

Greenscapes



The Green Infrastructure Element
February 2009



The Comprehensive Plan for Lancaster County, Pennsylvania

Photos from the Cover...



The Conewago Potholes in the Susquehanna River near the village of Falmouth is one of several State-designated Outstanding Scenic Geological Features in Lancaster County.

(Photo courtesy of PA Dutch Convention & Visitors Bureau.)



Shade trees like these in Denver Borough are good examples of "urban greening."



Tree planting volunteers helping to restore Jacob's Creek in East Hempfield Township.

(Photo courtesy of Lancaster County Conservation District.)



Bike riders enjoying an early fall ride on a section of Manheim Township's extensive bike path system.

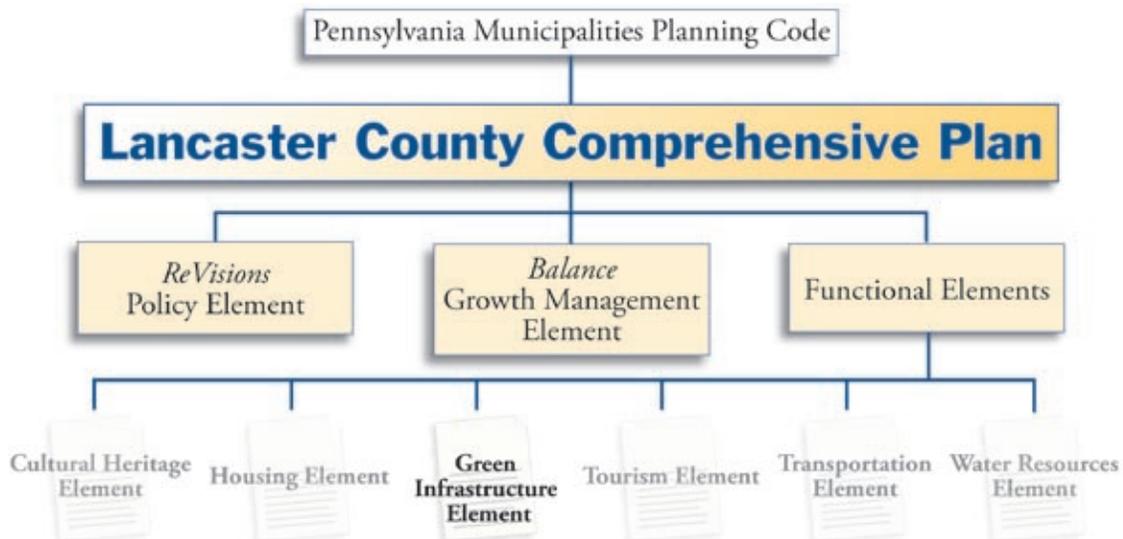


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RESOLUTION NO. 5 OF 2009

On motion of Commissioner Martin, seconded by Commissioner Lehman;

WHEREAS, The Board of County Commissioners charged the Lancaster County Planning Commission with developing a Comprehensive Plan for the County; and

WHEREAS, The Comprehensive Plan recognizes the importance of a healthy natural environment to the quality of life of residents in Lancaster County; and

WHEREAS, The Lancaster County Planning Commission appointed a fifteen member Task Force to assist in the development of Greenscapes: The Draft Green Infrastructure Element of the Lancaster County Comprehensive Plan; and

WHEREAS, Greenscapes provides a framework for coordinated action by all sectors of the community to create a healthy and sustainable green infrastructure system; and

WHEREAS, The Lancaster County Planning Commission has distributed the Draft Green Infrastructure Element to all segments of the community, as required by the Pennsylvania Municipalities Planning Code; and

WHEREAS, The Lancaster County Planning Commission and the Green Infrastructure Task Force sought extensive public involvement and comment on the draft plan; and

WHEREAS, The Lancaster County Planning Commission has considered and incorporated all appropriate comments into the Draft Green Infrastructure Element; and

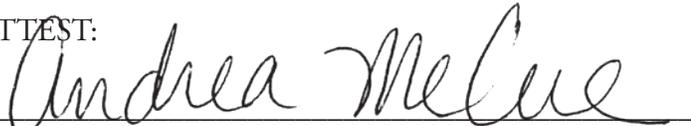
WHEREAS, The Lancaster County Planning Commission, at its regularly scheduled meeting on February 2, 2009, recommended that the Lancaster County Board of Commissioners adopt Greenscapes as an official element of the Lancaster County Comprehensive Plan.

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF COMMISSIONERS OF LANCASTER COUNTY, PENNSYLVANIA That the Board hereby adopts Greenscapes as an official element of the Lancaster County Comprehensive Plan.

Motion passed unanimously.

I, Andrea McCue, Chief Clerk to the County of Lancaster, Pennsylvania, do hereby affirm that the above resolution was passed unanimously by the Lancaster County Board of Commissioners on the 25th day of February, 2009.

ATTEST:



Andrea McCue
Chief Clerk
County of Lancaster
Date: February 25, 2009

Prepared by

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Lancaster County Green Infrastructure Project
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Acknowledgements

Introduction

Key Message

Lancaster County has a rich legacy of natural resources that has allowed its inhabitants to thrive for centuries. While it is known that Native Americans modified the environment to suit their needs, the period since European settlement has witnessed an unprecedented alteration of the natural landscape to accommodate a growing population. Activities such as agriculture, the construction of roads and other infrastructure, and – most recently – suburban and rural development have all contributed to the degradation of the County’s natural resources. While many of these changes have significantly impacted our air and water, fragmented native habitats, and resulted in the loss of plant and animal species, the County’s landscape still retains a number of important natural resources. The extensive network of rivers and streams, the wooded slopes of the Pennsylvania Highlands (Furnace Hills and Welsh Mountain), and the spectacular Susquehanna River gorge are a few examples of the County’s natural heritage that helps define the County’s identity and quality of life. Woodlands, stream corridors, open spaces, and other “green” resources are an integral part of the landscape throughout the County’s rural and urban areas and perform essential and irreplaceable “life support” functions for residents.

GreenScapes: The Green Infrastructure Element of the Lancaster County Comprehensive Plan defines a vision, goals and objectives, strategies, and tools to preserve, conserve, restore, and enhance natural resources through the establishment of a countywide, integrated green infrastructure system. It highlights the importance of protecting large blocks of contiguous land and improving connectivity as it aims to establish a network of natural areas, conservation lands, and working landscapes. GreenScapes provides a blueprint for accommodating appropriate growth and development while preserving the region’s most valuable natural resources, native species, cultural assets and agricultural economy.

The green infrastructure system created by applying the strategies and tools contained in GreenScapes will provide a framework for sustainable growth and economic vitality in Urban Growth Areas, for agriculture and other compatible uses in rural areas, and for outdoor recreation and related activities such as walking, biking or paddling throughout the County.

1.1 What Is Green Infrastructure?

Green infrastructure has been defined as:

...the Nation’s natural life support system – a strategically planned and managed network of wilderness, parks, greenways, conservation easements, and working lands with conservation value that supports native species, maintains natural ecological processes, sustains air and water resources, and contributes to the health and quality of life for America’s communities and people.

The Green Infrastructure network encompasses a wide range of landscape elements, including: natural areas - such as wetlands, woodlands, waterways, and wildlife habitat; public and private conservation lands - such as nature preserves, wildlife corridors, greenways, and

parks; and public and private working lands of conservation value - such as forests, farms, and ranches. It also incorporates outdoor recreation and trail networks.¹

Gray infrastructure consists of engineered and built systems that support community functions, for example: roads; sewer and water facilities; gas pipelines and electrical transmission lines; and communication towers.

Green infrastructure differs from gray infrastructure in many ways, yet both are essential to a healthy, viable community. Gray infrastructure is

¹ GreenInfrastructure.net, sponsored by the Conservation Fund and USDA Forest Service

Table 1-1. Benefits of Green Infrastructure

Environmental Quality
• Preserves natural resources, such as floodplains, steep slopes, and wetlands
• Recharges and protects the quality of surface and ground waters
• Provides natural stormwater management services, including flood protection, erosion control, and pollution reduction
• Reduces energy use and captures carbon dioxide, thus helping to counteract global climate change
• Conserves native communities and provides habitat for plant and animal species of concern
Community Health
• Cleanses the air we breathe and the water we drink
• Promotes outdoor recreation and exercise through activities such as walking, biking and paddling
• Brings people into contact with nature, providing important psychological benefits
Sustainable Economy
• Strengthens the economy through improved quality of life, increased property values, and increased economic activity
• Conserves resources that support the economy
- Hunting, fishing, paddling and other forms of outdoor recreation
- Tourism
- Rural land uses such as agriculture, forestry, and resource extraction
• Reduces costs associated with engineered “gray infrastructure” systems (stormwater, wastewater, etc.)

the man-made substructure that supports societal functions such as communications, movement, and commerce. Green infrastructure – natural resources such as streams and waterways; wetlands and floodplains; woodlands, etc. – is the substructure that supports life itself. Both are equally important to the physical and economic health of a community. Table 1-1 summarizes the many benefits that green infrastructure provides for the economic, social, and overall well-being of our community.

Benefits of Green Infrastructure

As illustrated in Table 1-1, green infrastructure provides numerous benefits, functions, and values that address environmental, social, and economic needs – the three foundations of a sustainable community. A green infrastructure system helps to protect, enhance, and restore the natural functions and services of an ecosystem. These “ecosystem services” include cleaning the air, filtering and cooling water, recycling nutrients, pol-

linating crops, regulating climate, capturing and storing excess carbon in the atmosphere, reducing storm and flood damage, and maintaining groundwater aquifers. The woodlands, wetlands, and waterways that comprise the County’s green infrastructure also provide marketable goods and assets such as forest products, fish and wildlife, outdoor recreation, and scenic views. All of these benefits contribute to the health, quality of life, and economic prosperity of County’s residents.

There is a tendency to think of green infrastructure in purely aesthetic terms or as something that is only appreciated by those who work or recreate in the outdoors. But the fact is that green infrastructure touches the lives of every resident, every day. Those involved in farming and timbering rely on the County’s good soils and moderate climate to grow crops and harvest trees for their livelihoods. Those living and working in the County’s urban areas rely on green infrastructure to provide fresh drinking water, clean air to breathe, and places to recreate. Green infrastructure is also critical to the perpetuation

of the County's native plant and animal communities and to the survival of plant and animal species of concern.

The following is a summary of just a few of the functions and benefits of green infrastructure:

Cleaning the Water: Clean water is essential for a healthy community, a vibrant economy and the continued existence of the County's native plants and animals. Urban and suburban development adds pollutants such as excess nitrogen and phosphorus, oil, grease, and heavy metals to local waterways from parking lots, roads, and lawns. Also, agricultural runoff contributes excess nutrients and pesticides to adjacent streams, contaminates ground water, and degrades drinking water supplies. Excess nutrients (and other contaminants) in the County's waterways are a major concern for both local residents and those concerned about the health of the Chesapeake Bay.

Green strips of vegetation, such as forests and grasses adjacent to stream banks and floodplains (referred to as riparian buffers), are an effective means of reducing the amount of nutrients, sediments, and pesticides that enter surface waters. Riparian buffers slow water runoff so that contaminants can be filtered and absorbed by plants and microbes in the soil. In addition, by anchoring soils with their roots, stream buffers stabilize soils along stream banks and steep slopes where soils are highly erodible. Stream sediments can impact fish and invertebrate populations and habitats, alter stream channels, and reduce water quality. Also, the shade provided by riparian trees can significantly reduce the effect of summer temperatures on streams and waterways. Cold water, which holds higher levels of dissolved oxygen, is critical to the health of certain fish, such as brook trout, invertebrates, plants, and other aquatic organisms.

Wetlands are another green infrastructure resource that has the ability to cleanse water before it enters a stream or river. Wetlands reduce the velocity of water flowing through them so that sediment can settle out and native plant species can absorb or break down various pollutants.

Reducing the Impacts of Flooding: The conversion of natural lands to urban and suburban uses directly impacts the degree and extent of flooding that occurs during and after large storm events. Impervious surfaces such as roads, driveways, parking lots, and rooftops prevent the infiltration of rain water. The resulting runoff is typically directed to storm drains or facilities that may or may not retain the water before discharging it into the nearest waterway, where it can result in flooding that may destroy property and erode stream banks. Historic communities are frequently affected the most by flooding due to their frequent locations on or near major waterways. Flooding problems tend to worsen over time as land is developed from its natural state to development and more impervious surface is created.

Green infrastructure can reduce flooding in several ways. Natural lands such as forests absorb rainfall and recharge groundwater aquifers, thereby reducing the severity of runoff during large storm events. Forests absorb water at a rate nearly ten times that of lawn, helping to maintain groundwater levels for water supply wells and providing base flow for streams during dry periods. In suburban and urban areas, trees intercept and absorb rainwater, reducing the amount of water that is channeled through streets and gutters. Researchers have found that evergreens, conifers, and trees in full leaf can intercept up to 36% of the rainfall that falls on them. Floodplains and wetlands store water as it overflows the stream bank. Friction caused by trees, shrubs, and other vegetation in these areas also helps reduce the velocity of water flow.



Pervious sidewalks like these at Warwick Township's municipal office help reduce storm water runoff by allowing rainwater to be absorbed into the ground.

In urban areas where there are large amounts of impervious surfaces, green infrastructure such as street trees and urban forests, and “green interventions” such as green roofs, natural drainage swales, porous pavement, rain barrels, tree box filters and rain gardens can absorb, cleanse and hold storm water. This function is particularly important in older urban communities that have combined sanitary/stormwater sewers. Large storm events often overload these antiquated systems, sending untreated wastewater directly into local waterways. In areas with separate storm sewers, green infrastructure also acts as a “biological filter” that helps cleanse urban runoff before it is discharged to waterways.

Cleaning the Air: Air quality is a major factor in human illnesses ranging from cardiovascular disease to cancer to respiratory ailments. Automobiles, fossil fuel plants, factories, and other point sources of air pollution are the primary culprits contributing to the County’s poor air quality. Air quality has a significant impact on the health of local ecosystems as well. Impaired air quality creates stresses on forests, either directly (e.g., ozone damage to leaves) or indirectly (e.g., the



Trees help clean the air by absorbing pollutants and releasing oxygen. A mature leafy tree produces as much oxygen in one season as 10 people inhale in a year.

effect of acid rain on the ability of trees to absorb nutrients and necessary trace elements). In addition, there is scientific evidence that air pollution contributes to the global concerns of ozone depletion and climate change, which is a major threat to life on the planet as we know it.

Although air quality is a complex and challenging issue that requires action at the regional and national levels, there are a number of steps that can be taken locally to help improve the quality of the air we breathe. Green infrastructure can play a significant role in this effort.

Simply planting and conserving trees can improve air quality. The leaves and needles of trees have surface areas that absorb pollutants such as carbon dioxide, sulfur dioxide, and nitrogen oxide and, in turn, release oxygen. They also trap particles in the air and tropospheric (ground-level) ozone that can be harmful to humans, plants, and animals. The air purification functions of trees are particularly important in urban areas where air pollution is often more concentrated.

In addition, since the automobile is one of the largest sources of pollution, reducing the dependence on the car to travel can effectively improve air quality. One method of accomplishing this is to encourage the development of pedestrian and bike-friendly communities. Building sidewalks, mixing land uses, and building compact communities are all effective means of enabling people to walk or bike to school, work, or shop. Connecting different land uses with trails not only provides people with direct access to open space to recreate; it also provides people with an alternative to the use of their automobile for short trips.

Conserving Energy: The term “heat island” refers to urban air temperatures that are higher than nearby rural areas. Because buildings, roads and other structures retain heat, rural areas cool off faster at night than cities. Some cities have air temperatures up to 10°F warmer than the surrounding countryside. Heat islands form as cities replace natural land cover with pavement, buildings, and other gray infrastructure. These changes contribute to higher urban temperatures in a number of ways:

- The removal of trees and vegetation minimizes the natural cooling effects of shading and evaporation of water from soil and leaves.
- Large buildings and narrow streets reduce air flow and heat air trapped between them.
- Heat from vehicles, buildings, and air conditioners add warmth to their surroundings.

These higher temperatures amplify smog and air pollution, threaten the lives of urban residents during extreme heat events, and contribute to higher energy costs and other quality of life impacts.

Infusing green infrastructure into urban areas through the planting of trees and other vegetation is a simple and effective way to reduce the urban heat island effect and decrease local air temperatures during hot periods. A mature tree can effectively cool the air and shade buildings and hard surfaces, thus reducing the amount of heat absorbed throughout the day. Other ways to reduce the heat island effect include installing cool or vegetated green roofs and switching to lighter colored, heat-reflecting paving materials. In addition, by placing trees, shrubs, and other vegetation in the right locations, a homeowner can reduce the energy required to keep homes and surrounding areas comfortable during winter and summer. Trees can reduce summer temperatures by shading roofs from the afternoon sun. Deciduous trees provide summer shade and then shed their leaves in the fall, allowing sunlight to filter through their bare branches in winter to help warm the home. The cost savings provided by green infrastructure can be significant in a time of increasing fossil fuel costs.

Conserving Native Plant and Animal Diversity: When land is cleared of its native vegetation for uses such as agriculture, road construction, and development, plant and animal habitat is typically broken up into small isolated islands or patches. This process, known as “habitat fragmentation,” has a significant impact on the biological diversity of a community such as Lancaster County, where agriculture and land development have dramatically reduced the amount of available habitat for native plants and animals. Mobile species such as birds and mammals can retreat into the remaining patches of habitat and may use more than one fragment; however, less

mobile species are restricted to the fragments available to them. Small fragments of habitat can only support small populations of plants and animals. Minor fluctuations in climate, food resources, disease, or other factors to which larger populations can adapt may be devastating to these smaller, isolated populations. Therefore, habitat fragmentation is a significant cause of species extinction.

Corridors or ribbons of green infrastructure through the landscape are critical elements of an effective ecosystem conservation strategy. When combined with a system of green infrastructure hubs, these ribbons of open space, often referred to as “greenways,” can help preserve rare, threatened, and endangered plant and animal communities as well as providing outdoor recreational opportunities. Connecting isolated habitat patches through greenways enables certain animal species to migrate between the patches and mix with other populations of the same species. This strengthens the overall gene pool of the species and its ability to withstand otherwise catastrophic events such as outbreaks of disease.

Economic Benefits of Green Infrastructure

The 2004-2005 “i-Tree” study in Minneapolis by the USDA Forest Service found that the City’s public street trees provide at least \$24.9 million in quantifiable annual benefits (about \$150 per household), including annual energy savings of more than \$6.8 million, reduced stormwater runoff benefits equal to \$9.1 million in savings, and aesthetic and property value increases of at least \$7.1 million. These figures do not account for other benefits such as noise and air pollution reduction.

Minneapolis Tree Advisory Commission Annual Report, 2006

Strengthening the Economy: Green infrastructure yields important fiscal benefits for citizens, businesses, and government. For instance, it has been shown that green space can increase the resale value of a home. Statistics from the National Homebuilders Association show that residential properties realize a 10 to 20 percent gain in value



Studies show that consumers spend up to 13% more at shops near green landscapes.

when they are close to green space; this premium can increase to 25 percent when homes are surrounded by trees. While this is perhaps the most direct economic benefit for the private citizen, the incorporation of green infrastructure can save homeowners money in other ways. For example, careful landscaping can reduce cooling and heating costs by 30 percent. Shade trees can prevent direct sunlight from heating up exterior walls and roofs and reflected light from conveying heat into a house from the ground or other surfaces. And by reducing wind velocity, a tree slows air leakage from a house. With energy cost on the rise, these simple changes can save homeowners money and reduce carbon emissions from energy use for cooling and heating as well.

In addition to benefiting individual homeowners, green infrastructure makes important contributions to the local economy. Studies show that consumers will pay a greater than 10 percent premium when they shop next to greenspace compared to what they pay for the same products in other shopping areas. Promoting greenspace attracts new businesses to communities and creates new revenue sources from tourism. Other important economic contributions made by green infrastructure include sustainable resource extraction activities such as forestry and frequently overlooked “free” ecosystem services such as crop pollination. In addition, green infrastructure is increasingly being used for purposes such as flood control and stormwater management, often times at a fraction of the cost of traditional engineered solutions.

Agricultural Land and Green Infrastructure

Approximately 342,000 acres or 54% of the Lancaster County landscape is currently in agricultural use. Though agriculture has impacted Lancaster County’s native plant and animal communities, farmland should be considered an important green infrastructure resource that adds value to ecosystem processes and functions such as groundwater recharge and habitat for certain species. While these benefits merit consideration in Greenscapes, the primary focus of the Plan is preserving natural lands such as the habitat of plant and animal species of concern and conserving semi-natural land and water resources such as riparian corridors and passive recreation areas. Lancaster County has a longstanding tradition of protecting its farmland through effective agricultural zoning ordinances that limit non-farm development in rural areas as well as a purchase of development rights (PDR) program that has permanently preserved approximately 80,000 acres of farmland, more than any other program in the nation. Also, farmland preservation specialists in the County are exploring new methods of making the agricultural preservation program more effective and efficient while Balance, the Growth Management Element of the County Comprehensive Plan, defines new directions to strengthen the agricultural economy as part of a comprehensive Rural Strategy.

Because of the above efforts, Greenscapes does not directly address farmland preservation. Nevertheless, farmland has an important role to play in implementing Greenscapes – especially in efforts to enhance surface water quality by establishing riparian buffers and to connect isolated patches of habitat by developing greenway corridors for species migration.



Poor agricultural practices have contributed to Lancaster County's surface and ground water quality problems.

1.2 The Challenge

In the broadest sense, green infrastructure and the ecological functions and services it provides are essential to the survival of all life. Green infrastructure provides life-sustaining benefits, such as cleansing the air we breathe and the water we drink, that have largely been taken for granted. When natural lands are converted to development, the hidden costs of losing the ecosystem services they provide are almost never accounted for in the marketplace. The loss of these services often results in damages that take a heavy toll on human health, as well as on the survival of native plant and animal communities. Remediating these problems after the fact is difficult and costly and the realization that ecosystem services must be afforded greater consideration is growing. Moreover, in an era characterized by environmental trends such as natural resource depletion, global warming, and species extinction, there is increasing recognition that green infrastructure is a key to a sustainable future.

Although Lancaster County has never formally prepared a green infrastructure plan or a comprehensive assessment of the health of its natural resource base in the past, stresses on the County's green infrastructure are readily apparent. For example, a significant number of the County's surface waters are severely degraded by sediment and nutrients. Eroded stream banks with sparse riparian vegetation are common in the County's urban and agricultural landscapes. High nitrates are frequently detected in the drinking water of

rural residents and water drawn from wells to supply public drinking water systems. Growth tracking reports prepared by the Lancaster County Planning Commission (LCPC) indicate that land development in rural areas is consuming significant amounts of prime farmland, fragmenting forestland, and negatively impacting natural habitat areas. A number of plant and animal species have been identified as rare, threatened, or endangered (species of concern). Air quality is also a major concern. The American Lung Association report, *State of the Air: 2008* (covering data from 2004 through 2006) ranks Lancaster County as being the eighth worst of 31 Pennsylvania counties for which ground-level ozone data were collected, and 115th worst out of 680 counties across the U. S.

These are a few of the major issues Lancaster County will need to address in creating a healthy and sustainable green infrastructure system. Additional information on the health of the County's green infrastructure resources and threats to those resources is presented in Chapter 2.0 of the plan.

1.3 Purpose of Greenscapes and Relationship to the Lancaster County Comprehensive Plan

Need for and Purpose of the Plan

The Pennsylvania Municipalities Planning Code (MPC) mandates that county comprehensive plans include provisions for the protection of natural and historic resources. First passed by the Pennsylvania General Assembly in 1968, the MPC is the Commonwealth's "enabling" legislation for municipal governments. It outlines the structure through which municipalities create and enforce planning and zoning regulations. The MPC has been amended many times since its creation. One of the most sweeping changes occurred in 2000, when the MPC began requiring county and municipal comprehensive plans to include provisions for the protection of natural and historic resources.

As an element of the Lancaster County Comprehensive Plan, Greenscapes fulfills the mandate of

the MPC to specify provisions to protect natural resource lands. It defines a system of green infrastructure lands – natural areas, green spaces, and greenway connections – within the County and identifies strategies and tools that can be used by Lancaster County and others to preserve and enhance the system. The system includes both natural resources (e.g., forestlands, habitat for plant and animal species of concern, and river and stream corridors) and “green” features integrated into human settlement patterns (e.g., parks, community gardens, and the urban tree canopy). The plan provides a framework for coordinated action by the public, nonprofit, institutional, and private sectors to create a healthy and sustainable green infrastructure system.

Greenscapes is an element of Envision Lancaster County, the Lancaster County Comprehensive Plan. It replaces and updates the Lancaster County Regional Open Space Plan, which was adopted in August 1992 as an element of the Comprehensive Plan. The 1992 plan defined a countywide open space system consisting of a regional park system, a natural heritage preservation system, and a greenway system. This plan incorporates the three open space components from the 1992 plan into a more comprehensive green infrastructure system consisting of hubs, greenways, nodes, and links (see Section 3.3 for definitions of these structural elements of the system). In doing so, it provides guidance to municipalities in meeting local outdoor recreation needs, to Lancaster County in completing the regional park system, and to Lancaster County and various partners in developing a countywide greenway trail system. To meet the important goal of promoting biodiversity, it also incorporates information from the updated Natural Heritage Inventory of Lancaster County, Pennsylvania which was compiled and written by the Pennsylvania Natural Heritage Program (PNHP) in 2008. The Natural Heritage Inventory of Lancaster County is a document that builds on the original Natural Areas Inventory (NAI) of Lancaster County completed in 1990 by the Pennsylvania Science Office of the Nature Conservancy. This inventory identifies habitat for plant and animal species of concern and other key ecological resources that should be preserved as part of the green infrastructure system.

The following are the major components of the Lancaster County Comprehensive Plan together with explanations of how they relate to Greenscapes:

Policy Element (ReVisions)

Adopted in 1999, the Policy Element contains the vision and goals of the Lancaster County Comprehensive Plan. Prepared with extensive public input, this element is designed to show the interconnectedness between different planning issues. It identifies six Key Focus Areas, or issues that county residents feel are worthy of special attention based on the public input. They are:

- Protect and preserve our natural and cultural heritage
- Revitalize our urban communities
- Develop livable communities
- Create a sustainable economy
- Celebrate, invest in, and mobilize the talents of our human resources
- Promote strong leadership, awareness, responsibility, and involvement in community issues

While not all of the Key Focus Areas previously mentioned can be implemented through Greenscapes, some are directly relevant. The following Key Focus Areas and *Policies* from **ReVisions** are directly related to the implementation of Greenscapes.

Key Focus Area #1: Protect and preserve our natural and cultural heritage.

Policies for this focus area related to Greenscapes include:

- Preserve, protect, enhance, and restore the County’s native plant and animal diversity and functioning natural systems
- Protect and improve the quality of our air
- Protect, conserve, and improve surface and groundwater resources for human and non-human use

Protecting plant and animal species of concern; ensuring clean air to breathe and clean water for public consumption; and preserving the County’s treasured natural places, such as the Susquehanna

River gorge, are all objectives consistent with the purposes of Greenscapes.

Key Focus Area #2: Revitalize our urban communities.

Policies for this focus area related to Greenscapes include:

- Establish cohesive, safe, and violence-free neighborhoods and a clean, healthy physical environment.

Community gardens, neighborhood parks, high-profile public green spaces, and other green infrastructure components make urban environments more attractive and livable places, bring neighbors together, and enhance the quality of life in urban areas.

Key Focus Area #3: Develop livable communities.

Policies for this focus area related to Greenscapes include:

- Develop aesthetically pleasing, interconnected transportation systems that encourage walking, biking, and public transit, and discourage high speed traffic.
- Develop a permanently preserved open space system that provides a diversity of publicly accessible open space resources in the form of town squares, greenways, parks, and natural areas.
- Encourage existing communities to establish a central focus that combines commercial, civic, cultural, and recreational uses.
- Minimize the impact that large-scale development has on the environment and character of existing communities.

Infusing green infrastructure into existing communities and carefully planning open space systems in new developments are methods to help ensure that all our communities are healthy, livable environments in which to live, learn, work, and play.

Key Focus Area #4: Create a sustainable economy.

Policies for this focus area related to Greenscapes include:

- Develop tourism facilities that improve the economic vitality of the County in a manner

that is in harmony with our distinct historic, cultural, and natural heritage.

A clean, healthy natural environment can help attract new businesses and retain existing ones, as well as provide opportunities for growth in the local economy through heritage development and ecotourism.

Growth Management Element (Balance)

The Growth Management Element of the Lancaster County Comprehensive Plan was adopted in 2006 as an update to the 1997 Growth Management Plan. It translates the vision and goals of the Policy Element into an overall framework and targets strategies for managing growth and land preservation in Lancaster County. It is divided into three primary components – an Urban Growth Area Strategy, Rural Strategy, and Implementation Strategy – as follows:

Urban Growth Area Strategy: The overall goal of the Urban Growth Area (UGA) Strategy is to focus growth in areas where infrastructure and services presently exist or are anticipated in the future. Key objectives include increasing the countywide proportion, density, and intensity of new development within UGAs; placing a new emphasis on compatible reinvestment, infill, and redevelopment; improving the character of new development; increasing housing choice and affordability; and increasing employment opportunities. Of particular relevance for Greenscapes is policy direction to integrate open space and natural resources into UGA development patterns and to promote opportunities for walking and biking.

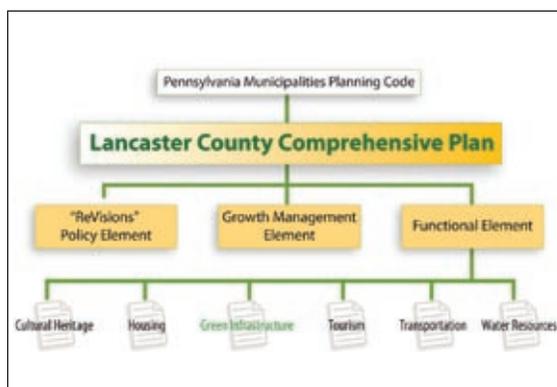
Rural Strategy: The Rural Strategy is designed to maintain the resources and traditional ties to the land that define Lancaster County's rural character. The strategy centers on Designated Rural Areas, including Agricultural Areas, Agricultural with Natural Areas, and Natural Areas, within which rural resources, character, and way-of-life are to be sustained and incompatible development precluded. Natural Areas correspond to major natural resource hubs identified in Greenscapes (see Chapter 3.0). Agricultural with Natural Areas highlight the importance of

maintaining the integrity of green infrastructure resources such as steep slopes and stream corridors in agricultural landscapes. A key goal of the Growth Management Element is to reduce non-rural development outside of Urban Growth Areas and direct it to Rural Centers (areas of existing development such as villages and cross-roads communities).

Implementation Strategy: The Implementation Strategy is designed to provide municipalities and the County with the tools needed to effectively implement the Urban Growth Area and Rural Strategies. It includes a County Action and Funding Program to facilitate assistance and collaboration with municipalities, communities, and nonprofit groups; a Smart Growth Toolbox comprised of policy, regulatory and capital investment tools available to implement the Urban Growth Area and Rural Strategies; and a Monitoring Program to measure progress made in implementing the Update. Much of the proposed funding strategy, tools, and monitoring program are directly relevant to Greenscapes. Both the strategies and tools presented in Chapter 4.0 and the action plan and plan monitoring program presented in Chapter 5.0 build on and adapt the Growth Management Element recommendations to focus on green infrastructure.

Functional Elements

Functional elements are specialized planning documents that address specific topical areas of concern, such as green infrastructure. As these plans are completed they are adopted as official amendments to the Lancaster County Comprehensive Plan. The current functional elements



“Greenscapes” is one of six officially adopted functional elements of the Lancaster County Comprehensive Plan.

(with their year of adoption by the Lancaster County Board of Commissioners) include:

- Cultural Heritage (2006)
- Housing (2006)
- Tourism (2006)
- Transportation (2008)
- Water Resources (1996)
- Open Space (1992) (superseded by Greenscapes)

The County is currently in the process of preparing an Economic Development Plan and updating the Water Resource Element, which will focus on the water resource issues directly related to the implementation Balance—the County’s Growth Management Plan.

The Comprehensive Plan functional elements are designed to work together to support balanced growth and preservation through policies and strategies to strengthen and sustain Lancaster County’s urban and rural communities, its diverse economy, its choice of housing types and affordability, and its natural and cultural heritage. The Cultural Heritage, Tourism, and Water and Wastewater Elements are linked to the Green Infrastructure Element by policies to conserve components of the County’s natural heritage. While less directly related to Greenscapes, the Housing and Transportation Elements define strategies for housing and transportation improvements that need to be coordinated with strategies to maintain and enhance green infrastructure. In addition, the Transportation Element update provides opportunities to better integrate green infrastructure functions such as bicycle and pedestrian mobility into the County’s transportation system.

1.4 Planning Process

Greenscapes was prepared by the Lancaster County Planning Commission working with a consultant team comprised of RETTEW Associates, Inc. and Wallace Roberts & Todd, LLC. Mapping, analysis, and assessments provided by the Pennsylvania Natural Heritage Program were integral to the development of the Plan. In addition, a Task Force comprised of representatives of County departments, other agencies and

organizations, businesses, and citizen groups with an interest in green infrastructure issues met regularly to provide input. The Task Force provided advice, policy direction, coordination, and technical assistance throughout the planning process. The process consisted of the following major steps:

1. **Project Initiation:** This step defined expectations and outcomes for the planning process and introduced the project team to relevant plans, initiatives, and data. Research was conducted on green infrastructure initiatives from around the nation and their potential application to Lancaster County.
2. **Background Information:** This step involved an assessment of existing conditions, trends, and initiatives affecting Lancaster County's green infrastructure resources. It also included community input via a public workshop and focus group meetings with key green infrastructure stakeholders.
3. **Vision Statement:** In this step a strategic vision of Lancaster County's future green infrastructure system was formulated.
4. **Plan Development:** In this step the complete Greenscapes was developed, including an action plan and tools for implementation.

Public input in step 2 played a key role in informing the development of the strategic vision and action plan. The results of this input are summarized below:

Public Meeting

A public meeting to present the concept of green infrastructure and solicit input into development of Greenscapes was conducted in February 2007. As part of this meeting, four breakout groups were facilitated to develop ideas on the following topics: environmental resources; park and recreation needs; treasured resources; and urban green infrastructure. The participants were also given an opportunity to indicate which ideas they felt were most important. The following were the five highest rated ideas/comments by each group:



Break out sessions were held at the public event to gather input from interested citizens on priority focus areas for Greenscapes.

Environmental Resources

- Stream valleys and waterways
- Forested lands
- Groundwater
- Agricultural lands
- Native plants and animals/habitats/natural communities

Park and Recreation Needs

- Walking/biking trails
- Parks closer to population centers
- Low-Grade line / Rail to Trail
- More and better public access to streams and rivers (water trails)
- Connectivity with transit

Treasured Places

- Critical lands adjacent to other protected lands to prevent fragmentation
- Susquehanna River Corridor, including islands
- Classify all waterways as important resources
- Agriculture is fully developed lands – soil is resource
- Low grade corridor

Urban Green Infrastructure

- Green streets, rain gardens, and green roofs/solar
- Turn an urban street into pedestrian corridor, greenbelt
- Pedestrian network – art walks (something along river, through city, too)
- Old cemeteries designed for living, also relight them, etc.
- More substantial landscape pockets

Focus Groups

In May 2007 four focus group sessions were conducted to seek further input into development of Greenscapes. Three of the groups consisted of persons with special interests or affiliations related to rural green infrastructure, urban green infrastructure, and parks and recreation. The fourth group included members of the Green Infrastructure Task Force to review and discuss the results of the previous sessions. The focus group results provided valuable input to development of the plan goals, objectives, and strategies for implementation. Some of these themes included:

- Establish stream buffers
- Develop model natural resource ordinances
- Assist municipalities and property owners with tree planting and maintenance
- Build connections for people to parks
- Focus on connections as the next phase of County park development
- Determine roles and responsibilities

1.5 Contents of the Plan

Greenscapes includes the following sections:

- Chapter 2.0 describes existing conditions and trends affecting green infrastructure in Lancaster County, including:
 - Regional and land use context
 - Green infrastructure resources (landform, water and air, plant and animal communities, threats to those resources, and potential restoration areas)
 - Parks and recreation
- Chapter 3.0 articulates a strategic vision for green infrastructure as Lancaster County's **natural life support system**. It describes the benefits to be provided by this system, along with its major structural components – **hubs** and **greenways** at the countywide scale, **nodes** and **links** at a more localized scale, and the urban, suburban, and rural **landscapes** within which these components are located.

- Chapter 4.0 defines goals, objectives, and strategies for the green infrastructure system based on the four primary functions of the system:

- **Preservation** of exceptional natural resources;
- **Conservation** or stewardship of important natural resources and the essential life support services they provide;
- **Restoration** of natural resource systems and ecological connections; and
- **Recreation** and improved community health.

It also identifies specific tools in four broad categories – **policy and planning, regulation, capital investment, and education and outreach** – that can be used by a variety of partners to realize the goals, objectives, and strategies.

- Chapter 5.0 lays out a framework for action by Lancaster County and partners in the public and private sectors to implement the plan. This framework includes:
 - An **action plan** consisting of five key initiatives – communications, technical assistance, funding, capital planning and development, and partnership – and supporting priority actions. Included is a proposed **Lancaster County Green Infrastructure Coalition**, a network of existing agencies, organizations, and groups to coordinate initiatives and projects related to green infrastructure.
 - A definition of **roles and responsibilities** of the public and private sector partners in creating a healthy and sustainable green infrastructure system
 - A process for **monitoring progress** in implementing the plan, including a system of green infrastructure indicators

The appendices include additional background information for Greenscapes, including “best practice” case studies of green infrastructure

initiatives from around the country and supporting data for the parks and recreation analysis in Chapter 2.0.

Greenscapes lays out a framework and blueprint for action by the entire community to create a comprehensive, integrated green infrastructure system. This system is important not only to sustaining the natural systems and functions on which life depends, but also to achieving goals such as improved community health, sustainable economic development, and a high quality of life for all Lancastrians. By implementing the actions and using the tools defined in this plan, we can help ensure that future generations will enjoy all of the benefits provided by green infrastructure – Lancaster County’s natural life support system.

Goals and Objectives

The goals and objectives presented in Greenscapes outline what should be accomplished during the life of the plan. The four goals listed below establish the principal directions that should be followed in order to implement the vision for the green infrastructure system. The objectives beneath each of the goals describe, in more detail, the intent of the goals. The strategies and tools presented in Chapter 4.0 further detail how the objectives will be implemented to meet the goals of the plan. By implementing the four goals, Lancaster County can protect, preserve, restore, and enhance the natural environment that supports life sustaining functions and directly relates to the quality of life of the citizens of Lancaster County.

1. **Preserve Lancaster County’s exceptional natural resources.**

- A. Secure the future of the County’s natural heritage by defining, identifying, and permanently protecting its most important natural and treasured resources.
- B. Ensure the long term viability of the County’s biological diversity by maintaining, enhancing, and restoring habitat for plant and animal species of concern and greenway connections between them.

2. **Conserve natural resources and services throughout Lancaster County’s urban, suburban, and rural landscapes.**

- A. Maintain the ecological integrity of environmentally sensitive lands.
- B. Promote land management practices that result in the conservation and sustainable use of renewable natural resources.
- C. Increase the understanding and awareness of citizens and elected officials of the social, economic, and environmental importance of natural resource conservation.

3. **Restore ecological connections and natural resource systems throughout Lancaster County’s urban, suburban, and rural areas.**

- A. Restore the County’s natural environment and its ecological functions.
- B. Incorporate green elements throughout the built environment to improve the environmental quality of urban and suburban development.
- C. Enhance the quality and ensure the quantity of surface and groundwater resources needed to sustain healthy aquatic ecosystems, drinking water supply, and water-based recreation activities.
- D. Enhance the County’s air quality through reforestation and tree planting.

4. **Enhance the quality-of-life of residents through the provision of a diversity of easily accessible outdoor recreation opportunities and experiences.**

- A. Protect large open spaces for passive outdoor recreational opportunities such as hiking, biking, paddling, wildlife viewing, outdoor learning, and the traditional pastimes of hunting and fishing.
- B. Provide a diversity of close-to-home, active recreation opportunities within Designated Growth Areas.
- C. Create a countywide network of open/green spaces and connections between them.
- D. Improve community health by providing convenient, accessible opportunities for outdoor recreation and exercise.

Existing Conditions

2.1 Green Infrastructure Context

2.1.1 Regional Context

Lancaster County is located in southeastern Pennsylvania approximately 40 miles west of Philadelphia (Figure 1). The County is about 950 square miles in size and had an estimated population of 494,486 in 2006. Like most of southeastern Pennsylvania, Lancaster County's native, largely forested cover has been extensively altered by centuries of human use. The County's physiographic features – its underlying bedrock, topography, and soils – have greatly influenced the ways humans have used the land. Figure 2 shows the physiographic sections of Lancaster County based upon underlying geologic formations.

As shown on Figure 2, Lancaster County is located within a large plateau region referred to by geologists as the Piedmont Province – one of the 13 physiographic provinces of the Appalachian Highlands, which extends through the eastern United States and Canada from Georgia to New Brunswick. The Piedmont Province is divided into two distinct sub-areas called the Upland and Lowland Sections. Located primarily in southern

Lancaster County, the Piedmont Upland Section consists of broad, rolling hills dissected by valleys. This part of the County supports agricultural uses interspersed with forested cover along the valley slopes. In the central portion of Lancaster County, the Piedmont Lowland Section (also called the Lancaster Plain) consists of broad valleys separated by low ridges. In this area the underlying limestone has weathered into a gentle, rolling plain with rich soils that are ideal both for agriculture and for development. As a result, the Lancaster Plain supports the County's most extensive farming and its largest urban and suburban settlements.

The northernmost part of Lancaster County is characterized by rolling hills and valleys that developed on more erosion-resistant red sedimentary rock, with some of the hills reaching 1,000 feet or more in height. In geologic terms, this area of the County is referred to as the Gettysburg-Newark Lowland Section of the Piedmont Province. Because its steep topography and thin, erosion-prone soils are less suitable for agriculture and urban development, this area has much of the remaining forest lands in Lancaster County.

Figure 1 - Regional Context

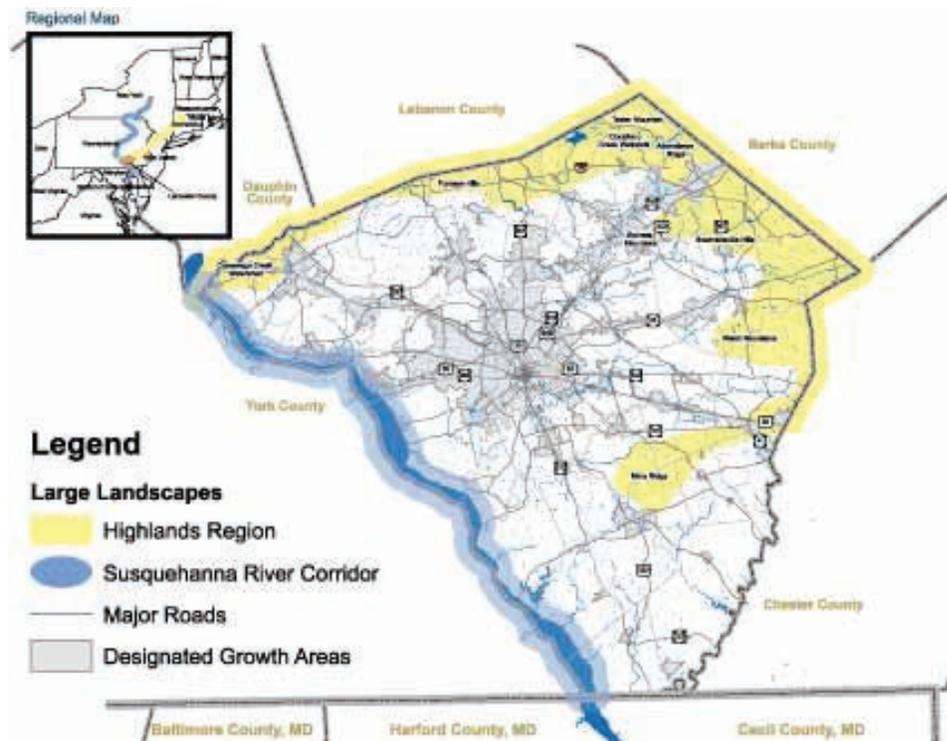
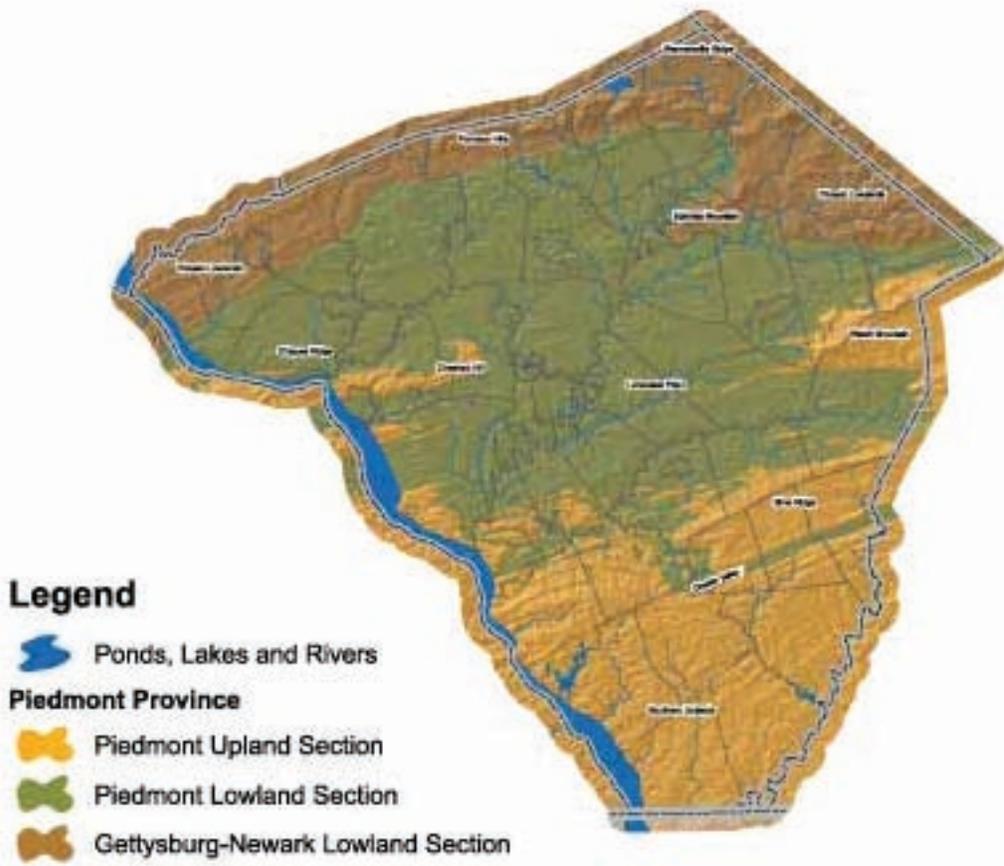


Figure 2 - Lancaster County Physiography



Lancaster County’s regional context includes two much larger, multi-state ecological landscapes: the Highlands Region and the Susquehanna River Corridor. The northern and northeastern edges of the County (the Gettysburg-Newark Lowland Section and Welsh Mountain within the Piedmont Upland Section) are part of the Highlands Region, which consists of forested mountains and hills extending from northwestern Connecticut through New York, New Jersey, and Pennsylvania to the Maryland state line. The ecological importance of the Highlands Region was recognized by the federal Highlands Conservation Act of 2004. The Susquehanna River Corridor, which forms the western border of Lancaster County with York County, is a segment of the east coast’s longest river. The Susquehanna River flows from New York through Pennsylvania and Maryland to the Chesapeake Bay, one of the world’s great estuaries. In Pennsylvania, the Highlands and the Susquehanna have been designated by the Department of Conservation and Natural Resources as two of only five “Mega-Greenways” within the Commonwealth.

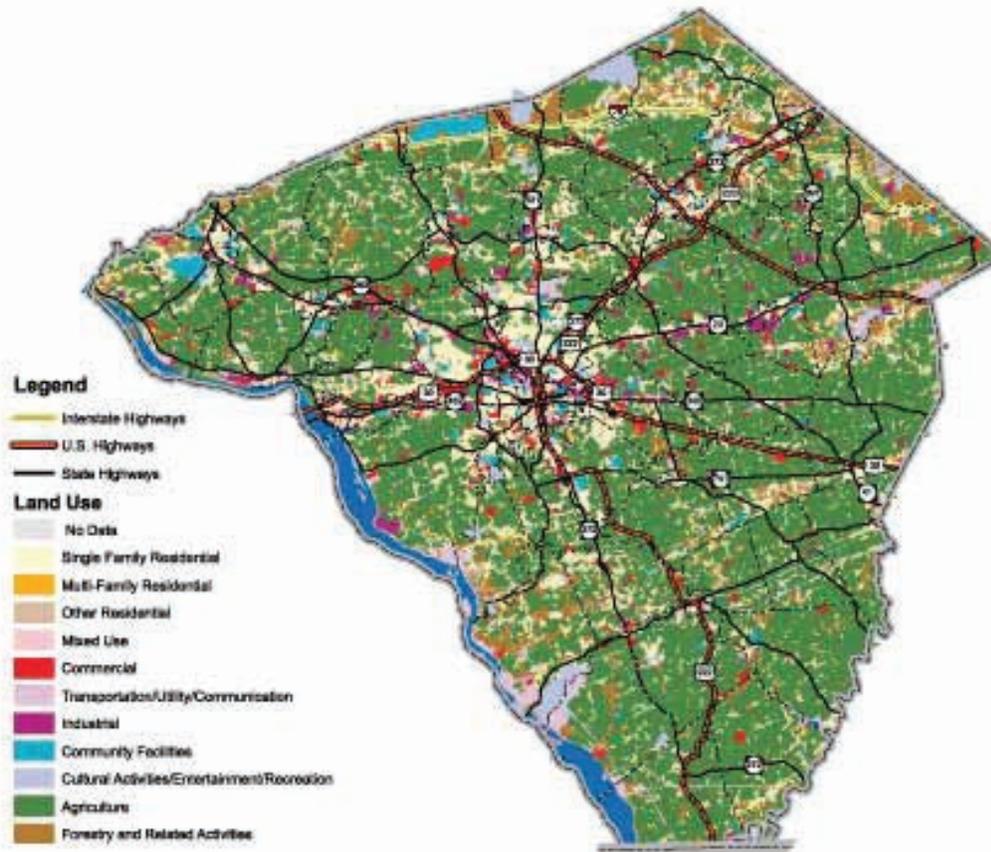
2.1.2 Land Use and Demographic Context

Existing Land Use

The predominant land use in Lancaster County is agriculture. Approximately 54% of land in the County is in some form of agricultural use (Figure 3). While agricultural land itself is generally considered a green infrastructure resource, it can have a negative impact on other natural resources—particularly water quality. Other “developed” land uses – residential, commercial, industrial, and the like – comprise a significant proportion (18%) of the County’s land area. These uses are concentrated in the central Lancaster region extending outward along major road corridors, including US 30, US 222, and PA 283. They too add to the pressure on the ecology and the natural resource systems in the County.

Only 17% of Lancaster County’s landscape is forested. These natural lands are highly fragmented by the other land uses mentioned previously. The largest concentrations of natural

Figure 3 - Existing Land Use



land cover are located in areas with steep slopes or shallow soils such as the Furnace Hills, Welsh Mountains, and the Susquehanna River Gorge. These areas remain in their natural state primarily due to their poor suitability for agriculture or land development purposes. Natural vegetation is also found along river and stream corridors, particularly in southern Lancaster County, where stream valleys are steeper and less suitable for agricultural uses.

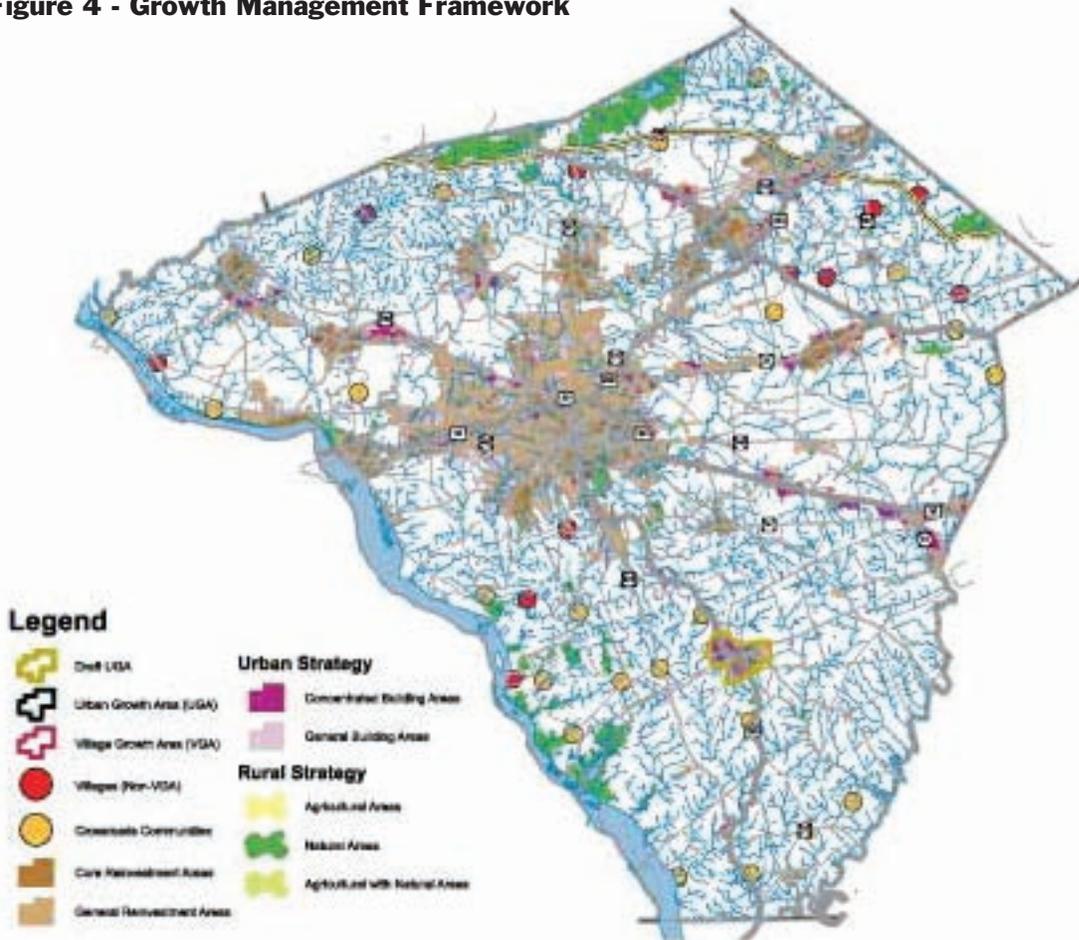
Demographics

Lancaster County has been one of the fastest growing counties in Pennsylvania during the last several decades. From 1980 to 2000 the County's population grew from 362,346 to 470,658, an increase of 30%. The U.S. Census estimate for 2006 was 494,486, an additional 5% increase. The Planning Commission projects that the county's population will increase to approximately 585,500 citizens by 2030--18% greater than the 2006 population estimate. This population growth is indicative of the County's strong economy, low unemployment, prime geographic

location, attractive urban and rural landscapes, and the high quality of life enjoyed by residents.

Lancaster County growth management strategy--most recently defined in the 2006 Growth Management Update (see Section 1.3)--is designed to accommodate development in a manner that preserves the characteristics that define the County's unique "sense of place" which distinguishes it from other communities. This program targets most new growth to occur in designated Urban Growth Areas around the County's 18 boroughs and the City of Lancaster. A lesser amount of development is to be directed to designated Village Growth Areas and other rural centers as an alternative to rural sprawl. Development within designated Growth Areas is to occur in more compact forms with mixed uses and the physical characteristics and functions of a traditional town or neighborhood. Land outside of designated Growth Areas is to retain its rural character and identity through the use of tools and techniques to preserve agriculture, natural resources, and cultural heritage. The Growth Management

Figure 4 - Growth Management Framework



Framework Map (Figure 4) provides a spatial representation of the Urban Growth Area and Rural Strategies as a guide for more detailed planning and implementation at the multi-municipal and municipal levels. The framework recognizes the importance of green infrastructure in the overall land use pattern of Lancaster County by designating much of the County’s land area as Natural Areas (scenic, recreational, and natural resource areas) or Agricultural with Natural Areas (agriculture mixed with a significant proportion of environmentally sensitive resources).

2.2 Green Infrastructure Resources

The definition of green infrastructure as the “nation’s natural life support system”¹ covers a wide range of natural resources, including Lancaster County’s underlying bedrock, soils,

¹ Greeninfrastructure.net, sponsored by the Conservation Fund and USDA Forest Service (see Section 1.1 for a complete definition).

and slopes; groundwater, surface waters, and the air we breathe; and vegetation and wildlife. These resources have been analyzed and mapped where appropriate to provide a basis for defining the framework of a green infrastructure system for Lancaster County. The results of this analysis are summarized in the following sections:

- **Section 2.2.1** addresses the locations of selected resources related to the County’s physiography, including steep slopes, highly erodible soils, and unique geological formations.
- **Section 2.2.2** addresses surface water hydrology, surface water quality based on an analysis of riparian (river and streamside) buffers, and air quality.
- **Section 2.2.3** addresses Lancaster County’s biodiversity – its natural plant and animal communities. Topics addressed include vegetated cover types; Natural Heritage Areas (habitat for plant and animal species of concern); areas designated as Important Bird Areas (IBAs) and Important Mammal Areas

(IMAs); the quality (biological integrity) of forests and other natural communities; and “Natural Gems” designated by the Lancaster County Conservancy.

- **Section 2.2.4** discusses several types of resources that could potentially become part of Lancaster County’s green infrastructure system if restored through actions such as reforestation.
- **Section 2.2.5** provides an overview of major threats to Lancaster County’s green infrastructure resources.

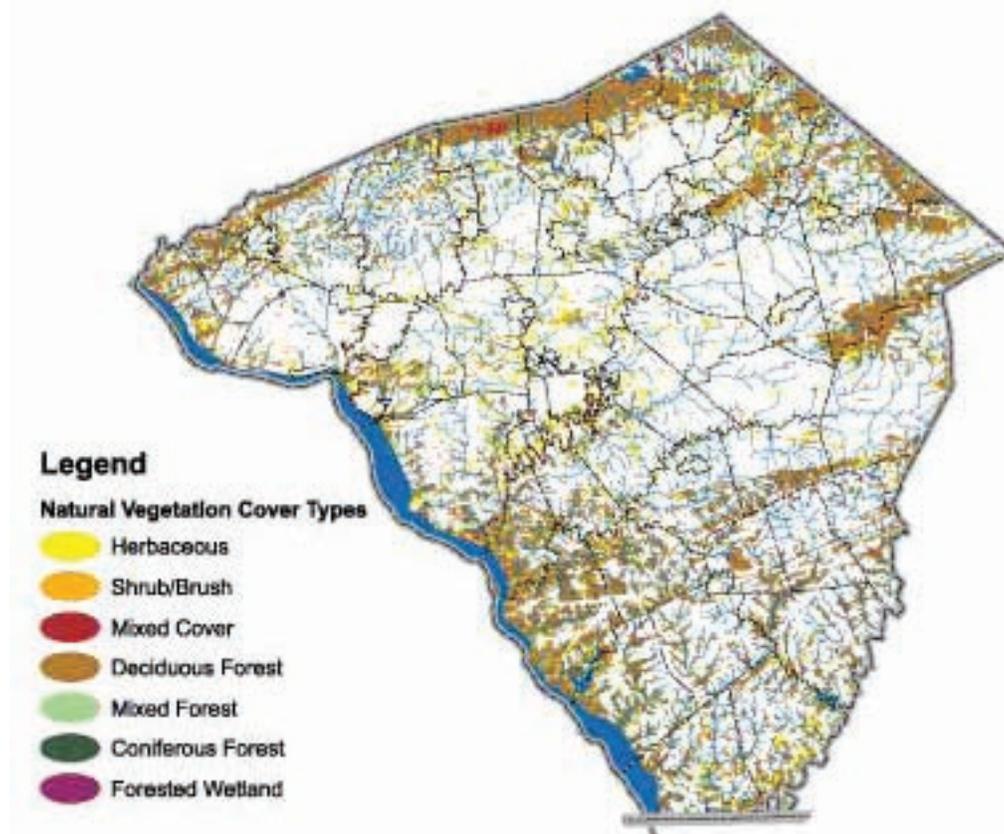
Portions of this analysis are derived from the work conducted by the Pennsylvania Natural Heritage Program in completing the 2008 Update to the Natural Heritage Inventory of Lancaster County.

2.2.1 Landform

Natural Vegetation

Natural vegetation consists of plant communities defined broadly as assemblages of plant populations that share a common environment; interact with each other, with animal populations, and with the physical environment; and are not actively managed by humans. The extent of natural vegetation in Lancaster County has been greatly reduced by agriculture, urban development, gray infrastructure, and other human activities. Figure 5 shows the County’s remaining natural vegetation classified according to structural cover type. This information was derived from GIS land coverage data based on satellite photography provided by the Lancaster County Planning Commission. The County’s different cover types include herbaceous (typically abandoned agricultural fields that are being colonized by natural vegetation, but also including some high quality natural communities); shrub/brush; mixed cover (a mixture of grasses, shrubs, and or

Figure 5 - Natural Vegetation



The Value of Early Successional Habitat

“Early successional habitat” refers to land in an early stage of recovery from natural or man-made disturbance. It is typically dominated by a dense, shrubby groundcover and fast-growing saplings of shade-intolerant tree species. Given time, the process of natural succession will turn these areas into mature forests. Early successional habitat includes the shrub/brush and mixed cover types shown on Figure 5.

This natural cover type provides critical habitat for a variety of species. A study by the University of Missouri on the breeding habitat of song birds found that while most nesting requirements are met in mature forests, early successional cover may provide a greater abundance of food and shelter and that some forest birds actually breed in this habitat. While early successional and shrub-dominated habitats were widely distributed throughout the United States prior to European colonization, they are increasingly rare today due to development, abandonment of agricultural lands, and natural succession. To maximize value for a diversity of wildlife, land management plans should create and maintain early successional habitats along with large, unbroken forest tracts.

trees), and several types of forests. Forest types include deciduous forest (primarily hardwoods such as oaks, maples, and ash), coniferous forest (dominated by softwoods such as pines and hemlocks), and mixed forest (a mix of deciduous and coniferous species such as maples, oaks, white pines, and ash).

No two locally occurring examples of the general cover types shown on Figure 5 are identical in their species composition or their physical environment and thus more detailed fieldwork is necessary to characterize specific community types. Nevertheless, Figure 5 provides a general representation of the distribution of the County’s natural vegetation. Forests are by far the most common cover type and represent Lancaster County’s predominant vegetated cover prior to European settlement and widespread clearing for agriculture and other purposes. Forest cover is most prevalent in areas with hilly and steep topography around the periphery of the County and along stream corridors in the southern part of the County. Additional information on forest size and quality is provided below in the sections entitled “Forest Blocks” and “Interior Forests.”

Steep Slopes and Highly Erodible Soils

Steep slopes and soils that are prone to erosion are sensitive environmental resources that should be considered for inclusion in the green infrastructure system. Construction in these areas disturbs fragile land and can exacerbate soil erosion on hillsides and increase soil sediment deposited in streams and waterways. Aquatic species that

depend on high quality water conditions are particularly sensitive to sedimentation. Protecting steep slopes and highly erodible soils prevents flooding and other problems due to slope instability. Steep slopes also provide aesthetically pleasing open spaces and habitat for native plant and animal species.

Slope is measured by percentage calculated as the ratio of the vertical rise in elevation to the horizontal distance of the slope. Slopes above 15% are generally considered steep and require precautionary measures when natural cover is removed for other land uses. Slopes above 25% are generally considered severe and unsuitable for both agriculture and land development.

The central portion of Lancaster County is dominated by the rolling hills of the Lancaster Plain with slopes that typically do not exceed 15% and rarely exceed 25%. By contrast, the Southern Uplands region is a landscape of more extreme slopes; here, 15% and 25% are not uncommon. Steep slopes are also common in the northern and northeastern edges of the County, including Furnace Hills, Bowmansville Hills, and Welsh Mountain.

Figure 6 illustrates areas within Lancaster County that have slopes between 15% and 25% and above 25%. Also shown on Figure 6 are highly erodible soils based on the USDA Natural Resources Conservation Service’s (NRCS) soil classification system. Class VI soils are defined as having severe limitations that make them generally unsuitable for cultivation. Class VII soils

Figure 6 - Steep Slopes and Highly Erodible Soils

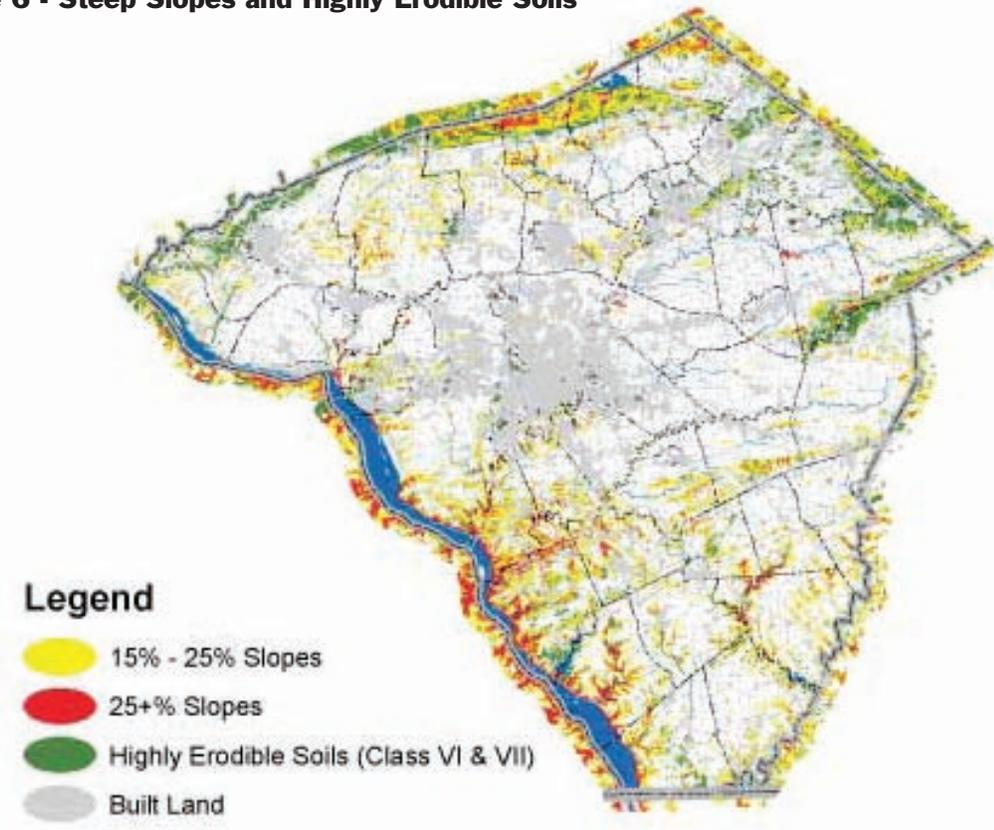
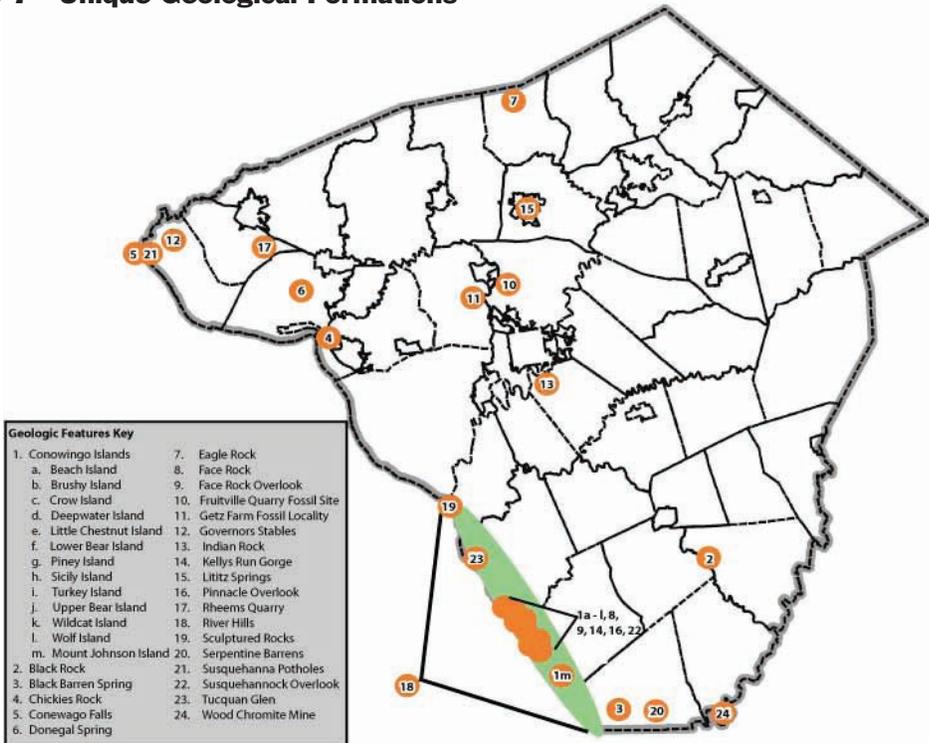


Figure 7 - Unique Geological Formations



Existing Conditions

are defined as having very severe limitations that make them unsuitable for cultivation.

Unique Geological Formations

Unique geological formations are natural resources that have been identified as areas of geological significance in Pennsylvania. These resources are typically scenic and offer opportunities to learn about the natural history of the county and state. The 24 sites identified in Lancaster County are derived from Outstanding Scenic Geological Features of Pennsylvania, which was published by the Pennsylvania Geological Survey in two volumes.

As shown on Figure 7, the majority of these features are located on the western side of Lancaster County. A significant number of sites are clustered in the lower Susquehanna River gorge. Many of the unique geological formations are related to the bedrock outcroppings – referred to as the Conowingo Islands – in the river.

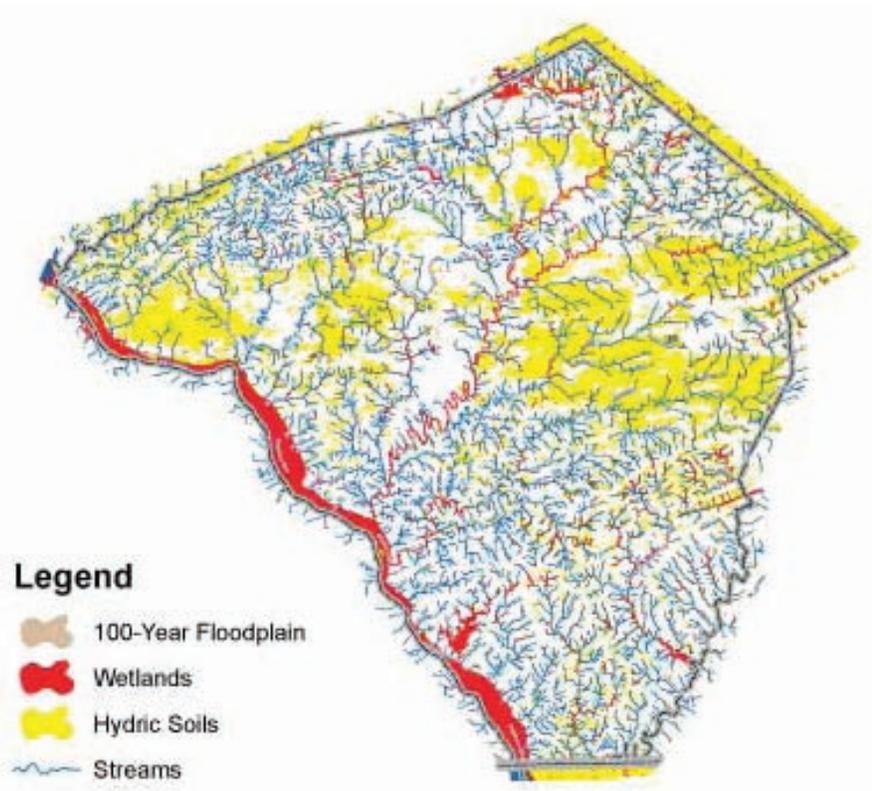
2.2.2 Water and Air

Hydrology

Figure 8 depicts hydrological (water) resources in Lancaster County, including the network of rivers, streams, and water bodies; wetlands and 100-year floodplain areas associated with these surface waters; and hydric soils (soils characterized by wet conditions). These resources provide numerous benefits for the community, such as groundwater recharge, public water supply, habitat for plants and animals, wildlife migratory corridors, and opportunities for recreation and education. Rivers and streams with adjoining riparian vegetation can function as key connectors in a countywide green infrastructure system. However, much of the native vegetation along the County's rivers and streams has been removed for agriculture and urban development, resulting in serious water quality impacts (see discussion of Surface Water Quality below).

As shown on Figure 9, Lancaster County is divided into 20 different watersheds, each of which drains to a separate river or stream system within

Figure 8 - Hydrology



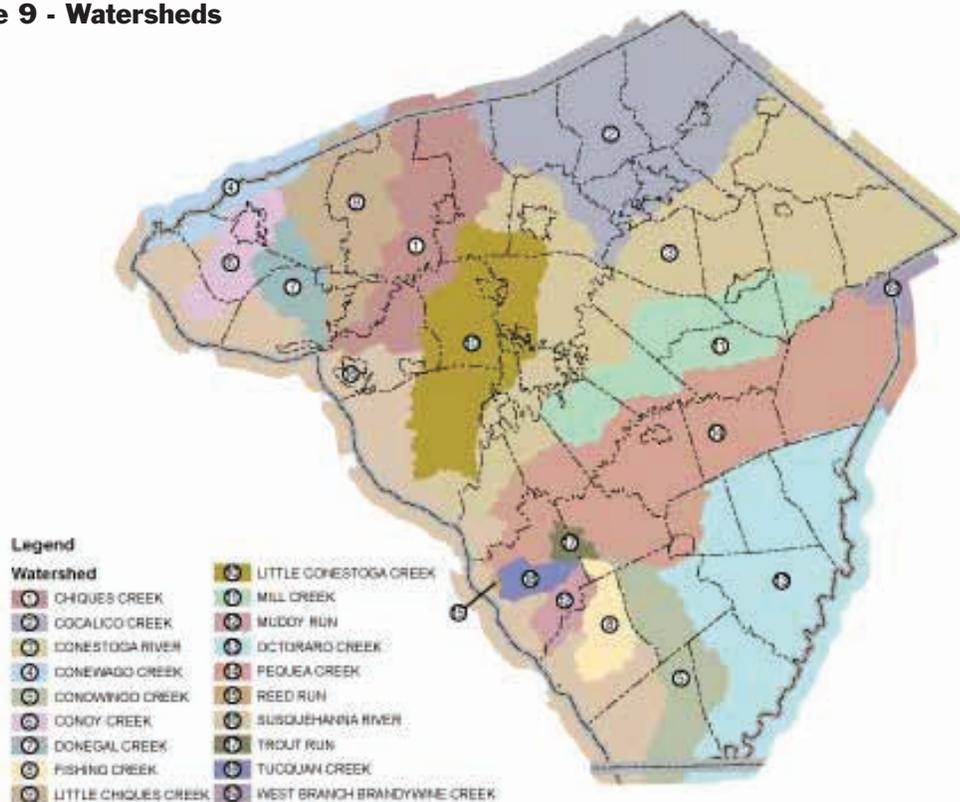
Conowingo Islands

The rocky islands scattered throughout Susquehanna River in southern Lancaster County are collectively known as the Conowingo Islands. Both geologically and ecologically important, as well as a scenic resource, they are one of the Susquehanna's most remarkable natural features.

The Conowingo Islands consist of more than 30 islands stretching 3.5 miles downstream of Holtwood Dam. They range in size from small rock outcroppings to 65-acre Upper Bear Island. The islands are rugged and feature high cliffs separated by narrow channels. Some islands have gigantic potholes, a few of which are 10 to 20 feet in diameter and equally as deep. Other islands have mature forests, ponds, and marshes. Wolf Island consists of eight enormous rocks, one of which rises 60 feet above the water.

Unlike the river's alluvial islands, which are formed from deposits of sediment, these islands consist of bedrock. They were carved by the Susquehanna's swift current as it cut into the hard schist bedrock on the river bottom. The islands contain an impressive array of native plants that have adapted to the river's fluctuating water level. Botanists have identified more than 540 different plant species. They are also home to otters, beavers, mink, deer, raccoon, and fish-eating birds such as the osprey and bald eagles.

Figure 9 - Watersheds



the County. Ultimately, nearly all of the County's surface waters drain to the Susquehanna River, the major tributary to the Chesapeake Bay.

Surface Water Quality

While some of Lancaster County's watercourses are characterized by excellent water quality, particularly in headwater areas with significant forested cover, the quality of other rivers and streams has been severely impacted by agriculture and urban development. Approximately 689 miles of the County's watercourses are on the list of impaired waters compiled by the Pennsylvania Department of Environmental Protection (DEP) as required by Section 303(d) of the Clean Water Act, and more may be added in the future.

Riparian buffers – the lands directly adjacent to streams, creeks, and rivers – have a direct influence on the quality of water and the habitat it supports. To help characterize the quality of the County's watercourses, each riparian buffer segment with the exception of the Susquehanna River was analyzed by the Pennsylvania Natural Heritage Program in conjunction with the 2008 Update to the *Natural Heritage Inventory*

of Lancaster County. Based on this analysis, the segments are ranked according to their potential cumulative effect on water quality. Variables used in this analysis include:

- Percent of riparian buffer in agriculture
- Percent of riparian buffer in urban uses
- Percent of riparian buffer undeveloped (forested area, wetlands, etc.)
- Percent of total upstream watershed in agriculture
- Percent of total upstream watershed in urban uses
- Percent of total upstream watershed undeveloped (forested area, wetlands, etc.)
- Number of upstream road crossings
- Number of upstream point sources of pollution

The Stream Scores were then sorted from best to lowest quality, resulting in four categories of potential water quality:

1. Best Potential Water Quality
2. Second-Best Potential Water Quality
3. Second-Lowest Potential Water Quality
4. Lowest Potential Water Quality

Pennsylvania Water Resources Plan

Lancasterians rely on clean and abundant sources of water for everyday functions such as drinking, cooking, and bathing; recreational activities like fishing, swimming and boating; and economic activities such as agriculture, energy production, and industrial and commercial uses. Clean water and reliable flows are also vital to the county's green infrastructure--especially its indigenous aquatic community.

To ensure that Pennsylvanians always have a safe and reliable supply of water for these activities, the state is currently updating its water plan. Guided by the enactment of PA Act 220, several key components of the new water plan include surface and groundwater inventories, assessments and projections of existing and future demand, identification of potential conflicts between projected uses and availability, and review and evaluation of existing statutes, regulations, policies, agreements and programs.

The new legislation calls for designating Critical Water Planning Areas (CWPA) or areas where demands on the resource exceed, or threaten to exceed, availability. Once identified, Critical Area Resource Action (CARA) plans will be developed for each CWPA. These plans will include assessments of water uses, availability and quality, conflicts among users, the identification of alternatives to assure supply as well as considerations of storm water and floodplain issues. The state water plan will also focus on strengthening water conservation planning activities including technical and financial incentives for awareness and promotion of water conservation applications, devices, and designs by builders, businesses and municipalities. The use of low impact stormwater design such as bioswales, green roofs, and porous paving treatments is also encouraged.

The categories are referred to as “potential” because they are based on GIS-derived data, which is subject to error. These categories should guide planning efforts and aid in the decision-making process, but should not be substituted for on-site stream assessments. In general, Categories 1 and 2 should receive the highest and second-highest priorities for preservation and conservation measures, while Categories 4 and 3 should receive the highest and second-highest priorities for restoration.

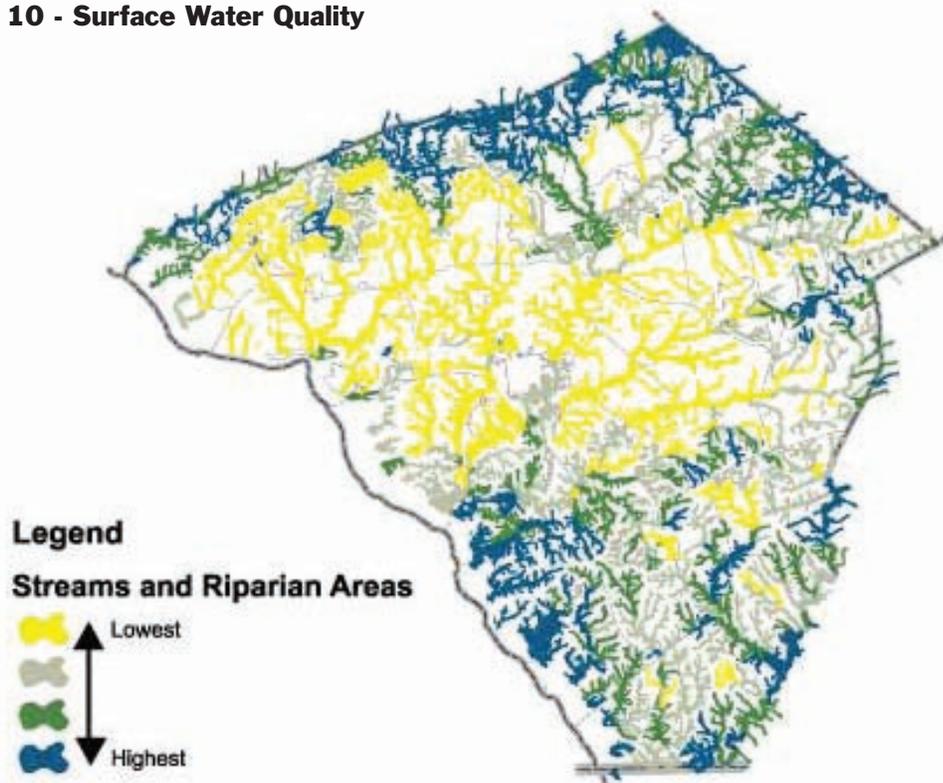
Figure 10 shows the distribution of rivers and streams in Lancaster County based on this categorization. Waterways with the best potential water quality are generally located in southern, northern, and northeastern parts of the County, where they tend to correspond with significant natural features such as Furnace Hills, Welsh Mountain, and the Susquehanna River Gorge. Waterways with the worst potential water quality are concentrated in central Lancaster County associated with agricultural and urban uses.

Agriculture, Water Quality, and the Chesapeake Bay

Agriculture is the dominant form of land use in Lancaster County by far. Approximately 5,225 farms use about two-thirds of the land in the County (approximately 342,000 acres) to produce over \$3.2 billion worth of agricultural products each year. The County is the most productive non-irrigated county in the United States. Lancaster County farmers generate three times the income per acre of the average Pennsylvania farmer.

The County’s agricultural production is intense. A 2006 report by the Lancaster County Conservation District, the “Lancaster County Conservation District County Implementation Plan,” states that the average farm in Lancaster County is less than 100 acres in size and only 10% of the farms are 500 acres or greater. The report further states that poultry and dairy sales will continue to increase while swine and cash crops decline. More animals mean more manure to dispose of and, because of rural sprawl; there is less and less land to apply this manure to. These excess nutri-

Figure 10 - Surface Water Quality



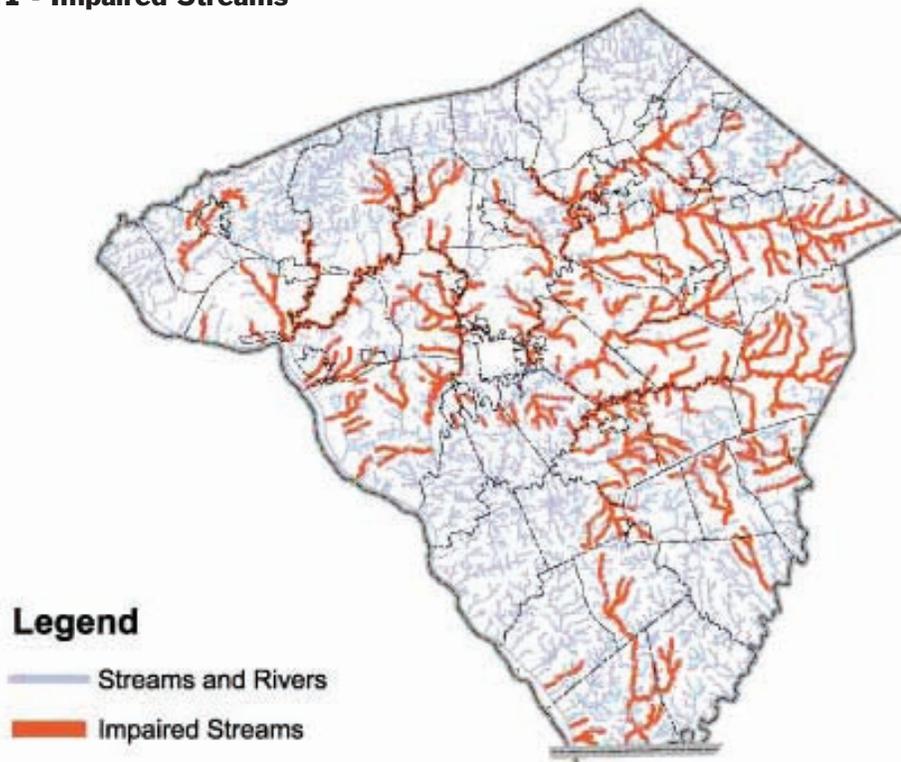
ents are one of the greatest single threats to the Chesapeake Bay that exists today (see text box on page 46).

Agriculture has negatively impacted the quality of the County's surface and ground water. Pennsylvania DEP data indicates that approximately 689 miles of the 1,365 miles of streams in Lancaster County are considered "Impaired" (Figure 11). Agricultural sources (sediment and nutrients) have been identified as a source of impairment for over 650 (or 95%) of the impaired streams in the County. The vast majority of agriculturally impacted stream segments are in the Conestoga watershed. In addition, testing for municipal (Act 537) sewage disposal plans indicates that the groundwater in most of county's agricultural communities has high levels of nitrates. Add to this the problem of "legacy sediments" (see text box on next page), as well as the fact that 98% of surface water draining from the County flows to the Chesapeake, and it is easy to see why Lancaster County is the target of conservation efforts to improve the health of the Bay.

While agriculture is the primary culprit, the built environment of the County also is a significant contributor to surface water pollution. Virtually every resident and business in Lancaster County produces nutrients that can eventually reach the Bay. The vast majority of nutrients reach the Bay through point sources such as wastewater treatment plants, storm drains, and industrial facilities. Although many of these point sources release treated water, this water often still contains large amounts of nutrients that are discharged into local streams and rivers, eventually reaching the Bay.

Urban and suburban development adds nutrients to local waterways though chemical laden runoff from fertilized lawns, roads and streets, and parking lots. Rural development adds nitrates to the groundwater through septic systems. Air pollution from vehicles, industries, gas-powered lawn tools and other emitting sources also contribute nutrients to the Bay and its tributaries. Nitrogen released into the air eventually falls back down onto the land or water.

Figure 11 - Impaired Streams



With Lancaster County's steady population growth and strong economy, focusing solely on agriculture alone will not resolve the excess nutrient problem confronting the Chesapeake Bay.

Air Quality

Air is an essential natural resource necessary to sustain life that is often taken for granted. Lancaster County's air quality is impacted by harmful emissions from mobile sources (on-road and

off-road vehicles) point sources (power plants, waste incinerators, manufacturing facilities, etc.) and area sources (dry cleaners, gas stations, auto body shops, etc.). The 1990 Clean Air Act Amendments required the U.S. Environmental Protection Agency (EPA) to establish national air quality standards for six pollutants: carbon monoxide, lead, nitrogen dioxide, ground-level ozone, particulate matter, and sulfur dioxide. Lancaster County's air quality exceeds the standards for

Legacy Sediments

Much of the effort to restore the health of the Chesapeake Bay has centered on reducing sediments and nutrients entering the Bay from its largest tributaries. Because the Susquehanna River provides over 50% of the fresh water to the Bay, its watershed, and the quality of water emanating from it, has been the focus of attention since clean up efforts were initiated in the mid-1970s. Lancaster County's agricultural landscape has been identified as a major contributor to the high nutrient and sediment loads of the Susquehanna River and has become a focal point in the debate about efforts to save the Chesapeake Bay. However, agriculture is not solely to blame for the Bay's water quality problems. Recent groundbreaking work by two professors at Franklin & Marshall College, Dorothy Merritts and Robert Walter, suggests that many of the problems experienced in the waterways of the County's agricultural landscape can be traced back to the way agricultural products were processed prior to the 20th century. This work was featured on the cover of the January 2008 issue of Science Magazine.

Before the advent of modern manufacturing and transportation, agricultural products and other goods were transported by horse and wagon to local mills for processing. Poor roads and transport vehicles made it necessary for mills to be located close to agricultural producers. Approximately 400 mills were built to process goods produced in rural areas; it has been estimated that Lancaster County streams averaged a dam every two miles. Because mills used water to power machinery, they had to be located next to a stream or river. Each mill had a dam with a large impoundment or "pond" behind it, from which water was drawn to power the equipment. Stream or river sediments settled out when the water slowed down upon reaching the dam. Unfortunately, poor farming practices and widespread clear cutting of forests caused tremendous amounts of sediment to wash down local waterways into mill ponds.

While most of the County's mills and their associated dams and ponds have disappeared from the landscape, the sediment deposited centuries ago behind these dams still remain. In some areas, the accumulated materials, often referred to as "Legacy Sediments", are 20 feet deep over the stream's original floodplain. According to Dorothy Merritts and Bob Walter of F&M, as the mill structures disappeared from the County's landscape, the water that once flowed over the dams began cutting narrow channels down through the sediment accumulated on top of the original floodplain. Initially, the amount of sediment eroded was relatively small and the banks remained intact as the stream dug deeper. But when the stream cuts through the sediments into the coarse gravel of the original floodplain, the gravel quickly erodes, undercutting the steep bank above and sending tons of nutrient-laden sediment into the stream and on to the Chesapeake Bay.

Studies are now underway to identify the tallest stream banks that are actively eroding and target them for floodplain restoration actions. However, experts warn that efforts to restore the health of the Chesapeake Bay will only succeed if actions to manage soil erosion and excess nutrients generated by farms are taken simultaneously with legacy sediment restoration efforts.

Cool Cities

The Cool Cities movement was launched by Mayor Greg Nickles of Seattle on February 16, 2005, the same day the Kyoto Protocol became law for the 141 countries that had ratified it. Mayor Nickles's US Mayors' Climate Protection Agreement, the heart of the Cool Cities movement, asks mayors from across the country to ensure that their cities meet or exceed the standards set forth by the Kyoto Protocol. Each city is left to determine the best strategy for their citizens; examples include hybrid fleet vehicles, the use of "green energy" in power grids, green (LEED-certified) buildings, and simpler steps such as energy efficient lighting.

Mayor Rick Gray signed the US Mayors' Climate Protection Agreement on November 13, 2007, adding Lancaster City to the list of over 800 cities that have pledged to reduce their own contribution of global warming pollutants. Currently the City is working to equip traffic lights with energy efficient LED bulbs and is conducting an energy audit of all municipal buildings in an effort to reduce energy costs and increase efficiency.

five of these pollutants (carbon monoxide, lead, nitrogen dioxide, ozone, and sulfur dioxide) and is worse than the standard for small particulate matter (PM_{2.5}). In the past Lancaster County was not able to meet the standard for ozone. However, that situation improved in recent years due in part to emissions testing of vehicles registered in the County. In July of 2007, the EPA approved a re-designation of Lancaster County from a marginal nonattainment area to an attainment area for ozone as a result of our improving air quality. However, in 2008 EPA announced tougher ground-level ozone limits nationwide that will put the County's air back into nonattainment.

In addition, the American Lung Association report, State of the Air: 2008 (covering data from 2004 through 2006) ranks Lancaster County as being the eighth worst of 31 Pennsylvania counties for which ground-level ozone data were collected, and 115th worst out of 680 counties across the U.S. For daily fine particle pollution levels, Lancaster County ranked 10th worst of 21 Pennsylvania counties and 65th worst of 591 counties nationwide. Most startling, for annual average fine particle pollution levels, Lancaster County tied with Beaver and York Counties for 2nd worst of 18 Pennsylvania counties (behind only Allegheny County), and tied with Beaver and York for 20th worst of 518 counties in the country for this measure of this pollutant.

Global warming – the measurable increase in average air temperatures near the earth's surface since the beginning of the 20th century, a trend that is projected to continue in the future – is another air quality issue of concern. As summarized in the 2007 Report by the Intergovernmental Panel on Climate Change (IPCC), there is widespread consensus among scientists that most of the observed temperature increases are the result of elevated concentrations of so-called greenhouse gases (carbon dioxide, methane, and nitrous oxide) as a result of human activities.

Green infrastructure resources are impacted by air pollutants and can also contribute to improving air quality. The adverse effects of acid rain – caused by sulfur dioxide and other air pollutants from sources such as power plants and industry – on surface waters and forests have been well documented. The smog created by ozone can damage forests and crops. Conversely, trees and other vegetation remove many pollutants from the atmosphere, including nitrogen dioxide, sulfur dioxide, ozone, carbon monoxide, and particulate matter of ten microns or less, by absorbing them through leaf and plant surfaces. As an example, the Urban Ecosystem Analysis conducted by the USDA Forest Service found that trees in a 775,000-acre study area within metropolitan Atlanta removed approximately 19 million pounds of air pollutants annually, equivalent to \$47 million in value.² Trees and

² The dollar value of the tons of pollutants removed was calculated based on "externality" costs or costs to society that are not reflected in marketplace activity.

Agriculture and Global Warming

Agriculture can both reduce and increase global warming. According to the Summer 2007 issue of *American Farmland*, the newsletter of the American Farmland Trust, conservation practices on farms such as no-till cultivation, new tree plantings, rotational grass-based livestock grazing, and vegetative buffers along streams can capture and store carbon in the soil. Conversely, a report authored by Professor Pete Smith of the University of Aberdeen for Greenpeace describes ways “industrial” farming can contribute to global warming, primarily as a result of fertilizer overuse, land clearance, soil degradation, and intensive animal farming. Entitled *Cool Farming: Climate Impacts of Agriculture and Mitigation Potential*, the report identifies a variety of practical solutions that farmers can implement to reduce greenhouse gas emissions.

other vegetation also remove carbon dioxide from the atmosphere, thus helping to counteract global warming.

2.2.3 Biodiversity

Biodiversity refers to the variety of life in a habitat, region, or even globally. This natural variation includes everything from microscopic organisms through plant and animal species up to and including humans. Generally, biodiversity varies with latitude with the regions of greatest variation located around the equator and the number of species progressively diminishing as one approaches the poles. On a regional scale biodiversity depends on four factors: climate, altitude, soils, and species richness (the total number of native plant and animal species occurring in an area). Unfortunately, the fourth factor – species richness – has been greatly impacted by humans over time.

Historically, Pennsylvania was home to numerous species that can no longer be found in the Commonwealth. Gray wolves, eastern cougars, wolverines, bison, and moose were all once inhabitants of the Commonwealth that have long since disappeared due to habitat loss and over hunting. Today, habitat loss is the single greatest threat to Lancaster County’s biodiversity. One of the principal benefits of a healthy green infrastructure system is to maintain connectivity between habitat areas, thus helping to ensure that our natural heritage and its associated biodiversity persist for the benefit of future generations. Key objectives are to maintain and enhance total species richness as well as habitat for species of concern that are “endemic” to Lancaster County

(i.e., species whose natural occurrence and geographic distribution are restricted).

Natural Heritage Areas

Although Figure 12 indicates that the richness of Lancaster County’s biological diversity is a mere fragment of what it was prior to European settlement, pockets of high quality habitats harboring fragile plant and animal species still exist today. These areas are termed “Natural Heritage Areas” and are documented in the 2008 Update to the Natural Heritage Inventory of Lancaster County by the Pennsylvania Natural Heritage Program. Natural Heritage Areas are habitats that contain plant or animal species considered rare, threatened or endangered (referred to as “species of concern”) at the state or federal levels. Natural Heritage Areas can also be high quality natural communities, which are those considered to be uncommon or among the best of their type within the state.

Figure 13 shows Natural Heritage Areas in Lancaster County categorized as either “species of concern core habitat” or “supporting landscapes.” Designation on the map is simply a convenient method of labeling habitat areas of “species of concern” that occur singly or overlap with adjacent habitats. The designations are used primarily as a framework for discussion of the various natural features that occur within a particular area. The differences between the two designations are based on susceptibility to habitat disturbance, as follows:

- **Species of concern core habitat** are the actual and adjacent similar habitat of individual species of concern (plants and/or animals considered rare, threatened or endangered at state or federal levels),

Serpentine Barrens

Unknown to many residents, southern Lancaster County is home to a landscape found in few places on Earth. When European settlers first arrived, they described the scrubby land in the southern part of the County as “barren” because of its inability to support crops. Characterized by thin soils, stunted trees and prairie grasses, the barrens were a unique feature on the forested frontier.

The cause of this distinctive landscape lies a few inches below the shallow soil. Here the bedrock is Serpentinite, a green metamorphic rock formed millions of years ago that contains an abundance of heavy metals that are toxic to most species of plants. Certain plants, however, have adapted to this harsh living environment and thrive in the nutrient poor soils. Many of these plants grow nowhere else in the world.

The nutrient poor soils combined with periodic natural and human-induced fires have kept adjacent forest vegetation from colonizing the Serpentine Barrens, which today support rare and endangered species. Native flowering species such as round-leaved fame-flower, the prairie dropseed, and the serpentine aster can be found in the barrens. This unique ecology also provides habitat for numerous species of insects that are not normally found in Pennsylvania.

exemplary natural communities, or areas with exceptional native diversity. This level of mapping delineates essential habitat that cannot absorb significant levels of habitat-disturbing activity, such as land development, without substantial impact to the elements of concern.

- **Supporting landscapes** are the areas necessary to maintain vital ecological processes or secondary habitat that could be impacted by certain types of habitat-disturbing activities. There are significant overlaps of the Supporting Natural Landscapes, creating larger areas or corridors that could become part of the framework of a countywide green infrastructure system. Many of the Supporting Landscape areas coincide to the upstream watersheds of species of concern core habitat. Activities that occur within the upstream portions of the watershed can have a significant impact on the core habitat.

The 2008 Natural Heritage Inventory of Lancaster County should be consulted for individual Natural Heritage Area descriptions and specific management recommendations for each site.

Important Bird and Mammal Areas³

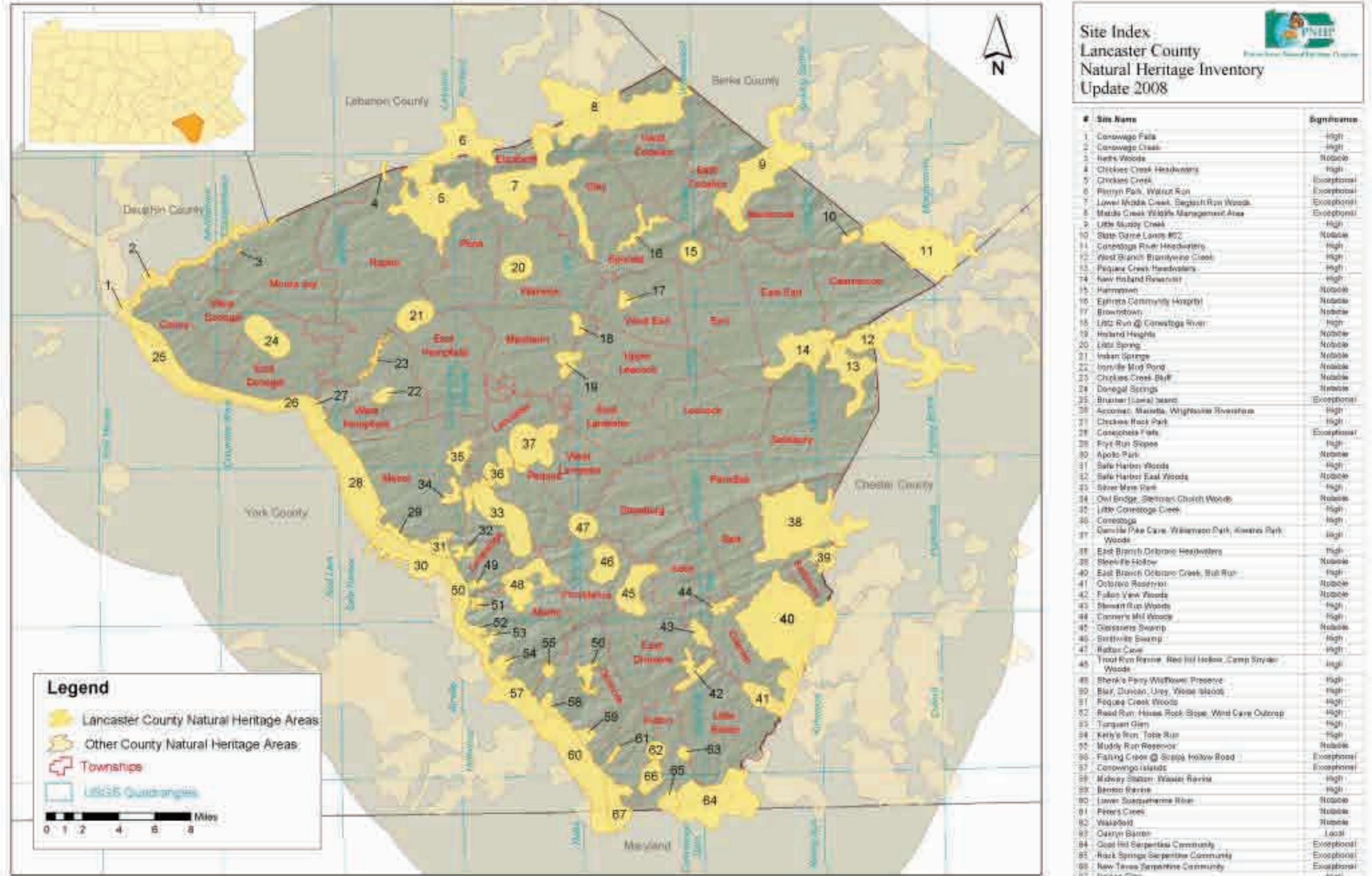
An Important Bird Area or IBA is a site that is part of a global network of places recognized for their outstanding value to bird conservation. IBAs are sites that provide essential habitat for one or more species of breeding, wintering, and/or migrating birds. Sites range in size from a few acres to thousands of acres, but typically are discrete areas with different ecological characteristics from the surrounding landscape. IBAs include both a Core Area and a Support Area.

The IBA program was started in Europe in the 1980s by BirdLife International a global coalition of partner organizations in over 100 countries. The National Audubon Society is the U.S. Partner Designate of BirdLife International and administers the IBA program in the United States.

Similar to the Important Bird Area program, the Important Mammal Area Project (IMAP) is a program administered by an alliance of sportsmen, conservation organizations, wildlife professionals, and scientists. The program is funded through the Wildlife Conservation and Restoration Account, a federal program administered in Pennsylvania by the PA Game Commission. The primary purpose of the IMAP program is to help ensure the future of Pennsylvania's wild

³ Note: The following information is adapted from the Audubon Pennsylvania IBA website (Audubon 2002). Additional information can be found at <http://pa.audubon.org/iba/>.

Figure 12 - Natural Heritage Areas Site Index



Existing Conditions

Figure 13 - Natural Heritage Areas

Existing Conditions

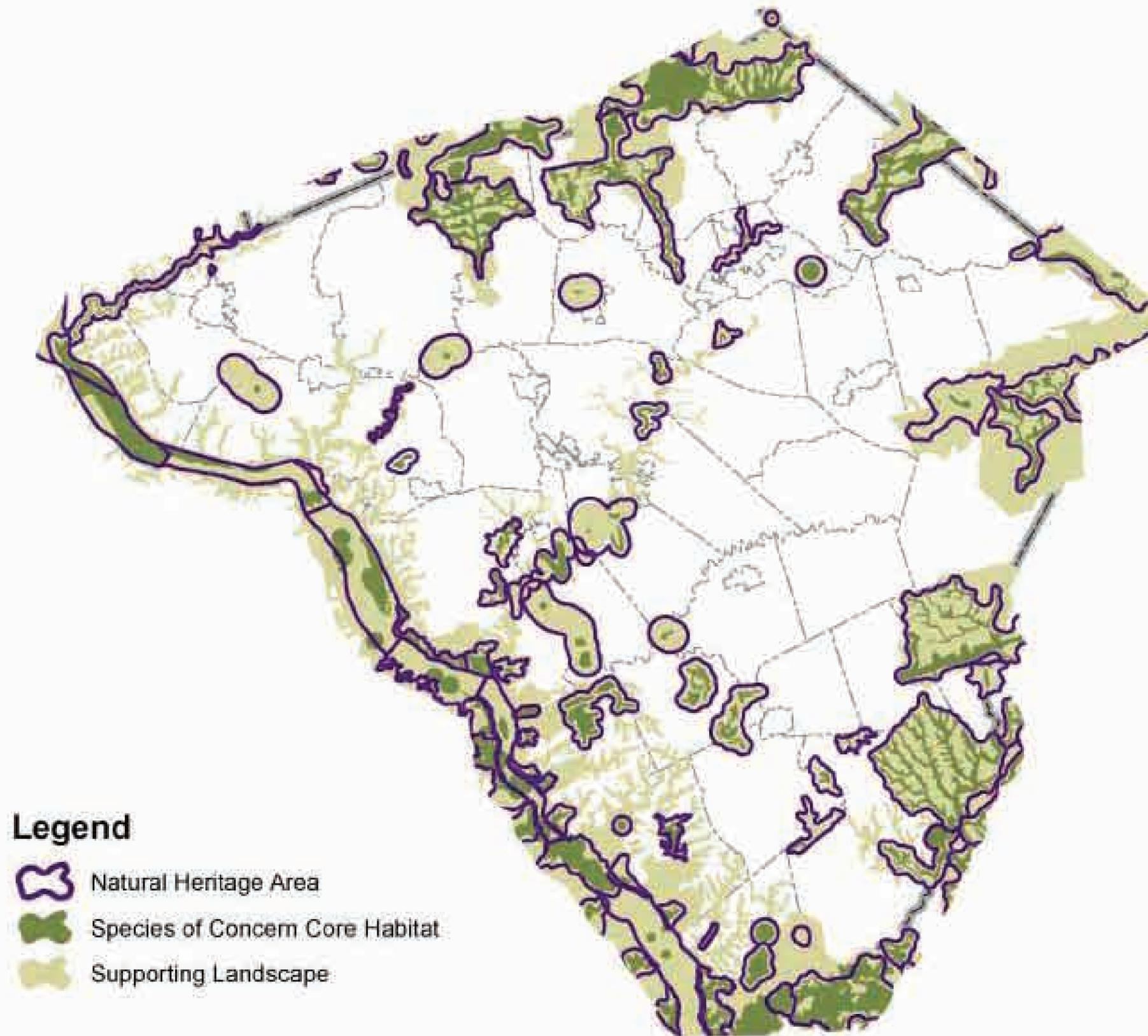
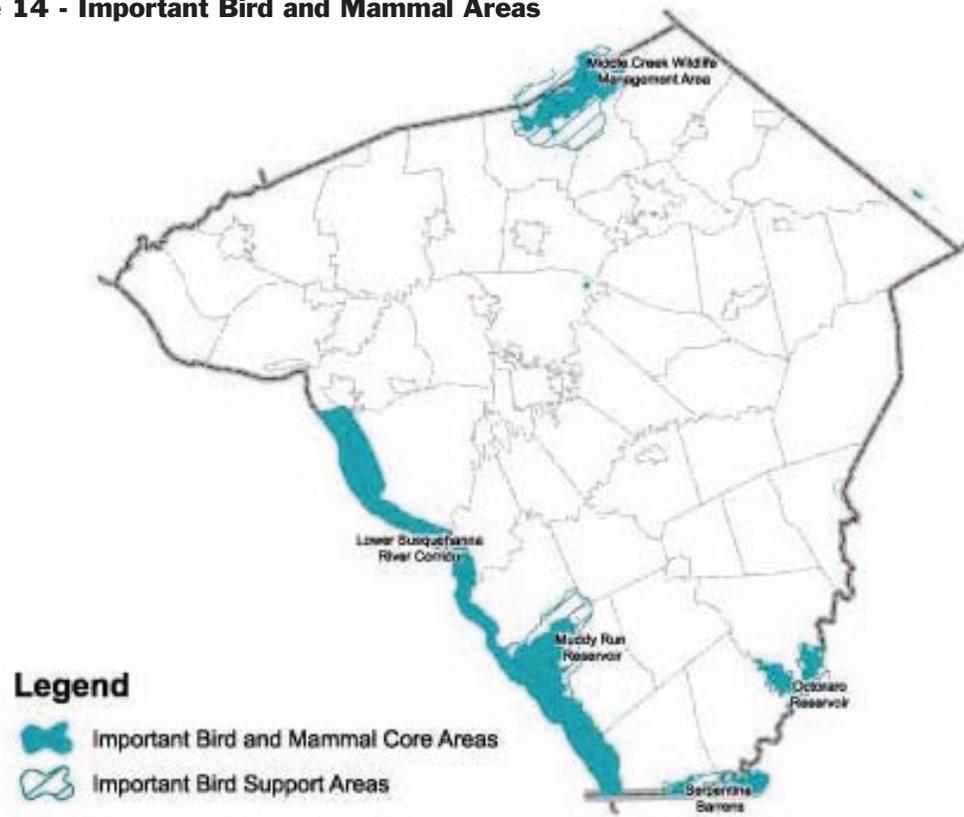


Figure 14 - Important Bird and Mammal Areas



mammals, including both game and non-game species. Although particular attention is given to species of special concern, the program also focuses on habitats that have high mammalian diversity.

Both IBAs and IMAs may include lands in public or private ownership, or both, and the lands may or may not be protected or permanently preserved. The IMA and IBA designation does not preclude or limit land owners from undertaking any activity on the property. It simply denotes the importance of the site and can influence the planning and decision-making process for habitat preservation efforts. Sites accessible to the general public, whether publicly or privately owned, provide excellent outdoor learning opportunities as well as attraction for eco-tourist interested in wildlife watching.

The locations of IMA and IBA sites in Lancaster County are shown on Figure 14. Many of the sites overlap; indicating that quality habitat for mammals is also good for birds (and vice versa). There are five primary concentrations of IMAs and IBAs in the County:

- The Susquehanna River Corridor from Columbia Borough south to the Maryland border
- Muddy Run Reservoir
- The Serpentine Barrens in the southern part of the County
- The Octoraro Reservoir
- The Middle Creek Wildlife Management Area in the northern part of the County

Forest Blocks

Most of Lancaster County’s original forest cover has been lost to other land uses such agriculture or development. The remaining forests are, for the most part, fragmented into relatively small patches that are scattered across the landscape. Often, these lands have remained forested because they are unsuitable for agriculture or other land uses.

In general terms, a large contiguous area or “block” of forest has a higher conservation value than several smaller, fragmented pieces. This is due, in part, to the larger blocks having a greater proportion of forest “interior” (see below). Some

Figure 15 - Forest Blocks Ranked by Size

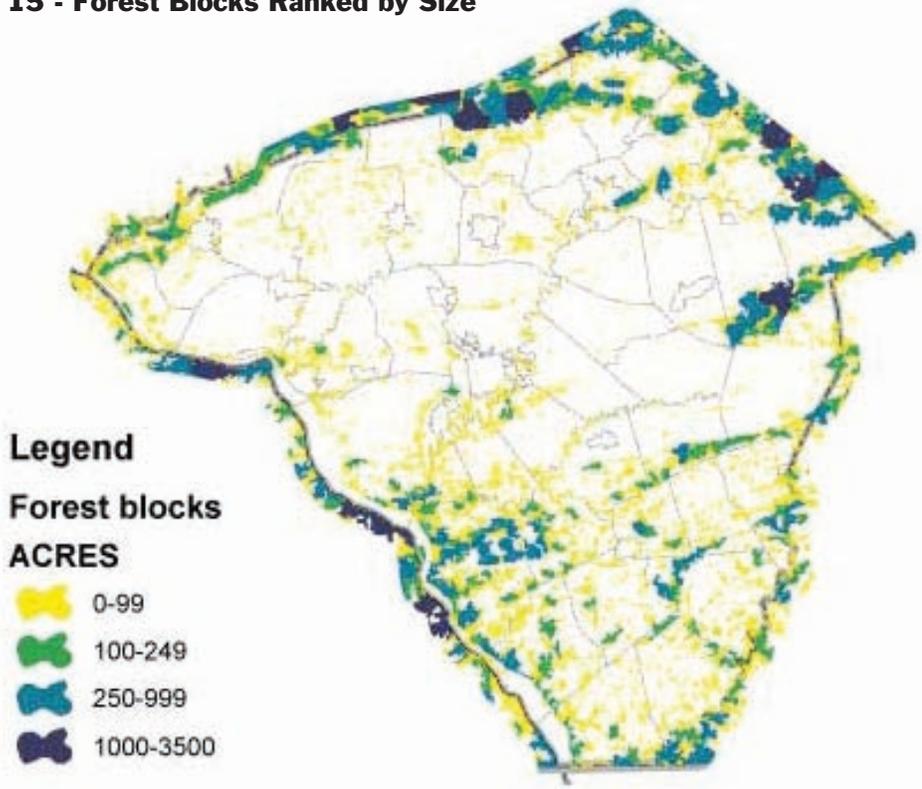
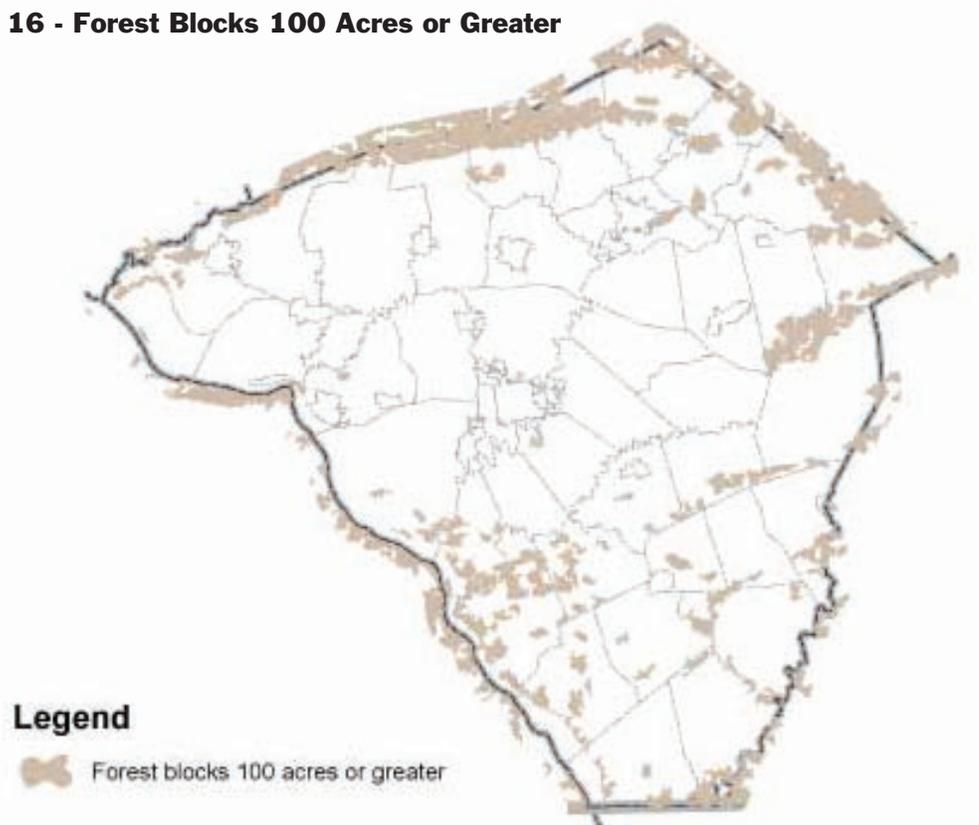


Figure 16 - Forest Blocks 100 Acres or Greater



species strongly prefer this type of habitat as opposed to areas closer to the forest edge. To inform efforts to conserve the County's natural biodiversity and to preserve the best quality habitat for native plant and animal species, the largest of these fragmented forest patches were identified in the planning process.

Forest blocks were initially identified using 2000 Penn State land cover data derived from satellite imagery. Aerial photographs were used to identify additional fragmenting features, such as roads, railroads, utility rights-of-way, and development, which were incorporated into the analysis. As shown on Figure 15, the resulting forest blocks were grouped into several size classes: less than 100 acres, 100 to 250 acres, 250 to 500 acres and greater than 500 acres. Figure 16 shows forest blocks that are greater than 100 acres in size. The analysis revealed that Lancaster County's largest forest blocks are found in the Furnace Hills, along the County's northern border with Lebanon County, in the Bowmansville Hills area in the northeast, and on Welsh Mountain.

Interior Forests

Interior forests provide important habitat that is preferred by certain native plant and animal species that require conditions that are absent in non-forest ecosystems. These habitats are relatively rare and easily disturbed. When the land adjacent to an intact forest is cleared, the area at the edge is exposed to sunlight and wind that penetrates the forest, dries out the interior, and changes the air temperature, light intensity, and soil moisture. These conditions are much different from the habitat conditions found in an undisturbed forest and affect the forest ecosystem for some distance in from the edge.

As shown on Figure 17, the natural occurrence of interior forests has been much reduced in Lancaster County. For the purpose of this analysis, interior forests were defined as forest areas (patches) located at least 100 meters in from the woodland edge or from any human-created opening such as a field, road, railway line, or utility right-of-way. Similar to the analysis of forest blocks, the largest interior forests in Lancaster

Figure 17 - Interior Forests

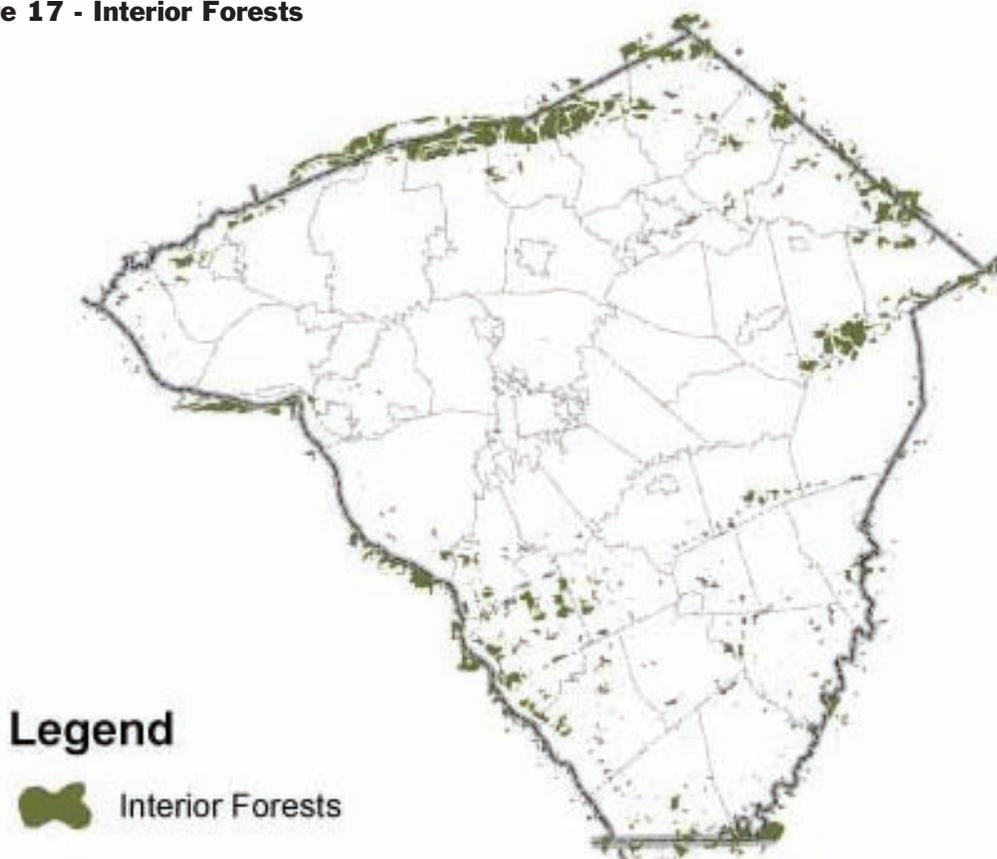
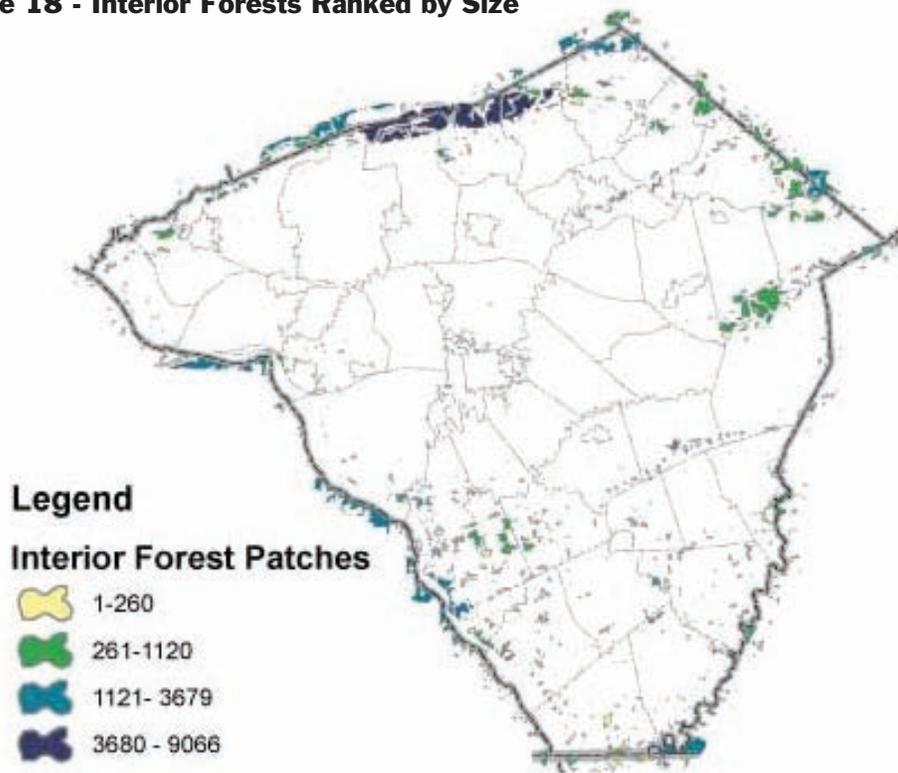


Figure 18 - Interior Forests Ranked by Size

County are concentrated in the Furnace Hills, Bowmansville Hills, Welsh Mountain, and a small area on Texter Mountain in the northern part of the County.

In addition to determining the distribution of interior forest throughout the County, interior forest patches were ranked according to size with larger patches considered more valuable than smaller patches (Figure 18). Forest patches smaller than five acres were dropped from the analysis, as they are likely too small to be suitable habitat for forest interior species.

In addition to size, the shape of a patch of interior forest also has impacts the quality of the habitat. A patch of interior forest that is long and narrow may have the same area as an interior forest patch that is more compact and circular in shape, but the latter will have a smaller perimeter to area ratio, thus providing more interior habitat that is buffered from edge effects.

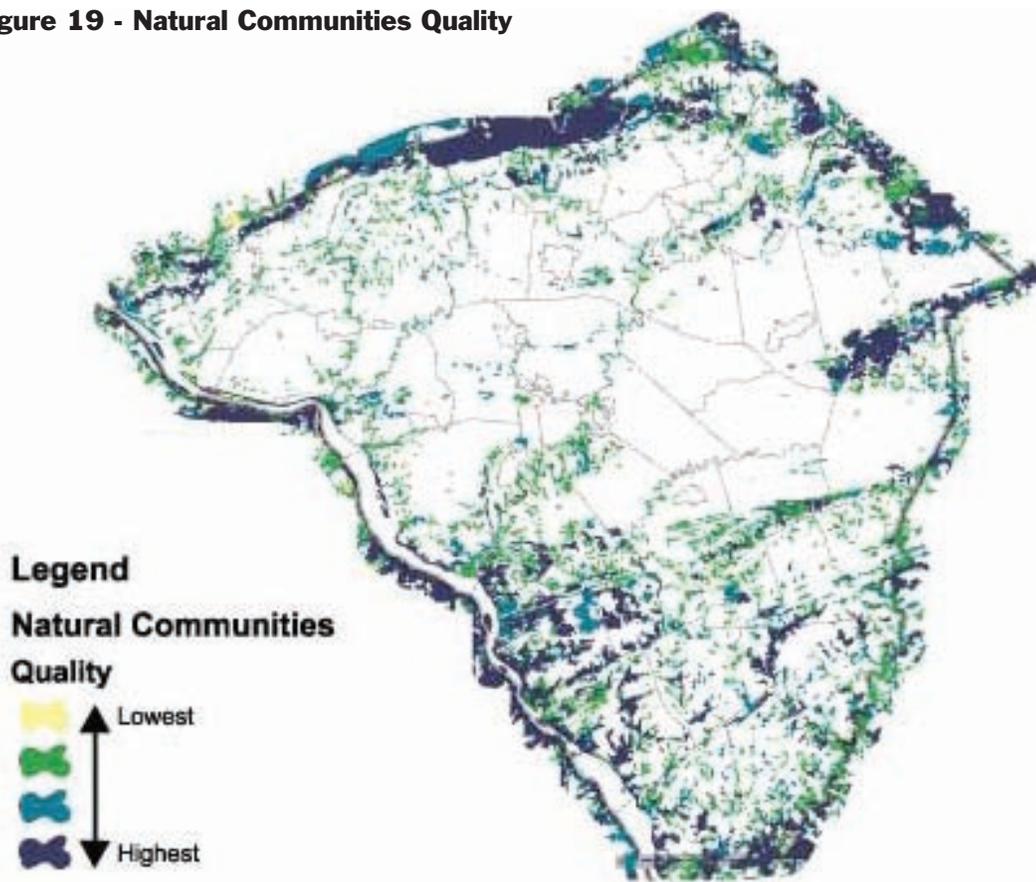
Natural Communities Quality Analysis

A natural community is an assemblage of different plant species that live together in a common area at a particular time and in a specific habitat,

and which interact with each other, with animal populations, and with the physical environment. The location and abundance of natural communities are determined by environmental factors such as climate, geology, land form, soils, and hydrology interacting with natural disturbance events, such as fires, droughts, and floods, to shape the landscape. Human activities have also had a profound impact on the county's natural communities. The highest quality natural communities are deemed most significant because of their undisturbed condition. Natural communities were delineated by the Pennsylvania Natural Heritage Program based on a review of 2005 aerial photographs, followed by targeted "ground-truthing." Terrestrial & Palustrine Plant Communities of Pennsylvania by Jean Fike, published by the Pennsylvania DCNR in 1999, was consulted in this analysis. All areas were ranked based on natural habitat quality. The results of this analysis are shown on Figure 19.

Habitats identified as a "natural community" were assigned the number value 3 (the highest rank). These were regarded as essentially naturally occurring communities with little evidence of invasion by introduced species. Those habitat types identified as a natural community with a negative

Figure 19 - Natural Communities Quality



The Importance of Native Plants

The relationship between plants and insects is an important part of the food chain that sustains the diversity of animal species in our area. Lancaster County's native plants evolved over millions of years in response to the local climate and soil conditions. Insects co-evolve with native plants and most have highly specific preferences for certain plant species as food. Research shows that native insect populations cannot be sustained by most non-native plants. Thus, the loss of native plants impacts the availability of certain beneficial insects that many birds and other animals rely on as a food source.

Many non-native plant species arrived here from other continents as ornamental garden plants that escaped and propagated in the wild. While many of these introduced species, such as the dandelion, are harmless, numerous others compete with our native species for resources and habitat. Since these non-native competitors often lack population checks such as predators, they can easily gain a foothold in disturbed habitats. Frequently, the native plants cannot compete with these introduced species, resulting in the degradation of healthy ecosystems.

There are numerous ways that individuals can help preserve our native plant communities. The first, and most important, is to refrain from disturbing or taking native plants from their natural habitat. If such a disruption is unavoidable, the replanting of native species is strongly encouraged. The principle of planting native species applies to home gardens as well; because many of the non-native plants currently in Pennsylvania originated in gardens, planting only native species eliminates this concern. Moreover, native plants provide food and habitat for native insects. Rare native plant species could be propagated for introduction into "backyard restoration" areas, thus increasing biodiversity throughout Lancaster County.

Existing Conditions

influence (e.g., some presence of invasive species) were given a rank of 2. At the low end of the scale, those habitats considered to be in an early stage of succession and recovering from recent past disturbances such as farming or timber harvesting were ranked 1. Modified successional forest, a habitat type common in Lancaster County, was also identified as low quality habitat. This type of forest typically has regenerated after a period of disturbance such as farming, pasture, grazing, or repeated logging. Such forests typically contain a high proportion of invasive and introduced plants and therefore are considered low-quality natural communities.

All of the species of concern core habitats are critically important for the long-term viability of the native plant and animal species they harbor. However, Figure 19 illustrates the relative importance of the individual core habitat areas by integrating the number, quality, and rarity of the species of concern in each area. Darker areas shown on the map represents concentrations of species of concern or “hotspots.” This analysis clearly portrays the State Line Serpentine

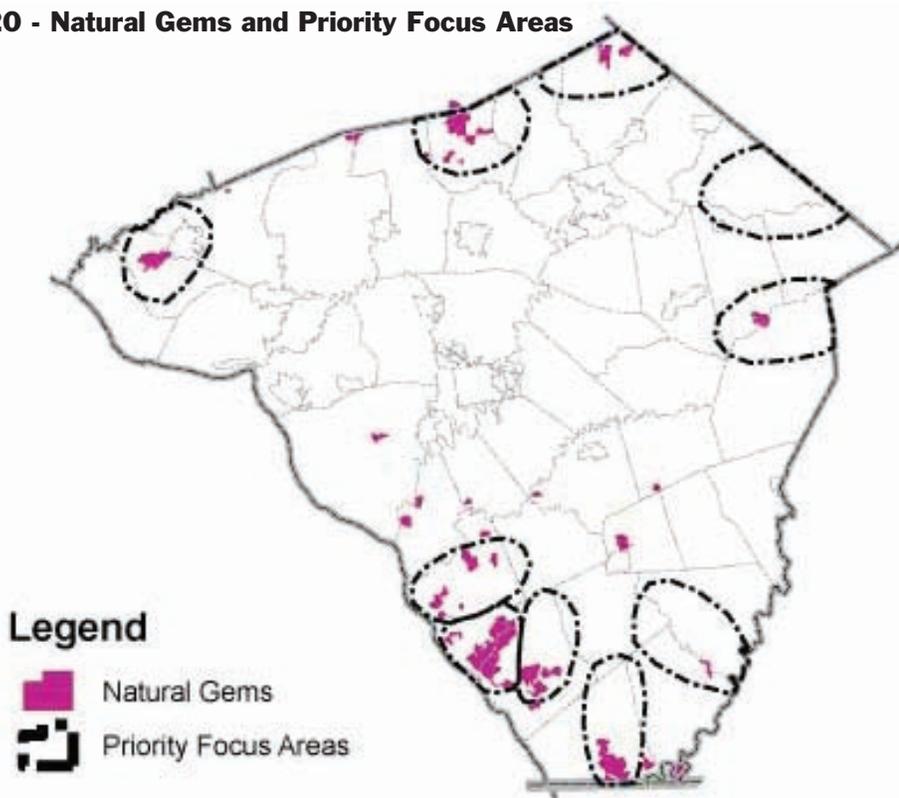
Barrens and the Conowingo Islands as the most significant Natural Heritage Areas in the County. This is due to the high numbers of species of concern documented at these locations as well as the relative degree of state and global rarity of each species.

Natural Gems

Natural Gems are priority natural resource areas identified by the Lancaster County Conservancy that are the focus of the Conservancy’s preservation efforts. Natural Gems were identified through a sophisticated GIS analysis process using a rating system based on seven important environmental attributes. These attributes are listed below along with the highest and lowest of the five possible ratings for each attribute.

- Water bodies (highest rating where rated “Exceptional Value” and/or wild trout waters; lowest rating if no water resources present)
- Wetland (highest rating for wetland listed in the Pennsylvania Natural Diversity Inventory (PNDI); lowest rating if no wetland present)

Figure 20 - Natural Gems and Priority Focus Areas



- Forestland (highest rating if greater than 200 acres; lowest rating if smaller than one acre)
- Grassland (highest rating for grassland listed in the PNNDI; lowest rating if no grassland present)
- Geological Features (highest rating for sites with rare features, fossil beds, caves, and/or cliff communities; lowest rating if nothing to observe)
- Plants (highest rating if more than three state-listed species of concern present; lowest rating if no plant community or species of concern present)
- Animals (highest rating if more than two state-listed species of concern present; lowest rating if no habitat or species of concern present)
- Adjacency to other preserved tracts (highest rating if adjacent to other Conservancy tracts; lowest rating if not adjacent to other preserved tracts)

Through this analysis, the Conservancy identified 65 parcels in the County with the high-quality natural resource attributes it wishes to preserve. Clusters of these parcels were targeted as priority

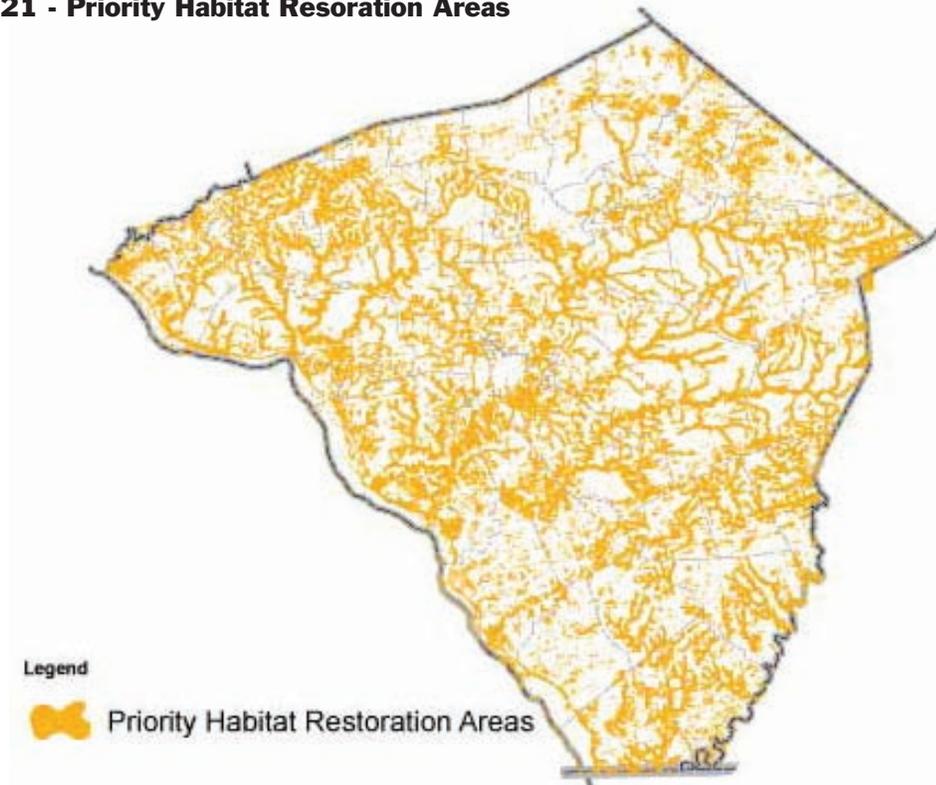
focus areas for preservation at the landscape level. The evaluation process is a dynamic process that is ongoing using the Natural Gem rating system as a tool.

The locations of the Natural Gems and priority focus areas are shown on Figure 20. They are generally located in peripheral areas of the County that support much of the remaining intact natural habitat, with a heavy concentration of sites along the lower Susquehanna River gorge. While the Conservancy does not rely solely on the Natural Gems to guide its preservation efforts, it is an important tool it uses to assist in decision-making when tracts of land become available for acquisition.

2.2.4 Potential Restoration Areas

The analysis of Lancaster County’s natural communities reveals that they have been greatly altered and fragmented by human activities over time. Therefore, creating a healthy, functioning green infrastructure system requires not only preservation of the remaining examples of the County’s natural habitat, but also restoration

Figure 21 - Priority Habitat Restoration Areas



of natural communities in suitable locations throughout the County.

Priority Habitat Restoration Areas

Figure 21 combines several resource factors that are indicators of the need and potential for habitat restoration. These factors include slopes greater than 25%, the 100- and 500-year floodplain, stream quality based on the riparian buffer analysis, forest block size, and habitat quality. High quality habitats were excluded as not needing immediate attention, as were resource areas deemed too expensive or impractical to restore. Based on this analysis, the priority restoration areas shown on Figure 21 contain degraded habitat that still presents the possibility of substantial restoration. Examples of priority restoration habitats include non-forested areas separating large forest blocks; streams with partial, but not contiguous, forested riparian buffers; and steep slopes lacking adequate forest cover to prevent erosion.

Potential Forest Corridors

Establishing (or reestablishing) contiguous forest corridors around and through Lancaster County

is important to create an interconnected green infrastructure system. These corridors facilitate species movement and migration that is otherwise impossible through urban and agricultural landscapes. Figure 22 illustrates the best potential areas for the establishment of forest corridors through the County. This map was created by evaluating existing forest blocks as the basis for creating connections that avoid urban development and incorporate the greatest amount of existing forestland. Steep slopes, poor soils, and riparian corridors were preferentially included in the potential forest corridors. Where existing forests, steep slopes, poor soils, and riparian corridors were unavailable the next most direct path was chosen. Based on this analysis, the thicker, darker lines shown on Figure 22 indicate areas where more work will be required to restore the forest corridor. Existing forests are not shown on the map.

Potential Agricultural Conversion Lands

The majority of the Lancaster County landscape is well-suited for agricultural uses; approximately 75% of the County has soils classified as prime

Figure 22 - Potential Forest Corridors

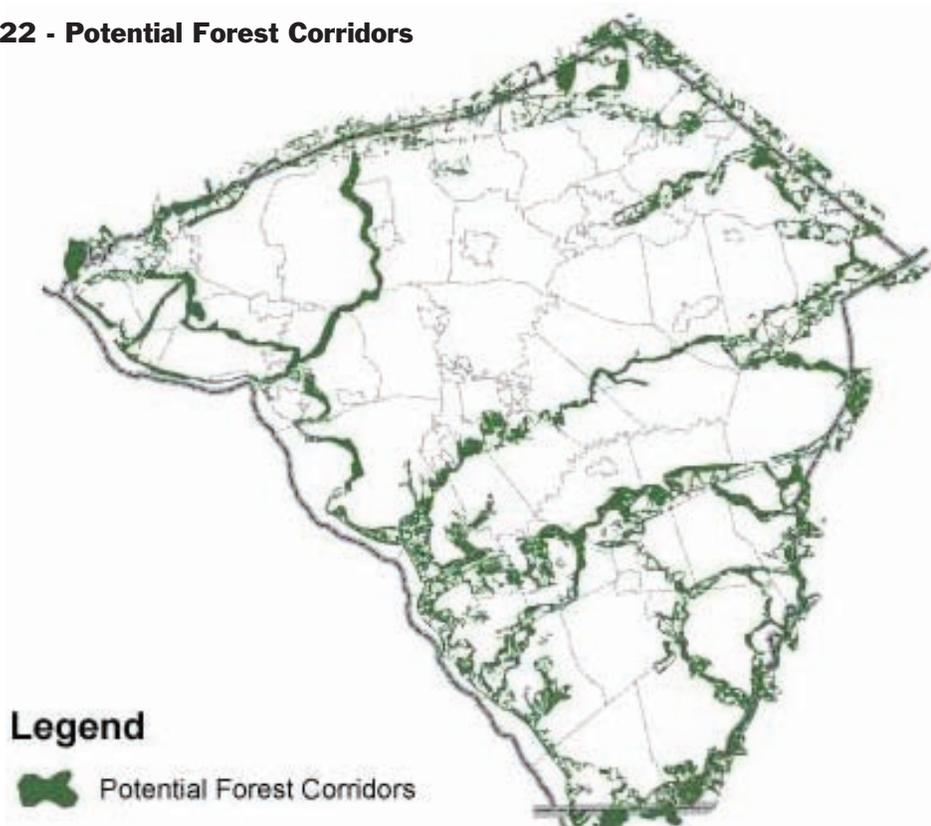
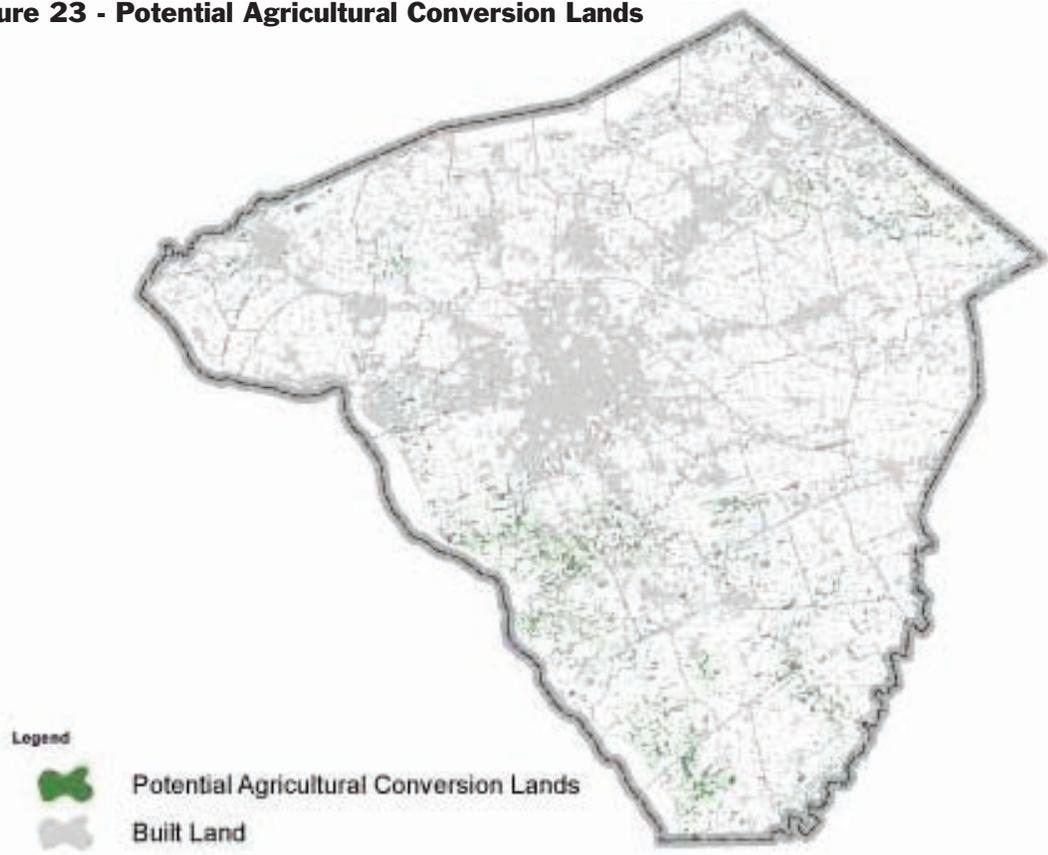


Figure 23 - Potential Agricultural Conversion Lands



farmland (NRCS Class I and II) or of statewide importance (NRCS Class III). However, certain areas located outside of the Lancaster Plain have topography and soil conditions that are susceptible to severe soil erosion. Farming these areas without impacting the water quality of local streams and waterways is difficult. Therefore, it may be appropriate to convert some of these agricultural areas back to a natural land cover. Restoration of these lands could improve stream water quality and provide habitat for native plant and animal species.

Figure 23 illustrates areas in Lancaster County that are being farmed on slopes exceeding 25% or on lands with highly erodible soils. These areas should be evaluated to determine if conversion to natural cover such as early successional habitat would be appropriate. Existing programs offering financial assistance to farmers who are willing to take this course of action on appropriate lands are available. For example, the U.S. Department of Agriculture's Conservation Reserve Program (CRP) and Conservation Reserve Enhancement Program (CREP) provide financial assistance

to farmers who convert agricultural lands to a more natural state. While these programs have primarily focused on reestablishing wetland and grassland habitat, they could also be applied to steeply sloping, highly erodible lands.

2.2.5 Threats to Green Infrastructure Resources

Threats to Lancaster County's Green Infrastructure are many and varied, ranging from the direct and indirect impacts of development to agricultural practices to global trends such as climate change and invasive species. The following provides an overview of key threats:

- 1. Development:** Scattered, large-lot development outside of Designated Growth Areas is consuming a significant amount of land and fragmenting green infrastructure resources. Projections of future population growth in the County and the amount of land zoned for large residential lots (typically 1-2 acres) in rural areas suggest the potential for

Nutrients and the Health of the Chesapeake Bay

Excess nutrients are harmful to aquatic environments. Elevated levels of nitrogen and phosphorus, two types of nutrients, are the main cause of the Bay's poor water quality and loss of aquatic habitats.

Nutrient runoff from urban, suburban, and rural areas fuel the growth of algae blooms that rob the Chesapeake Bay's aquatic life of sunlight and dissolved oxygen. Such blooms on the surface of the water prevent the sun's rays from reaching underwater bay grasses growing at the bottom. Without sunlight, bay grasses cannot grow and provide food and habitat for blue crabs, waterfowl, and juvenile fish. Excess algae that are not consumed by the Bay's algae-eating organisms eventually die and sink to the bottom, where they decompose in a process that leaves bottom waters with little or no dissolved oxygen for crabs, oysters and other bottom-dwelling species.

continuing impacts on green infrastructure resources, including:

- Impacts on natural/native communities (habitat loss, fragmentation, and degradation)
- Water quality impacts (impacts of on-site sewage disposal on groundwater; erosion and sedimentation from construction activities; stormwater runoff from impervious surfaces; and other forms of pollution such as chemical fertilizers and pesticides)
- Water supply impacts (effects of impervious surfaces on groundwater recharge; implications of groundwater withdrawal for carrying capacity)

2. **Gray Infrastructure Systems:** The major "gray" infrastructure systems that affect green infrastructure resources are transportation (primarily roads), wastewater treatment, and stormwater drainage. These systems result in both direct and indirect resource impacts. Indirect impacts result when roadway, sewer, water, and similar improvements promote urban development that impacts green infrastructure resources. Direct impacts caused by gray infrastructure construction are similar to urban development and include impacts on natural/native communities, water quality impacts (effluent discharges, combined sewer overflows, etc.), and water supply impacts.
3. **Agriculture:** Agriculture is the largest single land use in Lancaster County, covering approximately 54% of the County's land area. Farming is central to the County's heritage and identity, maintains land and soil resources in productive uses, and provides

positive environmental benefits such as aquifer recharge and stopovers for wildlife migration. Nevertheless, agricultural practices have caused negative impacts on green infrastructure resources, beginning with the historic removal of native vegetation to accommodate farming. These impacts include:

- Impacts on natural/native communities (habitat loss, fragmentation, and degradation)
- Water quality impacts (pollution from animal wastes and other agricultural practices; removal of riparian buffers; erosion and sedimentation, including contribution to legacy sediments)

The impacts of agriculture on surface water quality are further described in Section 2.2.2.

4. **Outdoor Recreational Uses:** While recreation is a generally compatible, beneficial function of green infrastructure, it is possible for the level of usage to exceed carrying capacity, resulting in resource degradation. Examples of this potential threat include unregulated ATV use in native habitat areas and heavy mountain biking and equestrian use in the Susquehanna River Corridor.
5. **Other Land Uses:** Chemical pollution (fertilizers and pesticides) from golf courses and residential yards and inappropriate forestry practices (e.g., clear cutting within riparian buffers) are examples of threats to green infrastructure resources associated with other land uses.

6. **Legacy Sediments:** As described in Section 2.2.2, legacy sediments are materials that accumulated behind historic dams and today cover the historic floodplains of many of the County’s waterways to depths of up to 20 feet. Erosion of these sediments is a serious threat to the water quality of rivers and streams and ultimately to the Chesapeake Bay.
7. **Large-Scale Environmental Trends:** These include the impacts of invasive species (and deer) and the long-term effects of global climate change on natural communities.

2.3 Parks and Recreation

Community recreation is a major function performed by the green infrastructure system. The opportunity to experience high quality natural resources in the outdoor environment is a fundamental part of a community’s quality of life. Perhaps nowhere is this more true than in Lancaster County, where gently rolling farmland, meandering streams, thick canopied forests, and other resources blend together to form a landscape of unparalleled beauty. This open space is essential to community character and a primary attraction for people who live, work, and visit Lancaster County.

Although Lancaster County is seemingly blessed with an abundance of open space, in actuality very little of it is publicly accessible. While approximately 54% of the County’s land area is in agricultural use – including some 80,000 acres that have been permanently preserved by the County Agricultural Preserve Board and the nonprofit organization Lancaster Farmland Trust – this land is not open to the public for outdoor recreational purposes. In total, only about four percent of the County’s land area is available to the public for outdoor recreational use. Continuing growth and development is magnifying this problem by changing the character of Lancaster County, making it increasingly more difficult for residents to enjoy the outdoors and appreciate the County’s bountiful natural resources.

The Lancaster County Regional Open Space Plan, adopted by the County in 1992 as an element of the Lancaster County Comprehensive

Plan, established standards, policies, and strategies designed to guide the County and municipalities in meeting citizens’ needs for parks and recreation at the countywide and municipal levels. This plan updates the 1992 plan by addressing parks, recreation, and open space as part of countywide green infrastructure system. Balance, the 2006 Update to the Growth Management Element of the Comprehensive Plan, provides important context for the role of parks and open space in the County’s overall land use framework. Guiding growth to Designated Growth Areas (DGAs) and having it occur in a more compact form—a basic premise of both the Urban Growth Area and Rural Strategies contained in Balance – requires that residents of these areas have less private “back yard” space in order to achieve other goals, particularly farmland preservation in rural areas. However, in order to ensure that quality of life is not reduced for those living in DGAs, public open spaces need to be carefully planned and incorporated into land use and development patterns so that residents have easy access to “close-to-home” outdoor recreational opportunities. In addition, guiding growth to DGAs provides public agencies and private land trusts the opportunity to preserve the most sensitive natural resource areas (generally located in rural parts of the County) before they are lost to large-lot residential or other forms of development. Ideally, more developed parks and active recreational facilities inside DGAs and passive, natural resource-based open spaces outside of DGAs should be connected through a network of publicly accessible hiking and biking trails. The following text provides background information and standards for the provision of parks, recreation, and open space in Lancaster County. It is divided into the following sections:

- **Section 2.3.1** defines general roles and responsibilities for the provision of parks, recreation, and open space in Lancaster County.
- **Section 2.3.2** addresses parks, recreation, and open space planning in Lancaster County at the state, county, and regional levels.
- **Section 2.3.3** provides an inventory of existing parks, recreation, and open space lands in Lancaster County.
- **Section 2.3.4** establishes standards for the provision of publicly accessible parks and



Neighborhood and Community parks are important to the quality-of-life of residents in traditional urban communities and growing suburban areas.

open space lands at the countywide and municipal levels.

Additional policy direction and recommendations for the provision of parks, recreation, and open space as part of a countywide green infrastructure system are integrated into Chapters 3.0, 4.0, and 5.0. Chapter 3.0 establishes an overall recreation goal as one of the primary functions of the green infrastructure system. Chapter 4.0 defines objectives, strategies, and tools in support of the recreation goal. Chapter 5.0 recommends actions by Lancaster County and its partners to provide for the outdoor recreational needs of Lancasterians.

2.3.1 Parks, Recreation, and Open Space Roles and Responsibilities

Meeting the parks and recreation needs of Lancaster County residents is a collaborative responsibility in which all levels of government as well as the nonprofit and private sectors have important roles to play. The following text provides a brief overview of the general purpose and activities of the entities involved in parks, recreation, and open space preservation in Lancaster County.

Commonwealth of Pennsylvania

The Commonwealth of Pennsylvania preserves natural, cultural, and historic resources of statewide significance. These resources are often located within large landholdings that transcend municipal – and often county – boundaries. Therefore, the management of these resources

usually exceeds the resources available at both the county and municipal levels.

Three Pennsylvania agencies provide public open space in Lancaster County. The Pennsylvania Game Commission manages wildlife resources and provides opportunities on portions of their land holdings for public hunting, trapping, hiking, and other recreational activities. The Department of Conservation and Natural Resources (DCNR) Bureau of State Parks manages the Commonwealth's state parks, including one park in Lancaster County. The Pennsylvania Fish and Boat Commission manages the Commonwealth's aquatic resources, enforces regulations, and provides access points for fishing and motorized and non-motorized boating access.

In relation to Lancaster County's green infrastructure, the Commonwealth's primary role is to maintain large open space areas that preserve important natural resources and entire ecosystems. Many of the areas owned and managed by state agencies contain the headwaters to the County's largest waterways, forests that cleanse the air and protect water quality, and habitat for plant and animal species of concern. The location of these lands is determined primarily by natural resource quality rather than by proximity to urban populations. While state game lands and preserves provide extensive opportunities for outdoor recreation, they are typically undeveloped with little or no active recreational facilities.

Lancaster County

The primary role of Lancaster County is to acquire, preserve, and manage lands with natural resources of countywide significance. This responsibility is met through the provision of primarily passive outdoor recreation opportunities in regional parks and regional trails. Regional parks are generally natural resource-based, range from 400 to 800 acres in size, and are located within a 10-mile radius of every resident of the County. Regional parks have limited developed recreational facilities, which can include parking lots, restrooms, picnic tables, hiking trails, boating access, and interpretive signage. Regional parks may also incorporate historic and/or cultural resources. While most regional parks serve primarily a passive recreational function, Buchmiller and Central Parks provide both

active and passive recreational opportunities for residents of Lancaster City and the larger central Lancaster County area.

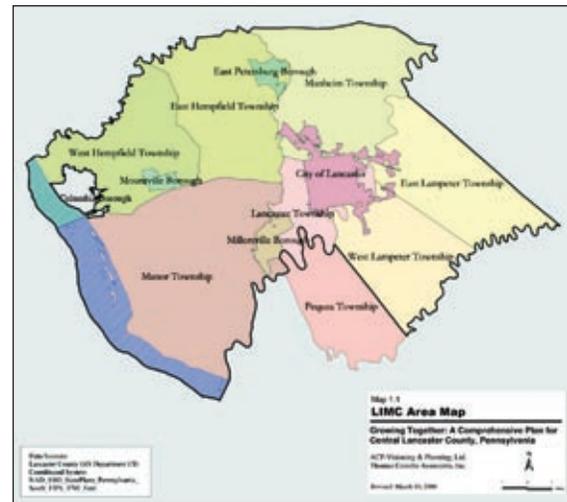
In addition to regional parks, the County also manages regional trails that provide opportunities for hiking and biking. Regional trails transcend municipal boundaries and typically follow linear features such as a stream or river, ridgeline, abandoned rail line, canal towpath, or utility corridor.

Inter-Municipal Organizations

Inter-municipal organizations include regional planning bodies, task forces, and councils of governments. The primary role of these organizations is to improve coordination, efficiency, and functionality among participating local governments. They are often in the best position to implement greenway and trail systems because of the need to coordinate greenway preservation and development across multiple properties that often transcend municipal borders. An excellent example is the Lancaster Inter-Municipal Committee's (LIMC) coordination of the proposed Conestoga Greenway.

LIMC is a council of governments comprised of 13 municipalities in central Lancaster County. LIMC's 1999 Conestoga Greenways River Corridor Conservation Plan proposed a greenway system along the Conestoga River, Little Conestoga Creek, and the West Branch of the Little Conestoga Creek in the multi-jurisdictional area covered by LIMC. The affected municipalities have implemented ordinance language to support greenway dedication consistent with the plan; however, gaps in the proposed system still remain. The recent "Growing Together" Comprehensive Plan for the LIMC area reaffirms the goal of establishing the greenway system and includes recommendations to bridge disconnected greenway segments.

Another important role of inter-municipal organizations is the sharing of park and recreational facility management, maintenance, and programming in order to increase efficiency and reduce the costs of providing services at the local level. Examples of county recreational organizations that are sharing resources on a regional level include the Conestoga Valley Community Center,



Councils of Government (or COGs) such as the Lancaster Intermunicipal Committee (LIMC) play an important role in coordinating regional parks and trail planning activities.

Ephrata Recreation Center, Greater Elizabethtown Area Recreation Services (GEARS), Hempfield Area Recreation Commission, Lancaster Recreation Commission, Lititz Recreation Commission, Manheim Central Parks and Recreation Department, and the Southern End Community Association (SECA). These and other recreational providers are part of the Lancaster County Recreation and Parks Alliance, which promotes sharing of responsibilities to manage recreation resources across municipal boundaries.

Local Municipalities and School Districts

The primary role of local municipalities and school districts is to provide "close-to-home" recreational opportunities for Lancastrians. They have the major responsibility to provide active recreation facilities available to residents of the municipalities. Public schools are often close to residential areas and have a variety of recreational facilities, such as playgrounds and athletic fields, that can greatly enhance local park and recreational systems. Where possible, school districts should work with municipalities to develop joint school/park complexes and other facilities, programs, and events in DGAs.

Municipalities can help improve access to parks by creating local recreational trail networks. Trail connections to parks are particularly useful for children that typically have to rely on parents to drive them to recreational facilities. Trails are also popular destinations for adults who use them for

Existing Conditions



The primary role of municipalities in the provision of outdoor recreation is active recreation experiences in neighborhood and community park settings. Leacock Township Park is an example of a municipally-owned neighborhood park that provides a diversity of recreation experiences for nearby residents.

walking, jogging, or biking. Trails can connect residential neighborhoods to a variety of destinations besides parks, such as shopping areas, work places, community centers, libraries, and places of worship. Local trail systems can be developed in a variety of locations, for example along streams and rivers in urban communities, along abandoned rail lines in suburban communities, and along ridgelines in rural parts of the County.

Municipalities also have an important role to play in protecting natural resources at the local level. Natural resource protection ordinances and acquisition of land or development rights are examples of the tools available to municipalities to protect important resources (see Chapter 4.0). As previously mentioned, greenway and trail dedication provisions have been incorporated into some municipal ordinances.

Semi-Public Sector

The semi-public sector refers to private entities that provide open space that is open to the public for outdoor recreation use. These include power-generating utilities – Exelon, PECO Energy, Pennsylvania Power and Light (PPL), and Safe Harbor Water Power Corporation – and water authorities such as the New Holland Borough Authority. These entities play a significant role in maintaining or impacting the County’s open space and natural resources. For example, the Federal Energy Regulatory Commission (FERC) requires that electric utilities provide the public with recreational opportunities as a condition of licensing. To help meet this requirement,

PPL Corporation recently announced plans to transfer approximately 3,500 acres of publicly accessible lands with valuable natural resources in the Susquehanna River Gorge to the Lancaster County Conservancy to protect in perpetuity. This type of cooperation between semi-public and private nonprofit partners should be encouraged as a way to protect the County’s significant natural resources.

Semi-public agencies such as water authorities can also help preserve important natural resources. The Lancaster County Conservancy is cooperating with Lancaster County to secure protection of approximately 800 acres of land owned by the New Holland Water Authority on Welsh Mountain adjacent to the Money Rocks County Park. This is another example of how public, semi-public, and nonprofit partners can work together to protect the County’s natural resources.

Private Nonprofit Sector

The private nonprofit sector includes land conservation trusts such as the Lancaster County Conservancy, watershed and other environmental organizations, and citizen groups focused on outdoor recreation, such as trail organizations and recreation clubs. These organizations have an important role to play in meeting the outdoor recreation needs of county residents. The Lancaster County Conservancy has a long history of natural resource protection through the acquisition of land or easements. As demonstrated by the examples provided above, it is making significant contributions to the large-scale preservation of natural resources in the County through collaborative partnerships with other entities.

Although the Lancaster County Conservancy and other land trusts focus on protecting high quality natural resources, their lands are often open to the public for uses such as hiking, biking, fishing, hunting, and wildlife observation. Because the location of the lands depends on the quality of the natural resources protected, they are largely found in isolated, less populated areas around the periphery of the County. Natural preserves such as Tucquan Glenn and Fishing Creek are almost exclusively oriented towards passive recreation. Since the intent of such preserves is to protect the natural resources within them, there



The Lancaster County Conservancy plays an important role in the provision of outdoor recreation by preserving natural lands like those found along Tucquan Glen in Martic Township.

is typically little or no recreational facility development with the exception of signage, crushed stone parking lots, and trails.

Watershed organizations such as the Cocalico Creek Watershed Association, Conoy Creek Watershed Association, Lititz Run Watershed Alliance, Little Conestoga Watershed Alliance, and Octoraro Watershed Association contribute to maintaining and restoring the health of the County's waterways and advocate for natural resource and open space preservation. Recreational and trail clubs are also important advocates for preserving the County's outdoor recreational resources and help to maintain trails and other facilities through volunteer activities.

Private For-Profit Sector

The private for-profit sector includes Lancaster County's business and development community. Developers provide close-to-home recreational facilities, trails, or greenways in their projects and developments. New development projects should help to "build community" by incorporating parks, water access, and recreational facilities that are accessible to local residents via walking or biking. Trails should be incorporated into the design of every development to create interconnected park and trail systems throughout the community.

Developers also play an important role in protecting natural resources by limiting impacts on waterways, steep slopes, woodlands, and other important natural resources in development projects. These resources can be utilized as positive design features that provide passive recreational

opportunities, perform important environmental functions such as stormwater management, and increase the value of the development.

Another component of the private, for-profit sector, recreational businesses provide recreational facilities or programs that are not traditionally offered by local municipalities based on land availability or fiscal considerations. Such facilities include golf courses, fitness centers, ice hockey rinks, etc.

2.3.2 Parks, Recreation, and Open Space Planning

Planning for the provision of parks, recreation, and open space planning in Lancaster County is ongoing at multiple scales and levels of government. These various efforts provide important context for the parks and recreation component of Greenscapes and are summarized below.

Commonwealth of Pennsylvania

Pennsylvania's Recreation Plan 2004-2008:

Published in 2004 as the fifth update to the 1967 Statewide Outdoor Recreation Plan, this document is the Commonwealth's official policy document identifying statewide recreational issues, needs, policies, and capital investment priorities. It is required to maintain eligibility to receive monies from the federal Land and Water Conservation Fund. The 2004 Plan established three major priorities for action:

- **Funding:** Increase funding for planning, acquisition, development, and rehabilitation of natural, cultural, historic, and recreation resources, facilities, and programs in order to enhance quality of life and meet the growing needs of Pennsylvanians.
- **Healthy and Livable Communities:** Create more healthy and livable communities that will more successfully serve the recreational needs of those who live, work, and play within them.

- **Capacity Building:** Build more capacity at all levels, through partnerships and innovative ways of doing business, to empower stakeholders in meeting recreation needs.

Pennsylvania's Greenways – An Action Plan for Creating Communities: Adopted in 2001, this plan defines a coordinated and strategic approach to establishing a network of greenways throughout Pennsylvania. It establishes the following vision for Pennsylvania's greenways:

Pennsylvania and its many partners will develop an outstanding network of greenways across the Commonwealth, creating an asset highly valued by Pennsylvanians and enhancing the quality of life for all. This network of greenways will connect Pennsylvania's open space, natural landscape features, scenic, cultural, historic and recreational sites, and urban and rural communities. Greenways will become one of the Commonwealth's most powerful tools to achieve sustainable growth and livable communities.

This network is envisioned as consisting of “hubs” (parks, forests, game lands, lakes, towns, and other destinations) and greenway “spokes” (connecting corridors such as land and water trails, natural corridors, etc.). The spokes include greenways of statewide significance, as well as local and regional greenway networks. Greenways of statewide significance identified in Lancaster County include the Susquehanna Greenway, Lower Susquehanna River Water Trail, the Horse-shoe Trail, and the Conestoga Trail.

Lancaster County

As previously noted, the Lancaster County Regional Open Space Plan (1992) has provided policy guidance for the provision of parks, recreation, and open space in the County. This plan proposed establishment of a regional open space system comprised of three major components: a countywide regional park system, a countywide natural heritage preservation system, and a countywide greenway system. The plan provided recommendations for acquiring regional parklands, preserving high quality natural areas as natural heritage preserves, and preserving nine regional and sixteen inter-municipal greenways throughout the County.

The Regional Open Space Plan also established the following standards for the provision of regional (county) parkland and local (municipal) parkland in Lancaster County:

- Provide a minimum of 5 acres of county-owned regional parkland per 1,000 residents.
- Provide a minimum of 10 acres of municipal parkland per 1,000 residents.

The County has implemented several of the key regional park recommendations of the 1992 Plan by acquiring an additional 929 acres in three regional park sites: Speedwell Forge, Money Rocks (Welsh Mountain), and the Theodore A. Parker III Natural Area (Stewart Run and Upper West Branch of Octoraro Creek). Also, Silver Mine Park, identified as a potential regional park site by the 1992 Plan, has been acquired by Pequea Township. Other regional park sites proposed by the 1992 Plan have not been implemented, including Bowmansville Hills, Adamstown Ridge, Lower West Branch of Octoraro Creek, Wooded Ridgeway West of Octoraro Creek, and Shearers Creek.

Less progress has been made in establishing the greenway network proposed in the 1992 Regional Open Space than in implementing the regional park recommendations. Accomplishments include completion of major segments of the proposed Conestoga North and South Trails, water and land trails along the Susquehanna River, the Middle Creek and Segloch Run Inter-Municipal Greenway, and portions of other inter-municipal greenways. The Susquehanna River Water Trail, a federally designated National Recreation Trail, extends along the length of the Susquehanna River in Lancaster and York Counties. A comprehensive water trail paddler's guide has been developed for non-motorized watercraft and 21 interpretive panels installed at key access points to inform visitors about the rich heritage of the river.

Regional Comprehensive Plans and Recreation Plans

A number of multi-municipal comprehensive and recreation plans have been completed for various parts of the County. Themes common to



Converting abandoned rail lines like this one in Ephrata Borough provides recreation for residents as well as an alternative means of travel.

all or most of these plans as they relate to parks, recreation, and open space planning include:

- In general, the plans express the desire to protect, preserve, and enhance natural resources, including but not limited to floodplains, wetlands, streams and stream banks, forested areas, agricultural soils, and wildlife habitats, through conservation and education initiatives.
- The plans support coordination of recreational facilities and programs at a regional level. There is a movement to provide and maintain a regionally connected system of active and passive recreation opportunities. Some of the plans advocate coordinating a regional parks system with open space conservation efforts.
- Regions that are anchored by boroughs and older urban areas express a need for aesthetic improvements (e.g., urban greening) and increased pedestrian and bicycle connectivity between cultural, business, artistic, and historic destinations.
- Although most of the regional plans allude to preservation and enhancement of streams and waterways, Lancaster Inter-Municipal Committee's Growing Together: A Comprehensive Plan for Central Lancaster County, PA is the only one that specifically discusses recreation "along and in the waterways."

The plans express the need to reduce conflicts between motorized and non-motorized traffic and to increase non-motorized movement opportunities by means of trails, greenways, bike routes, bike lanes, and other systems.

Other Special Studies

A number of other studies have been developed that are relevant to planning for parks, recreation, and open space in Lancaster County. These studies are summarized below.

Pennsylvania Highlands Conservation Atlas:

The Highlands is a large landscape of forested mountains and hills that extends from northwestern Connecticut through New York, New Jersey, and Pennsylvania to the Maryland state line. The northern and northeastern edges of Lancaster County are part of the Highlands region. The Highlands Conservation Act, signed by President Bush in 2004, is designed to assist the four states in conserving land and natural resources in the Highlands region through federal assistance for land conservation projects. In 2006 the Highlands Coalition, in cooperation with the Appalachian Mountain Club and Trust for Public Land, released the Pennsylvania Highlands Conservation Atlas. This study identifies high-priority conservation areas, including the Furnace Hills and Welsh Mountain in Lancaster County, where outstanding natural resource values coincide with stakeholder priorities for greenways, trails, and open space preservation.

Susquehanna Greenway Strategic Action Plan:

Led by a coalition of public and private agencies and organizations called the Susquehanna Greenway Partnership, the purpose of the Susquehanna Greenway is to link and protect natural, cultural, historic, and recreational resources along the 500-mile long Susquehanna River corridor in Pennsylvania. The Action Plan was completed in 2005 to provide a guide for implementing the greenway focused on the first three years of operation. The greenway is divided into six "reaches" in Pennsylvania from the New York to Maryland borders. Lancaster and York Counties comprises most of the Lower Susquehanna Reach, which extends from Harrisburg to the Pennsylvania/Maryland border and also includes

portions of Perry, Dauphin, and Cumberland Counties. Greenscapes incorporates the goals and objectives of the Susquehanna Greenway Strategic Action Plan.

Horse-Shoe Trail Preservation Plan: The Horse-Shoe Trail is a 140-mile multi-use trail that runs from the Valley Forge National Park to the Appalachian Trail north of Harrisburg, PA. The Horse-Shoe Trail in Lancaster County was proposed by the 1992 Regional Open Space Plan as a regional trail from Shearers Creek in Penn Township to the Berks County line in East Cocalico Township. Most of this greenway exists as an informal trail system but is unprotected; development pressures have forced some pieces to be abandoned or relocated along rural roads. In 2001, the trail was severed in Dauphin County, with no linkage around the closure. In 2002 the Horse-Shoe Trail was declared an Endangered Hiking Trail by the Keystone Trail Association. The National Park Service developed a preservation plan for the Horse-Shoe Trail but there has been little progress to date in protecting Lancaster County segments of the trail from development pressures.

The Conestoga Greenways – A River Corridor Conservation Plan: This plan establishes strategies for cooperation among municipal governments, non-profit organizations, businesses, and landowners to protect and preserve the environmental quality, scenic attributes, and recreation and transportation opportunities of the Conestoga River, Little Conestoga Creek, and the West Branch of the Little Conestoga Creek.⁴ The Conestoga River was identified as a Regional Greenway in the 1992 Lancaster County Regional Open Space Plan. The Conestoga Greenways study has promoted regional collaboration amongst the LIMC municipalities to establish greenway connections, for example by setting aside portions of the greenway system through the development review and approval process. As previously noted, greenway implementation was reinforced by the recently adopted LIMC Growing Together Comprehensive Plan. In 2007, the Lancaster County Conservancy coordinated

⁴ The Conestoga Greenways: A River Corridor Conservation Plan, Lancaster Inter-Municipal Committee (LIMC), Land Ethics, Inc., and Derck & Edson Associates, LLP, 1999



Developing a recreation trail along the abandoned Enola Railroad Branch is an opportunity to provide both recreation for area residents and interpret the heritage of the County.

an effort to construct a 1.3-mile trail along the Conestoga River in the Sunnyside peninsula area that will provide a direct link to the County's Central Park.

Atglen-Susquehanna Trail Master Plan

Report: The Atglen-Susquehanna Trail is a regional greenway proposed by the 1992 Lancaster County Regional Open Space Plan that would extend from the Susquehanna River east through the Borough of Quarryville to the border of Chester County just south of the Borough of Christiana. The 1992 plan identified this line as the best opportunity for the County to acquire a multi-use, long distance passive recreation trail through two distinctive Lancaster County landscapes: the forested River Hills and the Plain Sect farmland. In 2008, Norfolk Southern transferred ownership of the abandoned rail corridor to the adjacent municipalities.

2.3.3 Parks, Recreation, and Open Space Inventory

This section provides an inventory of existing parks, open space, and trails in Lancaster County. Existing parks, open spaces, and trails are shown in Figure 24 at a countywide scale. The total acreage of state, county, municipal, school district and nonprofit (Lancaster County Conservancy) lands is summarized in Table 2-1. Information for this inventory was compiled from county tax parcel information, municipal comprehensive plans, municipal park and recreation plans, and nonprofit sources. It should

Table 2-1. Lancaster County Parks, Recreation, and Open Space Land Inventory

Ownership Type	
Public	
Commonwealth of Pennsylvania (parks, game lands, forests)	9,700
Lancaster County (regional parks)	1,974
Municipalities (active and passive recreational lands)	2,813
School district facilities	1,653
Subtotal – Public Parks and Open Space Lands	16,140
Private	
Lancaster County Conservancy (fee simple ownership)	2,081
Lancaster County Conservancy (easements)	1,082
Subtotal – Private Non-Profit Parks and Open Space Lands	3,163
Total Public and Private Parks and Open Space Lands	19,303

Note: Inventory does not include private commercial recreational facilities.

be noted that the inventory is in a constant state of change and that information is not provided for some important open space holdings, most notably the utility company lands, that are not necessarily permanently protected.

Commonwealth of Pennsylvania Park and Open Space Lands

State lands provide opportunities for outdoor recreation and environmental education in

Table 2-2. Regional Parks Managed by Lancaster County

Property	Location	Size
Buchmiller Park	West Lampeter Township	79 acres
Central Park	West Lampeter Township and City of Lancaster	544 acre
Chickies Rock Park	West Hempfield and East Donegal Townships (between Columbia and Marietta Boroughs)	422 acres
Money Rocks Park	Caernarvon, East Earl, and Salisbury Townships	381 acres
Speedwell Forge Park	Elizabeth and Penn Townships	415 acres
Theodore A. Parker III Natural Area	Colerain Township	133 acres

natural settings that preserve natural, cultural, and historic resources. The Pennsylvania Game Commission manages nearly 9,500 acres of game lands within Lancaster County, the majority of which is located in the Furnace Hills along the northern edge of the County. These lands are managed for their natural habitat value but hunting, fishing, hiking, and similar activities are encouraged.

Located in southern Lancaster County, the 224-acre Susquehannock State Park is Lancaster County’s only state park. It is located on a wooded plateau overlooking the Susquehanna River in Drumore Township.

The PA Fish & Boat Commission (PA F&BC) also owns a small amount of land in Lancaster County and has lease arrangements with several entities for public fishing and boating access. A full inventory of this land and other publicly accessible waterway access points is not currently available but should be conducted by the Planning Commission in the near future.

Lancaster County Park and Open Space Lands

Lancaster County’s regional park resources are managed by the Department of Parks and Recreation (DPR). DPR was established to preserve and manage significant tracts of land and water for recreation and conservation of scenic, historical, geological, and ecologically significant areas for the enjoyment of Lancaster County residents. DPR oversees six regional parks (Table 2-2). In addition to the six regional parks, DPR manages two linear (rail-trail) parks (see Table 2-3):

Existing Conditions

- The 5.5-mile Conewago Recreation Trail runs parallel to the Conewago Creek from Route 230 to the Lebanon County line.
- The 2.3-mile Lancaster Junction Recreation Trail runs from the Lancaster County Public Safety Training Center next to Route 283 to the hamlet of Lancaster Junction.

The regional parks provide primarily passive recreational and environmental education opportunities for users with the exception of Buchmiller Park and Central Park, which provide active recreational facilities to support the recreational needs of the residents of Lancaster City and the larger central Lancaster County area. They contain some of the County's most notable natural features, such as Chickies Rock, a scenic overlook above the Susquehanna River in Chickies Rock Park, and Money Rocks, a rock outcropping in Money Rocks Park in the eastern part of the County.

DPR maintains the regional parks and trails, provides security, and offers recreational and environmental programs to residents. Park maintenance responsibilities include the inspection of facilities, routine maintenance, and undertaking minor park improvements and repairs. The parks are patrolled by a staff of park rangers led by the Chief Ranger. Rangers are responsible for law enforcement and general security and also provide information and education to park visitors. Environmental education opportunities are available to residents through the Lancaster County Environmental Center in Central Park. Central Park is the main hub of the County's regional park network, housing the DPR main office, maintenance facility, and park ranger headquarters.

Existing Regional Trails

Existing regional trails in Lancaster County are shown in Table 2.3. Maintained by the Horse-Shoe Trail Club, the Horse-Shoe Trail is part of a 140-mile long hiking and equestrian trail that runs from Valley Forge Park in Chester County to the Appalachian Trail in Dauphin County. The Conestoga Trail traverses most of the length of Lancaster County and connects the Horse-Shoe Trail to the north with the Mason-Dixon trail to the south via a sidewalk on a the PA Rt.



Small, close-to-home recreation facilities that adults and kids can easily access by walking or biking are important components of a well-rounded park system.

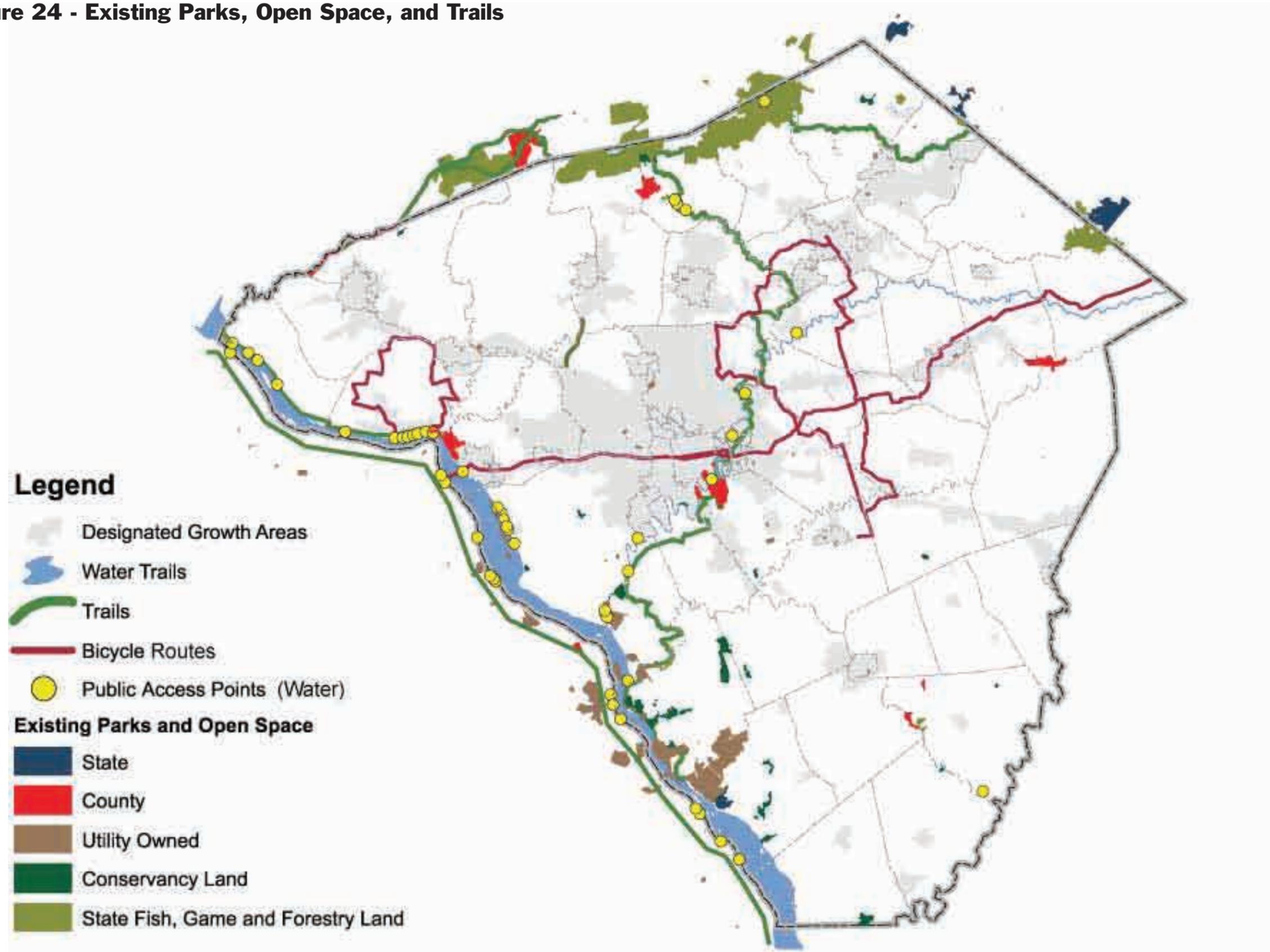
372 bridge across the Susquehanna River. It is maintained by the Lancaster Hiking Club. As previously noted, the Conewago and Lancaster Junction Trails are owned by Lancaster County and maintained by the Lancaster County Department of Parks and Recreation. The Northwest River Trail is a regional trail that extends along the Susquehanna River through five northwest Lancaster County municipalities. Of the five existing regional trails, only the two owned by Lancaster County are permanently protected for recreational use in their entirety. The Horse-Shoe and Conestoga Trails are particularly vulnerable to impacts from development or other private uses.

In addition to the existing land-based trails listed in Table 2-3, water trails have been designated along the Susquehanna and Conestoga Rivers in Lancaster County.

Municipal Parkland

Most Lancaster County municipalities, with the exception of some of the more rural townships, own parkland and provide outdoor recreation opportunities for the benefit of their residents. The range and diversity of park facilities at the local level varies widely depending upon the demographic makeup, size, and character of the municipality. In urban communities, such as the City of Lancaster and Columbia Borough, where neighborhoods are more compact with higher overall densities and vacant land is rare, neighborhood parks, plazas, and similar small resources are the most common elements of the park system. Larger community parks are more common in rural townships, such as Brecknock Township, where more land is available and most

Figure 24 - Existing Parks, Open Space, and Trails



Chickies Rock Park

At 422 acres, Chickies Rock County Park is the second largest park in the Lancaster County park system. From the mid-1800s until the turn of the 20th century, the land between Marietta and Columbia was a beehive of industrial activity area where eight anthracite iron furnaces produced pig iron for eastern markets. After the local decline of the iron industry, natural vegetation gradually reclaimed the area, although some of the ruins of the furnaces remain. The park itself derives its name from a distinctive outcrop of Cambrian quartzite overlooking the Susquehanna River. From the summit of Chickies Rock visitors can enjoy to a magnificent view of York County, Marietta, and the rural landscape of northwestern Lancaster County.

homeowners have large private yards. Suburban communities with larger tax bases and available land, such as East Hempfield, Manheim, and Warwick Townships, are most likely to have a wider range neighborhood parks, community parks, and trails (see Section 2.3.4 for definitions of different types of parks). A complete listing of municipal parks is provided in Appendix B.

School District Recreational Lands

Lancaster County’s school districts provide valuable open space and recreational facilities such as playing fields, playgrounds, swimming pools, and gymnasiums. In many rural communities school districts are the major provider of recreational facilities for residents. While schools represent an important community recreational resource, availability can be a problem because school-related activities have the top priority in scheduling. Generally, school properties located in urban settings provide less acreage than those in suburban and rural areas. Nevertheless, the open space provided by these school properties is a critically important resource for the high-density neighborhoods of Lancaster City and the

Boroughs. There has been a trend in recent years of closure of such schools in favor of consolidation on larger “campuses” located outside of traditional urban and village areas. A complete listing of school district lands is provided in Appendix B.

Lancaster County Conservancy

The mission of the Lancaster County Conservancy is to maintain carefully selected examples of the County’s natural heritage in their natural state. The Conservancy maintains properties throughout Lancaster County that are open to the public for passive recreational purposes. The Conservancy currently owns approximately 2,081 acres of land in 25 different nature preserves or sanctuaries throughout the County. A list of these preserves is provided in Table 2-4. Many of the preserves the Conservancy has targeted over the past decade are those specifically identified in the 1992 Lancaster County Regional Open Space Plan. This table does not include the planned purchase of the Holtwood Environmental Preserve, approximately 3,500 acres of land in the Susquehanna River Gorge, from the

Table 2-3. Existing Regional Trails in Lancaster County

Trail	Location	Length	Protection Status
Horse-Shoe Trail	East Cocalico, West Cocalico, Clay, Elizabeth, & Penn Townships	24.3 mi.	48%
Conestoga Trail	Penn, Warwick, Ephrata, West Earl, Mannheim, Upper Leacock, East Lampeter, West Lampeter, Pequea, Conestoga, & Martic Townships; Lancaster City	58.7 mi.	13%
Conewago Trail	Mount Joy Township	5.5 mi.	100%
Lancaster Junction Trail	East Hempfield Township	2.3 mi.	100%
Northwest River Trail	Columbia & Marietta Boroughs; West Hempfield, East Donegal, & Conoy Townships	13.6 mi.	93%

Table 2-4. Lancaster County Conservancy Nature Preserves

Property	Location	Acres
Alexander-King Nature Preserve	Little Britain Township	24
Bellaire Woods Nature Preserve	Mount Joy Township	38
Bell's Run Nature Preserve	Colerain Township	10
Boyer Nature Preserve	Manor Township	10
Ferncliffe Wildflower and Wildlife Preserve	Drumore Township	65
Fishing Creek Nature Preserve	Drumore Township	171
Fishing Creek North Nature Preserve	Drumore Township	71
Greider's Run Nature Preserve	Lancaster Township	2
Holly Pointe Conservation Area	Lancaster City	2
Homewood Run Nature Preserve	Paradise Township	39
House Rock Nature Preserve	Martic Township	95
Kelly's Run Nature Preserve	Martic Township	55
Rannels-Kettle Run Nature Preserve	Elizabeth Township	91
Ray's Wood Nature Preserve	Providence Township	58
Reed Run Nature Preserve	Martic Township	149
Rock Springs Nature Preserve	Fulton Township	176
Shiprock Woods Nature Preserve	West Lampeter Township	37
Steinman Run Nature Preserve	Martic Township	264
Trout Run Nature Preserve	Martic Township	194
Tucquan Glen Nature Preserve	Martic Township	361
Turkey Hill Trail	Manor Township	25
Upper Hopewell Forge Wildlife Sanctuary	Elizabeth Township	8
Windoph Landing Nature Preserve	Lancaster Township	22
Wissler Run Nature Preserve	Drumore Township	18
Wilhelm Tract	W. Cocalico Township	96



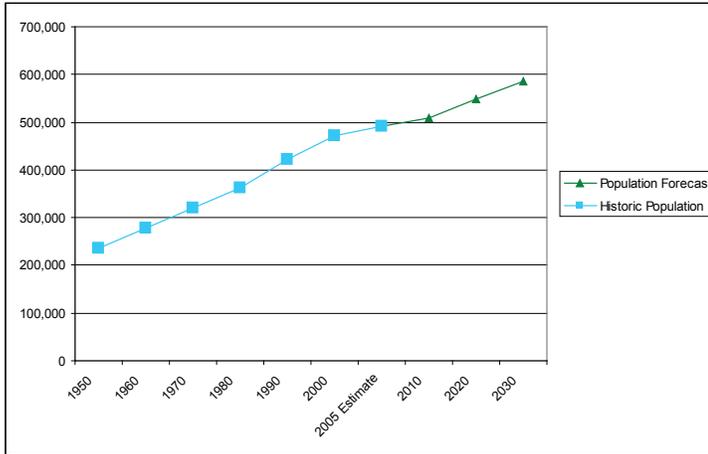
PPL Corporation or conservation easements held by the Conservancy on private landholdings. As noted in Section 2.2.3, the Conservancy focuses its land preservation activities on “Natural Gems” identified through GIS analysis.

2.3.4 Parkland Standards

As previously noted, the 1992 Regional Open Space Plan established the following standards for the provision of county and regional parkland in Lancaster County:

◀ **Kelly's Run in Martic Township is just one of 25 nature preserves the Lancaster County Conservancy owns throughout the county.**

Table 2-5. Lancaster County Population Trends



Source: US Census, Lancaster County Planning Commission

- Provide a minimum of 5 acres of county-owned regional parkland per 1,000 residents.
- Provide a minimum of 10 acres of municipal parkland per 1,000 residents.

A comparative review of current national standards and standards used in counties adjacent to Lancaster County was conducted to determine whether these standards should be continued or modified (see Appendix B for a review of standards in adjacent counties). Based on this review, Greenscapes reaffirms the standards defined in the 1992 Regional Open Space Plan while recommending that the municipal standard be applied in a flexible manner appropriate to differing circumstances in urban, suburban, and rural municipalities.

Based on the standards there is a deficiency of regional and municipal parkland in Lancaster County that will grow as the population increases unless action is taken to acquire additional parkland. Tables 2-5 and 2-6 present: 1) historic population trends from 1950 through 2006 (U.S. Census estimate); and 2) the Lancaster

County Planning Commission's projections of additional population growth through 2030.

Tables 2-7 and 2-8 present the deficits in regional and municipal parkland, respectively based on the County's population in 2000 and projections through 2030. Figure 25 shows municipalities that have a surplus or deficit of parkland based on 2006 population estimates.

The regional park standard of 5 acres per 1,000 residents to be met by Lancaster County does not include special use parks such as trails and nature preserves. Regional park locations are based on both the presence of natural resources and on an even distribution throughout the County, and the goal of providing a regional park within a 10-mile radius of every resident should be maintained. Specific recommendations for acquiring additional regional parkland are provided in Chapter 5.0.

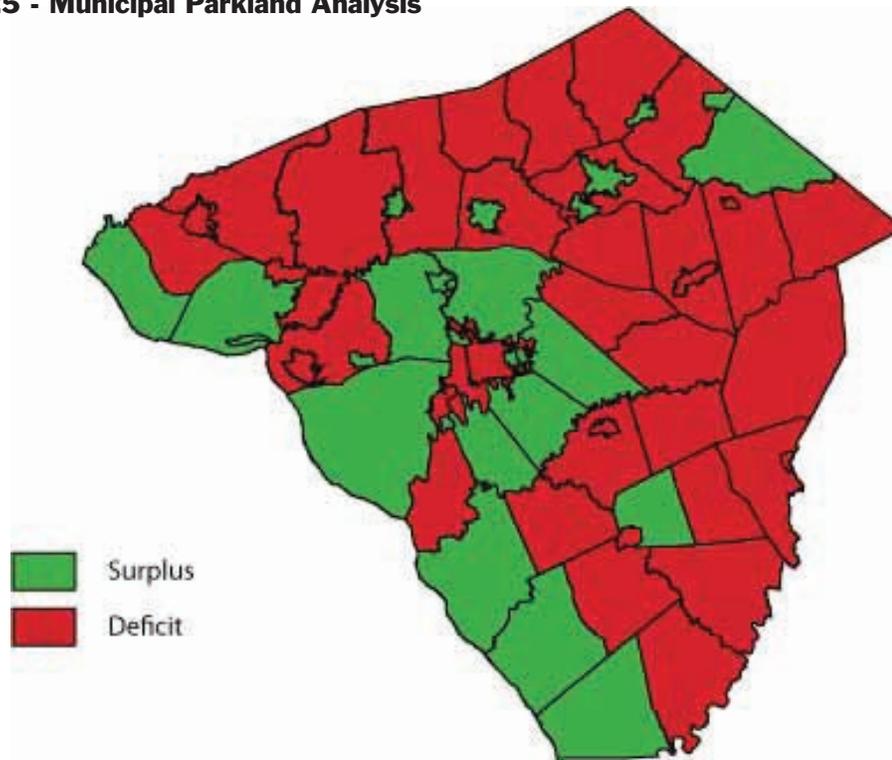
The overall goal of providing 10 acres of municipal parkland per 1,000 residents should be tailored to the differing local needs and circumstances of urban, suburban, and rural municipalities. Urban communities should focus on close-to-home recreational opportunities such as neighborhood parks and, where feasible, community parks. Since these communities have less available land and higher development densities, smaller parks and non-traditional types of open space such as vest-pocket parks, urban trails, community gardens, green streets, and green roofs should be emphasized. Suburban communities are in the best position to create diverse park systems. They typically have the strongest tax bases and available open land to create a system of close-to-home parks and recreational

Table 2-6. Lancaster County Population Forecasts

2000 Population	2010 Population	% Change, 2000-2010	2020 Population	% Change, 2010-2020	2030 Population	% Change, 2020-2030	Total Forecasted Change, 2000-2030	% Change, 2000-2030
470,658	509,720	8.30	548,979	7.70	585,487	6.65	114,829	24.40

Source: Lancaster County Planning Commission

Figure 25 - Municipal Parkland Analysis



facilities that include neighborhood parks, community parks, and local trail networks. Because rural communities contain lower population densities and ample private open space on large residential lots, less emphasis should be placed on neighborhood parks and more on developing community parks close to villages or other population centers. School district recreational facilities that are open for public use can be counted towards meeting a portion of the 10 acres/1,000 residents standard. However, municipalities should recognize that school recreation lands are not permanently protected and can be lost if the school district closes the school and sells the land and buildings.

In general, neighborhood and community parks are considered community facilities and, therefore, should be located within officially Designated Growth Areas. Locating parks inside Designated Growth Areas makes them easily accessible to the greatest number of residents. It also limits interference and conflicts with neighboring agricultural operations.

Park and Open Space Types

The following discussion of different types of parks and open spaces is derived from the

National Recreation and Parks Association's (NRPA) Park, Recreation, and Open Space Guidelines and tailored to meet the needs and circumstances of Lancaster County. This classification system is provided for general guidance purposes.

- **Mini-Parks:** A Mini-park is a small park area typically 2,500 square feet to one acre in size and serving residents living within a radius of less than ¼ mile. Mini-parks should be located within Designated Growth Areas (DGAs) and preferably in dense mixed-use areas accessible to residents, shoppers, and workers. Pedestrian access from the surrounding area is necessary because parking is often non-existent. Mini-parks address limited, isolated, or unique recreational needs. Many are owned by private businesses but open to the general public for use. Examples include tot lot/play structures, community gardens, courtyards, sitting areas, picnic areas, or landscaped public use plazas in a downtown. Steinman Park and Triangle Park in Lancaster City are examples of mini-parks in Lancaster County include.

Table 2-7. Regional Parkland Needs Based on Standard

Year	Lancaster County Population	Parkland Required @ 5 Acres / 1,000 population	Parkland Deficit/Surplus @ 5 Acres / 1,000 population
2000	470,658	2,353	(379)
2010	509,720	2,548	(574)
2020	548,979	2,744	(770)
2030	585,487	2,927	(953)

Source: U.S. Census, Lancaster County Planning Commission population projections

Table 2-8. Municipal Parkland Needs Based on Standard

Year	Lancaster County Population	Parkland Required @ 10 Acres / 1,000 population	Parkland Deficit/Surplus @ 10 Acres / 1,000 population
2000	470,658	4,706	(1,894)
2010	509,720	5,097	(2,285)
2020	548,979	5,489	(2,677)
2030	585,487	5,854	(3,042)

Source: U.S. Census, Lancaster County Planning Commission population projections

- Neighborhood Parks:** A Neighborhood Park is generally 1.5 acres or greater in size and provide close-to-home public areas for playgrounds, passive recreation, and limited recreational programming. Active recreational facilities such as ball fields and basketball courts are intended for informal and unstructured play activity. Neighborhood parks should strive to balance active and passive recreation activities geared toward a variety of age and user groups. They have a service radius of ½-mile, uninterrupted by physical barriers. Ideally, neighborhood parks should be located within Designated Growth Areas (DGAs) and integrated into compact residential neighborhoods. They should connect to other park system components, such as trails, and have limited parking. Recreation land associated with elementary schools in urban communities often functions as neighborhood parks for older neighborhoods. Examples of neighborhood parks in Lancaster County include Willow Street Elementary School in West Lampeter Township; Falcon Ridge Park in West Hempfield Township; and Rotary Park in Columbia Borough.
- Community Parks:** A Community Park is larger than Neighborhood Park, usually containing between 20 and 50 acres. Community parks are designed to provide opportunities for active and structured recreation activities as well as informal exercise and passive recreation. They can also preserve significant natural, historic, and cultural landscapes. Community parks usually serve two or more neighborhoods and have a 2-mile service radius. Community parks should be located as close to population centers as possible and preferably within Designated Growth Areas (DGAs). While pedestrian and bike access should be a goal, a significant number of people will arrive by car. Therefore, adequate parking should be provided. Communities should avoid locating community parks in active farming areas to minimize the impact on agricultural activities. Ideally, trails should connect the community park to a larger community trail system or greenway. Examples of community parks in Lancaster County include Rapho Township Community Park; SICO Park in Mount Joy Borough; and Paradise Township Memorial Park.



The soon-to-be redeveloped 6th Ward Park in the City of Lancaster is good example of a neighborhood park that serves a high density residential area.

- School-Parks:** Primary and secondary school properties can provide recreational facilities that fulfill the functions of neighborhood or community parks. In general, schools located close to population centers will receive more use than those located in locations accessible only by car. In addition, combining municipal and school district resources can leverage recreational opportunities available to the community. Establishing a clearly defined joint-use agreement between the agencies is critical to making the school-park relationship workable.
- Special Resource Parks:** This park type covers a broad range of public parks and single-purpose uses. Examples include arboretums, archeological sites, unique geological formations, historic resources, and heritage and cultural parks. The primary purpose of these parks is to highlight or celebrate a significant natural, cultural, or historic resource (or event) worthy of protection. The location of these parks is dependent upon the location of the resource to be highlighted. The size of special resource parks is variable and dependent on the land area necessary to protect the central feature highlighted in the park.
- Regional Reserves:** A Regional Reserve is a large land area set aside for preservation of significant natural features, ecosystems, and scenic character, such as

state game lands and state forests, municipal watersheds, and nature preserves. The objective is to preserve entire working ecosystems, high quality natural resources, stream headwaters, aquifer recharge areas, reservoirs, and highly scenic landscapes. Some natural resource extraction activities may be compatible with the natural resource and recreational objectives of these parks. Regional Reserves provide primarily passive recreational opportunities, such as nature study, picnicking, hunting, hiking and biking, swimming, camping, etc. The location of these parks is dependent upon the location of the resource to be protected. The size of these parks can vary; however, most include thousands of acres.

- Natural Heritage Areas:** A Natural Heritage Area is an open space resource that contains environmentally unique or fragile natural resources, plant or animal species or communities of special concern or exceptional quality, or highly scenic natural features. The location of natural areas is solely dependent upon the location of the resource to be protected. Their size can vary; however, they typically range from ten acres to a few hundred acres, depending upon the extent of the resource to be protected.



Converting abandoned rail lines into parks like the Northwest Corridor Linear Park in the City of Lancaster can help municipalities create a diverse parks and open space system.

- **Greenway Trails:** A Greenway Trail is a linear corridor of open space that follows natural or man-made features that provide for passive recreation opportunities. They can connect neighborhoods, urban communities, and other open spaces and provide for non-motorized travel between these resources. Different land and water-based travel modes accommodated by greenways include hiking, walking, jogging, bicycling, in-line skating, cross-country skiing, horseback riding, canoeing, etc. Greenway trails can include bike paths and multi-use trails along existing right-of-ways, utility corridors, and abandoned railroad lines. Many greenway trails are located along waterways and support floodplain management, water quality enhancement, and fish/wildlife habitat protection. Greenway trails vary in scale from narrow ribbons along railroad corridors (20 feet wide) to riparian corridors along waterways (200 feet wide or greater) to major wildlife corridors (1,000-foot width to allow for migration).

Strategic Vision

3.1 The Vision: Lancaster County's Natural Life Support System

Lancaster County's green infrastructure – land, water, air, and the plant and animal species they support – is vital to the health and well being of Lancasterians. As described in Chapter 1.0, the benefits provided by these resources are vast, ranging from ecological services such as cleaning the air and water, controlling flooding, and conserving native plant and animal diversity, to monetary benefits such as increasing property values, reducing energy consumption, and generating economic activity. However, the County's once abundant natural resources have been greatly altered by human activity, resulting in extensive negative impacts such as the loss and fragmentation of natural habitat and degraded air and water quality (see Chapter 2.0).

Greenscapes seeks to reverse this long-term trend through comprehensive action to maintain, restore, and enhance green infrastructure as Lancaster County's essential **natural life support system**. This system is envisioned as:

A network of **natural areas, green spaces, and greenways** in rural, suburban, and urban areas that sustains ecological functions and values and provides a broad array of benefits for the people of Lancaster County and the surrounding region, including:

- **Environmental Quality:** Natural resource protection and the perpetuation of native plant and animal species.
- **Community Health:** Water and air quality, recreation, and mobility (walking and biking as integral parts of the transportation system).
- **A Sustainable Economy:** Resource-based economic activity, increased property values, energy conservation, and reduced costs of engineered "gray infrastructure."

What does this vision mean for Lancaster County looking forward ten to twenty years and beyond? Imagine a future in which a healthy, interconnected network of natural and human ecosystems that contributes to the economic

vitality and quality of life of county residents has been established. Imagine that...

- Scenic natural landscapes, high quality river and stream corridors, habitat for native plant and animal species, and other elements of Lancaster County's natural heritage have been protected, restored, and managed for ecological health in a comprehensive, connected system extending throughout the County.
- Green infrastructure is an integral part of the County's urban, suburban, and rural communities, as reflected in elements such as a flourishing tree canopy; green streets, roofs, and parking courts; conveniently located parks and open spaces; and community gardens and backyard habitat areas.
- Lancasterians walk and bike to work, shop, and recreate using safe and attractive streets, paths, and greenway trails that provide seamless connections within urban and suburban communities and from these communities to rural destinations such as county parks.
- Productive and sustainable agricultural lands are managed to conserve natural resources, such as buffers of riparian vegetation along rivers and streams with exceptional water quality.
- Holistic approaches such as green buildings, biological stormwater and wastewater treatment systems, and community-wide tree plantings are used to conserve energy, improve air and water quality, offset carbon emissions, and avoids the financial and environmental costs of conventional engineering solutions.
- Ecotourism – the sustainable enjoyment and use of green infrastructure resources by visitors – contributes to the economic prosperity of Lancaster County's communities.

- Governmental officials and agencies, institutions, nonprofit organizations, businesses, and citizens of all ages and backgrounds appreciate, take pride in, and provide support for maintaining and enhancing Lancaster County's green infrastructure system. Instilled in school children from an early age, the essential value of green infrastructure as the County's natural life support system is central to community life and discourse.
- A conservation ethic and culture of stewardship of natural resources has been embraced by Lancastrians, who understand the importance of green infrastructure to quality of life, community health, and a sustainable economy.

3.2 The Concept: Lancaster County's Green Infrastructure System

What will Lancaster County's green infrastructure look like when this vision is achieved? A physical concept of the proposed green infrastructure system has been developed at a county-wide scale based on the resource mapping and analysis described in Chapter 2.0. The concept is a spatial depiction of resources that correspond to the four primary system goals more fully described in Chapter 4.0: Preservation, Conservation, Restoration, and Recreation.

- **Goal 1: Preservation**

Preserve Lancaster County's exceptional natural resources.

Lancaster County is fortunate to have a number and variety of high quality natural resources worthy of preservation. These areas should be preserved, in perpetuity, as part of the foundation of the County's green infrastructure system. The exceptional natural resources that should be preserved include the highest quality streams and riparian areas, unique geologic features, natural gems, species of concern core habitat, the highest quality natural communities, interior forests, forest blocks greater than 100 acres in size, and important bird and mammal areas. Described in Chapter 2.0 and shown as a

composite layer on Figure 26, these resources are the highest priorities for preservation as part of the green infrastructure system.

- **Goal 2: Conservation**

Conserve natural resources and services throughout Lancaster County's urban, suburban, and rural landscapes.

The patchwork of natural resources that threads its way throughout the County's urban, suburban, and rural landscapes performs a variety of important ecological functions. While the quality of these resources is not as high as those addressed by the Preservation goal, the functions they provide are essential to the health of our natural environment and to the quality of our lives. Conserving these resources through wise use and management is critical to sustaining the ecological functions they provide. Important natural resources (other than the exceptional ones addressed by Goal 1) include wetlands, 100-year floodplain areas, steep slopes and highly erodible soils, medium-quality streams and riparian buffers, medium quality natural communities, species of concern supporting habitat, forest blocks less than 100 acres in size, and other natural vegetation. Described in Chapter 2.0 and shown as a composite layer on Figure 27, these resources should be managed to maintain their ecological functions and natural carrying capacity. Important groundwater and wellhead protection zones also fall under the Conservation category but are not shown on Figure 27.

- **Goal 3: Restoration**

Restore ecological connections and natural resource systems throughout Lancaster County's urban, suburban, and rural areas.

The extent of degraded natural resources throughout Lancaster County's urban, suburban, and rural landscapes is widespread and readily apparent, even to the casual observer. Sediment-laden stream water, ozone alerts, and fish consumption warnings are all indicators of a highly stressed natural environment. Healing the landscape from three centuries of abuse will take both patience and perseverance. Degraded natural resource areas that provide opportunities for ecologi-

Figure 26 - Preservation Areas

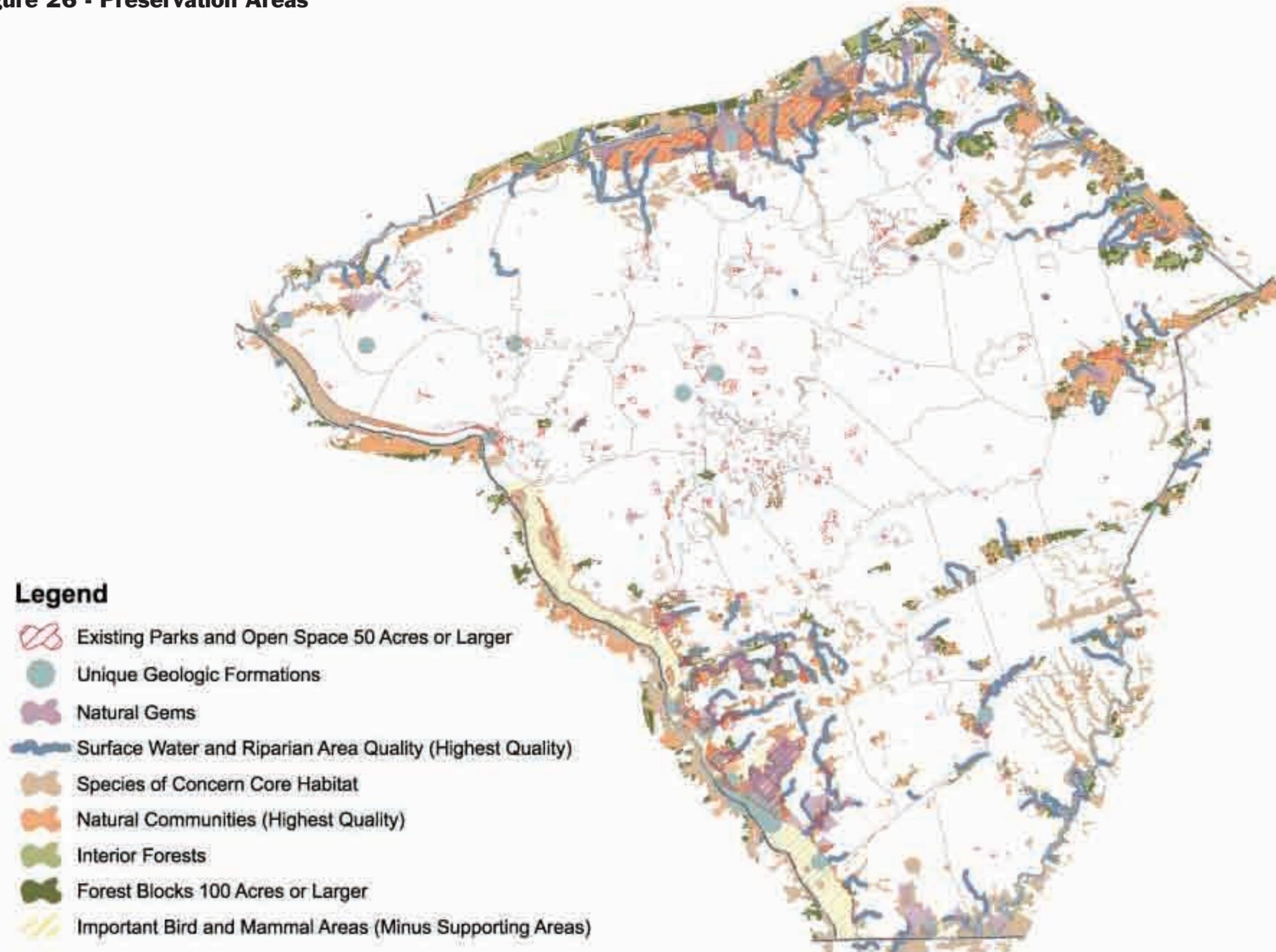


Figure 27 - Conservation Areas

Legend

- Wetland Sites
- 100-Year Floodplain
- Steep Slopes (15% or >) & Highly Erodible Soils
- Surface Water & Riparian Area Quality (Medium Quality)
- Natural Communities (Medium Quality)
- Forest Blocks < 100 Acres
- Species of Concern Supporting Habitat

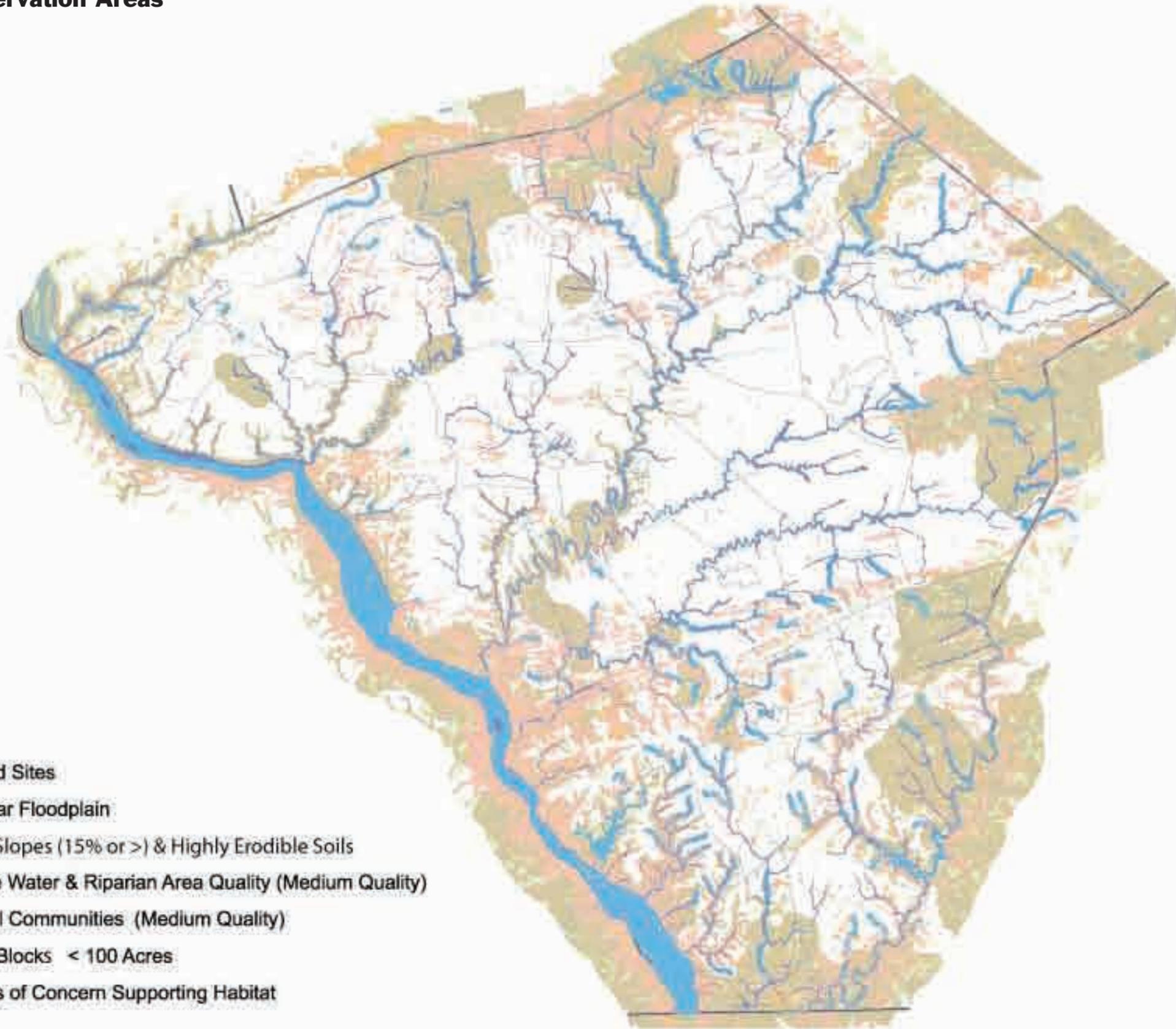


Figure 28 - Restoration Areas

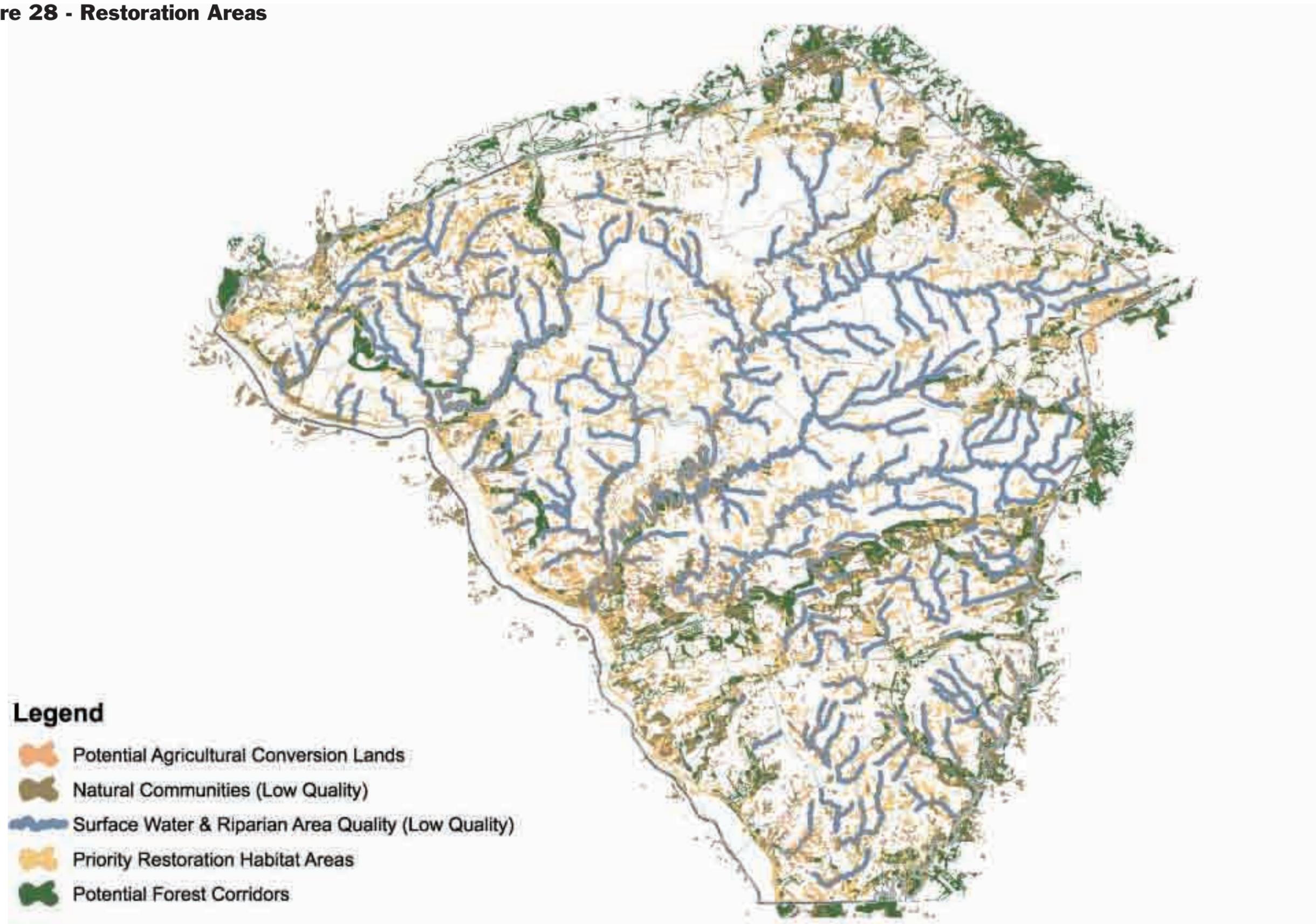


Figure 29 - Recreation Areas

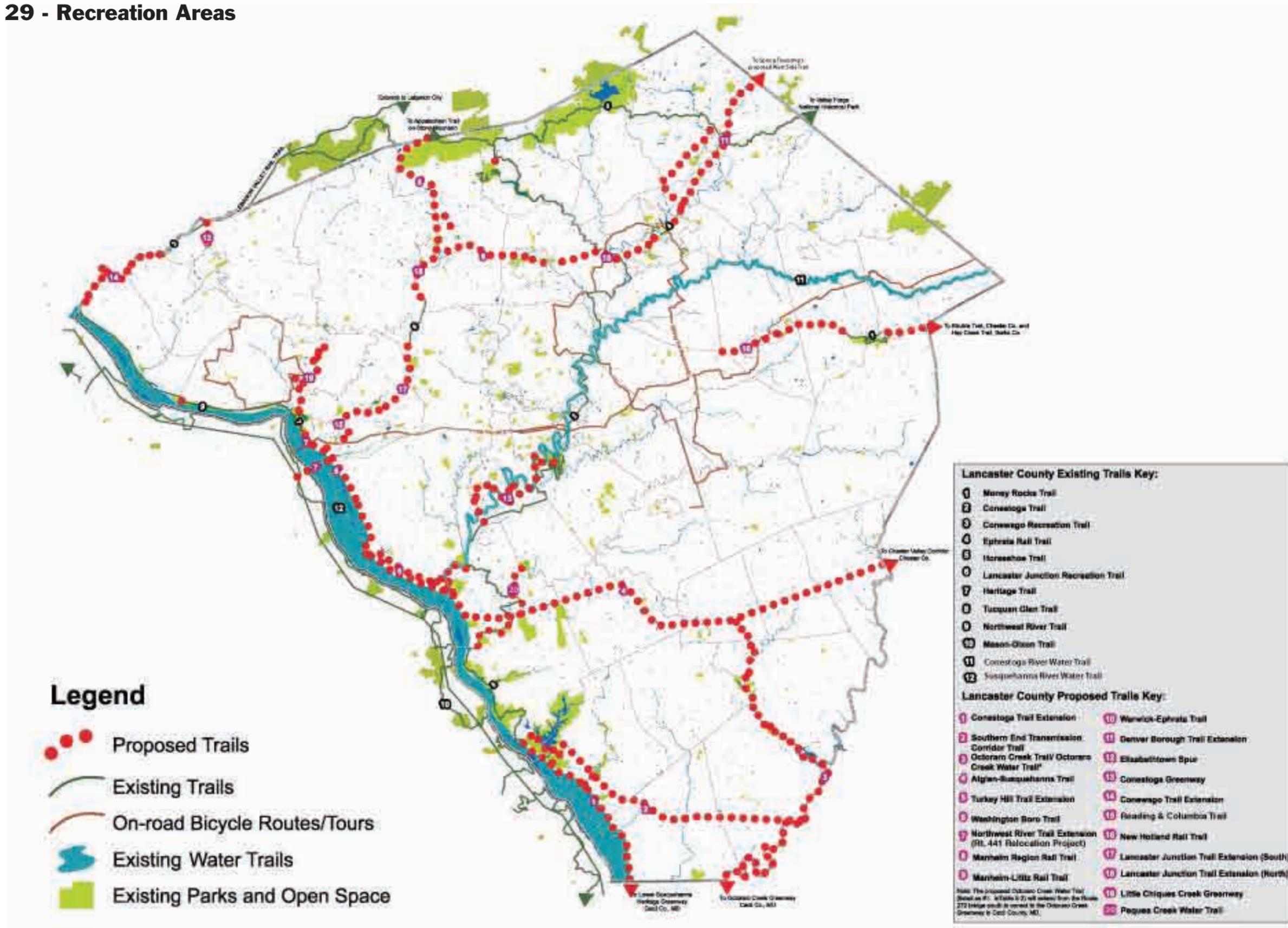
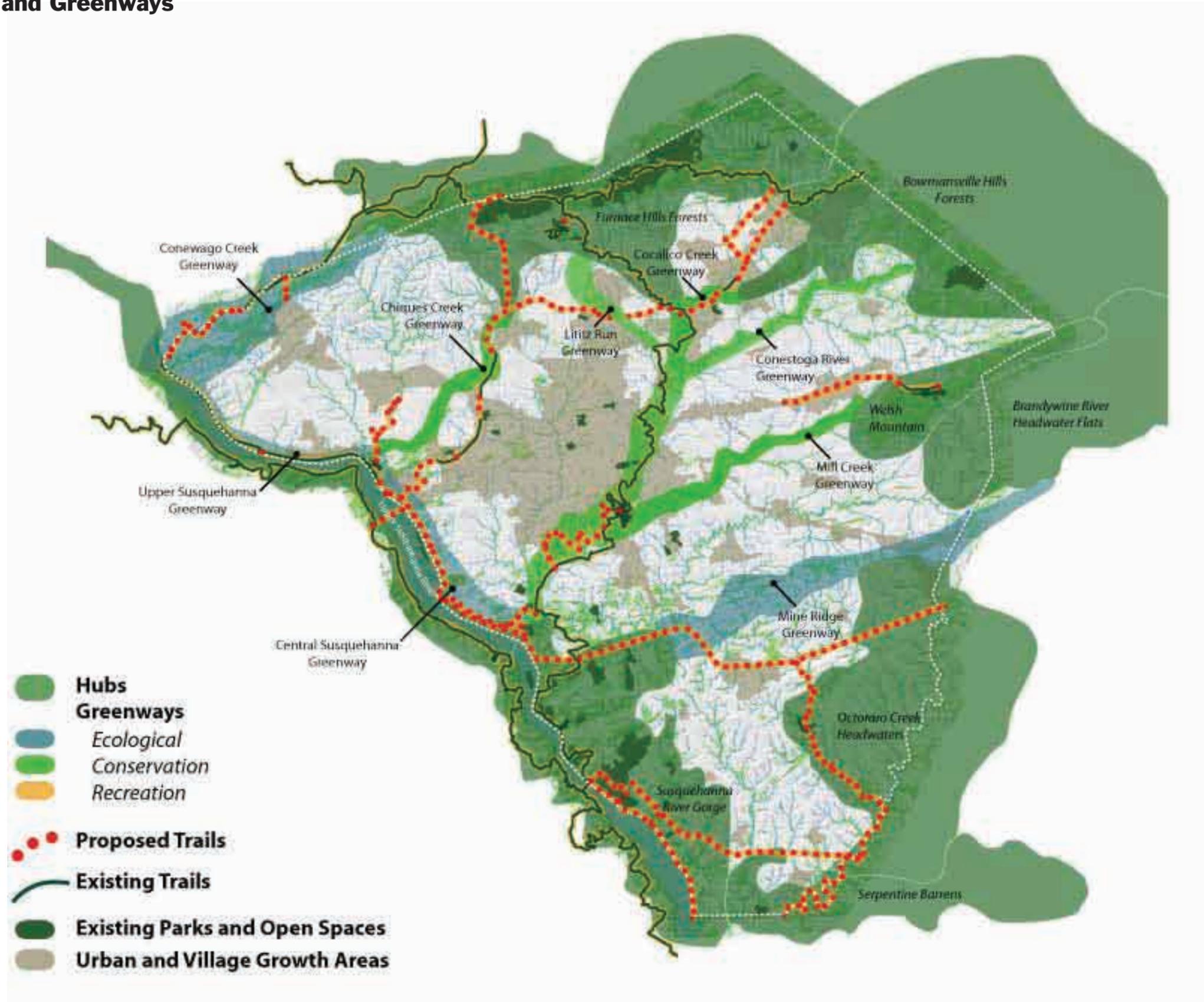


Figure 30 - Lancaster County Green Infrastructure Concept Map



Figure 31 - Hubs and Greenways



cal restoration include low quality streams and riparian buffers, low quality natural communities, priority restoration habitat areas, and areas that could be potentially established as forest corridors. Efforts to heal the County’s landscapes should focus on these areas, which are described in Chapter 2.0 and shown as a composite layer on Figure 28. It should be noted that incorporation of green elements such as street trees, parks and gardens, green roofs, etc. into the built environment is an important aspect of the restoration goal that cannot be mapped at a countywide scale and thus is not illustrated on Figure 28.

- **Goal 4: Recreation**

Enhance the quality-of-life of residents through the provision of a diversity of easily accessible outdoor recreation opportunities and experiences. The availability of quality outdoor recreation experiences is paramount to a high quality of life for Lancastrians. The County’s open space resources – whether resource-based, passive recreational opportunities on lands owned by the Commonwealth of Pennsylvania, Lancaster County, and Lancaster County Conservancy or active recreational opportunities on municipal and school district lands – should be thought of as a system or network that needs to be carefully planned and connected throughout the landscape. These outdoor recreational resources include trails; state, county, and municipal parks; and other types of recreation and open space lands such as school district facilities, state game lands, land owned by the Lancaster County Conservancy, and lands managed by utility companies as natural open space. These various types of resources are described in Chapter 2.0 and shown as a composite layer on Figure 29. Figure 29 illustrates a countywide trail system consisting of existing and proposed trails. The proposed trail segments are described in detail in Appendix C. While only existing county and municipal parks are shown on Figure 29, additional parkland should be added to the system through county and municipal actions to meet the standards of 5 acres of regional (county) parkland and 10 acres of municipal parkland per 1,000 residents.

Figure 30 combines the four categories of resources identified above into a complete green infrastructure system concept map depicting exceptional natural resources to be preserved, natural resources to be conserved, degraded natural resources to be restored, and existing and proposed publicly accessible recreational resources.

3.3 The Structure: Green Infrastructure System Components

The green infrastructure system is not intended to be separate and isolated from land uses such as residential or commercial development and agriculture, but rather to be integrated into the fabric of the County in multiple forms and at multiple scales. In addition to the spatial array of resource types shown in Figure 31, this system can be conceptualized in terms of four basic structural components or “building blocks”:

- Hubs
- Greenways
- Nodes
- Links

The largest scale components of the system, **hubs and greenways** establish the countywide framework for the green infrastructure system. Figure 31 shows the locations of these major system components in diagrammatic fashion, generalized from the Green Infrastructure Concept Map. **Nodes and links** are smaller components of the system (e.g., small parks or woodlots; local trails or stream corridors) found at the intermediate to local scales throughout the County. They should be identified and mapped at the multi-municipal and municipal levels within the countywide framework set by Greenscapes.

Given the intent to integrate the green infrastructure system into the overall fabric of Lancaster County, its four basic structural components – hubs, greenways, nodes, and links – need to be considered not only as individual elements, but also in relation to the larger context in which they occur. Therefore, a fifth structural component of the green infrastructure system has been identified: **landscapes** are the broad patterns of human settlement and use within which hubs,

greenways, nodes, and links are located. Hubs and greenways, nodes and links, and landscapes are described in more detail below in Sections 3.3.1, 3.3.2, and 3.3.3, respectively.

3.3.1 Hubs and Greenways

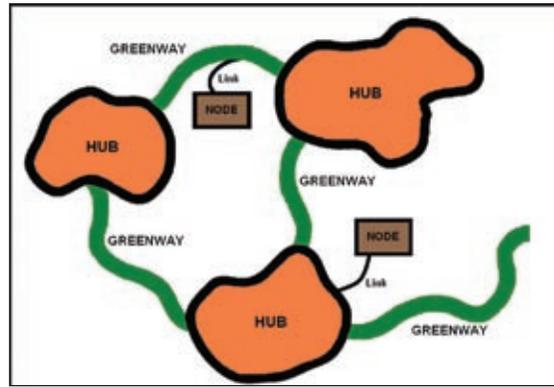
Hubs

Hubs are large areas that contain Lancaster County's greatest concentrations of the exceptional natural resources illustrated on Figure 31, along with support or buffer areas that directly contribute to the health of these resources.

Hubs are mostly located around the periphery of the County, where they extend into adjacent counties. While their primary value and function is to preserve natural resources and provide ecological services, hubs can also support passive recreational activities (e.g., hiking, nature observation, hunting, and fishing) and sustainable resource-based economic activities (e.g., sustainable forestry). These activities should be managed to maintain natural carrying capacity and avoid impacts on sensitive resources (e.g., species of concern habitat). The following green infrastructure hubs (listed alphabetically) are shown on Figure 31:

Bowmansville Hills Forests: The forested hills and rich stream valleys of this northeast hub straddle the border of Lancaster and Berks Counties and include numerous interior forest blocks. The area hosts the 598 acre State Game Lands 52. Creeks originating in the forested landscape feed the Conestoga River and Cocalico Creek in Lancaster County as well as the Schuylkill River in Berks County. The floodplains and wetlands associated with the many streams that meander through the hub provide important habitat for numerous native plant and animal species. These species include species of concern located in ten Natural Heritage Areas identified in the 2007 Lancaster County Natural Heritage Inventory Update.¹ Many of these species are shared with or occur completely within Berks County. The

¹ Natural Heritage Areas support species of concern (plants and/or animals considered rare, threatened or endangered at state or federal levels) that occur singly or in overlapping or adjacent habitats. (Pennsylvania Natural Heritage Program, A Natural Heritage Inventory of Lancaster County, Pennsylvania, Update 2007.)



Connecting various ecological components in the landscape will help rare, threatened, and endangered species survive by enabling them to migrate and diversify the gene pool.

streams originating from the forested hills are of high quality, but become quickly degraded as they progress through downstream agricultural and urban landscapes. Preservation of high quality creeks and restoration of floodplain and wetland habitats on all lower quality creeks should be a priority activity within this hub. In addition, the connectivity of natural habitats, especially intact forests and riparian corridors, should be preserved and enhanced.

Brandywine River Headwater Flats: This hub is located primarily in Chester County, but encompasses similar habitat in eastern Lancaster County where the streams draining south from Welsh Mountain meander across the relatively flat valley of the Pequea Creek watershed. There are no major parks or regional preserves in this area of the county. The predominantly agricultural landscape also contains considerable forested habitats, primarily in Chester County. The forests and other natural environments provide essential habitat for many native plants and animals as well as a key connection in a potential migratory pathway from the Bowmansville Hills Forests through Welsh Mountain to the Octoraro Creek Headwaters Hub. The meandering stream floodplains also provide essential habitat for several species of concern in six Natural Heritage Areas extending into Chester County. Riparian restoration of floodplain and wetland habitats should be a priority activity within this hub.

Furnace Hills Forests: The northern expanse of woodlands between Lancaster and Lebanon Counties referred to as the Furnace Hills contains the largest expanse of forested habitats and

most significant interior forest blocks remaining in Lancaster. The area also contains the largest amount of natural lands preserved in the county. Approximately 8,500 acres of natural lands, comprised primarily of state game lands, have been permanently protected in this hub. The hub also contains the 415 acre Speedwell forge County Park. This area provides substantial habitat and potential migratory pathways for a wide variety of native plants and animals, including a number of species of concern in ten Natural Heritage Areas. The nearly uninterrupted forested landscape provides a link to similar habitats in Lebanon and Berks Counties. In portions of the forest, the lack of understory recruitment of native trees and shrubs and a visible browse line suggests that action needs to be taken to reduce the deer herd. Invasive species of shrubs and trees dominate the understory in other locations, indicating a need for silvicultural restoration to improve future forest stands.

The Furnace Hills Forest hub encompasses a portion of a critical aquifer recharge area in northern Lancaster County that was evaluated by the Susquehanna River Basin in partnership with the Lancaster County Conservation District.² Included in this hub are the headwaters of Chiques Creek, Cocalico Creek and Middle Creek, which provide essential habitat for common native species as well as several species of concern. The Furnace Hills Forests Hub supports a large concentration of the highest quality streams in Lancaster County. However, the water quality of these streams decreases as they traverse agricultural and urban landscapes towards the Susquehanna River. Riparian restoration of floodplain and wetland habitats should be a priority activity within the southern portion of this hub.

Octoraro Creek Headwaters: Octoraro Creek forms the boundary between Lancaster and Chester Counties. Many branches of the creek meander across wide floodplains that have been used for pasture and hay crops. Portions of the floodplain have been revegetated by characteristic floodplain plant communities – primarily on the Chester County side of the creek – while

² Robert E. Edwards and Robert D. Pody, Northern Lancaster County Groundwater Study: A Resource Evaluation of the Manheim-Lititz and Ephrata Area Groundwater Basins, September 21, 2005

the Lancaster County side remains mostly in active agricultural production. Floodplains with native vegetation provide habitat for a variety of plants and animals as well as a potential natural migratory pathway from Chester County through Welsh Mountain south to Maryland. Riparian restoration of floodplain and wetland habitats should be a priority activity within this hub. Very little of the natural landscape has been preserved in this hub. The County's Ted Parker III Natural Area and State Game Lands 136 are the only two areas of significant size that have been preserved.

Serpentine Barrens: This southern hub supports a mixture of agricultural and rural residential uses with scattered woodlots and outcrops of serpentine bedrock that are among the most globally important habitats in Pennsylvania. The serpentine habitats are part of a series of terrestrial habitat "islands" (isolated patches of bedrock) located in southern Lancaster and Chester Counties and adjacent areas of Maryland that should be thought of as a single system. They contain a very high concentration of plant and insect species of concern found in ten Natural Heritage Areas identified in the 2007 Lancaster County Natural Heritage Inventory Update. The Lancaster County Conservancy's Rock Springs Nature Preserve is the only natural area permanently preserved within this hub.

The plants that characterize the serpentine barren habitats are adapted to the dry, nutrient poor soils and periodic fire events and require active management (e.g., prescribed burns) to prevent succession to woodlands. Protection of the core habitat areas and management of the surrounding landscape context is needed to ensure the future of these globally rare habitats. Natural corridors between the barrens should be established to allow genetic flow between isolated species populations. The landscape context may be best maintained in an agricultural or rural setting. Residential development near or between the barrens should be strongly discouraged.

Susquehanna River Gorge: This large hub in the southwest part of the county is known locally as the "River Hills." It includes the area along the Susquehanna River between the mouth of the Conestoga River at Safe Harbor and the Mary-

land border. Because it is characterized by steep, hilly topography and is mostly unsuitable for agricultural uses, this area has retained much of its natural forested character despite being repeatedly logged in the past. It contains 16 Natural Heritage Areas with numerous species of concern and also provides a wide natural habitat corridor that provides a vital link in the regional migratory pathway. Many of the cool, moist ravines provide habitat for an impressive suite of spring wildflowers, drawing tourists to Shenks Ferry and other destinations during the peak spring blooming season. Numerous species of concern also occur within the forested habitats of the ravines. The streams flowing through the forested ravines of this area are considered to have some of the most intact riparian buffers in Lancaster County.

In addition to the Susquehanna River Gorge's forested ravines, the river, its floodplain, and associated islands provide ample habitat for a wide array of native plants and animals. The deep water behind Holtwood Dam is a popular recreational boating area. The Susquehanna River below Holtwood Dam is one of Pennsylvania's most unusual and picturesque riverine landscapes with islands and exposed bedrock that support many plant species that are uncommon in Pennsylvania.

This hub contains a number of nature preserves owned by the Lancaster County Conservancy and a large passive park owned by Martic Township. However, unlike the Furnace Hill Hub, the preserves are smaller and scattered throughout the landscape. There are also several large utility owned parks in this hub. While open to the public, these areas are not permanently protected.

Upper Susquehanna River: The Upper Susquehanna River Hub includes the section of the Susquehanna River between the Dauphin County border at Conewago Creek and the mouth of the Conestoga River at Safe Harbor Dam. Sections of the river are popular recreational boating destinations due to the deep water created by the York Haven and Safe Harbor dams. This area also contains many significant riverine habitats, including eight Natural Heritage Areas, and functions as an important migratory corridor for many birds and fish. Most of the existing natural

habitat is within the river or its floodplain and associated islands, which support a wide variety of native plants and animals including several species of concern. The Susquehanna River is subject to extreme seasonal water level fluctuations; the natural disturbances of flooding and drying, along with seasonal ice scour, help maintain the unique habitats associated with the river. The natural disturbance cycle also creates conditions favorable for the establishment of invasive species of plants, which frequently dominate the shoreline of the river.

There are several large parks in this hub that have helped secure the protection of natural resources in the riparian areas of this corridor. Chickies Rock County Park (422 acres) in West Hempfield and Riverfront Park (238 acres) in East Donegal are two of the largest parks in this hub. The Northwest River Trail—a narrow linear corridor of open space from Marietta to the Dauphin County line—has been protected for the development of a 14-mile multipurpose recreation trail that generally follows the route of the historic PA Mainline Canal.

Recently improved fish ladders on the three major dams on the Susquehanna River in Lancaster County have helped to alleviate formerly impassable barriers to migratory fishes that live in salt water and migrate to freshwater habitats to spawn. However, the American eel, which lives in fresh water but breeds in the ocean, has not benefited from the current fish ladder designs. The American eel may be an important link in the



The American Eel—once a staple of Native Americans and early settlers in Lancaster County—no longer exists in the aquatic habitat of the Susquehanna River due to a number of factors including the presence of hydroelectric dams blocking traditional migratory routes.

lifecycle of several native freshwater mussel species, so an improvement in eel migratory routes may help improve freshwater mussel populations as well.

Welsh Mountain: The hilly topography of the Welsh Mountains in eastern Lancaster County supports extensive forests with several significant interior forest blocks. The forested landscape provides essential habitat and migratory potential for a wide variety of native plants and animals, including several species of concern located in a Natural Heritage Area identified in the 2008 Lancaster County Natural Heritage Inventory Update. Streams draining from Welsh Mountain flow to the Conestoga River, Mill Creek, and Pequea Creek. Most of Welsh Mountain is relatively undisturbed forest; however, several roads and numerous rural residences fragment the tree canopy. The hub includes Lancaster County's 381 acre Money Rocks Park. Over 800 acres of additional natural lands owned by the New Holland Borough Authority as watershed protection for the New Holland Reservoir are currently being acquired by the Lancaster County Conservancy.

Greenways

Greenways are linear “ribbons” that provide the major, countywide connections in the County's green infrastructure system. They run between and through green infrastructure hubs and connect the hubs to the interior of Lancaster County and its major population centers, as well as to greenways in adjacent counties. Greenways generally correspond to major river and stream corridors (including adjoining natural resource areas such as floodplain, riparian vegetation, and steep slopes), although they may also follow upland features such as ridgelines.

Greenways provide a variety of benefits, such as:

- Protection of water quality (filtering sediment, nutrients, and pollutants from runoff)
- Streambank stabilization (erosion protection during high water events)
- Storage of floodwaters
- Habitat for aquatic and terrestrial organisms (including species of concern)
- Migration pathways for native plants and animals (including species of concern)

- Aquatic ecosystem services such as shading, cooling, and providing food (leaf litter) for organisms
- Scenic value
- Recreational and educational opportunities

The functions and benefits of individual greenways vary based upon context. For example, the primary function of the largest greenways with the greatest concentration of natural resources is to preserve those resources and provide ecological services. These greenways should be as wide as possible to protect natural resources, provide interior habitat for species of concern such as neotropical songbirds, and support plant and animal migration. Like the County's green infrastructure hubs (with which they overlap), they can support passive recreational activities managed to maintain natural carrying capacity and avoid impacts on sensitive resources.

At the other end of the spectrum, greenways in Designated Growth Areas are typically limited in width due to surrounding development. Where possible, they should integrate ecological and recreational values through riparian buffers that protect water quality and wetlands while accommodating multi-use trails accessible to the surrounding population. Conversely, public access to greenways in working agricultural landscapes should be limited, although linear resources such as rail trails that can accommodate public access without interfering with the agricultural economy and way of life of the adjacent farm community should be permitted. In general, greenways in these areas should be managed to reestablish natural riparian buffers and reduce the water quality impacts of agricultural practices.

While greenways can provide multiple benefits, the proposed network of primary greenways shown on Figure 31 has been divided into three categories based upon primary function:

- **Ecological Greenways** provide critical habitat corridors for the movement of plant and animal species.
- **Conservation Greenways** promote the protection and restoration of riparian habitat along river and stream corridors, particularly in agricultural areas and

What is a Riparian Buffer?

A riparian buffer is the area adjacent to a stream bank that is inhabited by native trees, shrubs, and other types of vegetation. Riparian buffers offer countless benefits to the adjacent stream, the quality of water in the stream, and the aquatic species living in it. For example, riparian buffers help to improve water quality by filtering pollutants such as pesticides, sediment, nitrogen, and phosphorus contained in runoff from agricultural land. The roots of riparian vegetation hold soil in place, preventing stream bank erosion and sediment from entering the stream. Riparian buffers are most productive when they are allowed to grow freely with native vegetation, creating valuable wildlife habitat. They also provide areas for streams to overflow their banks during times of high water. This recharges groundwater and reduces the potential for flooding downstream by allowing the high water to dissipate naturally.

areas with urban or suburban development. Public access is typically restricted.

- **Recreational Greenways** promote public access and use along linear features such as major river corridors, abandoned rail lines, and canal towpaths.

Several greenways in Lancaster County have been designated as “Major Greenways” by the Pennsylvania Department of Environmental Conservation (DCNR) and are included in the County’s greenway network.³ These greenways are the Susquehanna Greenway, the Lower Susquehanna River Water Trail, the Horseshoe Trail, and the Conestoga Trail. The Susquehanna Greenway and Lower Susquehanna River Water Trail are part of a statewide greenway extending along the Susquehanna River from New York to Maryland, where it connects to a greenway initiative in Maryland. The Horseshoe Trail and Conestoga Trail provide important recreational connections from adjacent counties through the interior of Lancaster County.

The following greenways (listed alphabetically) are shown on Figure 31:

Central Susquehanna Forested Greenway/Upper Susquehanna Forested Greenway: These proposed Ecological Greenways comprise the terrestrial (upland) corridor associated with the Upper Susquehanna River Hub described above. Because the lands have been largely converted to agricultural, urban, and suburban uses, they currently have minimal natural habitat outside of

the vegetation located in the narrow area between the river bank and the railroad tracks that parallel the river. Therefore, in their present condition they provide little opportunity for the migration of native species that rely on upland habitat. By contrast, the Susquehanna River provides an excellent migration corridor for species that can use the aquatic habitat, and the Susquehanna River Gorge Hub to the south contains ample habitat for resident and migrating species. Expanding the upland natural habitat along the length of the Susquehanna River between the Conewago Creek and the Conestoga River should be considered a restoration priority to help improve a vital link in this important regional migratory pathway. The expanded greenway would also provide outdoor recreational opportunities and connect municipalities along the river through existing and proposed trails. It is a key linkage in the state-designated Susquehanna Greenway.

Chiques Creek Greenway: The Chiques Creek Greenway follows Chiques Creek from Manheim Borough to the Susquehanna River. This proposed Conservation Greenway currently has only fragments of natural habitat along the creek, its floodplain, and associated uplands. The many branches and tributaries of Chiques Creek originate in the Furnace Hills, where they are considered among the best quality streams in the County, but the water quality decreases as Chiques Creek flows towards the Susquehanna River. Restoration of floodplain, wetland, and upland forest habitats should be a priority activity along the entire length of Chiques Creek. The restored habitat would help provide suitable habitat for plants and animals, improve the water quality of Chiques Creek, and provide a natural

³ As defined by DCNR, a Major Greenway is 50 miles or more in length, passes through two or more counties, and is recognized in an official planning document.

connection between the Furnace Hills and the Susquehanna River through a predominantly agricultural and urban landscape.

Cocalico Creek Greenway: The Cocalico Creek Greenway is a key linkage connecting the Furnace Hills Forests and Bowmansville Hills Forests Hubs to the Conestoga River Greenway and Susquehanna River. This proposed Conservation Greenway could incorporate undeveloped and underutilized land in around Ephrata Borough and surrounding suburban areas, including the Cocalico Creek floodplain. Cocalico Creek and its associated floodplain and upland areas currently have only fragments of natural habitat. Riparian restoration would provide additional habitat for plants and animals, improve water quality, and create a local migratory corridor through a predominantly agricultural and urban landscape. Recreational opportunities could be provided for local communities, as compatible with establishing viable natural habitat.

Conestoga River Greenway: The Conestoga River is a proposed Conservation Greenway that is also a state-designated “Major Greenway” containing Lancaster County’s longest continuous trail, the Conestoga Trail. The greenway includes numerous fragments of natural habitat along its length from its headwaters in the Bowmansville Hills Forests Hub to the confluence with the Susquehanna River. These fragments include forested uplands where the creek is flanked by steep slopes and wide floodplain areas that occur intermittently along the meandering course of the river. The Conestoga River passes through southern Lancaster City, creating a potential barrier for animals using the river corridor as a migratory pathway. Upstream and downstream of Lancaster City, the surrounding landscape consists primarily of agriculture, rural residential development, and newer suburban development. By combining preservation of the remaining fragments with restoration of additional floodplain, wetland, and upland forest areas along the river and its tributaries, the Conestoga River could become a significant habitat corridor through Lancaster County to the Susquehanna. This restoration would provide additional habitat for plants and animals, improve water quality, and create a migratory corridor through the predominantly agricultural and urban landscape. Habitat



Linear open spaces (or Greenways) such as this along the Pequea Creek, serve as habitat for migratory animal species; filters stormwater before it enters the stream; and provides open space for recreation.

restoration could also provide an opportunity to expand recreational opportunities associated with the existing trail, serving communities along the length of the Conestoga River, as compatible with establishing viable natural habitat. The Conestoga Greenways River Corridor Conservation Plan, published by the Lancaster Intermunicipal Committee (LIMC) in 1999, provides strategies to develop greenways along sections of the Conestoga River, Little Conestoga Creek, and the West Branch of the Little Conestoga Creek in central Lancaster County.

Conewago Creek Greenway: The Conewago Creek Greenway is a proposed Ecological Greenway located between the Pennsylvania Turnpike and the Susquehanna River. The creek, stream banks, and adjacent vegetated upland areas provide habitat for a variety of native plants and animals, including several species of concern located in two Natural Heritage Areas. The greenway contains numerous patches of natural habitat, including several blocks of interior forest that form a “stepping stone” connection between the Furnace Hills Forests and the Upper Susquehanna River Hubs. Most of the forested habitat of this greenway occurs on thin soils over diabase bedrock that are not suitable for agricultural uses, so much of the area has remained forested. The Conewago Creek floodplain contains lesser amounts of natural habitat and should be considered a priority for riparian restoration.

Lititz Run Greenway: The Lititz Run Greenway is a proposed Conservation Greenway that follows the stream corridor and incorporates its

tributaries to the northeast. The headwaters of Lititz Run are primarily agricultural lands in the northwest part of the watershed. One species of concern has been documented at the cave openings of a spring that emanates from limestone bedrock in a park in Lititz Borough. The watershed incorporates all of Lititz Borough and the surrounding designated growth area in Warwick Township. The much-heralded Lititz Run has been the focus of a public-private restoration initiative for the past 20-years. Stream restoration initiatives in the corridor include riparian buffers, dam removal, agricultural best management practices (BMPs), floodplain restoration (including legacy sediment removal), and several wetland rehabilitation projects. Continued focus on BMPs, in the headwaters of the watershed, urban greening efforts in the designated growth area, and floodplain restoration will help continue the significant gains in water quality already achieved.

Mill Creek Greenway: Mill Creek is a proposed Conservation Greenway connecting the Welsh Mountain Hub with the Conestoga River Greenway and the Susquehanna. Like the other potential greenways, Mill Creek flows through a landscape dominated by agriculture, rural residences, and suburban developments and currently has only scattered fragments of natural habitats. With a combination of preservation of the fragments remaining and restoration of floodplain, wetland and upland forest habitats, Mill Creek could become a significant habitat connector through the county to the Susquehanna River. Restoration of floodplain, wetland



Trails can provide educational opportunities if they are paired with interpretive resources, such as this wayside panel along the Heritage Path in Chickies Rock County Park.

and upland forest habitats should be a priority activity along the entire length of Mill Creek and its tributaries to improve water quality and create a significant habitat corridor across the County.

Mine Ridge Greenway: The Mine Ridge Greenway is a proposed Ecological Greenway that follows a ridgeline of undulating hills that runs east-west across the southern part of Lancaster County and supports a significant series of upland forested habitats. The hilly topography and thin soils over quartzite bedrock are the likely factors that have kept the land out of agricultural production. Despite several significant interruptions, particularly in the vicinity of Route 222, the forested ridgeline makes a natural migratory pathway between the Lancaster / Chester county line and the Susquehanna River. Restoration of natural habitats along the floodplains of Big Beaver Creek and Little Beaver Creek could help provide the missing connections. By combining preservation of the forested ridgeline with restoration of floodplain and wetland habitats, Mine Ridge could become a significant habitat connector across southern Lancaster County.

3.3.2 Nodes and Links

The hubs and greenways are the largest components of Lancaster County's green infrastructure system and can be mapped at a countywide scale. Other existing and potential components of the system exist at a more local scale throughout rural, suburban, and urban parts of the County, where they can be identified and mapped through municipal and multi-municipal planning efforts within the countywide framework set by Greenscapes. They take a variety of forms and can perform a variety of functions, but are generally classified as **nodes** (local green infrastructure resources) and **links** (linear green infrastructure connections).

Nodes range from localized and sometimes isolated occurrences of natural resources (e.g., woodland, wetlands, steep slope areas with natural vegetation, and species of concern habitat) to "managed" landscape features in more urban settings (e.g., parks, other "green" open spaces, and vegetated stormwater management areas). Nodes can provide a variety of benefits, such as

water and air quality improvement, stormwater management, wildlife habitat, and recreation. While they can occur as isolated sites within surrounding agricultural or urban landscapes, their value to the green infrastructure system is enhanced when they are connected by greenways or links.

Links are smaller scale, linear components of the green infrastructure system that include both natural features (e.g., small stream corridors) and man-made feature (e.g., trails within rights-of-way). Similar to nodes they provide a variety of benefits ranging from water quality protection and stormwater management to recreation, with an emphasis on connectivity. A promising type of green infrastructure link for Lancaster County's urban and suburban areas is the "green street," a concept that has been developed in cities such as Portland and Seattle. Green streets typically integrate the following:

- Stormwater management such as vegetated swales and bioretention areas within the right-of-way, thus reducing the need for piped infrastructure

- Canopy trees that intercept rainwater, improve air quality, and cool the temperature
- Safe connections for bicyclists and pedestrians

Hedgerows – linear strips of trees, shrubs, and herbaceous plants along field borders – are an example of a link in rural parts of Lancaster County. Hedgerows provide wildlife habitat, reduce stormwater runoff and soil erosion, decrease wind damage, and provide opportunities for diversified income from farming operations.

3.3.3 Landscapes

Landscape is a word with rich and varied meanings. The traditional definition of the term relates to its visual or scenic qualities (e.g., "an expanse of scenery that can be seen in a single view"). Another definition relates to natural elements such as landforms or rivers that characterize a region. Two such regional landscapes designated by multi-state or state programs occur in Lancaster County:

What is a Landscape?

A Landscape is generally defined as a geographic region where the interaction of people and nature over time has produced an area of recognizable character with distinct aesthetic, ecological, and cultural values. The relationship of people and the land and natural resources they use to sustain them shapes the landscape and, in turn, the landscape shapes the people living in it--their settlement patterns, buildings, livelihoods, products, cultural practices and beliefs. Therefore, landscapes encompass the past and the present and include both tangible and intangible heritage elements. These landscapes can range from those that are primarily natural in character to those that have an emphasis in cultural distinctiveness.

While it is nearly impossible to find a landscape in today's world that hasn't had some human influence, there are still places that are very rich in biodiversity and other natural values. Here in Lancaster County, the Susquehanna River Gorge, the Furnace Hills, and the Welsh Mountains all exhibit this type of character. These are working landscapes that still contain a high level of biological diversity and important natural, cultural, and recreational resources. Other areas of the County illustrate a more dominant cultural influence on the landscape, such as the Mill Creek Valley in eastern Lancaster County where the Amish and Plain Sect communities practice their agrarian way of life.

The landscapes of present day Lancaster County are appreciated by residents and millions of visitors alike each year. These landscapes have been inherited from the past and reveal the relationships that people have had with their surroundings over time. As stewards of these living working landscapes, it is this generation's responsibility to help conserve and preserve these dynamic and highly complex resources for the future as models of sustainable land use and development.

- The Furnace Hills Forests and Welsh Mountains Hubs are part of the **Highlands Region**, a large geographic area of forested mountains and hills extending from northwestern Connecticut through New York, New Jersey, and Pennsylvania to the Maryland state line. The Highlands was recognized by the Highlands Conservation Act, signed by President Bush in 2004.
- The **Susquehanna River Corridor** in Lancaster County, which includes the Susquehanna River Gorge and Upper Susquehanna River Hubs, is part of the Susquehanna Greenway designated by the Commonwealth of Pennsylvania. It is also part of a river system that originates in upstate New York, flows through Pennsylvania and Maryland, and empties into the Chesapeake Bay, one of the world's great estuaries.

The Highlands and the Susquehanna have been designated by the Pennsylvania Department of Conservation and Natural Resources as two of only five “Mega-Greenways” within the Commonwealth. In addition, the lower Susquehanna River corridor has recently been recognized by DCNR as a Conservation Landscape Initiative (CLI). The CLI recognition is given to landscapes with state-significant natural resources and character. The CLI designation is a holistic planning approach that enables DCNR to focus both technical and financial resources in specific regions to preserve the characteristics that make them distinct.

While the Highlands and the Susquehanna River Corridor are major resources that provide a regional context for a significant part of Lancaster County's green infrastructure, a more holistic definition of landscape is needed that applies across the County. For the purposes of Greenscapes, **landscapes** are defined as the broad physical patterns of human settlement, land use, and resource conservation within which the core components of the green infrastructure system – hubs, greenways, nodes, and links – occur. At the broadest level, these landscapes are the Urban and Village Growth Areas and the Rural Areas defined by the Growth Management Element of the Lancaster County Comprehensive Plan. The Growth Management Framework Map further breaks down Rural Areas into three designations (Agricultural Areas, Agricultural with Natural Areas, and Natural Areas) based on mapping of key resource and land use factors.

Achieving the vision of a healthy green infrastructure system in Lancaster County depends not only on establishing the core hubs, greenways, nodes, and links, but also on managing the surrounding urban and rural landscapes to sustain green infrastructure functions and values. This means taking action at the landscape level to preserve and enhance the core components (e.g., riparian reforestation along stream corridor greenways and links in urban or agricultural landscapes to improve water quality). It also means integrating green infrastructure directly into the landscape fabric. In rural areas, this could mean approaches such as sustainable forestry or agriculture and improving wildlife habitat on farmland. In urban areas, it could mean approaches such as green roofs, canopy tree plantings, and backyard habitat.

Goals, Objectives, and Strategies

4.1 Goals, Objectives, and Strategies

The goals, objectives, and strategies presented in this section provide a framework for action to achieve the strategic vision set forth in Chapter 3.0. They address the four fundamental purposes of Lancaster County’s green infrastructure system defined in Section 3.2:

- **Preservation** of exceptional natural resources
- **Conservation** or stewardship of important natural resources and the essential life support services they provide
- **Restoration** of natural resource systems and ecological connections
- **Recreation** and improved community health

Section 4.2 identifies specific tools that can be used to carry out the goals, objectives, and strategies.

4.1.1 Preservation

Goal 1: Preserve Lancaster County’s exceptional natural resources.

Exceptional natural resources include the best remaining examples of Lancaster County’s natural heritage and should be preserved as the foundation of the green infrastructure system. Examples include small stream headwaters species of concern core habitat and high quality forests identified in the Pennsylvania Natural Heritage Program’s 2008 Update of the Natural Heritage Inventory of Lancaster County, PA and “natural gems” identified by the Lancaster County Conservancy Long Range Protection Plan. These resources require the highest degree of protection and management as necessary to ensure their continued existence and eliminate disruptive influences.

In order to achieve the goal of preserving the County’s exceptional natural resources over the next 20 years, an average of 4,675 acres of open space will have to be protected each year. This benchmark was determined by taking a 20 year planning timeframe against the total land acre-

age that needs to be preserved based on Figure 30 (93,371 acres). By meeting this benchmark in 2028, 18% of the Lancaster County will be permanently protected in open space. Given the increase in the availability of open space funding in the last few years, the growing interest in the use innovative open space development design techniques and the increase collaboration amongst public and private entities, this benchmark is achievable.

Objectives

- 1A. Secure the future of the County’s natural heritage by defining, identifying, and permanently protecting its most important natural and treasured resources.
- 1B. Ensure the long term viability of the County’s biological diversity by maintaining, enhancing, and restoring species of concern habitats and greenway connections between them.

Strategies

- Maintain an up-to-date inventory of species of concern habitat and other high quality natural areas in Lancaster County.
- Utilize the inventory in policy, planning, and regulatory initiatives and decision-making at the countywide, regional, and municipal levels.
- Permanently protect high quality areas identified in the inventory through acquisition or easements targeted towards eliminating “gaps” and encouraging the contiguity and connectivity of lands with ecologically significant habitats, species of concern, and other outstanding natural communities.
- Work with landowners to develop site-specific management plans to maintain and restore the integrity of high quality natural heritage areas (e.g., rare species habitats such as bog turtle wetland sites and serpentine barrens).
- Conduct outreach to citizens and officials on the importance of preserving Lancaster County’s exceptional natural resources.

4.1.2 Conservation

Goal 2: Conserve natural resources and services throughout Lancaster County's urban, suburban, and rural landscapes.

Important natural resources such as river and stream corridors, floodplains, wetlands, woodlands, and steep slopes are located throughout rural, suburban, and urban parts of Lancaster County. "Conservation" refers to the management of these resources to maintain their ecological functions and natural carrying capacity. For example, existing natural vegetation should be maintained on steep slopes and in riparian/floodplain areas to prevent erosion, protect water quality, and minimize flooding. In many cases, active restoration is needed to reestablish natural resource functions such as water quality protection (e.g., by planting native vegetation along rivers and streams). Restoration is addressed separately under Goal 3 below.

Objectives

- 2A. Maintain the ecological integrity of environmentally sensitive lands.
- 2B. Promote land management practices that result in the conservation and sustainable use of renewable natural resources.
- 2C. Increase the understanding and awareness of citizens and elected officials of the social, economic, and environmental importance of natural resource conservation.

Strategies

- Protect river and stream corridors, floodplains, wetlands, forested areas, steep slopes, and other natural resources through municipal zoning and subdivision regulations and conservation easements.
- Conserve natural resources, including environmentally sensitive lands within Designated Growth Areas (DGAs), through municipal regulations and incentives and better site design practices in new development.
- Conserve groundwater resources through actions to protect groundwater quality and quantity within critical aquifer recharge areas.
- Address natural resource conservation in policy and planning initiatives at the

countywide, regional, and municipal levels.

- Provide information and technical assistance to landowners to encourage conservation (e.g., sustainable forestry or agricultural practices that maintain the integrity of streams, forests, steep slopes, and other natural resources).
- Provide information and incentives to developers to encourage site design practices that reduce impervious surfacing and conserve open space and natural resources.
- Conduct outreach to citizens and officials on the importance of conserving Lancaster County's natural resources.

4.1.3 Restoration

Goal 3: Restore ecological connections and natural resource systems throughout Lancaster County's urban, suburban, and rural areas.

Much of the improvement in the quality of the County's air and water resources, plant and animal habitats, and overall community health will come as a result of efforts to heal the landscape through environmental restoration initiatives. A prime example is the need for river and stream restoration in agricultural and rural areas to improve water quality. Some of the best opportunities for environmental improvement are found in urban and suburban communities where green infrastructure features can be woven into the built fabric to provide environmental services such as energy conservation and improved air



Restoring buried floodplains and riparian areas, like this along Swarr Run in East Hempfield Township, can improve both water quality and habitat for native plants and animal species.

and water quality. Reestablishing migratory connections between species of concern habitats; installing livestock fencing and establishing riparian buffers along waterways in agricultural areas; restoring floodplains through the removal of so-called “legacy sediments” that have accumulated over the past two centuries; and planting shade trees in dense urban neighborhoods are just a few examples of restoration actions that can be taken to mitigate human impacts on the environment.

Objectives

- 3A. Restore Lancaster County’s natural environment and its ecological functions.
- 3B. Incorporate green elements throughout the built environment to improve the environmental quality of urban and suburban development.
- 3C. Enhance the quality and ensure the quantity of surface and groundwater resources needed to sustain healthy aquatic ecosystems, drinking water supply, and water-based recreation activities.
- 3D. Improve Lancaster County’s air quality through reforestation and planting.

Strategies

- Work with farmers and other landowners to establish riparian buffers of native vegetation along river and stream corridors throughout Lancaster County.
- Encourage all home and business owners throughout the County to landscape with native plants.
- Provide information and technical assistance to landowners to encourage restoration through measures such as invasive species control, reforestation, and ecological restoration (reestablishment of native plant and animal communities).
- Promote the propagation and reintroduction of rare native plant species into landscapes throughout the County in order to increase biodiversity (e.g., into “backyard restoration” areas)
- Target restoration of natural resources towards enhancing the ecological integrity of identified hubs and the greenway corridors that connect them.
- Integrate green infrastructure into development patterns in urban and suburban areas through measures such

as tree plantings, natural stormwater management practices (e.g. “rain gardens”), green streets, green roofs, and environmental restoration (e.g., degraded stream corridors, vacant properties, and remnant natural areas).

- Enact municipal regulations and incentives (street tree or parking lot planting requirements, sustainable stormwater management requirements, etc.) to promote incorporation of green infrastructure into new developments.
- Promote water quality restoration and reduction of pollutant loads to surface and ground waters through regional policy, planning, and implementation initiatives (watershed planning, nutrient trading, etc.), with the objective of meeting or exceeding all applicable water quality standards.
- Encourage restoration of native habitats on large institutional campuses (schools, hospitals, etc.) and business/industrial parks as an alternative to non-native lawns and landscape plantings that require intensive maintenance.
- Conduct outreach and provide technical assistance to citizens, officials, landowners, and developers on ways to restore natural resources and integrate green infrastructure into existing and new development.

4.1.4 Recreation

Goal 4: Enhance the quality-of-life of residents through the provision of a diversity of easily accessible outdoor recreation opportunities and experiences.

This goal embodies the Latin origin of the word recreation: “restoration to health.” It promotes outdoor recreation, walking, biking, and paddling and their roles in supporting healthy lifestyles as key benefits provided by the green infrastructure system. Recreational opportunities for citizens are needed at scales ranging from a countywide system of regional parks and greenway trails to close-to-home parks, sidewalks, paths, and trails serving urban and suburban communities. These opportunities will not only improve quality of life and community health,

but also contribute to improved air quality and reduced carbon emissions by encouraging walking and biking as alternatives to automobile use.

Objectives

- 4A. Protect large open spaces for passive outdoor recreational opportunities such as hiking, biking, paddling, wildlife viewing, outdoor learning, and the traditional pastimes of hunting and fishing.
- 4B. Provide a diversity of close-to-home, active recreation opportunities within Designated Growth Areas (DGAs).
- 4C. Create a countywide network of open/green spaces and connections between them.
- 4D. Improve community health by providing convenient, accessible opportunities for outdoor recreation and exercise.

Strategies

- Complete the Lancaster County regional park system and prepare management plans for individual parks that provide for passive recreation while maintaining and restoring natural resources.
- Encourage the Commonwealth of Pennsylvania, power companies, and other landowners to manage large open spaces to accommodate passive recreation and natural resource preservation.
- Provide active recreation within Designated Growth Areas through planning, regulations, capital investment, and partnerships at regional and municipal levels, with the goal of providing a minimum of 10 acres of community and neighborhood level parkland per 1,000 residents.
- Develop a countywide greenway trail system linking urban and suburban communities to regional parks and open space resources.
- Develop pedestrian and bicycling networks (sidewalks, trails, designated bike routes, etc.) at the countywide, multi-municipal, and local levels.
- Provide information and conduct outreach to Lancaster County citizens on the importance of and availability of recreational resources in the County.

4.2 Tools

Concerted and coordinated action over time by a wide spectrum of stakeholders – ranging from governmental agencies to nonprofit land trusts to private businesses, landowners, and citizens – is needed to realize the goals, objectives, and strategies identified in Section 4.1. This section of the plan identifies tools that can be used by these different entities to create the green infrastructure system. Chapter 5.0 lays out an action plan for applying the tools, including action steps to be taken by the County; direction regarding funding, organization and management; and monitoring of progress in plan implementation.

The tools are divided into four broad categories:

1. **Policy and Planning:** Address green infrastructure as a fundamental element of policy and planning initiatives at the regional, county, multi-municipal, and municipal levels.
2. **Regulation:** Address the green infrastructure goals of preservation, conservation, restoration, and recreation in municipal development regulations and incentives.
3. **Capital Investment:** Establish green infrastructure system components through public and private sector financial investment.
4. **Outreach and Partnerships:** Provide information and technical assistance to the public and involve landowners and other citizens in creating the green infrastructure system.

A priority tool(s) is recommended for each category, followed by additional tools listed in alphabetical order. Information provided for each tool includes a description, how the tool can be applied to Lancaster County's green infrastructure, and examples of current applications inside or outside of Lancaster County where applicable. The tools can be integrated with tools from other Lancaster County Comprehensive Plan elements, including the "Smart Growth Toolbox" developed for the Growth Management Element. A summary table identifying the goals (preservation, conservation, restoration, and/or recreation) and the growth management strategies (Urban Growth Area Strategy and/or Rural Strategy) that apply to each tool is provided at the end of the chapter.

4.2.1 Policy and Planning Tools

Purpose

Address green infrastructure as a fundamental element of policy and planning initiatives at the regional, county, multi-municipal, and municipal levels.

Major policy and planning initiatives include regional plans (e.g., the Pennsylvania Highlands Conservation Area initiative), the Lancaster County Comprehensive Plan and its functional elements (including Greenscapes), multi-municipal comprehensive plans (e.g., LIMC Growing Together), and functional plans (e.g., parks and recreation plans), also at the multi-municipal and municipal levels. Many of these plans address green infrastructure concepts in some fashion. For example, the Growth Management Element of the Comprehensive Plan addresses “Treasured Resources” as a key issue area, including:

- Environmentally sensitive resources... preserved a part of a network of open space and parks within Urban Growth Areas. (River and) stream corridors can provide an organizing physical framework for a countywide greenway/blueway network. (Urban Growth Area Strategy, p. 4-19)
- Healthy and functioning natural lands and systems, including water resources (surface and groundwater), natural habitat areas, and associated outdoor recreational opportunities. (Rural Strategy, p. 5-24)

Previous county, multi-municipal, and municipal planning efforts have not, however, addressed green infrastructure resources, functions, and benefits as a holistic system. Rather, they have typically addressed topics such as land use, transportation, and parks and recreation in a piecemeal manner without considering their broader implications for green infrastructure. The policy and planning tools are intended to integrate the green infrastructure system concept into policy and planning initiatives at the county, multi-municipal, and municipal levels.



Restoring green infrastructure resources like this stream segment along the Pequea Creek in southern Lancaster County will require policy and planning initiatives at all levels of government.

Priority Policy and Planning Tool

• I-A Green Infrastructure Planning

Description: Municipal and multi-municipal plans that define green infrastructure resources and strategies at the local level.

Green Infrastructure Application: Green infrastructure planning is an emerging concept nationwide. This plan is one of the first applications of the concept by a county as a comprehensive plan element. Following the model used by the LCPC to encourage preparation of regional comprehensive plans by municipalities, municipal and multi-municipal green infrastructure plans are proposed as the priority policy and planning tool to implement the plan. Just as the County’s Policy Plan and Growth Management Element provide guidance for municipal and multi-municipal comprehensive plans, the Green Infrastructure Element of the Comprehensive Plan establishes an overall framework for preparation of multi-municipal and municipal green infrastructure plans.

Three basic steps should be used to develop these plans:

1. Inventory existing green infrastructure resources in the municipality or municipalities.
2. Evaluate the degree of protection afforded to existing green infrastructure resources by regulation or ownership.

3. Develop strategies to protect, enhance, and restore green infrastructure resources and functions within the community.

In Lancaster City and the boroughs, green infrastructure plans can be used to promote “greening” of the urban environment. Preparation of municipal and multi-municipal green infrastructure plans should be supported by funding and technical assistance from the County and could be tied to a green infrastructure grant program for project implementation (see Chapter 5.0).

Example: There are no existing examples of green infrastructure plans at the municipal or multi-municipal levels.

Other Policy and Planning Tools

- **I-B Bicycle and Pedestrian Plan**

Description: A plan that defines a network to accommodate bicycle and/or pedestrian travel for recreation, commuting to work, and other purposes. Bicycle networks can include on-street bike lanes and off-street paths. Pedestrian networks can include sidewalks integrated with the street system as well as off-street trails. Both bicycle and pedestrian travel can be accommodated on multi-use paths or trails.

Green Infrastructure Application: Mobility is a key benefit provided by green infrastructure. Bicycle and pedestrian planning can be used as a tool to implement the green infrastructure system, particularly when conceived holistically in the context of multiple functions that can be performed by connections such as greenway trails and “green streets.”

Example: Lancaster County has a county-wide Bicycle and Pedestrian Transportation Plan and a map/guide to bicycling, walking, and transit in the County.

- **I-C Comprehensive Plan**

Description: An adopted municipal or multi-municipal document designed for use in decision-making by officials and citizens to guide future growth, development, and

preservation over a long-range (20-30 year) time horizon.

Green Infrastructure Application: Comprehensive plans by Lancaster County municipalities are typically prepared with funding and technical assistance by the Lancaster County Planning Commission (LCPC). Using the County’s Green Infrastructure Plan as a framework, the LCPC should educate local citizens and officials on the meaning and importance of green infrastructure and promote incorporation of green infrastructure goals, objectives, and strategies into comprehensive planning efforts.

Example: “Growing Together,” the Central Lancaster County Comprehensive Plan prepared by the Lancaster Inter-Municipal Committee (LIMC).

- **I-D Greenway/Open Space Plan**

Description: A plan that identifies strategies for the preservation and development of a greenway corridor or larger open space system in the context of the land use and development pattern of a municipality or a region.

Green Infrastructure Application: Greenways and open spaces are key components of green infrastructure. Greenway and open space plans can be used as tools to promote implementation of the green infrastructure system identified in this plan at the regional, multi-municipal, and municipal levels. However, priority should be given to preparation of more comprehensive and integrated green infrastructure plans.

Example: Conestoga Greenways: A River Corridor Conservation Plan.

- **I-E Heritage Byways**

Description: A new program initiated by LCPC to designate county roads with special significance as “Lancaster County Heritage Byways.” This program is intended to promote protection of roads that have “intrinsic qualities” (i.e., significant archaeological, cultural, historic, natural, recreational, and/or scenic resources).

What is a Landscape Conservation Plan?

Over the last few decades, there has been a growing recognition by national and international preservation organizations that a new approach to landscape conservation is necessary if to protect large, special landscapes for future generations. This new approach recognizes that the cultural and natural values of people and landscapes are inextricably linked and their future protection will depend on sustaining people's relationship to the land and its resources. It is now understood that stewardship of special landscapes and their associated resources is both an individual and a community responsibility. Since these landscapes typically encompass a mosaic of public, private and non-profit land ownership patterns, it follows that their future protection will be based on our ability to foster stewardship by those that own and/or live on the land, putting conservation in the hands of the people most affected by it.

A Landscape Conservation Plan, then, is a community-based approach to defining and implementing key strategies that will promote the future protection of these distinctive areas. Such a plan recognizes the multitude of landownership patterns, land use regulations, and land management practices that exist within in large-scale landscapes and fosters a coordinated and community-based collaborative approach to the future stewardship and protection of these special places. Landscape Conservation Plans are intended to guide future decisions and provide appropriate tools for the public, private and non-profit sectors to manage change in a way that contributes to a landscape's distinctive identity rather than detract from it.

The Lower Susquehanna River Corridor in Lancaster and York counties was chosen as the prototype for the development of a conservation plan to achieve these goals and serve as a model for other large natural or cultural landscapes within the region.

Green Infrastructure Application: The Heritage Byways Program is modeled in part after but is separate from state and federal byways programs, which emphasize "scenic" roadway qualities. It can be used to promote preservation and conservation of green infrastructure resources along roadways in Lancaster County. The program recognizes two types of byways:

- **Tourism Development Byways** combine resource preservation and conservation with heritage tourism marketing and promotion.
- **Preservation Byways** focus on resource preservation and conservation and will not be marketed to visitors.

The five-step designation process includes preparation of a Corridor Management Plan that includes procedures, controls, operational practices, and administrative tools to protect and enhance the byway.

Example: East Lampeter Township, Leacock Township, and Salisbury Township have expressed strong interest in studying the feasibility of designating Old Philadelphia Pike a Heritage Byway.

- **I-F Landscape Conservation Plan**

Description: A plan for a large-scale landscape that is defined by natural elements such as a common landform or a river valley. Multi-state and multi-county regional landscapes in Lancaster County include the Susquehanna River Corridor and the Highlands Region.

Green Infrastructure Application: Natural landscapes such as Welsh Mountain and the Furnace Hills (both part of the Highlands Region) and the Susquehanna River Gorge are the largest and most intact components of Lancaster County's green infrastructure system. These landscapes are experiencing ecological fragmentation and erosion of scenic character due to scattered rural de-

velopment. Regional landscape plans can be used as a tool to involve a range of partners in developing and implementing strategies to protect these important resources.

Example: Lancaster and York Counties are in the process of preparing a Susquehanna River Corridor Master Plan as a model for large-scale landscape conservation planning.

- **I-G Official Map**

Description: An official document adopted by a municipality that maps existing and proposed streets, pedestrian easements, open space, and other public lands or easements. The adopted map officially reserves the land for future public purpose.

Green Infrastructure Application: Official maps can be used to officially designate and reserve components of the green infrastructure system at the municipal level.

Example: Manor Township Official Map.

- **I-H Park and Recreation Plan**

Description: A plan that identifies strategies to meet the needs of current and future residents of a municipality or group of municipalities for parks and recreation facilities.

Green Infrastructure Application: Parks and outdoor recreation facilities are key components of the green infrastructure system in urban and suburban areas. Providing these facilities is the responsibility of municipalities and other local entities. Greenscapes establishes an overall framework and guidance for more detailed parks and recreation planning at the municipal and multi-municipal levels.

Example: Eastern Lancaster County Region Recreation, Park, and Open Space Plan.

- **I-I Transportation Plan**

Description: A plan defining capital improvements and other actions to be taken to develop a transportation system at the countywide, multi-municipal, or municipal levels. Transportation can also be addressed as an element of a comprehensive plan.

Green Infrastructure Application: In the past, transportation plans have often been damaging to green infrastructure resources because they emphasized mobility for automobiles at the expense of other values. However, transportation planning can be used to promote green infrastructure goals through approaches such as encouraging the use of alternative transportation modes and context-sensitive design that reduces impacts on natural resources.

Example: The Lancaster County Planning Commission maintains a transportation element of the Lancaster County Comprehensive Plan.

- **I-J Water Resources Plan**

Description: A plan to protect ground and surface waters, typically as they provide for drinking water supply. Watershed plans that address stormwater and surface water management are addressed separately below.

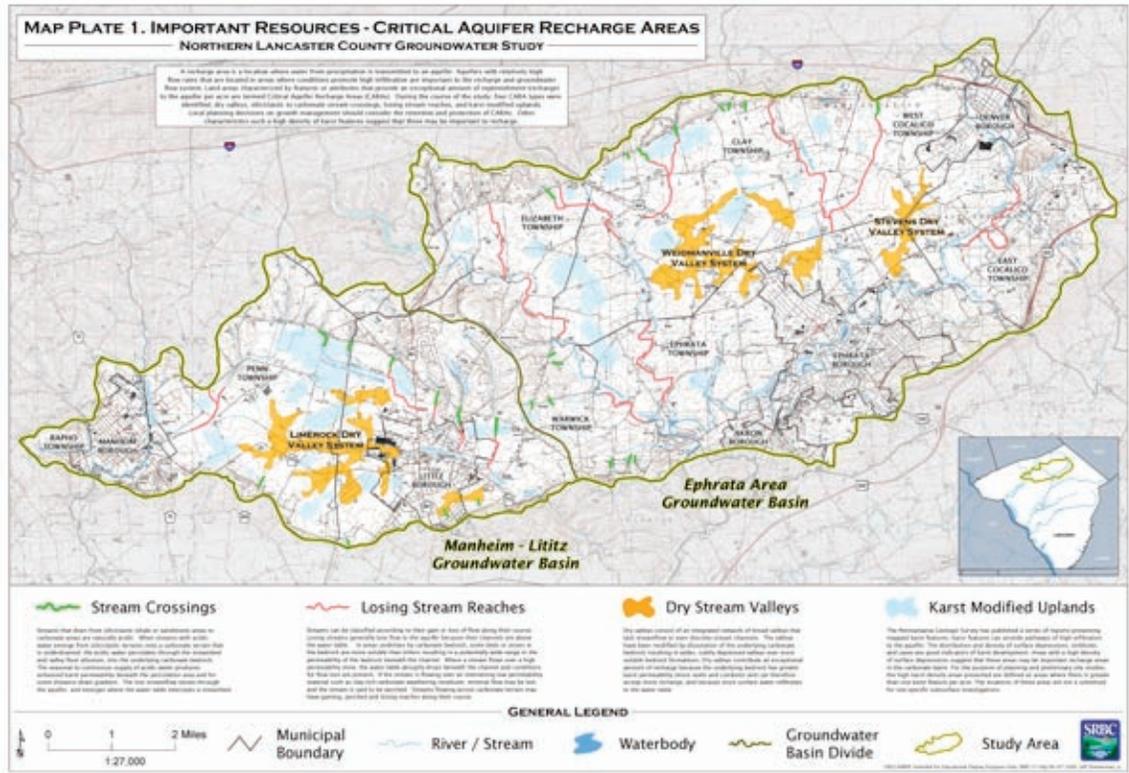
Green Infrastructure Application: Protecting water quality and safeguarding the quantity of Lancaster County's water supply are important functions performed by a healthy green infrastructure system. The need for planning to ensure a sufficient, sustainable, and safe drinking water supply will increase in importance as Lancaster County continues to grow. Water resources plans can be used to identify important areas that recharge the County's drinking water supplies – referred to as critical aquifer recharge areas – and develop strategies for their protection.

Example: The Northern Lancaster County Groundwater Study is a groundwater resources evaluation of a Critical Aquifer Recharge Area (CARA) prepared by the Susquehanna River Basin Commission (Figure 32).

- **I-K Watershed Plan**

Description: A plan intended to provide a framework for action to both restore water quality in impaired waters and to protect water quality in other waters threatened by

Figure 32 - Northern Lancaster County Groundwater Study Area



Northern Lancaster Groundwater Study

Changes in watershed hydrology can impact the availability of groundwater for municipal, domestic, industrial, and agricultural uses. New development, for example, can have small, incremental impacts on the environment that cumulatively result in adverse hydrologic changes. For example, in areas where residents depend on wells for their drinking water, scattered development can deplete underground aquifers and by increasing impervious surfaces and reducing water infiltration.

In northern Lancaster County, meeting current and future water supply needs has been a concern for local officials for over a decade. The area has been designated a potentially stressed area (PSA) by the Susquehanna River Basin Commission (SRBC) with regard to water supply. Increased water supply demand and stormwater runoff have exacerbated problems in the PSA. From 1990 to 2000, the growth rate of the northern part of the county exceeded the County's overall growth rate of 11.3 percent. In fact, one particular northern township experienced 33.2 percent growth during this time period.

In an effort to determine if the aquifer underlying northern Lancaster County could sustain these anticipated demands, a predictive water study was conducted (Figure 32). When allocated water use in 2000 was compared to the sustainable limit, the 50-square-mile carbonate area in northern Lancaster County had already reached 46 percent of the sustainable limit. Two sub-basins of this area, the Manheim/Lititz groundwater basin and the Ephrata area groundwater basin, were 70 percent and 34 percent of the sustainable limit, respectively.

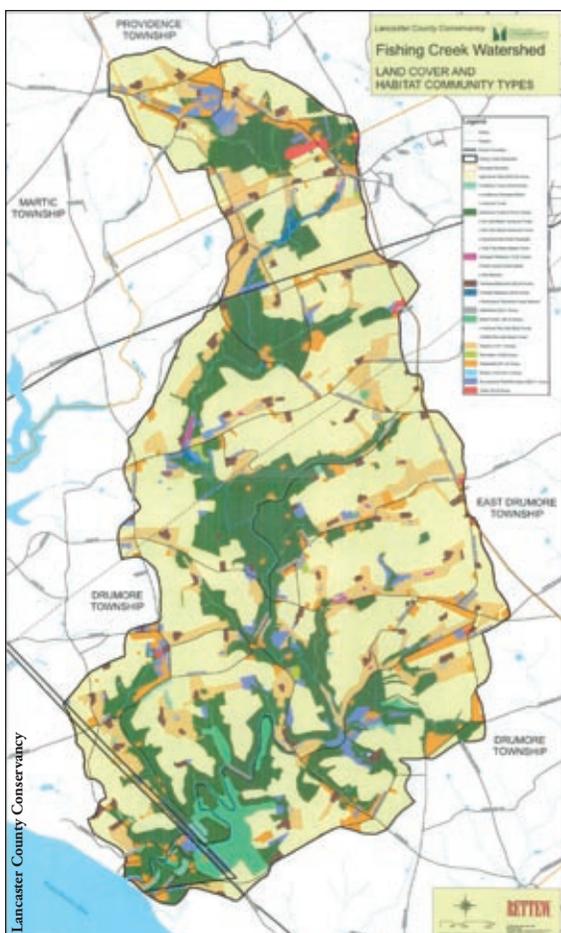
The study provided important information on water demand, water availability and the location of important water features. Local decision makers, in partnership with water resource managers, have used this information to educate the public on the importance of stormwater infiltration, the protection of aquifer recharge areas, conservation measures, and planning for growth.

Goals, Objectives, and Strategies

point source and non-point source pollution. The plan may cover an entire watershed or a portion of the watershed. Objectives may address issues such as stormwater management, agricultural best management practices, and aquatic habitat restoration. Watershed organizations and local, state or federal agencies all may play a part in watershed planning.

Green Infrastructure Application: Watershed plans may include specific recommendations for improving the health of river and stream corridors, the primary connections in Lancaster County’s green infrastructure system. Therefore, watershed plans can be used as a tool to implement Greenscapes.

Examples: Lancaster County Conservancy’s Fishing Creek Watershed Plan



The Fishing Creek Watershed Plan prepared by the Lancaster County Conservancy is an excellent example of a comprehensive approach to surface and ground water resource management.

- Pennsylvania Act 167 of 1978 requires counties to prepare watershed scale stormwater management plans for watersheds in the county. Act 167 plans must provide for management of large storm events, groundwater recharge, and water quality impacts from development sites. In addition, the Pennsylvania Department of Environmental Protection (DEP) has mandated that these plans must also address TMDLs (Total Maximum Daily Load) under the U.S. Clean Water Act. Act 167 plans have been prepared for four of Lancaster County’s twelve designated watersheds: Mill Creek, Conestoga River, Little Conestoga Creek, and Cocalico Creek. Lancaster County is in the process of developing Act 167 plans for the remaining watersheds.
- Lititz Run Watershed: A Community Improving Its Water Quality was published in March 1999 to “assist the local community, business owners, teachers, planners and elected officials in developing an understanding of the Lititz Run and an ability to view the watershed as a whole, instead of a series of independent political jurisdictions.” The plan includes a watershed inventory, an analysis of the watershed, and recommendations for protecting watershed.
- Mill Creek Watershed Implementation Plan, prepared by the Lancaster County Conservation District in June 2006, addresses the problems of excess nutrients and sedimentation and prioritizes projects within the watershed.
- Chiques Creek Watershed Assessment: Channel Stability Assessment and Stream Restoration Prioritization, prepared for the Chiques Creek Watershed Association in July 2002, assesses the overall condition of the study area and makes recommendations for restoration.

4.2.2 Regulatory Tools

Purpose

Address the green infrastructure goals of preservation, conservation, restoration, and recreation in municipal development regulations and incentives.

Regulations are used by municipalities to implement comprehensive plans and growth management initiatives. In Lancaster County municipal regulations have addressed conservation of agricultural rather than natural resources as a priority through approaches such as agricultural zoning and Transfer of Development Rights (TDR, an innovative approach that is beginning to be used in some townships). While it is extremely important to continue regulatory protection of agricultural lands, the use of regulations and incentives to protect and promote green infrastructure in both rural areas and Urban Growth Areas should be strengthened. While the responsibility for enacting regulations rests with municipalities, the LCPC has a key role to play in providing technical support.

Priority Regulatory Tool

- **II-A Green Infrastructure Overlay District**

Description: A zoning district that designates green infrastructure resources within a municipality and identifies performance standards to conserve them. Overlay districts apply as additional requirements beyond the underlying use-based zoning districts.

Green Infrastructure Application: Regulations to protect environmental resources typically are overlay districts that focus on a single type of resource (e.g., floodplains, steep slopes, woodlands, etc.). This approach is addressed below under natural resource protection ordinances. As an alternative to focusing on single resource types in separate ordinances, **green infrastructure overlay districts** that address environmental resources in a more integrated manner are proposed as the priority regulatory tool to implement the green infrastructure system.

The resources comprising the district could be identified on a municipal or multi-municipal basis through Greenscapes proposed in

Section 4.2.1 above as the priority policy and planning tool. They could also be delineated as resource conservation areas in comprehensive plans and on official maps, two other important policy and planning tools. Given the high priority placed by citizens and initiatives such as the Chesapeake Bay Program on maintaining and improving the water quality of rivers and streams, requirements for riparian buffers/setbacks to be maintained in natural vegetation should be a basic component of the ordinance.

The overlay district would not necessarily prohibit all development within green infrastructure resource areas. Instead, it could identify performance standards that allow limited development while maintaining the integrity and carrying capacity of resources such as steep slopes or floodplain. It could also be combined with approaches such as conservation subdivision design that protects resource areas while concentrating development in more suitable portions of the site. The LCPC could promote use of this tool by developing a model infrastructure overlay ordinance and standards.

Example: Loudon County, VA's General Plan defines green infrastructure resources (called "primary conservation areas") to be protected through zoning overlay districts and performance standards (e.g., for steep slopes). The overlays include the River and Stream Corridor Overlay District, Mountainside Development Overlay District, and Limestone Conglomerate Overlay District.

Other Regulatory Tools

- **II-B Conservation Zoning**

Description: A zoning district with large minimum lot sizes designed to preserve sensitive environmental features such as wooded hillsides.

Green Infrastructure Application: Effective conservation zoning can be used like agricultural zoning to protect the integrity of landscapes characterized by a preponderance of valuable natural resources (rather than farmland). It is particularly applicable to areas of the green infrastructure system identified as "hubs." In practice, existing

conservation zoning in Lancaster County typically allows two to three acre residential lots, which promotes “rural sprawl” and results in the fragmentation of natural resources. Larger minimum lot sizes (similar to effective agricultural zoning) would more effectively protect these resources.

Example: East Earl Township adopted one unit per 50 acre conservation zoning in the Welsh Mountain area in 2006.

- **II-C Conservation Subdivision Design Ordinance**

Description: A residential development design concept to preserve open space and valuable natural resource areas by concentrating homes on a portion of the property and maintaining the remainder as open space in perpetuity. The open space may be owned and maintained by a homeowners’ association, held by a private nonprofit organization (e.g., the Lancaster County Conservancy), or dedicated for public ownership and access.

Green Infrastructure Application: Conservation subdivisions can be used to permanently protect natural resource areas at no cost to the municipality while accommodating development in suitable locations. This approach may not be appropriate in rural parts of Lancaster County where it could promote scattered development and create conflicts between agricultural and residential uses. However, it has potential in Designated Growth Areas to promote development that maintains natural resources and provides connections in the green infrastructure system in the form of greenways and linkages.

Example: Lancaster Township Open Space Development zoning overlay section.

- **II-D Green Infrastructure Design Standards**

Description: Standards for the use of green infrastructure elements in the built environment. The U.S. Green Building Council’s Leadership in Energy and Environmental Design (LEED), a national rating system for developing high-performance, sustainable buildings, is the best known. The LEED

standards address techniques such as green roofs, reduced site disturbance/conservation of existing vegetation, and natural means of stormwater management (see also “Low Impact Development” under Stormwater Management Ordinances). While LEED is a voluntary program, some jurisdictions are beginning to incorporate its rating system or other “green” standards/incentives into building codes and ordinances.

Green Infrastructure Application: LEED or similar standards for sustainable building and site development can be used to integrate green infrastructure functions and benefits (e.g., energy conservation and mitigation of the urban heat effect) into urban landscapes in particular. Design standards for plant materials should promote the use of native rather than non-native or invasive species.

Examples: Arlington County (VA), Babylon (NY), Cranford (NJ), Nashville (TN), Pittsburgh (PA), and Portsmouth (VA) are examples of jurisdictions that have density bonuses, expedited permitting, or other forms of regulatory incentives for LEED-certified buildings.

- **II-E Landscape Ordinance**

Description: An ordinance establishing requirements for the planting of trees, shrubs, and other vegetation in new developments. Landscape ordinances can also address preservation of existing trees and vegetation (see also tree protection ordinance under natural resource protection ordinances below).

Green Infrastructure Application: Landscape ordinances can be used to integrate green infrastructure into new developments in the form of existing vegetation and new plantings that provide benefits such as cleaner air and water, stormwater retention, cooler air temperatures, and aesthetic improvements. Typical standards address issues such as protection of natural vegetation, plant installation standards and requirements, plant material standards and recommended species, stormwater retention and recharge, and maintenance. Species recommendations should promote the use of native plants that

provide wildlife habitat and have reduced maintenance requirements (mowing, irrigation, application of chemicals, etc.).

Example: Pequea Township Zoning Ordinance landscaping requirements.

- **II-F Natural Resource Protection Ordinances**

Description: An “overlay” ordinance that define standards beyond existing zoning requirements to protect a specific natural resource type. It differs from the Green Infrastructure Overlay District recommended as a priority regulatory tool above in that it addresses resource types in isolation rather than in a comprehensive, integrated manner. Natural resources addressed by these ordinances include:

- Floodplain Protection Ordinance: Restricts development within or near the 100-year floodplain and floodway.
- Habitat Protection Ordinance: Restricts development in or near natural habitat areas.
- Riparian Corridor Ordinance: Establishes buffers from rivers and streams, limiting development and requiring maintenance of natural vegetation.
- Steep Slope Protection Ordinance: Restricts development on steep slopes (e.g., 15% or 25% and above).
- Tree Protection Ordinance: Restricts removal of trees above a specified size, often including mitigation (replanting) requirements.
- Wetlands: Precludes development in designated wetland areas.

Green Infrastructure Application: Natural resource protection ordinances can be used to help maintain the integrity of green infrastructure resources by reducing the impacts of new development. As noted above, green infrastructure overlay districts that address multiple natural resources and functions in an integrated manner are proposed as the priority regulatory tool.

Example: Marlborough Township, Montgomery County, Pa.

- **II-G Parkland Dedication Ordinance**

Description: An ordinance requiring developers to meet the recreational needs generated by new developments, either through dedication of parkland within the development or by contributing to a fund for use by the municipality in developing parks and recreational facilities outside of the development.

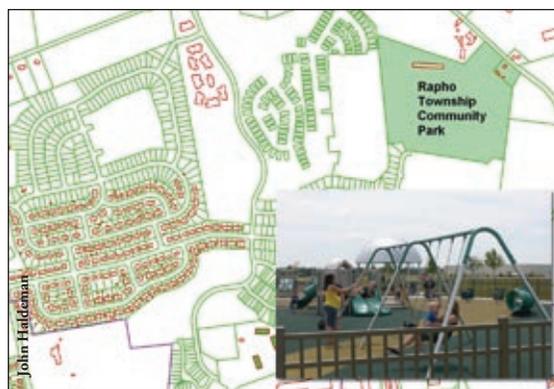
Green Infrastructure Application: Parkland dedication ordinances can be used as a tool to fulfill one of the functions of the green infrastructure system, meeting recreation needs at the local/municipal level (Objective 4B). Parkland, trails, and waterway access points created as a result of parkland dedication ordinances can function as nodes and links in the system.

Example: West Lampeter Township.

- **II-H Scenic Corridor Overlay District**

Description: An ordinance that protects views of landscapes identified as having special scenic value through application of design standards, setbacks, buffers, etc. Typically applied to roadway corridors; can also apply to trails

Green Infrastructure Application: Scenic corridor overlay districts can be used to help maintain the visual quality of large-scale green infrastructure system components (i.e., hubs and landscapes).



Rapho Township Community Park is a good example of the use of a mandatory dedication ordinance by a municipality to provide close-to-home recreation for new residents in an area targeted for residential growth.

Wellhead Protection

Our lifestyle and economy depends on the availability of clean water, yet clean water is a resource that is often taken for granted. This is particularly true with respect to groundwater. While groundwater is more difficult to contaminate than surface water, inappropriate land uses around wellhead recharge areas can significantly affect the quantity and quality of groundwater resources. For this reason the Pennsylvania DEP requires municipalities to regulate land uses within 100 to 400 feet of new or expanded municipal wellheads. While this requirement provides protection for public water supply sources, the protection of private wells is largely in the hands of the private users.

Regardless of whether well water is drawn from a public or private source, green infrastructure can be an effective way of protecting its quality. Natural vegetation around a wellhead area not only helps to assure that the well receives adequate recharge, the vegetation can intercept contaminants and excess nutrients before they reach the water table.

Example: The City of Austin, TX adopted an overlay zone with standards to protect views from several “hill country” roadways in the western part of the city.

- **II-I Site Design Standards**

Description: Standards governing the design and layout of streets, parking areas, lots, and other elements of new developments.

Green Infrastructure Application: Conventional site design standards can negatively impact green infrastructure resources by requiring excessively long and wide streets, large parking areas, and lot layouts that consume natural areas. As an alternative, municipalities can enact site design standards for new development that reduce impervious cover and associated impacts on green infrastructure resources; increase the amount of land maintained as natural areas or other open space; and use pervious areas for more effective stormwater treatment. Examples of possible standards include:

- Residential street layouts designed to minimize total street length, pavement width, and the number of cul-de-sacs
- Parking lot standards that minimize excessive parking space construction and provide for compact car spaces, smaller stall dimensions, efficient parking lanes, and use of pervious materials in spillover parking areas where possible

- Subdivision standards that incorporate smaller lot sizes and reduced setback requirements to minimize total impervious area, reduce construction costs, conserve natural areas, provide community recreational space, and promote watershed protection.

Example: West Lampeter Township TND Ordinance.

- **II-J Stormwater Management Ordinance**

Description: An ordinance designed to minimize the impacts of new developments on water quantity (flooding) and quality. Such ordinances typically require use of Best Management Practices (BMPs), such as on-site retention and infiltration basins, vegetated swales and open spaces, pervious pavement, and reduction of the development footprint.

Green Infrastructure Application: Stormwater management ordinances can promote integration of green infrastructure features and functions into the pattern of development in urban and suburban landscapes, particularly if used to implement an innovative approach known as Low Impact Development (LID). LID is designed to mimic a site's predevelopment hydrology by using design techniques that infiltrate, filter, store, evaporate, and detain runoff close to its source. With this approach the functioning green infrastructure system can include

not only open spaces, but also elements of the built environment such as rooftops, streetscapes, parking lots, sidewalks, and medians.

Example: Lancaster County has developed a model Stormwater Management Ordinance for use by municipalities. The Pennsylvania Stormwater Best Management Practices Manual, released by DEP’s Bureau of Watershed Management in 2007, identifies stormwater management practices to protect water quality, enhance water availability, and reduce flooding that can be incorporated into local ordinances.

- **II-K Subdivision Ordinance**

Description: An ordinance that establishes requirements for the design and layout of lots, buildings, streets, and infrastructure within a new development. While its use is often rather narrowly prescribed, the subdivision ordinance can be used to achieve green infrastructure objectives such as dedication of natural resource areas as open space and establishment of connections.

Green Infrastructure Application: Section 610 of the Lancaster County Subdivision and Land Development Ordinance contains specifications for the dedication of open space and trails as part of residential land developments. Trail dedication can include segments of existing trails such as the Horse-Shoe and Conestoga Trails that are currently unprotected. Subdivision ordinances can also prescribe standards for sidewalks and connected street systems, thus promoting a more walkable environment in developed areas.

Example: Lancaster County Subdivision and Land Development Ordinance.

- **II-L Transfer of Development Rights (TDR)**

Description: An ordinance that allows owners of property zoned for low-density development, agriculture, or conservation (sending areas) to sell development rights to owners of properties in designated receiving areas (e.g., Designated Growth Areas). The owners purchasing the development rights

are allowed to develop their properties at a higher density than would be permitted under the existing zoning.

Green Infrastructure Application: To date TDRs have been used in Lancaster County to protect agricultural lands. They also have the potential to protect components of the green infrastructure system, for example hubs and environmentally sensitive resource areas, by providing for the transfer of development rights to more suitable locations, such as designated growth areas.

Examples: Warwick and West Hempfield Townships have had the most active TDR ordinances in Lancaster County to date. Since 1991, Warwick’s program has successfully preserved nine farms totaling more than 790 acres through the transfer of development rights to a Campus Industrial Zone.

- **II-M Wellhead Protection Ordinance**

Description: An ordinance that imposes restrictions on land uses and activities to protect the groundwater recharge area immediately surrounding a public drinking water supply well.

Green Infrastructure Application: Like air and surface water quality, groundwater quality is part of the “natural life support services” provided by the green infrastructure system. Wellhead protection ordinances can be used as a tool to prevent degradation of this important resource by human activities at the landscape level.

Example: Warwick Township Wellhead Protection Areas.

4.2.3 Capital Investment Tools

Purpose

Establish green infrastructure system components through public and private sector financial investment.

Whereas policy/planning and regulatory tools to promote green infrastructure have a relatively specific focus on municipalities with support by Lancaster County, capital investment tools can

be used by a variety of public and private sector entities in diverse ways to create the green infrastructure system. Examples include governmental or nonprofit purchase of land or development rights; public capital improvements such as parks and trails; and public/private partnerships or private investments such as environmental restoration projects and green buildings.

Most of Lancaster County's natural resources are located on lands that are privately owned and potentially subject to development in the future (see Section 2.2.5). Therefore, two capital investment tools – land acquisition and purchase of development rights – are identified as priorities to secure permanent protection of valuable natural lands. It should also be noted that there is tremendous potential to leverage private sector investment to preserve, create, and restore green infrastructure through incentives, partnerships, and market-based approaches. As one example, the PPL Corporation is selling approximately 3,500 acres along the Susquehanna River to the Lancaster County Conservancy for \$5 million and then donating the \$5 million back to the Conservancy as part of a sustainable endowment fund to be used to maintain the land for natural resource conservation and public enjoyment. Market mechanisms such as nutrient trading can be used to promote the restoration goal of Greenscapes, particularly in relation to water resources. Another example is the Pennsylvania Department of Agriculture's Resource Enhancement and Protection Program (REAP), which provides tax credits to farmers who implement agricultural best management practices (see Outreach and Partnership tools below).

Priority Capital Investment Tool

- **III-A Land Acquisition**

Description: Fee simple purchase of land by a public entity or private land conservation trust for the purpose of securing its permanent protection.

Green Infrastructure Application: Fee simple land acquisition can be accomplished through a combination of state, county, municipal, and private land trust actions. Acquisition efforts should focus not only on valuable resources in rural areas, but also on opportunities to maintain and establish

green infrastructure nodes and links in urban and suburban landscapes. Potential land for acquisition by the County or other entities should be prioritized based on environmental resource value (e.g., species of concern habitat; "Natural Gems" identified by the Lancaster County Conservancy) and function in the green infrastructure system (e.g., meeting recreation needs or providing key nodes or greenway connections in Urban Growth Areas). Direct county acquisition efforts should focus on 1) expanding the regional park system to achieve the minimum standard of 5 acres/1,000 residents and 2) helping to create the greenway trail system (see Chapter 5.0, Actions 4-1 and 4-2). In addition, the County should continue to support land acquisition by municipalities, the Lancaster County Conservancy, and others through grants for projects that meet the defined priorities (e.g., preserving important natural resource lands or providing for local recreation needs based on the standard of 10 acres/1,000 residents).

Example: Lancaster County Natural Lands Preservation Fund: A \$1,000,000 challenge grant from the Lancaster County Board of Commissioners to the Lancaster County Conservancy to purchase natural lands open to the general public for recreational use.

Priority Capital Investment Tool

- **III-B Purchase of Development Rights**

Description: Acquisition of the right to develop the land, thus maintaining private ownership while requiring the landowner and his/her successors to keep the property in open space uses in perpetuity.

Green Infrastructure Application: Purchase of Development Rights (PDR) has been successfully used to protect working farmland in Lancaster County. The County should consider instituting a similar program for green infrastructure lands to supplement the existing PDR program. This program would allow privately owned lands to be used for sustainable forestry or similar activities while prohibiting development or other uses that would damage its natural resource value. It could be tied to a new Forest Security Area

initiative developed by the County to implement the Forest Legacy Program (see Section 4.2.4, Outreach and Partnerships).

Example: The Lancaster County Agricultural Preserve Board administers the County's PDR program for farmland.

Other Capital Investment Tools

- **III-C Agricultural Best Management Practices**

Description: Operational investments by farmers to reduce impacts on natural resources. Examples include restoration of the floodplain and the establishment of riparian buffers and measures to control runoff from animal concentration areas.

Green Infrastructure Application: Agricultural best management practices can be used to address one of Lancaster County's primary threats to green infrastructure: the water quality impacts of farming operations.

Example: The Pennsylvania Department of Agriculture's Resource Enhancement and Protection Program (REAP) provides tax credits to farmers who implement agricultural best management practices. Examples of eligible investments include development of a nutrient management plan, erosion and sedimentation control plan, and/or conservation plan; control of runoff from animal concentration areas/barnyards; installation of stream bank fencing and vegetated riparian buffers; manure storage systems and alternative manure treatment practices; and remediation of legacy sediments.

- **III-D Capital Improvements**

Description: Public construction projects such as parks, streets, and other infrastructure improvements. Such projects are typically incorporated into a capital improvement program, a plan adopted by a municipality that schedules planned capital expenditures over a multi-year period.

Green Infrastructure Application: Components of the green infrastructure system can be created by capital improvements made by municipalities, Lancaster County, and the

Commonwealth of Pennsylvania. Examples include:

- **Green Streets:** Typical of our nation, Lancaster County's road system is designed to move automobile traffic with little consideration of other potential functions. Designed to promote multiple values such as stormwater treatment and alternatives to automobile use, "green streets" incorporate features such as canopy trees, vegetated stormwater management areas, and connectivity for pedestrians and bicyclists. Green streets could be developed in Urban Growth Areas as links in the green infrastructure system. Extended into rural areas, they could provide connections from Urban Growth Areas to destinations such as county regional parks, particularly for bicycle travel.
- **Parking Lots:** Parking lots designed as large expanses of pavement have a number of damaging environmental impacts, including decreased groundwater recharge and increased stormwater runoff; contamination of the stormwater runoff by oil and other fluids leaking from parked vehicles; and heat island effects caused by the absorption of sunlight by pavement. However, parking lots can be designed to mitigate these impacts and even function as components of the green infrastructure system by incorporating features such as vegetated infiltration strips, permeable pavement in low traffic areas, subsurface stormwater stor-



Incorporating green infrastructure interventions such as these biofilters at the Warwick Township Municipal Office, into traditional capital improvement projects can be an effective means of improving the quality of storm water runoff.

age, and tree plantings to provide shade and prevent the heat island effect.

- *Parks:* Parks are important nodes within the green infrastructure system. Meeting citizens' needs for parks and recreational facilities at the local level is the responsibility of municipalities and school districts. These needs should be defined in municipal and multi-municipal park and recreation plans using the standard of a minimum of 10 acres of parkland per 1,000 residents as a guide. Parkland acquisition and development projects should be included in municipal capital improvements programs. Municipalities experiencing significant growth can use parkland dedication ordinances to meet park and recreation needs generated by new development. In addition, municipalities can work with school districts to meet needs through citizen recreational use of school properties.

Types of local parks include "mini" or "vest pocket" parks, neighborhood parks, community parks, and school-parks. Typically less than one acre in size, mini or vest pocket parks provide opportunities for informal recreation, community gathering, and green space that can be particularly beneficial in urban environments such as Lancaster City and the boroughs. Neighborhood parks provide a recreational and social focus for a sur-



Lancaster County Conservancy's Fishing Creek Nature Preserve is an example of a successful public/private-non profit partnership that preserves important natural resources while providing passive recreational opportunities such as hiking.

rounding neighborhood and (according to national standards) are typically five to ten acres in size. Community parks provide recreational opportunities at a community-wide rather than a neighborhood scale and are typically 20 acres or more in size. School-parks integrate recreational and social opportunities on school properties and can fulfill the functions of neighborhood or community parks.

- *Stormwater Management Facilities:* Capital investments in new stormwater management facilities can contribute to green infrastructure by incorporating features such as retention and infiltration basins, vegetated open spaces, and swales to absorb runoff. Such features can also be "retrofitted" into existing stormwater management facilities. Wherever possible, stormwater management facilities should be designed to address regional (watershed-wide) rather than individual site needs through non-structural solutions that are integrated into the green infrastructure system (e.g., jointly owned/managed wetland detention areas that are landscaped with native plants and provide public open space).
- *Trails:* Trails are key connections in the green infrastructure system for pedestrians, bicyclists, and paddlers. Figure 29 delineates a proposed countywide trail system following selected greenway corridors. Segments of this system can be implemented by Lancaster County, municipalities, and the state. Trail linkages can also be developed at the local level by municipalities, for example along stream or right-of-way corridors in Urban Growth Areas. Trails following river and stream corridors should be designed to maintain a buffer area of natural vegetation (25' to 50' recommended as a target) between the trail and the stream bank.

Examples:

- The Warwick Township Riparian Park includes a wetlands area, warm season grass meadow, in-stream habitat structures, and a walking trail that winds through this natural area. The park was

designed to provide a "living classroom" for local school students and Lancaster County residents.

- Another initiative worthy of note is Chicago's "Green Alley" project. The Green Alley project involves replacing old macadam alleys with new permeable concrete. The permeable concrete allows rain water to penetrate the soil, where microbes clean automobile and fertilizer contaminants and return it to Lake Michigan through groundwater recharge. The permeable concrete is also lighter in color and absorbs less heat, thereby reducing the heat island effect on urban air temperatures.

- **III-E Carbon Offsets**

Description: Reduction of carbon emissions into the atmosphere in one location to compensate for emissions in another location caused by a home, office, commute, travel, or other activities that use energy and generate carbon. Tree plantings (referred to as "carbon sequestration") and investments in renewable energy are examples of carbon offset projects.

Green Infrastructure Application: Carbon offsets could be used as a tool to encourage businesses and citizens to invest in green infrastructure projects such as tree plantings in urban areas and reforestation of marginal agricultural lands that have been taken out of production (e.g., in steep slope areas).

Example: The Home Depot, the world's largest home improvement retailer, entered into an agreement with Conservation Fund to offset all carbon emissions created in 2006 by the company's Atlanta headquarters and a portion of emissions created by associates commuting to work and traveling on business. Home Depot is funding the planting of thousands of trees on nearly 130 acres across metro Atlanta as part of The Conservation Fund's "Go Zero" program.

- **III-F Context-Sensitive Solutions for Roadway Design**

Description: Planning and design of transportation facilities that addresses environmental, scenic, and historic values along with mobility, safety, and economics.

Green Infrastructure Application: Transportation improvements can result in major negative impacts on natural resources and ecological functions. A concept that is gaining in acceptance by PennDOT and other state departments of transportation, context-sensitive solutions are designed to adapt conventional engineering approaches to local conditions. They can be used minimize the impacts of roadway, bridge, and other transportation construction projects on resources such as streams, woodlands, and scenic landscapes.

Example: The Longenecker Road Bridge over Little Chickies Creek in East Donegal Township, Rapho Township, and Mount Joy Borough is a bridge replacement project designed to be compatible with the historic, environmental, and agricultural setting.

- **III-G Environmental Restoration**

Description: Restoration of natural resources and functions through actions such as planting of native vegetation or removal of sources of human disturbance. It is closely related to the concept of ecological restoration, which is defined by the Society for Ecological Restoration as "the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed." Examples of different types of environmental restoration include:

- **Dam Removal:** Removal of derelict or dangerous dams and remediation of dam sites to restore the natural waterway.
- **Floodplain Restoration:** Removal of accumulated "legacy sediments" and other actions to restore the natural floodplain interaction of groundwater, stream base flow, and root systems.
- **Native Plantings:** Planting of native plant species in disturbed areas to restore natural ecosystem functions and provide wildlife habitat. This could include

propagation and planting of rare plant species in backyards and other restoration areas, thus increasing biodiversity throughout Lancaster County.

- *Invasive Species Removal:* Removal of non-native plant species that have proliferated in natural areas and displaced the originally occurring species.
- *Riparian Forest Plantings:* Planting of native tree species along rivers and streams to restore native habitat and functions such as filtering of sediments and pollutants from runoff.
- *Streambank Fencing:* Fencing on agricultural lands to prevent livestock from damaging riparian (river and stream) corridors.
- *Streambank Stabilization:* Techniques such as bioengineering (use of live plant materials) and structural reinforcement to stabilize eroding stream banks.
- *Wetland Restoration:* Reestablishment of wetland ecosystems that have been removed or degraded by human activity.

Green Infrastructure Application: Environmental restoration can be used in a variety of contexts throughout Lancaster County to re-establish or enhance components of the green infrastructure system. It can be used on publicly-owned lands, by farmers and landowners to promote green infrastructure functions on private lands, and by businesses to meet environmental requirements or take advantage of incentive programs. It also lends itself to use by citizen groups and volunteers (e.g., watershed associations) with technical assistance and support by funding agencies. Given the importance placed by citizens and initiatives such as the Chesapeake Bay Program on maintaining and improving the water quality of rivers and streams, *riparian restoration projects should be a high priority.*

Example: The Lititz Run Watershed Alliance has undertaken environmental restoration projects throughout the Lititz Run watershed.

• III-H Green Buildings/Green Roofs

Description: Environmentally sustainable design of buildings and sites, including elements such as energy efficient and recycled materials, water conservation, solar energy, porous pavement, and native landscaping. The U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) rating program provides for certification of buildings that achieve high levels of environmental performance.

Green Infrastructure Application: Green building features such as green roofs, vegetated stormwater management features (e.g., swales and bioretention areas), and native landscaping can function as components of the green infrastructure system in urban and suburban landscapes. Green building technology can be implemented through both private and public investment (e.g., corporate office buildings or new municipal facilities).

Example: The Lancaster County Roof Greening Project is facilitating the installation of approximately 79,000 square feet of green roofs on seven buildings in various urban areas in the County.

• III-I Nutrient Trading

Description: Nutrient trading is an approach to maintaining and improving water quality using market mechanisms to reduce nutrient and sediment loads in a watershed. The Pennsylvania DEP has developed a nutrient trading program to help meet federal requirements under the U.S. Clean Water Act and the Chesapeake 2000 Agreement. This agreement calls for Pennsylvania and other states within the Chesapeake Bay Watershed to reduce nutrient and sediment loading to the Susquehanna River and other bay tributaries, with the goal of removing the nation's largest estuary from the Clean Water Act's list of impaired waters by 2010. The nutrient trading program is a voluntary program under which parties that reduce the amount of nitrogen, phosphorus, and/or sediments they generate beyond baseline environmental obligations can sell the resulting credits to other parties. For example, credits can be

sold from farming operations that reduce nutrients generated by manure or chemical fertilizer application below specified thresholds to municipal sewage treatment plants to meet effluent discharge requirements under Pennsylvania’s Sewage Facilities (Act 537) Program.

Green Infrastructure Application: Nutrient trading can be used to address one of the key green infrastructure issues in Lancaster’s County: the poor quality of many of the county’s surface waters due to urban and rural (primarily agricultural) runoff. It is a relatively low cost method that leverages market forces and private sector investment to accomplish water quality improvement. As an example of a specific application, farms may receive credits for establishing permanent vegetated buffers 50’ or more in width along stream corridors.

Examples:

- Mount Joy Borough is pursuing a project to reduce nutrient loads through implementation of best management practices on farms and other community projects to offset requirements at the Borough’s wastewater treatment facility.
- Pfizer Pharmaceuticals generated pollutant reduction credits for transfer to the Borough of Lititz through restoration of a 1,300-foot segment of Santo Domingo Creek.

- **III-J Property Recycling**

Description: Reuse of vacant, previously developed properties to promote urban revitalization. Can include Brownfield’s (properties with known or suspected hazardous substances, pollutants, or contaminants), Greyfields (obsolete commercial properties with extensive surface parking), and vacant lots in urban neighborhoods.

Green Infrastructure Application: Property recycling can be used to establish parks, community gardens, and other forms of green infrastructure in urban environments. Studies have shown that, in addition to its

contribution to quality of life, “urban greening” increases property values and stimulates investment in urban areas. A study by the Wharton School of the University of Pennsylvania found that cleaning and greening of vacant lots in Philadelphia can increase adjacent property values by as much as 30%, planting a tree within 50 feet of a house can increase its value by about 9%, and locating a house within ¼ mile of a park can increase its value by 10%.

Example: The Pennsylvania Horticultural Society’s Philadelphia Green® is the nation’s most comprehensive urban greening program. Working in partnership with neighborhood residents, community organizations, and city agencies, the program supports the development and ongoing maintenance of community gardens, neighborhood parks, and public green spaces as a community building tool.

- **III-K Urban Greening**

Description: Planting of trees and other vegetation (preferably native species) to reinforce the urban tree canopy and “green” the urban environment in places such as streetscapes, parks and other public spaces, and private spaces such as residential yards.

Green Infrastructure Application: The urban tree canopy performs vital functions such as air quality, stormwater management, climate control, carbon sequestration, and aesthetics. However, urban tree canopies across the country are being eroded by development and environmental stressors such as limited root space, conflicts with overhead utility wires, and disease. Proper tree plantings and maintenance by municipalities, businesses, and individual landowners can help to reverse this trend in Lancaster County and integrate a type of green infrastructure into the urban landscape. Tree plantings can also be used as an implementing mechanism for carbon offset programs. Shrub and groundcover plantings and community gardens are other ways to infuse green infrastructure into the urban fabric. Guidance needs to be provided regarding

appropriate species (including native plants), planting conditions, and resources needed for ongoing maintenance.

Examples:

- Philadelphia Green® (see Property Recycling above).
- PA DCNR’s TreeVitalize Program is a new initiative to help facilitate the planting of trees in urban areas to increase the shade tree canopy cover and to encourage riparian buffer planting along waterways in rural areas to enhance water quality. The 50% matching grant program essentially pays for the cost of purchasing trees for planting in both urban and rural areas. The urban or “Metro” component of the program has a “Tree Tender” training element for citizen volunteers to help care for shade trees after planting. In 2008, Lancaster County was chosen as one of three pilot projects to implement the program. The County will be working with the City of Lancaster and the county’s eighteen boroughs to increase the shade tree cover in the urban centers, and the Conservation District to encourage streamside plantings in the rural landscape.
- The Tree City USA® program provides direction, technical assistance, public attention, and national recognition for urban and community forestry programs in thousands of municipalities across the country. This program is sponsored by The Arbor Day Foundation in cooperation with the USDA Forest Service and the National Association of State Foresters.

4.2.4 Outreach and Partnership Tools

Purpose

Provide information and technical assistance to the public and involve landowners and other citizens in creating the green infrastructure system.

The outreach and partnership tools are designed to be used to convey the importance of the County’s green infrastructure to citizens, businesses, and landowners and to engage them in



Technical assistance provided by the Lancaster County Planning Commission has helped spur an interest in “green roof” building in the City of Lancaster.

creating the green infrastructure system. Several of the tools involve public communications, for example: educational programs and materials and a Lancaster County green infrastructure website. Others – for example, conservation easements, limited development plans, and wildlife habitat management plans – entail cooperative partnerships between public or nonprofit organizations and private landowners.

Priority Outreach and Partnership Tools

- **IV-A Green Infrastructure Technical Assistance**
Description: Programs providing technical assistance to individuals and groups involved in implementing the green infrastructure system. Examples include assistance to municipalities in developing green infrastructure plans and regulations; grant writing assistance to groups such as watershed organizations; and assistance to landowners on green infrastructure issues related to their properties.

Green Infrastructure Application: Successful implementation of Greenscapes depends on building the capacity of the Lancaster County community – citizens, landowners, businesses, volunteer groups, etc. – to sustain and create green infrastructure in many contexts. Technical assistance is designed to leverage the resources and improve the capabilities of these various entities to apply the strategies and tools identified in the plan. Different organizations can provide technical assistance related to their missions and areas of expertise. For example, building on

its soil and water conservation mission, the Lancaster County Conservation District can promote green infrastructure through land management practices on private lands. The Lancaster County Conservancy can provide assistance to landowners on tools such as conservation easements to protect green infrastructure resources. The LCPC can provide assistance to municipalities in green infrastructure planning and regulatory approaches to establishing green infrastructure.

Example: Lancaster County Conservation District’s agricultural best management practices and watershed technical assistance programs.

- **IV-B Environmental Advisory Council**
Description: An appointed group of three to seven citizens that advises the local planning commission, park and recreation board and elected officials on the protection, conservation, management, promotion and use of natural resources within the jurisdiction. Municipalities and groups of municipalities are authorized to establish Environmental Advisory Council (EACs) by Act 177 of 1996 (originally Act 148 of 1973).

Green Infrastructure Application: EACs can play the primary role in promoting the concept of an integrated green infrastructure system at the municipal and multi-municipal levels. EAC members could receive training from the LCPC on green infrastructure and the Green Infrastructure Element of the County’s Comprehensive Plan.

Example: There are over 100 EACs in Pennsylvania. Greenscapes proposes that new EACs be established throughout the County to lead implementation of the plan at the local level and to serve as a conduit of green infrastructure information and resources from the County. The Pennsylvania Environmental Council has published The EAC Handbook: A Guide for Pennsylvania’s Environmental Advisory Councils (<http://eacnetwork.org/pdf/EACHB.pdf>).

Other Outreach and Partnership Tools

- **IV-C Conservation Easement Donation**
Description: Voluntary dedication of the development rights on privately owned lands to a public entity or qualified private land conservation organization. While the landowner maintains ownership of the property, the land must remain in open space uses in perpetuity.

Green Infrastructure Application: While acquisition of land and development rights is identified in Section 4.2.3 above as the priority capital investment tool for implementation of the green infrastructure system, it can realistically meet only a portion of the need for protection. Conservation easements can be used to preserve valuable green infrastructure resources without incurring the costs of acquisition of land or development rights while providing tax benefits for landowners. They are particularly appropriate to maintain green infrastructure in areas where public access is not a priority (although they can allow for such access with the agreement of the property owner). While conservation easements can be held by public entities, they are more typically implemented through legal agreements between landowners and private land conservation trusts.

Example: The Lancaster County Conservancy accepts donations of conservation easements on high quality wildlife habitat.

- **IV-D Cooperative Weed Management Area**
Description: A partnership of organizations, interested groups, and landowners to manage noxious weeds or invasive plants in a defined area characterized by a common geography, weed problem, community, climate, political boundary, and/or land use pattern.

Green Infrastructure Application: Cooperative Weed Management Areas (CWMAs) can be used to mobilize resources to reduce the threats posed by non-native invasive plant species on the integrity of native ecosystems. Headed by a steering committee representing landowners and natural resource managers in the area, CWMAs typically operate under a comprehensive plan addressing the manage-

ment or prevention of one or more noxious weeds or invasive plants. CWMA's have been most common in the western United States but are forming in the Midwest and East as well.

Example: The Long Island Weed Management Area is a group of 18 public and private partners formed to reduce invasive species threats on public and other conservation lands across Long Island.

- **IV-E Educational Programs**

Description: Programs and supporting materials used to teach the public about green infrastructure concepts and tools. Examples include classes and workshops, a speakers bureau, demonstration projects, brochures, information papers, and videos.

Green Infrastructure Application: Educational programs and materials can be tailored to address specific green infrastructure topics and to reach particular audiences, for example:

- Students (model curricula, “living classrooms,” etc.)
- Homeowners (backyard habitat, tree planting and maintenance in urban areas, fertilizer management, etc.)
- Farmers (streambank stabilization/livestock fencing, wildlife habitat management, etc.)
- Developers (information on LEED/green building, etc.)

This tool supports and overlaps with the priority Education and Outreach tool, Green Infrastructure Technical Assistance (see above). In addition, educational programs could be featured and educational materials provided electronically on a green infrastructure website (see below).

Example: Lancaster County Conservation District’s Conservation Education Program.

- **IV-F Forest Legacy Program**

Description: A U.S. Department of Agriculture program that provides support and technical assistance to landowners to protect

and conserve working forests. The Forest Legacy Program is administered in Pennsylvania by the Department of Conservation and Natural Resources (DCNR) – Bureau of Forestry.

Green Infrastructure Application: The Forest Legacy program can be used to work with landowners to promote conservation of forests in Lancaster County through the use of mechanisms such as conservation easements and sustainable forestry practices. Its goals include maintaining traditional forestry uses following best management practices; maintaining the productivity of forests for future generations; conserving significant tracts of contiguous forest and reducing forest parcelization; conserving water resources and important habitats for plants, fish, and wildlife; and restoring degraded forest ecosystems.

The Forest Legacy Program could be tailored for use in Lancaster County through initiation of Forest Security Areas, a proposed new concept that would be modeled after Pennsylvania’s Agricultural Security Areas (ASA) program. The ASA program is designed to promote more permanent and viable farming operations over the long term by strengthening the farming community’s “sense of security” in land use and the right to farm. Agricultural security areas are created by local municipalities in cooperation with individual



The Federal Forest Legacy program is a tool that can be used to preserve large tracts of woodland like those along the Susquehanna River, through the purchase of conservation easements from private landowners.

landowners who agree to collectively place at least 250 acres in the ASA. Participation in an ASA is a prerequisite for participation in Lancaster County's Purchase of Development Rights (PDR) program for agricultural lands. Forest Security Areas would be a voluntary program operating in a similar fashion to the ASA program by encouraging landowners to adopt sustainable, long-term management practices for forestlands. They could be tied to a PDR program similar to the County's current program for agricultural lands.

Example: Adams County is an approved Forest Legacy Area under the DCNR program. The Lancaster County Conservancy is a designated Forest Legacy sponsor in Lancaster County. There are no existing examples of Forest Security Areas.

- **IV-G Green Infrastructure Award Program**

Description: A program recognizing outstanding examples of green infrastructure in Lancaster County.

Green Infrastructure Application: The LCPC currently sponsors an annual Smart Growth Leadership Awards program, which recognizes planning activities and projects that foster smart growth. A Green Infrastructure Award could be instituted as an adjunct to or special category under the Leadership Awards Program. It would increase public awareness of the value of green infrastructure and its relationship to smart growth.

Example: Lancaster County Smart Growth Leadership Awards Program.

- **IV-H Green Infrastructure Website**

Description: A website dedicated to Lancaster County's green infrastructure.

Green Infrastructure Application: A green infrastructure website could be hosted on the Lancaster County website with links to the websites of other public and private agencies involved in green infrastructure. It would include information on green infrastructure, the Green Infrastructure Element of the County Comprehensive Plan, and how citizens can participate.

Example: The Conservation Fund maintains a national website devoted to green infrastructure (www.greeninfrastructure.net).

- **IV-I Limited Development**

Description: A plan that provides for low-impact development in suitable portions of the property to meet the financial objectives of the landowner while permanently protecting areas with valuable natural resources through a conservation easement.

Green Infrastructure Application: Similar to conservation easements, limited development plans can be used to preserve valuable natural resources without incurring the costs of acquisition of land or development rights. This approach is particularly well suited for application by private land conservation trusts with expertise in land planning, resource conservation, and estate planning.

Example: Brandywine Conservancy's Environmental Management Center in Chester County assists landowners in conservation planning, including limited development plans.

- **IV-J Wildlife Habitat Management Plan**

Description: A plan to improve wildlife habitat on a privately owned property. The plan typically addresses existing habitat conditions, landowner objectives, and recommended management actions and practices to improve conditions for the desired types of wildlife.



Limited development is a planning tool that can be used to preserve important natural lands by clustering all the housing units of a building site in one area of the tract and preserving the remaining portion.

Green Infrastructure Application: Wildlife habitat management plans can reinforce the value of green infrastructure and enhance green infrastructure functions on privately owned lands. They can be used in a variety of contexts, including farms, forests and other natural resource lands, and urban/suburban backyards, as well as to maintain or restore habitat for threatened and endangered species.

Examples: Various programs provide assistance to develop and implement wildlife habitat management plans, including:

- The federal Natural Resources Conservation Services' Wildlife Habitat Incentives Program provides technical and cost-share assistance to improve fish and wildlife habitat, primarily on private lands.

Priorities include restoring declining or important native wildlife habitats; protecting, restoring, developing or enhancing wildlife habitat of at-risk species; and reducing invasive species impacts.

- Established in 2004, the Pennsylvania Game Commission's Private Landowner Assistance Program has helped numerous landowners develop habitat management plans through technical assistance provided by program biologists. This program focuses on maintaining habitat for bird or mammal species of concern through recommendations to create, preserve, and enhance wildlife habitat.
- The National Wildlife Federation offers a Certified Wildlife Habitat program for landowners.

Table 4-1. Green Infrastructure Tools

Tool	Description	Applicable Goal(s)	Applicable Growth Management Strategy
Policy and Planning			
I-A	Green Infrastructure Planning (Priority)	Municipal and multi-municipal plans that define green infrastructure resources and strategies for establishing an integrated infrastructure system at the local level.	Preservation Conservation Restoration Recreation
I-B	Bicycle and Pedestrian Plan	A plan that defines a network to accommodate bicycle and/or pedestrian travel within a community.	Urban Growth Area Rural
I-C	Comprehensive Plan	An adopted municipal or multi-municipal document designed for use in decision-making by officials and citizens to guide future growth, development, and preservation over a long-range (20-30 year) time horizon.	Preservation Conservation Restoration Recreation
I-D	Greenway/Open Space Plan	A plan that identifies strategies for the preservation and development of a greenway corridor or larger open space system in the context of the land use and development pattern of a municipality or a region.	Urban Growth Area Rural
I-E	Heritage Byways	A new program initiated by LCPC to designate county roads with special archaeological, cultural, historic, natural, recreational, and/or scenic significance as "Lancaster County Heritage Byways."	Preservation Conservation
			Rural

Tool		Description	Applicable Goal(s)	Applicable Growth Management Strategy
I-F	Landscape Conservation Plan	A plan for a large-scale landscape that is defined by natural elements such as a common landform or a river valley.	Preservation Conservation Restoration	Urban Growth Area Rural
I-G	Official Map	An official document adopted by a municipality that maps existing and proposed streets, pedestrian easements, open space, and other public lands or easements and reserves the land for future public purpose.	Preservation Conservation Recreation	Urban Growth Area Rural
I-H	Park and Recreation Plan	A plan that identifies strategies to meet the needs of current and future residents of a municipality or group of municipalities for parks and recreation facilities.	Recreation	Urban Growth Area
I-I	Transportation Plan	A plan defining capital improvements and other actions to be taken to develop a transportation system at the countywide, multi-municipal, or municipal levels.	Preservation Conservation Recreation	Urban Growth Area Rural
I-J	Water Resources Plan	A plan to ensure a sufficient, sustainable, and safe water supply.	Conservation	Urban Growth Area Rural
I-K	Watershed Plan	A plan intended to provide a framework for action to both restore water quality in impaired waters and to protect water quality in other waters threatened by point source and non-point source pollution.	Conservation Restoration	Urban Growth Area Rural
II-A	Green Infrastructure Overlay District (Priority)	A zoning district that designates green infrastructure resources within a municipality and identifies performance standards to conserve them.	Preservation Conservation	Urban Growth Area Rural
II-B	Conservation Zoning	A zoning district with large minimum lot sizes designed to preserve sensitive environmental features such as wooded hillsides.	Conservation	Rural
II-C	Conservation Subdivision Design Ordinance	A residential development designed to preserve open space and valuable natural resource areas by concentrating homes on a portion of the property and maintaining the remainder as open space in perpetuity.	Conservation	Rural
II-D	Green Infrastructure Design Standards	Standards for the use of green infrastructure elements in the built environment (e.g., the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) rating system for developing high-performance, sustainable buildings).	Conservation Restoration	Urban Growth Area
II-E	Landscape Ordinance	An ordinance establishing requirements for the planting of trees, shrubs, and other vegetation in new developments. Landscape ordinances can also address preservation of existing trees and vegetation.	Conservation Restoration	Urban Growth Area

Tool	Description	Applicable Goal(s)	Applicable Growth Management Strategy
II-F	Natural Resource Protection Ordinances	An “overlay” ordinance that defines standards beyond existing zoning requirements to protect a specific natural resource type (e.g., floodplains, wildlife habitat, riparian corridors, steep slopes, trees, and wetlands).	Conservation Urban Growth Area Rural
II-G	Parkland Dedication Ordinance	An ordinance requiring developers to meet the recreational needs generated by new developments, either through dedication of parkland within the development or by contributing to a fund dedicated for park and recreational facility development.	Recreation Urban Growth Area
II-H	Scenic Corridor Overlay District	An ordinance that protects views of landscapes identified as having special scenic value through application of design standards, setbacks, buffers, etc. Typically applied to roadway corridors.	Conservation Rural
II-I	Site Design Standards	Standards governing the design and layout of streets, parking areas, lots, and other elements of new developments.	Conservation Restoration Urban Growth Area
II-J	Stormwater Management Ordinance	An ordinance designed to minimize the impacts of new developments on water quantity (flooding) and quality through the use of Best Management Practices (BMPs).	Conservation Urban Growth Area
II-K	Subdivision Ordinance	An ordinance that establishes requirements for the design and layout of lots, buildings, streets, and infrastructure within a new development. Can be used to achieve green infrastructure objectives such as dedication of natural resource areas as open space.	Conservation Urban Growth Area
II-L	Transfer of Development Rights	An ordinance that allows owners of property zoned for low-density development, agriculture, or conservation (sending areas) to sell development rights to owners of properties in designated receiving areas (e.g., Designated Growth Areas).	Preservation Conservation Rural
II-M	Wellhead Protection Ordinance	An ordinance that imposes restrictions on land uses and activities to protect the groundwater recharge area immediately surrounding a public drinking water supply well.	Conservation Rural
Capital Investment			
III-A	Land Acquisition (Priority)	Fee simple purchase of land by a public entity or private land conservation trust for the purpose of securing its permanent protection.	Preservation Conservation Recreation Urban Growth Area Rural

Tool		Description	Applicable Goal(s)	Applicable Growth Management Strategy
III-B	Purchase of Development Rights (Priority)	Acquisition of the right to develop the land, thus maintaining private ownership while requiring the landowner and his/her successors to keep the property in open space uses in perpetuity.	Preservation Conservation	Rural
III-C	Agricultural Best Management Practices	Operational investments by farmers to reduce impacts on natural resources, such as establishment of riparian buffers and measures to control runoff from animal concentration areas.	Conservation Restoration	Rural
III-D	Capital Improvements	Public construction projects such as parks, streets, and other infrastructure improvements that are incorporated into a municipal capital improvement program.	Restoration Recreation	Urban Growth Area Rural
III-E	Carbon Offsets	Reduction of carbon emissions into the atmosphere (e.g., through tree planting or renewable energy investments) to compensate for emissions caused by a home, office, commute, travel, or other activities that use energy and generate carbon.	Restoration	Urban Growth Area Rural
III-F	Context-Sensitive Solutions for Roadway Design	Planning and design of transportation facilities that addresses environmental, scenic, and historic values along with mobility, safety, and economics.	Preservation Conservation	Urban Growth Area Rural
III-G	Environmental Restoration	Restoration of natural resources and functions through actions such as planting of native vegetation or removal of sources of human disturbance. Examples include dam removal, floodplain restoration, habitat plantings, invasive species removal, riparian forest plantings, streambank fencing, streambank stabilization, and wetland restoration.	Restoration	Urban Growth Area Rural
III-H	Green Building/ Green Roofs	Environmentally sustainable design of buildings and sites, including elements such as energy efficient and recycled materials, water conservation, solar energy, porous pavement, and native landscaping.	Restoration	Urban Growth Area
III-I	Nutrient Trading	An approach to maintaining and improving water quality using market mechanisms to reduce nutrient and sediment loads in a watershed.	Restoration	Rural

Tool		Description	Applicable Goal(s)	Applicable Growth Management Strategy
III-J	Property Recycling	Reuse of vacant, previously developed properties to promote urban revitalization. Can include brownfields (properties with known or suspected hazardous substances, pollutants, or contaminants), greyfields (obsolete commercial properties with extensive surface parking), and vacant lots in urban neighborhoods.	Restoration	Urban Growth Area
III-K	Urban Greening	Planting of trees and other vegetation (preferably native species) to reinforce the urban tree canopy and “green” the urban environment in places such as streetscapes, alleys, parks and other public spaces, and private spaces such as residential yards.	Restoration	Urban Growth Area
Outreach and Partnership				
IV-A	Green Infrastructure Technical Assistance (Priority)	Programs providing technical assistance to individuals and groups involved in implementing the green infrastructure system. Examples include assistance to municipalities in developing green infrastructure plans and regulations; grant writing assistance to groups such as watershed organizations; and assistance to private landowners.	Preservation Conservation Restoration Recreation	Urban Growth Area Rural
IV-B	Environmental Advisory Council (Priority)	An appointed citizens group of three to seven citizens that advises municipal officials on the protection, conservation, management, promotion and use of natural resources within the jurisdiction; can be established at the municipal or multi-municipal level.	Preservation Conservation Restoration	Urban Growth Area Rural
IV-C	Conservation Easement Donation	Voluntary dedication of the development rights on privately owned lands to a public entity or qualified private land conservation organization. While the landowner maintains ownership of the property, the land must remain in open space uses in perpetuity.	Preservation Conservation	Rural
IV-D	Cooperative Weed Management Area	A partnership of organizations, interested groups, and landowners to manage noxious weeds or invasive plants in a defined area characterized by a common geography, weed problem, community, climate, political boundary, and/or land use pattern.	Restoration	Urban Growth Area Rural

Tool		Description	Applicable Goal(s)	Applicable Growth Management Strategy
IV-E	Educational Programs	Programs and supporting materials used to teach the public about green infrastructure concepts and tools. Examples include classes and workshops, a speakers bureau, demonstration projects, brochures, information papers, and videos.		
IV-F	Forest Legacy Program	A U.S. Department of Agriculture program, administered in Pennsylvania by the DCNR Bureau of Forestry, that provides support and technical assistance to landowners to protect and conserve working forests.	Conservation	Rural
IV-G	Green Infrastructure Award Program	A proposed program recognizing outstanding examples of green infrastructure in Lancaster County.	Preservation Conservation Restoration Recreation	Urban Growth Area Rural
IV-H	Green Infrastructure Website	A website dedicated to Lancaster County's green infrastructure.	Preservation Conservation Restoration Recreation	Urban Growth Area Rural
IV-I	Limited Development	A plan that provides for low-impact development in suitable portions of the property to meet the financial objectives of the landowner while permanently protecting areas with valuable natural resources through a conservation easement.	Preservation Conservation	Rural
IV-J	Wildlife Habitat Management Plan	A plan to improve wildlife habitat on a privately owned property.	Conservation Restoration	Urban Growth Area Rural

Goals, Objectives, and Strategies

Action Plan

Lancaster County’s green infrastructure – its essential natural life support system – has been extensively impacted by human activities for over two centuries. These impacts are particularly evident in the small remaining amount of intact forestlands and other natural communities; the poor water quality of many rivers and streams; and the lack of “green” elements in much of the County’s urban environment. Without prompt action to reverse this situation, the condition of Lancaster County’s green infrastructure will worsen as development pressures continue and global environmental trends such as climate change intensify. Chapter 4.0 describes strategies and tools that can be used to protect and enhance green infrastructure resources, functions, and values. Some of the tools are currently applied to a greater or lesser extent in Lancaster County, while others are new concepts for the County. This chapter lays out an action framework for use of the tools by Lancaster County and partners in the public and private sectors to achieve the four goals of preserving, conserving, and restoring green infrastructure and providing for the recreational needs of county residents. The framework includes three major sections:

- **Action Plan:** Section 5.1 identifies five key initiatives with supporting priority actions to implement Greenscapes. The five initiatives are:
 - Education and Communications
 - Technical Assistance
 - Funding
 - Capital Planning and Development
 - Partnership

The actions initiatives are designed to act as “catalysts” for future action across the Lancaster County community to create the green infrastructure system. In addition to Lancaster County, the Lancaster County Green Infrastructure Coalition, a proposed network of existing agencies, organizations, and groups involved in green infrastructure issues, is expected to play a key role in leading and coordinating implementation of the initiatives and associated actions. Action 5-2 below establishes an overall action agenda for the Coalition tied to the initiatives. This agenda includes developing a more detailed action plan to coordinate and expand existing

efforts to protect and restore riparian buffers, a key priority of Greenscapes that is not otherwise directly addressed by the initiatives.

- **Roles and Responsibilities:** Section 5.2 defines the roles and responsibilities of public and private sector partners in implementing the plan.
- **Monitoring:** Section 5.3 outlines a process for monitoring progress in implementing the plan, including indicators or measures of success that build on the Lancaster Community Indicators Project.

5.1 Action Plan

As noted, the Action Plan consists of five key initiatives and “catalytic” actions for each initiative. Designed to mobilize and focus the energy and resources of the County and its partners towards implementation, the actions are categorized according to timeframe:

- The **short-term** timeframe is within one year of plan adoption.
- The **mid-term** timeframe is within two to four years of plan adoption.
- The **long-term** timeframe is more than four years from plan adoption.
- **Ongoing** actions are to be carried out as continuing programs.

Four of the initiatives – communications, technical assistance, funding, and capital development – are proposed to be led by Lancaster County with the support of partners. The fifth initiative is designed to leverage the County’s efforts and broaden participation in implementing the green infrastructure system through establishment of a coordinating network of existing agencies and organizations, referred to as the Green Infrastructure Coalition. The proposed actions for each initiative are summarized in Table 5-1 and described in the following text. Existing entities that will play a leading role in implementation are identified for each action. As noted, the proposed Lancaster County Green Infrastructure Coalition is expected to coordinate and leverage the work of these entities through partnerships.

Table 5-1. Action Table

Action		Timeframe	Responsible Party
Initiative 1: Education and Communication			
1-1.	Greenscapes Outreach / Education	Short-term (plan roll-out) Ongoing (communications campaign)	Lancaster County and partners
1-2.	Green Infrastructure Website	Short-term (website development) Long-term (website maintenance)	Lancaster County
1-3.	Green Infrastructure Events	Ongoing (awards / events programs)	Lancaster County
Initiative 2: Technical Assistance			
2-1.	Green Infrastructure Municipal Planning Program	Short-term (development of program parameters) Ongoing (development of full program)	Lancaster County (program development) Municipalities (implementation)
2-2.	Model Green Infrastructure Overlay District	Short-term (model development)	Lancaster County (model development) Municipalities (implementation)
Initiative 3: Funding			
3-1.	County Green Infrastructure Funding Program	Ongoing	Lancaster County
3-2.	Coordination of Other Funding Programs	Ongoing	Lancaster County and partners
Initiative 4: Capital Planning and Development			
4-1.	Completion of County Regional Park System	Mid to Long-Term	Lancaster County
4-2.	County Greenway Trail System Development	Mid to Long-Term	Lancaster County and partners
4-3.	Green Infrastructure Design Standards	Mid-term (standards development) Ongoing (standards application)	Lancaster County
Initiative 5: Partnership			
5-1.	Green Infrastructure Summit	Short-term	Lancaster County Conservancy / Lancaster County
5-2.	Lancaster County Green Infrastructure Coalition	Short-term (establishment of coalition) / Ongoing	Lancaster County Conservancy and partners
5-3.	Lancaster County Environmental Advisory Council	Mid-term	Lancaster County Conservancy / Lancaster County Green Infrastructure Coalition
5-4.	Friends of Lancaster County Regional Parks	Mid-term	Lancaster County working with citizens

5.1.1 Initiative 1: Education and Communications

Green infrastructure is a relatively new concept that is not widely known by the general public. Therefore, an immediate focus of the County’s implementation efforts should be to educate and communicate the importance of green infrastructure and Greenscapes to the public, municipalities, and others who will play vital roles in its implementation.

- **Action 1-1: Green Infrastructure Plan Outreach/Education**
Description: Beginning with “plan roll-out” and adoption of Greenscapes, the LCPC should initiate a campaign to publicize the new Comprehensive Plan element through the media and meetings with municipalities and groups throughout Lancaster County. This campaign should clearly communicate in simple, non-technical terms what green infrastructure is, why it is vitally important to the health and well-being of Lancasterians and what can be done to establish a healthy green infrastructure system in rural and urban areas. It should provide concrete examples of actions that communities and citizens can take – for example, “greening” streets, yards, and school grounds in urban areas; restoring vegetation along streams in agricultural areas; and protecting Lancaster County’s remaining natural heritage in rural areas. The ongoing effort should be designed to provide information to and educate citizens regarding green infrastructure issues using a variety of media (see also Actions 1-2 and 1-3 below).

Timeframe: Short-term (plan roll-out) / Ongoing (communications campaign)

- **Action 1-2: Green Infrastructure Website**
Description: To support the plan outreach effort (Action 1-1) and provide information and updates on green infrastructure on an ongoing basis, the LCPC should develop and maintain a green infrastructure section of its existing website. This website should include information on green infrastructure (including links to other green infrastructure internet resources), Greenscapes, and how

citizens can participate. The website should be updated periodically to provide news on green infrastructure and progress made in implementing the plan.

Timeframe: Short-term (website development) / Ongoing (website maintenance)

- **Action 1-3: Green Infrastructure Events**
Description: The LCPC currently sponsors a Speakers Bureau, conferences, and annual Smart Growth Leadership Awards through its Envision Lancaster County program. Green infrastructure should be integrated into this program on an ongoing basis. Green infrastructure events could include invited speakers and an awards program recognizing outstanding achievements in green infrastructure in Lancaster County.

Timeframe: Ongoing (awards/events programs)

5.1.2 Initiative 2: Technical Assistance

Technical assistance is the priority education and outreach tool identified in Section 4.2.4 of the plan. The LCPC should focus its efforts in this area on educating municipalities regarding green infrastructure issues and helping them to develop plans and regulations that promote green infrastructure. The proposed Green Infrastructure Coalition (Action Initiative 5) will define other technical assistance programs to be carried out by a variety of public and nonprofit partners. This may include an additional role(s) for Lancaster County.

- **Action 2-1: Green Infrastructure Municipal Planning Program**
Description: Municipal and multi-municipal green infrastructure plans are identified as the priority policy and planning tool for plan implementation in Section 4.2.1. To promote use of this tool, the LCPC should develop guidance for the contents of local green infrastructure plans and the process to be used to prepare them. These plans should focus strategically on 1) existing green infrastructure resources and the degree to which they are currently protected and 2) key im-

plementation actions such as new regulations and capital projects. A municipality or group of municipalities should be sought to prepare the first green infrastructure plan with technical assistance and funding provided by the County. Over time this program could be integrated with the LCPC's technical assistance program for regional comprehensive plans. Municipalities should be encouraged to establish Environmental Advisory Councils to build capacity for green infrastructure plan development and implementation. In addition to developing a green infrastructure planning program, the LCPC should work with municipalities to integrate green infrastructure elements and concepts into traditional comprehensive and parks, open space, and recreation plans.

Timeframe: Short-term (development of program parameters, selection of initial project) / Ongoing (development of full program and integration with regional comprehensive planning program)

- **Action 2-2: Model Green Infrastructure Overlay District**

Description: Similar to municipal and multi-municipal green infrastructure plans, Section 4.2.2 identifies green infrastructure overlay districts as the priority regulatory tool for plan implementation. To promote use of this tool, the LCPC should develop a model district and guidance for municipalities to adapt it to local resource conditions. The district language should address the range of natural resources that occur in Lancaster County, such as stream corridors (with buffer requirements), floodplain, steep slopes, woodlands, and habitat for species of concern. The overlay district should be designed for use as an implementing action for municipal and multi-municipal green infrastructure plans.

Timeframe: Short-term

- **Action 2-3: Regional Landscape Conservation Plans**

Description: Greenscapes is intended as a framework for application of green infrastructure concepts in more detail at

the multi-municipal and municipal levels. Similar to the relationship of Balance – the Growth Management Element of the Lancaster County Comprehensive Plan – to the County's growth management program, multi-municipal plans are seen as the primary vehicle for developing green infrastructure policies, strategies, and actions that are tailored to the conditions of different geographic sub-areas within the County (Action 2-1). Beyond multi-municipal plans, however, there is a need to develop landscape conservation plans for large-scale regions defined by natural features such as a common landform or river valley (see Chapter 4, Tool I-F). Such regions transcend jurisdictional boundaries such as municipalities, multi-municipal planning areas, counties, and (in the case of the Susquehanna River Corridor and Highlands Region) even states. The LCPC has selected the Susquehanna River Corridor in Lancaster and York Counties for development of a landscape conservation plan that can serve as a model for development of other large-scale regional conservation plans.

Timeframe: Short-term (Susquehanna River Corridor Master Plan) / Mid to Long-Term (other regional landscape conservation plans)

5.1.3 Initiative 3: Funding

Funding is a key to building capacity for successful plan implementation. Lancaster County has limited fiscal resources compared to the level of need for financial assistance to municipalities and others to carry out the policies and recommendations of its Comprehensive Plan elements. Nevertheless, given the critical importance of green infrastructure to the County's future, the County should reevaluate and restructure its existing funding programs to address green infrastructure as a key objective. The County can also use Greenscapes to leverage funding from other sources (e.g., state and federal programs) for green infrastructure projects. In addition, the Green Infrastructure Coalition (Action Initiative 5) can help to define a broad-based funding strategy that draws on the resources of public and private sector partners.



Grant funding from the State and County was used by to the Lancaster County Conservancy to purchase land in Martic Township to create the Steinman Run Nature Preserve.

Because Greenscapes is an element of the Lancaster County Comprehensive Plan, this initiative focuses on the commitment of funding by the County with the assistance of state and federal funding sources. However, it should be noted that great potential exists to leverage financial resources from a variety of public, non-profit, and for-profit sources to create the green infrastructure system. For example, private businesses can be engaged in funding environmental conservation and restoration activities through market-based approaches and incentives (e.g., conserving and enhancing water-based resources to meet federal and state program requirements). Municipalities can also commit funding to address local green infrastructure priorities; numerous Pennsylvania communities in counties such as Bucks, Chester, and Northampton have approved bond referenda to acquire open space. Other public and nonprofit funding sources can also be explored available, such as foundation grants and Earned Income Taxes.¹

• **Action 3-1: County Green Infrastructure Funding Program**

Description: The County has several funding programs to assist in implementation of Comprehensive Plan policies and recommendations. These programs include:

- *Natural Lands Preservation Fund:* Provides funding for preservation of high priority, unprotected woodlands,

- wetlands, waterways, and rare species habitats in the County.
- *Purchase of Development Rights Program:* Provides funding for conservation easements on agricultural lands through purchase of development rights from farmers.
- *Municipal Transportation Grants Program:* Provides funding to municipalities to implement transportation related tools, such as official maps, access management plans, corridor planning and design standards, and pedestrian and bicycle paths.
- *Urban Enhancement Fund:* Provides funding to urban municipalities to implement economic, community, and neighborhood development projects.
- *Targeted Brownfield Assessment Program:* Provides assistance with conducting environmental assessments of brownfields-Brownfield's and developing clean-up plans (if needed).
- *Green Infrastructure Fund:* A new proposed program that would fund parkland acquisition as well as green infrastructure enhancement projects.

While the proposed Green Infrastructure Fund is specifically targeted towards green infrastructure projects, all of these programs can be used to fund projects or acquisitions that support green infrastructure. The County should examine each program to ensure that green infrastructure is included as a key evaluation criterion. A priority could be to fund model projects that demonstrate green infrastructure solutions (e.g., a model “green street” through the Municipal Transportation Grants Program) and generate momentum for further actions. Funding should be balanced to address green infrastructure in both urban and rural areas.

Timeframe: Ongoing

• **Action 3-2: Coordination of Other Funding Programs**

Description: A number of federal and state programs can be used to fund actions to implement the green infrastructure system. The LCPC should act as a clearinghouse

¹ Earned Income Taxes (typically 0.25% of earned income) have been used by a number of Pennsylvania municipalities, including adjacent Honey Brook Township in Chester County, to fund open space acquisition.

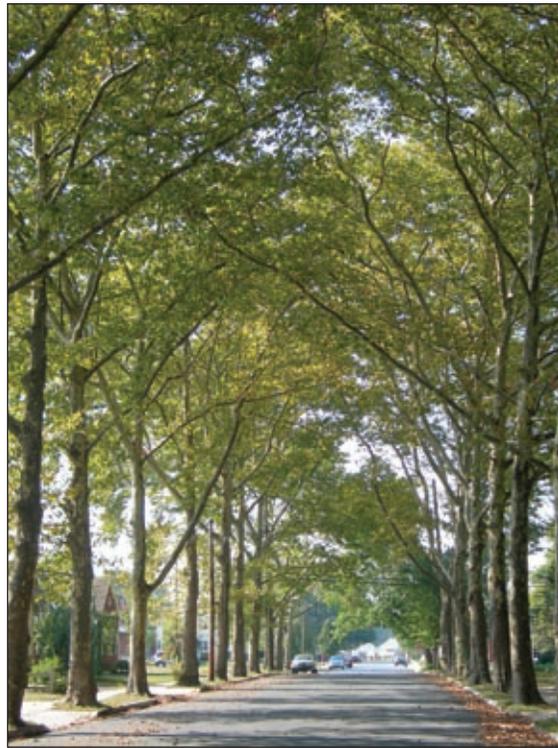
of information on these programs and as a catalyst for their application to projects in Lancaster County. Examples of these programs include:

Federal Programs:

- Chesapeake Bay Small Watershed Grants Program (administered by the National Fish and Wildlife Foundation in partnership with the Chesapeake Bay Program; primarily funded by the Environmental Protection Agency’s Chesapeake Bay Program office)
- Clean Water Act Section 319 Nonpoint Source Management Program
- Clean Water State Revolving Fund
- Groundwork USA (pilot program of the National Park Service Rivers, Trails, and Conservation Assistance Program in cooperation with the Environmental Protection Agency Brownfields Program)
- Highlands Conservation Act of 2004 (authorizes \$100 million over 10 years to be spent on land conservation partnership projects in the four Highlands States of Pennsylvania, New Jersey, New York, and Connecticut)
- National Resources Conservation Service Wildlife Habitat Incentives Program
- USDA Conservation Reserve Program (CRP) and Conservation Reserve Enhancement Program (CREP)

Pennsylvania Programs:

- Department of Agricultural Resource Enhancement and Protection Program (REAP – provides tax credits to farmers who implement best management practices)
- Department of Conservation and Natural Resources (DCNR) Community Conservation Partnership Program
 - Community Grants
 - River Conservation Grants
 - Pennsylvania Rails to Trails Grants
 - Rails-to-Trails Grants
 - Land Trusts Grants
 - Heritage Parks Grants
- Department of Environmental Protection (DEP) Growing Greener Watershed Grants
- DEP Stormwater Management Planning and Implementation Grants



Funding from the State’s new “TreeVitalize” program can help urban areas like Denver Borough plant more shade trees along public rights-of-way.

- Department of Transportation (PENNDOT) Transportation Enhancement Grants

It should be noted that in addition to governmental funding programs, significant important financial contributions can be made by the private sector sources (businesses, nonprofit organizations and foundations, citizens, etc.) to creating the green infrastructure system. These sources can significantly augment and leverage federal, state, and local governmental funding programs. An annual “green infrastructure funding workshop” should be considered to disseminate information to local municipalities and organizations on funding sources available for green infrastructure initiatives and projects. State agencies such as the Departments of Conservation and Natural Resources (DCNR) and Environmental Protection (DEP) should participate in the workshop.

Timeframe: Ongoing

5.1.4 Initiative 4: Capital Planning and Development

This initiative addresses priorities for capital investment by Lancaster County to implement the green infrastructure system. Regional parks and greenways are key components of the system and public input in the planning process identified trail connections as a top priority for implementation. Therefore, the County should focus green infrastructure capital planning and development on completion of the regional park system and creation of a countywide greenway trail system. In addition, it should develop standards for integrating green infrastructure into county capital projects, as well for managing existing facilities and properties.

- **Action 4-1: County Regional Park System**

Description: This Green Infrastructure Plan reaffirms the standard of 5 acres of county regional parkland per 1,000 residents originally established in the 1992 Regional Open Space Plan (see Section 2.4). Based on the 2006 U.S. Census estimate of 494,486 county residents, this standard amounts to approximately 2,472 acres, 498 acres more than the present county park system acreage of 1,974 acres. The additional acreage needed will increase to 771 acres and 953 acres, respectively, if the 5 acres/1,000 residents standard is to be met for the County’s projected population of 548,979 in 2020 and 585,487 in 2030. Acquisition efforts should focus on expanding existing regional parks as initially proposed in the 1992 Regional Open Space Plan rather than establishing new regional parks. Priorities include:

- **Money Rocks Park:** Set a target of acquiring an additional 481 acres to bring the total size of the park to 878 acres, consistent with the combined acreage proposed by the 1992 Plan for Money Rocks and Bowmansville Hills Park (the latter of which was never implemented).
- **Theodore A. Parker III Natural Area:** Set a target of acquiring an additional 275 acres to bring the total acreage of county parkland to 412 acres as proposed in the 1992 Plan for Stewart Run and the Upper West Branch of Octoraro Creek.

Achieving these two targets would add a total of 776 acres to the County’s regional park system, meeting the 5 acres/1,000 residents standard for the projected 2020 population. The County should evaluate the feasibility of acquiring specific properties in the vicinity of the two parks based on current land use and ownership patterns. The Green Infrastructure Concept Map (Figure 29) can be used to help prioritize lands for acquisition based on natural resource value. Additional land could be targeted in the vicinity of Speedwell Forge Park if sufficient land is not available in the vicinity of the two other parks (and also to help meet the standard for the projected 2030 population). County regional parkland can be supplemented by preservation actions taken by other entities (e.g., the Lancaster County Conservancy’s planned acquisition of watershed lands on Welsh Mountain from New Holland Borough).

In addition to completing the regional park system, the County needs to prepare management plans designed to integrate green infrastructure into the system. These plans should define how the preservation, conservation, restoration, and recreation goals and objectives established in Chapter 4.0 are to be applied to each park. This process has begun with the preparation of master plans for Buchmiller and Central Parks in Lancaster City, but needs to be expanded to address regional parks in rural parts of the County with larger concentrations of natural resources. The plans should also explore how the regional parks can be connected to a countywide greenway trail system (Action 4-2). As a long-term goal, leases on farmland within the parks should be terminated and the land restored as green infrastructure.

Timeframe: Mid to Long-Term

- **Action 4-2: County Greenway Trail System**

Description: Figure 29 illustrates a countywide system of existing and proposed trails. This system is designed to connect the County’s population centers, green infrastructure hubs, and major regional landscapes (the Highlands and the Susquehanna River Corridor). The proposed trail segments

Table 5-2. Proposed Trails

Proposed Trail	Location
1. Conestoga Trail Extension (South)	Along Susquehanna River from Norman Wood Bridge to the Maryland border
2. Southern End Transmission Corridor Trail	Follows PECO utility corridor from the Susquehanna River to Octoraro Creek
3. Octoraro Creek Trail/Octoraro Creek Water Trail	Along Octoraro Creek from Atglen-Susquehanna Trail to MD border/Rt. 272 bridge to MD border.
4. Atglen-Susquehanna Trail	Follows abandoned Enola Branch rail line from the Susquehanna River east to Chester County border
5. Turkey Hill Trail Extension	Along the Susquehanna River from existing Turkey Hill Trail south to Safe Harbor Dam
6. Washington Boro Trail	Along the Susquehanna from Turkey Hill section of Atglen-Susquehanna Trail north to River Park in Columbia Borough
7. Northwest River Trail Extension (Rt. 441 Columbia Relocation Project)	Chickies Rock County Park to River Park in Columbia Borough
8. Manheim Region Rail Trail	Existing Lancaster Junction Trail north to Lebanon County border
9. Manheim-Lititz Rail Trail	Manheim Borough to Lititz Borough
10. Warwick-Ephrata Trail	Existing Warwick Rail Trail in Warwick Township to existing Ephrata Rail Trail in Denver Borough
11. Denver Borough Trail Extension	Warwick-Ephrata Rail Trail to existing Horseshoe Trail
12. Elizabethtown Spur	Elizabethtown Borough to existing Conewago Recreation Trail
13. Conestoga Greenway	Manheim Township to Susquehanna River
14. Conewago Trail Extension	Existing Conewago Recreation Trail to the Susquehanna River
15. Reading & Columbia Trail	Eastern edge of Columbia Borough to Grubb Lake Park
16. New Holland Trail	Money Rocks County Park to PA 23 Corridor
17. Lancaster Junction Trail Extension (South)	Existing Lancaster Junction Trail south to Grubb Lake Park
18. Lancaster Junction Trail Extension (North)	Existing Lancaster Junction Trail north to Manheim Borough
19. Little Chiques Trail	Mount Joy Borough to Chickies Rock County Park / Northwest Trail
20. Pequea Creek Water Trail	Proposed water trail runs from Silver Mine Park to PPL Pequea Boat Access

are listed in Table 5-2 and described in more detail in Appendix C. The County should develop and implement a phased program to

implement the greenway trail system over a period of years.

Timeframe: Mid to Long-Term

The Highlands Trail

The Highlands Trail is a multi-state, long distance recreation trail that stretches from eastern Pennsylvania through New Jersey and New York to northwestern Connecticut. The trail currently traverses the New York Highlands and most of New Jersey Highlands, totaling over 130 miles. The Pennsylvania (PA) Highlands Trail Network will extend the Highlands Trail into the PA Highlands.

The PA Highlands Trail Network will focus on linking existing trails to create system of connected trails and new trail segments. Loop and spur trails will also be part of the network in order to create connections to parks and natural areas and nearby cities and towns. The PA Highlands Trail Network is a collaborative effort between non-profit organizations, public agencies, counties and municipalities, private foundations and other interested groups.

In Lancaster County, the PA Highlands Trail will follow the Horse-Shoe Trail, Conewago Recreation Trail, and its proposed extension to the Susquehanna River at the village of Falmouth in Conoy Township. From there, it will travel south along the Northwest River Trail. Once it reaches Columbia Borough, the Highlands Trail will cross the old Rt. 462 (Columbia-Wrightsville) Bridge. In Wrightsville, the trail will head north on the existing Mason-Dixon Trail.

Priority Trail Projects

The following trail projects are considered top priorities over the next decade. They vary in length and type, are geographically distributed throughout the county's landscape, and offer a diversity of outdoor recreation experiences for the trail user. These projects are all regional in scope and are either actively being implemented now or are in the initial planning stages.

While these projects are considered priorities, it does not mean other trail projects cannot move to the forefront of the community's priority shortlist. Nor does it mean that other trail projects should not be worked on by municipal and non-profit partners. It simply means that all of the projects on the list have recent activity, some degree of local support and an above average chance of succeeding.

A brief description of each priority trail project, along with its status and the next steps are provided below. For more detailed information on each trail project, see the Proposed Trails section in Appendix C.

- **Atglen-Susquehanna Trail**

Description - The proposed 28-mile Atglen-Susquehanna Trail (AST) would utilize the abandoned Enola Branch railroad corridor in western and southern Lancaster County, running from

the Susquehanna River to the Chester County border. The proposed trail is divided into two major sections; the 5-mile Turkey Hill section and the 23-mile Main Branch.

Status - The ownership of the Main Branch of the rail corridor was transferred from Norfolk-Southern to the six municipalities in southern Lancaster County (Providence Township owns the section in Quarryville Boroughs) in July 2008. Most of the municipalities along the corridor have expressed some interest, albeit varying, in the development of a recreation trail along the corridor. The ownership of the Turkey Hill section remains with Norfolk-Southern. However, Manor Township has expressed strong interest in acquiring this section from the railroad company and has initiated negotiations.

Next Steps - The controversy surrounding this project as well as the immense scope of the project and the high cost associated with the development of the trail are major stumbling blocks to the development of the full 28 miles. However, successful completion of a single section of the rail-trail may spur interest from other municipalities and momentum for the project. The County Plan-

ning Commission staff should work with all the municipalities along the corridor to identify the section most likely to be constructed first and provide assistance to ensure its success.

- **Turkey Hill Trail Extension**

Description – The existing hiking trail currently ends at an overlook at the top of Turkey Hill. The proposed trail extension in the river hills is approximately 6 miles in length running from the southern terminus of the existing Turkey Hill Trail to Safe Harbor Dam. Potential loop trails off the main stem could connect with the Turkey Hill Trail section of the Atglen Susquehanna Trail.

Status – The Lancaster County Conservancy is working with two major landholders along the corridor (PPL and the Lancaster County Solid Waste Management Authority) to designate an acceptable trail route. Since the trail corridor involves some of the lands to be sold to the Conservancy as part of the Holtwood Dam relicensing permit, the route identification has been temporarily put on hold.

Next Steps – The Conservancy anticipates the effort to establish the trail extension will be reinitiated following the transfer of the PPL lands in late 2008/early 2009.

- **Northwest River Trail**

Description – The Northwest River Trail is a 14-mile recreational trail being developed by five municipalities, the County Parks Department, and the Lancaster County Solid Waste Management Authority. The trail parallels the Susquehanna River for its entire length; generally following the route of the abandoned historic PA Mainline Canal towpath. The trail begins in Columbia Borough's River Park and heads northwest along the eastern bank of the river

until it reaches the PA Fish & Boat Commission boat launch in the village of Falmouth in Conoy Township.

Status – A feasibility study conducted for the project was completed in 2003. Most of the Northwest River Trail corridor is now in public or quasi-public ownership and an informal path exists along much of the proposed trail route. Because the trail has multiple owners, the development of individual trail segments varies in each municipality. However, there are on-going planning and/or engineering activities throughout the entire corridor and construction of a 3.5-mile section of the trail in Marietta, East Donegal, and Conoy is soon to be underway.

Next Steps – Trail planning and construction design activities for individual segments are underway in almost all the municipalities along the corridor. However, one section in need of attention is the area from the Marietta boat launch to the Decatur Street trailhead in Marietta Borough. County Planning staff should provide technical assistance to Marietta Borough to initiate the design phase of this trail segment.

- **Warwick-Ephrata Rail Trail**

Description – The proposed 5-mile Warwick-Ephrata Rail Trail would run from the western edge of Warwick Township to Denver Borough. The trail would begin at the eastern terminus of the existing Warwick Rail Trail and head due east along the abandoned Reading & Columbia Railroad Line. The trail would follow the rail corridor through Warwick Township and into Akron Borough. From Akron Borough, the trail would connect with the southern terminus of the existing Ephrata Rail Trail in Ephrata Borough. The trail would follow the existing Ephrata Rail Trail to its northern terminus and then continue into Ephrata Township. The trail would

follow the rail corridor through Ephrata Township to the southern terminus of the proposed Denver Borough Trail Extension.

Status – The municipalities along the corridor completed a feasibility study for the proposed trail project in 2006. Two sections of the trail already exist in Warwick Township and Ephrata Borough. Portions of the abandoned rail corridor were recently purchased by Warwick Township, Akron Borough, and Ephrata Township. The municipalities are working with other landowners along the corridor to secure easements and other rights-of-way to complete the trail.

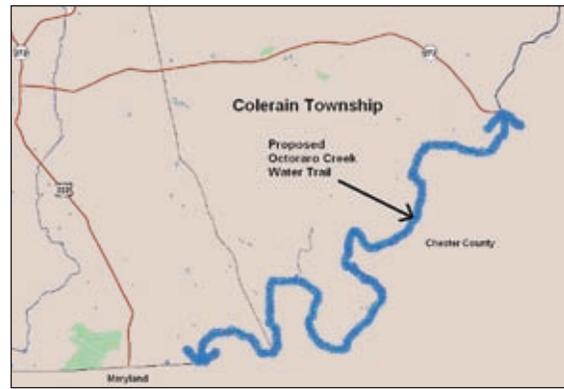
Next Steps – The municipalities should continue to work with landowners to secure all sections of the trail. Secured sections that are connected to the existing trail segments could be developed with grant funding assistance from the County of Lancaster and DCNR.

- **Octoraro Creek Water Trail**

Description – The proposed water trail would run approximately 10-miles in length from the Kirk’s Mill Bridge (Rt. 272 bridge) over Octoraro Creek, south to the Broad Creek boat launch just below of the Maryland border. The water in this stream segment is clear and typically deep enough in the spring for paddlers to work their way down the scenic ravine into Maryland.

Status – The Lancaster County Conservancy has recently acquired the land owned by the Chester Water Authority along the Octoraro Creek on both sides.

Next Steps – Development of a water trail along the creek and management of the riparian corridor for both habitat and passive recreation uses will require careful land planning. The Conservancy should initiate preparation of a manage-



The proposed 10-mile Octoraro Creek Water Trail would be the third designated water trail in Lancaster County.

ment plan in 2009 for the property that addresses all these issues in a comprehensive manner.

In addition, there is potential for the development of numerous other water trails in the county. Possible water trail segments could be developed for the Mill, Conewago, Little Conestoga, Cocalico, and others. All of these water trail opportunities should be evaluated and prioritized in the near future.

- **Pequea Creek Water Trail**

Description – The proposed water trail would run from Silver Mine Park in Pequea Township to the PPL Boat Access at the confluence of the Susquehanna River—a distance of approximately 7.7–miles.

Status – No discussions have occurred on the creation of the water trail at this time.

Next Steps – A meeting between County Planning, Pequea Township, PPL, and the PA Fish & Boat Commission should occur in the near future to see if there is sufficient support for the creation of the water trail. If there is a consensus to move forward, the County Planning Commission should seek funding for the project through DCNR and the Chesapeake Bay Gateways Program.

In addition to these new high priority trail projects, the permanent protection of the County's existing regional trails—the Conestoga and Horse Shoe—should be considered high priority initiatives. These informal, historic recreation trails are largely unprotected and are constantly threatened by encroaching rural development. Many segments of these trails have been forced onto existing roadways; making it neither safe nor attractive for hikers and equestrians.

Both the Conestoga and Horse Shoe Trail have support organizations that coordinate volunteer activities to help maintain these hiking paths. The County Planning Commission should coordinate with these organizations to assist them in securing the protection of these trail routes with perpetual trail easements. The Mason-Dixon Trail, which parallels the Susquehanna River in York County, is similar to the regional trails in Lancaster County. Efforts to coordinate with York County Planning and the Lancaster York Heritage Region should be initiated to ensure the protection of all the informal long-distance recreational trails that serve the residents of this region.

• **Action 4-3: Green Infrastructure Design Standards**

Description: Jurisdictions across the country are adopting LEED or similar standards for their capital projects. In keeping with the overall goal of integrating green infrastructure into the built environment, Lancaster County should develop standards for applying green building techniques, sustainable stormwater management practices, natural landscaping, and similar approaches into the design, renovation, and maintenance of county-owned capital projects, facilities, and properties. These standards could be developed in collaboration with Lancaster City as the County's major urban community. One or more projects could be developed as models for action by governmental and institutional entities throughout Lancaster County.

In addition to the standards for projects and facilities in urban contexts, management strategies such as native habitat restoration

and invasive species control should be applied to county regional parks.

Timeframe: Mid-Term (development of standards) / Ongoing (application of standards)

5.1.5 Initiative 5: Partnership

While Lancaster County will play a major role in leading implementation of Greenscapes, many other entities will through their own efforts make important contributions. These entities can be grouped into five major categories, as follows:

- Public Sector
 - Municipalities
 - Commonwealth of Pennsylvania (DCNR, DEP, PA F&BC, etc.)
- Semi-Public/Institutional Sector
 - Lancaster County Conservation District
 - School districts
 - Sewer and water authorities
 - Universities (e.g., Millersville University's role in providing environmental monitoring services for the Lancaster County Roof Greening Project)
 - Utility and infrastructure companies (PPL, Safe Harbor Water Power Corporation, Norfolk Southern, Amtrak, Conrail)
- Private Nonprofit Sector
 - Lancaster County Conservancy
 - Outdoor recreation groups



The Safe Harbor Water Power Company maintains the bird habitat at the Conejohela Flats—one of the most significant migratory bird habitats in all of Pennsylvania.

- Watershed organizations
- Urban community development organizations
- Foundations
- Private For-Profit Sector
 - Development community
 - Business/corporate community
- Citizen groups and individuals
 - Landowners
 - Environmental and Smart Growth Organizations (e.g., LAND, Coalition for Smart Growth, etc.)

The roles and responsibilities of these various entities in achieving the vision of a healthy and sustainable green infrastructure system are outlined below in Section 5.2.

Action Initiative 5 is designed to coordinate the efforts of these diverse entities (including the County) in a broad-based partnership – referred to as the Lancaster County Green Infrastructure Coalition – to create a healthy, sustainable green infrastructure system. It is proposed that this initiative begin with a Green Infrastructure Summit.

- **Action 5-1: Green Infrastructure Summit**
Description: The Green Infrastructure Summit is proposed as a one-day event involving representatives of the various organizations and interests identified above. It should be coordinated with the initial plan outreach activities (Action 1-1). The summit agenda should address Greenscapes, green infrastructure programs and initiatives in Lancaster County in the context of the plan’s recommendations, and formation of the Lancaster County Green Infrastructure Coalition.

Timeframe: Short-term

- **Action 5-2: Lancaster County Green Infrastructure Coalition**

Description: The Lancaster County Green Infrastructure Coalition is envisioned as a network of existing agencies, organizations, and groups that would meet on a regular basis to discuss and coordinate initiatives and projects related to green infrastructure. The overall mission of the coalition should be to create synergies, leverage resources, and define the most effective role each coalition

member can play in creating the green infrastructure system. Coalition working groups could be formed to address special topics, for example development of educational materials and technical assistance programs to be carried out by members or fundraising from corporate or foundation sources for green infrastructure projects. The Lancaster County Conservancy has offered to facilitate and coordinate this coalition.

An action agenda comprised of the following seven work programs is proposed to focus and prioritize the efforts of the Green Infrastructure Coalition:

1. Riparian Buffer Action Plan
2. Green Infrastructure Communications
3. Municipal Assistance
4. Green Infrastructure Funding
5. Regional Parks and Trails System
6. Regional Landscape Conservation Plans
7. Green Infrastructure Monitoring System

Riparian Buffer Action Plan: Degraded stream quality is one of the primary threats to green infrastructure in Lancaster County. To address this threat, a key priority of the Green Infrastructure Coalition should be to develop and implement a more detailed action plan promoting 1) restoration of floodplains and buffers of natural vegetation along the streams that have been heavily impacted by urban and agricultural uses and 2) preservation of existing buffers along high quality streams elsewhere in the County. This program is intended to coordinate and build on current riparian restoration initiatives (e.g., the Lancaster County Conservation District’s technical assistance program and the work of watershed organizations such as the Lititz Run Watershed Alliance). It should identify opportunities to target use of tools identified in Chapter 4.0 to achieve riparian buffer preservation, conservation, and restoration. Examples of these tools include:

- II-A. Green Infrastructure Overlay District
- II-F. Natural Resource Protection Ordinance
- II-J. Stormwater Management Ordinance
- III-A. Land Acquisition

- III-C. Agricultural Best Management Practices
- III-G. Environmental Restoration
- IV-C. Conservation Easement Donation

The action plan should identify indicators to be used to track the health of riparian buffers throughout Lancaster County as part of a green infrastructure monitoring system (see below). For example, miles of stream buffers restored or protected by landowners and organizations throughout the County could be compiled and tracked on an ongoing basis as an indicator of progress.

Green Infrastructure Communications

Program: Initiative 1 above calls for development of an education, outreach, and communications program to citizens, municipalities, landowners, and others with a stake in Lancaster County’s green infrastructure. Developing and implementing a clear, simple, and compelling green infrastructure communications program through means such as media outreach, educational materials, a website, and speakers’ events should be an immediate priority of the Green Infrastructure Coalition.

Municipal Assistance: Municipalities have a critical role to play in creating the green infrastructure system through actions such as green infrastructure planning, enactment of regulations, and commitment of local funding and resources. Therefore, outreach and technical assistance to municipalities should be another key priority of the Green Infrastructure Coalition. This program should build on and expand the Lancaster County Planning Commission’s existing municipal planning program to more directly address green infrastructure issues (Action 2-1). Development of model green infrastructure and related ordinances for use by municipalities should be a short-term priority (Action 2-2). Over time, assistance can be coordinated through Environmental Advisory Councils established by municipalities in accordance with Action 2-1.

Green Infrastructure Funding: Adequate funding for green infrastructure initiatives and projects is key to the success of Greenscapes. Coordination and dissemination of information on green infrastructure funding sources should be a Coalition priority. This should include 1) restructuring Lancaster County municipal grant programs to support projects such as “green streets”, urban “greening” projects, riparian restoration, etc. (Action 3-1) and 2) providing information and assistance on the range of available programs, including an annual “green infrastructure funding workshop” (Action 3-2). In addition to governmental grant programs, private sources of funding (nonprofits, businesses, citizen contributions, etc.) should be identified as part of the green infrastructure funding program.

Regional Parks and Trails System: Actions 4-1 and 4-2 address completion of the county regional park system and development of a countywide greenway trail system, respectively. While Lancaster County will have the primary responsibility for completion of the regional park system, the Green Infrastructure Coalition can provide support in this effort. The Coalition can also play a key role in bringing together and coordinating the many entities – municipalities, state agencies, private citizens’ groups, etc. – that will need to participate in creating the greenway trail system.

Regional Landscape Conservation Plans: Similar to its role in coordinating development of a countywide greenway trail system, the Coalition can help promote development of large-scale landscape conservation plans that transcend jurisdictional (municipal, multi-municipal, and county) boundaries (see Action 2-3 and Chapter 4, Tool I-F). The LCPC has initiated preparation of the Susquehanna River Corridor Master Plan in Lancaster and York Counties as a model regional landscape conservation plan.

Green Infrastructure Monitoring System: Use of quantitative indicators to measure progress is a key component of plan implementation (see Section 5.3). Building on the

Lancaster Community Indicators Project (Measure up Lancaster!), the Green Infrastructure Coalition should take the lead in establishing and monitoring indicators tied to plan goals, objectives, and strategies (e.g., riparian buffer restoration).

Timeframe: Short-term (establishment of Lancaster County Green Infrastructure Coalition) / Ongoing (work programs)

- **Action 5-3: Lancaster County Environmental Advisory Council**

Description: Environmental Advisory Councils (EACs) are expected to play a key role in implementing Greenscapes at the municipal and multi-municipal levels. Establishment of a countywide EAC is proposed to serve as an “umbrella” organization for local and regional EACs and to advise the Lancaster County Board of Commissioners on environmental and green infrastructure issues. Neighboring Berks County established an EAC in 2004, with the following mission:

The Berks County Environmental Advisory Council serves an advisory role to the Berks County Commissioners and its citizens with the understanding that all people have a right to clean air, pure water, and the preservation of natural, scenic, historic and esthetic values of the environment. The EAC seeks to improve the environmental welfare of Berks County. Its purpose is to provide leadership in objectively reviewing environmental issues and to provide guidance to the County regarding environmental matters within Berks County and the region. The EAC is committed to making Berks County a better place in which to live, and to the preservation of our resources for future generations. (<http://co.berks.pa.us/eac/site/default.asp>)

The Lancaster County Green Infrastructure Coalition established per Action 5-2 could assume the role of the Lancaster County Environmental Advisory Council, with the Lancaster County Conservancy playing a key role.

Timeframe: Mid-term



Establishing Environmental Advisory Committees (EACs) at the local municipal level is an important step towards implementing many of the recommendations in Greenscapes.

- **Action 5-4: Friends of Lancaster County Regional Parks**

Description: “Friends of Parks” organizations are nonprofit citizens’ groups that provide support and resources for county and municipal park systems, as well as individual parks. Friends of Parks organizations can raise significant funds for parkland acquisition, development, and maintenance through charitable donations and also support park projects and programs through volunteer activities. As an example, the Indianapolis Parks Foundation (Indy Parks) has donated more than \$7.5 million to the city’s parks since its inception in 1991. Lancaster County should explore interest in establishing such a foundation among citizens and businesses in the County. Such an organization could eventually provide significant support to the County’s regional park system.

Timeframe: Mid-term

5.2 Roles and Responsibilities

A wide variety of organizations, groups, businesses, and individuals will contribute to achieving the vision of a healthy and sustainable green infrastructure system. The following outlines the roles and responsibilities of the major players who will be involved in this effort. The proposed Lancaster County Green Infrastructure Coalition will help to coordinate and build partnerships among these diverse entities.

5.2.1 Public Sector

Lancaster County

- Lead countywide green infrastructure planning and outreach efforts
- Promote communication and collaboration on green infrastructure between different stakeholder groups, including establishment of the Lancaster County Green Infrastructure Coalition
- Provide technical assistance to municipalities in developing green infrastructure plans and regulations
- Provide funding assistance for urban and rural green infrastructure projects to municipalities and nonprofit organizations
- Expand the county regional park system to achieve the minimum standard of 5 acres of parkland per 1,000 residents
- Lead planning and development of a countywide greenway trail system
- Manage the regional park system and other county properties to reinforce green infrastructure functions and values
- Pursue opportunities to increase waterway access for non-motorized boaters.

Municipalities

- Prepare municipal and multi-municipal green infrastructure plans
- Enact ordinances to conserve green infrastructure resources
- Establish Environmental Advisory Councils (EACs) to coordinate green infrastructure planning at the municipal and multi-municipal levels
- Meet local recreational needs through the provision of “mini,” neighborhood, and community parks that meet or exceed the minimum standard of 10 acres of parkland per 1,000 residents
- Develop local greenway/trail systems
- Incorporate green infrastructure into local infrastructure improvements (e.g., multi-functional stormwater management solutions, context-sensitive roadway design, provision for bicycle and pedestrian connections)
- Lead implementation of other green infrastructure projects at the local level

(e.g., “urban greening” projects in Lancaster City and the boroughs)

- Pursue opportunities to increase waterway access for non-motorized boaters.

Commonwealth of Pennsylvania

- Provide funding and technical support for green infrastructure planning and development projects in Lancaster County
- Pursue opportunities to expand state park and game lands to protect green infrastructure resources
- Manage state park and game lands to reinforce green infrastructure functions and values such as natural resource preservation and provision of compatible recreation opportunities
- Provide funding and technical support for development of the countywide greenway trail network with a focus on connections that are part of the state greenway system
- Implement context-sensitive solutions that respect green infrastructure resources in the planning and design of transportation improvements
- Encourage non-structural green infrastructure solutions to environmental problems rather than relying on conventional engineered “gray infrastructure”
- Pursue opportunities to increase waterway access for motorized and non-motorized boaters.

5.2.2 Semi-Public/Institutional Sector

Lancaster County Conservation District

- Work with landowners to establish riparian buffers on degraded waterways in rural/agricultural areas
- Expand efforts to establish riparian buffers in urban and suburban areas
- Focus on restoration of streams and floodplains damaged by legacy sediments as a top priority
- Provide technical assistance to farmers and other landowners in managing prop-

erties to reinforce green infrastructure functions and values, including wetland restoration, maintenance or restoration of rare species habitat, agricultural best management practices, etc.

- Coordinate and provide technical assistance to the County’s watershed organizations in developing and implementing watershed initiatives that monitor, protect, and enhance green infrastructure

School Districts

- Work with municipalities to meet local recreation needs through the provision of “school-parks”
- Promote awareness of the importance of green infrastructure through school curricula, programs, and projects (e.g., student involvement in wildlife habitat improvement projects)
- Incorporate green infrastructure into school campuses
- Work with municipalities (especially boroughs) to save recreation land associated with elementary schools when the decision to close them has been made.

Sewer and Water Authorities

- Coordinate provision of public water and sewer service with growth management strategies such as Urban Growth Areas
- Implement wastewater treatment and public water supply solutions that minimize impacts on green infrastructure resources



By focusing on Natural Heritage Areas like the Rock Springs Serpentine Barrens in Fulton Township, the Lancaster County Conservancy will help preserve the county’s remaining biological diversity.

- Work with the County and municipalities to protect groundwater resources

Utility and Infrastructure Companies

- Continue to manage lands along the Susquehanna River to preserve natural resources and provide for compatible public recreation (PPL, Safe Harbor Water Power Corporation)
- Participate in developing a greenway trail along the Susquehanna River (Norfolk Southern, PPL, Safe Harbor Water Power Corporation)
- Participate in rail-to-trail projects where safety/liability issues can be addressed (Norfolk Southern, Amtrak, Conrail)
- Restore habitat for species of concern (e.g., fish passages for shad and American eel)
- Incorporate green infrastructure into “gray infrastructure” repair, replacement, and development projects

5.2.3 Private Nonprofit Sector

Lancaster County Conservancy

- Continue to protect valuable natural resource lands through acquisition and by accepting donations of land and easements, focusing on “Natural Gems” as a high priority
- Preserve and restore core habitat, supporting landscapes, and migratory corridors for species of concern
- Provide technical assistance to landowners in preserving and managing private lands to maintain and restore natural resource values (e.g., conservation easements, limited development options, natural habitat management, etc.)
- Provide passive outdoor recreational opportunities compatible with resource protection
- Participate in education and outreach efforts on the importance of green infrastructure
- Advocate/promote green infrastructure at multiple levels, including urban and suburban as well as rural areas

Montréal Process Criteria and Indicators

In 2001, the USDA Forest Service asked Baltimore County officials to participate in a project called “Linking Communities to the Montréal Process Criteria and Indicators.” The Montréal Process is an international effort to develop measures of the sustainability of temperate and boreal forest resources. Experts from 12 countries that represent 90% of the world’s temperate and boreal forests defined seven categories of critical ecological, economic, and social issues that needed to be addressed. The categories or “criteria” have a series of “indicators” associated with them to assess progress toward sustainable forest management.

Because many of the decisions that affect forest management in the US are made at the local level, the Forest Service wanted to determine if criteria and indicators developed at the international level could be applied by local communities to encourage more sustainable management of forest resources. Baltimore County was selected to test the indicators’ usefulness in an urban forest area because of its location in the greater Baltimore-Washington DC metropolitan area. The use of the Montréal Process criteria and indicators is credited as a significant factor in the success of Baltimore County’s Forest Sustainability Project. It provided both a structure for organizing complex forest issues into a manageable long-range picture and served as a catalyst for bringing people and organizations with diverse viewpoints together.

- Provide leadership in the Green Infrastructure Coalition
- Lead development of a network of municipal Environmental Advisory Councils (EACs)
- Pursue opportunities to increase waterway access for non-motorized boaters.

Urban Community Development Organizations

- Implement urban greening/green infrastructure projects (e.g., pocket parks, community gardens, canopy tree plantings)
- Involve the urban community in green infrastructure projects, including youths through training/life skills programs

Foundations

- Provide funding for green infrastructure projects (e.g., urban greening projects by community development organizations)
- Sponsor research on the benefits of green infrastructure and indicators of progress in creating the green infrastructure system

5.2.4 Private for Profit Sector

Development Community

- Incorporate green infrastructure into developments (e.g., provision of local recreational lands and trails, establishment of buffers adjacent to streams, protection of natural resources such as forestlands, wetlands, and rare species habitat through approaches such as conservation development, green building techniques)
- Participate in education and outreach efforts on green infrastructure in recognition of its importance to Smart Growth
- Pursue opportunities to increase waterway access for non-motorized boaters.

Business/Corporate Community

- Implement LEED or other green building standards and techniques in development projects
- Pursue market-based approaches to environmental restoration, particularly related to water resource protection and enhancement
- Incorporate green infrastructure into commercial, office, and industrial parks
- Participate in green infrastructure education and outreach efforts

- Support green infrastructure projects through charitable contributions and employee involvement

5.2.5 Citizen Groups and Individuals

Watershed Groups

- Develop multi-objective watershed management plans that apply green infrastructure concepts
- Implement watershed-based green infrastructure projects (e.g., riparian restoration, water quality improvements)
- Help maintain watershed-based green infrastructure projects, especially during the first several years
- Build grassroots citizen awareness of the importance of green infrastructure

Outdoor Recreation Groups (hiking, hunting, paddling, and fishing clubs, etc.)

- Participate in greenway trail, stream restoration, and other projects that provide for compatible recreational uses of green infrastructure resources
- Build grassroots citizen awareness of the importance of green infrastructure
- Assist in trail maintenance

Property Owners and Other Citizens

- Preserve and restore green infrastructure
- Permanently protect natural resources on your land (e.g., by donating a conservation easement)
- Develop and implement wildlife habitat management plans
- Use native plant materials, including the potential reintroduction of rare species
- Join an organization such as a watershed group to promote green infrastructure
- Become a spokesperson for green infrastructure in your community

5.3 Plan Monitoring

Greenscapes is not intended as a fixed or static document, but rather as one that will evolve over time as action to establish a countywide, integrated green infrastructure system moves forward on many fronts. To ensure the success of the plan, it is important to establish an ongoing process for monitoring progress in implementing the proposed strategies, tools, and action initiatives. This process should include:

- Development of annual work programs defining specific projects and tasks to be carried out over the next year, including responsible parties and resource commitments required;
- Establishment of statistical indicators for use in measuring progress towards achieving the plan goals and objectives; and
- Reviews on at least an annual basis to measure and assess progress and to make adjustments to the annual work programs, using the indicators as a measure of progress.

As previously noted, the Lancaster Green Infrastructure Coalition should lead the take on the responsibility for plan monitoring as part of its role in leading the overall implementation effort.

The Lancaster Community Indicators Project – Measure up Lancaster! – provides a starting point for identifying green infrastructure indicators. The following indicators from this project are most relevant to green infrastructure:

- Air Quality:
 - Total number of days annually that reach “Code Orange” levels for ground level ozone
 - Total number of days annually that reach “Code Red” levels for ground level ozone
- Protection and Preservation of Open Space:
 - Total acres of parkland and open space permanently preserved
 - Municipalities meeting or exceeding standards for publicly-owned parkland (i.e., a minimum of 10 acres of local parkland per 1,000 residents)

- Water Quality:
 - Percentage of county stream miles listed as “Impaired,” “High Quality” or “Exceptional Value,” or “Meeting Designated Use” designations by the Pennsylvania DEP

Examples of additional indicators that could be used to measure progress in implementing Greenscapes include:

- Acreage/percentage of exceptional natural resource lands (as delineated on Figure 26) with permanent protection
- Progress in achieving the minimum standard of 5 acres of county regional parkland per 1,000 residents
- Miles of greenway and waterway trails developed
- Watershed plans prepared
- Municipal green infrastructure plans prepared

- Percentage of tree canopy cover in urban communities (Lancaster County, boroughs)
- LEED certified buildings and green roofs constructed
- Percentage of core habitat for species of concern as defined by the Lancaster County Natural Heritage Inventory preserved
- Miles of streams and rivers restored with best management practices such as riparian plantings and fencing

The proposed Lancaster County Green Infrastructure Coalition, supported by the LCPC, could take the lead in developing the indicators, monitoring progress, and preparing an annual Green Infrastructure report. Private foundations could play a role in supporting research on green infrastructure indicators. The report would describe progress made during the previous year, measure where the green infrastructure system stands in relation to the indicators, and identify priority actions for the upcoming year.

Appendix A

Green Infrastructure Planning Case Studies

Although green infrastructure planning is a relatively new area of focus, there are a number of examples from across the country of communities taking a leadership role in planning for green infrastructure. The following are a few case study examples of green infrastructure initiatives from throughout the country.

GreenPrint State of Maryland

Maryland provides some of the best examples of Green Infrastructure planning, including the statewide GreenPrint Program and recent Greenscapes for Talbot and Prince Georges Counties. The GreenPrint Program used satellite imaging and Geographic Information Systems (GIS) analysis to map Green Hubs – largely intact natural areas typically hundreds to thousands of acres in size that are vital to maintaining the State’s ecological health – and Green Links – linear remnants of natural lands such as stream valleys and mountain ridges that serve as “habitat highways.” The County plans define more detailed Green Infrastructure networks at the county scale, along with strategies for their protection.

Legacy Open Space Plan Montgomery County, Maryland

In response to the belief that open space and quality of life are linked, the Montgomery County Planning Board and County Council developed a Legacy Open Space Functional Master Plan in 2000 “...to preserve the County’s most significant open space resources as a means to protect the County’s environment, quality of life, and economic vitality.” The Legacy Open Space program is a multi-million dollar program that expands on the existing park system with a public/private initiative to protect thousands of acres of important open space lands and heritage resources throughout Montgomery County. The goals of the program are: (1) Protection of environmentally sensitive natural resources, (2) protection of water supplies, (3) conservation of heritage resources, (4) protection of greenway links, (5) protection of farmland and rural open space resources, and (6) protection of urban open spaces. The Master Plan identifies target sites for protection and priorities are determined based on several criteria, which are recommended to an

Advisory Board. The recommendations are then provided to the Planning Board and incorporated into capital budgeting. The Maryland-National Capital Park and Planning Commission is currently preparing a county-wide Greenscapes that will complement the Legacy Open Space Master Plan.

Metro Greenways Program Twin Cities, Minnesota

The Twin Cities Metro Greenways program was launched in 1998 in response to Metro Greenprint, a citizen’s report that called for stronger efforts to protect nature in the face of urban growth. Administered by the Minnesota Department of Natural Resources, the program works with communities to preserve and restore their natural heritage. Metro Greenways has launched efforts to protect more than 3,000 acres of sensitive natural areas. It has provided technical help to numerous local units of government and worked with communities to inventory natural resources and develop stewardship plans affecting more than 600,000 acres. In the past four years, Metro Greenways has awarded nearly \$1 million in matching grants to communities to undertake resource inventories and develop plans for preserving and managing their natural infrastructure. The program has also committed \$9 million to protect some of the region’s best remaining natural areas and open spaces. This money has leveraged an additional \$25 million in other funds. Thirty-eight projects totaling over 3,000 acres have been approved for protection through acquisition and conservation easements. By working in this fashion with local government and non-profit organizations, Metro Greenways is facilitating a broader conservation partnership that will help meet the challenges of resource protection in an area of rapid growth.

EPA’s Southeastern Ecological Framework

The Southeastern Ecological Framework Project is a GIS-based analysis to identify ecologically significant areas and connectivity in the southeast region of the US. The project began in 1998 and was completed in 2001 by the University of Florida GeoPlan Center and sponsored by the US Environmental Protection Agency (EPA) Region 4. EPA Region 4 continues to use this data to facilitate EPA programs and to work with state and federal agencies and local groups to make

Appendix A

sound conservation decisions. The projects goals and objectives are as follows:

- Identify primary ecological areas that are protected by some type of conservation or ecosystem management program
- Identify a green infrastructure network that connects these primary ecological areas
- Identify the important ecological characteristics of the ecological areas and connecting green infrastructure
- Develop an understanding of the spatial scale issues involved in analyzing the ecological connectivity at local, state and regional scales, and
- Develop protocol for dissemination of the information.

This analysis was conducted using landscape ecology principles and Geographic Information Systems (GIS) tools. The products of this study can be used by local, state and federal agencies in developing a regional atlas of environmental issues and conflicts and threats to the natural ecosystems caused by human environmental impacts. State, local and private entities can utilize the information to address various environmental resource allocation issues.

Florida Greenways and Trails Plan

In 1991, two private conservation organizations, 1000 Friends of Florida and The Conservation Fund, initiated a state-wide greenways project to address the loss of natural habitat and ecological lands throughout the state. The outcome of the 1991 effort was the formation of the Florida Greenways Commission, established by the Governor, which later resulted in the Florida Greenways Coordinating Council. This public-private group recommended that Florida create a statewide system of greenways that would link natural areas and open spaces, conserving native landscapes and ecosystems and offering recreational opportunities across the state. This green infrastructure was to connect residents and visitors to the state's natural and cultural heritage, enhance their sense of place, and enrich their quality of life. The Greenways Coordinating Council worked with Florida Department of Environmental Protection to develop a 5-year implementation plan. The University of Florida GeoPlan Center developed the mapping for a

statewide system of greenways and trails. The plan proposes connecting ecologically significant sites through a system of cultural and historic trails. The University of Florida GeoPlan Center developed a GIS database of information to identify opportunity areas. The results of this effort include a series of maps defining trails and conservation areas to guide future open space acquisition and preservation efforts throughout the state.

Sonoran Desert Conservation Plan Pima County, Arizona

In 1998 the Pima County Board of Supervisors initiated discussions on land use planning and conservation that resulted in the preparation of a conservation plan for the Sonoran Desert. The area covered in the Sonoran Desert Conservation Plan includes 5.9 million acres located in Pima County, Arizona which includes the Tucson metropolitan area. It includes two major eco-regions known as the Sky Islands and the Sonoran Desert. The conservation planning effort addresses the problems of declining natural resources and the loss of cultural identity in one of the fastest growing parts of the country. The Plan is an innovative and far reaching blueprint for growing in an intelligent and graceful manner in Pima County. The Plan is designed to benefit the natural systems and residents of Pima County and to save the best lands and most precious resources for future generations to enjoy. The goals of the plan are to:

- Protect biological diversity and endangered species
- Protect critical riparian areas
- Preserve cultural and historic resources
- Ensure viability of ranching
- Connect open space and preserves into linked system

The planning process for the development and implementation of the vision engaged a broad and diverse group of stakeholders. The plan has successfully connected land use regulations with the ecological network design. The County is currently developing an ecological Monitoring Program to identify a set of indicators that can determine if the biological goal of the Sonoran Desert Conservation Plan is being achieved and

to provide information to managers to help them take more informed management actions.

Talbot County Green Infrastructure Plan Talbot County, Maryland

In 2004, Talbot County, MD, which is centrally located on Maryland's Eastern Shore of the Chesapeake Bay, completed a county-wide Green Infrastructure Plan. Talbot County is characterized by fragile system of islands and peninsulas that make up almost 600 miles of coastline bordering the Bay and its multiple inlets. Greenscapes identifies critical areas for conservation, establishes priorities for protection, and recommends implementation strategies and funding. The Plan focuses on ecologically important resource areas (woodlands, high quality wildlife habitat), highly productive working landscapes (farmland and forestland) and critical areas for the protection of aquatic resources (wetlands, sensitive shoreline areas, riparian corridors, floodplains). Greenscapes was developed in coordination with the County's updated Comprehensive Plan in order to reflect the community's values, future vision, and local interests. Greenscapes is intended to help public, private, and non-profit entities preserve natural resources, ensure the economic viability of working landscapes and manage development in a way that preserves the natural resources and character of the County.

Natural Connections

In 2000, Openlands, a non-profit conservation organization, convened a conference to address natural resource protection in the tri-state region of northeastern Illinois, northwestern Indiana, and southeastern Wisconsin. The conference's objectives were to identify the green infrastructure that connects the three states, assess the threats to these resources and the status of efforts to protect them, and define an agenda for the future. Conference participants identified obstacles to protecting natural resources that cross state lines and strategies for overcoming them. The conference attendees identified the lack of information about natural resources across jurisdictional lines was a major obstacle to cooperative efforts to protect these resources. They agreed that one of the most important ways to help interstate and regional conservation efforts would be to create a map and regional database that provided foundational information on green

infrastructure across the three-state region. In 2002, the Center for Neighborhood Technology and Openlands formed a partnership to address the need for better information about the green infrastructure in the 14-county region. The best available data was compiled from more than 60 local, state, and federal agencies, as well as private land trusts and conservation groups. Collectively, the green infrastructure detailed on the map represents more than 175 layers of data. The layers include publicly owned lands, existing and proposed greenways, waterways, trails, and other natural areas and open spaces.

Philadelphia Green

Started in 1974, Philadelphia Green is a program of the Pennsylvania Horticultural Society that supports the development and ongoing care of community gardens, neighborhood parks and high-profile public green spaces in Philadelphia. Working in partnership with neighborhood residents, community organizations and city agencies, the program uses greening as a community building tool. It educates and empowers people to make the city a more attractive and livable place through horticulture. Support for the program comes from proceeds from the annual Philadelphia Flower Show along with foundations, corporations, government agencies, and individuals. The Pennsylvania Horticultural Society's Green City Strategy calls for significant improvements to the city's open spaces as a means of attracting new residents and investment. It also addresses the problem of vacant land and promotes a citywide vacant land greening and management system. The City of Philadelphia has formally adopted the Green City Strategy as the cornerstone of its anti-blight campaign, known as the Neighborhood Transformation Initiative. PHS views greening as an integral way to bring urban neighbors together and create a higher quality of life throughout the city. Its Philadelphia Green program organizes residents and local groups to maintain parks, plant and maintain tree-lined streets, and transform vacant lots into community gardens and open spaces.

Lessons Learned

The case study review revealed a number of important lessons for successful green infrastructure planning. The process of developing a natural resource inventory is an important tool, but

without public support and stable leadership the plan will remain just that. An organized method for public participation and input to build a constituency to advocate for green infrastructure should be considered at the outset of every planning effort. Green Infrastructure planning requires a long term commitment and strong leadership to ensure the plan's implementation. The goals of assembling contiguous natural resources lands and linking them with green corridors are two common themes of most programs. In addition, conservation planning requires regular updates and re-prioritization based on new data. In many cases, the ecological resources that green infrastructure planning targets for preservation transcends municipal, county, and even statewide boundaries. Planning and implementation requires considerable coordination among different public, private, and non-profit groups; sometimes at a regional scale.

Appendix B

Parks and Recreation Background Data

This appendix contains miscellaneous background information in support of the parks and recreation analysis presented in Section 2.3 of the Plan. Table 5.1 presents municipal parkland and school district properties for each municipality in Lancaster County. It is followed by a comparison of the parkland standards adopted in Lancaster County's 1993 Regional Open Space Plan to parkland standards used in adjacent counties.

Table B-1. Lancaster County Municipal Parklands and School District Properties, by Municipality

Municipality	Property	Owner	Acres
Adamstown Borough			
	Adamstown Memorial Park	Adamstown Borough	0.6
	Adamstown Pool and Grove	Adamstown Borough	18.8
	Adamstown Elementary School	Cocalico School District	4.6
			24.0
Akron Borough			
	Broad Street Park	Akron Borough	3.4
	Lloyd H. Roland Memorial Park	Akron Borough	86.0
	Akron Elementary	Ephrata Area School District	7.5
			96.9
Bart Township			
	None		
Brecknock Township			
	Brubaker Park	Brecknock Township	88.4
	Brecknock Elementary	Eastern Lancaster County School District	9.8
			98.2
Caernarvon Township			
	Poole Forge	Caernarvon Township	21.8
			21.8
Christiana Borough			
	Christiana Elementary School	Christiana Borough	5.8
Clay Township			
	Hopeland Community Park	Clay Township	4.5
	Snyder Community Park	Clay Township	5.9
	Clay Elementary	Ephrata Area School District	7.7
			18.1
Colerain Township			
	Kirkwood Community Park	Colerain Township	5.4
	Bart-Colerain Elementary	Solanco School District	7
			12.4
Columbia Borough			
	Makle Park	Columbia Borough	3.0

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Municipality	Property	Owner	Acres
	Rotary Park	Columbia Borough	1.6
	Columbia High School	Columbia School District	25.3
	Park Elementary	Columbia School District	0.9
	Taylor Elementary	Columbia School District	0.8
			31.6
Conestoga Township			
	Conestoga Park	Conestoga Township	6.1
	Conestoga Elementary	Penn Manor School District	4.9
			11.0
Conoy Township			
	Bainbridge Playground	Conoy Township	0.8
	Conoy Canal Park	Conoy Township	49.5
	Conoy Creek Park	Conoy Township	33.8
	Conoy Township Park	Conoy Township	6.7
	Krieder Tract Park	Conoy Township	38.1
	Bainbridge Elementary	Elizabethtown Area School District	3.3
			132.2
Denver Borough			
	Bon view Estates Linear Park	Denver Borough	12.3
	Denver Memorial Park	Denver Borough	6.8
	Denver Community Pool	Denver Borough	5.0
	North Fourth Street Playground	Denver Borough	1.5
	Cocalico School District Campus	Cocalico School District	92.0
			117.6
Drumore Township			
	Drumore Township Community Park	Drumore Township	30.7
	Drumore Elementary School	Solanco School District	4.6
			35.3
Earl Township			
	New Holland Elementary	Eastern Lancaster County School District	6.3
East Cocalico Township			
	East Cocalico Township Office Land	East Cocalico Township	12.7
	Fishing Creek Park	East Cocalico Township	10.8
	Old Homestead Park	East Cocalico Township	9.2
	Reamstown Memorial Park	East Cocalico Township	15.5
	Township Land	East Cocalico Township	25.4
	Reamstown Elementary	Cocalico School District	8.3
			81.9
East Donegal Township			
	Front Street Park (Charles Property)	East Donegal Township	45.9

Municipality	Property	Owner	Acres
	Legion Park	East Donegal Township	4.7
	Lloyd H. Fuhrman Park	East Donegal Township	17.9
	Longwood Square	East Donegal Township	6.1
	R & J Memorial Baseball Field	East Donegal Township & Mount Joy Borough	7.7
	Riverfront Park	East Donegal Township	241.6
	Donegal High School	Donegal School District	23.1
	Maytown Elementary	Donegal School District	4.4
	Seiler Elementary	Donegal School District	1.8
			353.2
East Drumore Township			
	Solanco High School	Solanco School District	30.7
East Earl Township			
	Blue Ball Elementary	Eastern Lancaster County School District	4.4
East Hempfield Township			
	Amos R. Herr Park	East Hempfield Township	54.6
	East Hempfield Open Space	East Hempfield Township	24.7
	Nissley Road Property	East Hempfield Township	17.0
	Noel S. Dorwart Memorial Park	East Hempfield Township	9.9
	Nolt Road Property	East Hempfield Township	51.7
	Wheatland Hills Park	East Hempfield Township	11.9
	Centerville Elementary & Junior High School	Hempfield School District	39.2
	Hempfield Senior High School	Hempfield School District	86.9
	Landisville Elementary	Hempfield School District	3.4
	Roherstown Elementary	Hempfield School District	8.4
			307.7
East Lampeter Township			
	Flory Park	East Lampeter Township	43.8
	Hobson Road Park	East Lampeter Township	26.6
	Lafayette Park	East Lampeter Township	8.2
	Conestoga Valley Senior High School	Conestoga Valley School District	66.6
	J. E. Fritz Elementary	Conestoga Valley School District	5.2
	Smoketown Elementary	Conestoga Valley School District	8.6
			159.0
East Petersburg Borough			
	East Petersburg Fitness Park	East Petersburg Borough	5.3
	East Petersburg Borough Pool	East Petersburg Borough	8.5
	East Petersburg Civic Grounds & Community Park	East Petersburg Borough	39.2
	The Commons	East Petersburg Borough	0.1

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Municipality	Property	Owner	Acres
	East Petersburg Elementary	Hempfield School District	26.5
			79.6
Eden Township			
	George A. Smith Middle School	Solanco School District	24.3
Elizabeth Township			
	Elizabeth Township Community Park	Elizabeth Township	9.7
Elizabethtown Borough			
	Elizabethtown Borough Community Park	Elizabethtown Borough	20.8
	Hickory Lane Park	Elizabethtown Borough	12.7
	Poplar Street Park	Elizabethtown Borough	9.3
	East High Street Elementary School	Elizabethtown Area School District	23
	Elizabethtown Area High School & Middle School	Elizabethtown Area School District	17.2
	Fairgrounds	Elizabethtown Area School District	23
	Mill Road Elementary School	Elizabethtown Area School District	7.5
			113.5
Ephrata Borough			
	Bethany Park Estates	Ephrata Borough	3.9
	Edgewater Meadow Park	Ephrata Borough	5.7
	Ephrata Borough Community Park	Ephrata Borough	16.5
	Ephrata Rail Trail	Ephrata Borough	7.2
	Ephrata Recreation Center	Ephrata Borough	5.7
	Heatherwood Park	Ephrata Borough	19.5
	Irene Avenue Park	Ephrata Borough	14.6
	Lincoln Heights Outdoor Recreation Area	Ephrata Borough	15.0
	Lincoln Heights Playground	Ephrata Borough	0.9
	Martin Avenue Mall	Ephrata Borough	0.2
	Mountain Land	Ephrata Borough	18.3
	Moyer's Meadow	Ephrata Borough	12.6
	Open Space	Ephrata Borough	10.4
	Pioneer View Playground	Ephrata Borough	0.5
	Redcay Playground	Ephrata Borough	0.4
	Sycamore Park	Ephrata Borough	1.3
	Ephrata Junior High	Ephrata Area School District	38.1
	Ephrata Senior High School	Ephrata Area School District	17.5
	Fulton Elementary	Ephrata Area School District	16.7
	Highland Elementary	Ephrata Area School District	3.2
	Lincoln Elementary	Ephrata Area School District	2.9
	Washington Elementary	Ephrata Area School District	0.47

Municipality	Property	Owner	Acres
			211.6
Ephrata Township			
	Eastbrooke	Ephrata Township	0.6
	Ephrata Township Community Park	Ephrata Township	51.0
	Nissely Acres	Ephrata Township	18.0
	Bergstrasse Elementary	Ephrata Area School District	4.7
			74.3
Fulton Township			
	Clermont Elementary & Swift Middle Sch.	Solanco School District	29.8
	Fulton Elementary School	Solanco School District	2.4
			32.2
City of Lancaster			
	Binns Park	City of Lancaster	0.8
	Blanche Nevin Memorial Park	City of Lancaster	0.1
	Brandon Park	City of Lancaster	18.1
	Buchanan Park	City of Lancaster	21.4
	Camba Park	City of Lancaster	0.1
	Case Commons	City of Lancaster	0.1
	Conestoga Creek Park	City of Lancaster	12.7
	Conestoga Pines	City of Lancaster	71.3
	Conlin Field/Farnum Playground	City of Lancaster	3.9
	Crystal Park	City of Lancaster	0.8
	Ewel/Gantz Playground	City of Lancaster	0.1
	Joe Jackson Tot Lot	City of Lancaster	0.3
	Hands Woods	City of Lancaster	9.0
	Holly Pointe Park	City of Lancaster	10.0
	Lancaster Square	City of Lancaster	10.7
	Long's Park	City of Lancaster	69.8
	Musser Park	City of Lancaster	3.1
	North Market Street Kids Park	City of Lancaster	0.1
	Northwest Corridor Linear Park	City of Lancaster	2.6
	Penn Square	City of Lancaster	0.6
	Penn Avenue Totlot	City of Lancaster	1.1
	Reservoir Park	City of Lancaster	9.0
	Rodney Park	City of Lancaster	0.7
	Rotary Park	City of Lancaster	0.2
	Sixth Ward Park	City of Lancaster	3.1
	South Duke Street Mall	City of Lancaster	3.9
	South End Park	City of Lancaster	1.0
	Carter/McRae Elementary	Lancaster City School District	0.8
	Edward Hand Jr. High & Washington Elem.	Lancaster City School District	18.2

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Municipality	Property	Owner	Acres
	George Ross Elementary	Lancaster City School District	0.8
	Hamilton Elementary	Lancaster City School District	16.2
	J W. Price Elementary School	Lancaster City School District	2.3
	Lafayette Elementary	Lancaster City School District	8.5
	Lancaster City School District Campus	Lancaster City School District	43.0
	M. L. King Junior Elementary	Lancaster City School District	4.0
	Reigart Elementary School	Lancaster City School District	0.5
	Reynolds Junior High School	Lancaster City School District	0.8
	Robert Fulton Elementary	Lancaster City School District	0.7
	Wharton Elementary	Lancaster City School District	1.4
			351.8
Lancaster Township			
	Hamilton Park Playground	Lancaster Township	1.5
	Maple Grove Community Park	Lancaster Township	6.6
	Elizabeth Martin Elementary	Lancaster City School District	18.6
	James Buchanan Elementary	Lancaster City School District	1.1
	Lancaster Community Park	Lancaster City School District - Leased to Lancaster Twp	29.0
	T. H. Burrowes Elementary	Lancaster City School District	3.5
	Wheatland Junior High	Lancaster City School District	32.5
	Penn Manor Comet Field	Penn Manor School District	33.8
			126.6
Leacock Township			
	Leacock Township Park	Leacock Township	5.5
	Leacock Elementary	Pequea Valley School District	1.4
	Pequea Valley High School & Intermediate	Pequea Valley School District	33.0
			39.9
Lititz Borough			
	Lititz Lions Playground	Lititz Borough	1.4
	Lititz Springs Swimming Pool	Lititz Borough	12.7
	Locust Street Park	Lititz Borough	4.8
	Sixth Street Linear Park	Lititz Borough	5.8
	Warwick Township Linear Park	Lititz Borough	2.0
	John Bonfield Elementary School	Warwick School District	28.6
	Kissel Hill Elementary	Warwick School District	10.9
	Lititz Elementary	Warwick School District	1.6
	Warwick High School	Warwick School District	14.3
	Warwick Middle School	Warwick School District	19.9
			102.0
Little Britain Township			
	Little Britain Township Park	Little Britain Township	10.2
	Little Britain Elementary	Solanco School District	11.7

Municipality	Property	Owner	Acres
			21.9
Manheim Borough			
	Hollinger Field	Manheim Borough	1.2
	Logan Park	Manheim Borough	40.9
	Mummu Park	Manheim Borough & Rapho Township	8.7
	Memorial Park	Manheim Borough	48.2
	Swan Park	Manheim Borough	1.0
	H. C. Burgard Elementary	Manheim Central School District	2.0
	Manheim Central Junior High	Manheim Central School District	1.0
	Manheim Central Senior High	Manheim Central School District	13.3
	Stiegel Elementary	Manheim Central School District	0.7
			117.0
Manheim Township			
	Bucher Park	Manheim Township	8.2
	Jaycee Park	Manheim Township	2.4
	Landis Woods	Manheim Township	68.7
	Manheim Township Community Park	Manheim Township	33.9
	Municipal Park	Manheim Township	19.5
	Overlook Community Campus	Manheim Township	184.7
	Perelman Park at Binkley's Mill	Manheim Township	5.7
	Reidenbaugh Park	Manheim Township and School District	11.4
	Shaeffer Park	Manheim Township	3.8
	Skyline Park	Manheim Township	8.0
	Stauffer Park	Manheim Township and Stauffer Park Trustees	16.8
	Stonehenge Greenway	Manheim Township	8.5
	Stoner Park	Manheim Township	19.9
	Brecht Elementary	Manheim Township School District	21.0
	C. Shaeffer Elementary School	Manheim Township School District	4.2
	Caleb W. Bucher Elementary	Manheim Township School District	2.8
	Manheim Township Middle School	Manheim Township School District	30.6
	Manheim Township High School	Manheim Township School District	25.9
	Reidenbaugh Elementary	Manheim Township School District	9.2

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Municipality	Property	Owner	Acres
	William E. Nitrauer Elementary	Manheim Township School District	12.7
	SDoL Campus	Lancaster City School District	37.4
			535.3
Manor Township			
	Central Manor Elementary-PM Jointure	Manor Township	5.1
	John G. Herr Park	Manor Township	23.1
	Manor Twp Municipal Office	Manor Township	5.5
	Manor Township Municipal Park	Manor Township	31.1
	Martin E. Grieder Park	Manor Township	16.2
	Springdale Park	Manor Township	31.1
	Stonemill Greenway	Manor Township	3.5
	Woods Edge Park	Manor Township	30.9
	Ann Letort Elementary	Penn Manor School District	7.4
	Hambright Elementary	Penn Manor School District	3.0
	Manor Middle School	Penn Manor School District	48.7
			205.6
Marietta Borough			
	Chestnut Street Park	Marietta Borough	1.8
	Flanagan Park	Marietta Borough	1.1
	Front Street Park (Charles Property)	Marietta Borough	41.1
	Front Street (Tract Two) Park	Marietta Borough	1.5
	Marietta Tot Lot	Marietta Borough	1.3
	Penncast Tot Lot	Marietta Borough	0.6
	War Memorial Park	Marietta Borough	10.8
	Riverview Elementary	Donegal School District	7.2
			65.4
Martic Township			
	Martic Township Park	Martic Township	378.6
	Martic Elementary School	Penn Manor School District	5.7
	Marticville Middle School	Penn Manor School District	20.4
			404.7
Millersville Borough			
	Millersville Borough Park	Millersville Borough	22.2
	Eshelmen Elementary	Penn Manor School District	10.9
	Penn Manor Comet Field	Penn Manor School District	4.5
	Penn Manor High School	Penn Manor School District	12.5
			50.1
Mount Joy Borough			
	Borough Park	Mount Joy Borough	9.2
	Florin Park	Mount Joy Borough	0.8
	Memorial Park	Mount Joy Borough	1.3

Municipality	Property	Owner	Acres
	Westview Park	Mount Joy Borough	2.1
	Grandview Park	Mount Joy Borough	12.3
	Washington Elementary	Donegal School District	1.1
	Donegal Springs Road Park	Mount Joy Borough	.08
	The Lakes Park	Mount Joy Borough	7
			33.9
Mount Joy Township			
	Wolgemuth Park	Mount Joy Township	10.1
	Fairview Elementary	Elizabethtown Area School District	7.1
			17.2
Mountville Borough			
	Froelich Park	Mountville Borough	25.1
	Lockard Park	Mountville Borough	2.6
	Mountville Borough Park	Mountville Borough	8.3
	Spring Hill Park	Mountville Borough	6.1
	VFW Memorial Park	Mountville Borough	1.9
	Mountville Elementary School	Hempfield School District	10.7
			54.7
New Holland Borough			
	Groff Memorial Park	New Holland Borough	2.2
	Garden Spot High School	Eastern Lancaster County School District	31.6
			33.6
Paradise Township			
	Paradise Township Memorial Park	Paradise Township	29.5
	Paradise Elementary	Pequea Valley School District	4.9
			34.4
Penn Township			
	Kauffman's Park	Penn Township	8.3
	Baron Fields	Manheim Central School District	32.8
	Doe Run Elementary School	Manheim Central School District	20.8
	Fairland Elementary	Manheim Central School District	5.2
	White Oak Elementary School	Manheim Central School District	3.7
			70.8
Pequea Township			
	Silver Mine Park	Pequea Township	144.0
	Pequea Elementary	Penn Manor School District	5.5
			149.5
Providence Township			

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Municipality	Property	Owner	Acres
	Providence Township Park	Providence Township	0.2
	New Providence Elementary	Solanco School District	27.2
			27.4
Quarryville Borough			
	Huffnagle Park	Quarryville Borough	3.0
	Memorial Park	Quarryville Borough	12.7
	Quarryville Elementary	Solanco School District	2.1
			17.8
Rapho Township			
	Rapho Township Community Park	Rapho Township	30.8
	Mastersonville Elementary	Manheim Central School District	3.5
	Sporting Hill Elementary	Manheim Central School District	3.9
	Elm Tree Elementary School	Manheim Central School District	4.6
			42.8
Sadsbury Township			
	None		
Salisbury Township			
	Salisbury Township Community Park	Salisbury Township	22.7
	Welsh Mountain Park	Salisbury Township	13.3
	Salisbury Elementary School	Pequea Valley School District	11.3
			47.3
Strasburg Borough			
	Strasburg Community Park	Strasburg Borough	12.3
	Strasburg Pond	Strasburg Borough	2.4
	Strasburg Elementary	Lampeter-Strasburg School District	1.5
			16.2
Strasburg Township			
	None		
Terre Hill Borough			
	Terre Hill Borough Community Park	Terre Hill Borough	9.3
Upper Leacock Township			
	Leola Community Park & Pool	Upper Leacock Township	19.4
	Mascot Park	Upper Leacock Township	0.4
	Olde Leacock Village Park	Upper Leacock Township	1.9
	Upper Leacock Offices	Upper Leacock Township	9.1
	Leola Elementary	Conestoga Valley School District	9.3
			49.4
Warwick Township			
	Lititz Run Riparian Park	Warwick Township	0.8

Municipality	Property	Owner	Acres
	Lititz/Warwick Trailway	Warwick Township	2.6
	Warwick Township Linear Park	Warwick Township	41.5
	Warwick Township Lions Park	Warwick Township	7.5
	Warwick Township Municipal Campus Park	Warwick Township	18.4
	John Bonfield Elementary School	Warwick School District	11.5
	John S. Beck Elementary	Warwick School District	3.4
	Warwick Middle School Campus	Warwick School District	50.7
			136.4
West Cocalico Township			
	Chapel Gate Park	West Cocalico Township	13.1
	Schoeneck Park	West Cocalico Township	12.2
	West Cocalico Township Park	West Cocalico Township	8.0
	Schoeneck Elementary	Cocalico School District	3.0
			36.3
West Donegal Township			
	Newville Park	West Donegal Township	0.8
	Rheems Athletic Association Field	West Donegal Township	5.2
	West Donegal Township Civic Park	West Donegal Township	12.1
	Rheems Elementary School	Elizabethtown Area School District	6.5
			24.6
West Earl Township			
	Neidermyer Park	West Earl Township	10.5
	West Earl Municipal Building	West Earl Township	6.4
	Brownstown Elementary School	Eastern Lancaster County School District	9.6
			26.5
West Hempfield Township			
	Grubb Lake Park	Mountville Borough	51.2
	Bridge Valley Park	West Hempfield Township	3.4
	Cedar Bluff Park	West Hempfield Township	2.0
	Eagle View Park	West Hempfield Township	3.7
	Fairview Park	West Hempfield Township	60.5
	Silver Spring Park	West Hempfield Township	10.7
	West Hempfield Township Building Park	West Hempfield Township	1.4
	Farmdale Elementary	Hempfield School District	14.9
			147.8
West Lampeter Township			
	Applecroft Neighborhood Park	West Lampeter Township	1.1
	Mill Creek Park	West Lampeter Township	12.7
	Northeast Neighborhood	West Lampeter Township	3.5
	Passive Open Space	West Lampeter Township	3.8

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Municipality	Property	Owner	Acres
	Silver Lane Park	West Lampeter Township	7.6
	West Lampeter Municipal Building	West Lampeter Township	5.5
	West Lampeter Township Community Park	West Lampeter Township	50.2
	Windy Hill Park	West Lampeter Township	4.1
	Lampeter-Strasburg Campus	Lampeter-Strasburg School District	123.6
	Willow Street Elementary	Lampeter-Strasburg School District	4.6
			216.7

Comparison of Lancaster County Standards to Adjacent Counties

The 1992 Regional Open Space Plan established the following standards for the provision of county and regional parkland in Lancaster County:

- Provide a minimum of 5 acres of county-owned regional parkland per 1,000 residents.
- Provide a minimum of 10 acres of municipal parkland per 1,000 residents.

A comparative review of current national standards and standards used in counties adjacent to Lancaster County was conducted to determine whether these standards should be continued or modified. The following summarizes the results of the review of standards of adjacent counties.

Lancaster County is surrounded by Berks, Chester, Dauphin, Lebanon, and York Counties. All of these counties have established standards for the evaluation of their park and recreation systems within planning documents. Review of these planning documents and standards can provide valuable input in determining the standards to be used in Lancaster County. All five of the adjacent counties employ the traditional acres per 1,000 population guideline established by the National Recreation and Park Association (NRPA) but each utilizes a different base acreage standard. The following summarizes each county's standard:

Berks County: The December 2007, Berks County Greenway, Parks, and Recreation Plan breaks the County into five sub regions, each of which was evaluated using a 6.25 acres per 1,000 population standard. Three regions were

deemed to have an acreage deficiency based on this standard.¹

Chester County: Chester County evaluated each municipality on an individual basis using the 10.5 acre per 1,000 population standard. In *Linking Landscapes: A Plan for the Protected Open Space Network in Chester County, PA* Chester County recommends that 5,000 acres of open space should be protected each year. This benchmark was developed after an extensive evaluation which determined that approximately 3,000 acres of open space was protected by land trusts, municipalities, agricultural easements and homeowner associations each year over the last twenty years. Given the increase in open space funding in the last few years, it was determined that an increase to 5,000 per year would be reasonable.²

Dauphin County: The County is in the process of updating its 1974 Parks and Recreation Plan. However, the 1974 Plan utilizes the NRPA standard of 10.5 acres of local public parkland for every 1,000 persons. The 1974 Plan does indicate that each municipality should evaluate whether it has adequate park and recreation facilities within or nearby to serve the needs of its residents, and pursue satisfying both the existing and future shortfalls.³

Lebanon County: The recently adopted Lebanon County Comprehensive Plan notes that few municipalities were actively pursuing parkland

1 Berks County Greenway, Parks, and Recreation Plan, Berks County Planning Department, Action Plan
 2 *Linking Landscapes: A Plan for the Protected Open Space Network in Chester County, PA* Executive Summary, Chester County Planning Commission, page 17
 3 1974 Dauphin County Park and Recreation Plan

acquisition. Parkland owned by the municipalities and the county totaled 820 acres, which equates to approximately 6.82 acres per 1,000 residents. The prevailing nationwide standard for park and recreation land over the past 30 years is 10.5 acres per 1,000 residents. Consequently, the December 2007 Lebanon County Comprehensive Plan established a goal of a minimum of 15 acres of parkland per 1,000 residents in Lebanon County.⁴

York County: The York County Open Space and Greenways Plan was adopted in December 2006. It focuses on the protection of the County's ecology and natural resources. The Plan includes an

⁴ Lebanon County Comprehensive Plan, December 2007, Recreation Plan, Gannett Fleming, RETTEW Associates, Inc, YSM, Toole Recreation Planning

inventory of existing parks and publicly-accessible open space, as well as an analysis of the important natural resources in the County. Using GIS analysis, the Plan identified eight open space focus areas richest in natural features. The eight focus areas encompass a total of 88,771 acres and approximately two-thirds of the total land area within the focus areas is undeveloped. The open space preservation benchmark set forth in the York County Plan is to preserve or protect 2,500 acres of open space annually; 15% of which is targeted to the open space areas. In the first year of implementation, York County reported a total of 2,923 acres of land preserved/protected. York County has a diversity of natural features that are precious and should be protected.

Appendix C

Proposed Trails

Greenscapes proposes that the following trail segments be developed as part of a countywide greenway trail network. The proposed locations of the trails are shown on Figure 29 (see Chapter 3.0).

1. **Conestoga Trail Extension (South):** This proposed trail is just over 9 miles and would extend the existing Conestoga Trail from the Norman Wood Bridge in Martic Township, south along the shoreline of the Susquehanna River to the Maryland border. The trail would cross a variety of highly scenic natural areas including House Rock; Tucquan Glenn; Kelly's Run; Pinnacle Overlook; Muddy Run; Susquehannock State Park; and Fishing Creek. The trail could be extended in the future to Port Deposit and the Chesapeake Bay.
2. **Southern End Transmission Corridor Trail:** This proposed 14-mile trail would connect the Conestoga Trail to the Octoraro Creek Trail. It would follow the PECO Energy utility corridor that runs in an east-west direction between the Susquehanna River and Octoraro Creek. The trail would connect with the Conestoga Trail at the Norman Wood Bridge, and with the Octoraro Creek Trail at a point just south of the Rt. 272 Bridge. The trail would traverse the rolling topography of southern Lancaster County, passing through farm fields and small forest patches.
3. **Octoraro Creek Trail:** This proposed trail is approximately 21.5 miles and would run from the proposed Atglen-Susquehanna Trail south to the Maryland border. It would connect with the Atglen-Susquehanna Trail at a point east of the Borough of Quarryville. The trail would run south along Bowery Run to its confluence with the West Branch of the Octoraro Creek, and continue on until it connects with the main stem of the Octoraro Creek at the Octoraro Reservoir. The trail would follow the natural drainage pattern of the landscape and would run parallel to water along its entire length. It would

pass through the county-owned Ted Parker Nature Preserve, State Game Lands No. 136, and the Alexander-King Nature Preserve.

Octoraro Creek Water Trail: The Lancaster County Conservancy's recent acquisition of land along both sides of the Octoraro Creek in Lancaster and Chester counties provides an opportunity to create a new 10-mile water trail in the region. From the Kirk's Mill Bridge (Rt. 272 Bridge) over Octoraro Creek, south to the Broad Creek boat launch just below the Maryland border, the water is clear and typically deep enough in the spring for paddlers to work their way down the scenic ravine into Maryland. This segment is a popular destination for fisherman and is one of the cleanest streams segments in all of Lancaster County. Establishing a water trail along this watercourse could focus improvements to enhance access and use of the corridor by others. Coordination with the Pennsylvania Fish & Boat Commission and the Chesapeake Bay Gateways Program would help ensure that the water trail is eligible to receive grant funds in the future for recreational enhancements.

4. **Atglen-Susquehanna Trail:** The proposed 28-mile Atglen-Susquehanna Trail (AST) would utilize the abandoned Enola Branch railroad corridor in western and southern Lancaster County, running from the Susquehanna River to the Chester County border. The proposed trail is divided into two major sections, the Turkey Hill section and the Main Branch.

The Turkey Hill Section of the AST would run in a north-south direction along the abandoned rail corridor that parallels the Susquehanna River. Approximately five miles long, it would begin at Creswell Station at the base of Turkey Hill and extend south to Brenner Hollow Road in Conestoga Township. The northern end of the Turkey Hill section at Creswell Station would intersect with the southern end point of the proposed Washington Boro Trail.

The Main Branch of the AST would connect with the southern end point of the proposed Turkey Hill Trail at Brenner Hollow Road. This section runs approximately 23 miles in an east-west direction along the abandoned railroad corridor. Proceeding east from Brenner Hollow Road, it would run through the Borough of Quarryville. From Quarryville, the route continues east, running parallel to Rt. 372, until it reaches the Chester County boundary just south of the Borough of Christiana. Here, the potential to connect to the Chester Valley Corridor exists.

The two sections of the trail would offer users a contrast in southern Lancaster County landscapes. The Turkey Hill section along the Susquehanna River offers spectacular views of the water and the forested valley walls of the river gorge. On the west side of the Main Branch, trail users would experience a steeply rolling, heavily vegetated landscape with restricted views due to the thick tree cover and the deep cuts of the former rail line. The trail would then proceed through the built environment of Quarryville Borough, where local businesses could benefit by providing needed retail services to trail users. The eastern side of the proposed trail overlooks gently rolling farmland, offering broad views of the landscape.

5. **Turkey Hill Trail Extension:** This proposed trail extension is approximately 6 miles in length and it runs from the southern terminus of the existing Turkey Hill Trail to the Safe Harbor Dam. The existing trail currently ends at an overlook at the top of Turkey Hill. The trail would proceed south from Turkey Hill, running parallel to the Susquehanna River to the Safe Harbor Dam access road where there is an opportunity to connect to the Turkey Hill Trail section of the proposed AST. Views of the River and access to the recreation facilities at Safe Harbor are among the amenities that would be offered by this trail extension.
6. **Washington Boro Trail:** This proposed 4.5-mile trail would run from the northern terminus of the Turkey Hill section of the AST to River Park in Columbia Borough. Head-

ing north from Creswell Station, the trail would parallel the Susquehanna River, run through the village of Washington Boro, and end at River Park in Columbia. River Park would be a major trailhead for a number of regional trails converging in Columbia. The Washington Boro Trail could potentially utilize the inactive section of the Enola rail line (if it were to be abandoned in the future), or the wide shoulder of the rail corridor along River Road. The proposed trail section offers expansive views of a broad section of the river, as well as connections to the Blue Rock Heritage Center, the public boat launch in Washington Boro, the Conejohela Flats Important Bird Area, and the recreational facilities available at River Park.

7. **Northwest River Trail Extension (Rt. 441 Columbia Relocation Project):** This proposed 1-mile trail would run from Chickies Rock County Park to River Park in Columbia Borough. Heading south from the rail tunnel at Chickies Rock Park, the proposed trail would extend south to River Park, skirting the Norfolk-Southern rail yard in Columbia by utilizing an abandoned rail siding and the shoulder of the proposed Rt. 441 Relocation Project. River Park would then become the southern terminus and trailhead of the Northwest River Trail. While not the most aesthetically pleasing proposed trail section, it nonetheless would bring people to Columbia to utilize the facilities at River Park, purchase supplies and services in the downtown, and explore the history and heritage of the Borough.
8. **Manheim Region Rail Trail:** The proposed 8-mile Manheim Region Rail Trail would run from the northern terminus of the existing Lancaster Junction Trail to the border of Lebanon County, where it would connect to the Horseshoe Trail. The proposed trail begins at Lancaster Junction and runs north through Veterans Memorial Park in Manheim Borough. The trail would then head due north along the abandoned Manheim/Cornwall Branch of the former Reading & Columbia Railroad. The proposed trail parallels Chiques Creek for most of its route, passing through the rural agricultural land-

scape of northern Lancaster County, under the PA Turnpike, and into the Furnace Hills. The trail would then enter Lebanon County and connect to the Horseshoe Trail a short distance north of the county line.

9. **Manheim-Lititz Rail Trail:** The proposed 5-mile Manheim-Lititz Rail Trail runs from Manheim Borough to Lititz Borough. The trail would begin at the eastern edge of Manheim Borough where it intersects the proposed Manheim Region Rail Trail. The trail would then head due east along the rail line connecting Manheim and Lititz. The trail would pass Warwick High School and Lititz Springs Park on the west side of Lititz, leaving the east side of the Borough to connect to the proposed Warwick-Ephrata Rail Trail. The connection between the two boroughs would have the added benefit of providing an alternative transportation route for area commuters.
10. **Warwick-Ephrata Trail:** The proposed 5-mile Warwick-Ephrata Rail Trail would run from the western edge of Warwick Township to Denver Borough. The trail would begin at the eastern terminus of the existing Warwick Rail Trail and head due east along the abandoned Reading & Columbia Railroad Line. The trail would follow the rail corridor through Warwick Township and into Akron Borough. From Akron Borough, the trail would connect with the southern terminus of the existing Ephrata Rail Trail in Ephrata Borough. The trail would follow the existing Ephrata Rail Trail to its northern terminus and then continue into Ephrata Township. The trail would follow the rail corridor through Ephrata Township to the southern terminus of the proposed Denver Borough Trail Extension. This proposed trail offers great recreational potential as well as alternative transportation opportunities for area commuters and students.
11. **Denver Borough Trail Extension:** This proposed 7-mile trail would run from the northern terminus of the Warwick-Ephrata Rail Trail to the existing Horseshoe Trail. The trail would begin at the northern edge of Ephrata Township and proceed in a
- northeast direction to Denver Borough. The trail would continue through the east side of Denver Borough until it connects to the Horseshoe Trail at its northern end point. An alternative route and/or loop route may be possible utilizing an existing utility right-of-way located just west of Denver Borough. After crossing the Lancaster-Berks County boundary, the trail could connect with Spring Township's proposed West Side Trail along the Lancaster Northern Railway. Like the proposed Warwick-Ephrata Trail, this trail offers both recreational potential and alternative transportation opportunities for area commuters and students.
12. **Elizabethtown Spur:** This proposed 1-mile trail would run from Elizabethtown Borough to the Existing Conewago Recreation Trail. The proposed trail would connect to Elizabethtown via Lancaster County Conservancy-owned land located east of the Borough along Mount Gretna Road. From there the trail would head north through the Conservancy land and connect to the Conewago Recreation Trail north of Beverly Road. This spur would enable trail users to stop and explore Elizabethtown Borough, purchase supplies, and utilize facilities located downtown. It would also provide borough residents with bike and pedestrian access to the Conewago Trail.
13. **Conestoga Greenway:** This proposed 9-mile trail runs from the northeastern edge of Manheim Township to the Susquehanna River. Beginning at the confluence of the Cocalico Creek and the Conestoga River in northeastern Manheim Township, the proposed trail would extend southwest along the Conestoga River. The trail would utilize portions of the existing Conestoga Trail, as well as existing open spaces such as Lancaster County Central Park, Buchmiller Park, and Safe Harbor Park. The trail would traverse numerous municipalities along its route to the Susquehanna River. A link with the Turkey Hill section of the Atglen-Susquehanna Trail near the Safe Harbor Dam may be possible.

14. Conewago Trail Extension: This proposed 6.5-mile trail runs from the western terminus of the existing Conewago Trail to the Susquehanna River. Beginning at the intersection of the Conewago Trail and Rt. 230 northwest of Elizabethtown Borough, the proposed trail would travel in a southwest direction, following the Conewago Creek through West Donegal and Conoy Townships. The trail would terminate at the Susquehanna River in northwest Conoy Township near the village of Falmouth. Here the trail would connect with the existing Conoy Canal section of the Northwest River Trail. A possible link north, crossing the Conewago Creek into Dauphin County, could extend the trail along the Susquehanna River to Middletown Borough.

15. Reading & Columbia Trail: This proposed 2.5-mile trail runs from eastern edge of Columbia Borough to Grubb Lake Park. Beginning at Glatfelter Park in Columbia Borough, the trail would extend in a northeast direction along the abandoned Reading & Columbia Railroad line. The trail would follow the abandoned rail corridor through West Hempfield Township until it reaches Grubb Lake Park. An extension of the trail to the north would connect with the southern terminus of the proposed southern extension of the Lancaster Junction Trail. The trail could include interpretative information regarding the connection between the iron ore quarry (Grubb Lake) and the iron furnaces and rolling mills along the Susquehanna River in Chickies Rock County Park.

16. New Holland Trail: This proposed 6.5-mile trail runs from Money Rocks County Park west to the eastern terminus of the PA Rt. 23 Corridor, commonly referred to as the “Goat Path.” The proposed trail would head west from Money Rocks County Park along the abandoned railroad corridor at the northern edge of the park. The proposed trail would continue along this corridor, through New Holland Borough, and on to the eastern terminus of the Goat Path near Rt. 772. The proposed trail would provide a direct alternative transportation connection between a

County regional park and a potential longer distance biking opportunity at the Goat Path.

A potential 2-mile extension of the trail in the future could be created by proceeding east out of Money Rocks County Park, crossing the county boundary into Chester County, and connecting with the proposed Struble Trail in Honey Brook.

17. Lancaster Junction Trail Extension

(South): This proposed 3-mile trail would run from the southern terminus of the Lancaster Junction Trail at the County Emergency Training Center to Grubb Lake Park. The proposed trail would head south from the Emergency Training Center, cross under Rt. 283, and continue along the rail corridor, passing Hempfield High School and crossing over Rt. 23 at Silver Spring. The trail would then proceed to Grubb Lake Park and connect with the northern terminus of the proposed Shawnee Run trail.

18. Lancaster Junction Trail Extension

(North): This proposed 2.5-mile trail would run from the village of Lancaster Junction to Manheim Borough. The proposed trail would begin at the northern terminus of the existing Lancaster Junction Trail and head north along the railroad corridor, paralleling Chiques Creek most of the way. The trail would enter Manheim Borough from the south, converging with the proposed Manheim Region Rail Trail and the proposed Manheim–Lititz Rail Trail. Manheim Borough is in a position to benefit economically should the creation of these three proposed trails come to fruition.

19. Little Chiques Trail: This proposed 4.5-mile trail would connect the Borough of Mount Joy to Chickies Rock County Park and the Northwest River Trail. The proposed trail would begin at Sico Park in Mount Joy and head south along Little Chiques Creek. The confluence of Little Chiques Creek and Chiques Creek is located just north of PA Route 23. From this point the trail would continue south following Chiques Creek to connect to Chickies Rock Park.

The trail would continue along the creek through Chickies Rock Park, terminating at the Northwest River Trail and the proposed Chiques Creek Bike/Pedestrian Bridge planned for construction in 2011.

20. Pequea Creek Water Trail: The proposed 7.7-mile water trail would run from Silver Mine Park in Pequea Township to the PPL Boat Access at the confluence of the Susquehanna River. This stretch of waterway is a popular tubing and paddling area. It offers a scenic journey through pastoral and wooded landscapes, and passes historic Sickmans Mill, State Game Lands No. 288, and PPL's Pequea Creek Recreation Area. Having a public access point for both the ingress and egress to the water, along with available camping sites along the corridor, make this a particularly attractive water trail segment. There may be a possibility of extending the trail above Silver Mine Park if there is interest from the upstream communities.

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