



Part VIII

RECOMMENDATIONS

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Watersheds are natural boundaries that bind water resources together. They usually do not conform to municipal or state lines. Natural and cultural resource problems must be solved within an ecological system—the watershed; and they must be solved locally by people with an interest in the health of their environment. Locally managed and monitored watershed improvement projects are integral in preserving, protecting, and enhancing the resources of the Lehigh River watershed.

The recommendations that follow have been based upon the current findings from literature reviews, field and laboratory studies, and suggestions and concerns broached by municipal leaders, conservation groups, and other interested organizations and individuals. Due to the wide variety, broad scope, and large scale of several potential projects and suggested recommendations, it should be recognized that this is a long-term plan for remediation and ongoing management of the watershed.

This section is organized into several parts. The eight goals for the watershed are listed below and include goals for each major component covered in this watershed plan (i.e., cultural, aquatic, land, biological, and recreational components) followed by goals for: increasing municipal understanding and involvement in watershed stewardship; increasing environmental awareness, knowledge, skills, and stewardship commitment; and a goal for monitoring and updating watershed resource information on a continuing basis.

Each goal is then expanded into several objectives. Recommendations are listed under each of those objectives. These recommendations are listed beginning with general recommendations followed by recommendations that are more specific for the watershed. It should be noted that there is some overlap of recommendations under each goal. For instance, riparian buffer protection and enhancement is listed under the goals for water quality, land protection, and biology since it is important to each of those watershed components.

Specific projects that were identified by Wildlands Conservancy staff or recommended by municipalities, watershed associations, or individuals are listed in the (Addendum A Specific Recommendations) at the end of the recommendations section. Due to the time and scope of work of the project, it is impossible to list all of the potential specific projects in the watershed. In the case that a specific project is not listed, the general recommendation, listed in the first part of the recommendation section would cover the activities taking place.

The major goals for the Lehigh River watershed are:

- A. GOAL:** PROTECT AND PRESERVE CULTURAL AND HISTORICAL RESOURCES
- B. GOAL:** IMPROVE WATER QUALITY IN THE LEHIGH RIVER WATERSHED
- C. GOAL:** PROTECT SIGNIFICANT AND VALUABLE LAND COMPONENTS
- D. GOAL:** PROTECT BIOLOGICAL RESOURCES
- E. GOAL:** INCREASE AND ENHANCE WATERSHED RECREATIONAL OPPORTUNITIES
- F. GOAL:** PROMOTE MUNICIPAL WATERSHED STEWARDSHIP

G. GOAL: PROMOTE ENVIRONMENTAL AWARENESS, KNOWLEDGE, SKILLS, SUPPORT, AND STEWARDSHIP COMMITMENT

H. GOAL: MONITOR AND UPDATE WATERSHED RESOURCE INFORMATION ON A CONTINUING BASIS

A. GOAL: Protect and Preserve Cultural and Historical Resources

The historic resources of the Lehigh River watershed are unique and valuable. Preservation must therefore become an integral part of public and private decision making. Many of the recommendations listed in this section are from the Pennsylvania Historic Preservation Plan completed by the Pennsylvania Historical and Museum Commission.

I. OBJECTIVE: IDENTIFY AND PRESERVE REGIONALLY AND NATIONALLY SIGNIFICANT HISTORICAL SITES AND LANDSCAPES WITHIN AND/OR CONNECTED TO THE LEHIGH RIVER WATERSHED.

- a. Recommendation:** Support watershed heritage tourism and program development.
- b. Recommendation:** Work with and help establish historical societies throughout the watershed (Specific examples included in Addendum A).
- c. Recommendation:** Conduct a systematic survey of the watershed and surrounding area to identify and list potential national historic registry sites and structures.
- d. Recommendation:** Work with historical societies and the Pennsylvania Historical and Museum Commission to create and maintain a collection of historical documents, photographs, paintings, etc., of the Lehigh River and its watershed (Specific examples included in Addendum A).
- e. Recommendation:** Support heritage resource publications that focus on the important role that the Lehigh River has had in the development of the Lehigh River watershed, Pennsylvania, and the nation.
- f. Recommendation:** Provide assistance to the Bureau for Historic Preservation to offer ongoing training workshops on getting properties listed on the National Register of Historic Places and applying for state grants and administering local historic districts.
- g. Recommendation:** Preserve and restore historic structures and districts important on a local, county, state, and/or federal level. (Specific examples included in Addendum A).

II. OBJECTIVE: EDUCATE RESIDENTS ABOUT THE WATERSHED CULTURAL AND HISTORICAL HERITAGE AND VALUE.

- a. Recommendation:** Support the expansion of Pennsylvania history, historic preservation, and archaeology in school curriculums.
- b. Recommendation:** Maximize the public benefit of historic preservation and archaeological projects by building public education activities into every project.
- c. Recommendation:** Provide more educational materials and events directed at state and local officials and public and private sector professionals involved in law, planning, real

estate, and land development. Make presentations at annual conferences and events they attend, inviting them to workshops designed specifically for them and providing briefings and technical assistance materials on request.

d. Recommendation: Work with partners to launch a new workshop series for teachers focusing on Pennsylvania history and heritage-related topics.

e. Recommendation: Work with middle schools, high schools, and community colleges to interest students in historic preservation. Specific ideas to be explored include internships, preservation-related job fairs, and expansion of Pennsylvania History Day programs in collaboration with the Pennsylvania Council for social studies and Penn State University.

f. Recommendation: Expand the historical marker program and work with the Pennsylvania Department of Transportation to promote history exhibits at highway welcome centers.

III. OBJECTIVE: BUILD BETTER COMMUNITIES THROUGH HISTORIC PROTECTION AND PRESERVATION.

a. Recommendation: Strengthen and expand historic preservation planning at the local and regional levels.

b. Recommendation: Continue to support studies on the economic impacts of historic preservation and distribute the findings into local communities.

c. Recommendation: Expand the use of historic preservation as an economic development strategy.

d. Recommendation: Develop model historic-preservation ordinances, design guidelines, and prepare case studies to support preservation and sound land-use planning.

e. Recommendation: Work with a wide range of state and local partners to develop heritage tourism potential in communities across the watershed.

f. Recommendation: Strengthen local and regional planning legislation at the state level and take steps to clarify and simplify the historic designation process at the local level.

g. Recommendation: Support getting more historical and archaeological resources inventoried, protected, and incorporated into local comprehensive plans and zoning ordinances.

h. Recommendation: Maximize use of existing programs such as Keystone Opportunity Zones and Community Development Block Grants to revitalize historic communities. Work in close collaboration with state and local governments, businesses, and community development corporations to encourage communities to apply for designation and funding under these programs.

i. Recommendation: Promote flexible building code interpretation and streamlining of local approval processes to facilitate rehabilitation of historic properties.

j. Recommendation: Develop user-friendly technical assistance materials. This will include establishing a clearinghouse of information on preservation-related grants, incentives, techniques, regulations, contractors, and consultants.

k. Recommendation: Develop a technical assistance outreach program. This will include outreach efforts directed at historic-property owners, non-profit organizations, and local governments.

I. Recommendation: Put state and local historical resource data on a Geographic Information System (GIS) available via the Internet. This will provide important information for individuals, local governments, and the development community during planning and development decisions.

B. GOAL: Improve Water Quality in the Lehigh River Watershed

Good quality water resources in the watershed are essential for recreation, industrial use, and human consumption. Natural conditions, historical and existing land-use practices, and other anthropogenic effects affect water quality in the Lehigh River watershed. This section lists recommendations for water quality and stream improvement and conservation in the watershed for the Lehigh River and its tributaries, groundwater, and lakes.

I. OBJECTIVE: REMEDIATE ABANDONED MINE DRAINAGE (AMD) IMPACTS IN THE LEHIGH RIVER AND ITS TRIBUTARIES

- a. Recommendation:** Reduce abandoned mine drainage impacts in the Lehigh River watershed by utilizing proven and innovative technologies.
- b. Recommendation:** Promote re-mining and reclamation of abandoned mine lands causing AMD.
- c. Recommendation:** Reclaim abandoned mine lands.
- d. Recommendation:** Increase public understanding and awareness about the mine drainage impacts to the Lehigh River.
- e. Recommendation:** Identify the locations of additional AMD sources affecting Nesquehoning Creek and the Lehigh River.
- f. Recommendation:** Install an aerobic wetland to treat the Lausanne Tunnel Mine Discharge.
- g. Recommendation:** Install a Successive Alkalinity Producing System (SAPS) to treat the Owl Hole discharge and determine where surface water is entering the mine pool that is drained by the Owl Hole discharge.
- h. Recommendation:** Reduce the Quakake Tunnel discharge by examining the Jeansville mine basin into which it drains and identify, prioritize, and remediate surface infiltration points within the area draining to the Quakake Tunnel.
- i. Recommendation:** Conduct further research and field reconnaissance to determine the possible existence of additional mine drainage sources in the Black Creek basin and conduct water quality monitoring on each of the four Black Creek tributaries (Beaver, Hazle, Quakake, and Wetzels creeks) to further define where AMD is entering the Black Creek.
- j. Recommendation:** Treat the Sandy Run discharge with a SAPS. Infiltration points draining to the tunnel should be identified, and appropriate measures taken to control the water on the surface.
- k. Recommendation:** Treat the Hazle Brook overflow with a step wetland (or vertical flow wetland) treatment system, and fill the water-filled pit directly north of the discharge.

l. Recommendation: Treat the Buck Mountain #1 Tunnel with an open limestone channel.

m. Recommendation: Treat Buck Mountain #2 discharge by constructing an oxic limestone drain.

n. Recommendation: Perform long-term maintenance and monitoring at the Lausanne Tunnel AMD project.

II. OBJECTIVE: PROMOTE STREAM, FLOODPLAIN, WETLAND, AND RIPARIAN-BUFFER RESTORATION AND ESTABLISHMENT FOR WATER-QUALITY IMPROVEMENT

a. Recommendation: Restore degraded stream reaches throughout the watershed.

b. Recommendation: Encourage voluntary planting of native species of streamside vegetation.

c. Recommendation: Work with local citizens, volunteer groups, and landowners to establish, monitor, and maintain wetlands and riparian buffers.

d. Recommendation: Use public lands to demonstrate the implementation of Best Management Practices (BMPs).

e. Recommendation: Provide educational programs and opportunities for municipal officials and landowners to learn about the benefits of floodplains, wetlands, and riparian buffers and how they improve water quality.

f. Recommendation: Incorporate wetlands into development plans as scenic or passive recreational spaces.

g. Recommendation: Establish riparian buffers along streams within the Lehigh River watershed (Specific examples included in Addendum A).

h. Recommendation: Provide technical assistance in the form of information, funding sources, and demonstrations to municipal officials and landowners for dealing with riparian issues and riparian restorations (Specific examples included in Addendum A).

i. Recommendation: Promote the use of conservation easements to permanently protect stream and riparian corridors and reduce streambank erosion.

j. Recommendation: Implement stream and riparian buffer restoration- and enhancement-related recommendations listed within existing watershed conservation management plans, assessments, and restoration plans including:

- Little Lehigh Creek Stream Corridor Conservation Project Stream Status Report (Wildlands Conservancy 1994);
- Monocacy Creek Watershed Conservation Management Plan (Wildlands Conservancy 1998);
- Jordan Creek Watershed Conservation Management Plan (Wildlands Conservancy 2000);
- Lehigh River Abandoned Mine Drainage Assessment and Abatement Plan (Wildlands Conservancy 2000)
- Little Lehigh Creek Watershed Stream Assessments (Biohabitats, 2003);
- Monocacy Creek Erosion Restoration Plan (Lehigh Valley Planning Commission, 2003);
- Leibert Creek Watershed Assessment (Emmaus Borough and Barry Isett & Associates in-progress);

- Lynn/Albany Township Watershed Assessment Project (Spotts Stevens and McCoy and Lehigh County Conservation District, in-progress).

k. Recommendation: Promote the implementation of fluvial geomorphic-based restoration approaches such as the Natural Stream Channel Design, where appropriate, to achieve channel and streambank stability, restore sediment transport, reduce erosion and sedimentation, and improve water quality and aquatic habitats.

l. Recommendation: Complete fluvial geomorphic assessments and develop stream restoration plans for streams (Specific examples included in ADDENDUM A).

m. Recommendation: Remove low-head run-of-the-river dams in the Lehigh River watershed, where feasible and appropriate, to reduce thermal pollution, improve water quality, restore fish passage, and improve aquatic habitat (Specific examples included in Addendum A).

n. Recommendation: Remove rock dams and establish a riparian buffer on streams (Specific examples included in Addendum A).

o. Recommendation: Construct stable access point(s) and place educational signage along the Lehigh River at the Canal Street Park in Northampton Borough, Northampton County.

p. Recommendation: Address channel alteration and establish a riparian buffer along Coplay Creek at Twin Lakes Golf Course, North Whitehall Township, Lehigh County.

q. Recommendation: Specify limits on development and encroachment within mapped floodplains (land-use density, intensity, elevations, location), including areas of shallow flooding.

r. Recommendation: Reduce and manage floatable debris (garbage) stored in the floodplain.

s. Recommendation: Retain and preserve floodplains for open space and recreation.

t. Recommendation: Update and expand the assessment of floodplain resources to include smaller streams, percentage of hydric soils, and frequency and duration of flooding.

III. OBJECTIVE: REDUCE URBAN AND SUBURBAN NON-POINT SOURCE POLLUTION

a. Recommendation: Use public rights-of-way as an opportunity for stormwater runoff controls such as wet ponds or vegetated swales. Examples include: land under bridges and overpasses, the median strips of roads and highways, and the exit ramp rights-of-way off major roads.

b. Recommendation: Encourage municipalities to use all road salt, pesticides, herbicides, and fertilizers sparingly and according to manufacturers' directions.

c. Recommendation: Avoid direct discharge of soap and oily grit into the stormwater system by washing cars on the lawn instead of the driveway.

d. Recommendation: Fix oil leaks in vehicles to avoid the excess oil becoming a part of non-point source pollution.

e. Recommendation: Educate homeowners about the benefits of using all pesticides, herbicides, and fertilizers sparingly and according to manufacturers' directions.

f. Recommendation: Dispose of all household chemicals safely and at community waste-disposal facilities.

- g. Recommendation:** Implement and support existing county hazardous-waste programs.
- h. Recommendation:** Dispose of all pet waste appropriately and avoid letting waste and associated bacteria wash into the stormwater system.
- i. Recommendation:** Promote the use of lawn alternatives such as wildflower meadows and native grasses in place of manicured lawns in municipal, institutional, commercial, and residential landscapes.
- j. Recommendation:** Promote the use of environmentally friendly lawn practices such as installing drought-resistant lawn, mulching lawnmowers, and push lawnmowers.
- k. Recommendation:** Promote subdivision ordinances that require riparian areas to be kept un-mowed and planted with native plant species in a corridor with a minimum width of about 100 feet along streams
- l. Recommendation:** Support the dirt and gravel road program to stabilize ditches, ditch drain outlets, roads, and road banks for the reduction of sediment pollution to waterways.
- m. Recommendation:** Establish new and support existing community shade-tree commissions.
- n. Recommendation:** Use commercial, institutional, and governmental parking lots as opportunities for runoff controls such as vegetated 'rain gardens,' swales, channels, and basins.

IV. OBJECTIVE: INSTITUTE AND IMPROVE STORMWATER MANAGEMENT PRACTICES

- a. Recommendation:** Develop Act 167 Plans for sub-watersheds of the Lehigh River that currently do not have them, and update existing plans, as needed.
- b. Recommendation:** Promote and implement storm runoff volume and rate controls as described in the approved Act 167 Stormwater Management Plans in the watershed.
- c. Recommendation:** Implement the recommendations listed in the appendix of the Lehigh Valley Planning Commission's Act 167 Stormwater Management Plans and other approved plans throughout the watershed.
- d. Recommendation:** Incorporate NPDES Phase II standards for stormwater quality into new Act 167 Plans.
- e. Recommendation:** Evaluate Best Management Practices (BMPs) to determine if they are effective, require modification or updating, and make necessary changes to improve effectiveness of BMPs.
- f. Recommendation:** Implement BMPs for controlling stormwater quantity and quality.
- g. Recommendation:** Avoid direct discharges from storm drains to the river and tributaries.
- h. Recommendation:** Install storm-drain curb markers, available through Pennsylvania's Growing Greener "Only Rain in the Drain" program, as a visual reminder to keep trash, motor oil, soap suds, fertilizer, and other pollutants from getting into the storm-drain system.
- i. Recommendation:** Convert stormwater runoff to sheet flow over a porous medium or channeled to an infiltration structure, such as a sedimentation pond or trench that directs runoff into the ground rather than directly into the river and tributaries.

j. Recommendation: Support and encourage municipalities to construct, repair, manage, and maintain dirt and gravel roads.

k. Recommendation: Encourage counties and municipalities to cooperate in their stormwater management regulations and efforts.

l. Recommendation: On sites where standard BMPs are not feasible, use innovative BMPs that are designed to function by gravity flow between components. Some of these include:

- Sand filtration systems;
- Underground sand filters consisting of multiple chambers;
- Surface sand filters such as double-trench systems; and
- Peat/sand filtration systems.

m. Recommendation: Implement the BMPs associated with Municipalities Stormwater (MS4) requirements in all regulated communities. Some of these practices include:

- Replace existing open-throated city inlets;
- Maintain and inspect detention basins;
- Implement regular street sweeping and leaf removal;
- Clean stormwater inlets and catchment basins;
- Monitor and control pollutants from permitted sites;
- Clean-up snow dumpsites; and
- Review BMPs on an annual basis.

n. Recommendation: Identify and minimize combined sewer overflows.

o. Recommendation: Culverts and bridges should be sized and located to convey both low flow and storm events. Structures must also be properly maintained and inspected to prevent obstruction, scour, and erosion.

p. Recommendation: Identify and minimize erosion caused by stormwater.

V. OBJECTIVE: REDUCE AGRICULTURAL NON-POINT SOURCE POLLUTION

a. Recommendation: Encourage streambank fencing and riparian planting in agricultural areas.

b. Recommendation: Continue to develop and support existing partnerships and coordinate watershed planning efforts between organizations to implement and promote the use of agricultural BMPs.

c. Recommendation: Educate landowners about the environmental, economic, recreational, and aesthetic benefits associated with agricultural BMPs.

d. Recommendation: Encourage landowners to work with appropriate agencies to develop and adhere to Nutrient Management Plans.

e. Recommendation: Educate landowners about the various federal and state conservation programs that can provide funding and technical assistance in planning, designing, permitting, implementing, and maintaining agricultural BMPs.

f. Recommendation: Implement and promote the use of agricultural BMPs such as stream

fencing, agricultural crossings, and riparian buffers to reduce non-point source pollution, improve water quality, and improve aquatic and terrestrial habitats on agricultural lands along tributaries of the Lehigh River (Specific examples included in Addendum A).

g. Recommendation: Continue to develop and support existing partnerships and coordinate planning efforts between members of the agricultural community, watershed organizations, and federal, state, and local conservation agencies.

h. Recommendation: Promote the use of conservation easements to permanently protect stream and riparian corridors, and to reduce streambank erosion.

i. Recommendation: Install stream fencing, establish a riparian buffer, and remove low-head dam on a private horse farm along Saucon Creek located on Creek Road in Northampton County.

VI. OBJECTIVE: PROMOTE THE PROPER OPERATION AND MAINTENANCE OF SEPTIC SYSTEMS AND SEWAGE TREATMENT PLANTS

a. Recommendation: Properly maintain and operate sewage treatment facilities within the Lehigh River watershed.

b. Recommendation: Reduce rainwater infiltration into the sewage treatment system lines.

c. Recommendation: Assess current sewage collection systems in order to reduce leakage and infiltration.

d. Recommendation: Conduct workshops for on-lot septic system owners about proper maintenance and cleaning procedures.

e. Recommendation: Promote and adopt municipal ordinances designed to insure the proper maintenance and operation of on-lot septic systems

f. Recommendation: Work with wastewater treatment plants to ensure proper operation and maintenance.

VII. OBJECTIVE: MANAGE WATER RESOURCE AT FRANCIS E. WALTER RESERVOIR

a. Recommendation: Bring together parties interested in the water storage and use of Francis E. Walter Reservoir to discuss current and future discharge rates and scenarios.

b. Recommendation: Manage the Francis E. Walter Reservoir to provide the maximum environmental, water-quality, recreational, and economic benefits to the watershed community.

c. Recommendation: Conduct public forums and meetings to discuss the issues surrounding the Francis E. Walter Reservoir.

d. Recommendation: Bring together all interested parties, fishing community, private boaters, whitewater rafting companies, environmental professionals, water suppliers, and the general public to reach consensus on the uses of the Francis E. Walter Reservoir.

e. Recommendation: Conduct the needed studies to determine optimal flow rates from the Francis E. Walter Reservoir to protect the environment and provide maximum additional recreational opportunities.

f. Recommendation: Comprehensively evaluate the data available from all sources to determine the water-quality, environmental, recreational and economic opportunities and benefits of additional releases from Francis E. Walter Reservoir.

- g. Recommendation:** Conduct a flow-needs assessment of the Lehigh River.
- h. Recommendation:** Construct a road across the top of the dam in order to provide additional flexibility in storage capacity at the Francis E. Walter Reservoir.
- i. Recommendation:** Assess the precipitation of iron oxide and elevated hydrogen sulfide levels in the discharge of Francis E. Walter Reservoir if the pool level is held at a higher level than normal for drought relief and downstream flow augmentation (Reynolds 2000).
- j. Recommendation:** Work with the U.S. Army Corps of Engineers and other appropriate state and federal agencies to provide a forecast of potential future flows.
- k. Recommendation:** Natural flows should be paralleled as closely as feasible (Reynolds 2000).
- l. Recommendation:** The 1994 agreement, which stipulates that releases should not be reduced below 144 cfs during storage events for whitewater releases, should be adhered to (Reynolds 2000).
- m. Recommendation:** Document the effects of additional water releases from the Francis E. Walter Reservoir and Beltzville Reservoirs.
- n. Recommendation:** Continue to operate the Francis E. Walter Reservoir to meet the flood control objectives of the reservoir to protect life and property downstream.
- o. Recommendation:** Pursue congressional re-authorization of the uses of the Francis E. Walter Reservoir.

VIII. OBJECTIVE: PROMOTE WATER CONSERVATION

- a. Recommendation:** Complete comprehensive water-budget studies for all sub-watersheds.
- b. Recommendation:** Combine existing source-water and groundwater studies to generate watershed-based water budgets that consider the cumulative impacts of water withdrawal and recharge.
- c. Recommendation:** Provide education and support educational events designed to educate students and residents about water conservation.

C. GOAL: Protect Significant and Valuable Land Components

The five main land-use types in the watershed are forest, agriculture, urban, wetlands, and barren lands. Past and current patterns of land use have caused significant impacts to the Lehigh River watershed. This section lists recommendations for land protection in the watershed.

Information regarding the methodology developed by Wildlands Conservancy for land protection prioritization is shown in Appendix B – 1.

I. OBJECTIVE: PRESERVE NATURAL AREAS INVENTORY SITES (NAIs) AND HIGH PRIORITY AREAS

- a. Recommendation:** Utilize innovative strategies and funding sources to acquire, manage, and protect open space.

b. Recommendation: Educate the watershed community in the benefits of “smart-growth” and conservation strategies.

c. Recommendation: Protect priority lands as designated by county and local open-space plans throughout the watershed.

d. Recommendation: Protect or acquire unprotected NAI sites in all counties throughout the watershed.

e. Recommendation: Update NAI studies in the watershed and complete the NAI study and field verifications for Carbon County.

f. Recommendation: Protect high-priority areas including, but not limited to:

- Exceptional Value (EV) streams;
- All stream headwaters and riparian corridors;
- Wetland areas;
- Aquashicola and Pohopoco Creek valleys – Carbon and Monroe counties;
- Headwaters of Lehigh River-Lehigh Township, Wayne County;
- Riparian buffers on Lehigh River-Borough of White Haven, Luzerne County;
- Riparian zone along Trout Creek- Salisbury Township, Lehigh County;
- Bear Creek acquisition/protection project-Bear Creek Township, Luzerne County;
- Sub-watersheds of Mountain and Swabia creeks and headwaters of Mountain Creek-Borough of Macungie, Lehigh County;
- Headwaters of Jordan Creek – Lehigh County;
- Headwaters of the Little Lehigh Creek – Lehigh and Berks counties;
- In-holdings between Lehigh Gorge State Park and Hickory Run State Park;
- In-holdings in State Gamelands #91 and #135;
- In-holdings in Bethlehem Water Authority / Wild Creek Reservoir;
- Lands connecting The Nature Conservancy lands, Bethlehem Water Authority, and State Gamelands #127;
- Lehigh River corridor from State Gamelands #141 / Lehigh Gorge to the Blue Mountain;
- Lehigh River between State Gamelands #40 and #135;
- Lands between Lehigh River and State Gamelands #40;
- Lands that connect Jordan Creek headwaters with State Gamelands #205;
- Lands that connect State Gamelands #217 with preserved farms and surrounding farm-lands (Trexler Hollow, Lowhill Township);
- Lands that connect the Appalachian Trail with Cherry Valley, Monroe County;
- Preserve land holdings in Long Pond, working with The Nature Conservancy;
- Unprotected lands designated as Scenic River lands by Pennsylvania Department of Conservation & Natural Resources;
- Lands along the main stem of the Lehigh River;
- In-holdings along the Little Lehigh Parkway, city of Allentown; and
- Lands adjacent to the Robert Rodale Reserve and the South Mountain Preserve, South Mountain.

II. OBJECTIVE: CREATE AND PROTECT GREENWAYS AREAS

- a. Recommendation:** Identify and protect potential and existing greenways from development in the Lehigh River watershed.
- b. Recommendation:** Incorporate greenways and connections to greenways into development plans as scenic and/or passive recreational space.
- c. Recommendation:** Utilize rail, transportation, and utility corridors to develop a network of greenways.
- d. Recommendation:** Educate community residents and municipal officials on the benefits greenways provide, and how to plan for them.
- e. Recommendation:** Share information and data to coordinate greenway development and preservation in eastern Pennsylvania.
- f. Recommendation:** Develop new greenways to connect to existing greenways (Specific examples included in Addendum A).

III. OBJECTIVE: PROTECT FORESTS

- a. Recommendation:** Protect large areas of contiguous forestlands.
- b. Recommendation:** Promote the development of Department of Interior's Forest Stewardship Program to forest landowners.
- c. Recommendation:** Protect mountainous areas (Specific examples included in ADDENDUM A).

IV. OBJECTIVE: PRESERVE FARMLAND AREAS

- a. Recommendation:** Protect agricultural lands designated by county agricultural-land preservation programs including:
 - Lands with classes I – IV soils in areas possessing preserved farms;
 - Buffer lands within preserved farms areas;
 - Other productive farmlands; and
 - Farms adjacent to protected farms.
- b. Recommendation:** Encourage and support county agricultural-preservation programs.
- c. Recommendation:** Promote new and support existing agriculture security areas.
- d. Recommendation:** Educate farmers, community residents, and municipal officials on the benefits of protecting farmlands.
- e. Recommendation:** Share information and data to coordinate agricultural preservation in Pennsylvania.
- f. Recommendation:** Encourage and provide technical and financial support for farmers to diversify and develop entrepreneurial ventures.

V. OBJECTIVE: PROTECT EXISTING RIPARIAN AREAS AND WETLANDS

- a. Recommendation:** Protect wetlands and streamside riparian areas throughout the watershed.

- b. Recommendation:** Protect buffer lands bordering streams throughout the watershed, especially lands bordering Exceptional Value (EV) streams (Cross Keys Run, Frame Cabin Run, Shafer Run, Stony Creek, Deep Run, First Hollow Run, White Bear Creek, and Wild Creek) and headwater tributaries.
- c. Recommendation:** Acquire and protect existing water-authority lands from development.
- d. Recommendation:** Educate community residents and municipal officials on the benefits of wetlands.
- e. Recommendation:** Implement municipal wetland and riparian buffer ordinances that protect water resources.
- f. Recommendation:** Incorporate wetlands and riparian corridors into development plans as scenic and/or passive recreational space to ensure that the natural functions of the wetland are undisturbed.
- g. Recommendation:** Encourage municipalities to develop an official wetland map to be used to foster open discussions with developers over wetland delineations such as, but not limited to:
- h. Recommendation:** Permanently protect wetlands with conservation easements, especially if developers are required to create wetlands as part of a permitting process.

VI. OBJECTIVE: PROTECT OTHER LAND RESOURCES

- a. Recommendation:** Encourage and support programs for recycling metal, batteries, compost, glass, paper, plastics, refrigerant, tires, and used oil.
- b. Recommendation:** Protect lands adjacent to Pennsylvania State Gamelands, especially where these will link gamelands to other protected lands such as state forests and state parks.
- c. Recommendation:** Utilize innovative strategies and funding sources to acquire, manage, and protect open space.
- d. Recommendation:** Protect open land adjacent to other protected lands.
- e. Recommendation:** Protect lands adjacent to the Appalachian Trail, the D & L Trail, and other established trails.
- f. Recommendation:** Acquire and protect lands along the Lehigh River that are outside of the Lehigh Gorge State Park boundary and south of the Francis E. Walter Dam.
- g. Recommendation:** Protect open space, as is feasible, adjacent to schools, colleges, retirement centers, hospitals, and other public and private institutions (Specific examples included in Addendum A).
- h. Recommendation:** Design and implement gateway gardens, utilizing Best Management Practices and native plant species, to create gateways into communities (Specific examples included in Addendum A).

VII. OBJECTIVE: MANAGE PRESERVED AND PROTECTED LAND

- a. Recommendation:** Provide landowners with information on land protection techniques, wise forestry practices, and Best Management Practices (BMP) for forestlands.
- b. Recommendation:** Educate landowners and municipal officials about land stewardship, development of management plans, and the facilitation of these management plans.

- c. Recommendation:** Provide BMP assessments for lands already protected by public or private means.
- d. Recommendation:** Conduct environmental resource inventories for privately owned forestlands, where appropriate.
- e. Recommendation:** Develop and adopt sound forest management plans that protect environmentally sensitive wooded areas.

VIII. OBJECTIVE: PROMOTE THE RE-USE AND REVITALIZATION OF BROWNFIELDS AND GRAYFIELDS

- a. Recommendation:** Support the re-use and revitalization of abandoned or under-utilized industrial sites, or brownfields.
- b. Recommendation:** Promote the reclamation and re-use of abandoned mine lands, or grayfields.
- c. Recommendation:** Support organizations involved in the re-use of brownfields like the Lehigh Valley Land Recycling Initiative (LVLRI).
- d. Recommendation:** Address and/or support specific brownfield projects (Specific examples included in Addendum A).
- e. Recommendation:** Support and encourage the vision for the National Museum of Industrial History, being developed in concert with the Smithsonian Institution, on the former Bethlehem Steel site in the city of Bethlehem, Northampton County.
- f. Recommendation:** Support and encourage the vision for the development of The Bethlehem Works Project on the former Bethlehem Steel site in the city of Bethlehem, Northampton County.
- g. Recommendation:** Encourage and support communities to utilize funding available through Main Street Program as well as Keystone Opportunity Zones.
- h. Recommendation:** Determine best course of action for the Lafarge Quarry in Allen Township, Northampton County.
- i. Recommendation:** Redevelop existing commercial and industrial urban properties to support the economic health of urban areas.
- j. Recommendation:** Encourage in-fill housing in smaller boroughs and villages, towns and cities, especially in Allentown, Bethlehem, and Easton.

D. GOAL: Protect Biological Resources

The biological resources in the watershed are essential to the health of the natural environment, and to sustaining the benefits human beings derive from nature. This section lists recommendations for addressing the threats to, and advancing conservation of, the watershed's biological resources. Many of the recommendations listed here are from Pennsylvania Department of Conservation & Natural Resources' report entitled Pennsylvania's Wildlife and Wild Places, 2003.

I. OBJECTIVE: PROTECT BIODIVERSITY AND WILDLIFE HABITAT

- a. Recommendation:** Restore and improve degraded or impaired habitats.
- b. Recommendation:** Restore wetlands and riparian buffers.

- c. Recommendation:** Keep deer populations at levels that permit forest regeneration and restore habitat for small mammals, songbirds, forest amphibians, and woodland wildflowers.
- d. Recommendation:** Provide ecological restoration opportunities for the public, assist with a wide variety of projects such as tree planting, removal of invasive plant species, planting native species, and bank stabilization in both urban and rural areas. Restoration efforts should focus on degraded waters or habitats that have significant economic or ecological value.
- e. Recommendation:** Provide resources, equipment, and expertise for local and county municipalities to develop and implement management for preserved woodlands, natural areas, riparian zones, and recreational areas.
- f. Recommendation:** Understand and control the spread of the hemlock wooly adelgid.
- g. Recommendation:** Develop and implement management plans for publicly owned woodlands.
- h. Recommendation:** Acquire and/or protect wetland habitat suited for endangered bog turtles, and other threatened and endangered species.
- i. Recommendation:** Promote wildlife habitat-friendly conservation practices for homeowners and businesses.
- j. Recommendation:** Identify, establish, and protect Important Bird Areas (IBAs) and Important Mammal Areas (IMAs).
- k. Recommendation:** Reclaim surface-mine lands with grassland to provide habitat for grassland birds.
- l. Recommendation:** Control invasive species to promote the health of native plant and animal communities.
- m. Recommendation:** Provide educational materials to municipalities about invasive and native plant species, and support municipalities in the process of removing invasive plants along the Lehigh River.
- n. Recommendation:** Provide community education and outreach programs related to wildlife and wildlife habitat.
- o. Recommendation:** Control invasive and exotic plant species throughout the watershed, specifically at, but not limited to:
- Along roadways, under power lines, in greenways, and adjacent to trails and railroad tracks;
 - The Appalachian Trail;
 - Federal, state and local parks;
 - The Hellertown Swamp;
 - All Natural Areas Inventory sites;
 - Pool Wildlife Sanctuary;
 - All Riparian corridors;
 - South Mountain;
 - All Pennsylvania State Gamelands;
 - Trexler-Lehigh County Game Preserve.

II. OBJECTIVE: CONDUCT AND SUPPORT SPECIES INVENTORIES AND RESEARCH PROGRAMS

- a. Recommendation:** Support statewide efforts to inventory the status of biodiversity in Pennsylvania.
- b. Recommendation:** Inventory the watershed to locate and identify the presence of any threatened or endangered species of flora and fauna.

E. GOAL: Increase and Enhance Watershed Recreational Opportunities

Recreation plays an important role in the lives of the residents of the Lehigh River watershed. The protection, enhancement, and creation of recreational resources within the watershed will have significant positive impacts on many aspects of the community. This section lists recommendations on increasing and enhancing the recreational resources in the watershed.

I. OBJECTIVE: CREATE, IMPROVE, AND EXPAND WATERSHED RECREATIONAL FACILITIES.

- a. Recommendation:** Support and encourage the construction and/or restoration of parks, recreational greenways, and trails.
- b. Recommendation:** Support, encourage, and facilitate frequent trail maintenance.
- c. Recommendation:** Conduct studies of existing streamside parks in the watershed in order to guide future environmental improvements in these parks.
- d. Recommendation:** Maintain publicly owned land in the watershed, in a natural environmentally beneficial state, wherever practical.
- e. Recommendation:** Work with state, county, and local recreational agencies to form a watershed recreation task group to coordinate planning for development and operation of recreational facilities within the watershed.
- f. Recommendation:** Re-establish or improve riparian corridors in watershed recreational areas.
- g. Recommendation:** Examine the feasibility of linking recreational areas along the Lehigh River and its tributaries with riparian corridors through easement or acquisition.
- h. Recommendation:** Expand current Pennsylvania State Gamelands and improve access to gamelands throughout the watershed.
- i. Recommendation:** Develop all-terrain vehicle (ATV) recreational alternatives on appropriate lands within the Lehigh River watershed. Use mine-impacted lands where feasible. (Specific examples included in Addendum A).
- j. Recommendation:** Support, encourage and facilitate the master planning of parks, recreational greenways, and trail designs.

II. OBJECTIVE: IMPLEMENT AND ENHANCE TRAILS AND RAILS-TO-TRAILS PROJECTS.

- a. Recommendation:** Enhance the experience of using greenways by providing informa-

tion about ecology, natural history, and conservation through the installation of educational signs posted along greenway trails and appropriate riparian corridors.

- b. Recommendation:** Work with state, county, and local agencies and landowners in creating volunteer trail-maintenance programs to help maintain trails and greenways.
- c. Recommendation:** Conduct a feasibility study to: assess the extent of abandoned rail lines and public right-of-way lands; the possibilities of linking the lines; the costs associated with acquiring the necessary lands or easements; and converting and maintaining them as usable trails.
- d. Recommendation:** Examine the economic benefits of trails and rails-to-trails projects.
- e. Recommendation:** Connect recreational facilities, parks, stream corridors, schools, and communities using trails or greenways.
- f. Recommendation:** Establish and support rails-to-trails and trail projects in the Lehigh River watershed (Specific examples included in Addendum A).
- g. Recommendation:** Connect the Nor-Bath Trail in East Allen Township, Northampton County, to the D&L Trail.
- h. Recommendation:** Acquire missing segments of the D&L trail along the Lehigh River and Lehigh Canal.
- i. Recommendation:** Establish connections from Hazleton to the D&L Trail.
- j. Recommendation:** Establish spur trails off the D&L Trail.
- k. Recommendation:** Enhance existing trails and rails-to-trails projects (Specific examples included in ADDENDUM A).

III. OBJECTIVE: SUPPORT RIVER-BASED RECREATION

- a. Recommendation:** Provide and improve access to the Lehigh River and its tributaries for recreational activities.
- b. Recommendation:** Create, maintain, and improve the Lehigh River Water Trail, including signage.
- c. Recommendation:** Support the Urban Wilderness Challenge and other events designed to promote river recreation and awareness.
- d. Recommendation:** Create and support programs designed to promote river recreation.
- e. Recommendation:** Open additional stream miles to public recreation.
- f. Recommendation:** Enhance existing fishing opportunities and areas.
- g. Recommendation:** Promote the establishment of special regulation areas where appropriate to protect naturally reproducing fish populations.
- h. Recommendation:** Support organizations whose mission is it to promote the recreational use of the river and its tributaries.

IV. OBJECTIVE: CLEAN UP THE STREAM CORRIDORS, PARKS, GREENWAYS, AND TRAILS WITHIN THE WATERSHED.

- a. Recommendation:** Sponsor public river corridor, park, greenway, and trail clean-up days, which also provide opportunities for education.

b. Recommendation: Develop strong public-education programs encouraging residents to use the waterways and land responsibly, and to feel a sense of ownership and to help prevent littering. Post “no littering or dumping” signs on recreation lands throughout the watershed and promote the “carry in-carry out” ethic, where appropriate

c. Recommendation: Support organizations dedicated to the clean-up of watershed recreational areas and trails.

d. Recommendation: Annual or semi-annual clean-ups should occur throughout the Lehigh River watershed (Specific examples included in Addendum A).

F. GOAL: Promote Municipal Watershed Stewardship

Planning and municipal involvement is extremely important to the health of the watershed. This section lists recommendations for increased municipal understanding and involvement in watershed stewardship.

I. OBJECTIVE: IMPLEMENT AND IMPROVE MUNICIPAL ORDINANCES

a. Recommendation: Use zoning ordinances to control the type of development or redevelopment allowed within community boundaries.

b. Recommendation: Promote regulations which require proper operation and maintenance practices for on-site septic systems.

c. Recommendation: Encourage municipalities to adopt environmentally friendly ordinances including, but not limited to:

- Sewage-management ordinances and programs for areas with high potential for malfunctioning on-lot systems;
- Sinkhole ordinances;
- Riparian buffer ordinances;
- Floodplain ordinances (100 – 500 year)

d. Recommendation: Adopt environmentally beneficial ordinances in municipalities dealing with environmental-ordinance issues (Specific examples included in Addendum A).

e. Recommendation: Support wellhead-protection ordinances and programs in municipalities, especially those without public sewers (Specific examples included in Addendum A).

f. Recommendation: Develop and update floodplain management ordinances and zoning to provide standards for the use and development of land in floodplain areas.

II. OBJECTIVE: IMPLEMENT AND IMPROVE MUNICIPAL PLANS

a. Recommendation: Encourage regional planning among municipalities.

b. Recommendation: Develop and/or update regional comprehensive and open-space plans, zoning ordinances, and sub-division and land-development ordinances (SALDO) to promote the development of greenways and trails, and to preserve lands and open space across municipal boundaries.

- c. Recommendation:** Update municipal Official Sewage Facilities plans (Act 537 plans). Make the Act 537 plans consistent with comprehensive plans and zoning ordinances to provide infrastructure needed in areas planned or zoned for growth.
- d. Recommendation:** Update, develop, and implement park, recreation, open space, and environmental plans.
- e. Recommendation:** Inventory and document the environmental condition of municipal natural resources and open space.
- f. Recommendation:** Incorporate all related land and water issues into municipal park, recreation, open space, and environmental plans.
- g. Recommendation:** Provide educational workshops and programs for municipal officials concerning environmentally beneficial zoning, regional planning, and ordinances.
- h. Recommendation:** Create municipal newsletters and websites to inform and educate municipal residents about environmental issues.
- i. Recommendation:** Update/develop local and regional municipal comprehensive plans that are 10 or more years old such as, but not limited to:

BERKS COUNTY

Townships: Longswamp

Boroughs: Topton

CARBON COUNTY

Townships: East Penn, Franklin, Lehigh, Mahoning, Penn Forest, Towamensing

Boroughs: East Side, Jim Thorpe, Lower Summit Hill, Nesquehoning, Palmerton, Parryville, Weatherly, and Weissport

LACKAWANNA COUNTY

Townships: Clifton, Covington, Spring Brook, and Thornhurst

LEHIGH COUNTY

Townships: Heidelberg, Lower Macungie, Lower Milford, Lynn, Salisbury, South Whitehall, Upper Macungie, Upper Milford, Upper Saucon, Washington, Weisenberg, Whitehall, and city of Allentown

Boroughs: Alburtis, Coopersburg, Coplay, Emmaus, Fountain Hill, Macungie, and Slatington

LUZERNE COUNTY

Townships: Bear Creek, Buck, Butler, Dennison, Foster, Hazle, and Jenkins

Boroughs: Freeland, White Haven, and Hazleton City

MONROE COUNTY

Townships: Chestnuthill, Coolbaugh, Eldred, Polk, and Tunkhannock

NORTHAMPTON COUNTY

Townships: Allen, Bushkill, East Allen, Lower Nazareth, Lower Saucon, Moore, Palmer, and Upper Nazareth

Boroughs: Bath, Chapman Quarries, Freemansburg, Glendon, Hellertown, North Catasauqua, Northampton, Walnutport, West Easton, and Wilson

SCHUYLKILL COUNTY

Townships: East Brunswick, Kline, Rush, and West Penn

Boroughs: McAdoo and Tamaqua

j. Recommendation: Update/develop zoning, ordinances, and SALDOs which are 10 or more years old such as, but not limited to:

ZONING

BERKS COUNTY

Boroughs: Tipton

BUCKS COUNTY

Townships: Springfield

CARBON COUNTY

Boroughs: East Side, Lansford, Nesquehoning, Parryville, and Weissport

LACKAWANNA COUNTY

Townships: Clifton

LEHIGH COUNTY

Townships: Heidelberg, Lynn, North Whitehall, Salisbury, South Whitehall, Upper Macungie, Upper Milford, Upper Saucon, Washington, and Weisenberg
Boroughs: Alburtis, Coopersburg, Coplay, Emmaus, Fountain Hill, Macungie, and Slatington

LUZERNE COUNTY

Townships: Buck, Butler, Dennison, Foster, Hazle, and Pittston
Boroughs: Freeland, White Haven, and Hazleton City

MONROE COUNTY

Townships: Eldred and Polk

NORTHAMPTON COUNTY

Townships: East Allen, Lehigh, Lower Nazareth, Lower Saucon, Moore, Palmer, Upper Nazareth, Williams, and city of Easton
Boroughs: Bath, Chapman Quarries, Freemansburg, Glendon, Hellertown, Walnutport, West Easton, and Wilson

SCHUYLKILL COUNTY

Townships: East Brunswick and Kline
Boroughs: McAdoo

WAYNE

Townships: Lehigh

SALDO

BERKS COUNTY

Townships: Maxatawny

CARBON COUNTY

Townships: Franklin and Lower Towamensing
Boroughs: Bowmanstown, Lansford, Lehighton, Palmerton, Parryville, and Weissport

LACKAWANNA COUNTY

Townships: Clifton and Thornhurst

LEHIGH COUNTY

Townships: Hanover, Heidelberg, Lowhill, Lynn, South Whitehall, Upper Macungie, Upper Milford, Upper Saucon, Washington, Weisenberg, Whitehall, and city of Allentown
Boroughs: Alburtis, Catasauqua, Coopersburg, Coplay, Emmaus, Fountain Hill, Macungie, and Slatington

LUZERNE COUNTY

*Townships: Bear Creek, Buck, Butler, Dennison, Foster, Hazle, Pittston, and Hazleton City
Boroughs: Freeland and White Haven*

MONROE COUNTY

Townships: Chestnuthill, Eldred, Polk, and Tobyhanna

NORTHAMPTON COUNTY

*Townships: Allen, Bethlehem, East Allen, Hanover, Lehigh, Lower Nazareth, Moore, Palmer, Upper Nazareth, city of Bethlehem, and city of Easton
Boroughs: Chapman Quarries, Freemansburg, Glendon, Hellertown, Northampton, West Easton, Walnutport, Wilson*

SCHUYLKILL COUNTY

*Townships: Kline, Rush, and West Penn
Boroughs: McAdoo and Tamaqua*

G. GOAL: Promote Environmental Awareness, Knowledge, Skills, Support, and Stewardship Commitment

Education about and awareness of Lehigh River watershed resources is important in developing a sense of watershed stewardship, which is important to the protection, preservation, and enhancement of watershed resources. This section lists recommendations for increasing environmental awareness, knowledge, skills, support, and stewardship commitment.

I. OBJECTIVE: PROVIDE ENVIRONMENTAL, HERITAGE, AND CULTURAL EDUCATION OPPORTUNITIES FOR THE GENERAL PUBLIC, LOCAL GOVERNMENT, AND BUSINESS LEADERS.

- a. Recommendation:** Educate the public with a basic knowledge of: 1) the natural laws which govern the environment of the watershed; 2) the skills needed to solve its environmental problems; and 3) recognition of each individual's responsibility to find solutions to the environmental problems of the watershed.
- b. Recommendation:** Encourage the development of a stewardship ethic that leads to the conservation of the watershed's natural, historical, and cultural heritage, and to the correction and prevention of environmental degradation in the watershed.
- c. Recommendation:** Promote the creation of watershed organizations on tributaries of the Lehigh River (Specific examples included in Addendum A).
- d. Recommendation:** Support the efforts of watershed organizations and other environmental groups.
- e. Recommendation:** Educate stakeholders in benefits of "smart growth" and conservation strategies.
- f. Recommendation:** Establish a Lehigh River watershed land preservation consortium to inventory and improve the communication and effectiveness of proactive conservation efforts, among watershed associations, conservation groups, and state, county, and local governments and resource offices throughout the watershed.

- g. Recommendation:** Provide educational programming that will familiarize all members of the watershed community with Best Management Practices for homeowners and farmers to protect streams.
- h. Recommendation:** Develop a “Lehigh River Walk” three-dimensional working model of the Lehigh River and its canal depicting the history of the industrial, cultural and natural history of the watershed in Bethlehem, Pennsylvania at the site of BethWorks.
- i. Recommendation:** Document the entire length of the Lehigh River and its tributaries using video, photos, and written descriptions of significant sites for use in planning and educational efforts.
- j. Recommendation:** Develop books, brochures, guides, videos, tours, etc. to be used to promote public awareness of the natural, recreational, and heritage resources of the Lehigh River watershed, and of the efforts underway for the implementation of this plan.
- k. Recommendation:** Develop and post educational signs at critical sites along waterways at key locations such as stream crossings and recreational sites to increase public awareness of threats to the Lehigh River watershed.
- l. Recommendation:** Post signs at every major river and stream crossing identifying the name of the water body.
- m. Recommendation:** Post watershed boundary signs along major traffic corridors near watershed boundaries.
- n. Recommendation:** Educate landowners about land preservation options.
- o. Recommendation:** Improve communication between the agricultural and land-owning community and the appropriate agencies to find the sources of funding for acquisition and preservation of these valuable resources.
- p. Recommendation:** Provide information about farmland preservation available to watershed landowners.
- q. Recommendation:** Educate local municipal and county governments and landowners about sprawl and about methods to control it.
- r. Recommendation:** Educate the general public, landowners, and especially municipal officials about the actual cost of residential developments verses the actual cost of open space or farmland for a municipality.
- s. Recommendation:** Promote the formation of environmental advisory councils (EACs) in each of the watershed municipalities (Specific examples included in Addendum A).

II. OBJECTIVE: PROVIDE EDUCATIONAL OPPORTUNITIES FOR ALL STUDENTS IN THE LEHIGH RIVER WATERSHED.

- a. Recommendation:** Create and expand watershed educational programs that provide field trip opportunities to school-age students.
- b. Recommendation:** Continue and expand experiential educational programs within the watershed – like Wildlands Conservancy’s Bike & Boat, Navigators, and River Rat programs – that expose students to the culture and environments of the Lehigh River watershed.
- c. Recommendation:** Continue and expand the Northampton County Junior Conservation School and other school-related programs designed to expose students to the outdoors.
- d. Recommendation:** Support the Pennsylvania Envirothon.

- e. Recommendation:** Support student involvement in watershed groups.
- f. Recommendation:** Continue the Lehigh River Sojourn and other programs designed to promote river awareness.
- g. Recommendation:** Create original productions like 'My Name is Jeremiah' dealing with the Lehigh River watershed and its resources.
- h. Recommendation:** Maintain and expand a 'Walk on the Watershed Map' of the Lehigh River watershed, and conduct in-school programs.
- i. Recommendation:** Develop and distribute educational Lehigh River watershed book covers to school districts within the Lehigh River watershed.
- j. Recommendation:** Develop educational programs that are aligned with the Pennsylvania Academic Standards.
- k. Recommendation:** Incorporate watershed themes into school districts' education programming (Northampton Middle School is a model).
- l. Recommendation:** Cooperate and provide assistance to student groups and school districts conducting monitoring projects in the Lehigh River watershed.
- m. Recommendation:** Maintain and make available to the public the Harry C. Trexler Lehigh River Watershed Exhibit Center at Pool Wildlife Sanctuary in Emmaus.
- n. Recommendation:** Hold and support an annual Pennsylvania Youth Summit.

III. OBJECTIVE: PROVIDE EDUCATIONAL OPPORTUNITIES FOR EDUCATORS WITHIN THE LEHIGH RIVER WATERSHED.

- a. Recommendation:** Provide continuing education classes on the resources of the Lehigh River watershed.
- b. Recommendation:** Develop and hold field trips and educational tours of the Lehigh River watershed.
- c. Recommendation:** Provide training on the Pennsylvania Academic Standards using the Lehigh River watershed.
- d. Recommendation:** Provide technical support for teachers and school districts using the Lehigh River watershed as a resource.
- e. Recommendation:** Develop a committee of Lehigh River watershed educators to continue, create, and expand educational opportunities and ideas for students of the Lehigh River watershed.

IV. OBJECTIVE: SUPPORT ORGANIZATIONS AND ACTIVITIES, WHICH PROTECT WATERSHED RESOURCES

- a. Recommendation:** Contact local, county, state, and federal government officials to encourage them to financially support all programs which enhance, protect, and restore environmental resources.
- b. Recommendation:** Promote the use of federal tax credits and state and federal grants to revitalize historic communities by providing information and assistance regarding applying for funds.
- c. Recommendation:** Provide funding for educating potential farmers at colleges, universities, and trade schools.

d. Recommendation: Support financially organizations and activities, which protect environmental resources.

V. OBJECTIVE: HOLD PUBLIC MEETINGS AND FORUMS

a. Recommendation: Hold an annual Lehigh River watershed partnership forum.

b. Recommendation: Develop articles and editorials in local newspapers, as well as television and radio features, to keep the general public well informed about issues and activities in the Lehigh River watershed.

c. Recommendation: Develop and conduct periodic seminars on environmental topics affecting the Lehigh River watershed.

d. Recommendation: Work with the Penn State Cooperative Extension, County Conservation Districts, and NRCS to promote education about Best Management Practices to farmers.

H. GOAL: Monitor and Update Watershed Resource Information on a Continuing Basis

Maintaining and updating records on the condition of the watershed is essential for recognizing and assessing threats that may disrupt the balance of the ecosystem. Monitoring watershed resources can also be used to demonstrate the effectiveness of restoration and preservation projects. This section lists recommendations for the continued monitoring and updating of watershed resource information.

I. OBJECTIVE: CONDUCT WATER QUALITY SAMPLING AND ANALYSIS.

a. Recommendation: Coordinate water-quality monitoring efforts within the watershed.

b. Recommendation: Develop and maintain continuous water-quality monitoring on the Lehigh River.

c. Recommendation: Conduct water sampling and analysis of the Lehigh River tributaries on a regular basis to:

- Identify problem areas on which to focus remediation;
- Monitor and document changes in overall health of the watershed while providing background information for future studies and projects; and
- Note adjustments that should be made in management practices.

d. Recommendation: Conduct stream walks annually to monitor physical changes within the watershed such as sedimentation, streambank stabilization, and vegetative cover.

e. Recommendation: Standardize sampling protocols and reporting procedures throughout the watershed.

f. Recommendation: Promote and enhance communication between groups monitoring the Lehigh River and its tributaries.

g. Recommendation: Continue and support the sampling programs of Tobyhanna/Tunkhannock Creek Watershed Association.

- h. Recommendation:** Monitor the effects of abandoned mine drainage remediation projects.
- i. Recommendation:** Create real-time water-quality monitoring on the Lehigh River at the Northampton Borough Municipal Authority and other appropriate locations.
- j. Recommendation:** Conduct comprehensive sediment studies for Lehigh River tributaries.
- k. Recommendation:** Complete visual stream assessments, such as U.S. Environmental Protection Agency's "Rapid Bio-assessment Protocols" or U.S. Department of Agriculture's "Stream Visual Assessment Protocols" for Lehigh River tributaries.
- l. Recommendation:** Complete fluvial geomorphic stream assessments, stream classifications, and restoration plans for Lehigh River tributaries.

II. OBJECTIVE: CONDUCT BIOLOGICAL MONITORING.

- d. Recommendation:** Maintain records of the condition of the stream-corridor habitat and the vegetative, aquatic, and wildlife species present within that corridor.
- e. Recommendation:** Conduct research on the flora and fauna of the Lehigh River watershed, i.e., mammal, bird, fish, macro-invertebrate, native and exotic trees/shrubs, and wildflower inventories.
- f. Recommendation:** Conduct periodic macro-invertebrate sampling.
- g. Recommendation:** Encourage the implementation of monitoring standards for volunteer-stewardship, youth-education, and stream-watch programs to survey or maintain stream corridor vegetation, stream quality, and biological habitat.
- h. Recommendation:** Provide resources, equipment, and expertise for area school districts, colleges, and watershed groups interested in conducting water-quality and water-quantity monitoring on the Lehigh River and its tributaries.

III. OBJECTIVE: DEVELOP, UPDATE, AND MAINTAIN WATERSHED RESOURCE INFORMATION

- d. Recommendation:** Develop and update a watershed-wide database that will include water, land, cultural, and biological resource information.
- e. Recommendation:** Make the database and interactive GIS information available on the web.
- f. Recommendation:** Utilize and support Lehigh University as a clearinghouse for Lehigh River watershed information.
- g. Recommendation:** On a regular basis, visually inspect the watershed to identify and examine areas of concern, and to identify potential opportunities to protect its natural, cultural, historic, and recreational resources.
- h. Recommendation:** Establish and maintain regular features in the media throughout the watershed about the resource.
- i. Recommendation:** Develop watershed conservation or watershed restoration plans for key sub-watersheds of the Lehigh River (Specific examples included in Addendum A).
- j. Recommendation:** Complete an update of this Lehigh River Watershed Conservation Management Plan every five years.
- k. Recommendation:** Complete a State of the Lehigh River Report every five years, at a minimum.

Addendum A

SPECIFIC RECOMMENDATIONS

Recommendation: Work with and help establish historical societies throughout the watershed. Specific examples included Lynn Township, Lehigh County.

Recommendation: Work with historical societies and the Pennsylvania Historical and Museum Commission to create and maintain a collection of historical documents, photographs, paintings, etc., of the Lehigh River and its watershed. Specific examples include Lower Saucon Township, Northampton County.

Recommendation: Preserve and restore historic structures and districts important on a local, county, state, and/or federal level. Specific examples include:

- The central business district in the city of Easton;
- Log house and farm houses and barns in Lower Macungie Township, Lehigh County;
- The Old Mill Bridge, Meadows Bridge and Heller Homestead in Lower Saucon Township, Northampton County;
- Canal boat artifacts in the Borough of Northampton, Northampton County;
- Historic homes in the Borough of Macungie, Lehigh County;
- The Helfrich Springs Grist Mill and Grim Homestead in Whitehall Township, Lehigh County;
- The old post office and old grist mill in the Borough of White Haven, Luzerne County;
- The Kreidersville covered bridge in Allen Township, Northampton County.

Recommendation: Establish riparian buffers along streams within the Lehigh River watershed. Specific examples include:

- Unnamed tributary to the Monocacy Creek, located west of Rt. 987 in Moore and East Allen townships, Northampton County;
- Little Lehigh Creek along Spring Creek Road in Lower Macungie Township, Lehigh County;
- Saucon Creek located immediately downstream of Chestnut Hill Road/Bridge crossing in Upper Saucon Township, Lehigh County;
- Hokendauqua Creek at Kreidersville Covered Bridge Park in Allen Township, Northampton County;
- Leibert Creek and its tributaries in Emmaus Borough and Upper Milford Township, Lehigh County.

Recommendation: Provide technical assistance in the form of information, funding sources, and demonstrations to municipal officials and landowners for dealing with riparian issues and riparian restorations. Specific examples include:

- Kidder Township, Carbon County – Restoration and flood controls are needed in the Hickory Run Stream and the Mud Run Creek;
- Borough of Macungie, Lehigh County – Mountain Creek and Swabia Creek;
- Whitehall Township, Lehigh County – Riparian buffer areas need improvement at Coplay Creek, Jordan Creek, and the Lehigh River;
- Eldred Township, Monroe County -- Riparian buffer needs improvement in the Buckwha Creek area.

Recommendation: Complete fluvial geomorphic assessments and develop stream restoration plans for streams. Specific examples include:

- Jordan Creek at Covered Bridge Park in South Whitehall Township, Lehigh County;
- Jordan Creek at Jordan Park in Allentown, Lehigh County;
- Catasauqua Creek at Willow Brook Golf Course, Catasauqua Borough, Northampton County;
- Saucon Creek at Saucon Valley Country Club, Upper and Lower Saucon townships, Lehigh and Northampton counties;
- Saucon Creek at Saucon Park, Bethlehem Township, Northampton County;
- Little Lehigh Creek at Wildlands Conservancy/Pool Wildlife Sanctuary, Lower Macungie Township, Lehigh County;
- Mahoning Creek, Lehighton Borough, Carbon County.

Recommendation: Remove low-head run-of-the-river dams in the Lehigh River watershed, where feasible and appropriate, to reduce thermal pollution, improve water quality, restore fish passage, and improve aquatic habitat. Specific examples include:

- Lehigh River below Bowmanstown, Carbon County;
- Hokendauqua Creek at Petersville Rod and Gun Club in Moore Township, Northampton County;
- Monocacy Creek in the city of Bethlehem, south of Route 22;
- Catasauqua Creek at the Willow Brook Golf Course, Catasauqua Borough, Northampton County;
- Little Lehigh Creek at Wildlands Conservancy/Pool Wildlife Sanctuary, Lower Macungie Township, Lehigh County;
- Leibert Creek, Furnace Dam, Upper Milford Township;
- Unnamed tributary to the East Branch of the Monocacy Creek in Lower Nazareth Township, Northampton County.

Recommendation: Remove rock dams and establish a riparian buffer on streams. Specific examples include:

- Saucon Park, Bethlehem Township, Northampton County; and
- Lizard Creek at Andreas Sporting Club on Rt. 895 in Andreas, West Penn Township, Schuylkill County.

Recommendation: Implement and promote the use of agricultural BMPs such as stream fencing, agricultural crossings, and riparian buffers to reduce non-point source pollution, improve water quality, and improve aquatic and terrestrial habitats on agricultural lands along tributaries of the Lehigh River. Specific examples include:

- Dry Run Creek in Allen Township, Northampton County;
- Little Lehigh Creek in Longswamp Township, Berks County;
- Switzer Creek at the intersection of Bausch and Miller Roads in Lynn Township, Lehigh County;
- Saucon Creek, Northampton County.

Recommendation: Develop new greenways to connect to existing greenways. Specific examples include:

- Lands that connect Little Lehigh Creek headwaters with preserved farms and surrounding farmlands;

- Lands that connect the Robert Rodale Reserve and the South Mountain Preserve (both on South Mountain) with Walking Purchase Park in Salisbury Township;
- Longswamp Township, Berks County – develop a regional recreational greenway plan;
- Borough of White Haven, Luzerne County – develop greenway/trail connection to Hazleton from Lehigh Gorge;
- Bushkill Township, Northampton County – develop a township-wide greenway plan which connects with greenways in adjacent municipalities in the watershed;
- City of Bethlehem, Northampton County – develop linear greenway park along the old Southern rail line;
- Upper Milford Township – develop a greenways plan to serve as a blueprint of green infrastructure in which stormwater management, natural landscaping, and ecological restoration and management are integrated into land development projects and to protect the Little Lehigh, Indian, and Swabia Creek riparian zones;
- Washington Township, Lehigh County – implement the Slate Heritage Trail Master Plan;
- Washington Township, Lehigh County – develop spur rail-trail off of Slate Heritage Trail

Recommendation: Protect mountainous areas. Specific examples include:

- South Mountain (Emmaus) – acquire land to add to the South Mountain Preserve and develop a management plan for the preserve;
- Kittatinny Ridge/Blue Mountain (throughout watershed) – protect open space and natural areas from development;
- Jonas Mountain – protect natural areas and wildlife habitat of Jonas Mountain, Polk Township, Monroe County.

Recommendation: Encourage municipalities to develop an official wetland map to be used to facilitate open discussions with developers over wetland delineations. Specific examples include:

- Longswamp Township, Berks County;
- Kidder Township, Carbon County;
- Lynn Township, Lehigh County;
- Upper Milford Township, Lehigh County.

Recommendation: Protect open space, as is feasible, adjacent to schools, colleges, retirement centers, hospitals, and other public and private institutions. Specific examples include:

- Lower Macungie and Upper Milford townships, Lehigh County-protect 24-acre and 51-acre tracts as open space adjacent to East Penn School District.

Recommendation: Design and implement gateway gardens, utilizing Best Management Practices and native plant species, to create gateways into communities. Specific examples include:

- Nesquehoning Township, Carbon County;
- Lake Harmony and Kidder townships, Carbon County;
- Trexlertown and Upper Macungie townships, Lehigh County.

Recommendation: Address and/or support specific brownfield projects. Specific examples include:

- Lebanon Chemical and City Incinerator sites, Lehigh County;
- City of Bethlehem, former Bethlehem Steel properties, Northampton County;
- Palmer Twp., former Bethlehem Corp. site, Northampton County;
- Palmerton Borough, Horsehead Industry Corp., Carbon County;

- Banks Township, strip mines, Carbon County;
- Borough of White Haven, old printing factory, Luzerne County;
- Lehigh Landing (former A&B Meat Packing Plant), City of Allentown.

Recommendation: Develop all-terrain vehicle (ATV) recreational alternatives on appropriate lands within the Lehigh River watershed. Use mine-impacted lands where feasible. Specific examples include Borough of White Haven, Luzerne County.

Recommendation: Establish and support rails-to-trails and trail projects in the Lehigh River watershed. Specific examples include:

- Bodnarczuk Tract, Hokendauqua Creek, Allen Township, Northampton County;
- Thornhurst Township, Lackawanna County – develop township-owned land for public access to the Lehigh River and active and passive recreational areas;
- Borough of Macungie, Lehigh County – connecting parks in borough and connecting to Lock Ridge Park in Alburdis, Lower Macungie Township and Borough of Alburdis;
- Upper Milford Township, Lehigh County – study township and develop trail plan;
- Salisbury Township, Lehigh County; protect land along Trout Creek, and develop a trail system;
- Allen Township, Northampton County – develop the existing towpath along the Lehigh Canal;
- Borough of White Haven, Luzerne County – new trail development plan on the rail-trail north of White Haven;
- Thornhurst Township, Lackawanna County – public access to the Lehigh River, active and passive recreational areas;
- Borough of White Haven, Luzerne County – assessment of regional recreational scope
- Longswamp Township, Berks County – develop a recreational trail through the Macungie Mountain Ridge woodland;
- Upper Saucon Township, Lehigh County – rails-to-trails project;
- City of Allentown, Lehigh County – Little Lehigh Parkway.

Recommendation: Enhance existing trails and rails-to-trails projects. Specific examples include:

- D & L Trail along the Lehigh River;
- Ironton Rail –Trail, Whitehall and North Whitehall townships and the Borough of Coplay, Lehigh County;
- Buckwha Creek Trail – completion of trail and parking lot design and construction Lower Towamensing Township, Carbon County;
- Nor-Bath Trail, East Allen Township, Northampton County;
- Switchback Trail, Carbon County;
- The Appalachian Trail, Carbon, Lehigh, Monroe, and Northampton counties;
- Northern Lehigh Slate Trail.

Recommendation: Annual or semi-annual clean-ups should occur throughout the Lehigh River watershed. Specific examples include:

- Main stem of the Lehigh River from Allentown to Easton;
- The D & L Trail;
- The main stem of the Jordan Creek in the city of Allentown;
- Thornhurst Township, Lackawanna County – Lehigh River and adjacent lands;

- Various slate and limestone quarries throughout Lehigh and Northampton counties;
- The Appalachian Trail.

Recommendation: Support wellhead-protection ordinances and programs in municipalities, especially those without public sewers. Specific examples include Covington Township, Lackawanna County and Eldred Township, Monroe County.

Recommendation: Adopt environmentally beneficial ordinances in municipalities dealing with environmental-ordinance issues. Specific examples include:

- Palmer Township, Northampton County – support and provide information on conservation district ordinances;
- Lower Milford Township, Lehigh County – adopt natural features preservation zoning;
- Lynn Township, Lehigh County – update conservation district ordinances.

Recommendation: Promote the creation of watershed organizations on tributaries of the Lehigh River. Specific examples include:

- Black Creek;
- Cedar Creek;
- Coplay Creek;
- Jordan Creek;
- Lizzard Creek;
- Mahoning Creek;
- Nesquehoning Creek;
- Saucon Creek;
- Sandy Run.

Recommendation: Promote the formation of environmental advisory councils (EACs) in each of the watershed municipalities. Specific examples include:

- Longswamp Township, Berks County – develop an EAC to address water issues;
- Kidder Township, Carbon County – institute an EAC to address trail, stormwater management, water control, and development issues.

Recommendation: Develop watershed conservation or watershed restoration plans for key sub-watersheds of the Lehigh River. Specific examples include:

- Aquashicola Creek;
- Black Creek;
- Cedar Creek;
- Coplay Creek;
- Hokendauqua;
- Lizard Creek;
- Nesquehoning Creek;
- Pohopoco Creek;
- Saucon Creek;
- Sandy Run;
- Tobyhanna/Tunkhannock Creeks

References

RECOMMENDATIONS

Reynolds, Lou and Leroy Young. Investigation of the Effect of White Water Boating Releases from the F.E. Walter Reservoir on Benthic Macro-Invertebrate Communities in the Lehigh River. PA Fish and Boat Commission, 2000.