are found in these areas.” (MCPC, 1996) The Plan also maps Swamp Creek Road along Unami Creek as an Aesthetically Unique Scenic Road.

“The plan promotes cooperation among our 62 municipalities, our neighboring counties, the state, and land conservation groups.”

“The plan recommends preserving areas with concentrations of natural resources. Preserving areas identified as significant in the Natural Areas Inventory, areas containing important natural features (both land-based and water-based), and land within large, contiguous woodlands (over 1,000 acres) is given the highest priority.” (MCPC, 1996). The Plan includes a detailed section on strategies for preserving open space, and highlights the importance of partnerships between the County and regional land trusts.

“Montgomery County residents ranked preserving natural areas as the most important reason for saving open space.” (MCPC, 1996)

Trails and Greenways

The Plan identifies the corridor along the Perkiomen Creek as one of four Primary Greenways in the County. The Perkiomen Creek Greenway is the major natural corridor linking the Schuylkill River at Valley Forge National Historical Park and the far northwest corner of Montgomery County above Green Lane Reservoir Park.

The Plan also proposes creation of the 25.5 mile Perkiomen Trail along the old Reading Railroad line that follows this corridor. “The Perkiomen Creek Greenway should serve to protect environmental resources while accommodating trail development, but natural feature preservation should be of foremost importance where trail use conflicts with conservation needs.” (MCPC, 1996) One of the proposed trailheads is located at Upper Perkiomen Valley Park, just outside the Unami Creek Valleys program area. This trailhead could provide an important link to potential trails in the Unami Creek Valleys.

The Open Space Plan also recommends protection of five Secondary Greenways in the Unami Creek Valleys program area, including natural corridors along the Unami Creek and Ridge Valley Creek.

One of the most important local partners in the ongoing Unami Creek Valley conservation effort is the Unami Hills Preservation Association (UHPA). UHPA is an important conservation partner for NLT in the Unami Creek Valleys area. All UHPA members are local residents in one of the three townships. Members are active in local land planning decisions and have a network of contacts that the Trust can use to gain introductions to important landowners. The Association hosted a landowner workshop in late 1998 that introduced the entire community to NLT and the land conservation tools that are available.

Community Profiling

Effective implementation of the Unami Creek Valleys Landscape Conservation Plan must be based on a clear understanding of the interests and concerns of the residents and landowners that

make up the community. The identification of Landscape Conservation Priorities, and specific parcels within Critical Conservation Areas and Critical Restoration Areas, raises many questions about the potential for implementation. Are individual landowners in these areas to inclined toward voluntarily conservation and restoration activities? Can the community be engaged in conservation and restoration actions that work to protect and restore the ecological values of this unique landscape? Natural Lands Trust has owned the Fulshaw Craeg Preserve for over a decade, and has made important contacts with local conservationists, residents and municipal officials. Without an on-site land manager, however, the Trust has not established a clear understanding of the stewardship potential of the local community. To address this need, the Trust should carry forward a community profiling project. This may include proven techniques such as interviews, questionnaires, and focus groups to gauge the sentiments of local residents about the importance of the Unami Creek Valleys landscape, their interest in living there, and their concerns about its future.

Conclusion

Natural Lands Trusts's Fulshaw Craeg Preserve represents a cross-section of the most important environmental, cultural and historic resources that create a healthy living environment in the Unami Creek Valleys -- and that face the greatest threat from encroaching suburban development. The preserve includes scenic, naturally forested diabase slopes, ridges, wetlands, wet meadows and stream frontage that characterize the Unami area and its High Quality streams, and provides substantial habitat for a diversity of native plant and wildlife species. Newly subdivided lots and newly constructed homes on several of the dirt roads surrounding the Preserve symbolize the very real growth pressures facing the area -- and the associated impacts on traffic, groundwater, surface water, loss of wildlife and plant habitat, and degradation of scenic and historic landscapes, and the overall peace and tranquility of the Unami Creek Valleys.

Yet it is the *story* of how the Fulshaw Craeg Preserve came to be, however, that represents the future of the local landscape and communities. It is the conservation ethic of landowning family who shared a commitment to leave their land as a legacy to benefit the community. It is the support and encouragement they received from their neighbors and municipal officials. It is the partnership they were able to form with the Trust as a charitable conservation organization. Finally, it is the ongoing expansion of this preserve and buffer areas around it and up and down the stream valleys, owing to the generosity and vision of local landowners and the technical and funding support of local, County and State organizations, foundations and agencies. Each of the chapters in this story holds answers for the future of the Unami Creek Valleys.

This Unami Creek Valleys Landscape Conservation Plan provides *information* on the key natural and cultural features of the Unami area, and the landscape ecology that supports local and regional biodiversity and sustains stream and ground water. It includes current and projected land use and land ownership patterns affecting the area. It compiles this information using the Trust's Geographic Information System (GIS) database, field visits, and dialogue with local residents and government officials, and the associated text and series of maps are presented in this report.

This Plan also provides *knowledge* to assist in carrying forward the ongoing effort to prioritize and protect the most important conservation lands in the area. The GIS-based analysis provided in the Plan has generated a detailed listing of Landscape Conservation Priorities, including parcel-specific identification of critical areas for short-term conservation and longer-term restoration. The list and map include explanations of the important resources to be protected, parcel by parcel, and how they contribute to the conservation value of one tract over another.

This Landscape Conservation Priorities list and map Habitat Conservation Networks with Critical Parcels are offered as a road map for Trust staff and local conservation leaders to use in charting the future of the Unami landscape. Partnerships with landowners, local governments and County and State agencies can follow this Plan's recommendations to create a viable network of protected and restored open spaces that will sustain the ecological and cultural integrity of this landscape, and contribute to biodiversity conservation in southeast Pennsylvania. In so doing, conservation activists in the Unami Creek Valleys area will be making a valuable local contribution to landscape conservation in the Piedmont region of southeast Pennsylvania.