

Lehigh Mountain Park Master Plan

Prepared for:
County of Lehigh
17 South Seventh Street
Allentown, PA 18101



Looking east, the Lehigh River and Lehigh Mountain Parklands



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(Originally submitted February 2008)



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Lehigh Mountain Park Master Plan

prepared in conjunction with:

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Salisbury Township
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This Plan was adopted by:

The County of Lehigh Commissioners _____

The City of Allentown Mayor and Council _____

Salisbury Township Board of Commissioners _____

Executive Summary

Lehigh Mountain Park is an island of natural space centered in an otherwise rapidly urbanizing landscape. The Park provides surrounding communities with a place to walk, hike, run, and bike, as well as to simply enjoy nature. The Park protects critical habitats and sensitive species.

Lehigh Mountain Park originated as two distinct areas: the *Lowlands* and the *Uplands*. This plan will help to unify these areas into one identifiable park. However, the two areas are very different and are thus suitable for very different uses.

The Uplands is an approximately 230-acre relatively undisturbed, exceptionally healthy second growth forest. It contains an astounding diversity of native trees, shrubs and herbaceous plants, and is surely home to wildlife species that can rarely be found elsewhere in the Lehigh Valley. The Uplands also contains an important natural feature—the Lehigh Mountain Seeps and the plant and animal communities they support. The Lehigh Mountain Uplands likely represents the most ecologically intact forested land in the Lehigh Valley. All of the recommendations in this plan are aimed at protecting (and in a few places restoring) the ecological integrity of the Uplands forest.

The Lowlands consists of approximately 300 acres and includes nearly 2.5 miles of river frontage. Unfortunately the Lowlands area is plagued by the rampant spread of invasive/exotic plants, extensive illegal dumping, and unauthorized motorized vehicle use. However, with investments in ecological restoration and infrastructure improvements, the Lowlands has potential to become a unique outdoor recreational destination for the surrounding communities. Advantageous features of the Lowlands include: relatively flat topography, a remnant network of trails and farm roads, unique historical features, easy access to the Lehigh River, and opportunities for improved public access and the addition of future park amenities.

The most immediate priorities for protecting and developing Lehigh Mountain Park are:

- Develop a resource conservation plan to protect the ecological integrity of the Uplands forest and to preserve or restore the Park's historic features,
- Install gated access to the Park to eliminate illegal uses and dumping,
- Clean up the areas where illegal dumping has taken place, and
- Install signage describing the site, its allowed uses and emergency information.

Lehigh Mountain Park as it exists today is a true conservation success story. Wildlands Conservancy, The County of Lehigh, The City of Allentown, and Salisbury Township have worked together over the past 20 years to protect Lehigh Mountain from development. Today it is one of the largest forested public spaces between the Blue and South Mountains. There is still much work to be done. Remarkably, considering that it is located almost exactly in the middle of the Lehigh Valley's largest urban center (Allentown-Bethlehem), there is the potential to approximately double the size of the Park and connect it with other publicly owned open space through the acquisition of surrounding large wooded parcels.

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I. INTRODUCTION

A. Vision

Lehigh Mountain Park is an island of natural space in a sea of urbanization. The Park provides surrounding communities with a place to walk, hike, run, and bike, as well as to simply enjoy nature. The Park protects critical habitats and sensitive species.

There are many features and characteristics that make the Lehigh Mountain Parklands truly unique. To begin with, the parklands together total approximately 530 acres, making it one of the largest forested public spaces between the Blue and South Mountains. Remarkably, considering that it is located almost exactly in the middle of the Lehigh Valley's largest urban center (Allentown-Bethlehem), there is the potential to approximately double the size of the Park and connect it with other publicly owned recreation lands through the acquisition of surrounding large wooded parcels.

Secondly, the Lehigh Mountain property has a well-documented history that is representative of the greater Lehigh Valley region. Remnants of historical structures, from some of the earliest Native American inhabitants to the first European settlers, still exist in the Lowlands part of the Park. These resources could become a highlighted feature of the Park.

Finally, and perhaps most importantly, the Lehigh Mountain Uplands forest is surprisingly healthy, consisting almost exclusively of native trees, shrubs and herbaceous plants. The Park provides nearly 2.5 miles of protected riparian corridor to the Lehigh River. The Uplands also contains an important natural feature—the Lehigh Mountain Seeps and associated communities. The Lehigh Mountain Uplands area likely represents the most ecologically intact forested land in the Lehigh Valley. Although extensive field observations could not be completed within the scope of work for this plan, preliminary assessments indicate that the Upland portion of the Park has the potential to harbor a very wide array of ecologically sensitive species.

Lehigh Mountain Park originated as two distinct areas: the Lowlands and the Uplands. This plan will help to unify these areas into one identifiable park. However, the two areas are very different and are thus suitable for very different uses. Ecologically, the Lowlands area is highly disturbed, while the Uplands area is likely the most pristine forest in the Valley. Therefore, any infrastructure improvements or additions should absolutely be restricted to the Lowlands. The Park's main entrance and welcome area should be located in the Lowlands. The remaining historical features in the Lowlands could be tied together with a trail system for bikers and walkers/runners. The Uplands forest is, and should be treated as, an ecologically sensitive area in need of greater conservation efforts. The Uplands forest contains a high priority NAI site. Prevention of any further fragmentation, along with some restoration, is strongly recommended. The Uplands forest should be restricted to low-impact, passive enjoyment.

B. Plan Goals and Objectives

The Lehigh Mountain Park Master Plan evaluates current park conditions and identifies needed improvements and conservation measures. The goals of developing this plan include:

GOAL 1. Develop a Master Plan for the area that will provide guidance for future development by working with stakeholders to:

- Investigate existing environmental factors and identify potential improvements
- Research historical and cultural resources of the area for park planning and educational opportunities
- Hold public meetings to gain local insight, identify issues, and respond to the needs of the community
- Develop preliminary concepts for park programming and development
- Develop final concepts for park programming and development
- Develop preliminary cost estimates for improvements
- Develop a guidance document for seeking future funding for park conservation, expansion, and improvements

GOAL 2. Create ideas for an identifiable regional park.

- Create consistent signage
- Create use areas throughout the park with safe and accessible facilities for a variety of recreational users
- Develop stewardship programs for the park
- Create public association with the area as a park through development of park facilities and the staging of events

GOAL 3. Create and work with local organizations that will support the development and maintenance of the parklands.

- Create a Friends of Lehigh Mountain association as a working partner
- Continue to work with Wildlands Conservancy

C. Plan Development Process

This plan was developed by a planning team consisting of Salisbury Township, the County of Lehigh, Wildlands Conservancy, and CMX Engineering (the project consultant). Input from project stakeholders was garnered throughout the planning process. Stakeholders included representatives from:

The Township of Salisbury

The County of Lehigh

The City of Allentown, Department of Parks and Recreation

The Borough of Fountain Hill

Wildlands Conservancy

The Pennsylvania Game Commission, Southeast Region

The process began with a project kick-off meeting with the Township of Salisbury staff and park stakeholders. The planning process included several public meetings, hearings and presentations. Five separate field visits by members of the planning team were conducted in order to better understand the site, to determine the areas appropriate for recreational development and those for which preservation is required, and to gauge the effectiveness of the recommended improvements and restoration measures.

Meeting and Presentation Dates:

- 21 Jun 07: Kick-off meeting and site visit with Salisbury Township and Wildlands Conservancy
- 23 Jul 07: Initial site investigation by project consultant ecological staff to determine environmental features and land use
- 27 Jul 07: Work group meeting
- 14 Aug 07: Work group meeting
- 28 Nov 07: Site visit by members of working committee and project consultant to gather environmental information about the site
- 05 Dec 07: Site visit by consultant staff to assess site conditions and gather ecological data
- 10 Dec 07: First committee meeting to present ecological findings and observed land uses and to formulate vision for the Lehigh Mountain Parklands
- 17 Jan 08: Presentation of the draft site master plan to the Salisbury Township Board of Supervisors
- 22 Jan 08: Public meeting on initial site concepts for site development
- 12 Feb 08: Finalization of preliminary recommendations for the Lehigh Mountain Parklands
- 19 Feb 08: Workgroup meeting to discuss public input
- 08-15 Apr 08: Workgroup comment period on preliminary recommendations and draft master site plan
- 08 Jul 08: Public presentation of Master Plan at Salisbury Township Board of Supervisor meeting
- 28 Aug 08: Final presentation of master plan concept to the Salisbury Township Board of Supervisors
- 03 May 10: Wildlands Conservancy receives copy of plan and is asked to revise.

II. CONTEXT

A. Location

Lehigh Mountain Park is located in Salisbury Township, Lehigh County, and is bordered to the northwest by the City of Allentown, to the northeast by the City of Bethlehem, and to the southeast by Fountain Hill Borough (Map 1). The park's location is central to the most densely populated areas of both Lehigh and Northampton Counties.

Lehigh Mountain Park currently consists of three separate parcels and totals approximately 530 acres. The northern portion of the park borders the Lehigh River and was acquired in

1989 when Wildlands Conservancy purchased the 156 acre parcel from Bethlehem Steel. The property became known as *Walking Purchase Park*. The southwest 232 acre portion of the park was also purchased by Wildlands Conservancy in 1989. This parcel was subsequently sold to the combined ownership of the City of Allentown, Lehigh County and Salisbury Township, and was known as the Lehigh Uplands Preserve. The southeastern portion of the park was acquired in 2006 when Lehigh County purchased a 141 acre parcel formerly owned by the Bethlehem Water Authority. These two parcels together are commonly, and will in this plan be, referred to as “the Uplands.” The Walking Purchase Park parcel is referred to as “the Lowlands.”

The *Uplands* and the *Lowlands* are essentially separated from each other by an active railroad and three industrial-type parcels: 54.5 acres owned by Harris Rebar (zoned Industrial), 40 acres owned by Norfolk Southern (zoned Utility), and seven acres owned by Lehigh County (zoned Institutional (Lehigh County Correctional facility)). In the Uplands section, along the power line, Pennsylvania Power and Light owns a 2.1 acre parcel. Map 2 shows the parcels that are contained within, and that constitute, Lehigh Mountain Park.

Lehigh Mountain Park is remarkable because it is a relatively large area of wooded open space completely surrounded by urbanization. Though centered in one of the most heavily industrialized parts of Lehigh County, and having both river frontage and a major rail line access, environmental factors such as steep slopes and low lying floodplain areas have spared the parkland from major development. To the south and southwest the park is currently bordered by relatively large (approximately 30-60 acres) wooded parcels, providing the potential to expand the park and to connect it to other publicly owned open space.

B. History

The area that has become Lehigh Mountain Park has a long and unique history. Artifacts found along the River indicate that the area was continuously inhabited by early Native Americans. Prior to the arrival of European settlers the Lenape Indians, a branch of the Algonquians, settled in the area of Lehigh Mountain. William Jennings, the first known European resident of the area, established a farmstead in the Lowlands. Jennings was one of three runners of the “Walking Purchase,” the infamous 1737 arrangement between the descendants of William Penn and the Lenape by which the Penns acquired approximately 1,200,000 acres of land owned by the Lenape.

Lehigh Mountain was significant in the development of the growing cities of Allentown and Bethlehem. The Mountain first provided timber, and by the early 1800s iron ore was being mined. Timber and iron ore made the charcoal that fired the iron furnaces that fueled the Valley’s Industrial Revolution. Sandstone quarries on the north slope of the Mountain produced the materials to build many of the public buildings in Allentown and Bethlehem.

In 1758 Jacob Geissinger bought the Jennings farmstead. The farm remained in the Geissinger family until the late 1950s when it was purchased by the Bethlehem Steel Corporation in anticipation of expansion.

To save the Mountain from development Wildlands Conservancy purchased 232 acres of the Upland section in 1998. In 1998 the Conservancy purchased 156 acres of the Lowlands area and in 2006 Lehigh County purchased an additional 141 acres. Today these properties are collectively referred to as Lehigh Mountain Park.

A more detailed history of the Lehigh Mountain Park site can be found in Appendix B.

C. Demographics

1. Community Planning and Demographics

Lehigh Mountain Park is located in Salisbury Township, Lehigh County and is central to the most densely populated municipalities of the Lehigh Valley. Known for its bucolic and working farms, steel mills and downtowns, the Valley is a place of stark and wonderful contrasts. On any given day, residents and visitors can experience a morning canoe trip or nature hike and in the evening tour a museum, attend a professional sports event and enjoy fine dining.

A community planning coalition including the County of Lehigh, the Lehigh Valley Planning Commission (LVPC), Wildlands Conservancy, and now Salisbury Township and the Pennsylvania Highlands Coalition helped to establish the private to public ownership of Lehigh Mountain Park and to document its ecological significance. These same entities provide the most relevant and publicly accessible documentation for planning the park's usage.

- South Mountain-A Study by the Joint Planning Commission (LVPC-1977)
- Lehigh Valley Natural Areas Inventory (LVPC-1999)
- Lehigh Valley Planning Commission Comprehensive Plan (LVPC-2005)
- Lehigh Valley Greenways Plan (LVPC-2007)
- Parks, Open Space, and Outdoor Recreation Inventory (LVPC-2008)
- Highlands Coalition-Ongoing
- Lehigh Valley Trails Inventory (LVPC-2010)

The Lehigh Valley region consists of 62 municipalities, including the metropolitan centers of Allentown, Bethlehem and Easton. In 2000, it was home to 579,156 persons. The four municipalities bordering the park reported 196,013 persons in the same year, or 34 % of the entire region's population. If planning forecasts are accurate, the Valley is expected to grow by nearly 124,870 persons between 2000 and 2020. Park planning is critical to sustaining the Park's natural beauty while at the same time offering the highest quality outdoor experiences.

Park planning considers the demographics of a region for a number of reasons. First, the park should be available for use by a broad spectrum of residents and visitors, regardless of their age and ability. Secondly, park amenities, such as boat launches, trails, parking, information centers, and pavilions, should be designed and located to capture the most diverse audience of users without creating overcrowding of scenic areas. And, thirdly, sustaining the outdoor experience for future generations requires careful consideration of the volume of visitors and the ongoing maintenance resulting from their use of the park.

To date, the demand for Lehigh Mountain Park usage has been described mostly as locally derived. Nature lovers, hikers, mountain bikers, and sportsmen have kept the mountain in relatively sound ecological health, and continue to volunteer for its maintenance and litter removal. However, with a desire to promote the Mountain as a regional park comes the need to identify a larger population of possible park visitors who will travel greater distances to get to the Park, and in turn put greater demand on infrastructure and natural resources.

2. Providing for a Regional Population

The National Recreation and Park Association (NPRA) established new standards for meeting the demand for regional parks. In the past, the Association suggested a regional park should be designed to offer approximately 10-acres of parkland for every 1,000 persons within a “1-hour” driving radius. Recently, the Association and land planners at large suggested regional parks be designed on the basis of a community’s socioeconomic character, needs and desires and compliment the national trend toward walking for wellness and maintaining parks for their ecological significance.

3. Local Population

Lehigh Mountain Park is most immediately accessed by the residents of Fountain Hill Borough and Salisbury Township. Portions of the cities of Allentown and Bethlehem either abut these municipalities or are located across the Lehigh River. In total, however, the population of these municipalities represents 34% of the entire Lehigh Valley population and the volume of users of new park facilities should be considered.

Table 1. Population Estimates for Municipalities Adjacent Lehigh Mountain Park

Source: Lehigh Valley Planning Commission-Population Projections, 2007

Municipality	2000 Pop.	2010 Pop. Est.	2020 Pop. Est.
City of Allentown	106,632	107,110	107,469
City of Bethlehem	71,329	72,867	72,968
Fountain Hill Borough	4,614	4,595	4,595
Salisbury Township	13,498	13,895	14,094
Total	196,073	198,467	199,126

4. Regional Population

The regional population considered for this study is found within the Lehigh Valley. Using the NRPA’s older version of regional park analysis, figures would be derived from an approximate “1-hour” drive radius from Lehigh Mountain Park and include parts of Bucks, Montgomery, Berks, Carbon, and Monroe counties in Pennsylvania, and parts of New Jersey. Instead, Lehigh County has wisely chosen to address the needs and desires of the Valley’s varied suburban and urban populations.

The entire population of Lehigh County recorded in 2000 was 312,090 persons and in the same year Northampton County recorded 267,066 persons for a total of 579,156 persons. Of this total figure nearly 214,984 persons were recorded in highly urbanized areas.

Table 2. Population Estimates for Urbanized Communities near Lehigh Mountain Park

Source: Lehigh Valley Planning Commission-Population Projections, 2007

Municipality	2000 Pop.	2010 Pop. Est.	2020 Pop. Est.
City of Allentown	106,992	107,110	107,469
City of Bethlehem	72,895	72,867	72,968
City of Easton	26,263	26,279	26,323
West Easton Borough	1,152	1,170	1,170
Wilson Borough	7,682	7,753	7,753
Total	214,984	215,179	215,683

The populations of several suburban communities are included in the regional calculation because their residents lack comparably sized municipal parks and would enjoy ease of access to Lehigh Mountain Park, by way of local and state transportation routes.

Table 3. Population Estimates for Suburban Communities near Lehigh Mountain Park

Source: Lehigh Valley Planning Commission-Population Projections, 2007

Municipality	2000 Pop.	2010 Pop. Est.	2020 Pop. Est.
Bethlehem Township	21,171	25,193	28,979
Catasauqua Borough	6,588	6,553	6,553
Coopersburg Borough	2,582	2,570	2,570
Emmaus Borough	11,313	11,351	11,351
Freemansburg Borough	1,897	1,973	1,973
Glendon Borough	367	368	368
Hanover Township	9,563	10,560	11,472
Hellertown Borough	5,606	5,615	5,615
Lower Nazareth Township	5,259	7,085	10,222
Palmer Township	16,809	19,554	22,289
Williams Township	4,470	6,178	7,372
Total	85,625	97,000	108,764

5. Ageless Park Planning

Whether a park visitor arrives by automobile, bicycle or public transportation, the facilities enjoyed at the park should be designed for the enjoyment of all ages. Within the eighteen municipalities surrounding the park, the Lehigh Valley Planning Commission projects all will experience increases in the median age of persons and the total number of persons over the age of 55 will increase dramatically: by approximately 69.4% from year 2000 to year 2030. Within the entire Lehigh Valley, it is projected that the number of people 75 years of age or older will increase by 29,402 persons from year 2000 to year 2030. While these figures are just simple statements of the overall dominant age cohorts, they suggest park planning should establish design standards, goals and objectives to meet the needs of an aging population.

D. Nearby Park and Recreation Lands

1. Greenways

The Pennsylvania Department of Conservation and Natural Resources has identified 34 major greenways (greenways that are greater than fifty miles in length, pass through two or more counties, and are recognized in an official planning document) in Pennsylvania. Two of these greenways encompass all or part of Lehigh Mountain Park: The Lehigh River Greenway and the Pennsylvania Highlands.

The Lehigh River Greenway is a 36-mile long, multi-use greenway extending from the confluence of the Lehigh and Delaware Rivers in Easton, upriver through 24 municipalities, to the Lehigh Water Gap at the Carbon County line. The Lehigh River Greenway is part of the Delaware & Lehigh Navigation Canal National Heritage Corridor.

Lehigh Mountain Park is located within Pennsylvania Highlands. The Pennsylvania Highlands is a section of the Appalachian Mountains frequently cited as a candidate for extensive ecological preservation. In 2004 Congress recognized the Highlands as "nationally significant" through enactment of the Highlands Conservation Act. The Highlands span an approximately 1.4 million acre area from south-central Pennsylvania, along the Maryland border, to New Jersey. The heavily forested region is seen as ecologically significant because it provides clean drinking water, important habitat for native flora and fauna, and a variety of recreational uses for the region's residents and numerous visitors.

Lehigh Mountain Park also features prominently in the 2007 Lehigh Valley Greenways Plan. The Greenways Plan recommends preserving the lands surrounding the Uplands forest.

2. Trails

The Lehigh River Water Trail is a designated Pennsylvania Water Trail. The 75-mile trail extends from the Francis E. Walter Dam to the mouth of the Lehigh River, and is used by kayakers and canoers. Lehigh Mountain Park is located between the Lock 40 and the Sand Island access points, and serves as an unofficial put-in and take-out point for the trail.

Across the River from Lehigh Mountain Park is the Delaware & Lehigh National Heritage Corridor. Although the Park does not provide direct access to the Trail, users of the Allentown to Bethlehem River-Canal Loop, a circular paddling course using both the Lehigh River and the Delaware Canal, put-in and take-out from Lehigh Mountain Park. The Lehigh River contains five sections of Class I rapids to challenge beginning to intermediate level paddlers along this reach.

3. Adjacent & nearby parkland

Upriver on the south side of the River are a series of parcels owned by Lehigh County and the City of Allentown. Two privately held parcels prevent the Uplands portion of the park from connecting to the County parcels at this time. Across the River from the County & City property is the City of Allentown's Canal Park. Canal Park provides canoe/kayak access to the River and the Canal, and is utilized by Wildlands Conservancy's *Bike & Boat* program. Sterner's Island is located in the River adjacent to the Lowlands area. This island is owned by the City of Allentown and is also used by Wildlands Conservancy for public education.

Dodson Park (located at the end of Dodson Street) is a 5-acre park in Salisbury Township that includes two baseball fields, a volleyball area, portable toilets, and a small parking area. The fields are primarily used by the youth sports groups of the Borough of Fountain Hill. Improved access and an improved trailhead at Dodson Park would provide a neighborhood and northern approach to the Park and its trail system. Map 3 shows the nearby recreational lands and other parcels in public ownership.

III. NATURAL RESOURCES

A. Natural Features & Existing Conditions

1. Overview

Ecologically and geographically the Uplands and the Lowlands are very distinct. The Lowlands includes approximately 1.75 miles of a narrow strip land between the Lehigh River and Pumphouse Road. The road parallels the River and creates an approximately 20-foot high, 30-foot wide berm that obstructs water from entering the floodplain. The floodplain area south of the berm/road is a highly disturbed successional zone. This area should be the focus of large scale restoration efforts. Currently the area contains extensive invasive plant stands and is heavily degraded by off-road vehicles and illegal dumping (Figures 1A, B).

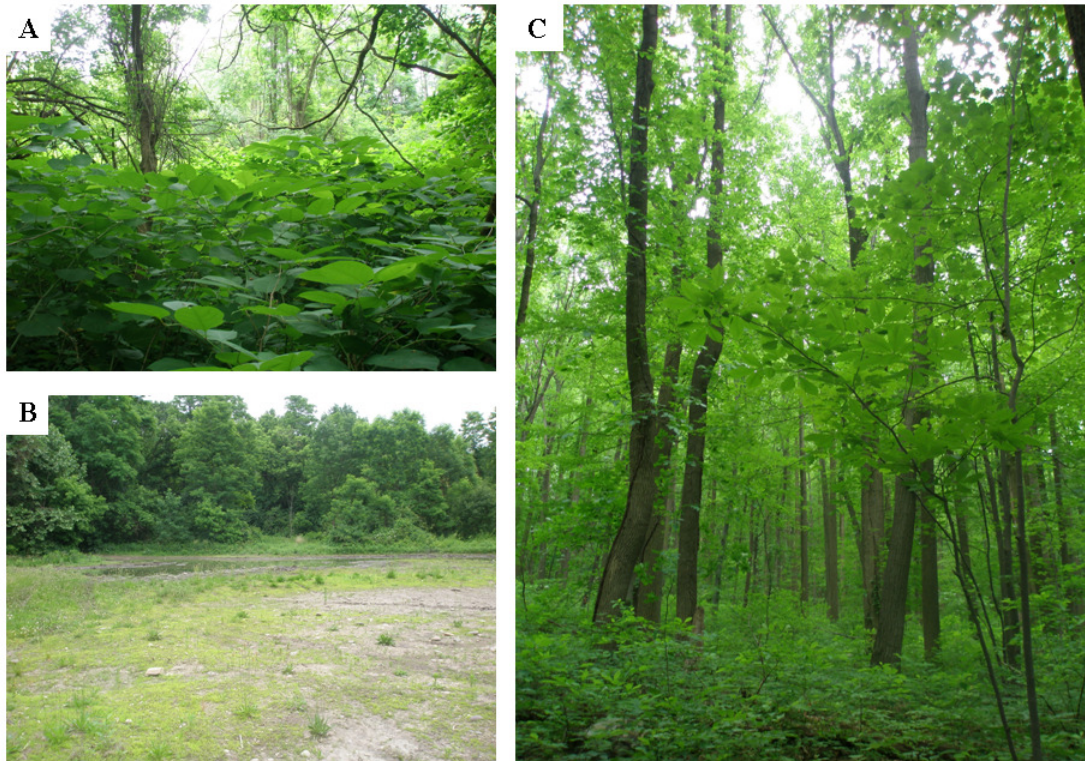


Figure 1. Vegetation and disturbance in the Lowlands and Uplands. A. Large stands of Japanese knotweed have taken over the floodplain areas to the south of the Lowland access road/berm, B. Also adjacent to the access road is an area ruined by illegal motorized vehicle use, C. In contrast, a characteristic view of the Lehigh Mountain Upland forest

In dramatic contrast, the Uplands area is an exceptionally healthy second growth forest containing an astounding diversity of native trees, shrubs and herbaceous plants (Figure 1C). The Uplands contain an important natural area—the “Lehigh Mountain Seeps.” Although the forest is fragmented by an extensive trail network, there are remarkably few invasive plants, a unique situation almost certainly attributable to the fact that the area is not widely visited. Even the power line corridor that runs along the southern edge of the forest, an area where invasive species are expected to dominate, contains several species of native ferns and wildflowers.

2. Physical features

a. Geology & Topography: Lehigh Mountain is part of the Reading Prong section of the New England Physiographic Province and an extension of the Blue Ridge in Pennsylvania. The Reading Prong is a series of geologic materials that are unique to the Highlands of New Jersey, New York, and Pennsylvania. These formations can be traced through New Jersey north to New England and south through Pennsylvania to the Blue Ridge Mountains. The Reading Prong Section consists of circular to linear, rounded low hills or ridges that project upward in significant contrast to the surrounding lowlands. The hills and ridges are made up of metamorphic rocks and gneiss, which date to the Precambrian period and range from 570 to 1,600 million years old. These rocks are very resistant to erosion and thus the hills and ridges stand higher than the softer sedimentary rocks that surround them. The slopes of these hills and ridges are steep and have a very well defined change in slope where the bases of the hills and ridges meet the lower and gentler slopes of adjacent sections. The Reading Prong ranges in elevation between 400 and 1300 feet above sea level.

In Lehigh Mountain Park the Lowlands area is almost entirely underlain by the Leithsville formation. The Leithsville formation extends southward into the Uplands area and meets the Hardyston formation to the southeast and Amphibolite to the west. The southwestern corner of the Uplands contains Alaskite and the southeaster corner contains Hornblende granite (Map 4).

The Lehigh Mountain appears on the United States Geological Survey (USGS), Allentown East 7.5 Minute Quadrangle Map. The highest point of the Park is at approximately 800 feet above sea level and the lowest at the Lehigh River is approximately 220 feet (Map 5). Steeply sloped areas are highlighted in Map 6.

b. Soils: There are 14 soil types identified in the Lehigh Parklands (Table 4, Map 7).

Table 4. Soil Types in the Lehigh Mountain Parklands

Soil Type	Depth to bedrock	Seasonal High Water Table	Drainage Class	Erodibility (Kw)	Hydric
Gibraltar silt loam	Very deep	36-60"	Well drained	0.43	No
Gladstone gravelly loam, 3 to 8% slopes, very bouldery	Very deep	>60"	Well drained	0.28	No
Gladstone gravelly loam, 3 to 8% slopes	Very deep	>60"	Well drained	0.28	No
Gladstone gravelly loam, 8 to 15% slopes	Very deep	>60"	Well drained	0.28	No
Gladstone gravelly loam, 15 to 25% slopes	Very deep	>60"	Well drained	0.28	No
Gladstone gravelly loam, 8 to 25% slopes, very bouldery	Very deep	>60"	Well drained	0.28	No
Gladstone gravelly loam, 25 to 55% slopes, very bouldery	Very deep	>60"	Well drained	0.28	No
Holly silt loam	Very deep	0-12"	Poorly drained	0.28	Yes
Linden silt loam	Very deep	36-72"	Well drained	0.37	No
Middlebury silt loam	Very deep	6-24"	Moderately well drained	0.28	No
Quarries	Very deep	>60"	Not rated	Not rated	No
Urban land	Very deep	>60"	Not rated	Not rated	No

3. Aquatic Features

a. River & floodplains: As mentioned above, the Lowland area consists of approximately 1.75 miles of river bank. The River's access to its floodplain is impeded by a man-made berm (Map 8).

b. Wetlands: Wetlands are areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally have three attributes: (1) presence of hydrophytic vegetation, (2) presence of hydric soil, and (3) presence of water during the growing season.

The US Fish & Wildlife Service maps wetlands on a national scale and inventories the wetland areas in a database called the National Wetland Inventory (NWI). The NWI database displays three *Temporarily Saturated Broad Leaved Deciduous Palustrine Forest* wetland areas within the limits of Lehigh Mountain Park, all of which are in the Lowlands area near the River (Map 8).

c. Seeps: The southwestern portion of the Uplands area contains spring seeps (water emerges from the ground and flows across the soil surface without a defined bed and banks, Map 8). Spring seeps are important to wildlife because they provide a variety of food sources during periods of snow cover, provide breeding habitat for many reptiles and amphibians, and support unique assemblages of native plants. These seeps and the communities of plants and animals they support are considered a priority natural area and are listed in the Lehigh & Northampton County Natural Areas Inventory.

4. Plant communities

The upland forest plant community is remarkably healthy and diverse, and in the opinion of the authors is probably the most ecologically intact forest in the Lehigh Valley. The area is mostly second growth mature forest, with some scattered older trees left from an earlier clearing. Oaks, hickories, maples, and tulip poplars are prevalent (Figure 1C). There appears to be substantial forest regeneration, as evidenced by the prevalence of tulip poplar, sassafras, maple, and other native tree saplings. The vast majority of the herbaceous plants on the forest floor are native (Figures 2 and 3). Prevalent forest floor species include: Mayapple, Bainberry, Rue anemone, Jack-in-the-pulpit, Wild ginger, and several species of ferns. Invasive/exotic plant species are less prevalent than at any other site the authors have seen and are largely restricted to the biking/hiking trail edges. Invasives include some Japanese barberry and a small amount of garlic mustard. Some of the trails are covered in Japanese stilt grass.

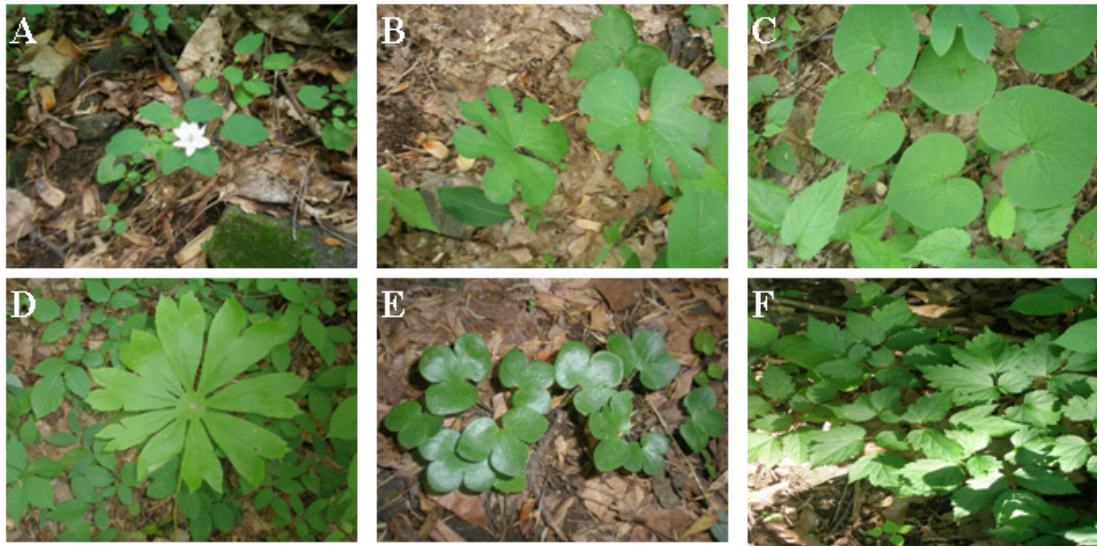


Figure 2. Native plants commonly found on the forest floor in the Uplands. A. Rue-anemone, B. Bloodroot, C. Wild ginger, D. May-apple, E. Round-lobed hepatica, F. White baneberry



Figure 3. Ferns commonly found on the forest floor in the Uplands. A. Christmas fern, B. Sensitive fern, C. Cinnamon fern

The vegetation under the power lines is a mixture of native and exotic species (Figure 4). Native trees include young oaks, sassafras, and tulip poplars. Invasive exotic shrubs include Multiflora rose and Autumn olive. Herbaceous plants include Milkweed, wood geranium, and hoary beardtongue. This area could be a valuable habitat for butterflies because of the preponderance of wildflowers, and for reptiles because the clearing provides ample opportunities for basking.

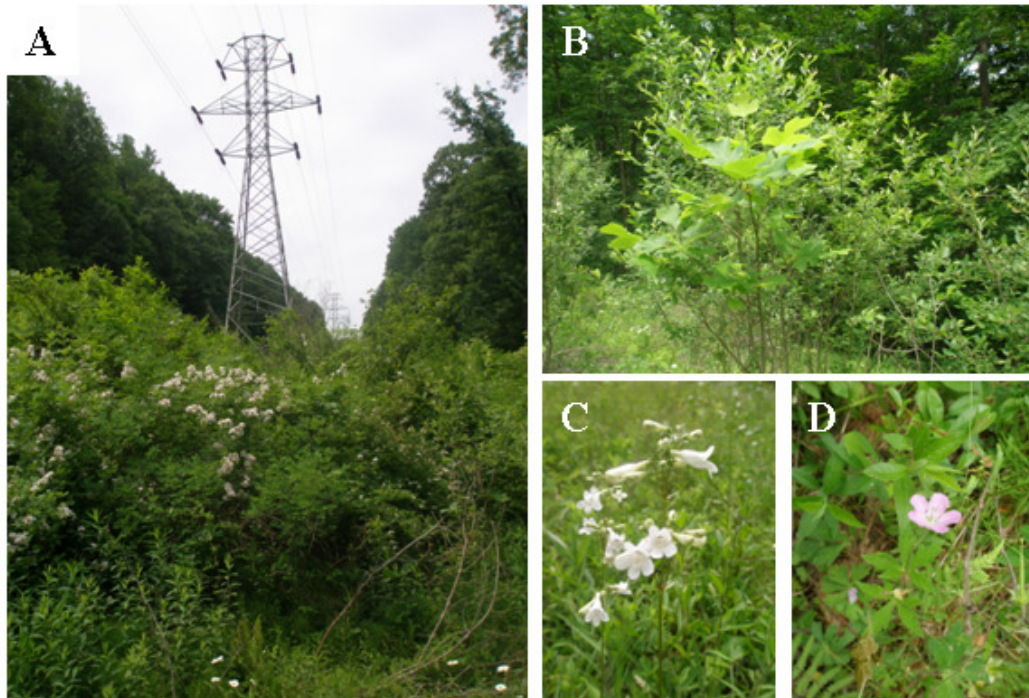


Figure 4. Vegetation under the powerlines. A. Multiflora rose, B. Young tulip poplar with Autumn olive in background, C. Beard tongue, D. Wild geranium

Unfortunately the Lowlands area is highly disturbed and heavily impacted by invasive plants. Garlic mustard and Dame's rocket are probably the most prevalent herbaceous plants in the lowlands area. As described above, there are several large wet areas where Japanese knotweed has completely taken over (Figure 1A). The area being utilized by off-road vehicles is dominated by locust trees, multiflora rose, and a mixture of invasive herbaceous plants, including Crown vetch and Creeping cinquefoil.

Invasive-exotic plants usually become established in places where the soil has been disturbed and where vegetation clearing has altered the natural light regime. Invasive plants are most often found along utility corridors, roads, and trails. Because they tend to be fast-growing and can capitalize on degraded soil conditions, invasive plants can quickly out-compete native ones to become the dominant vegetation type. Ecological restoration projects aimed at controlling invasives and establishing native vegetation should be a very high priority at Lehigh Mountain.

Table 5. Plant Species Observed at Lehigh Mountain (not an exhaustive list)

Common Name	Botanical Name	Native	Exotic	Invasive
TREES				
Box elder	<i>Acer negundo</i>	X		
Black Maple	<i>Acer nigrum</i>	X		
Norway maple	<i>Acer platanoides</i>		X	X
Red maple	<i>Acer rubrum</i>	X		X
Sugar Maple	<i>Acer Saccharum</i>	X		
Silver maple	<i>Acre Saccharinum</i>	X		
Tree of Heaven	<i>Ailanthus altissima</i>		X	X
Yellow birch	<i>Betula allegheniensis</i>	X		
Sweet birch	<i>Betula lenta</i>	X		
Pignut hickory	<i>Carya glabra</i>	X		
Shagbark Hickory	<i>Carya ovata</i>	X		
Catalpa	<i>Catalpa speciosa</i>	X		
American beech	<i>Fagus grandifolia</i>	X		
Green ash	<i>Fraxinus pennsylvanica</i>	X		
Honey locust	<i>Gleditsia triacanthos</i>	X		
Witch-hazel	<i>Hamamelis virginiana</i>	X		
Black Walnut	<i>Juglans nigra</i>	X		
Tulip poplar	<i>Liriodendron tulipifera</i>	X		
Red mulberry	<i>Morus rubra</i>	X		
Hop hornbeam	<i>Ostrya virginica</i>	X		
Norway spruce	<i>Picea abies</i>		X	
American Sycamore	<i>Platanus occidentalis</i>	X		
Sweet cherry	<i>Prunus avium</i>	X		
Black cherry	<i>Prunus serotina</i>	X		
White oak	<i>Quercus alba</i>	X		
Pin Oak	<i>Quercus palustris</i>	X		
Chestnut Oak	<i>Quercus prinus</i>	X		
Red oak	<i>Quercus rubra</i>	X		
Black locust	<i>Robinia pseudoacacia</i>	X		
Sassafras	<i>Sassafras albidum</i>	X		
Basswood	<i>Tilia americana</i>	X		
Slippery elm	<i>Ulmus</i>	X		
American elm	<i>Ulmus americana</i>	X		
Black haw	<i>Viburnum prunifolium</i>	X		
SHRUBS				
Barberry	<i>Berberis sp.</i>		X	X
Flowering dogwood	<i>Cornus florida</i>	X		
Hawthorne	<i>Crataegus sp.</i>		X	
Autumn olive	<i>Elaeagnus umbellata</i>		X	X
Winged burning bush	<i>Euonymus alatus</i>		X	X
Privet	<i>Ligustrum vulgare</i>		X	X
Spice bush	<i>Lindera benzoin</i>	X		
Tartarian Honey Suckle	<i>Lonicera tatarica</i>		X	X
Multiflora Rose	<i>Rosa multiflora</i>		X	X
Wineberry	<i>Rubus phoenicolasius</i>		X	

Common Name	Botanical Name	Native	Exotic	Invasive
Maple leaved viburnum	<i>Viburnum acerifolium</i>	X		
Arrow-wood	<i>Viburnum dentatum</i>	X		
HERBACEOUS				
White baneberry	<i>Actaea pachypoda</i>	X		
White snake root	<i>Ageratina altissima</i>	X		
Garlic mustard	<i>Alliaria petiolata</i>		X	X
Annual ragweed	<i>Ambrosia artemisiifolia</i>		X	
Rue-anemone	<i>Anemonella thalictroides</i>	X		
Spikenard	<i>Aralia racemosa</i>	X		
Jack-in-the-Pulpit	<i>Arisaema</i>	X		
Wild ginger	<i>Asarum canadense</i>	X		
Honewort	<i>Cryptotaenia canadensis</i>	X		
Hayscented fern	<i>Dennstaedtia punctilobula</i>	X		
Horsetail fern	<i>Equisetum</i>	X		
Trout lily	<i>Erythronium americanum</i>	X		
Japanese stilt grass	<i>Eulalia viminea</i>		X	X
Joe pyeweed	<i>Eupatorium dubium</i>	X		
White wild licorice	<i>Galium circaeazans</i>	X		
Wild geranium	<i>Geranium maculatum</i>	X		
Round-lobed hepatica	<i>Hepatica americana</i>	X		
Dame's rocket	<i>Hesperis matronalis</i>		X	
Stargrass	<i>Hypoxis hirsuta</i>	X		
Sensitive fern	<i>Onoclea sensibilis</i>	X		
Sweet Cicely	<i>Osmorhiza claytonii</i>	X		
Cinnamon fern	<i>Osmunda cinnamomea</i>	X		
Hoary beardtongue	<i>Penstemon hirsutus</i>	X		
May-apple	<i>Podophyllum peltatum</i>	X		
Solomon's-seal	<i>Polygonatum biflorum</i>	X		
Great solomon's-seal	<i>Polygonatum canaliculatum</i>	X		
Japanese Knotweed	<i>Polygonum cuspidatum</i>		X	X
Pennsylvania smartweed	<i>Persicaria pensylvanica</i>		X	X
Christmas fern	<i>Polystichum acrostichoides</i>	X		
Creeping cinquefoil	<i>Potentilla reptans</i>		X	
Dewberry	<i>Rubus recurvicaulis</i>	X		
Bloodroot	<i>Sanguinaria canadensis</i>	X		
False solomon's-seal	<i>Smilacina racemosa</i>	X		
Skunk cabbage	<i>Symplocarpus foetidus</i>	X		
Wood violet	<i>Viola hirsutula</i>	X		
VINES				
Oriental bittersweet	<i>Celastrus orbiculatus</i>		X	
Japanese honeysuckle	<i>Lonicera japonica</i>		X	
Virginia Creeper	<i>Parthenocissus quinquefolia</i>	X		
Poison Ivy	<i>Toxicodendron radicans</i>	X		
Grape	<i>Vitis sp</i>	X		X

5. Wildlife

Tables 6-8 include amphibians, reptiles, birds and mammals that exist or potentially exist at Lehigh Mountain Park. Detailed field surveys were not performed as part of this planning project. The information contained in the following tables is based on the authors' experience with similar properties and habitats. Below are recommendations for restoring and managing the Park to provide the habitat diversity required to support diverse wildlife communities.

Table 6. Amphibians and Reptiles that May Inhabit Lehigh Mountain Park

	Common name	Scientific name	
SALAMANDERS	Spotted salamander	<i>Ambystoma maculatum</i>	
	Marbled salamander	<i>Ambystoma opacum</i>	
	Northern dusky salamander	<i>Desmognathus fuscus fuscus</i>	
	Northern two-lined salamander	<i>Eurycea bislineata</i>	
	Longtail salamander	<i>Eurycea longicauda</i>	
	Northern spring salamander	<i>Gyrinophilus porphyriticus</i>	
	Four-toed salamander	<i>Hemidactylium scutatum</i>	
	Red spotted newt	<i>Notophthalmus viridescens viridescens</i>	
	Redback salamander	<i>Plethodon cinereus</i>	
	Northern slimy salamander	<i>Plethodon glutinosus</i>	
	Red salamander	<i>Pseudotriton ruber</i>	
	FROGS & TOADS	Eastern American toad	<i>Bufo americanus</i>
		Fowler's toad	<i>Bufo woodhousii fowleri</i>
Gray treefrog		<i>Hyla versicolor</i>	
Northern spring peeper		<i>Pseudacris crucifer</i>	
Bullfrog		<i>Rana catesbeiana</i>	
Green frog		<i>Rana clamitans melanota</i>	
Pickereel frog		<i>Rana palustris</i>	
Northern leopard frog		<i>Rana pipiens</i>	
Wood Frog	<i>Rana sylvatica</i>		
SNAKES	Northern black racer	<i>Coluber constrictor</i>	
	Ringneck snake	<i>Diadophis punctatus edwardsii</i>	
	Black rat snake	<i>Elaphe obsoleta obsoleta</i>	
	Eastern milk snake	<i>Lampropeltis triangulum triangulum</i>	
	Northern watersnake	<i>Nerodia sipedon sipedon</i>	
	Northern brown snake	<i>Storeria dekayi dekayi</i>	
	Eastern garter snake	<i>Thamnophis sirtalis</i>	
TURTLES	Common snapping turtle	<i>Chelydra serpentina</i>	
	Painted turtle	<i>Chrysemys picta</i>	
	Wood turtle	<i>Clemmys insulpta.</i>	
	Map turtle	<i>Graptemys geographica</i>	
	Eastern box turtle (Figure 5)	<i>Terrapene carolina carolina</i>	



Figure 5. An Eastern box turtle basking in the power line right-of-way

Table 7. Bird Species that May Inhabit Lehigh Mountain Park

	Common name	Scientific name
SMALL BIRDS	Tufted Titmouse	<i>Baeolophus bicolor</i>
	Cedar Waxwing	<i>Bombycilla cedrorum</i>
	American Goldfinch	<i>Carduelis tristis</i>
	House Finch	<i>Carpodacus mexicanus</i>
	Chimney Swift	<i>Chaetura pelagica</i>
	Yellow-rumped Warbler	<i>Dendroica coronata</i>
	Dark-eyed Junco	<i>Junco hyemalis</i>
	Song Sparrow	<i>Melospiza melodia</i>
	House Sparrow	<i>Passer domesticus</i>
	Downy Woodpecker	<i>Picoides pubescens</i>
	Black-capped Chickadee	<i>Poecile atricapilla</i>
	Golden-crowned Kinglet	<i>Regulus satrapa</i>
	White-breasted Nuthatch	<i>Sitta carolinensis</i>
	Chipping Sparrow	<i>Spizella passerina</i>
	Carolina Wren	<i>Thryothorus ludovicianus</i>
	White-throated Sparrow	<i>Zonotrichia albicollis</i>
MEDIUM BIRDS	Red-winged Blackbird	<i>Agelaius phoeniceus</i>
	Northern Cardinal	<i>Cardinalis cardinalis</i>
	Northern Flicker	<i>Colaptes auratus</i>
	Rock Dove	<i>Columba livia</i>
	Blue Jay	<i>Cyanocitta cristata</i>
	Red-Bellied Woodpecker	<i>Melanerpes carolinus</i>
	Northern Mockingbird	<i>Mimus polyglottos</i>
	Brown-headed Cowbird	<i>Molothrus ater</i>

	Common name	Scientific name
	Eastern Towhee	<i>Pipilo erythrophthalmus</i>
	Common Grackle	<i>Quiscalus quiscula</i>
	Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>
	European Starling	<i>Sturnus vulgaris</i>
	American Robin	<i>Turdus migratorius</i>
	Mourning Dove	<i>Zenaida macroura</i>
LARGE BIRDS	Cooper's Hawk	<i>Accipiter cooperii</i>
	Sharp-shinned Hawk	<i>Accipiter striatus</i>
	Great blue heron	<i>Ardea herodias</i>
	Canada Goose	<i>Branta canadensis</i>
	Great Horned Owl	<i>Bubo virginianus</i>
	Red-Tailed Hawk	<i>Buteo jamaicensis</i>
	Turkey Vulture	<i>Cathartes aura</i>
	American Crow	<i>Corvus brachyrhynchos</i>
	Double-breasted Cormorant	<i>Phalacrocorax auritus</i>
	Wild Turkey	<i>Meleagris gallopavo</i>

Table 8. Mammal Species that may Inhabit Lehigh Mountain Park

Common name	Scientific name
Coyote	<i>Canis latrans</i>
American beaver	<i>Castor canadensis</i>
Virginia opossum	<i>Didelphis virginiana</i>
Big brown bat	<i>Eptesicus fuscus</i>
North American porcupine	<i>Erethizon dorsatum</i>
Red bat	<i>Lasiurus borealis</i>
Ground hog/Woodchuck	<i>Marmota monax</i>
Striped skunk	<i>Mephitis mephitis</i>
Meadow vole	<i>Microtus pennsylvanicus</i>
Pine vole	<i>Microtus pinetorum</i>
Long-tailed weasel	<i>Mustela frenata</i>
American mink	<i>Mustela vison</i>
Southern red-backed vole	<i>Myodes gapperi</i>
Little brown bat	<i>Myotis lucifugus</i>
White-tailed deer	<i>Odocoileus virginianus</i>
Muskrat	<i>Ondatra zibethicus</i>
White-footed mouse	<i>Peromyscus leucopus</i>
Deer mouse	<i>Peromyscus maniculatus</i>
Raccoon	<i>Procyon lotor</i>
Eastern gray squirrel	<i>Sciurus carolinensis</i>
Eastern cottontail rabbit	<i>Sylvilagus floridanus</i>
Eastern chipmunk	<i>Tamias striatus</i>
Red fox	<i>Vulpes vulpes</i>

6. Natural Areas Inventory

The Lehigh and Northampton Counties Natural Areas Inventory (1999, 2005) lists Lehigh Mountain as a locally significant area.

Lehigh Mountain includes a large and relatively contiguous second growth forest that occurs on a north facing slope above the Lehigh River and contains a wide variety of habitat types. The site is described as a mixed second growth forest with oaks, tulip poplar, sassafras, red maple, and sweet birch as the most common canopy trees. Large oval-shaped seepy areas dominated by skunk cabbage, ferns, and mosses are interspersed with upland woods across the upper slope of a northwest-facing hillside. Lehigh Mountain is considered significant because it is one of the largest tracts of relatively undisturbed forest left along the Lehigh River south of Blue Mountain.

The “Lehigh Mountain Seeps” is located in the Uplands section of Lehigh Mountain Park and is identified as a top priority natural area in Lehigh County and as an area of statewide significance (Map 8). The NAI classifies the Lehigh Mountain seeps community as a Northern Appalachian Circumneutral Seeps Natural Community, which is considered an exemplary natural community type within Pennsylvania. The series of seeps spans the north-facing forested slope of the Mountain and provides excellent habitat for many species, especially of amphibians and reptiles. Threats to the Seeps area include the presence of invasive shrubs, particularly Multiflora rose and Japanese barberry, and inappropriate land uses, including mountain biking and hiking trails and utility corridors.

A PDNI (Pennsylvania Natural Diversity Index) review of the Lehigh Mountain Park site revealed three species of concern that could potentially be impacted by activities at Lehigh Mountain Park: Waterhemp ragweed (*Amaranthus cannabinus*), Schweinitzii flatsedge (*Cyperus schweinitzii*), and Northern water-milfoil (*Myriophyllum sibiricum*), as well as indicated that the seeps community was a *Special Concern Resource*. A copy of this PDNI review receipt is located in Appendix C.

B. Natural Resource Protection

1. Recommendations for the Uplands

As discussed above, the Uplands forest is remarkably healthy and is quite likely the most intact large forested area in the Lehigh Valley.

Great care should be taken to ensure that invasive/exotic plant species do not spread through the site.

- Train staff members to identify invasive plants and conduct regular monitoring. Concentrate activities along biking/hiking trails. Presently there are so few invasive that removing plants by hand would be feasible and effective.

- The area under the power line provides excellent habitat for butterflies and reptiles, and adds to the overall habitat diversity of the park. The current vegetation management schedule for this right-of-way appears to be working well. If possible, the best time to cut down the vegetation would be in the winter. Selectively cutting and treating the invasive shrubs (Multiflora rose, Autumn olive, Japanese honeysuckle) should be done annually in order to prevent the spread of seeds into the forested areas. Because these species grow faster than the native woody vegetation, removing invasives will decrease the number of mowings required to maintain the power lines. Reduced mowing under the power lines will allow the native trees and shrubs to grow tall enough to produce seeds, adding to the forest seed bank.
- Consider enlisting experts to conduct a detailed Natural Areas Inventory or Natural Resources Management Plan for the site.

Prevent further forest fragmentation and spread of invasive/exotic plants by prohibiting the establishment of any new biking/hiking trails. Protect the Seeps from degradation due to mountain biking.

- There is an extensive network of trails through the Uplands forest. Most trails are well marked. The numerous unmarked spur trails are not necessary and should be closed by planting native trees and shrubs and if necessary by placing boulders.
- There are several places where bike trails cross over the numerous seeps. Placing large rocks or small boardwalks at these areas will reduce erosion and disturbance in these areas.
- Enlist the help and advice of the Lehigh Valley Mountain Bikers in these activities.
- The seeps community of Lehigh Mountain is considered an important natural habitat, and should be treated as such. These seeps likely serve as critical breeding habitats for numerous amphibians, and for this reason it is recommended that the trails crossing the seeps be temporarily closed during the early spring.

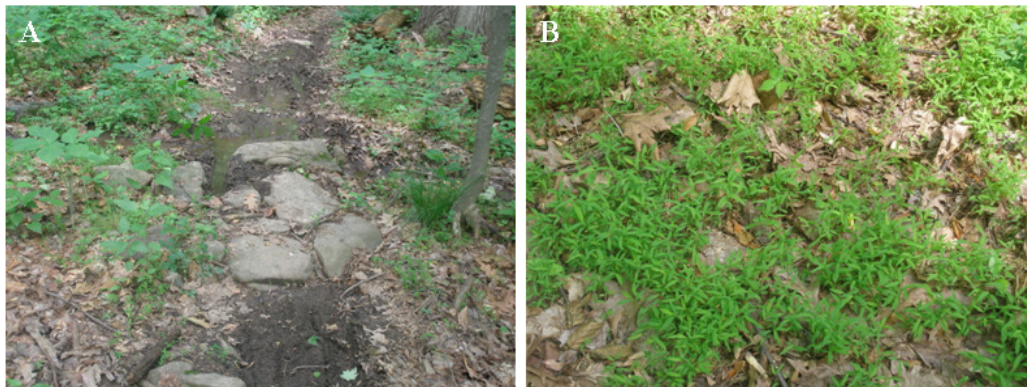


Figure 6. A. Mountain bike tracks crossing the Seeps, B. Japanese stilt grass is a common invader along trails.

2. Recommendations for the Lowlands

The Lowlands area is plagued by the rampant spread of invasive/exotic plants, extensive illegal dumping, and un-allowed motorized vehicle use.

Eliminate illegal motorized vehicle access to Lehigh Mountain Park.

- Place gates at the east and west ends of Pumphouse Road.
- Install clear and abundant signage stating that motorized vehicles are not permitted.
- Place boulders at points of entry for vehicles.
- Monitor the area for evidence of vehicles.

Restore the area damaged by illegal motorized vehicles.

- Once there are no longer any signs of vehicle use in the park steps should be taken to reclaim the disturbed area. As described above, the existing vegetation here includes native locust trees and invasive/exotic shrubs (Multiflora rose, Japanese honeysuckle) and herbaceous plants (Crown vetch, Creeping cinquefoil). Because of the prevalence of invasive plants and the highly compacted soil conditions, there is very little chance that this area will recover on its own. Because locust trees are native and can colonize disturbed areas it is recommended that they be planted in the open areas. Invasive shrubs should be cut by hand and stumps should be treated with herbicide. Most of the herbaceous plants prevalent in the area are not shade tolerant and should decrease as the trees grow.

Restore the areas that have been taken over by Japanese knotweed.

- Japanese knotweed is an extremely difficult plant to eradicate, but without taking steps to remove it, it is guaranteed to quickly spread through the rest of the Park. Knotweed roots can grow to a depth of more than six feet, and can grow horizontally as far as 23 feet from the original plant. A tiny piece of root can develop into a plant, and even pieces of the stem can form new plants. Once plants are established at a site, whether by seeds or vegetatively, they continue to grow by sending out roots, resulting in larger and larger patches. It is recommended that the areas overrun with knotweed be mowed regularly and sprayed annually with a selective glyphosphate herbicide (commonly called Round-up or Rodeo).
- Two to three years of mowing and spraying should significantly reduce the prevalence of knotweed. After this time it is suggested that the area be planted with native trees and shrubs. Knotweed does not grow well in shady environments. Because the area is relatively wet, and plants should be selected that are tolerant of wet conditions. Such species include: Silver maple, River birch, Green ash, Sycamore, Swamp white oak, Black walnut, Black chokeberry, Buttonbush, Silky dogwood, Gray dogwood, and Arrowwood viburnum.

Eliminate illegal dumping.

- Place gates at the east and west ends of Pumphouse Road.
- Install clear and abundant signage stating that there is a monetary fine for dumping and littering.
- Remove the garbage that already exists at the Park.

3. Park-wide recommendations

Promote responsible use and environmental stewardship

- Install signs that provide information to park visitors about the environmental sensitivity of the Park.
- As ecological restoration projects proceed, use them as opportunities to educate park users about the environmental challenges and issues affecting the Park.
- Investigate the possibility of installing 5 mile/hour speed limit signs along Cardinal Drive as it enters the Park, along with signs explaining that visitors are about to enter an important natural area and are asked to drive carefully and yield to wildlife.
- Post information about the wildlife visitors might be lucky enough to encounter at the Park.
- Encourage the use of the uplands forest as an outdoor classroom and laboratory by local colleges and universities.
- In an effort to unify the uplands and lowlands into one park, provide educational signage about the historic uses of both areas and how those activities shaped the current environmental conditions.
- At the time of publication Salisbury Township is conducting its own Natural Resource Inventory. The information collected for Lehigh Mountain should certainly be incorporated into this plan and actions should be taken to protect any additional significant natural features identified.

4. Park expansion and land acquisition

To the south and southwest Lehigh Mountain Park is currently bordered by relatively large (approximately 30-60 acres) wooded parcels, providing the potential to expand the park and to connect it to other publicly owned open space. These parcels are currently zoned “Rural” (Map 9). As opportunities arise, efforts should be taken to preserve high-quality habitat types and/or large parcels of property in close proximity to the parklands in order to protect natural resources, add to the connectivity of the parklands with other preserved properties, and increase the acreage of Pennsylvania Highlands held in open space. Map 10 shows the ownership of privately held wooded parcels surrounding Lehigh Mountain Park.

IV. RECREATIONAL RESOURCES

A. Overview

The result of this planning effort is a master plan that will begin to guide protection and sustainable management methods of Lehigh Mountain Park without disturbing or destroying the significant ecological, scenic, and historic values of this diverse property. Conceptual designs and basic cost estimates have been created which will allow for safe, practical and efficient access to the site and a variety of minimal impact outdoor recreation options. Preparation of this plan did not include feasibility studies or the in-depth engineering required to properly construct the suggested improvements. Before engaging in any additional improvements, design professionals should be consulted to assist with the technical specifications. This plan includes an inventory of existing conditions and provides suggestions for modifications and additions that will both enhance the park users’ experiences and protect and restore the Park’s natural features. As a result the

recommendations provided in this section complement and overlap with those described in the Natural Resource Protection chapter above.

Lehigh Mountain Park is classified as a regional passive park¹. Situated in a rapidly urbanizing landscape, the Park provides the community with a place that is conducive to small boat activities, mountain biking, hiking, birding, wildlife photography, fishing, and other general nature observation. As it exists today, the park is home to a system of hiking and biking trails that have been installed and are maintained by area mountain bikers, but the site is not easy to access, and therefore use for other forms of passive recreation are not managed. As discussed previously, there are obvious signs of illegal motorized vehicle use and dumping. This plan calls for the elimination of off-road motorized vehicle use.

The Lehigh Mountain Uplands and Lowlands should be considered two distinct management areas. The Uplands forest contains abundant native plants and wildlife, and should be managed to remain that way. Conversely, the Lowlands has been is infested with invasive plants and is suffers from improper uses. Due to topography, potential access, and utility and amenities development, the Lowlands area is more suitable for higher use daily recreation activities.

It is important to protect the Park's natural resources and to provide the public with a place to enjoy low impact recreational activities in a woodland setting. In order to manage environmental impacts, the design and location of amenities must be carefully analyzed. Parking, for example, should be offered in an area that is readily accessible by improved and maintained roadways and is close to existing utilities. Other amenities that attract groups of people, like pavilions and indoor meeting space, should be in relative close proximity to the parking areas. Emergency access to the site, and providing compliance with the Americans with Disabilities Act², also needs prioritized consideration.

The recommended area for larger gatherings of people and vehicles is the eastern end of the park, with access provided via Riverside Drive. Secondary access and parking should be located near the intersection of Cardinal Drive and Constitution Drive and south of the active railroad right-of-way, at the western end of the park.

The highest and most immediate priorities for protecting and developing this site should be to:

- Develop a resource management plan to protect biodiversity of the Uplands forest and to preserve or restore the Park's historic features
- Install gated access to site to minimize illegal uses and dumping
- Clean up debris
- Install signage describing the site, its allowed uses and contact information

¹ National Recreation and Park Association (NRPA), 22377 Belmont Ridge Road, Ashburn, VA 20148

² Americans with Disabilities Act (ADA)- Draft Final Outdoor Developed Areas Guidelines available at www.access-board.gov

These four items should be acted upon immediately. Remaining recommendations regarding the ample opportunities for hiking and biking trails, improved parking and access, a boat launch facility, and environmental education follow.

B. Uplands Recreational Resources

Proven successful trails include features that provide a memorable experience and different challenges, and are well maintained. Presently the Uplands area of the property has a trail system for hikers and bikers, commonly referred to as “shared-use” trails (Map 11).

Reportedly, these trails have been built and are maintained by the Valley Mountain Bikers (VMB)³, a local mountain biking club “dedicated to promoting mountain biking in the Lehigh Valley, PA area through organizing rides, social activities and the building and maintaining of trails.” According to its website, www.bikevmb.com, trail building or maintaining is based on International Mountain Bicycling Association (IMBA) standards.⁴ The VMB club’s website also ranks the Lehigh Mountain trails 3 out of 5 for riding difficulty and the “Visitor Rating” gives the trail system five stars, the highest possible score. Only one other Pennsylvania venue is rated this high on the website.⁵

The outer loop of the trail system takes an average of 90 minutes for experienced riders to complete and is generally suitable for intermediate to advanced users. The approximately 13 mile system allows riders and hikers access to remote areas of Lehigh Mountain and to enjoy a variety of natural features (seeps, steep-sloped inland forest, glacial till boulder field). Trails do unfortunately have the adverse effects of fragmenting the forest and providing a route for the invasion of exotic plant species. Presently it appears that, with a few exceptions, the trails have little impact to the forest. The trails should be regularly monitored to make sure they are not widened over time, are not causing any erosion issues, and are not becoming lined with invasive/exotic plants. It is recommended that no new trails are added to the Uplands. The Lehigh & Northampton County NAI report recommends this as well. If new trails are to be cleared, they should be approved by a land owner/manager and be done with the guidance of a qualified ecologist and a trail builder. Any new trails should be “planned with wildlife in mind”⁶ and away from ecologically sensitive areas. Clearing of any new trails should be accompanied by the closing of the same length of existing trail. Closing a trail requires the installation of native trees and shrubs, and may include placing boulders or other obstacles to prevent use.

Another concern is that several trails take users off of public parklands and onto private property (Map 11). This plan recommends abandoning those trail segments crossing onto public property and working with local organizations to realign the trails so they remain on

³ Valley Mountain Bikers (VMB) – www.bikevmb.com

⁴ International Mountain Bicycling Association (IMBA) - http://www.imba.com/resources/trail_building/index.html

⁵ Valley Mountain Bikers – www.bikevmb.com/trailfinder

⁶ "Planning Trails With Wildlife in Mind", 1988, Colorado Department of Parks, 1313 Sherman St., Rm. 618, Denver CO 80203

public property. As part of the process, an official trails map outlining trails, trail names, and elevations should be developed. Trail way-finding signage should be installed correlating to the official map.

There are several places where trails cross the Lehigh Mountain Seeps (Map 11). The Seeps are important natural areas that warrant serious protection. It is recommended that an informal group of interested Park users and ecologists from Wildlands Conservancy investigate ways to better protect the Seeps. In the early spring the Seeps become fertile breeding grounds for many small, rare and sensitive amphibian species. For this reason, consideration should be given to seasonally closing trails that cross the Seeps.

Access to the Uplands trails should be limited to a few trailheads and must be clearly identified. Both the proposed eastern and western parking areas, as well as places like Dodson Park are convenient locations.

C. Lowlands Recreational Resources

As described previously, the Lowlands is well suited for recreational infrastructure enhancements. The relatively flat topography will allow for the establishment of a trail system suitable to a wider array of users than that of the Uplands. Access to the Lehigh River and the remnants of several historic structures are features that should be highlighted.

1. Trails

The Lowlands are traversed by a system of elevated farm roads and the former rail bed now called Pumphouse Road (Map 12). This unimproved four-mile network of trails has been heavily used by ATV and other motorized vehicle users. It is proposed that these pathways be developed for a higher-use non-motorized trail system than the Uplands trails. A Lowlands trail system would provide the community with a place that is easy to walk or bike (compared to the steep, challenging Upland trails). Improvements to Pumphouse Road would provide a connection to the eastern and western gateway areas. These trails will also encourage patrolling of remote regions of the Lowlands that have historically been the site of undesirable and illegal activities (dumping, vandalism). Meetings with the local emergency departments (police, fire, ambulance) should be conducted to collect expert advice and to garner support for safety, emergency response protocols and aid in controlling illegal conduct.

According to a Rails-to-Trails Conservancy fact sheet, “The research that has been conducted, along with anecdotal evidence, suggests that converting an abandoned rail corridor to a trail actually tends to reduce crime by cleaning up the landscape and attracting people who use the trail for recreation and transportation.”⁷ Certainly, having more people on the trails will provide additional vigilance to curb any prohibited activity.

Being near the terminus of the South Bethlehem Greenway, and understanding that St. Luke’s Hospital is planning traffic improvements in the area, it is feasible to connect the

⁷ “*Rail-Trails and Safe Communities – The Experience on 372 Trails*”, January 1998, Rails-to-Trails Conservancy, The Duke Ellington Building, 2121 Ward Ct.,NW, 5th Floor, Washington DC 20037

South Bethlehem Greenway to the Lehigh Mountain Lowlands via Riverside Drive. A trail along Riverside Drive can connect to the former Pumphouse Road path (which should be improved with a crushed limestone or paved surface, Map 12). The trail would parallel the Lehigh River, offering users a scenic view of the River and a relatively flat, smooth trail. The trail can terminate at the western parking area or, upon further discussions with the City of Allentown and Salisbury Township, be studied to continue westward along Constitution Drive and connect with the City of Allentown's trail system. The active railroad along the southern boarder of the Lowlands needs consideration. Formal discussions with the railroad owner should take place to optimize safety and public access. The feasibility of a rail-with-trail, a non-motorized trail that parallels the active rail line, can also be investigated.

All trail access points should include some type of an unauthorized vehicle restriction, namely a gate or removable bollards, which can be unlocked for official entry only. Signage should also be located at each trail head showing allowed uses, restrictions, property amenities, directions, and emergency contact information.

The Delaware and Lehigh National Heritage Corridor (DLNHC) and Lehigh Valley Planning Commission should be consulted to ensure that efforts at Lehigh Mountain are consistent with region-wide planning efforts. The DLNHC is a 501(c) 3, non-profit organization dedicated to creating a 165-mile Corridor across five counties and some 100 municipalities.⁸ Its management plan details priorities within the corridor, one of which is trail development along the Lehigh and Delaware rivers. Even though the currently planned D&L trail is on the opposite side of the Lehigh River from Lehigh Mountain, there is expertise available from its staff that could be beneficial, such as a trail maintenance volunteer base, signage, and heritage interpretation.

2. Riverfront

Formal access to the Lehigh River can be offered for fishing, wildlife viewing, and canoeing and kayaking. The Lehigh River Water Trail, a 75-mile water trail that begins with Class II and Class III Rapids in White Haven, Luzerne County, ends in the City of Easton, Northampton County, about 10-miles downstream of Lehigh Mountain Park.

⁸ "Delaware & Lehigh Canal National Heritage Corridor and State Heritage Park - Management Action Plan," 1993, The Delaware & Lehigh National Heritage Corridor, 2750 Hugh Moore Park Road, Easton PA 18042



Figure 7. Participants of Wildlands Conservancy's Lehigh River Sojourn and Bike & Boat trips paddle past Lehigh Mountain Park

There are two potential locations for a boat launch, the feasibility and desirability of which should be investigated (Map 12). The western location proposal requires driving on Constitution Drive or Cardinal Drive then crossing the active rail line. A new parking area and improved roadway that will handle two-way traffic will need to be constructed. The other option is to provide primary access from the east via Riverside Drive. The Borough of Fountain Hill, in its comprehensive plan, identifies a boat launch as one of its recommendations. It states, "The nearest designated access point is at Sand Island in Bethlehem on the other side of the river. Although there are obstacles such as the active railroad and steep slopes on the north side of Lehigh Mountain, potential exists for providing improved access to the river in the form of trail linkages, small boat access areas and other improvements."⁹ This plan recommends formal discussions with the Borough of Fountain Hill and the Pennsylvania Fish & Boat Commission to determine the feasibility of constructing a boat launch facility in this area. The Fountain Hill site is not within the perimeter of the park boundaries and parking could be limited.

The Lehigh is classified as a warm water fishery, which supports fish species such as bass, walleye and muskellunge. Fishing is a popular activity along the Lehigh River and should continue as an allowed recreational activity. Waterfowl, amphibians and reptiles are also present and provide wonderful opportunities for wildlife photography.

3. Remaining historical features

The Lowlands portion of Lehigh Mountain Park contains the ruins of several historic structures that together could be interpreted to tell the story of the Park site, the Lehigh Valley, and the Lehigh River, from the time of the early Native Americans to the heyday of Bethlehem Steel.

⁹ "Fountain Hill, Pa. Comprehensive Plan," adopted by Fountain Hill Borough Council on August 22, 2007

In 1843 Franz Heinrich Oppelt, a German physician, came to Bethlehem and created a hospital based on water therapy and homeopathic practices. The ruins of the hospital can still be seen directly behind the present St. Luke's Hospital.

A stone fish trap built by the Lenape Indians is still visible in the Lehigh River at Sterner's Island. The Solomon Jennings homestead has been reduced to rubble but is still present within the park. The ruins of the Geissinger farmstead are clearly definable in the park as well (Figure 8, Map 12).



Figure 8. Remnants of the Geissinger farmstead.

Perhaps the Park's most impressive historical landmark is the Works Progress Administration (WPA) park site, referred to as the Lehigh Valley's first theme park, and the area surrounding the water reservoirs on the recently acquired Bethlehem Water Authority land (Figure 9, Map 12). Restoring features of the WPA site and creating informational signage would provide another characteristic feature to the park.



Figure 9. Remnants of the WPA park.

These unique historical sites should feature prominently in the Park. Creating a “Trail of History”, with signage and a printed guide or a with a cell phone based information system within the park would be a unique way to tie these features together to better present the historical significance of the Park.

D. Overview of Recreation and Infrastructure Recommendations

The major features of the development plan include the development of two new gateways to the parklands, management of the existing hiking/biking trail network to balance resource protection and recreation, and the provision of universal park signage at park access and way-finding points.

Lehigh Mountain Park should remain classified as a passive recreation park and protection of all of the Park’s natural resources should be the highest priority. The Uplands area needs continual attention to its natural resources; any recreation activities should be secondary. The Lowlands is the place for concentrated recreation activities because of the existing infrastructure and less sensitive natural areas. Fittingly, several of the *Recreation and Infrastructure* recommendations listed below overlap those listed in the *Natural Resource Protection* chapter above.

1. Uplands Recommendations

Manage the Upland Trail System

- No new trails should be constructed without approval of land owner/manager *and* a site visit with a qualified ecologist and a trail builder.
- The trails should be regularly monitored to make sure they are not widened over time, are not causing any erosion issues, and are not becoming lined with invasive/exotic plants.
- Trails extending onto neighboring private properties need to be closed and/or rerouted to remain on public park land (Map 12).

- Official trail maps should be developed and the map located at the Cardinal Drive parking lot should be updated.
- Official trails should be clearly blazed and spur trails should be closed.

2. Lowlands Recommendations

Restrict Motorized Vehicle Access

- Access to the park must be secured with locked gates, so that only authorized vehicles can access the park interior for maintenance and emergency uses (Map 12). All other motorized vehicle access must be prohibited and enforceable with strengthened municipal ordinances.

Create Boat Launch

- The two proposed areas for boat launches need further investigation, but the preferred site, based on concentrating activity and infrastructure, would be the eastern or downriver part of the park (Map 12). The proposed launch area must be designed to allow ADA access to the waters edge. This launch will provide the Lehigh Mountain Park with a direct linkage to the Lehigh River Water Trail.

Improve Lowlands Trails

- Trails in the Lowlands section should be developed for heavier use and should be constructed with a crushed limestone or a paved surface (Map 12). The abandoned rail bed that parallels the river should be cleared of vegetation and developed as a rail-to-trail that connects both ends of the park.
- Investigate which trail remnants should be improved and which should be abandoned
- Incorporate the remaining historical features into the Lowlands trail system.

3. Park-wide Recommendations

Improve Public Access

- The highest public access to the park should be from the east via Riverside Road. Secondary access should be located near the intersection of Cardinal and Constitution Drives and south of the active railroad right-of-way, at the western end of the park.
- The eastern half of Pumphouse Road should be improved for emergency vehicles.
- The recommended area for larger gatherings of people and vehicles is the eastern end of the park, with access provided via Riverside Drive.

Enhance the Park with Signage

- Signage, ranging from gateway structures to interpretive kiosks, is highly recommended for the site. Other signage necessities could include park boundary markers, rules and regulations, directional signage, color coded trail markers, hours of operation, emergency contact information, trail challenge levels, municipal boundaries, and more. Signs should be constructed from weather resistant materials, aesthetically pleasing to the surroundings, consistent, and universally understood.
- Interpretive kiosks can be installed where trails meet natural, historic and cultural sites, such as former farmsteads in the Lowlands and the WPA site in the Uplands. Informative signs can be placed at trailheads and should contain trail maps and describe the trail conditions and rules and regulations.

4. Potential Future Amenities

For a regional park of this size, it would be advantageous to have indoor meeting space with restrooms, and possibly space for maintenance equipment and supplies. Being that the infrastructure is better served at the eastern end of the property, it is recommended that a future park office/education center be located along Riverside Drive and, if feasible, to share a parking area with the proposed boat launch (Map 12). A pavilion for outside gatherings would also be beneficial. Construction costs and ongoing maintenance needs of these facilities will need to be determined. The benefits of locating such services here versus the western gateway include: access is readily available, visibility is not as confined, utilities are more predominant, the general area is accustomed to traffic, construction costs are consolidated, footprint of environmental disturbance is reduced, and there is potential to connect to the South Bethlehem Greenway.

The design and location of any future amenities must be carefully analyzed. Parking, for example, should be offered in an area that is readily accessible by improved and maintained roadways and is close to existing utilities. Other amenities that attract groups of people, like pavilions and indoor class space, should be in relative close proximity to the parking areas. Emergency access to the site, and providing compliance with the Americans with Disabilities Act¹⁰, also needs prioritized consideration.

¹⁰ Americans with Disabilities Act (ADA)- Draft Final Outdoor Developed Areas Guidelines available at www.access-board.gov

APPENDIX A

Recommendations & Cost Projections

Recommendations and Timeframe for Implementation (Refer to Map 12):

Recommendation	Timeframe for Implementation	Site Plan (Map 12)
Eliminate unauthorized vehicle access		
install locked gates across both ends of Pumphouse Road	immediately	1
install "absolutely no motorized vehicle access" signs	immediately	
Clean-up illegal dumping		
remove existing garbage	immediately	
install "no dumping" signs and signs warning of fines	immediately	
Improve public access		
improve the eastern half of Pumphouse Road so it can be used by emergency vehicles	short term	6
build a parking lot where Riverside Drive meets the east end of the Lowlands	long term	8
install way finding signs at/along the four points of entry (Constitution Drive, Cardinal Drive, Riverside Drive, Dodson Park)	short term	
Protect the Uplands forest		
develop natural resource management plan	immediately	
develop an informal working group with park users and ecologists	short term	
regularly monitor trails	ongoing	
close trail segments on private property	immediately	11
Manage invasive plants		
manage Japanese knotweed in lowlands	ongoing*	4
enlist volunteers to remove invasives along Uplands trails	ongoing*	
selectively cut invasive shrubs along power line	short term	
restore the area degraded by unauthorized motor vehicles	long term	5
Improve the Lowlands trail system		
improve the eastern half of Pumphouse Road	short term	6
improve and map existing trail network	short term	3
Enhance the Park with Signage		
Maps and Rules at Cardinal Dr, parking lot, Dodson Park trail head, west end of Pumphouse Road	short term	
Re-blaze official Upland trails (to minimize use of spur trails)	short term	
Create educational signage for historical features	long term	
Create educational signage about natural features	long term	
Preserve or restore remaining historical features		
Restore Geissinger homestead	long term	2
Restore Jennings homestead	long term	7
Restore WPA Park site	long term	10
Enhance Park infrastructure		
create a boat launch	long term	9
build pavilions	long term	
build Park office/education center	long term	
Pursue the acquisition of surrounding wooded parcels		
	ongoing	

* Although we realize there are limited resources to direct to Lehigh Mountain Park, we suggest dedicating effort toward the invasive plant problem now, because with each year that passes the problem becomes more and more unmanageable.

Immediate = <1 year
Short-term = 1-3 years
Long-term = >4 years

10-Year Cost Phasing: Phasing of the capital improvements proposed for the Lehigh Mountain Park Site Plan over a 10-year period is recommended as follows:

A-2

OVERALL SITE DEVELOPMENT COST PHASING SCHEDULE									
Overall Site Costs	Qty	Unit	Unit Cost	Cost	Phasing				
					Year 1	Year 2-3	Year 4-5	Year 6-7	Year 8-10
1. Security Gates	2	LS	\$7,500	\$15,000					
2. East Pumphouse Rd. improvement	4500	LF	\$32	\$144,000					
3. Main access Signage	2	LS	\$5,000	\$10,000					
4. Boat Launch	1	LS	\$75,000	\$75,000					
5. Facilities Building	1	LS	\$500,000	\$500,000					
6. Tree Removal	3	Ac	\$6,000	\$18,000					
7. Earthwork & Grading	1	LS	\$45,000	\$45,000					
8. Stabilization & Seeding	1	LS	\$12,000	\$12,000					
9. Native plant landscaping	1	LS	\$20,000	\$20,000					
10. East Parking (75 spaces)	1	LS	\$120,000	\$120,000					
11. Stormwater Management	1	LS	\$15,000	\$15,000					
12. Other signage (boundary, directional, rules/regs, maps, etc)	1	LS	\$50,000	\$50,000					
13. Clean up debris (dumpster rental, fees)	1	LS	\$20,000	\$20,000					
14. Pavilions	2	LS	\$25,000	\$50,000					
15. Improve West Parking area	1	LS	\$5,000	\$5,000					
Probable Cost of Construction				\$1,099,000	\$35,000	\$209,000	\$183,000	\$100,000	\$572,000
Engineering & Design Services (15%)				\$164,850	\$5,250	\$31,350	\$27,450	\$15,000	\$85,800
Contingency (10%)				\$126,385	\$4,025	\$24,035	\$21,045	\$11,500	\$65,780
Park Development Total				\$1,390,235	\$44,275	\$264,385	\$231,495	\$126,500	\$723,580

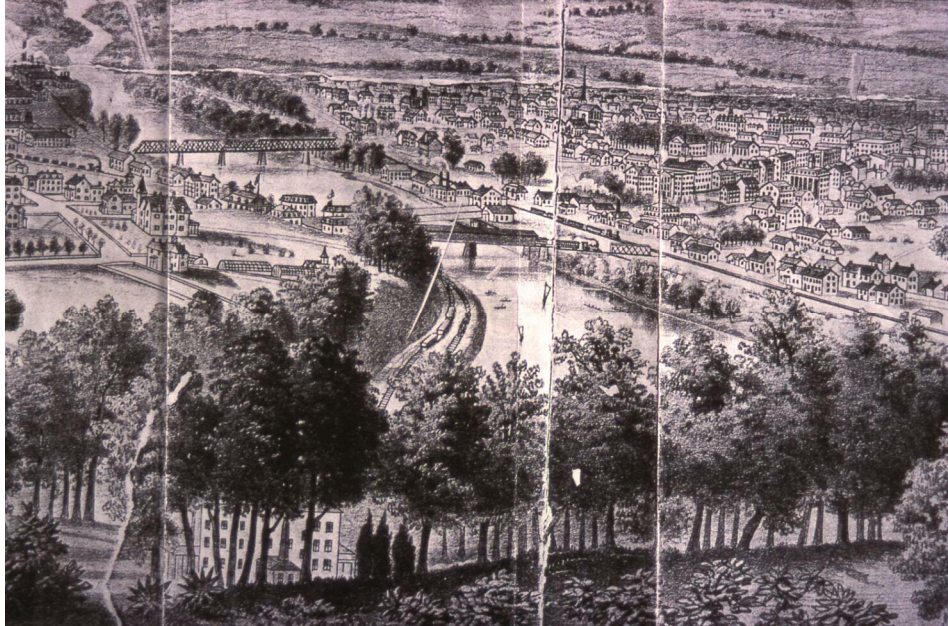
**10-Year Cost Phasing of Total Improvement Costs for the Lehigh Mountain Park Site
Master Plan:**

Year 1:	\$44,275 (#1, #13)
Year 2:	\$82,225 (#3, #12, #15)
Year 3:	\$182,160 (#2)
Year 4:	\$174,570 (#6, #10)
Year 5:	\$56,925 (#9, #14)
Year 6:	\$63,250 (#4 -partial, #7-partial, #14)
Year 7:	\$63,250 (#4-finish, #7-partial)
Year 8+:	\$91,080 (#7, #8, #11)
Year 9+:	\$250,000 (begin #5)
Year 10+:	\$382,500 (finish #5)

APPENDIX B

History of Lehigh Mountain

No matter the era—from the Illinoian glacier that smoothed its slopes 150,000 years ago, to the determined participants climbing those same hillsides in the 2007 Metrowilderness Adventure Race—Lehigh Mountain has been a sentinel for the Lehigh Valley.



Geology

Geologically speaking, Lehigh Mountain is part of the Blue Ridge in Pennsylvania. The Blue Ridge east of the Susquehanna River is called the Reading Prong. The mountain rises from an elevation of approximately 400 feet above sea level to approximately 900 feet at its summit. There are two major geological features associated with Lehigh Mountain. One is the fact that the Blue Ridge rocks originated far to the southeast and were pushed northwest into their present location. Such a dramatic horizontal translation of rocks is accomplished by a low-angle fault called a thrust fault. The second geological feature of note is the fact that Lehigh Mountain marks the general location where an ancient glaciation banked up along its northwest flank.

The Appalachian Mountains and the Reading Prong

The crystalline rocks of the Reading Prong, rock types including granite, gneiss, and quartzite, are out of place. They are derived from far to the southeast, perhaps as far away as Philadelphia. The Appalachian Mountains were built by shorting, folding and faulting of the earth's crust between 450 and 250 million years ago. During this time, an era known as the Paleozoic, there was no Atlantic Ocean as we know it. Instead, there was a more narrow sea called Iapetus with North America on one side and Africa on the other. During most of the Paleozoic period, North America, Africa, and Eurasia slowly, but steadily, moved toward one another, closing the Iapetan Sea. As these three continents drew closer, the crust was repeatedly crumpled and uplifted to form mountain ranges. The Iapetus Sea finally closed completely about 250 million years ago, resulting in a head-on collision between North America and northwestern Africa. The result was a major shortening of the crust and the

uplift of a youthful Appalachian Mountain chain, of which Lehigh Mountain is a part. Crust shortening is accomplished by rocks moving horizontally and stacking on top of one another. In a mountain range, the crumpling occurs above the low-angle faults called thrust faults. The Reading Prong is one such fault sheet. The Reading Prong thrust fault sheet is composed of very old rocks approximately one billion years old. It sits on top of limestone and shale that is much younger at only 450 million years old. The crystalline rocks of Lehigh Mountain are hard, so they stand topographically high. In contrast, the thick vegetation and wet climate of Pennsylvania work to efficiently dissolve the limestone that underlies the crystalline rocks, so these rocks are low standing.

Ice Ages and a Pirated River



In the last approximately 2.5 million years of the earth's history, the climate has been relatively cold. At least seven or eight times over those years, enormous ice sheets have grown over eastern Canada and flowed south into Pennsylvania. The Illinoian ice age made an appearance in the Lehigh Valley and receded about 150,000 years ago. As the glacial ice flowed southwest into the Lehigh Valley toward what is now Allentown, it completely covered the Lehigh River. More importantly, it banked up against the northwest flank of Lehigh Mountain, completely blocking the path of any river or stream trying to flow north into the Lehigh River. The Little Lehigh Creek is one such north-flowing tributary that had its path completely blocked by the wall of ice in the Lehigh Valley. A lake formed in the valley of the dammed Little Lehigh Creek. The lake rose steadily until it found an outlet to the south through which it could drain. That outlet was where the present town of Topton is located.

When the Lehigh River, flowing south, reaches Allentown, it encounters crystalline rocks for the first time. These are the Precambrian gneisses of Lehigh Mountain. Up to this point, the river has been flowing across stratified rocks. Now, as it meets the ancient crystalline formations it finds that it runs into a formidable opponent. The Lehigh River bows to the inevitable and turns left to flow eastward to the Delaware River. Lehigh Mountain has a fascinating and diverse geological history derived from tectonics, glacial and weathering

processes. The landscape on Lehigh Mountain reveals the geological evolution of eastern North America.

Native Americans and Lehigh Mountain

From the great number of artifacts and jasper chips found on the flat land, today's Walking Purchase Park, on the south side of the Lehigh River the broad curve of the river between Allentown and Bethlehem and formerly known as Geissinger Farm, it would seem that groups of Native Americans lived at this spot repeatedly if not continuously. During the last portion of the Woodland Period, 100 B.C.-1600 A.D. before the arrival of



within



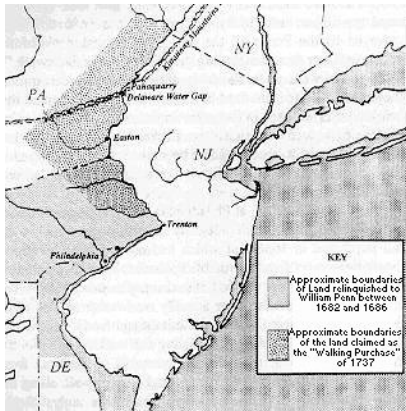
Europeans, the Lenape Indians, a branch of the Algonquins, lived in what is now southeast Pennsylvania. The Lenape discovered jasper, a hard, yellow, red or brown cryptocrystalline quartz (flint-type mineral) near Vera Cruz. The Lenape used jasper for making arrowheads and other cutting implements. There is archeological evidence-jasper flakes at campfire sites in the Lehigh Mountain area - that only the rough trimming was done at the quarries and the finishing was done in the camps along the river. The Lenape built no permanent structures and they made only minor use of the soil. Their chief occupations of hunting and fishing modified the countryside so little, that little remains other than stone tools and flakes from their creation. There have also been artifacts found that predate the traditional Native American presence and started approximately 11,000 years ago. These objects are best classified as "Paleoliths." This fits with some historians who believe that other human beings wandered through the Lehigh Mountain area previous to the Native Americans. It seems plausible that some of the artifacts found in the region that are attributed to the Lenape, who lived in a Stone - Age culture, are actually the work of more ancient man.

The First Europeans

Solomon Jennings was the first white resident of what was to become Salisbury Township. Jennings was a farmer who settled on the south bank of the Lehigh River, which today is the site of Walking Purchase Park. Jennings' farm was also a site for a Lenape settlement in the early 1700s. There was a Lenape burial ground, a stone fish trap in the Lehigh River at the end of Sterner's Island, and a Lenape trading post within a half mile of the Jennings Farm. Also, one branch of the Warrior's Path came down from the north along the Lehigh River and led to the ferry Jennings operated on the river. Even though Jennings was a principle participant in the infamous "Walking Purchase" of 1737, there is every indication he continued to live peaceably with the Lenape throughout his life.



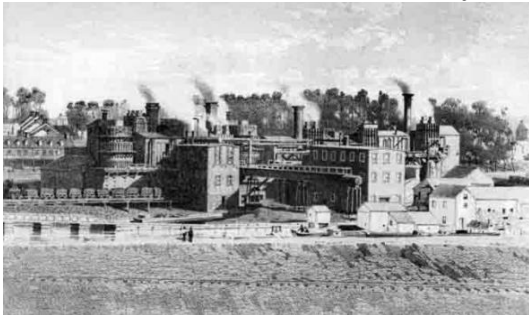
The Walking Purchase of 1737 and Solomon Jennings



No one knows the exact place the “Walking Purchase” participants crossed the Lehigh River between Allentown and Bethlehem. It is reported to be “a couple of miles west of the confluence of the Lehigh River and the Monocacy Creek” which puts the spot right in the area of Solomon Jennings’s farm, now called Walking Purchase Park. The “Walking Purchase” was an arrangement between the descendants of William Penn and the Lenape Indians to make more land available to European settlers. Because of cultural differences, the Lenape didn’t understand the white man’s system of land ownership or their willingness to use

chicanery to increase the distance covered by the walkers. The event was a disaster to both parties. The Europeans did get over 750,000 acres of land—more than twice the anticipated amount, but they also turned the Lenape, until that event a friend of European settlements, into a formidable enemy in the upcoming French and Indian War. Solomon Jennings, one of the three walkers in the “Walking Purchase” and the first official settler in Salisbury Township, squatted on the land as early as 1717 to 1728. When Jennings settled there, it was the extreme frontier of the country in the area, and his house was one of only two in that neighborhood when the Moravians came. He built a stone house which was torn down in 1855, and a large brick house was built on its site. The latter house was badly run down and was torn down by Bethlehem Steel after the disastrous hurricane which hit the area in 1955. An old stone barn built by the Jennings family also was there. Solomon Jennings died in 1757 and was buried in the family graveyard on his farm. The Jennings family cemetery disappeared when a later farmer got tired of plowing around it and went right over it. Legend has it that there was also a Revolutionary Soldier burial ground on the site, though it has never been located. On the death of his widow in 1764, the 200-acre farm was sold at public sale to Jacob Geissinger. It appears that Geissinger started farming the Jennings farm as early as 1758 before purchasing it in 1764.

Early Economic Development



Trees were the first economic product taken from Lehigh Mountain. The location of the mountain close to the river for the transportation of logs and the growing cities of Bethlehem and Allentown made it an ideal place to harvest lumber. The mining of iron ore on Lehigh Mountain began in the early 1800s. The greatest mining activity was from the end of the Civil War to about 1885. By 1910, the iron-ore mines were gone. The

availability of iron ore and trees to make charcoal to fire the iron furnaces helped give rise to the iron industry and the Industrial Revolution in the Lehigh Valley in the 19th century. Two blast furnaces existed in 1873 just south of the confluence of the Little Lehigh Creek and the Lehigh River along what today is Constitution Drive. The Lehigh Valley Railroad, with its

headquarters two miles down-river, built a rail line along the north base of Lehigh Mountain in the 1870s. On the north slope of the mountain sandstone quarries were also discovered that produced material to build many of the public buildings in the Allentown and Bethlehem area as well as buildings on the campuses of Lehigh University and Moravian College. Jacob Geissinger bought the Solomon Jennings farm in 1758, and the Geissinger family raised hogs and field crops on the 200 acre farm until the late 1950s when the Bethlehem Steel Corporation purchased the Geissinger Farm and additional land on Lehigh Mountain for future expansion of their steel-making operation located two miles down the Lehigh River. After the hurricane-caused flood of 1955, Bethlehem Steel constructed a dike system to prevent the land along the Lehigh River from future flooding. With the exception of the construction of the Bethlehem Fabricators plant, now Harris Rebar Eastern Inc., the land along the Lehigh River has since returned to successional forest growth.

20th Century Land Protection and Recreation

In 1987, a residential subdivision for up to 168 homes was proposed for the upland north slope of Lehigh Mountain, serviced by a 2.94-mile four-lane road. In 1989, 232 acres of this uplands section of Lehigh Mountain were purchased by Wildlands Conservancy and subsequently sold to the combined ownership of the City of Allentown, Lehigh County, and Salisbury Township. The addition of this parcel created a 311.7-acre Lehigh Uplands Preserve. This steep area, with slopes ranging from 6% to 40%, is ideal for hiking, mountain biking, bird watching, and nature study. Soon after the successful acquisition and permanent protection of the uplands section of Lehigh Mountain, Wildlands Conservancy began proceedings to protect the riverside portion of the Bethlehem Steel property. In 1998 the \$750,000 purchase of the 156.1-acre “Riverside Park” was made by a coalition of the City of Allentown, Lehigh County, and Salisbury Township with the help of the Pennsylvania Department of Environmental Protection and the Pennsylvania Fish and Boat Commission. In 2006, the County of Lehigh purchased a 141-acre parcel from the Bethlehem Water Authority on the eastern end of Lehigh Mountain. Collectively, Walking Purchase Park, Lehigh Uplands Preserve, and the Water Authority parcel are referred to as Lehigh Mountain.

By 2007, a 10-mile mountain biking-hiking trail system that covers the entire Lehigh Mountain tract had been created by the Valley Mountain Bikers Club; the fifth annual Metro Wilderness Adventure Race, that utilizes the north slope of the mountain, was held in September; the 11th Lehigh River Sojourn floated by the mountain in June; and Wildlands Conservancy’s Bike & Boat Educational and Recreational program escorted over 3,000 middle-school-aged students along the four-mile shoreline of Walking Purchase Park during the school year.



APPENDIX C

PNDI Receipt

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APPENDIX D

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